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## RN6BN`s new 32 x 15 ele xpol

# Inhalt / Content 4/04

**Title: RN6BN`s new 2m EME array in KN95: 32 x 15 Ele. X-yagi**

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# Editorial

Dear DUBUS Reader!

Here is the last issue for 2004 and it is time again to ask you to renew your subscription for 2005 with your national distributor (or directly with us) as soon as possible.

We would be happy to see all subscriptions renewed again for 2005, of course.

Furthermore we would like to ask you to consider to sponsor subscriptions for VHF newcomers. May be this will result in more weak signal OPs in interesting squares! For sure it will help to keep this magazine alive. To be honest we need something like this otherwise DUBUS magazine will be history in a couple of years thanks to the web and decreasing amateur radio activity.

Please check the new rules for the EU WW EME contest 2005 on page 67. We hope to satisfy as many of you as possible with the new rules.

With JT1 to come very soon EME will become a mode that can be worked by any average Tropo station. So let`s hope for a boost in EME activity in 2005!

Please keep sending your reports and technical articles for the benefit of all readers. Thank you!

Seasons`s Greetings to all readers and friends and all the best for 2005

from Joe, DL8HCZ / CT1HZE
and the DUBUS team!

Liebe DUBUS Leser!

Hier ist nun die letzte Ausgabe für das Jahr 2004 und es ist schon wieder Zeit, das Abo für 2005 zu verlängern. Wir bitten alle unsere Bezieher in DL zu unserer Arbeitserleichterung, das Abo für 2005 möglichst zwischen dem 1. Januar und dem 28. Februar 2005 zu verlängern. Der Abo-Preis beträgt 22 Euro für 2005. Wir würden uns freuen, wenn uns möglichst alle Leser auch im Jahr 2005 weiterhin treu bleiben.
Darüberhinaus möchten wir unsere Leser einmal bitten, zu überlegen, ob nicht eventuell auch einmal ein DUBUS-Abonnement für einen VHF-Newcomer gesponsert werden könnte. Vielleicht resultiert das dann in mehr VHF-DX-Aktivitäten aus seltenen Feldern etc. Und es würde natürlich DUBUS helfen, „am Leben" zu bleiben. Denn ehrlich gesagt, ohne eine derartige Aktion wird DUBUS sonst in einigen Jahren „Geschichte" sein.

Auf Seite 67 finden sich die neuen Ausschreibungsbedingungen für den EU WW EME Contest 2005. Wir hoffen, es damit möglichst vielen Recht zu machen. Mit dem in Kürze kommenden JT1-Mode wird EME eine Betriebsart, die sogar von nahezu jeder kleinen Tropo-Station gearbeitet werden kann. Also: Hoffen wir auf eine explodierende EME-Aktivität in 2005!

Wir bitten weiterhin zahlreich Aktivitätsberichte und technische Artikel einzusenden, damit alle Leser davon profitieren können.

Wir wünschen unseren Lesern und Freunden alles Gute für 2005!

vy 73 von Joachim, DL8HCZ / CT1HZE
und vom ganzen DUBUS-Team!

# Septum Feed – History in OK

*by Frantisek Srihavka, OK1CA*

The need to control MAGION science satellites launched in 1992 by the Geophysical Institute of the Academy of Science of Czech Republic, ASCR, created the requirement for a dish antenna feed with both circular polarizations. Franta, OK1CA, an employee of ASCR, asked J. Kysela, OK1AHH /silent key 2001/, a professional RF antenna designer at the Radioelectronic Institute of TESLA Pardubice, now ERA Pardubice, to help to design and develop the required feed. Kysela designed the septum feed for a 10 m dish in 1992. This feed was used for receiving telemetry from MAGION 4 and 5 satellites on 1.6 GHz.

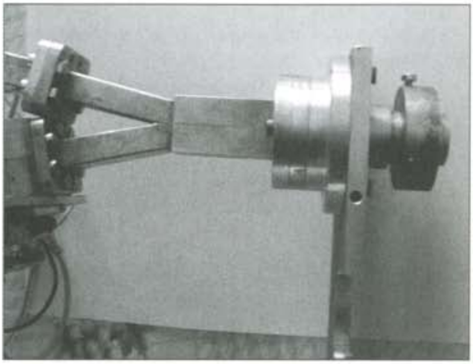
At the same time, members of radio club OK1KIR were looking for a feed suitable for EME applications at 5.7 and 10 GHz. Kysela designed these septum feeds for both bands, probably based on IEEE references. A feed for 10 GHz, designed by Kysela, was first built by Antonin, OK1DAI, in early 1993 with construction of the 5.7 GHz feed beginning in the later half of the same year. Feeds for other amateur radio bands have been designed basing on these two examples. Antonin published technical information on the 5.7 and 10 GHz feeds in the French magazine "HYPER" for the 1998 EME conference in Paris. Additional information on septum feed was published by Zdenek, OK1DFC, on a CD ROM prepared for the 2002 EME conference in Prague.

Franta designed and built a 10 m dish antenna incorporating a septum feed in a Cassegrain configuration in early 1995. The first QSO on 23 cm was established on 7 May 1995. The first contact on 13 cm was made by Franta on 27 March 1999.

All feeds described above were manufactured according to Kysela's design, using a square shaped waveguide coupled to a circular aperture. Feeds were of simple design or perhaps included a multi-collar choke. The septum feed described by Zdenek for the 2002 EME conference in Prague employed a square shaped aperture. This type of septum feed is mechanically simple to manufacture and is suitable for deeper dishes with f/d ratios of 0.35 to 0.40.

Septum feed design continues to evolve with further improvements being made to the basic configuration, such as the modified feed developed by R. Galuscak, OM6AA, which is described in the following article.

**OK1DAI 5.7 GHz Septum Feed**



**OK1DAI 10 GHz Septum Feed**

**Measurement preparation, left OM6AA, right Mr. Bartik, head of the anechoic chamber of CTU in Prague**

# Die Gechichte des Septum Feed in OK

**von *Frantisek Srihavka, OK1CA***

Um die MAGION Wissenschaftssatelliten, die 1992 vom Geophyikalischen Instiut der Tschechischen Akademie der Wissenschaften (ASCR) gestartet wurden, steuern zu können, wurde ein Spiegel-Feed benötigt, das beide zirkularen Polarisationen liefern kann.
Franta, OK1CA, ein Angestellter der ASCR, fragte J. Kysela, OK1AHH (silent key 2001), der als professioneller HF-Antennen-Entwickler beim Radioelektronischen Institut TESLA in Pardubice, jetzt ERA Pardubice, arbeitete, ob er helfen könnte, das benötigte Feed zu zu designen und zu entwickeln. Kysela entwickelte also 1992 das Septum Feed für einen 10m Spiegel.
Dieses Feed wurde dazu benutzt, die Telemetrie der MAGION 4 und 5 Satelliten auf 1.6 GHz zu empfangen.

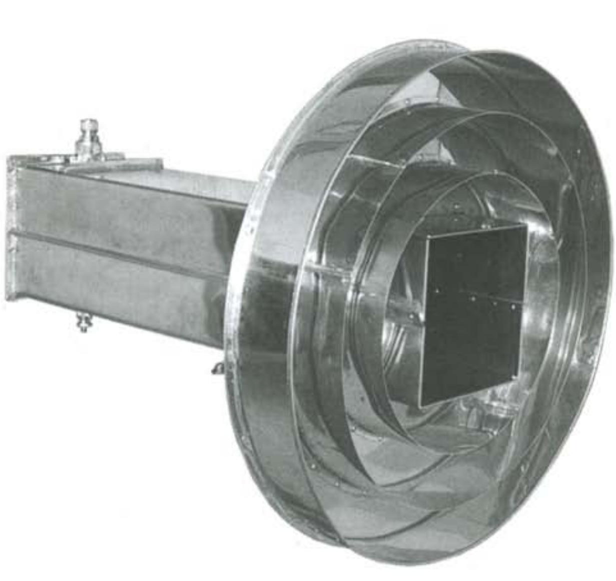
Zur selben Zeit suchten Mitglieder des Radio Club von OK1KIR ein passendes Feed für EME-Anwendung auf 5.7 und 10 GHz. Kysela entwickelte für beide Bänder Septum Feeds, die wahrscheinlich auf IEEE-Referenzen zurückgehen.
Ein 10-GHz-Feed nach Kysela wurde dann erstmalig von Antonin, OK1DAI, Anfang 1993 gebaut. In der zweiten Jahreshälfte wurde dann das 5.7 GHz Feed gebaut. Feeds für andere Amateurfunkbänder wurden dann basierend auf diesen beiden Feeds designed. Antonin publizierte erstmals technische Informationen über das 5.7 und 10 GHz-Feed in dem Französischen Magazin „Hyper" anlässlich der EME Konferenz 1998 in Paris.
Weitere Informationen über das Septum Feed wurden von Zdenek, OK1DFC, auf einer CD ROM für die EME Konferenz in Prag 2002 zusammengestellt.

Franta, OK1CA, designte und baute einen 10m-Cassegrain-Spiegel mit einem Septum-Feed Anfang 1995. Das erste QSO auf 23cm wurde damit am 7. Mai 1995 gestätigt. Das erste 13cm-QSO folgte am 27. März 1999.
Alle oben erwähnten Feeds wurden basierend auf Kyselas Design unter Verwendung eines quadratischen Wellenleiters gekoppelt an eine runde Öffnung hergestellt. Die Feeds blieben einfach so oder wurden ggf. mit einem Choke aus mehreren Ringen versehen.
Das Septum Feed, das von Zdenek, OK1DFC, zur EME Konferenz 2002 in Prag vorgestellt wurde, arbeitet mit einer quadratischen Öffnung.
Diese Ausführung des Septum Feed ist mechanisch einfach herzustellen und brauchbar für tiefere Spiegel mit f/d-Verhältnissen von 0.35 bis 0.40.

**OM6AA`s Modified Septum Feed in anechoic chamber**

Das Design von Septum Feeds geht weiter und Verbesserungen zur Grundkonfiguaration konnten erreicht werden, wie bei dem modifiziertem Septum Feed, das von Rastislav Galuscak, OM6AA, enwickelt wurde, und das im folgenden Artikel beschrieben wird.

**OM6AA`s Feed – close view**



# Septum Feed Revisited

*by Rastislav Galuscak, OM6AA*

### Introduction

Septum feed was evaluated when I considered new feed configurations for my larger dish antenna. Franta, OK1CA, developed and Zdenek, OK1DFC [1], described septum feed for hams working on 23 and 13 cm. Computer analysis of this feed configuration performed by Paul Wade, W1GHZ [2], gave good results. Paul's analysis inspired me to improve the efficiency of my septum feed by adding "multi-collar rings," also referred to as a "choke." This type of modified circular feed is known as "Chaparral" style feed [3].

According to this reference, I have added three rings with minimal spacing between rings of 0.22 λ, so as not to block a relatively small dish diameter of 16.4 λ. Dimensions of the resulting modified feed assembly for 23 cm are shown in FIG 1. The feed assembly was made from 0.8mm thick polished stainless steel plate. Stainless steel was chosen for its superior anti-corrosive properties, unlike those of copper or aluminum. Incremental loss is minor; only a few thousanths of a dB on 23 cm compared to copper. However, at higher frequencies a material with higher conductivity should be used.

Inside the feed assembly, the septum is soldered to the feed body on both sides and is attached by rivets to the plate at the closed end. The end plate is also soldered to the feed body. The area around the connectors is mechanically reinforced by a second plate formed in a "U" shape on which the coaxial connectors are mounted. The rings are affixed with rivets and the widest one is soldered from the outer side as well. The TX port employs a 7/16" female connector and its probe is a 6mm diameter silver plated brass rod. Minimum VSWR is adjusted by the probe length and also with a tuning screw that is perpendicular to the probe. The RX port employs a male, "N" type, connector and its probe is a 2.3mm diameter rod, also of silver plated brass. Minimum VSWR here is adjusted by the probe length only.

My interest in studying the performance of the modified septum feed led me to Czech Technical University (CTU) in Prague, where I was able to take advantage of their interest in this device. Thanks to Prof. Miloš Mazánek, head of the Department of Electromagnetic Fields, I was able to perform and publish these measurements.

All measurements were performed in an anechoic chamber at CTU. The feed assembly being tested was placed on a rotating turntable as a receiving antenna, for all pattern measurements.
A wide-band horn was used as the transmitting antenna. The measurement configuration is shown in FIG 2. Both antennas were able to rotate 90 degrees longitudinally for specific measurements. The feed assembly probe orientation (vertical or horizontal) was used to define elevation and azimuth planes. Similarly, v or h polarization defines the orientation of the transmitting antenna.

"FEEDPATT" software, written by W1GHZ [4], was used to evaluate the feed efficiency in a dish antenna. The "ANT-PC " program package, developed by Miroslav Procházka [5] and "PARPACUP.for" software, developed by Thomas Milligan [6] and modified by Miroslav Procházka, were used to calculate the dish antenna's resulting radiation pattern and directivity.

The following measurements have been performed:

I. Impedance Match at RX and TX Ports
II. Impedance Match Changes against a Conductive Plate
III. Comparison of Radiation Characteristics at RX and TX Ports
IV. Radiation Patterns at both Ports with various choke positions
V. Feed Pattern Frequency Dependency
VI. Isolation Between Ports
VII. Phase Center Position

### I. Impedance Match at RX and TX Ports

Measurement condition: Choke flush, free space.
An ANRITSU S400A Site Master transmission line and antenna analyzer was used for these measurements. Results are shown in FIG 3.
The return loss at the RX port is about 40 dB. This very good impedance match can be viewed as a trade-off for narrower bandwidth. A return loss 33 dB was achieved at the TX port, with wider bandwidth.

### II. Impedance Match Changes against a Conductive Plate

Measurement condition: Choke flush.
These measurements were made to investigate VSWR changes that may be encountered when assembling the feed to a dish. A 1m x 1m conductive plane plate positioned normal to the feed's longitudinal axis was used to simulate the dish. The distance between the feed and plate was varied from 50 cm to 90 cm. The resulting VSWR performance is shown in FIG 4 and FIG5.
At distances over 90 cm, VSWR changes were negligible.

Shorter distances between the feed and conductive plane simulate the effects of a deeper and smaller dish. At these shorter distances, VSWR ripple was observed. This indicates that when assembling the feed to a deeper and smaller dish, probe length adjustments may be necessary.

### III. Comparison of Radiation Characteristics at RX and TX Ports

Measurement condition: Choke flush.

These measurements, which compare radiation patterns at both ports, gave the first indication of feed circularity. Radiation patterns were measured with vertical feed orientation and both horizontal and vertical transmitting antenna polarizations. Initially, the feed's vertical axis of rotation was placed at the geometrical center of the feed assembly, midway between the closed end and the open end or aperture. With the axis located there, the observed radiation pattern was narrower than it actually was.

For all further pattern measurements, the feed's vertical axis of rotation was placed at the feed's aperture, where the phase center position is expected. Results are shown in FIG 6.

Essentially identical radiation patterns were observed between the angles of 125 and 235 degrees with very good axial ratio, so good circularity is achieved at 180 degrees. The difference between ports is a maximum of only 0.7 dB at 180 degrees. From the graph, it is obvious that levels at the RX and TX ports are equivalent and the choke in this position does not degrade the circularity of the feed.

### IV. Radiation Patterns at both Ports with Various Choke Positions

Measurement condition: The choke position was varied along the feed body toward the closed end according to FIG 7.

Feed radiation patterns were measured at both ports for the following choke positions:

**1. Flush with open end, x = 0**
**2. Choke 30 mm back, x = 30**
**3. Choke 60 mm back, x = 60**
**4. Bare feed, no choke**

Normalized radiation patterns at the RX port for vertical and horizontal feed orientations and for vertical and horizontal transmitting antenna polarizations are shown in FIG`s 8 through 11. Patterns were normalized to their respective maximums. We can see how the choke position affects the beam width as well. Moving the choke back toward the closed end of the feed assembly makes the beam wider, but differences between the polarizations increase.

The resulting dish antenna efficiency for the RX port with various choke positions was calculated using FEEDPATT software. These results are shown in FIG's 12 through 15. These calculations are based on average values from vertical and horizontal polarization measurements for the appropriate plane with adjustments made for variations in symmetry, since both software programs assume symmetrical radiation patterns. From these figures it is apparent that the ring choke improves the efficiency of a dish of this size. Additionally, the use of a choke gives us the opportunity to tailor the feed's beam width appropriately for a given dish. For very deep dishes, good efficiency may be achieved, but with some associated degradation of circularity.

The dish antenna's directivity, Sa and resulting radiation pattern were calculated using ANT-PC and PARPACUP.for software. The PARPACUP.for program does not use actual measured values, but calculates the approximate radiation pattern using $\cos^N \theta$. The exponent, N, is based on dish edge illumination. FIG 16 shows calculated results for the bare feed configuration where the dish aperture is partially blocked by the square waveguide supported by four 14 mm diameter struts. In FIG 17, calculated results for the feed configuration having the choke 30 mm back and the same dish aperture blockage are shown. The program does not perform calculations using feed efficiency.

Similar results were obtained at the TX port. This port generates opposite, left-turn circular polarization. Radiation patterns are shown in FIG's 18 and 19. As the patterns are nearly identical with those obtained at the RX port, only one plane was measured. Also, because of only minor differences between ports, antenna efficiency for the TX port was not calculated.

For all calculations, a phase center position at the feed's aperture was assumed.

### V. Feed Pattern Frequency Dependency

Measurement condition: Choke flush

This test provides information on how the feed radiation pattern depends on frequency. These measurements are useful for the 13 and 3 cm bands, where split frequency EME operation is common. Feed dimensions scaled according to frequency should not have an influence on the radiation pattern. The feed pattern's response to frequency is shown in FIG20 and FIG21. Only a small enlargement of the pattern is observed, especially on the TX port at higher frequencies.

### VI. Isolation Between Ports

Measurement condition: TX port driven by HP 8350 B signal generator, RX port analyzed with HP 8564 E spectrum analyzer.

Very good isolation between ports, 31 dB, was measured on a bare feed assembly beaming to free space. This isolation decreased to 21 dB when a choke in the flush position was added.

Mounting the feed assembly onto a dish resulted in a further reduction in isolation between the ports. This is due to a portion of the reflected signal, which exhibits opposite rotational polarization, radiating back into the feed assembly. Dish antenna efficiency is reduced by approximately this amount. This is not a problem unique to septum feed, but in general, to most feed configurations that work with reversed polarization. To investigate this, a feed assembly having a choke in the flush position was tested against a conductive plate, which was again used to simulate a dish. Isolation was seen to vary with the feed-to-plate distance and isolation ripple of between 16 and 30 dB was measured. A worst-case isolation of 16 dB was measured with short distances between the feed assembly and the plate. A diagram of this is not available.

In the case of high transmitting power, such as 1kW for example, a signal of about 25W may appear on the RX port. Because of this, a good isolation switch with adequate power handling capability must be used in front of the LNA.

## VII. Phase Center Position

Measurement condition: Choke 15mm back.

Two methods were applied to locate the feed's phase center. The first was based on relative changes in radiation patterns with various distances between the feed's aperture end and its vertical axis of rotation and the geometry of appropriately positioned antennas. This method yielded somewhat imprecise results. Some of the calculations indicated that the phase center position for this feed configuration is located about 2 cm inside the feed's open aperture.

To confirm this, a second method based on constant phase was applied. An Agilent Technologies E8364A network analyzer was used, but no special antennas for circular polarization were available at that time. Consequently, the second measurement also yielded an imprecise result.

Phase center position measurement is very complex and requires special equipment. Perhaps the best method is to use a "sun noise measurement." Regardless, previous measurements indicate that the overall efficiency of the dish assembly is less sensitive to phase center position than to adjustments made for reflected power of reversed polarization.

## Summary and Conclusion

Despite favorable computer analysis, some asymmetry between azimuth and elevation planes was detected and investigated. Neglecting manufacturing inaccuracy and measurement error, this property of the feed assembly is most likely inherent to the square shape of the waveguide. To improve the axial ratio and phase characteristics, some authors report using a series of tuning screws following the septum. Performance is controlled by adjusting the depth of these screws [7]. Others report controlling circularity with additional corner brackets and stiffeners employing a small ground plane [8]. Another solution, mounting a dielectric slab of Teflon behind the septum, was also described [9]. For higher frequencies, a solution employing a corrugated waveguide section following the septum was published [10]. To reduce the asymmetry problem, a circular feed assembly with septum polarizer can be used. This is an area open to further experimentation.

In spite of these problems, septum feed has many advantages for deep-dish applications. A multi-collar ring choke improves efficiency for dishes 10λ and larger. To find the optimum choke position for a dish, the graph of FIG22 was compiled. This graph, for EME use, is based on "low noise" edge illumination of 13 dB. I regret that because of my time schedule, I am unable to discuss practical experience with this feed configuration or to compare it to my present VE4MA style feed at this time.

I plan to place all measurement data on my web site, www.webpark.sk/om6aa , in Excel format. Until this time, measurement data can be obtained by sending me an e-mail request at OM6AA@martinet.sk .

## Acknowledgement

I would like to express my thanks to everyone who helped me create this article.

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# Septum Feed - überarbeitet

*von Rastislav Galuscak, OM6AA*

### Einleitung

Als ich neue Möglichkeiten eines Feeds für meinen größeren Spiegel erwog, wure auch ein Septum Feed untersucht. Franta, OK1CA, entwickelte und Zdenek, OK1DFC [1], beschrieb Septum Feeds für den Amateurfunkbereich auf 23 und 13 cm. Computeranalysen dieser Art des Feeds wurden von Paul Wade, W1GHZ [2] durchgeführt und ergaben gute Ergebnisse. Pauls Analyse inspirierte mich die Effektivität meines Septum Feed durch duch Hinzufügen mehrere konzentischer Ringe – auch als „Choke“ bezeichnet – zu verbessern. Diese Art des modifizierten zirkularen Feed ist auch als "Chaparral" Feed [3] bekannt.

Basierend auf dieser Referenz habe ich drei Ringe mit einem minimalem Abstand von 0.22 lambda zwischen den Ringen hinzugefügt, um nicht den relativ kleinen Spiegeldurchmesser von 16.4 lambda zu blockieren.

Die Abmessungen des resultiereden modifizierten Feed für 23cm sind in Abb. 1 dargestellt. Das Feed wurde aus 0.8mm poliertem Edelstahlblech angefertigt. Edelstahl wurde wegen seiner im Vergleich zu Kupfer und Aluminium überragenden Korrosionsfreiheit ausgewählt. Die Verluste sind nur gering und liegen bei einigen wenigen tausendstel eines dB auf 23cm im Vergleich zu Kupfer. Auf höheren Frequenzen sollte jedoch ein Material mit besserer Leitfähigkeit verwednet werden.

Im Inneren der Feed-Konstruktion ist das Septum auf beiden Seiten an den Körper des Feed gelötet worden und mit Nieten an der Platte des geschlossenen Endes befestigt worden. Die End-Platte wurde ebenfalls mit dem Feed-Körper verlötet. Der Bereich um die Anschlussbuchsen wurde mechanisch durch Anbringen einer zweiten U-förmigen Platte verstärkt, auf der die Koax-Verbinder montiert werden.

Die Ringe sind mit Nieten befestigt und der größte Ring wurde außen auch verlötet. Der TX-Eingang ist eine 7/16" Buchse und die Einkopplung besteht aus versilbertem Messing mit 6mm Durchmesser.

Auf minimales SWR wird abgestimmt durch die Länge der Einkopplung und außerdem auch durch eine Abstimm-Schraube, die sich lotrecht zur Einkopplung befindet. Der RX-Eingang ist ein N-Stecker und die Einkopplung besteht aus versilbertem Messing mit 2.3mm Durchmesser. Hier wird auf minimales VSWR nur durch die Länge der Sonde abgestimmt.

Mein Interesse die Performance dieses modifizierten Septum Feeds zu untersuchen, führte mich an die Technische Universität Prag (CTU), wo ich von deren Interesse an diesem Teil profitieren konnte. Dank Prof. Miloš Mazánek, dem Leiter der Abteilung für Elektromagetische Felder, war ich in der Lage diese Messungen durchzuführen und hier zu publizieren.

Alle Messungen wurden in einem reflektionsfreien Raum der CTU durchgeführt. Das zu testende Feed wurde für alle Messungen auf einem drehbaren Tisch als Empfangsantenne platziert.

Als Sendeantenne wurde ein Breitband-Horn verwendet. Die Meßanordung ist in Abb. 2 dargestellt. Beide Antennen konnten für besondere Messungen auch 90 Grad longitudinal gedreht werden.

Die Orientierung der Sonde (vertikal oder horizontal) der Feed-Konstruktion wurde benutzt, um Elevation und Azimuth-Ebenen zu definieren.

Genauso definiert v oder h Polarisation die Orientierung der Sendeantenne.

"FEEDPATT" Software, die von W1GHZ [4], geschrieben wurde, wurde benutzt, um die Effektivität des Feeds in einem Spiegel zu untersuchen.

Das "ANT-PC" Programm-Paket, das von Miroslav Procházka [5] entwickelt wurde, und "PARPACUP.for" Software, entwickelt von Thomas Milligan [6] und modifiziert von Miroslav Procházka, wurden verwendet, um die resultierenden Strahlungsdiagramme und Direktivität des Spiegels zu berechnen.

Folgende Messungen wurden durchgeführt:

I. Impedanz-Anpassung bei RX und TX Ports
II. Änderungen der Impedanz-Anpassung gegen eine leitende Platte
III. Vergleich der Strahlungscharakteristiken am RX und TX Port
IV. Strahlungsdiagramm an beiden Ports bei unterschiedlichen Choke-Positionen
V. Frequenzabhängigkeit des Strahlungsdiagramms des Feed
VI. Isolation zwischen den Ports
VII. Phasen-Mitten-Position

## I. Impedanz-Anpassung bei RX/TX Ports

Messbedingungen: Choke flush, Freiraum.
Für diese Messungen wurde eine ANRITSU S400A Site Master Transmission Line und ein Antennen Analyzer verwendet. Die Ergebnisse zeit Abb. 3. Der Returnloss am RX Port liegt bei 40dB. Diese sehr gute Impedanzanpassung wird durch schmalere Bandbreite „erkauft". Am TX Port werden 33 dB Return Loss bei breiterer Bandbreite erreicht.

## II. Änderungen der Impedanz-Anpassung gegen eine leitende Platte

Messbedingungen: Choke bündig.
Diese Messungen wurden durchgeführt, um VSWR-Änderungen zu untersuchen, die eventuell auftreten, wenn das Feed in einem Speigel montiert wird. Dazu wurde eine 1m x 1m große ebene leitende Platte längs der Feed-Achse positioniert, um einen Spiegel zu simulieren. Der Abstand zwischen Feed und Platte wurde zwischen 50 und 90cm variiert. Das resultierende VSWR ist in den Abb. 4 und 5 dargestellt. Bei einem Abstand von 90cm und mehr wurden die Änderungen des VSWR unbedeutend.
Kleinere Abstände zwischen Feed und Platte simulieren Effekte eines tieferen und kleineren Spiegels. Bei diesen kürzeren Abständen konnte ein VSWR Ripple beobachtet werden. Diese zeigt auf, dass man bei Einbau des Feeds in tiefe und kleine Spiegel eventuell die Sondenlänge nachjustieren sollte.

## III. Vergleich der Strahlungs-charakteristiken am RX und TX Port

Messbedingungen: Choke bündig.
Diese Messungen, die die Strahlungsdiagramme an beiden Ports vergleichen, gaben einem ersten Eindruck der Zirkularität des Feed. Die Strahlungsdiagramme wurden mit vertikaler Ausrichtung des Feed und vertikaler und horizontaler Ausrichtung der Sendeantenne gemessen.
Anfänglich wurde die vertikale Rotations-Achse des Feed in der geometrischen Mitte des ganzen Feed – also in der Mitte zwischen offenem und geschlossenem Ende – positioniert. In diesem Fall wurde ein engeres Strahlungsdiagramm gemessen als es tatsächlich ist.
Für alle weiteren Messungen der Strahlungscharakteristik wurde die vertikale Rotationsachse an der Öffnung des Feeds platziert, dort wo die Phasen-Mitten-Position erwartet wird. Die Erbenisse zeigt Abb. 6.
Grundsätzlich gleiche Strahlungsdiagramme wurden im Bereich von 125 bis 235 Grad beobachtet bei einem sehr guten axialen Verhältnis, so dass gute Zirkularität bei 180 Grad erreicht wird. Die Differenz zwischen den Ports beträgt maximal nur 0.7 dB bei 180 Grad.
Von der Abbildung ist ersichtlich, das der Level am RX und RX Port äquivalent ist und der Choke in dieser Position die Zirkularität des Feeds nicht verschlechtert.

## IV. Strahlungsdiagramm an beiden Port bei unterschiedlichen Choke-Positionen

Messbedingungen: Die Position des Choke wurde verändert entlang des Feed-Körpers in Richtung des geschlossenen Endes, entsprechend Abb. 7. Die Strahlungsdiagramme des Feed wurden an beiden ports gemessen für die folgenden Choke-Positionen:

1. **Bündig mit dem offenen Ende, x = 0**
2. **Choke 30 mm zurück, x = 30**
3. **Choke 60 mm zurück, x = 60**
4. **Feed alleine, ohne Choke**

Normalisierte Strahlungsdiagramme am RX Port für vertikale und horizontale Feed-Orientierungen und für vertikale und horizontale Polarisation der Sendeantenne zeigen die Abb. 8 bis 11.
Die Diagramme wurde auf ihre respektiven Maxima normalisiert. Man kann nun auch sehen, wie die Position des Choke den Öffnungswinkel beeinflusst.
Wenn man den Choke zurück in Richtung des geschlossenen Endes des Feeds bewegt, wird der Öffnungswinkel größer, aber die Unterschiede zwischen den Polarisationen werden größer.
Die resultierende Effektivität des Spiegels für den RX Port wurde für verschiedene Choke-Positionen mit der FEEDPATT Software simuliert. Die Ergebnisse zeigen Abb. 12 bis 15. Diese Berechnungen basieren auf Durchschnittswerten von vertikelen und horizontalen Polarisationsmessungen für die jeweilige Ebene mit Justierungen bei dem Symmetrieabweichungen, da beide Programme symmetrische Strahlungsdiagramme annehmen.
Anhand der Abbildungen ist ersichtlich, dass der Ring-Choke die Effektivität eines Spiegels dieser Größe erhöht. Zusätzlich ermöglicht die Verwendung eines Choke, den Öffnungswinkel des Feed an einen vorgegebenen Spiegel anzupassen. Für sehr tiefe Spiegel kann eine gute Effektivität erreicht werden, es müssen dann aber einige Abstriche bei der Zirkularität gemacht werden.
Die Direktivität des Spiegels, Sa und die resultierenden Strahlungsdiagramme wurden mit ANT-PC und PARPACUP.for simuliert. PARPACUP.for verwendet nicht die aktuellen Messdaten, sondern errechnet die ungefähren Strahlunsgdiagramme mit Hilfe von $\cos^N \theta$. Der exponent N basiert aus der Ausleuchtung der Ränder des Spiegels.
Abb. 16 zeigt die simuliereten Ergebnisse für das Feed alleine, wobei der Spiegel partiell blockiert ist durch quadratischen Wellenleiter und vier 14mm Streben.
In Abb. 17 wird die Simulation für dieselbe Konfiguration mit dem Choke 30mm zurückgesetzt und derselben Blockierung des Spiegels gezeigt.
Das Programm ermöglicht keine Berechnungen aufgrund der Effektivität des Feeds.
Ähnliche Ergebnisse wurden am TX Port erhalten. Dieser Port generiert entgegengesetzte, linksdrehende zirkulare Polarisation. Die Strahlungsdiagramme zeigen Abb. 18 und 19. Da die Diagramme nahezu identisch mit denen des RX Port waren, wurde nur eine Ebene gemessen. Und, weil es auch nur kleine Unterschiede zwischen den Ports gab, wurde die Effektivität der Antenne für den TX Port nicht berechnet.
Für alle Berechnungen wurde angenommen, dass sich die Position des Zentrums der Phase an der Öffnung des Feeds befindet.

## V. Frequenzabhängigkeit des Strahlungsdiagramms des Feed

Messbedingungen: Choke flush.

Dieser Test liefert Informationen darüber, wie die Strahlungsdiagramme des Feed von der Frequenz abhängen. Diese Messungen sind sinnvoll für das 13cm und 3cm-Band, wo Split-Betrieb bei EME üblich ist.

Die Feed-Dimensionierung im Maßstab auf die Frequenz sollte keinen Einfluß auf die Strahlungsdiagramme haben. Die Frequnzabhängigkeit der trahlungscharakteristik des Feed ist in den Abb. 20 und 21 dargestellt. Nur eine kleine Vergößerung des Diagramms konnte beobachtet werden, dies besonders am TX Port bei höheren Frequenzen.

## VI. Isolation zwischen den Ports

Messbedingungen: Am TX Port ein HP8350B Signal-Generator, RX Port analysiert mit einem HP 8564 E Spectrum Analyzer.

Eine sehr gute Isolation von 31 dB zwischen den Ports bei einem Feed ohne Choke, das in den Freiraum strahlt, wurde gemessen.

Die Isolation sank auf 21 dB, wenn ein Choke in der Flush-Position hinzugefügt wurde.

Wenn man das Feed in einen Spiegel montierte, wurde eine weitere Reduzierung der Isolation gemessen. Dies ist verursacht durch einen Anteil des reflektierten Signals, das zurück in das Feed gelangt. Um etwa diesen Betrag wird auch die Effektivität des Spiegels gemindert.

Dies ist kein spezielles Problem des Septum-Feedm sondern allgemein bei den meisten Feed-Anordnungen vorhanden, die mit umgekehrter Polarisation arbeiten.

Um dies zu untersuchen, wurde ein Feed mit einem Choke in Flush-Position getestet gegen eine leitende Platte, die wieder einen Spiegel simulieren sollte.

Die Isolation variierte mit dem Abstand zwischen Feed und Platte und ein Ripple von 16 bis 30 dB wurde gemessen. Im schlechtesten Fall wurde eine Isolierung von 16 dB bei kurzen Abständen zwischen Feed und Platte gemessen. Hiervon gibt es keine Abbildung.

Im Fall von hoher Sendeleistung, wie z.B. 1 KW, kann dann am RX Port ein Signal von 25 Watt anliegen. Deshalb muss vor dem LNA ein entsprechend gut isolierender und für diese Leistung ausgelegter Schalter vorhanden sein.

## VII. Phasen-Mitten-Position

Messbedingungen: Choke 15mm zurück.

Zwei Methoden wurden angewendet, um Phasen-Mitten-Position des Feed zu lokalisieren.

Die erste Methode basiert auf relativen Änderungen der Strahlungsdiagramme mit verschiedenen Abständen zwischen der Feed-Öffnung und der vertikalen Rotationsachse und der Geometrie passend positionierter Antennen. Diese Methode ergab etwas ungenaue Ergebnisse. Einige dieser Berechnungen ergaben, dass die Phasen-Mitten-Position dieses Feeds etwa 2cm innherhalb der Feed-Öffnung liegt.

Um dies zu bestätigen wurde eine zweite Methode basierend auf konstanten Phasen, angewendet.

Ein Netzwerkanalysator Agilent E8364A wurde verwendet, aber es waren zu diesem Zeitpunkt keine besonderen Antennen für zirkulare Polarisation vorhanden.

Folglich ergab auch die zweite Methode ungenaue Ergebnisse. Die Messung der Phasen-Mitten-Position ist sehr komplex und erfordert spezielles Equipment. Vielleicht ist die beste Methode dafür, das „Messen des Sonnenrauschens"

Jedenfalls zeigen die vorherigen Messungen, dass die Gesamt-Effektivität der Spiegel-Konstrukttion weniger empfindlich in Bezug auf die Phasen-Mitten-Position ist, sondern mehr in Bezug auf Justierungen hinsichtich der reflektierten Leistung und umgegehrten Polarisation.

## Zusammenfassung und Fazit

Entgegen ermutigender Computer-Analysen wurde etwas Assymetrie zwischen horizontaler und vertikaler Ebene entdeckt und untersucht. Läßt man Ungenauigkeiten bei der Herstellung und Messfehler einmal aussen vor, ist diese Eigenschaft des Feeds höchst wahrscheinlich auf die eckige Form des Wellenleiters zurückzuführen.

Um das axiale Verhältnis und die Phasen-Charakteristik zu verbessern, beschreiben einige Autoren die Verwendung von einer Reihe von Abstimmschrauben entlang des Septums.

Die Performance wird nun durch Justierung der Tiefe dieser Schrauben kontrolliert [7].

Andere berichten davon, die Zirkularität mit zusätzlichen Klammern in den Ecken und Streben, die eine kleine Masse-Fläche bewirken, kontrollieren zu können [8].

Eine andere Lösung, nämlich ein dieelektische Platte aus Teflon hinter dem Septum zu montieren, wurde auch in [9] beschrieben.

Für höhere Frequenzen wurde eine Lösung publiziert, bei der eine geriffelte Wellenleiter-Sektion dem Septum folgt [10].

Um das Assymmetrie-Problem zu reduzieren, kann ein rundes Feed mit einem Septum-Polarisator verwendet werden. Dies wäre ein Gebiet für weitere Experimente.

Trotz dieser Probleme hat das Septum-Feed viele Vorteile bei der Anwendung in tiefen Spiegeln.

Ein Choke mit mehreren Ringen verbessert die Effektivität für Spiegel von 10λ und größer.

Um die optimale Position des Choke für einen Spiegel zu finden, wurde Abb. 22 beigefügt. Dieser Graph – für EME-Verwendeung – basiert auf „low noise" Ausleuchtung der „Ecken" von 13 dB.

Leider kann ich zeitbedingt momentan keine Diskussion meiner praktischen Erfahrungen dieses Feeds veröffentlichen oder es mit meinem vorhandenen VE4ME-Feed vergleichen.

Ich beabsichtige alle Messdaten im Excel-Format auf meiner Webseite www.webpark.sk/om6aa zu Veröffentlichen. Bis dahin könne die Daten auch per email bei mir angefordert werden: OM6AA@martinet.sk .

## Danksagung

Ich bedanke mich bei allen, die mir bei der Erstellung dieses Artikels geholfen haben.

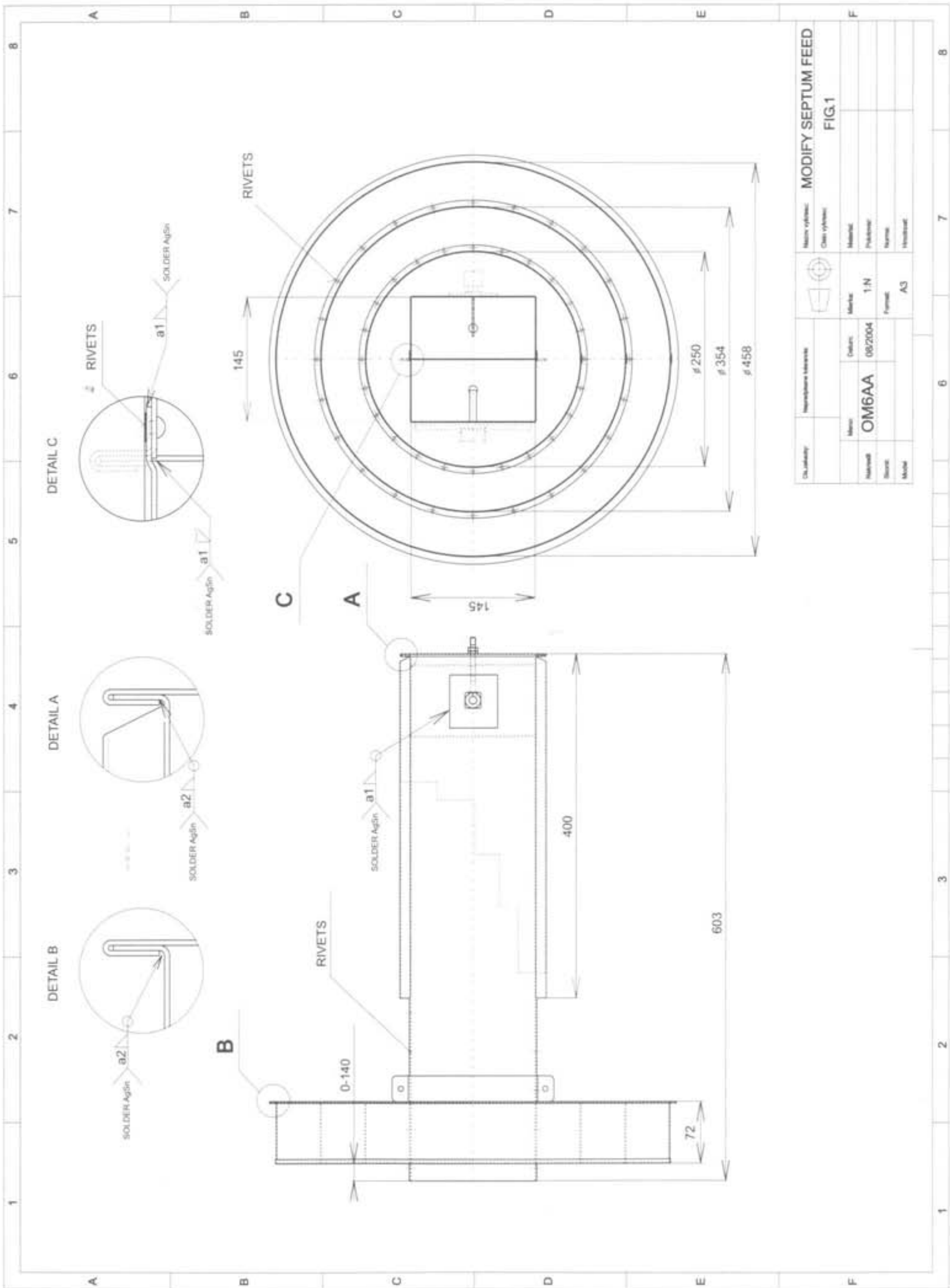

MODIFY SEPTUM FEED
FIG.1
OM6AA
08/2004
1:N
A3
DETAIL A
DETAIL B
DETAIL C
RIVETS
SOLDER AgSn
a1
a2
A
B
C
145
ø250
ø354
ø458
400
603
0-140
72

Fig. 1

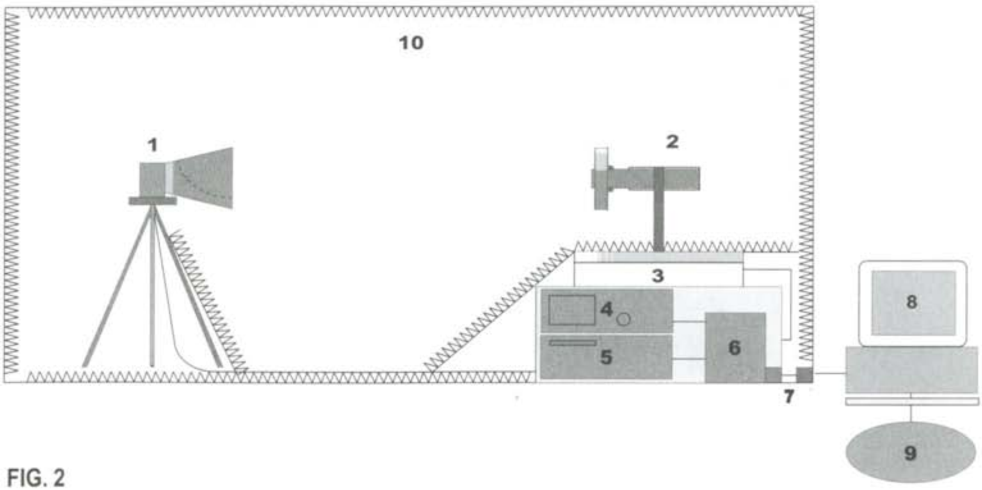



FIG. 2

1- TX ANTENNA, 2- RX ANTENNA, 3- ROTATOR, 4- HP 8564E SPEKTRUM ANALYZER, 5- HP 8350B SIGNAL GENERATOR, 6- PC, 7- AC FILTERS, 8- CONTROL COMPUTER, 9- INTERNET, 10- ANECHOIC CHAMBER.

FIG 3
Feed VSWR/50 Ohm

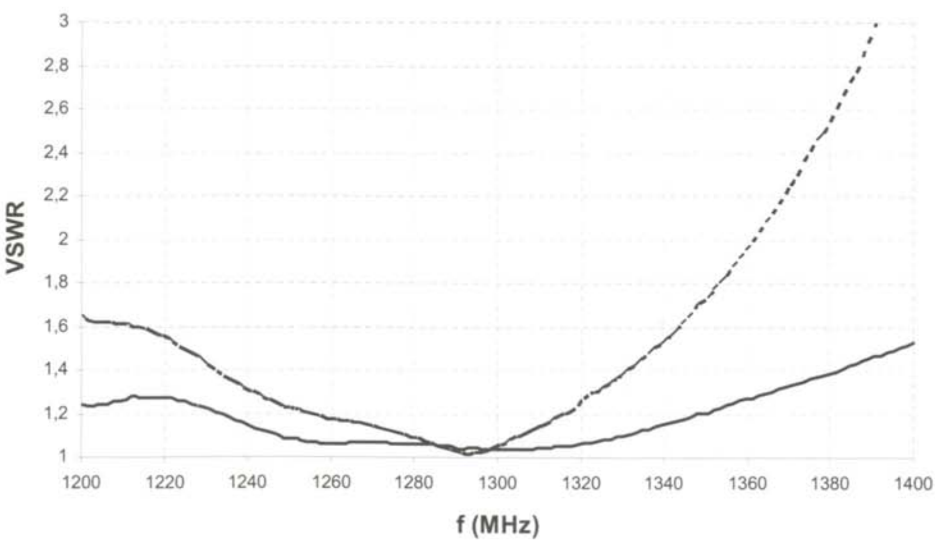


**FIG 4**
**Impedance Match Changes against a Conductive Plate**
**RX port**

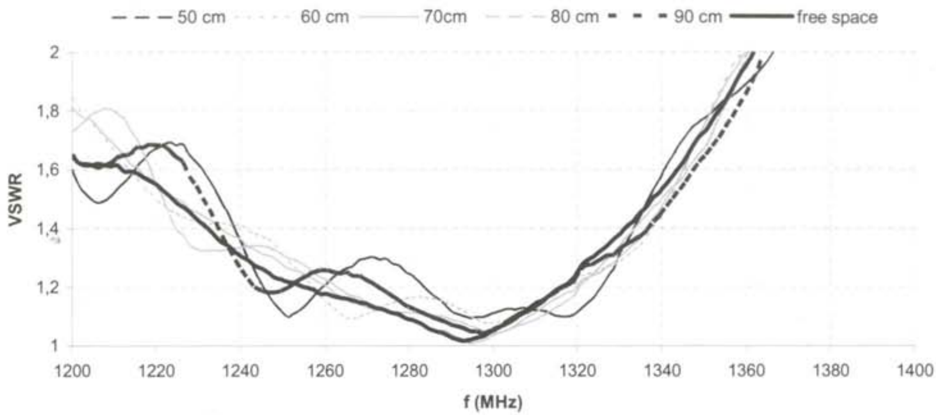



**FIG 5**
**Impedance Match Changes against a Conductive Plate**
**1 x 1 m, TX port**

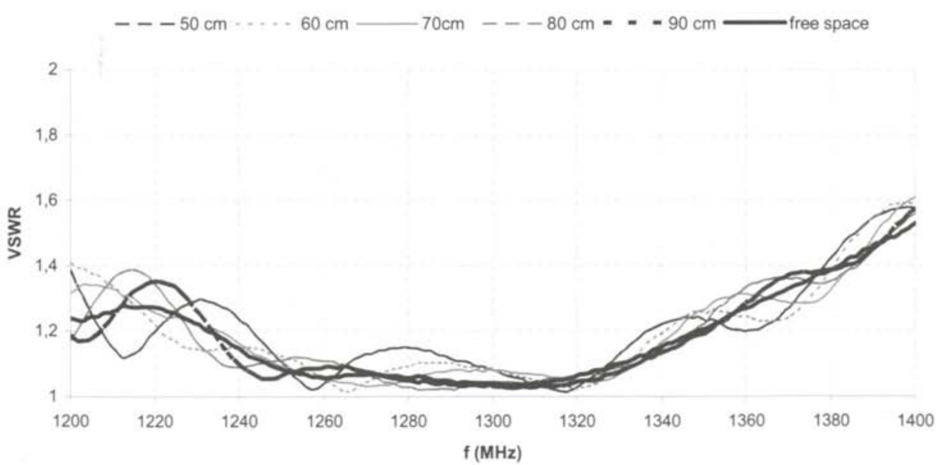


FIG 6
Radiation Pattern, RX + TX Ports, Feed Oriented Vertically
Transmitted Hor. + Ver. Pol.

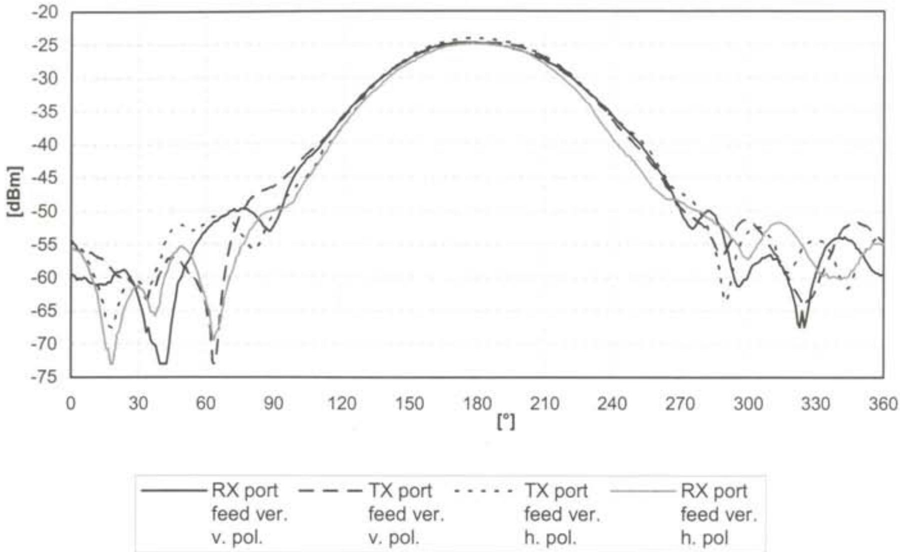



FIG. 7

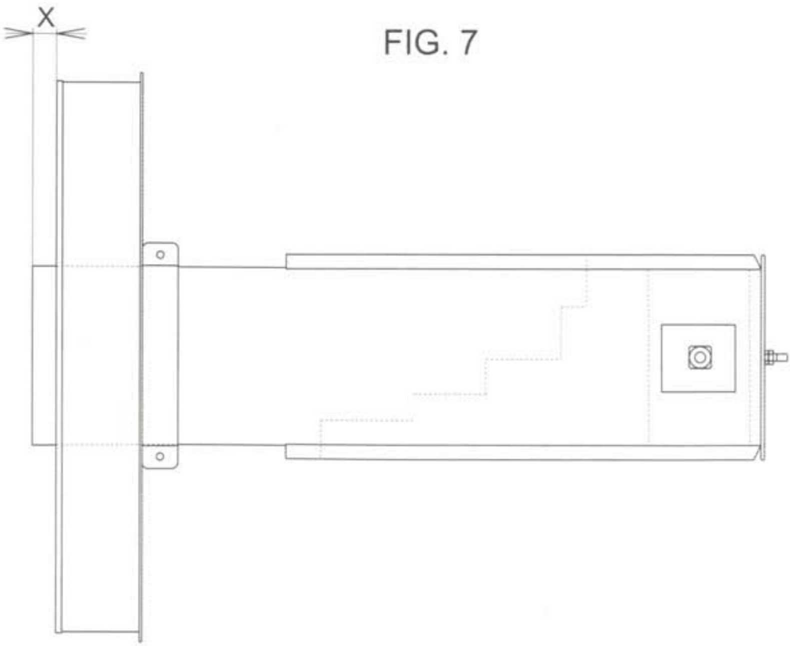


FIG 8
**Radiation Pattern, RX Port, Feed Oriented Horizontally**
**Transmitted Vert. Pol.**

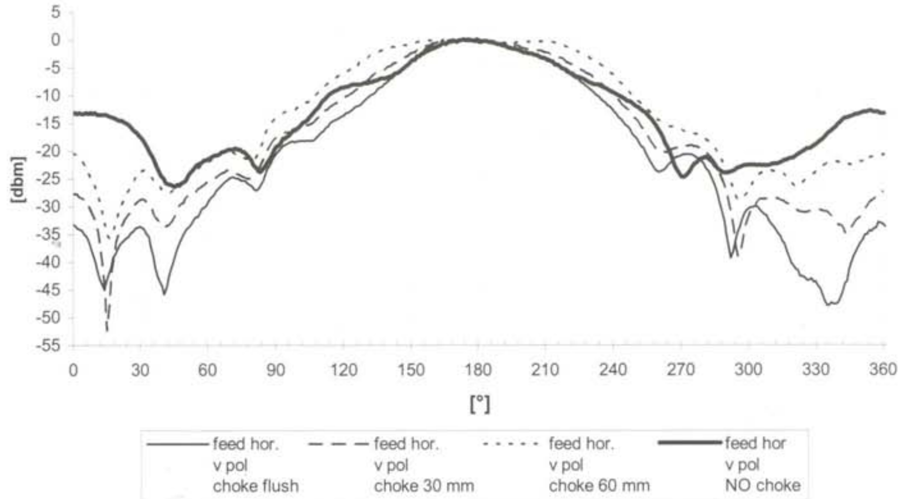



FIG 9
**Radiation Pattern, RX Port, Feed Oriented Horizontally**
**Transmitted Hor. Pol.**

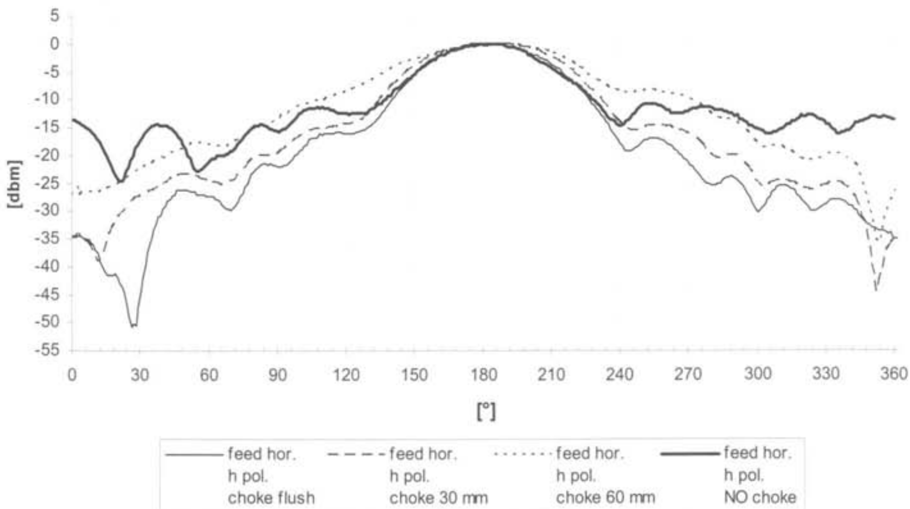


**FIG 10**
**Radiation Pattern, RX Port, Feed Oriented Vertically**
**Transmitted Vert. Pol.**

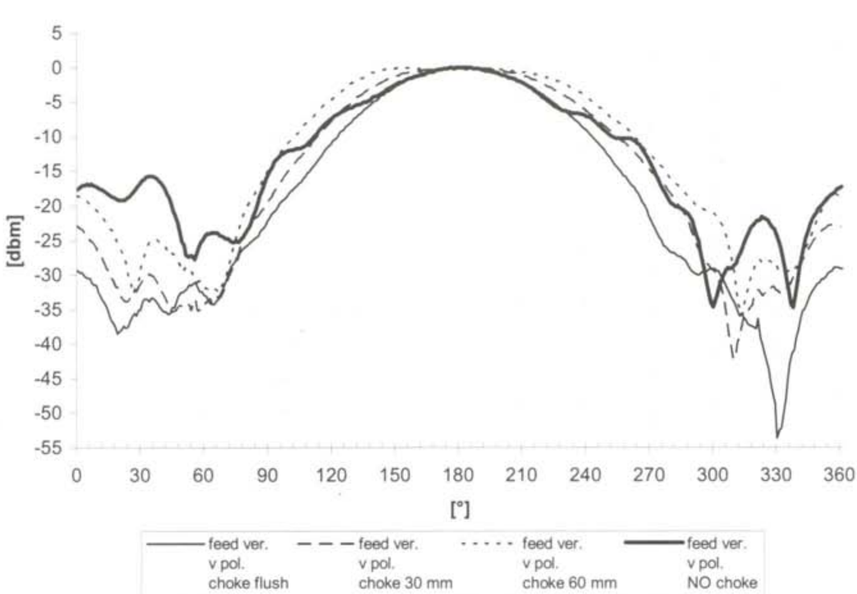
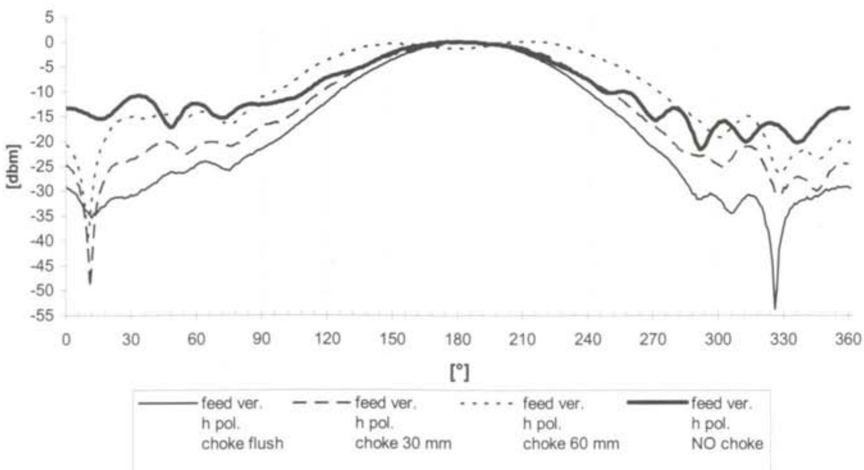



**FIG 11**
**Radiation Pattern, RX Port, Feed Oriented Vertically**
**Transmitted Hor. Pol.**



# Septum Feed, OM6AA modification, Choke flush

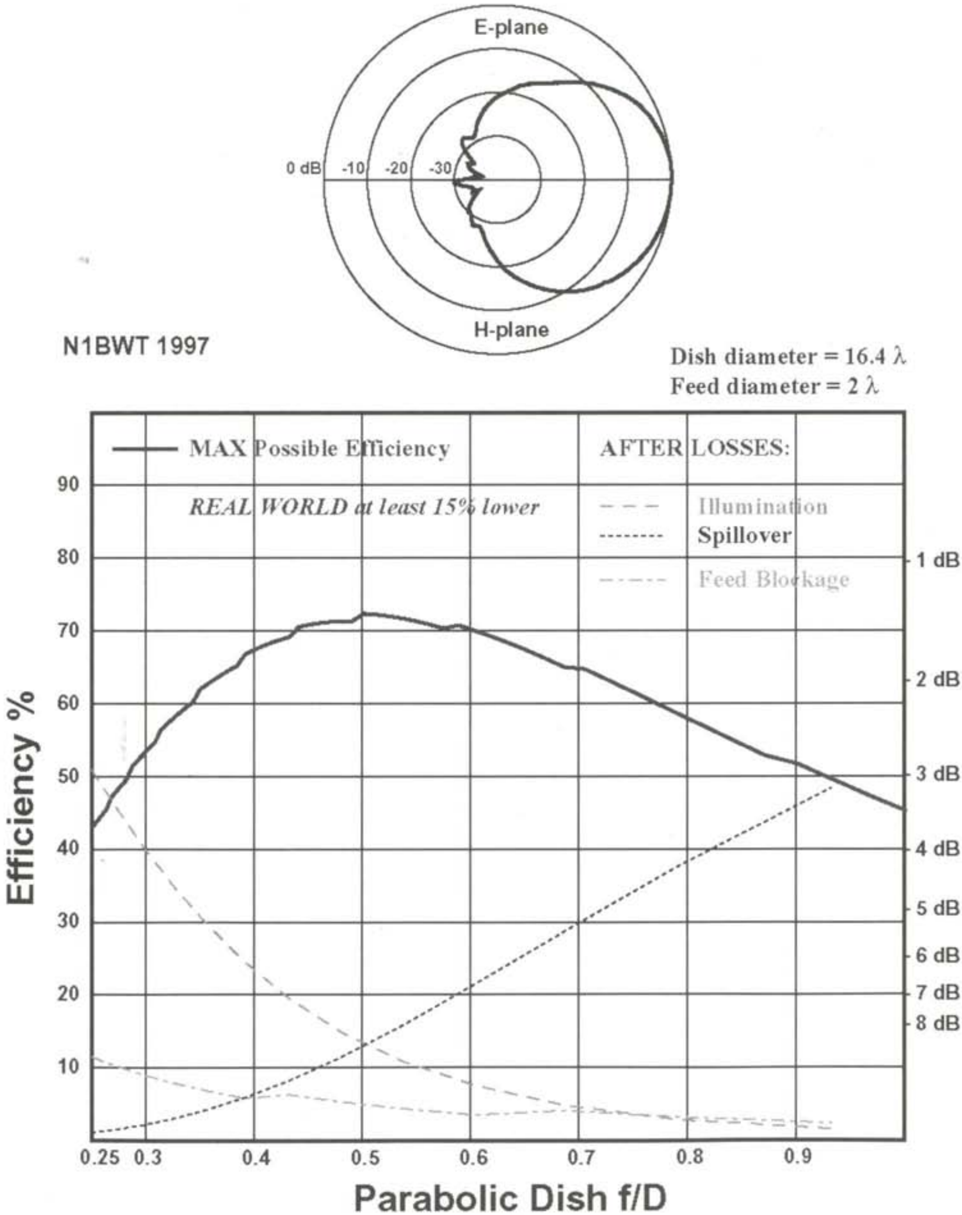



Fig. 12

# Septum Feed, OM6AA modification, Choke 30mm back

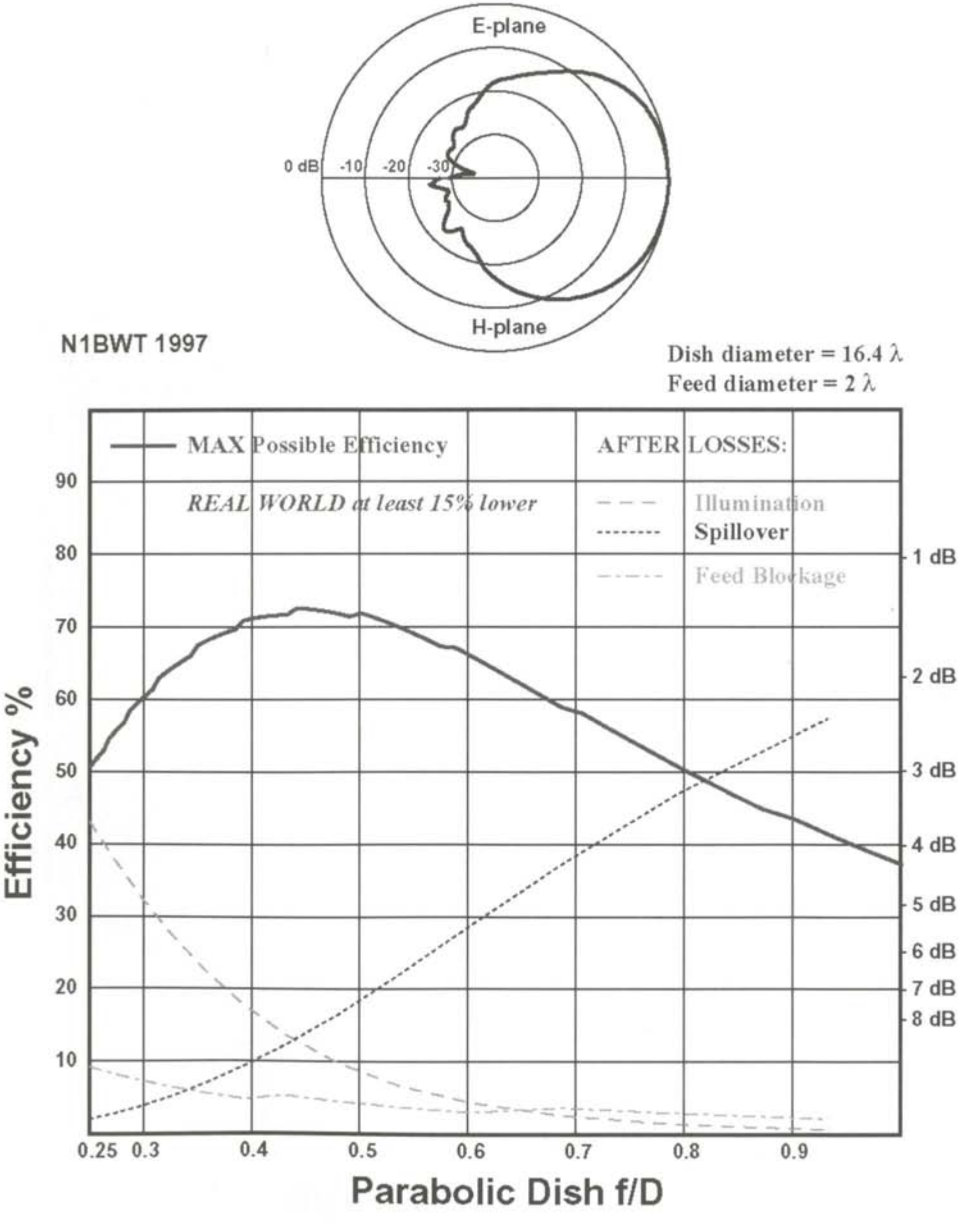



Fig. 13

# Septum Feed, OM6AA modification, Choke 60mm back

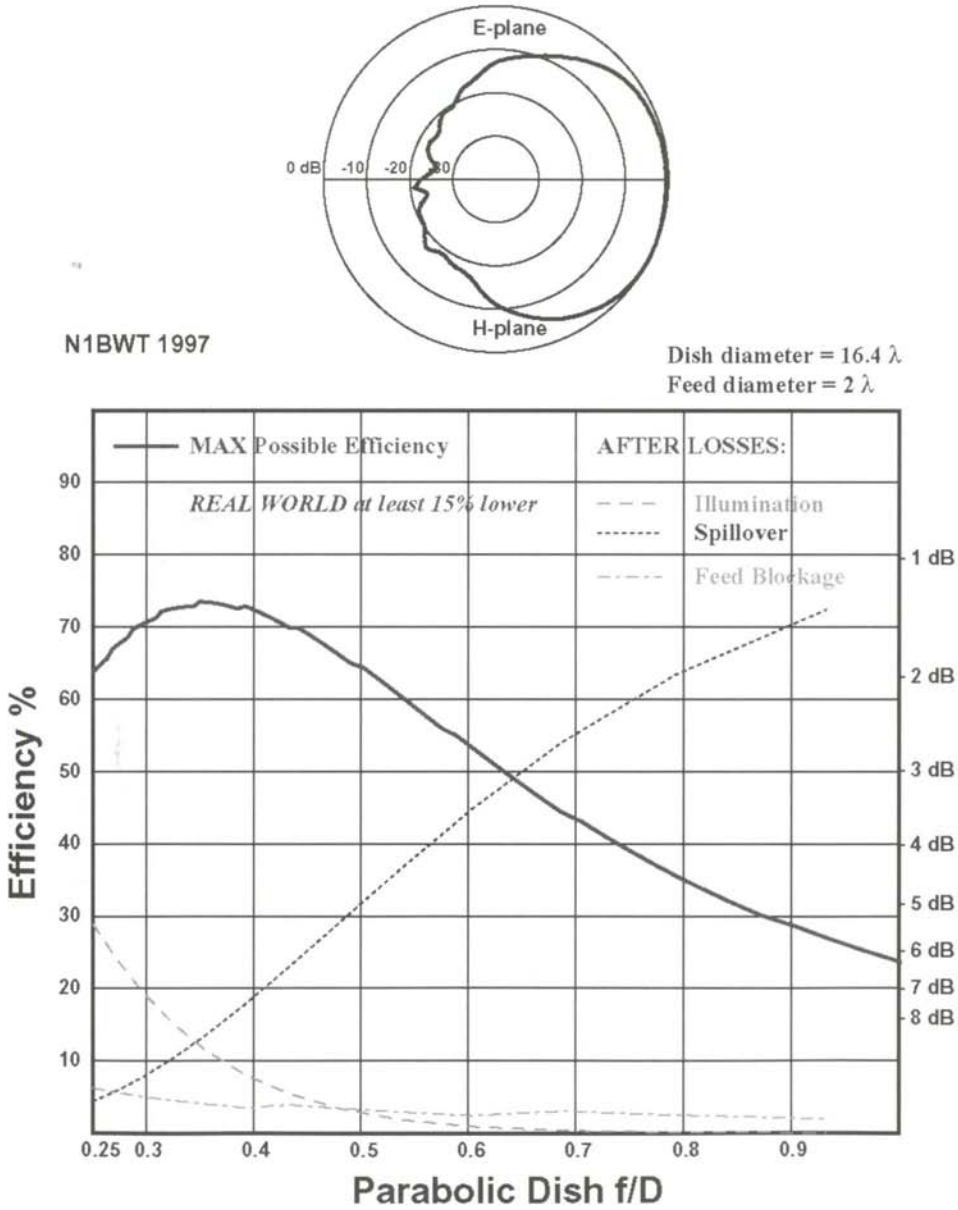



Fig. 14

# Septum Feed, RX port, NO Choke

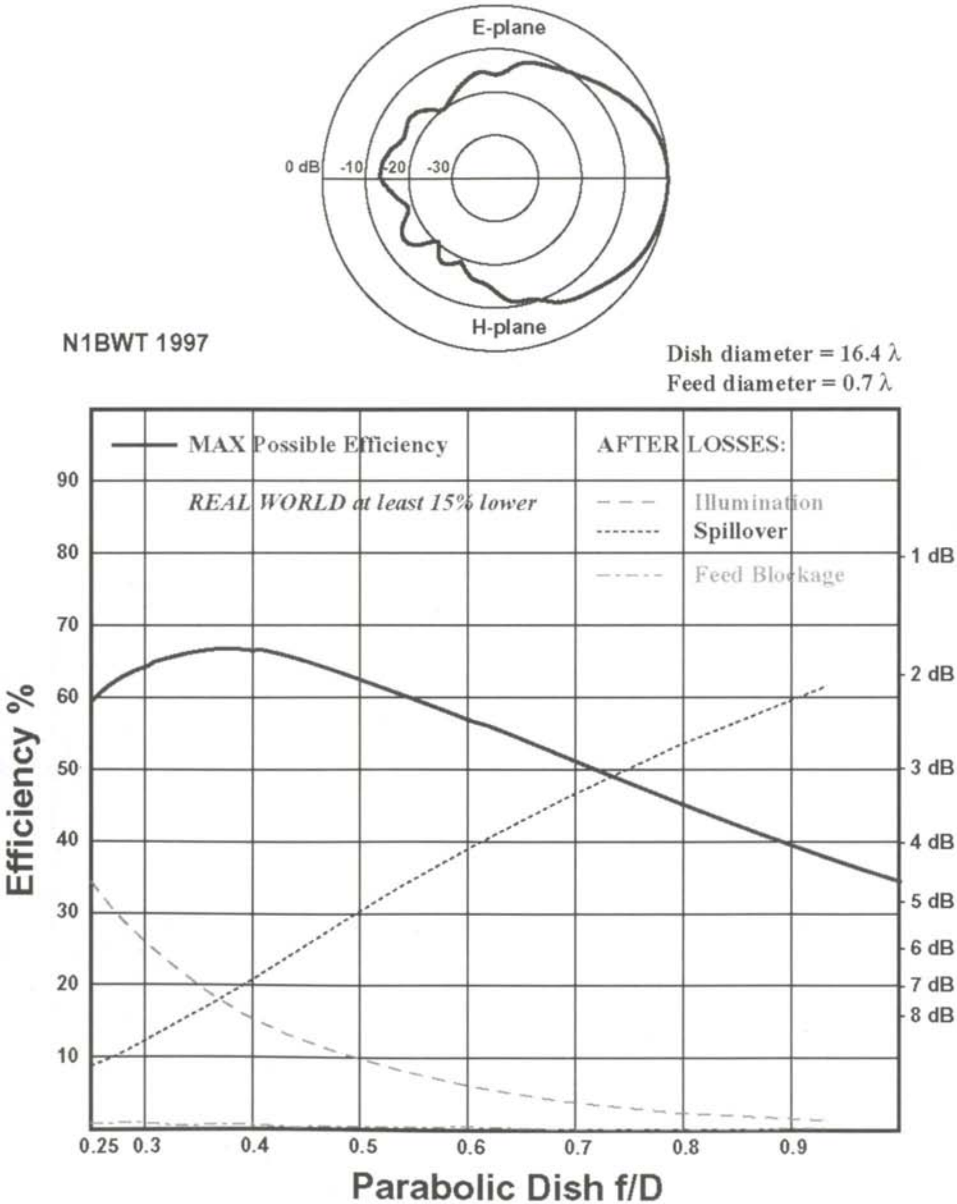



Fig. 15

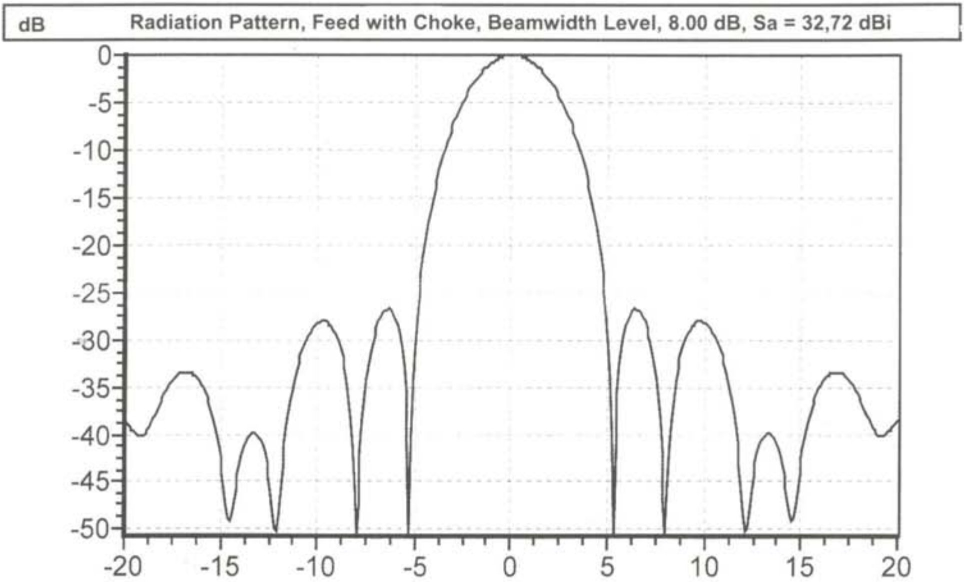



Fig. 16

Parabolic Antenna

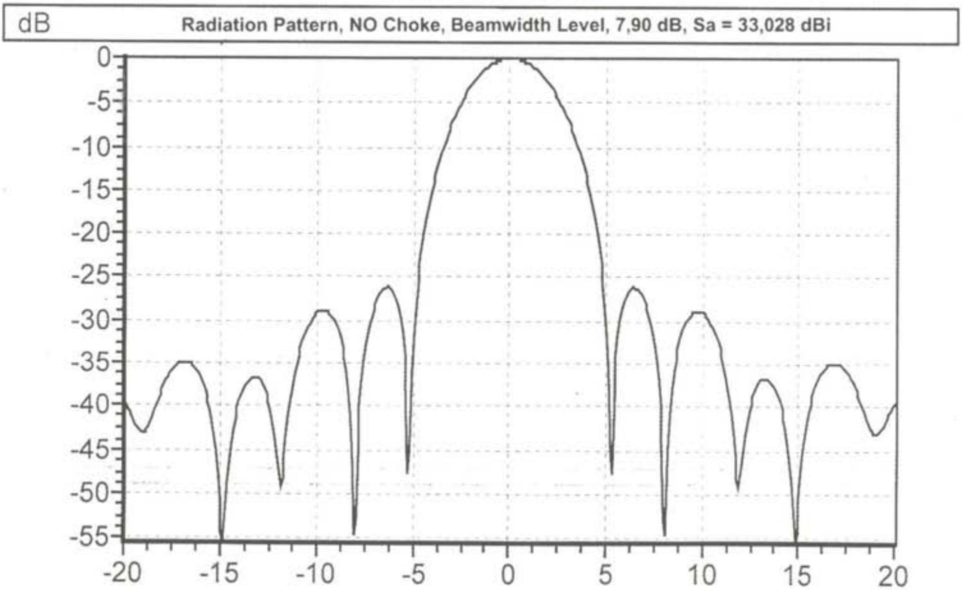



Fig. 17

**FIG 18**
**Radiation Pattern, TX Port, Feed Oriented Vertically**
**Transmitted Ver. Pol.**

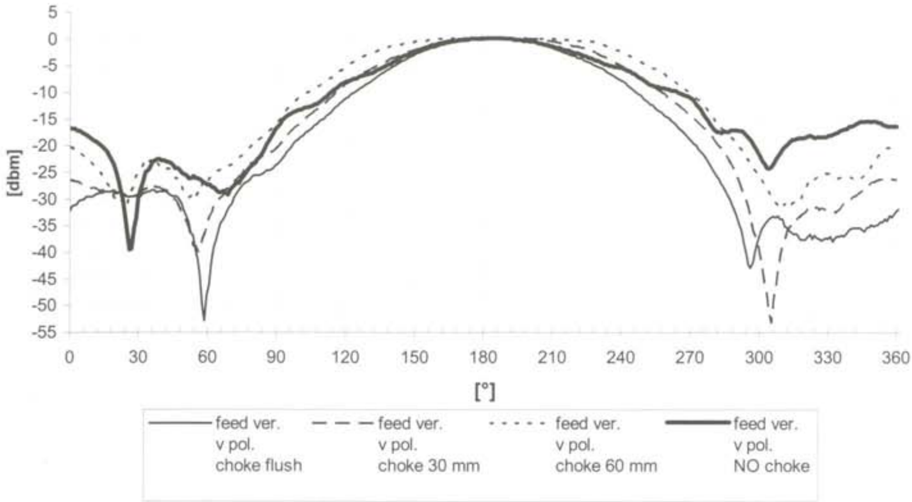



**FIG 19**
**Radiation Pattern, TX Port, Feed Oriented Vertically**
**Transmitted Hor. Pol.**

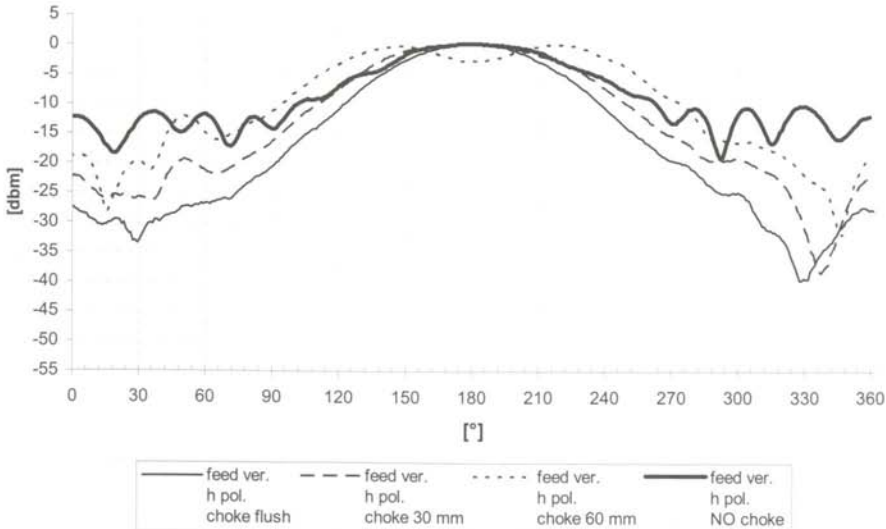


**FIG 20**

**Radiation Pattern, Frequency Response, RX Port, Feed Oriented Vertically, Transmitted Ver. Pol.**

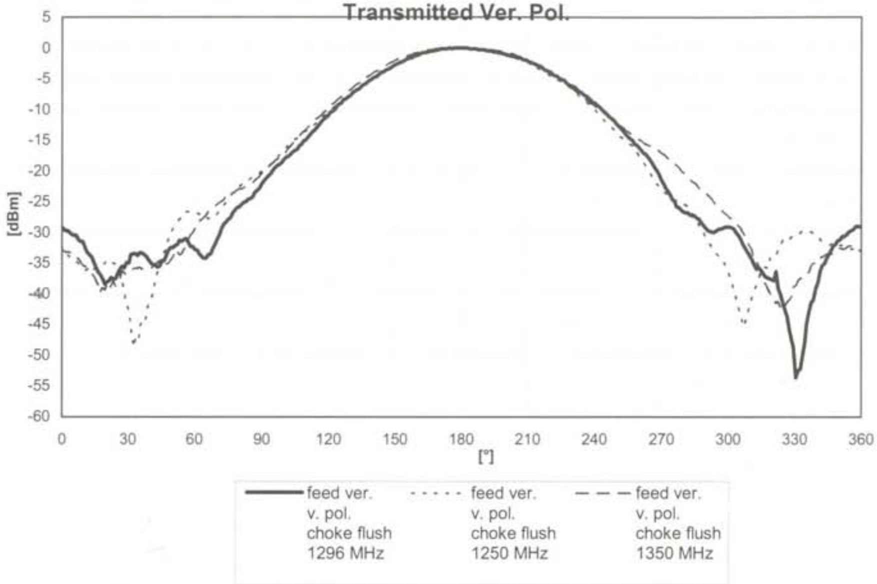



**FIG 21**

**Radiation Pattern, Frequency Response, TX Port, Feed Oriented Vertically, Transmitted Ver. Pol.**

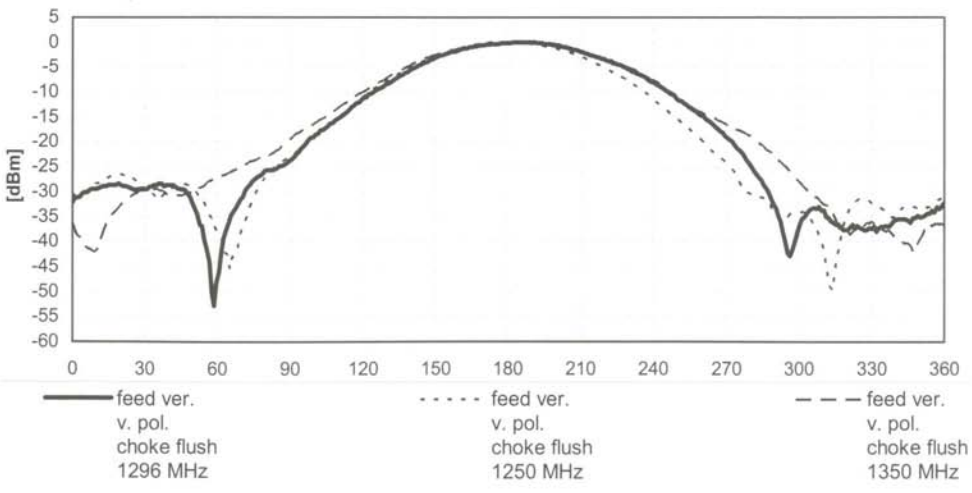


FIG 22

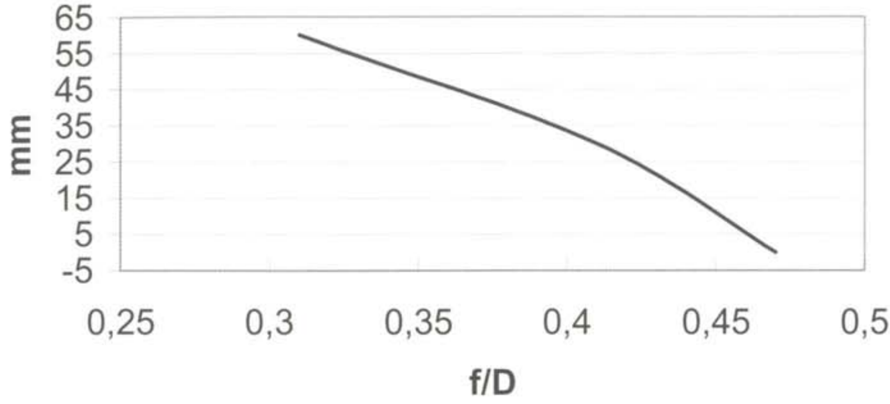



Fig. 23 Septum Feed in chamber

# High Power PIN Diode Switch

## 5 KW on 144 MHz

*Leif Asbrink, SM5BSZ*

PIN diodes are regularly used as power switches in radio transceivers. The advantage of a PIN diode over a mechanical relay is the very high speed and absence of moving parts. The advantage of a PIN diode compared to an ordinary switching diode is that a PIN diode is non-rectifying, and it can carry much more RF current than the DC current used for biasing. Both of these features are due to the PIN diode's very long carrier lifetime, typically several hundred nanoseconds or more. When the applied RF voltage is reduced or even reversed, current carriers still persist in the PIN junction, so the diode continues to conduct.

PIN diodes are typically operated in 50 ohm systems and many different configurations are possible. When high power is desired and narrow bandwidth is not a problem, a switch like the one shown in Fig 1 is a common solution.

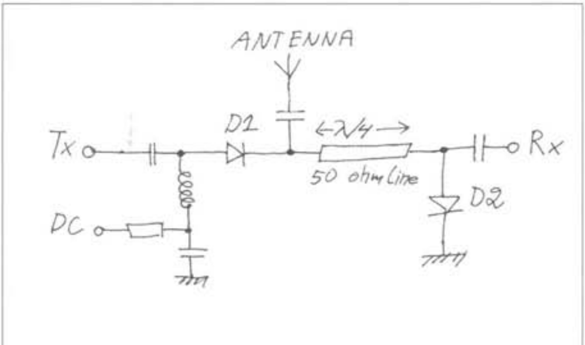



***Fig. 1** Typical PIN diode TR switch*

In receive mode, the DC voltage is zero and the PIN diodes have a very high RF resistance. In transmit mode, a suitable DC voltage drives current through both diodes, so they have a very low RF resistance. D1 connects the transmitter to the antenna, and D2 shorts the receiver input to ground. The quarter-wave line is shorted at the receiver end, so exactly at the design frequency, the impedance is purely resistive and extremely high. It will not affect the load impedance of the transmitter much, as long as the frequency of operation is within about 5% of the design frequency. One advantage of the TR switch of Fig 1 is that there is no need for a high-voltage diode. Biasing is also very simple. The switch of Fig 1 is described in the data sheet of the high-power PIN diode UM9415, and the data sheet says that this switch can handle 1 kW safely.

At a power level of 1 kW the RF current through D1 is 4.5 amperes. The current through D2 is similar. We can see the quarter-wave line as a transmission line through which 'forward' and 'reflected' waves of half the amplitude flow. At the antenna end the currents cancel and the voltages add; while at the Rx end, the voltages cancel and the currents add. The UM9415 diode can carry 10 amperes of RF current, so the switch in Fig 1 could handle 5kW into 50 ohms. But if we attempt to transmit into a high SWR, then even at lower power the RF currents may be much higher than 10 A, and may destroy the diodes.

How can we improve this, to make a PIN switch that will handle EME powers in real life? It is really very straightforward - we use quarter-wave impedance transformers to allow the diodes to operate at lower RF currents. Look at Fig 2. There is a 50 ohm coax from Tx to antenna. Along this cable there are two T connections separated by one quarter-wavelength. At each T a high impedance quarter-wave coax stub is connected. These two stubs are made from specially constructed 100 ohm coax, with a centre conductor diameter of only 3 mm and an outer conductor diameter of about 45 mm (taken from a 2-inch 50 ohm cable). Two spacers made from 1 mm teflon hold the centre conductor in place, one near the midpoint and one a few centimetres from the PIN diode. At the T connection the centre conductor is well kept in place by being soldered to the much thicker centre conductor of the 50 ohm Tx cable.

At the end of each high impedance stub there is a PIN diode from the inner conductor to an RF ground point to which the DC for the diode is routed. The RF ground point is a piece of thick copper to keep the PIN diode cool, which is well decoupled to chassis ground (the parasitic inductance of the decoupling capacitor adds to the diode inductance, but is balanced out by a little coil; see below).

Figs 3a and 3b show the construction. Fig 3a is the Tx side. A shielding box of something like 60*90*30 mm is soldered to the end of the large outer conductor of the 100 ohm stub. A 15 mm hole allows the centre conductor of the stub to pass through into the box.

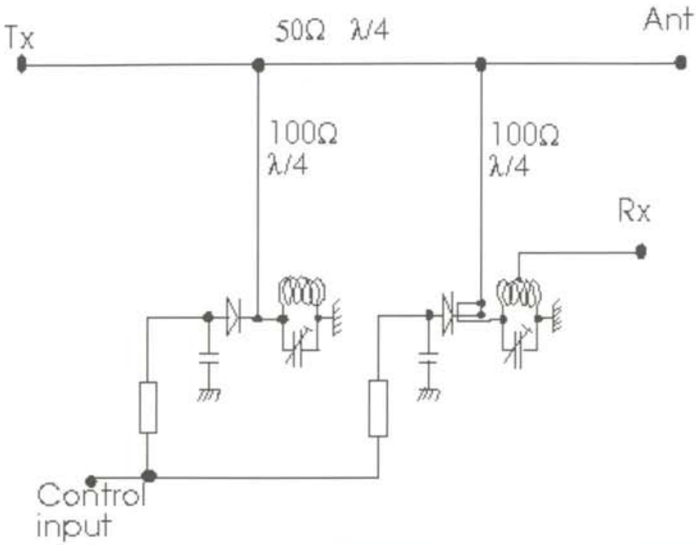



*Fig. 2 Schematic diagram of high power PIN diode switch*

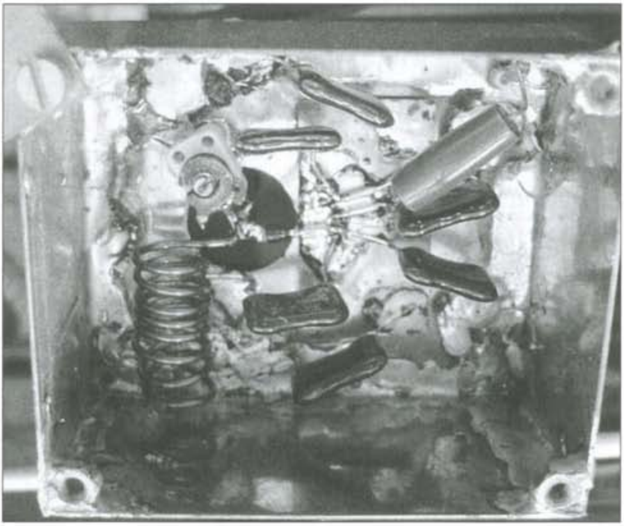


*Fig. 3a The PIN diode at the Tx side.*

*Immediately right to the hole is the 50*25 mm piece of 1 mm thick copper, the purpose of which is to remove heat. The PIN diode is soldered between this copper sheet and the inner conductor of the stub, with less than 1 mm lead lengths*

A 1 mm thick copper plate, something like 50*25 mm, is sitting a few mm above the base of the box. The plate is positioned towards the right in Fig 3a, so that the diode can be soldered between the end of the coax centre conductor and the edge of the plate with practically zero lead lengths. The purpose of the plate is to provide good cooling for the PIN diode, and to distribute the RF current equally between several bypass capacitors. The capacitors have to carry 10 amps in total, so the number that you need will depend on what current each one can take. Silver mica was the only "high current" capacitors in my junk box - I would think that the capacitors used in transistor amplifiers in the 100W range would also be suitable for currents in the 10A range.

For transmit, the wirewound resistor is selected to give 1A forward DC current through the diode when 5V is applied to the control input. In receive, both diodes have 12V DC backwards.

From the centre conductor at the same point as where the PIN diode is connected, there is a LC circuit for 144 MHz, that can be tuned to make each quarter-wave stub exactly resonant for maximum isolation.

The coil has many turns (8) so it is tuned with a very small capacitor (above the coil). The impedance is VERY high at this point in receive mode, which is necessary to make the impedance VERY low at the other end of the quarter-wave, so any noise from the transmitter is well suppressed. A very high L/C ratio makes the isolation good over

*Fig. 3b The PIN diode at the Rx side*

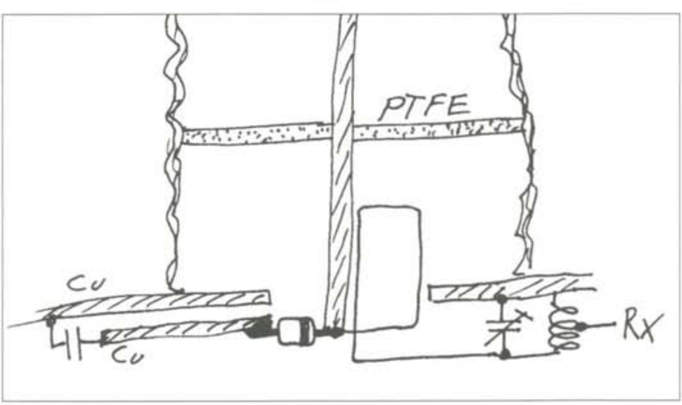
a reasonable bandwidth. The coil and trimmer capacitor are connected to the 3 mm inner conductor of the 100 ohm coaxial stub where it enters the little box containing the components.

The Rx side in Fig 3b is basically the same, except that the Rx output is connected to a tap on the coil. The L/C ratio here is much lower because the impedance is only 200 ohms, and the coil is used to transform the impedance down to 50 ohms by a centre tap. To make the isolation from the transmitter better, a small rectangular loop, about 8 by 20 mm, is positioned alongside the inner conductor of the stub as illustrated in Fig 3c. (This loop is indicated in Fig 2 but not visible in Fig 3b.) The loop couples to the current flowing through the diode, and when adjusted correctly, it balances the voltage due to the inductance of the diode. The loop is adjusted for maximum isolation in TX mode.

### Operation in RX Mode

With 100 ohms impedance in the coax stubs, the impedance in a 50 ohm system becomes 200 ohms at the PIN diode, so a tap halfway up the coil restores 50 ohms. When the Rx is connected, the PIN diode is loaded by 200 ohms, so at the other end of the 100 ohms quarter-wave, 50 ohms is obtained.

*Fig 3c Details of the Rx side*



This point will see 50 ohms towards the antenna, and an open circuit towards the transmitter - a quarter-wave to the short circuit created by the other open quarter-wave stub.

To check the position of the centre tap, just measure the SWR (low power) of the Rx port in Rx mode. The reactive part of the impedance is tuned to zero with the tuning capacitor (or the total number of turns). The real part can be adjusted by moving the tap. You may also tune and tap for minimum (=0dB) loss in a 50 ohm lab system. That will give an identical result.

If the diodes are not reverse biased for Rx, the loss is about 0.5 dB, because the resistance is about 1.5 kohms at zero volts. With 12V backwards bias, the resistance is maybe 5 times higher and the losses in Rx mode is maybe 0.1dB. The reverse current causes no measurable noise in the Rx path. The carrier lifetime is very long, 2 microseconds, so noise is not produced at VHF - or at least, I can not measure it.

## TX Mode and Power Handling

The PIN diode makes a very good RF short circuit (0.1 ohms) when 1A DC is flowing through it. The two quarter-wave stubs operate in identical fashion in Tx mode. The HF power coming from the Tx will see 50 ohms towards the antenna, and 10000/R ohms towards the PIN diode at both T points (where R is the resistance of the PIN diode). Other losses are negligible compared to the diode losses.

At SWR=1, this PIN switch should allow at least 20kW continuous wave, and much higher peak powers, based on the following analysis (with thanks to Steve Harrison, KO0U, for corrections). At 20kW and SWR=1, 20A will flow towards the antenna with 1000 volts at each T junction. The diode UM9415 has an RF resistance of 0.1 ohms at 1A DC bias, so the impedance at the T junction is transformed to 100,000 ohms due to the quarter-wave stub made from 100 ohm line. 1000 volts over 100,000 ohms is transformed by the stub to 1 volt over 0.1 ohms, so the current is at the limit of 10A for this PIN diode. The power dissipated in the diode is 10 W, which is permitted if both leads are extremely short and kept below 50 degrees C, which is not really a problem.

Of course, the power rating has to be reduced at higher SWR values. For example, at SWR=4 with an unfavourable phase angle, the current through the diode may reach 10A/10W at a much lower power level of 5kW; and higher SWR values will reduce the allowable power level further. However, in several years of practical experience with this PIN diode switch, it has plenty of power margin for EME operation, even when the antenna is detuned by wet ice.

The UM9415 diode can be bought in small quantities at www.antennspecialisten.se. It is manufactured by Microsemi, who have an excellent booklet *PIN Diode Designers' Handbook* describing the use of PIN diodes for various purposes including phase shifters and high power switches (30kW).

## Preamp Cable Length

The GaAsFET preamp is connected directly to the PIN diode switch with no additional protection. BUT the PIN diode switch is a source of a very low impedance at the Rx port in transmit mode (like all shorting relays), so the cable length between the PIN diode switch and the preamp is important, to minimise the power feed-through from the Tx. At full power I get about 1 volt rms across a 50 ohm resistor if I connect it instead of the preamp. This is only 20 mW, so one might think it is not any problem. BUT if a 1 ohm resistor is connected, with a cable of an electrical length of a half wavelength, the voltage is still the same, and the power is then 1W. When the preamp is driven into saturation the impedance is far from 50 ohms. If the cable length is badly selected too much power may be transferred.

The practical solution is as follows - and it may be useful also if you use normal mechanical relays for Rx/Tx switching. I assume a GaAsFET is used as the active component.

1. Switch off the DC voltage to the GaAsFET at the same time as the current through the PIN diodes is switched on. There is no need to heat the chip with power from drain current.

2. When you have verified that the Tx/Rx switch does not give more than say 5 volts in a 50 ohm resistor at full output power, lower the power by 20dB and connect the preamp. Measure the voltage across the source resistor, which gives the gate current - remember, no DC to the drain. If you can not see any gate current, increase power until you can.

3. Try some different cable lengths between the preamp and the Tx/Rx switch. For each length, start at low power. There will be a very sharp minimum in the gate current at a certain length, and that is the correct length to use.

The MGF1502 which I use could take 30 mA of gate current for a very long time - but not forever. I had been running the system for two years before it failed. That was before I realised that the cable length is important. Now the gate current is below 5mA after I inserted a quarter-wave more cable. I did not really worry to look for the exact minimum since I think the margin is good enough.

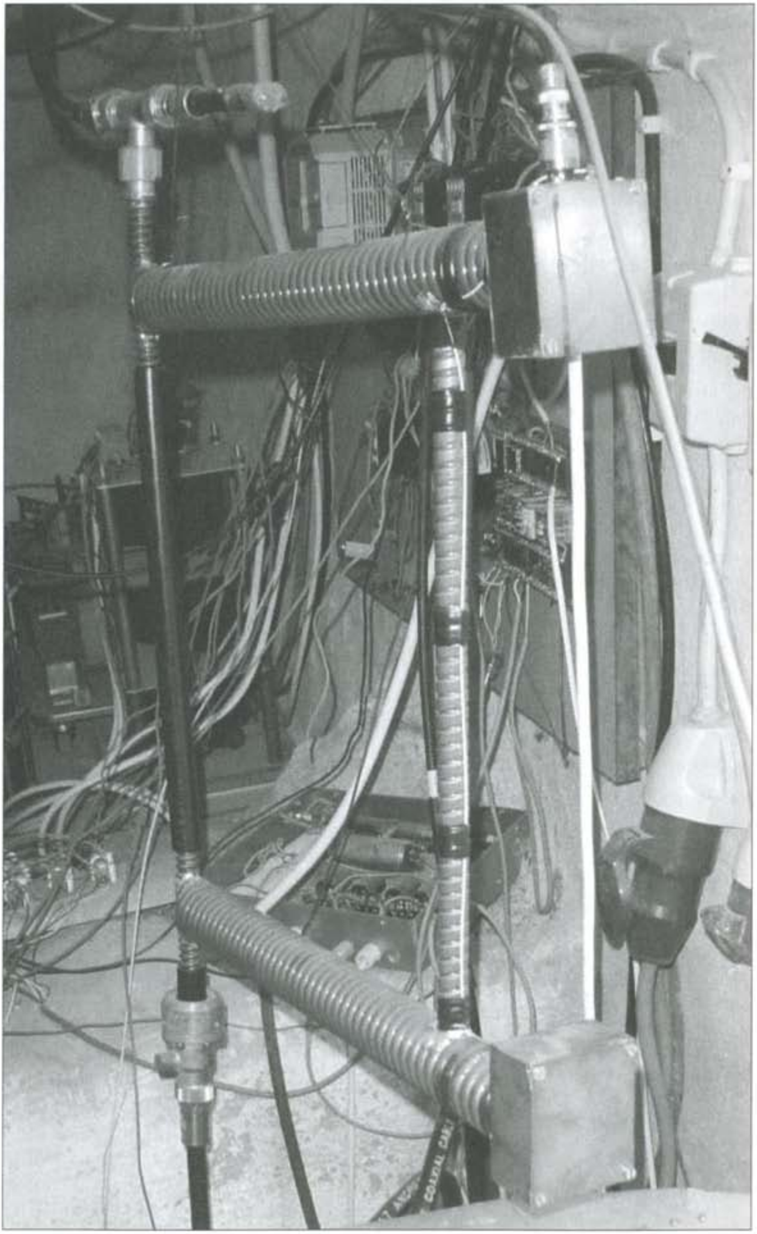


***Fig. 4*** *The high power PIN diode switch*

*The control unit in the open aluminium box supplies the PIN diode switch with +5V or –12V. It also supplies the control grid of the QBL5/3500 with –400V to prevent it from generating noise in Rx mode, or it gives the normal DC bias for a suitable idle current in Tx mode. (Above the switch you can see an open quarter-wave stub, not mentioned in the article, that eliminates 432 MHz. There is a second stub further up the cable to provide a really deep notch at 432 MHz.)*

# High-Power PIN-Diodenrelais

## 5 KW auf 144 MHz

***von Leif Asbrink, SM5BSZ***

PIN-Dioden werden häufig als Leistungsschalter in Funkgeräten eingesetzt. Der Vorteil einer PIN-Diode gegenüber einem mechanischen Relais liegt in der sehr hohen Geschwindigkeit und dem Fehlen beweglicher Teile. Der Vorteil einer PIN-Diode gegenüber einer normalen Schaltdiode ist, dass die PIN-Diode nicht gleichrichtet und sie viel mehr HF-Strom verträgt als Ruhe-DC-Strom. Diese beiden Eigenschaften sind in der sehr langen Carrier-Lebensdauer der PIN-Diode begründet, die typisch bei einigen hundert Nanosekunden oder mehr liegt. Wenn die anliegende HF-Spannung sinkt oder sogar umgepolt wird, bleibt der Strom-Carrier im PIN-Übergang immer noch bestehen, d.h. die Diode bleibt leitend.

PIN-Dioden werden normalerweise in 50-Ohm-Systemen eingesetzt. Viele verschiedene Schaltungen sind möglich. Wenn hohe Leistung benötigt wird und eine schmale Bandbreite kein Problem darstellt, ist ein Schalter wie in Bild 1 dargestellt, eine gängige Lösung.

**Abb. 1:** *Typischer PIN-Dioden S/E-Schalter*

Im Empfangsmodus ist die DC-Spannung Null und die PIN-Dioden haben einen sehr hohen HF-Widerstand. Im Sendemodus wird duch eine geeignete DC-Spannung Strom durch beide Dioden geschickt, so dass sie einen sehr geringen HF-Widerstand haben. D1 verbindet den Sender mit der Antenne, D2 legt den Empfängereingang an Masse. Die Viertelwellenleitung wird am RX-Ende so exakt auf die Sollfrequenz abgestimmt, dass die Impedanz sehr hoch und nur resitiv wird. Die Last-Impedanz des Senders wird kaum beeinflusst solange die Arbeitsfrequenz nicht um mehr als 5% von der Design-Frequenz abweicht. Ein Vorteil der Schaltung von Bild 1 ist, dass keine Hochspannungsdiode benötigt wird. Die Vorspannungserzeugung ist auch sehr einfach. Der Schalter von Bild 1 ist im Datenblatt der Hochleistungs-PIN-Diode UM9415 beschrieben. Das Datenblatt gibt an, dass dieser Schalter 1 KW sicher verarbeiten kann.

Bei einer Leistung von 1 KW beträgt der HF-Strom durch D1 4.5 Ampere. Der Strom durch D2 ist ähnlich. Wir können die Viertellwellenleitung als Transmission-Line betrachten, durch die vor- und rücklaufende Wellen halber Amplitude laufen. Am Antennenende löschen sich die Stöme aus und die Spannungen addieren sich. Am RX-Ende löschen sich die Spannungen aus und die Ströme addieren sich. Die UM9415-Diode kann 10 Ampere HF-Strom vertragen, so dass der Schalter aus Bild 1 5 KW bei 50 Ohm vertragen könnte.

Wenn man aber versucht, in ein höheres SWR zu senden, dann kann sogar bei niederiger Leistung der HF-Strom viel grösser als 10 A und die Dioden könnten zertört werden.

Wie kann man das verbessern, d.h. einen PIN-Schalter für EME-Power im täglichen Leben realisieren?

Es ist wirklich ganz einfach: Wir benutzen Viertelwellen-Impedanz-Transformatoren, damit die Dioden bei niedrigeren HF-Strömen arbeiten können. Schaltung siehe Abb. 2.

Da läuft ein 50-Ohm-Koax vom Sender zur Antenne. In diesem Kabel sitzen zwei T-Stücke im Abstand von einer viertel Wellenlänge. An jedes T-Stück ist ein Viertelwellenstück-Koax (Stub) mit hoher Impedanz angeschlossen. Diese beiden Stubs werden aus speziell konstuiertem 100-Ohm-Koax angefertigt, das einen Innenleiter von nur 3 mm Durchmesser besitzt. Der Außenleiter stammt von einem 2-Zoll-Kabel für 50 Ω mit einem Durchmesser von 45 mm. Zwei Abstandshalter aus 1 mm Teflon halten den Innenleiter im Zentrum, einer in der Mitte und einer wenige Zentimeter von der PIN-Diode entfernt. Am T-Stück wird der Innenleiter durch die Verlötung mit dem wesentlich dickeren Innenleiter des 50 Ω-Kabels gehalten.

Am Ende jedes Viertelwellenstückes sitzt eine PIN-Diode zwischen dem Innenleiter und einem Stück dickem Kupfer, über das die Gleichspannung für die Diode zugeführt wird - Kupfer aus Gründen der besseren Kühlung. Ansonsten ist nur eine gute elektrische Entkopplung wichtig. (Die Induktivität der Entkopplung (Entkoppel-C) addiert sich zu der Diodeninduktivität und wird durch eine kleine Spule ausgeglichen, siehe weiter unten.)

Abb 3a und 3b zeigen die Konstruktion. Abb. 3 a zeigt die TX-Seite. Ein Metallkasten von ca. 60 x 90 x 30mm wird zur Abschirmung auf das Ende des großem Aussenleiters des 100-Ohm-Stub gelötet. Ein Loch von 15mm Durchmesser ermöglicht die Einführung des Innenleiters des Stubs in den Kasten.

**Abb. 2:** *Schaltbild High Power PIN-Dioden Schalter*

Eine Kupferplatte von etwa 60x90 mm wird an das Ende des Außenleiters gelötet. Eine 15 mm Bohrung in der Platte läßt den Innenleiter herausschauen. Eine weitere Kupferplatte von ca. 50x50 mm sitzt einige mm über der anderen Plat-te, und zwar an der Seite, so, daß die Diode prak-tisch mit Drahtlänge null angelötet werden kann. Der Rand der kleinen Platte ist rundherum mit Abblockkondensatoren versehen, die sich den Strom teilen sollen – der Gesamtstrom beträgt 10 A HF, die Anzahl der C's richtet sich danach, wieviel sie vertragen.

Eine 1mm dicke Kupferplatte von etwa 50 x 25mm sitzt einige mm über dem Boden des Kastens. Die Platte ist rechts in Abb. 3a positioniert, so dass die Diode direkt zwischen Ende des Koax-Innenleiters und der Ecke der Kupferplatte eingelötet werden kann, praktisch ohne Anschlusslängen. Die Platte ermöglicht eine gute Kühlung der Diode und eine gleichmässige Verteilung des HF-Stroms auf mehrere Kondensatoren. Die Kondensatoren müssen insgesamt 10 Ampere verkraften können, d.h. die benötigte Stückzahl hängt von den verwendeten Typen ab bzw. was für Ströme sie vertragen. Bei mir waren als „Hochstrom-C's" nur „Silver mica" in der Baselkiste vorhanden. Ich denke, dass Kondensatoren aus 100W-Transistor-PA's ebenfalls geeigent für Ströme im 10-A-Bereich sein müssten.

In der Betriebsart Senden fließen je 1 A Ruhestrom durch beide Dioden. Ein Drahtwiderstand führt die nötigen 5 Volt zu. im Empfangsfalle liegen 12 VDC Sperrspannung an.

Am Mittelleiter, da wo die PIN-Diode angelötet ist, liegt ein LC-Schwingkreis für 144 MHz, der so abgestimmt wird, dass die beiden Viertelwellen-Stubs exakt resonant sind für maximale Isolation.

**Abb. 3a:** *Die PIN-Diode auf der TX-Seite*

*Direkt rechts neben dem Loch befindet sich die 1mm dicke 50 x 25mm Kupferplatte, die zur Kühlung dient. Die PIN-Diode wird zwischen dieser Kupferplatte und dem Inneleiter des Stub eingelötet, wobei weniger als 1mm Zuleitungslänge nötig ist.*

Sie Spule hat viele Windungen (8), so dass sie mit einem sehr kleinen Trimmer-C (über der Spule) abgestimmt wird. Die Impedanz ist SEHR hoch an diesem Punkt im RX-Mode. Dies ist nötig, damit die Impedanz SEHR niedrig am anderen Ende der Viertelwellenleitung wird. Damit wird jedes Störsignal vom TX gut unterdrückt. Ein sehr hohes L/C-Verhältnis macht die Isolation über eine brauchbare Bandbreite gut.

Die Spule und der Trimmerkondensator werden an den 3mm-Innenleiter des 100-Ohm-Koax-Stubs dort angelötet, wo er in den Kasten mit den Bauelementen eintritt.

**Abb. 3b:** *Die PIN-Diode auf der RX-Seite*

Die RX-Seite in Abb 3b ist vom Grundsatz her gleich mit Ausnahme, dass der RX-Ausgang an einer Anzapfung der Spule angeschlossen ist. Das L/C-Verhältnis hier ist viel geringer, weil die Impedanz nur 200 Ohm beträgt. Die Spule wird zur Transformation der Impedanz auf 50 Ohm durch eine Mittelanzapfung benutzt.

Um eine bessere Isolierung vom Sender zu erreichen, wird eine kleine rechtwinklige Schleife von ca. 8 x 20mm längs des Innenleiters des Stubs angebracht, wie in Abb 3c zu sehen. Die Schleife ist in Abb. 2 eingezeichnet, in Abb. 3b aber nicht sichtbar. Die Schleife koppelt auf den Strom der Diode und gleicht bei richtiger Einstellung die Spannung aus, die aufgrund der Induktivität der Diode entsteht. Die Schleife wird auf maximale Isolation im TX-Mode abgestimmt.

### Arbeiten im RX-Mode = Empfangen

Mit den 100 Ω des Koax-Stubs ergeben sich 200 Ω an der PIN-Diode. Damit kommt man mit einer Anzapfung in der Mitte der Spule wieder auf 50 Ω. Wenn der Empfänger angeschlossen ist, wird die Diode also mit 200 Ω belastet, so dass sich am anderen Ende der 100-Ohm-Viertelwellenleitung 50 Ω ergeben. Dieser Punkt sieht 50 Ω Richtung Antenne, und ist hochohmig (offen) Richtung Sender – λ/4 zu dem durch das andere offene Viertelwellenstück erzeugten Kurzschluss.

Um die Position der Mittelanzapfung zu verifizieren, mißt man einfach das VSWR (bei wenig Leistung) am Empfängeranschluß im Zustand Empfangen. Der Blindanteil der Impedanz wird entweder mit dem Abstimm-C oder der Anzahl der Windungen auf null getrimmt. Der Realanteil kann durch Verschieben der Anzapfung eingestellt werden. Man kann auch auf Minimum-Verluste (= 0 dB) an einem 50 Ω-System auf dem Labortisch justieren. Das Ergebnis ist identisch.

**Abb. 3c:** *Details der RX-Seite*

Wenn die Dioden beim Empfang nicht mit einer negativen Vorspannung versorgt werden, beträgt der Verlust 0.5 dB, da der Widerstand etwa 1.5 kOhm bei 0 Volt beträgt. Mit 12V Sperrspannung ist der Widerstand ungefähr 5x höher und der Verlust im RX-Mode beträgt rund 0.1 dB. Durch den Sperrstrom wird kein messbares Rauschen im RX erzeugt. Die Lebensdauer der Carriers ist mit 2 Mikrosekunden sehr lang, so dass kein Rauschen im VHF-Bereich erzeugt wird, zumindest kann ich keins messen.

### Senden und Leistung

Die PIN-Diode erzeugt einen sehr guten Kurzschluß (0.1 Ω), wenn 1A Vorwärtsstrom fliessen.

Die beiden Viertelwellenstubs arbeiten in der gleichen Weise im Sendemodus.

Die HF-Leistung vom Sender sieht 50 Ω Richtung Antenne, und 10000/R Ω Richtung PIN-Diode an beiden T-Verbindungen (R ist der Widerstand der PIN-Diode). Andere Verluste sind vernachlässigbar im Vergleich zu den Verlusten der Diode.

Bei SWR=1 sollte dieser PIN-Schalter mindestens 20 KW CW vertragen können und viel höhere Spitzenleistungen, basierend auf der folgenden Analyse (mit Dank an Steve Harrison, KO0U für die Korrekturen).

Bei 20 kW und SWR=1 fliessen 20A Richtung Antenne mit 1000 V an jeder T-Verbindung. Die Diode UM9415 besitzt 0.1 Ω HF-Widerstand bei 1A Ruhestrom, so dass die Impedanz wegen der Viertelwellen-100-Ω-Leitung an der T-Verbindung auf 100.000 Ω transformiert wird. Die Verlustleistung über der PIN-Diode beträgt dann 10 W. Dies ist noch zulässig, wenn die Temperatur 50 Grad nicht übersteigt, und die Anshclüsse extrem lurz sind, was beides kein Problem ist. Die gesamte Leistung fällt an der 100.000 Ω-Last ab (1000 V über 100.000 Ω transformieren zu 1 V über 0.1 Ω mit einer 100 Ω Viertelwellenleitung). Der Strom liegt mit 10 A am Limit der Diode.

Natürlich muss die Leistung bei höherem SWR reduziert werden. Bei SWR=4 kann der Strom durch die Diode bei 5 kW HF-Leistung 10A (bzw. 10W Verlustleistung) erreichen. Das gibt viel Spielraum mit dieser PIN-Diode, auch wenn die Antenne z.B. durch nasses Eis verstimmt ist.

Die UM9415 wird von Microsemi hergestellt. Sie haben eine excellente Broschüre „PIN Diode Designers' Handbook". Es beschreibt diverse Anwendungen der PIN-Diode wie Phasenschieber und Leistungsrelais bis 30 kW. Die Diode kann in kleinen Stückzahlen von www.antennspecialisten.se bezogen werden.

## Vorverstärker und Kabellänge

Ein GaAs-FET-Vorverstärker wird ohne weiteren Schutz direkt an den PIN-Diodenschalter angeschlossen. Es ist wichtig zu wissen, daß die Kabellänge zwischen PIN-Diodenrelais und Vorverstärker entscheidend ist. Bei voller Leistung habe ich 1 Veff an einem 50 Ω -Widerstand anstelle des Empfängers gemessen. Man könnte denken, das sind nur 20 mW und kein Problem. Wenn jedoch ein 1 Ω -Widerstand hinter einer λ/2 –Leitung angeschlossen wird, ist die Spannung immer noch die gleiche, und damit die Leistung 1 W – der PIN-Diodenschalter stellt am RX-Anschluß im Sendenfall eine Quelle mit sehr geringer Impedanz dar (wie alle kurzschließenden Relais). Wenn der Vorverstärker in die Sättigung gefahren wird, liegt seine Impedanz weit weg von 50 Ω. Wenn die Kabellänge ungünstig gewählt wird, sieht der Vorverstärker zuviel Leistung.

Die Lösung für die Praxis folgt – sie ist vielleicht auch für die Verwendung normaler Relais hilfreich, wenn ein GaAs-FET im Vorverstärker sitzt.

1) Gleichspannung zum GaAs-FET in dem Moment abschalten, in dem der Strom durch die PIN-Diode eingeschaltet wird. Es gibt keinen Grund, den Chip mit seinem Drain-Strom zu heizen.

2) Wenn sichergestellt ist, daß der Sende /Empfangsschalter bei voller Leistung nicht mehr als z.B. 5 V an einem 50 Ω Widerstand abgibt, senkt man die Leistung ca. 20 dB ab und schließt den Vorverstärker an. Jetzt wird die Spannung am Source-Widerstand gemessen, woraus man den Gate-Strom errechnen kann (zur Erinnerung: kein Gleichstrom am Drain!). Wenn kein Gate-Strom zu sehen ist, Leistung erhöhen, bis Strom fließt.

3) Nun werden verschiedene Kabellängen zwischen Relais und Vorverstärker ausprobiert. Für jeden Versuch beginnt man bei niedriger Leistung. Es gibt ein sehr scharfes Minimum im Gate-Strom (bei sehr hoher Leistung). Das ist die gesuchte Kabellänge.

Der MGF1502, den ich benutze, kann am Gate 30 mA für eine sehr lange Zeit vertragen – aber eben nicht für immer. Ich habe das System 2 Jahre lang betrieben, bevor er gestorben ist. Das passierte, bevor mir klar wurde, daß die Kabellänge von Bedeutung ist. Heute liegt der Gate-Strom unter 5 mA, nachdem ich das Kabel um ein λ/4 -Stück verlängert habe. Ich habe mir nicht die Mühe gemacht, das exakte Minimum herauszufinden, ich war mir sicher, dass die Reserve groß genug ist.

**Abb. 4:** *High power PIN diode switch*

*Die Control Unit in der offenen Aluminium-Box versorgt den PIN-Dioden-Schalter mit +5 oder -12 Volt. Sie versorgt ausserdem das Steuergitter der QBL5/3500 mit -400V, damit bei Empfang kein Rauschen erzeugt wird. Beim Senden wird die normale Vorspannung für Ruhestrom zugeführt Oberhalb des Schalters sieht man einen offenen Viertelwellen-Stub, der nicht in diesem Artikel erwähnt ist. Er eliminiert 432 MHz. Ein zweiter Stub weiter oben im Kabel ermöglicht einen tiefen Notch bei 432 MHz.*

(TNX an Klaus, DL4EBY, für die deutsche Übersetzung!)

# The Geometry of Aurora Communication

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The phenomena of Aurora are strongly aligned to the Earth's magnetic field. Accordingly, backscattering is a nonisotropic process. The geometric laws have been known for 50 years [1] and are used to support amateur radio [2]. However, the knowledge of this geometry is not widely spread. The following paper has been written to deepen the useful basic knowledge for operation. The described geometry is also valid for connections via Field Aligned Irregularities (FAI).

### Scattering

A wave exiting from point A is shown in Fig. 1 as a black ray. The ionization along the magnetic field line scatters this ray in many directions, which lie on the surface of a cone whose axis is the field line. The aperture angle of the cone is given in such a way that the incident ray extending beyond the scattering point lies on the curvature of the cone. This backscatter cone intersects the Earth's surface as a curved line, as shown in Fig. 1. Aurora QSOs can take place between point A and all points lying on the curve of intersection; but in reality the surface of the cone should not considered to be infinitely thin. Backscattering signals can often still be heard some way from the ideal line. Angles of deviation from the ideal cone (difference between the reflected and the incident angle) are given in Figures 3 – 6. A decrease in the signal strength of about 6 dB for each degree of deviation must be expected at 144 MHz.

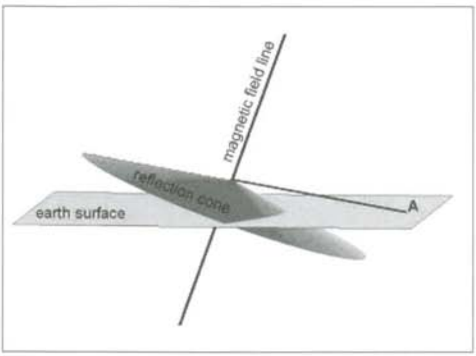


*Fig. 1. A ray exiting from point A is scattered at the ionized field line to form a cone The intersection with the Earth's surface shows where the backscattered wave can be received.*

### The Earth's magnetic field

The Earth's magnetic field is essentially a dipole field (Fig. 2). In the outer regions it is heavily distorted by the solar wind. Even on the Earth's surface the field is complicated in detail and it is time variant. In the case of Aurora communication the field at a height of 100 – 105 km is of importance. For calculations like those done in this work, the International Geomagnetic Reference Field (IGRF) is used. Unlike the simple dipole approximation, the IGRF model gives the important parameters of the Earth's real magnetic field at any place, and also at any past time. It is documented in great detail in the internet. The Earth's magnetic field changes so slowly, that the following depicted graphs look similar from year to year. Significant differences can be noticed only at larger periods of time. The author's Aurora observations started in 1958. At that time, by following the geometry, the most southern theoretically reachable location from Hamburg was Madrid. Today this place is 200 km to the north. During this time the compass needle in Hamburg moved several degrees. Even strong magnetic storms change the field given by IGRF so minimally, that we do not have to consider this in the following.

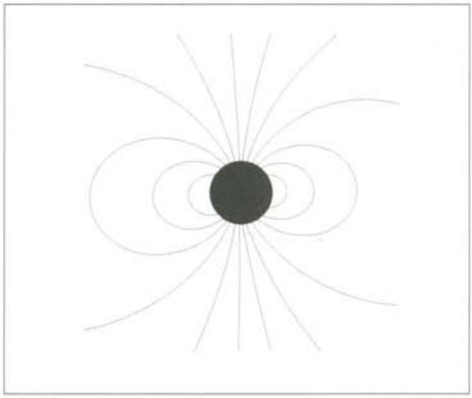

*Fig. 2. In a first order approximation the Earth's magnetic field is a dipole field. However, the deviations from this approximation are so serious, that the International Geomagnetic Reference Field (IGRF) was used for calculations in this work.*

### The geometry of Central Europe

The most directly northern auroral ionization that would allow QSOs in Hamburg (JO53) would be located above Trondheim in JP53. Fig. 3 shows this situation. The upper large circle is the horizon seen from the scattering point. The thick line describes the ideal intersection of the scattering cone with the Earth's surface, evoked by a wave exiting from the transmitter in Hamburg. (The line of intersection is bow-shaped, and not an ellipse, parabola or hyperbola as could be expected from intersection of a cone with a plane. This is because the cone does not intersect with a plane as shown in Fig. 1 but with the globe.) Anywhere along the thick line, a CQ call from Hamburg can be heard if the antenna is properly directed to the scattering point. OH1/2 and parts of UA1 as well as the Shetland islands can apparently be well reached, however, Oslo, Stockholm and the mainland of Scotland cannot.


Fig. 3. Point A in reference to Fig.1 is located near Hamburg (JO53). The ionization is above Trondheim (asterisk, JP53). The ideal intersection line between the scattering cone and the Earth's surface is drawn as a thick line. The lighter lines correspond to the angle deviations from ideal reflection as given in the legend.

Moscow can often be reached from Hamburg since the required point of reflection lies relatively far north above southwest Finland, where auroral ionization occurs quite often. However, the elevation angle of the beam has to be very low on both sides, because the distance between the reflection point and both sides is at maximum. Therefore high transmitting power and antennas with small beam widths are advantageous at the limits of DX. Fig. 4 demonstrates this situation. The same reflection point is suitable for easier QSOs with south Norway, Stockholm and Estonia.

The illustration of Fig. 4 is useful if the position of the auroral ionization is known. Frequently the reverse question arises: Where does the ionization have to be, in order to make communication between A and B possible? For this purpose the author has written a MATLAB program with the parameters: own QRA locator and date (for calculation of the Earth's magnetic field). The destination QRA is defined by a mouse click on the map, initiating a recalculation of the scattering points. The example of Fig. 4 with the QRA of the author and the destination Moscow is shown in Fig. 5. An additional window giving the azimuth and elevation directions of the antenna is inserted. In this case a very narrow beam antenna (EME antenna) directed to 32° azimuth and 0° elevation is of advantage as already stated in discussing Fig. 4.

For stations being closer than those of the last example the possible area of reflections is mostly larger. As an example Fig. 6 gives the destination Budapest from Hamburg. Depending on where the current scattering ionization is located the antenna has to beam between 335° and 85° with an elevation of 0° to 26°. The author has made 21 Aurora QSOs with HA stations within the last 2 years, with 10 of those at an elevation of approx. 5° and QTF 80° to 85°, 9 with an elevation of 15° and QTF 60° to 65°, and 2 with an elevation of 25° and QTF 10° (the 17 dB antenna can be turned from every position to another position by hand within less than 2 seconds, thus allowing a perfect localization even in the hectic pace of Aurora appearances).

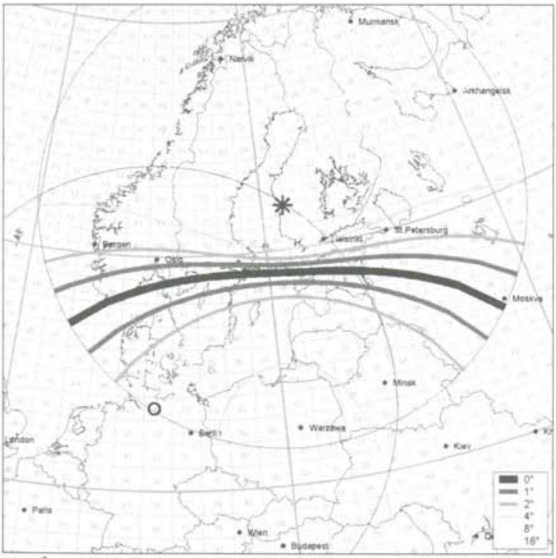


Fig. 4. Auroral Ionization above southwest Finland allow QSOs from Hamburg to south Norway, Stockholm, Estonia and –at the limit- Moscow.


*Fig 5. Illustration of all possible scattering points for aurora communication between Hamburg and Moscow. Please note that only QTF 32° is possible. A high-gain, narrow-beam antenna is optimum for this case.*

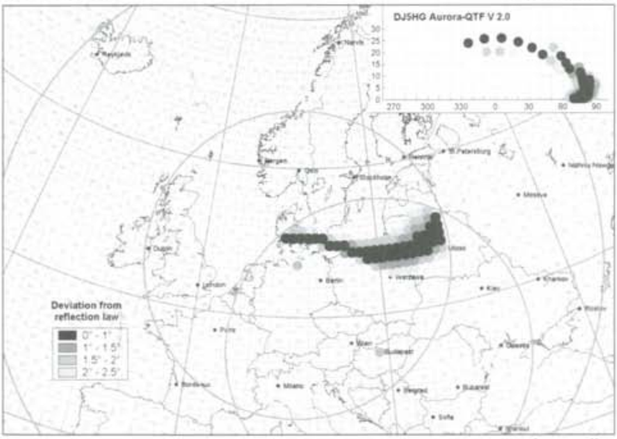


*Fig. 6. At shorter distances the region of possible scattering points is mostly large. Only a very restricted part is almost always currently active, if at all. The window at the upper left corner shows the position of the scattering points in the sky for both partners in azimuth and elevation.*

## Accessible regions

The calculations predict possibilities where I had never believed Aurora QSOs to be possible: the Spanish west coast (IN52) as well as the Crimea (KN65) are reachable from Hamburg. For several days in the last few years the, aurora scattering points were sufficiently far south, although probably not at the suitable position. Regions beyond Moscow definitely do not work, and Iceland cannot be reached from DL while following the ideal geometry.

## Deviations of the geometry

For nearly all Aurora QSOs of the author the described geometry was perfectly fulfilled. The maximum deviation was smaller than 2° (Hamburg – Rimini) and this can be explained with the equipment of the stations and with inversion above the Adriatic Sea. Recently it has been reported that some QSOs took place during Aurora openings, which completely deviates from the geometry [3].

If deviations from the ideal geometry of e.g. 20° would be possible, then deviations of 15° would occur more frequently and even deviations of 10°. However, I do not believe this to be the case. I believe the large deviations have to follow a different principle (probably Aurora E). Stations located far north should beam their antennas from time to time on southern located auroras (and please: QTF 110 for people living in Iceland).

For determination of the spectrum of QSOs with obvious deviation of the hereby described geometry an audio record would be very helpful (a few seconds are sufficient). The direction of the antenna should always be determined.

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[1] H. G. Booker, „A theory of scattering by nonisotropic irregularities with application to radar reflections from the aurora", J. Atm. Terr. Phys. 8, 204-221, 1956

[2] V. Grassmann, „Dx radius in Aurora and FAI radio propagation / Geographical signature of backscattering aligned to the Earth's magnetic field", DUBUS 3, p. 23-30, 2002

[3] V. Grassmann, Unusual Aurora observations in the 144 MHz band, Off-normal Auroral scattering, in amateur radio" Dubus, 4, p. 35-39, 2002

Additional literature on this issue can be found in the internet. The current page of DK5YA www.vhfdx.de gives good additional references. An appropriate word search for the Earth's magnetic field is "IGRF", the acronym for International Geomagnetic Reference Field.

The programs can be obtained from the author as MATLAB sources. Visit the author's home page at www.qsl.net/dj5hg for download of compiled versions.

Anmerkung der Redaktion: Dieser Artikel von DJ5HG ist in der cq-DL 1/2005 in deutscher Sprache erschienen. Wir danken der Redaktion der cq-DL für die Möglichkeit, den Artikel an dieser Stelle in engl. Sprache abdrucken zu dürfen.

# Die Geometrie von Meteorscatter-verbindungen

*Prof. Dr. Klaus von der Heide, DJ5HG*

Seit Jahrzehnten wird Meteorscatter im VHF-Bereich zur Überbrückung von Entfernungen von 1000 – 2400 km benutzt. Mit der von Joe Taylor, K1JT, durch sein Programm WSJT eingeführten Betriebsart FSK441 ist Meteorscatter - einst eine Methode für Spezialisten - zu einem beliebten Sport geworden. Ziel von K1JT, war, auch die kurzen sogenannten Pings für den Funkverkehr zu nutzen. Diese Pings sind Streuungen an Meteorbahnen, deren Ionisation für eine Reflexion nicht ausreicht. Für die schwach ionisierten Bahnen gibt es ein einfaches Gesetz, das die Geometrie der Streuung beschreibt. Schon McKinley gibt in seinem Buch aus dem Jahre 1961 [1,2] quantitative Formeln an zur Berechnung der Empfangsenergie. Das Wissen darüber wird in der Praxis aber kaum genutzt. Das mag daran liegen, dass bislang die länger anhaltenden Reflexionen von hochionisierten Meteorbahnen bevorzugt wurden. Diese selteneren sogenannten Bursts werden auch für SSB-Verbindungen genutzt. Bei FSK441 jedoch sind die ewa 100 mal so häufigen kurzzeitigen schwachen Ionisationen wesentlich. Deshalb sollte man etwas über die Geometrie der Streuung wissen, um Zeitpunkt des QSOs und Antennenrichtung optimal zu wählen.

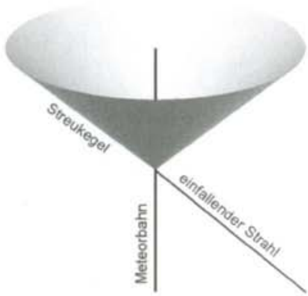


**Bild 1** *Geometrie des Streukegels*
**Fig 1** *Scatter cone geometry*

## Das Streugesetz

Das Streugesetz ist qualitativ mit einem Satz zu beschreiben: Die auf die Meteorbahn treffende Welle wird kegelförmig gestreut mit der Meteorbahn als Achse des Kegels, so dass die über die Meteorbahn geradeaus fortgeführte einfallende Welle auf dem Kegel liegt. Dies ist in Bild 1 dargestellt. Ein Meteor ist deshalb für eine gegebene Verbindung nur dann nutzbar, wenn

1. die Meteorbahn die E-Schicht durchquert
2. die Sendeantenne auf die Meteorbahn in der E-Schicht gerichtet ist
3. die Empfangsantenne auf die Meteorbahn in der E-Schicht ausgerichtet ist
4. die Empfangsantenne auf dem Streukegel liegt.

Die Kegelwand ist allerdings nicht unendlich dünn. Die ionisierte Meteorbahn nutzen wir nämlich als parasitären Strahler. Das Richtdiagramm dieses Strahlers ist der genannte Kegel, wobei die Kegelwand im Querschnitt die Hauptkeule darstellt. Diese Hauptkeule ist wegen der Länge des parasitären Strahlers von vielen tausend Wellenlängen ziemlich scharf. Bei flachem Einfall der Kegelfläche (große Entfernungen!) kann das Schnittgebiet mit der Erdoberfläche dennoch recht groß sein.

## QSOs in bekannten Meteorschauern

Wir betrachten zunächst den Fall von QSOs in einem bekannten Meteorschauer. Dann ist der Radiant der Meteorbahnen bekannt. Die zugehörigen Sternschnuppen scheinen radial vom Radianten am Himmel auszugehen (daher der Name). Tatsächlich sind sie alle parallel. Man sieht aber nur die Projektion an die Himmelssphäre. Der Radiant bewegt sich mit den Sternen am Himmel. Die Geometrie einer Verbindung ändert sich deshalb mit der Tageszeit. Es ist dabei nicht nur wichtig zu wissen, ob der Radiant über dem Horizont ist (nur dann gibt es Meteorbahnen), sondern auch, in welche Richtung die Streuung führt. Erst dann kann man sinnvoll CQ rufen, und nur dann begeht man nicht den fatalen Fehler, die Antenne auf einen schon erfolgten Anruf hin direkt auf den Anrufer auszurichten. Das minimiert nämlich fast immer den Erfolg und maximiert die Frustration gleich an zwei Enden.
Zunächst betrachten wir den einfacheren Fall, bei dem die Meteorbahn und der Ort des Senders bekannt sind. Daraus kann die Lage des Streukegels berechnet werden und dessen Schnittlinie mit der Erdkugel. Natürlich ist von dieser Schnittlinie nur der Teil relevant, der vom Streupunkt aus über dem Horizont liegt. Bild 2 zeigt als Beispiel den Fall der Quadrantiden morgens um 5.45 UTC. Offensichtlich lohnt es sich vom Standort Hamburg aus in Richtung Barcelona/Mallorca CQ zu rufen, denn für ganz Italien ist das Streugesetz allein schon für einen einzigen Streupunkt erfüllt. Der Autor hat dies probiert und in schneller Folge mehrere I- und S5-Stationen mit QTF=205° gearbeitet, in der Hoffnung dass diese nicht auf die Idee kommen, ihre Antenne nach Hamburg zu drehen.

S5 geht zu dieser Zeit genauso gut. Das Reflexionszentrum liegt dann von Hamburg aus exakt in der selben Richtung, aber etwas näher. Das Streugesetz ist bei den einzelnen Meteoren meistens nur für höchstens eine Gegenstation erfüllt. Die Tatsache, dass fünfzig Stationen in Europa gleichzeitig auf 144.370 MHz senden können (in der E-Schicht muss ein grauenvolles QRM herrschen) und man dennoch die einzelnen trennen kann, ist die Folge der Gültigkeit des Streugesetzes. Der zweite Fall ist etwas komplizierter. Gegeben seien die Orte von Sender und Empfänger und der Radiant der Meteorbahnen sowie Datum und Uhrzeit. Wir fragen nach der Lage aller Streuzentren, die die Geometrie für perfekte Streuung zwischen den Stationen erfüllen. Als Beispiel für die beiden Orte wurde hier Hamburg und Barcelona gewählt. Meteorstrom und Datum sind wieder die Quadrantiden am 4. Januar. Weil der Radiant morgens um 8:20 Ortszeit im Zenit steht, stellt man den Wecker möglichst früh oder macht gleich die Nacht vom 3. zum 4. durch. Um 3:00 UTC sehen wir das in Bild 3 dargestellte Reflexionsgebiet. Es liegt deutlich neben der direkten Verbindung. Vier Stunden später ist das Reflexionsgebiet noch weiter westlich gedriftet, so dass die beiden Antennenrichtungen sich dort (hoffentlich!) im rechten Winkel treffen wie Bild 4 zeigt. Nach einer weiteren Stunde steht der Radiant zwischen beiden Stationen fast im Zenit. Dann kann das Streugesetz nirgends erfüllt werden außer angenähert ganz am Horizont. Bild 5 zeigt diese Situation. Man bedenke, dass zu dieser Zeit an diesem Ort maximal viele Metore fallen. Im Jahr 2004 fiel dieser Moment sogar mit dem ziemlich spitzen Maximum des Meteorstroms zusammen und dennoch herrschte nach guter nächtlicher Aktivität plötzlich Ruhe auf dem Band – von wenigen schwachen Bursts abgesehen. Die Ruhe hält nicht lang. Eine Stunde später ist wieder voller Betrieb bei ausgezeichneten Signalen – sofern die Antenne gedreht wurde, denn das Reflexionsgebiet liegt jetzt auf der anderen Seite (Bild 6).

Gut zu sehen ist auf den Bildern, dass stark bündelnde Antennen durchaus angebracht sind. Man muss sich mit dem QSO-Partner nur einig sein. Das ist das Problem. Bei Random-Meteorscatter kann deshalb nur gelten: Hörst (besser: liest) du jemanden in mehreren Pings, so antworte, aber drehe die Antenne nicht. Falls aber in der Antennenrichtung mit Sicherheit kein Reflexionsgebiet ist, dann richte die Antenne auf das Reflexionsgebiet und warte, ob der OM besser ankommt. Erst wenn er aus der geänderten Richtung auch mehrfach kam, sollte man auf Sendung gehen. Vermutlich werden die allermeisten Meteorscatterverbindungen mit verquer stehenden Antennen gefahren, weil man auf einen in einem Burst gelesenen CQ-Ruf antwortet. Dann kann man die Pings nicht nutzen und muss auf weitere Bursts warten, und das kann dauern. Insbesondere QSOs mit Entfernungen unter 1000 km laufen meistens schlecht, weil die Ungewissheit über die Antennenrichtungen wegen der Nähe und Ausdehnung des Reflexionsgebietes groß ist.

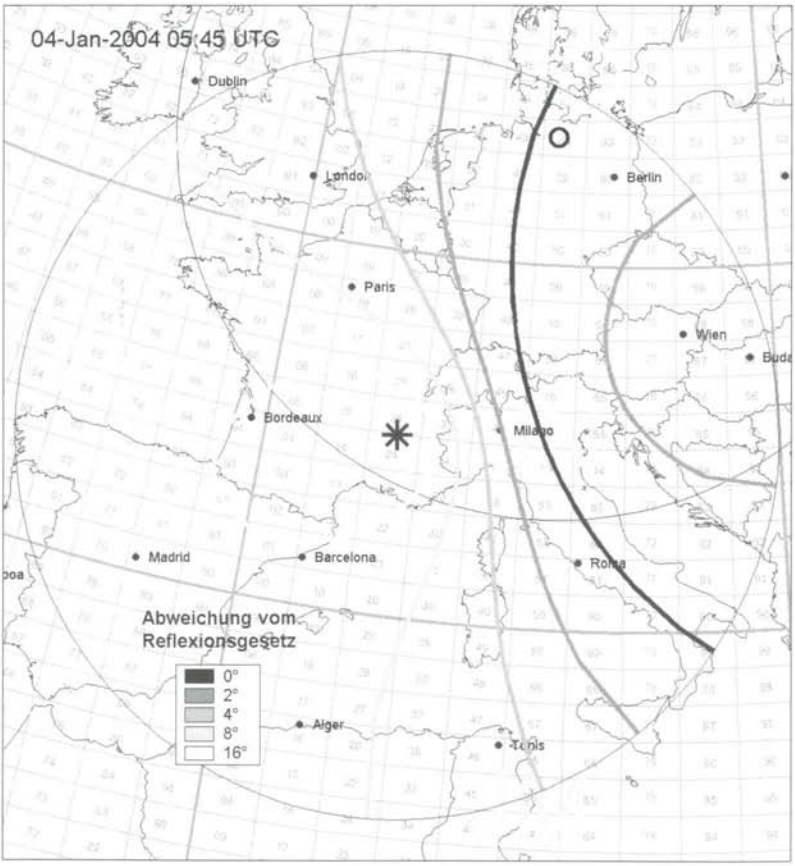


**Bild 2** ***Senderstandort JO53***

*In Südostfrankreich steil von Nordost einfallender Meteor (Stern). Die Schnittlinie des Streukegels mit der Erdoberfläche ist als schwarze Linie eingezeichnet*

**Fig 2** ***TX-location JO53***

*Meteor falling steeply from northeast to southeastern France (star). The crossing line of the scatter cone with the earth's surface is the black line. Other gray scale lines for alteration from reflection principle.*

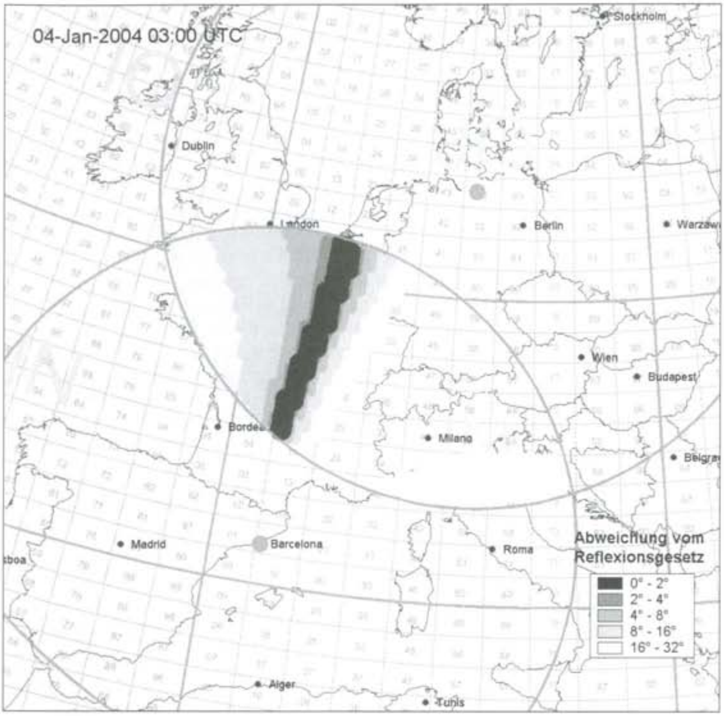


**Bild 3**
*Die Reflexionsbedingung ist für die Strecke Hamburg-Barcelona im Fall der Quadrantiden um 3:00 UTC im markierten Gebiet erfüllt. Die Kreise markieren jeweils die Schnittlinie des Horizonts mit der E-Schicht.*

**Fig 3**
*During quadrantids at 03:00 UTC the law of refraction for direction Hamburg-Barcelona is valid in the black marked area. The circles mark the cross-section of the horizon with the E-layer.*

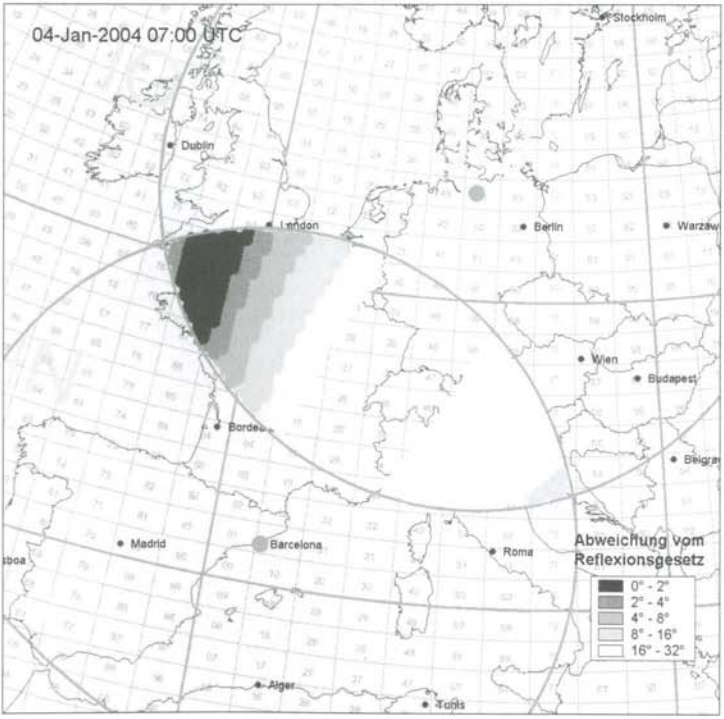


**Bild 4**
*Je steiler die Meteore einfallen, desto weiter liegt das Reflexionsgebiet von der direkten Verbindung*

**Fig. 4**
*With increasing elevation of falling meteors the scatter-point is more off the direct path*

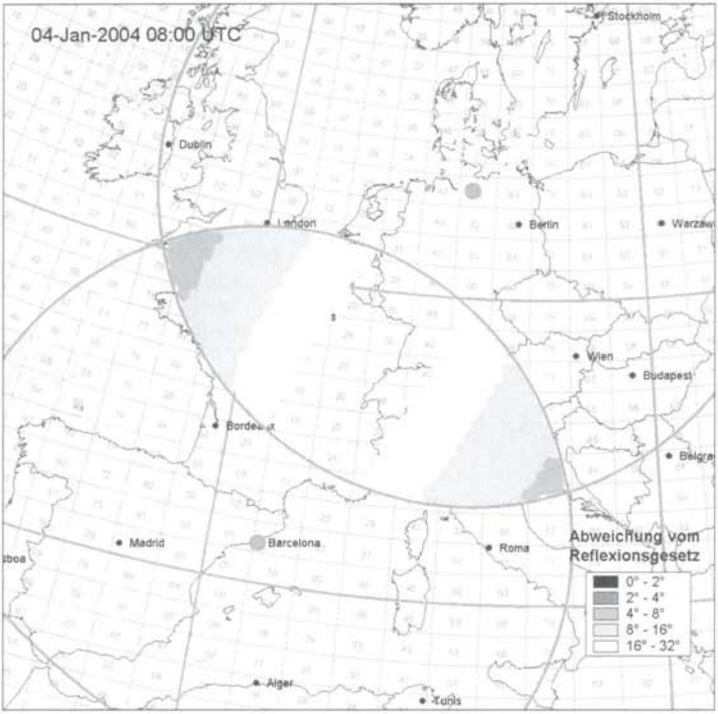


**Bild 5**
*Senkrecht fallende Meteore erfüllen das Reflexionsgesetz für größere Distanzen nie*

**Fig. 5**
*Meteors falling perpendicular never fulfil the reflection law for longer distances*

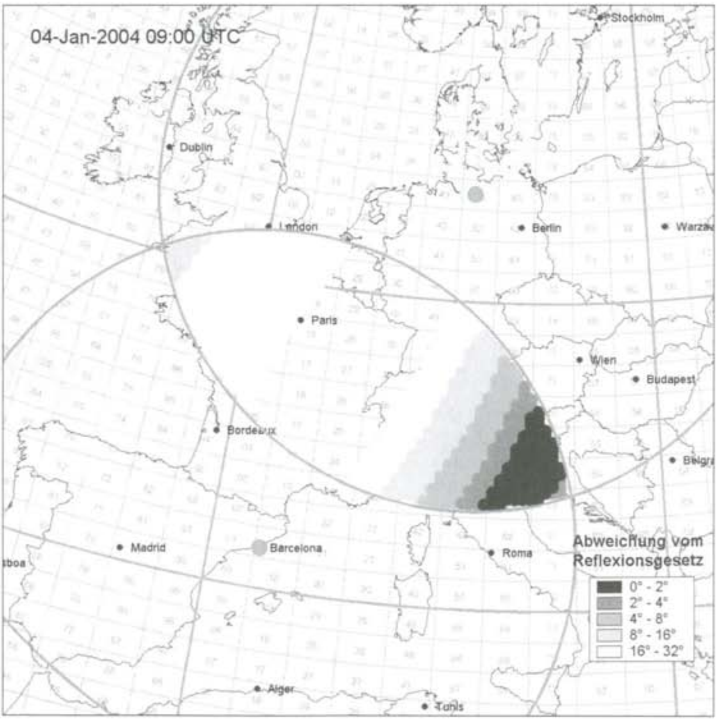


**Bild 6**
*Von Westen einfallende Meteore erfüllen das Reflexionsgesetz nur östlich der direkten Verbindung*

**Fig. 6**
*Meteors falling in from the west fullfill the reflection law only eastern of the direct path*

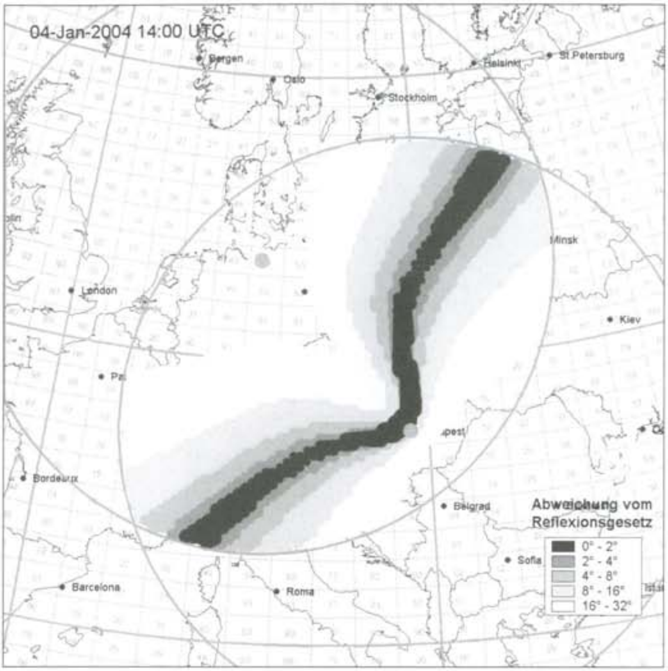


**Bild 7**

*Bei kleinen Entfernungen kann das Reflexionsgebiet sehr groß sein. Im Fall der direkten Antennenrichtung nach JO53 muss die ungarische Antenne in diesem Fall die Elevation von 70° haben. Besser ist QTF = 0°*

**Fig. 7**

*For short distances the scatter area can be very large. The antenna in HA needs to have 70° elevation when beaming directly to JO53. A QTF of 0° would be better.*

## Effizienz der MS-Verbindungen

Die Qualität einer Meteorscatterverbindung lässt sich aufgrund der bekannten Geometrie vorhersagen. Sie hängt ab erstens von der Größe des Gebietes, in dem die Reflexionsbedingung erfüllt ist und zweitens von den aktuellen Winkeln einschließlich der Polarisation. Man könnte meinen, auch die Höhe des Radianten über dem Horizont müsste wesentlich eingehen, weil pro Quadratkilometer der Ionosphäre bei sehr stehendem Radianten. Tatsächlich sind die Meteorbahnen bei niedrig stehendem Radianten aber länger. Damit steigt die Wahrscheinlichkeit der Nutzbarkeit für eine gegebene Verbindung. Für die nachfolgend beschriebenen Rechnungen wurde eine maximale Länge der nutzbaren Meteorbahnen von 100 km angenommen. Dieser Parameter bestimmt wesentlich die vorausgesagte Effizienz bei niedrig stehendem Radianten. Bei den folgenden Bildern wird nicht unterschieden zwischen großer Häufigkeit der Meteorbahnen einerseits und großen Signalpegeln aufgrund besserer Geometrie andererseits. Beides hebt die Effizienz. Abhängig von den benutzten Antennen, abhängig von der Richtung des Radianten und abhängig vom Meteorschauer selbst und abhängig von weiteren Parametern wie lokalem Rausch- und Stör-Pegel wirken sich Signalpegel und Häufigkeit der Meteore aber unterschiedlich auf eine Verbindung aus. Die hier angegebenen Werte für die Effizienz sind deshalb nur als Richtwerte anzusehen. Die geschätzte Genauigkeit von besser als 6 dB ist für den Bereich des Amateurfunks ausreichend. Schließlich macht gerade das Gefühl des Angelns den Reiz aus bei Random-MS. Der Autor hat alle Faktoren einschließlich der Formel aus McKilby (1961) zusammengetragen und damit eine relative Effizienz der Meteorscatterverbindung berechnet.

Als 0 dB wurde das Maximum der Effizienz einer Nord-Süd-Verbindung über den Äquator bei der Distanz 1000 km gewählt. Radiant ist dabei [0,0] und die Verbindung findet am Tag der Tag-und-Nachtgleiche statt.

Bild 7 zeigt eine typische Situation. Der Leser möge sich zunächst in die Lage des Autors versetzen, der einem mit der nach Moskau gedrehten Antenne gehörten CQ-Ruf aus HA antworten möchte, und anschließend in die Lage des Ungarn, der den Anruf von DJ5HG hört anstelle eines erwarteten aus OH. Man bedenke dabei, dass im Fall der direkten Antennenausrichtung auf der ungarischen Seite eine Elevation von 70° erforderlich ist.

Die relative Effizienz lässt sich für jede Verbindung als Funktion der Tageszeit berechnen. Das Ergebnis ist in Bild 8 für die Strecken Hamburg – Barcelona, Hamburg – Sofia, Hamburg – Moskau und Hamburg - Narvik dargestellt für die Quadrantiden. Auf allen Teilbildern ist die oben beschriebene Lücke aufgrund der gegen 8 UTC senkrecht fallenden Meteore zu sehen. Die Lücke ist bei Verbindungen nach Osten früher und bei solchen nach Westen später. Der Radiant ist im Zeitraum 18 – 22 UTC im Norden tief unten am Horizont. Der Radiant der Quadrantiden steht mit 49° über dem Himmelsäquator und geht deshalb in unseren Breiten nicht unter. Verbindungen nach Norden (Narvik, Reykjavik, Murmansk) sind deshalb auch um diese Zeit möglich. Die Formel nach McKilby liefert in diesem Zeitbereich besonders gute Signale, wenn die Meteore genau längs der Verbindungslinie fallen. Bild 8 zeigt deshalb für Narvik das Effizienzmaximum bei ca. 19 UTC,

obwohl die absolute Häufigkeit der Meteore dann gering ist. Allerdings liefert in diesem Fall auch feinster Meteorstaub noch brauchbare Pings, so dass die beobachtete Häufigkeit der Pings bei flachem Einfall sogar zunehmen kann.
Bild 8 gibt für die betrachteten 4 Verbindungen zusätzlich den tageszeitlichen Verlauf der optimalen Antennenausrichtung an. Die größte Änderung findet wiederum statt, wenn der Radiant gegen 8 Ortszeit am Streupunkt von Ost über den Zenit nach West kippt. Am stärksten macht sich das bemerkbar bei Nord-Süd-Kontakten mit QRB unter 1500 km.
Bild 9 zeigt die entsprechenden Ergebnisse für München anstelle von Hamburg als einen der beiden Standorte. Narvik wurde durch Trondheim ersetzt, weil Narvik von München aus mit der angenommenen Höhe der Reflexion von 102 km nicht erreichbar ist. Die grundsätzlichen Verläufe der Effizienz über der Tageszeit sind in beiden Bildern sehr ähnlich. Während aber z.B. Moskau von Hamburg bis 2:30 UTC offen ist, gibt man diese Richtung in München sinnvollerweise schon um 0:30 UTC auf.

## Zufällige Meteore außerhalb von Meteorschauern

Das Streugesetz lässt sich natürlich nur nutzbringend anwenden, wenn man die Richtung der Meteore, also den Radianten kennt. Das ist nur der Fall in ganz bestimmten jährlich wiederkehrenden, meist kurzen Perioden von allenfalls einigen Tagen. Zwischen diesen bekannten Schauern fällt aber genügend Meteorregen auf die Erde, um – dank FSK441 - täglich Meteorscatter fahren zu können. Diese Meteore fallen zufällig aus allen Richtungen ein. Über den einzelnen Meteor kann man deshalb keine Aussage machen. Wir versuchen nachfolgend einen statistischen Ansatz.
Bekannt ist, dass in den Morgenstunden wesentlich mehr zufällige Meteore fallen als am Abend. Das liegt daran, dass auf der sich drehenden Erde gerade die Orte mit 6 Uhr Ortszeit in Richtung der Erbahn um die Sonne liegen. Auf der Rückseite (12 – 0 Ortszeit) fallen nur Meteore, die schneller als die Erde sind und somit die Erde auf ihrer Bahn einholen können. Statistisch gibt es also einen Radianten in Richtung der Erbahn.

Dieser Punkt liegt auf der Ekliptik (das ist die Linie, die die Sonne im Lauf eines Jahres am Himmel zieht) und zwar 90° rechts der Sonne (gesehen auf der Nordhalbkugel, andernfalls links). Dieser statistische Radiant steht morgens um 6 Uhr Ortszeit im Süden dort, wo drei Monate vorher die Sonne mittags stand. Der Radiant steht damit am Frühlingsanfang am tiefsten. Deshalb ist die Rate der zufälligen Meteore auf der Nordhalbkugel von Februar bis April viel geringer als um den Herbstanfang.
Aus der Tatsache, dass der statistische Radiant nie höher als die Sonne steht, folgt für nichttropische Gebiete: Die zufälligen Meteore fallen im Mittel mehr von Süden ein als von Norden (auf der Nordhalbkugel). Obwohl wir über die Richtung der einzelnen Meteore nichts wissen, können wir daraus immerhin schließen, dass bei west-östlichen Meteorscatterverbindungen nördlich der direkten Verbindungslinie mehr Meteore das Streugesetz erfüllen als südlich dieser Linie. Für Nord-Süd-Verbindungen gilt: vor 6 Uhr Ortszeit liegen im Westen mehr Streuzentren, danach im Osten. Wie weit die Antennen von der direkten Richtung abweichen sollten, hängt von der Entfernung der beiden Stationen ab. Da diese Betrachtung nur auf Statistik basiert, ist die tatsächliche Verdrehung der Antennen unkritisch. Die Missweisungen der Antennen beider Partner müssen aber auch hier zueinander passen. J. Richardson [2] empfiehlt folgende Werte:

| QRB (km) | 1000 | 1250 | 1500 | 2000 |
|---|---|---|---|---|
| Missweisung der Antenne (Grad) | 13 | 11 | 10 | 10 |

Bei CQ-Rufen sollte man das berücksichtigen. Wird man angerufen, so heißt es aber auch hier: die Antenne sollte nicht gedreht werden – es sei denn, es ist völlig klar, dass eine Drehung nur Besserung bringen kann.

## Bursts

Das Sreugesetz gilt für die Streuung an schwach ionisierten Meteorbahnen. Größere Meteore erzeugen hohe Ionisation in zylinderförmigen Gebieten. Modelliert man stark ionisierte Meteorbahnen durch entsprechend dicke Metallzylinder, so ergibt sich in Bezug auf die Geometrie ein ähnliches Gesetz für die Reflexion. Inhomogenitäten und vor allem der örtlich unterschiedliche zeitliche Verlauf des Abklingens der Ionisation, Wind in der Ionosphäre und das magnetische Feld der Erde sorgen aber zunehmend für chaotische Verhältnisse, so dass mehrere Ausbreitungswege zwischen den Stationen entstehen mit schnellem QSB als Folge. Dennoch ist das einfache Modell nicht grundsätzlich falsch, in der ersten Zehntelsekunde is es sogar korrekt. Die Anwendung der hier gezeigten Bilder auch auf Meteorscatter durch Bursts ist daher durchaus sinnvoll. Wird das Streugesetz von einem Burst eingehalten, so erhält man ein sehr starkes Signal. Brauchbare Reflexionen bekommt man von Meteorbahnen hoher Ionisation aber auch bei größeren Abweichungen vom Streugesetz, und zwar mit zunehmender Degradierung der ursprünglich linearen Meteorbahn. Ein Burst erreicht deshalb seine maximale Stärke u.U. erst nach vielen Sekunden.
Arbeitet man mit WSJT, so sollte man nicht auf CQ-Rufe antworten, die man nur in einem Burst gehört hat. Nur Pings geben Auskunft darüber, ob die Reflexionsbedingung für die gewählten Antennenrichtungen ausreichend erfüllt ist. Wegen der chaotischen Reflexion aller die Bahn treffenden Signale sind Bursts beim Betrieb mit WSJT eher störend als nützlich.
Auch für Auroraverbindungen gilt das beschriebene Streugesetz. Anstelle der Richtung des Radianten sind dann die magnetischen Feldlinien der Erde zu nehmen, die nicht mit den Sternen über den Himmel wandern, dafür aber von Ort zu Ort verschieden verlaufen. Diesen Fall behandelt der Autor in einem getrennten Artikel in diesem Heft.

## Literatur

[1] D.W.R. McKinley: „Meteor Science and Engineering", McGraw-Hill, 1961
[2] J. Richardson: „Some Notes and Equations for Forward Scatter". Diese kurze Zusammenstellung der wichtigsten Zusammenhänge und Formeln basierend auf [1] findet sich im Internet an mehreren Stellen.

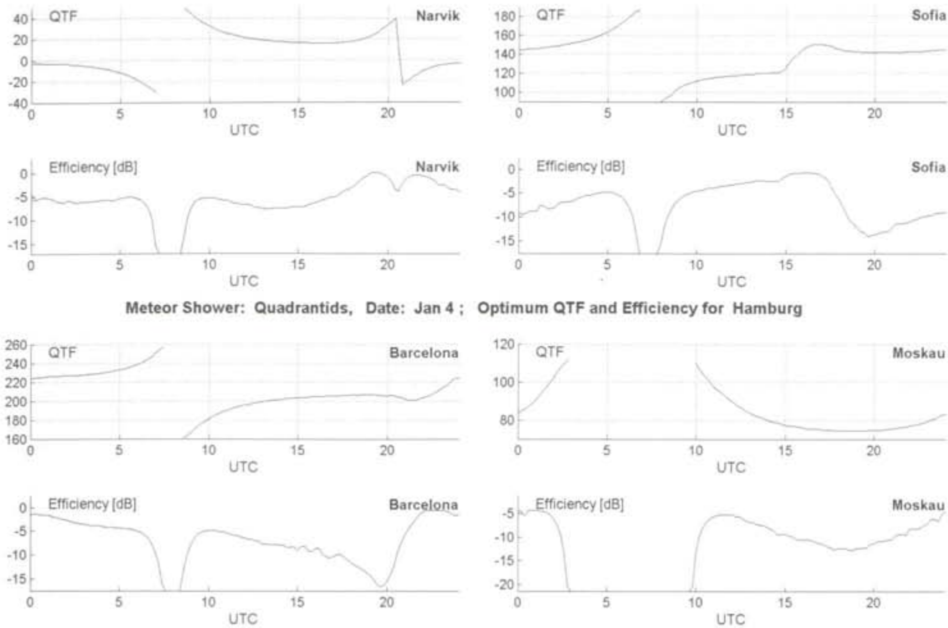


**Bild 8** *Die Qualität einer Verbindung über Meteorscatter hängt von der Tageszeit ab. Hier ist die Effizienz der Quadrantiden für vier Strecken angegeben sowie die optimale Antennenrichtung in JO53. Andere Schauer ergeben andere Bilder.*

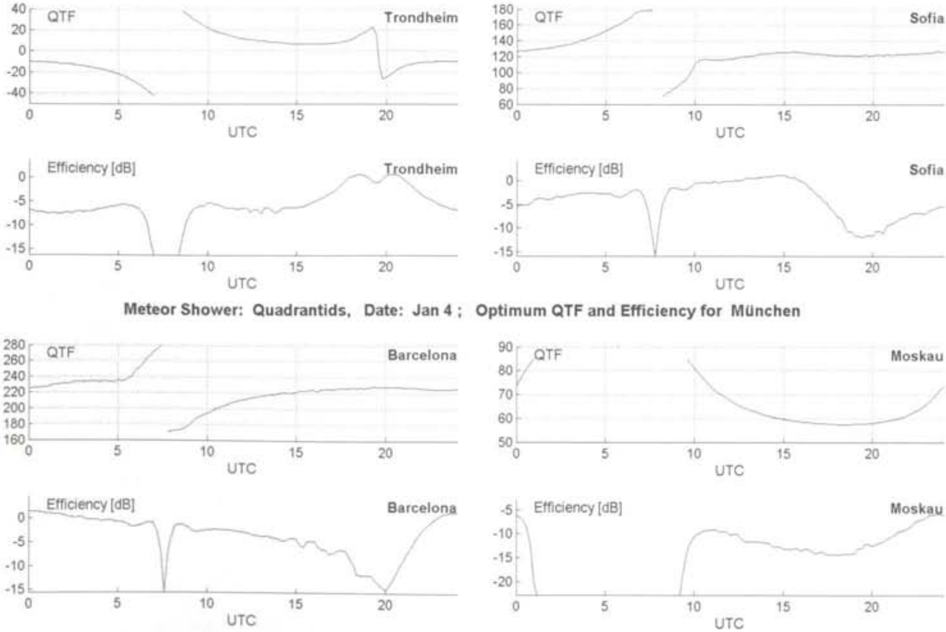


**Bild 9** *Trotz der relativ kleinen Entfernung zwischen Hamburg und München können sich im Zeitplan der Verbindungen deutliche Verschiebungen ergeben. Hier z.B. München-Moskau gegenüber Bild 8 Hamburg-Moskau*

**Fig. 8** The quality of a path depends on daytime. Here the efficiency of quadrantids for 4 paths can be seen in conjunction with the optimum antenna heading in JO53. This is different during other showers.

**Fig. 9** shows the corresponding results for the location Munich. The other location is Trondheim, because Narvik is out of reach with a reflection height of 102 km. The graphs are similar. While Hamburg-Moscow is open until 02:30, Munich-Moscow is only possible until 0:30 utc.

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Auch weitere Literatur zu diesem Thema findet man im Internet. Z.B. enthält die aktuelle Seite von DK5YA www.vhfdx.de gute Verweise, darunter auf deadband.htm von Palle, OZ1RH. Lesenswert ist auch D. E. Warren & R. Desourdis: „Meteor Burst Communications The Gap Filler". Die Arbeit findet man als metburdu.html. Ein weiteres geeignetes Suchwort ist „IMO", das Akronym für International Meteor Organization.

Die Programme sind vom Autor als MATLAB-Quellen erhältlich. Sie laufen unter Matlab ab Version 6.0. Für Version 5.3 sind nur kleine Änderungen nötig. Octave ist nicht geeignet, da dies die Handle-Graphik mit den unverzichtbaren GUI-Möglichkeiten leider nicht unterstützt.

Der Autor ist erreichbar per Mail unter v.d.heide@on-line.de

Im Web sind unter http://www.vhfdx.de/mseff/mseffmain.html den Abb. 8 bzw. 9 entsprechdende Grafiken für folgende Städte und Schauer abrufbar:

**City/Städte: Barcelona, Berlin, Dublin, Hamburg, Kiev, Madrid, Moskau, Reykjavik, Rom and Sofia**

**Shower/Schauer: Quadrantids, Lyrids, Eta-Aquarids, Southern-Delta-Aquarids, Perseids, Alpha-Aurigids, Orionids, Leonids, Geminids and Ursids**

# The Geometry of Meteorscatter Communication

*Prof. Dr. Klaus von der Heide, DJ5HG*

Since decades meteorscatter is used for VHF-communication at distances of 1000 – 2400km. With the implementation of FSK441 by Joe Taylor, K1JT, in his WSJT-software this type of communication has changed from a task for specialists to a sport for the average amateur. K1JT wanted to make the short reflections (pings) usable for communication. Pings are scattered by meteor-trails whose ionisation is not enough for a reflection. A simple law describes the geometry of those underdensed trails. McKinley presented formulas to calculate the received energy in his book [1,2] in 1961. This knowledge is rarely used. In the past mostly the longer lasting reflections of overdensed trails were used. Those rare "bursts" are used even for SSB-qsos. FSK441 uses the 100 times more often occuring pings. For optimum timing of a qso knowledge of the geometry of scattering is necessary.

## Law of refraction

The law of refraction can be described in one sentence: The wave is scattered into a cone which axis is the meteor-trail while the wave crossing the trail describes the wall of the cone, see fig. 1. A meteor is only usable if:

1. The meteor-trail crosses the E-layer
2. The TX-antenna is pointing towards the trail in the E-layer
3. The RX-antenna is pointing towards the trail in the E-layer
4. The rx-antenna is on the surface of the scatter-cone.

The wall of the cone isn't infinite thin. We are using the trail as a parasitic radiator, whose pattern is the cone and the cross-sectional view is the main lobe. Because the radiator is several thousand wavelenght long, this main lobe is very sharp. Looking at the cone at low elevation-angels (great distances) can nevertheless result in a wide reflection plane.

## QSOs during meteorshowers

A first look will be done on qsos during a known meteor-shower. The radiant of the trail is known. The meteors seem to come radial out of the radiant. In reality they are all parallel. We only see the projection on the sphere. The radiant moves with the stars on heavens. The geometry of a communication-path alters during the day. We have to know if the radiant is above the horizon (only then meteor-trails are possible) and in which direction the refraction points. Only then a cq-call will be effective and the antenna will not be pointed directly onto the partner, which will mostly minimise the chance of a qso and maximise frustration on both sides.

At first we'll investigate the simple case, where tx-location and meteor-trail are known. Then the orientation of the scatter-cone and its cross-section with the earth-surface can be calculated. Only the part above the horizon is of interest of course. Fig. 2 shows as example the quadrantids at 05:45 UT. Obviously it's effective to call cq in direction Barcelona/Mallorca, the law of refraction spreads over whole Italy for only one scatter-point. The author has tried this and worked very quickly some I- and S5-Stations with qtf 205° hoping that they wont turn their antennas to Hamburg. Working S5 is also possible at this time. The Scatter-point is in the same direction but somewhat nearer.

For a single meteor the law is normally only valid for one partner-station. The fact, that 50 stations in Europe are transmitting together on 144.370 (a terrible qrm must exist in the E-layer) and it's possible to separate them, confirms this.

The second case is more complicated. Tx- and rx-location, the radiant and time are known. We're searching the scatter-points in conjunction with the law of refraction. Example is again Hamburg and Barcelona during quadrantids at 4. Jan.. Because the radiant is in zenith at 08:20, it makes sense to operate the whole night. Fig. 3 shows the scatter-region at 03:00 UT. It's far off the direct path. Four hours later the scatter-point has drifted further west. The qtf of both stations should meet there at an angle of about 90°, see Fig. 4. Another hour later the scatter-point is in zenith between both stations. No scatter-point exists, see Fig. 5. At this time lots of meteors are falling. In 2004 this was the sharp peak of the quadrantids. After good activity during the night, at this time there was nearly silence besides a few weak bursts! One hour later we had good activity with good signals again, the Scatter-point was now on the other side, see Fig.6.

These pictures show, that antennas with narrow beamwith should be used. The problem is proper planing with the sked-partner. On random: If you hear some pings from a station, answer, but don't turn the antenna. If there is no scatter area in your antenna direction, beam to the next scatter area and check, if the station produces better reflections. If so, give him an answer. I guess, the most qsos are done with wrong antenna positions, because a cq is heard in a burst. Then pings are not usable and one has to wait for the next burst, that's timeconsuming. Especially qsos below 1000km are difficult, because the position and width of a scatter area and corresponding antenna direction is not known. Fig.7 shows a typical situation. The author wants to answer the cq of a HA with antenna pointing to Moskow. The HA hears the call from DJ5HG instead of an expected OH-station. Using the direct path would require 70° elevation at the HA-station.

## Efficiency of an MS-path

The quality of an MS-path can be defined by the known geometry. It depends on the width of the scatter area and the angles incl. polarisation. The hight of the radiant above horizon is of great importance. There are more meteors per area at a high elevation but the trails of the meteors are much longer at low elevation and therefore better usable for a given path. The following calculations are based on a trail-length of 100km; this parameter is essential for the predicted efficiency at low elevation of the radiant. In the following pictures no difference is made between number of meteor trails and better signal strenght due to better geometry. Both factors are equally good for efficiency. Depending on antennas used, direction of radiant, the shower itself and other parameters like local noise and interference, the signal-level and numbers of meteors have different effects on a qso. The given efficiencies are only rough numbers. Estimated precision of 6dB is good enough for amateur use, searching stations is fun of random operation.

The author has collected all facts incl. the formula of McKilby (1961) and has calculated a relative efficiency of a meteor-scatter-path. 0dB is the maximum efficiency of a north-south path over the equator at a distance of 1000km. Radiant is [0,0] and the communication is taking place at the day of equal day- and night-length. The relative efficiency can be calculated for every path as a function of the time. The result is presented in fig. 8 for the path Hamburg-Barcelona, Hamburg-Sofia, Hamburg-Moscow and Hamburg-Narvik during quadrantids. All figs. show the described gap caused by meteors coming in with 90° elevation at 08:00. The gap exists earlier on paths to the east and later on paths to the west. The radiant is slightly over the horizon to the north between 18 and 22 UTC. The radiant of quadrantids is 49° over the celestial equator and doesn't set in DL. Paths direction north are possible at these times. McKilby's formula brings good results in this time interval, when meteors are falling along the direct path. Fig. 8 shows the maximum efficiency at abt. 19UTC despite the number of meteors are minimum then. In this case even dust produces pings, the number of pings at low elevation can grow therefore.

Fig. 8 shows for the 4 paths the optimum antenna direction with daytime as parameter. The biggest difference can be seen when the radiant goes through zenith at abt. 08 utc. Greatest effect is seen on north-south paths with qrb below 1500km.

## Random meteors

The law of refraction can only be used when the radiant is known. This is only true during showers. Between these showers there are daily enough random meteors for successful operation with FSK441. These meteors are falling in from different directions. No statement can be done for a single meteor. I'll try a statistically based statement.

Well known is, that during the morning hours more random meteors are falling than in the evening. Cause is, that every place on earth's surface is heading in direction of earthorbit around the sun at 06:00 local time. On the other side (12-0 local time) only meteors are falling that are quicker than earth and can overtake earth on its orbit. Statistically there is a radiant in direction of the earth orbit. This point is on the eclipse (the line on heavens on which the sun travels during a year) 90° right of the sun position (on north hemisphere, otherwise left). This statistic radiant is in south at 06:00 local time, where the sun has been located 3 month before at noon. The radiant has its lowest elevation at commencement of spring. Therefore the number of random meteors is much lower from February until April than in autumn on the northern hemisphere.

From the fact, that the statistic radiant cannot be higher than the sun follows for not tropical regions: more random meteors are falling from south than from north (on northern hemisphere). Despite we don't know anything about the single meteor, we can conclude, that for a west-east path more meteors are holding the law of refraction north of the direct path than south of the direct path. At north-south paths holds: before 06:00 local time there are more scatter-points in the west, later more scatter-points exist to the east. The difference of antenna heading to the direct path depends on the qrb of the stations. While this is a statistic statement, the heading offset is uncritical, but should correspond for both stations. J. Richardson [2] presented the following data:

| QRB (km) | 1000 | 1250 | 1500 | 2000 |
|---|---|---|---|---|
| Heading antenna offset (deg) | 13 | 11 | 10 | 10 |

This should be taken into account during cq-calls. When being called the following holds: don't turn the antenna- despite it's surely known, that turning the antenna will produce better results.

## Bursts

The law of refraction holds for underdensed meteor trails. Bigger meteors produce high ionisation with cylindrical shape. Modelling meteor trails with metal cylinders produces a similar law for the reflection. Irregularities, the different duration of ionisation in different locations, wind in the ionosphere and the magnetic field of earth produce unpredictable situations with multipath propagation and quick qsb between the stations. Nevertheless the simple model is not wrong, especially in the first tenth second it's true. The shown pictures can be used also for meteorscatter-bursts. If the burst holds the law of refraction, we will have very strong signals. Usable reflections from overdensed trails can occur with some deviation from the law, especially with further degradation of the trail, that is linear at first. Often the signalstrength gets maximum after several seconds.

Using WSJT, cq-calls been heard in one burst should not been answered. Only pings show the right antenna-direction for a given path. Bursts are sometimes inconvenient.

The law of refraction holds also for communication via aurora. Here the magnetic field lines of earth have to be taken instead of the radiant. The direction of the magnetic field differs with the location. This is discussed in another article in this issue.

On the web **http://www.vhfdx.de/mseff/mseffmain.html** you can find Meteor Scatter efficiency tables like Fig. 8 and Fig 9. for the following cities and showers:

**City/Städte: Barcelona, Berlin, Dublin, Hamburg, Kiev, Madrid, Moskau, Reykjavik, Rom and Sofia**

**Shower/Schauer: Quadrantids, Lyrids, Eta-Aquarids, Southern-Delta-Aquarids, Perseids, Alpha-Aurigids, Orionids, Leonids, Geminids and Ursids**

## Literatur

[1] D.W.R. McKinley: „Meteor Science and Engineering", McGraw-Hill, 1961
[2] J. Richardson: „Some Notes and Equations for Forward Scatter". Diese kurze Zusammenstellung der wichtigsten Zusammenhänge und Formeln basierend auf [1] findet sich im Internet an mehreren Stellen.

More literature is available on the web, e.g. on the site from DK5YA -www.vhfdx.de- there are good links.
For example to deadband.htm from Palle, OZ1RH.
Worth reading is also: D. E. Warren & R. Desourdis: „Meteor Burst Communications The Gap Filler". This you may find on metburdu.html.
You may also google for „IMO", the acronyme for International Meteor Organization.

Die programms are available from the author as MATLAB sources. They run under Matlab 6.0 and higher. For version 5.3 only small changes are necessary. Octave is not suitable because it does not support handle graphics with the demanded GUI-facilities.

You may contact the author at
v.d.heide@on-line.de

# Microwave Parts

Hittite bietet neue Vervielfacher an: Der HMC448 von 10 auf 24 GHz einsetzen. Preis um 20 USD. Hittite offers new muliplier. The HMC448 is intersting for 10 -> 24 GHz. Price around 20 USD.

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# HMC448

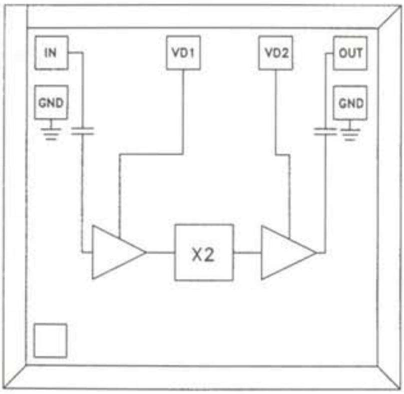
## GaAs MMIC x2 ACTIVE FREQUENCY MULTIPLIER, 19 - 25 GHz OUTPUT

### Typical Applications

The HMC448 is suitable for:

- Clock Generation Applications: SONET OC-192 & SDH STM-64
- Pt to Pt & VSAT Radios
- Test Instrumentation
- Military & Space

### Functional Diagram




### Features

Output Power: +11 dBm

Wide Input Power Range: -4 to +6 dBm

Fo, 3Fo Isolation: >20 dBc @ Fout= 20 GHz

100 KHz SSB Phase Noise: -135 dBc/Hz

Single Supply: 5V@ 48 mA

Die Size: 1.16 mm x 1.20 mm x 0.1 mm

### General Description

The HMC448 die is a x2 active broadband frequency multiplier chip utilizing GaAs PHEMT technology. When driven by a 0 dBm signal, the multiplier provides +11 dBm typical output power from 19 to 25 GHz. The Fo and 3Fo isolations are >22 dBc up to 22 GHz. This multi-rate frequency multiplier can be used in the generation of a half rate clock for 40 Gbps systems or as part of a multiplier chain to generate a full rate 40 Gbps clock. The HMC448 is also ideal for use in LO multiplier chains for Pt to Pt & VSAT Radios yielding reduced parts count vs. traditional approaches. The low additive SSB Phase Noise of -135 dBc/Hz at 100 kHz offset helps maintain good system noise performance. All data is with the chip in a 50 ohm test fixture connected via 0.076mm x 0.0127mm (3mil x 0.5mil) ribbon bonds of minimal length 0.31mm (<12mils).

### Electrical Specifications, $T_A$ = +25° C, Vd1 = Vd2 = 5.0V, 0 dBm Drive Level

| Parameter | Min. | Typ. | Max. | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Frequency Range, Input | | 9.5 - 11.0 | | | 11.0 - 12.5 | | GHz |
| Frequency Range, Output | | 19 - 22 | | | 22 - 25 | | GHz |
| Output Power | 5 | 9 | | 8 | 12 | | dBm |
| Fo Isolation (with respect to output level) | | 25 | | | 15 | | dBc |
| 3Fo Isolation (with respect to output level) | | 25 | | | 22 | | dBc |
| Input Return Loss | | 9 | | | 6 | | dB |
| Output Return Loss | | 5 | | | 5 | | dB |
| SSB Phase Noise (100 kHz Offset) | | -135 | | | -135 | | dBc/Hz |
| Supply Current (Idd) | | 48 | | | 48 | | mA |

4

FREQ. MULTIPLIERS - CHIP



*For price, delivery, and to place orders, please contact Hittite Microwave Corporation: 12 Elizabeth Drive, Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373*

# GaAs MMIC x2 ACTIVE FREQUENCY MULTIPLIER, 19 - 25 GHz OUTPUT

## Handling Precautions

*Follow these precautions to avoid permanent damage.*

**Cleanliness:** Handle the chips in a clean environment. DO NOT attempt to clean the chip using liquid cleaning systems.
**Storage:** All bare die are placed in either Waffle or Gel based ESD protective containers, and then sealed in an ESD protective bag for shipment. Once the sealed ESD protective bag has been opened, all die should be stored in a dry nitrogen environment.
**Static Sensitivity:** Follow ESD precautions to protect against > ± 250V ESD strikes.
**Transients:** Suppress instrument and bias supply transients while bias is applied. Use shielded signal and bias cables to minimize inductive pick-up.
**General Handling:** Handle the chip along the edges with a vacuum collet or with a sharp pair of bent tweezers. The surface of the chip has fragile air bridges and should not be touched with vacuum collet, tweezers, or fingers.

## Mounting

*The chip is back-metallized and can be die mounted with AuSn eutectic preforms or with electrically conductive epoxy. The mounting surface should be clean and flat.*

**Eutectic Die Attach:** A 80/20 gold tin preform is recommended with a work surface temperature of 255 deg. C and a tool temperature of 265 deg. C. When hot 90/10 nitrogen/hydrogen gas is applied, tool tip temperature should be 290 deg. C. DO NOT expose the chip to a temperature greater than 320 deg. C for more than 20 seconds. No more than 3 seconds of scrubbing should be required for attachment.
**Epoxy Die Attach:** Apply a minimum amount of epoxy to the mounting surface so that a thin epoxy fillet is observed around the perimeter of the chip once it is placed into position. Cure epoxy per the manufacturer's schedule.

## Wire Bonding

Ball or wedge bond with 0.025mm (1 mil) diameter pure gold wire. Thermosonic wirebonding with a nominal stage temperature of 150 deg. C and a ball bonding force of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Use the minimum level of ultrasonic energy to achieve reliable wirebonds. Wirebonds should be started on the chip and terminated on the package or substrate. All bonds should be as short as possible <0.31mm (12 mils).

## Mounting & Bonding Techniques for Millimeterwave GaAs MMICs

The die should be attached directly to the ground plane eutectically or with conductive epoxy (see HMC general Handling, Mounting, Bonding Note).

50 Ohm Microstrip transmission lines on 0.127mm (5 mil) thick alumina thin film substrates are recommended for bringing RF to and from the chip (Figure 1). If 0.254mm (10 mil) thick alumina thin film substrates must be used, the die should be raised 0.150mm (6 mils) so that the surface of the die is coplanar with the surface of the substrate. One way to accomplish this is to attach the 0.102mm (4 mil) thick die to a 0.150mm (6 mil) thick molybdenum heat spreader (moly-tab) which is then attached to the ground plane (Figure 2).

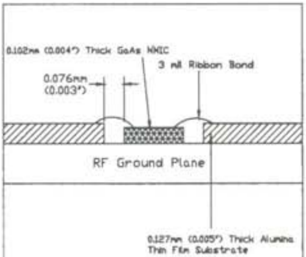



Figure 1.

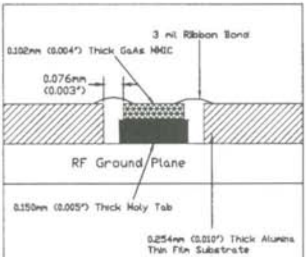



Figure 2.

Microstrip substrates should be brought as close to the die as possible in order to minimize ribbon bond length. Typical die-to-substrate spacing is 0.076mm (3 mils). Gold ribbon of 0.075 mm (3 mil) width and minimal length <0.31 mm (<12 mils) is recommended to minimize inductance on RF, LO & IF ports.

An RF bypass capacitor should be used on the Vdd input. A 100 pF single layer capacitor (mounted eutectically or by conductive epoxy) placed no further than 0.762mm (30 Mils) from the chip is recommended.



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**Also HMC449:** 13.5-16.4 -> 27-33 GHz, 10dBm Check www.hittite.com

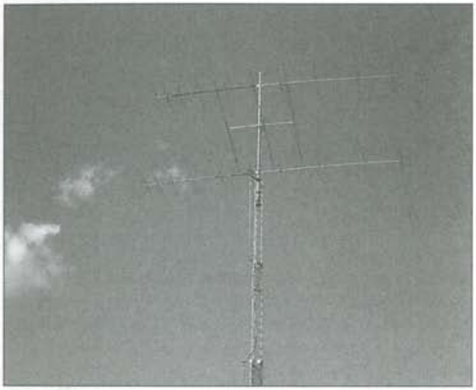
# Microwave Japan

## Seiji Fukushima, Ph.D, JH6RTO

### Two EME Topics

**Akira Kumabe, JM1SZY, reports:**

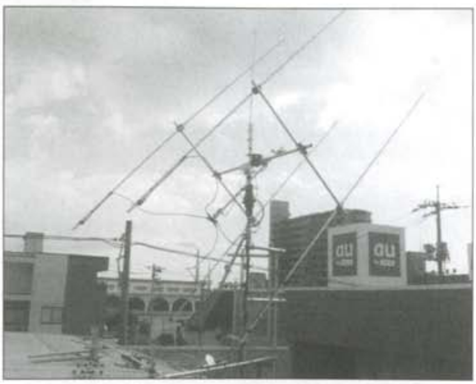
6m EME was permitted in Japan on the 13th of January 2004, as reported in this column of DUBUS 2004-1. We, Japanese moon-bouncers, have worked 64 stations in 13 DXCC entiteties by the 24th of October as far as I know. These include W, SM, JA, I, ZS, F, LY, GD, ES, OH, LZ, LA, and ZL in 5 continents but South America has yet to be worked for WAC. I worked 19 stations in 13 countries.



**JM1SZY - Akira's 6m antenna (2x10)**

**Hidehiko Matsuo, JH6VAX/4, reports:**

I am one of the smallest moonbouncers although I worked HB9Q on 70cm JT44. My output power was only 50 Watts, which is a maximum power of the Japanese portable station. I used a 4x25-element antenna and a HEMT LNA with NF of 0.6dB. Thanks to HB9Q.



**JH6VAX - Hidehiko's 70cm antenna (4x25)**

### 'The 10th Annual Microwave Meeting'

**by Nobuo Katsuma, JF1WKX**

74 Japanese amateur microwavers attended the Meeting on the 14th of November, 2004 in Tokyo. There were four presentations.

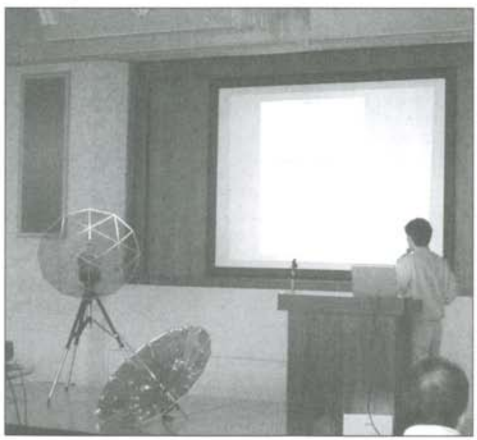
As the first one, a new Japanese digital network called 'D-Star' was presented by Satoshi Yasuda, 7M3TJZ. D-Star is one of the Japanese amateur digital networks, which can connect us in both digital data and digital voice simultaneously. This year band plans were renewed for these high-speed digital experiments. Satoshi described its communication protocol and how-to-use-it. According to him, D-Star can be applied to data communication through internet as well as P2P digital voice QSO.

Yoshiyuki Takeyasu, JA6XKQ, presented a novel dish called geodesic parabola antenna. The antenna components are triangle and it is easy to build and to reproduce. His homepage is written in Japanese but its structure figures can be found in www.terra.dti.ne.jp/~takeyasu/.

The third topic was a PC-based spectrum analyzer called Giga-St, presented by Tsuguo Okamoto, JN1AYV. Giga-St is a cheap spectrum analyzer kit (park7.wakwak.com/~gigast/ in Japanese). He presented a few applications such as adjustment of 1.2/2.4GHz diplexers and measurements of LNA's NF and antenna's VSWR. The Giga-St has a measurement frequency of up to 4GHz..

Finally, Hiroyuki Makioka, JH1UGF, demonstrated his two-band (5.7 and 10 GHz) transverter. Note that he is a president of an amateur microwave manufacturer, Maki-denki Co. Ltd. (www.makidenki. co.jp, partly in English). He demonstrated microwave digital communication, using an Icom's D-Star radio, ID-1, and his transverter.

The flea market was also successful. The next Meeting will be held on 20-11-2005.



**JA6XKQ, Yoshiyuki, presenting his geodesic parabola antennas**

# Microwave Europe

## Editor: Simon Lewis, GM4PLM

Hello and welcome to another Microwave Europe column. As I write this it is cold and dark outside and there is snow in the wind – definitely a winters evening! The lovely summer days seem so far away at this time of year especially here in the North Rhein area. Winter is always a good time for projects of course and now is a great time to start thinking about next years tropo openings and thinking about building something new. Which new band will you activate this coming year?

### Amateur Linked Long Base line Interferometer Network (ALLBIN)

For Radio Astronomy as well as other applications a large antenna is favourable under the motto the bigger the better , as the Diameter increases the gain improves as well as the angular resolution, the gain seems at first the big advantage of using big antennas but today this may be done with super low noise preamps and in the case of Radio Astronomy by using very wide band widths which multiplied by the Boltsmans constant give very high signal levels indeed. The only reason why one should wish to build a very big dish at all may at first glance be because of the angular resolution possible from the antenna. The dream of having Jodrell bank or an Effelsberg in the garden to play with is honestly not realistic but mounting 2 x 3 meter dishes together with a large base line is more than realistic, in fact a number of such systems exist already by amateurs in this case we talk about a Single site Interferometer with the same target in front of both "Barrels" and 2 mixers fed from the same LO producing the IF at a much lower frequency which may then be transported over larger distances to the middle position where the phase of both signals is added automatically to peak and trough so giving so called 'fringes' which may be seen wonderfully when a target drifts through the beam of the Radio Telescope dishes. The next logical step is to get a larger distance between the dishes as well as more dishes together to electrically and mathematically build a very large dish say as large as Europe itself, we call this Continental Very long base line interferometry which has been for many years, the domain only of very large institutes and universities, their trick has been to clock everything very exactly with different clocks controlling all timing operations at each station using Atomic clocks to even generate the LO signals up to the exact computing speed of processing data. We note here that 2 problems exist. Time which is responsible for the phase of the LO frequency used and computing sync. With the European Radio Astronomy Clubs Project ALLBIN "Amateur Linked Long base line Interferometer Network" we are trying for the first time as Amateurs and Professionals to build up a very low cost network to do high resolution Radio Astronomy. On our web site www.eracnet.org the ALLBIN Project may be seen as well as the powerpoint presentation of how the hardware works, the timing problem has been solved using a very fine improved GPS System as yet not on the web it will be up soon! And the computing problem has been solved very simply by commanding synchronously the convert command for the A/D Converter which synchronously produces data on the PCI bus to be then asynchronously processed by the very fast computer generation of today, our system improves on the professional systems of today as they still use magnetic tapes which give observational results months later and our system is live on the internet.

With the greatest pride I would like to announce here that ERAC Member in May 2004 Marko Cebokli, S57UUU, from Ljubljana, Slovenia managed to do digital correlation of 2 signals from 2 antenna receiver systems of the sun "the strongest and easiest source" to get wonderful fringes for the first time ever, no single person has managed to achieve this till this date and using very inexpensive equipment.

This is a wonderful step forward to doing Amateur Radio Astronomy with small dishes all over Europe and now that this technology has been proven. Other applications are also possible, for instance EME (please replace the word moon for mars in this acronym!). With ALLBIN technology and linking via the internet this may be possible. Open offer to the ham radio community to work together jointly in both directions. Ham Radio is not only purchasing Japan made black boxes plugging them in and experiencing the next "Kick" that money can buy , ham radio was originally radio science and Iwould like to invite the very small number of engineers to work together again to cross new borders. If enough interest can be found I am prepared to organize a conference for the first time to discuss using ALLBIN technology for amateur radio goals at Heppenheim, Germany.

Peter Wright, DJ0BI, ERAC President. erac@eracnet.org

### Beacon News

The F1EIT 10GHz beacon, original location in JN03TI, has been moved to a better QTH. The call sign has also been changed. The beacon is now F6CXO (waiting for an official call sign later) Location:JN14EB 650m ASL F1A modulation 1W power, the beacon antenna is a slotted waveguide with 13db gain. The frequency is 10368.950MHz.

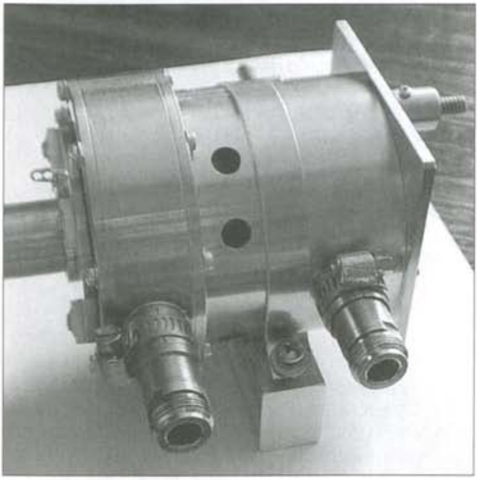
73, Dom/F6DRO

### 23cm 300W Valve Amplifier

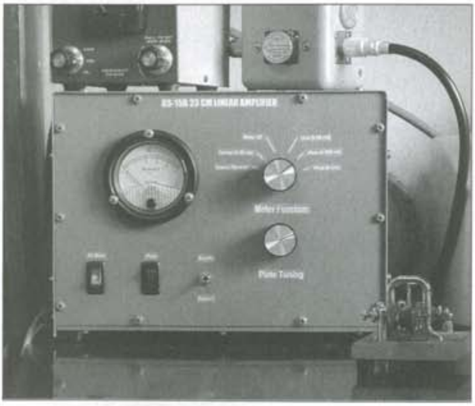
The December 2004 issue of QST carries an interesting article from W6PQL on a 23 cm amplifier (pictured here). It delivers more than 300 watts with 10 watts drive. He actually has driven it to 400w+. It is water-cooled, thermally stable, and features very smooth-tuning. It includes a TR switch, relay sequencer, and all controls necessary to operate the amplifier safely and reliably. At its heart is a Russian tetrode, the GS-15B, modified for water cooling. Running in a well-made cavity he purchased from Mats Bengstton, KD5FZX. Complete information on the cavity itself can be viewed online courtesy of Mats and Paul ND2X.

**http://www.w6pql.com/23cm_amplifier.htm**

(see pictures on the next page)



**W6PQL Cavity for 23cms**



**W6PQL`s 300W PA for 23cms**

# Microwave USA

## Editor: Kent Britain, WA5VJB

### New US 47 GHz Record and World Record

Again another US record – Sunday 19 Sep. during the 10GHz and Up Cumulative Contest W6QI/6 and AD6FP/6 completed a 47GHz contact over a 290Km distance to set a new world record. W6QI operated from Shuteye Peak DM07GI just south of Yosemite and AD6FP operated from Frazier Mountain DM04MS north of Los Angeles. W6QI had to brave 30 degree temperatures and snow while modifying the radio in order to complete the contact. Signal margins were >40 db on the W6QI end and about 8 db on the AD6FP end. The contact was completed using a combination of narrow band FM and CW. The station details are as follows: W6QI: 36" cassegrain dish, 10dbm xmit, 8 db nf, ocxo locked. AD6FP: 12" splash plate dish, 45 dbm xmit, 4 db nf, Rb locked. The weather conditions were quite unusual for September with scattered rain showers in the central California valley between Shuteye and Frazier.
Frank W6QI, Gary AD6FP

### New 122 GHz record

W0EOM and KF6KGV extended their 11.7km record from May $31^{st}$ to 24.8km on August $24^{th}$ when W0EOM/6 (CM97cj) worked KF6KVG/6 (CM87xh).

### Long distance QSOs on 10 GHz

**XE2/W6YLZ (DL27PT) wkd on August $21^{st}$ 2004 on 10 GHz via Tropo:**

N6RMJ/6 (CM95xv), 1028km
N6CA/6 (DM06cf), 1049km
WA6CGR/6 (DM06bg), 1057km
WB6CWN/6 (CM96om), 1135km

# 2-m-EME News

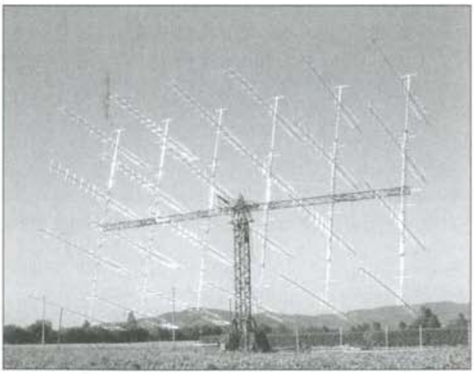
**Bernd Mischlewski, DF2ZC**
**e-mail: BerndDF2ZC@t-online.de**

## ARRL EME Contest 2004

EME hams only know few propagation qualities: mediocre, bad and worse. From discussions on the various loggers it can be concluded the first leg of the ARRL EME contest showed conditions closer to "bad" but to "worse". In other words, they were quite o.k. Apparent was the lack of activity from the United States – for whatever reason. And a common thread of discussion afterwards was the use of loggers such as N0UK, W3EME or ON4KST for enabling JT65 contacts. Since JT65 signals can be near or below the noise floor in an SSB bandwidth, the finding of random JT65 signals without the logger is problematic for many. Only, do the rules justify this?

The ARRL rules sections say: "3.10. The use of non-Amateur Radio means of communication (for example, Internet or telephone) to solicit a contact (or contacts) during the contest period is not permitted." Does this wording allow soliciting QSOs via DX-Cluster (in case it is being accessed by packet radio and not by internet)? Or the use of WWC? Maybe it does – at least it looks it – but would this be according to the philosophy of the rules?

Another topic was the mixing of CW and JTxx-contacts where many think they should not be counted equal but put into different entrants classes. For example, the Bavarian Contest Club differentiates between both modes in their annual meteorscatter contest by awarding FSK441-QSOs only half the points awarded to CW-QSOs.



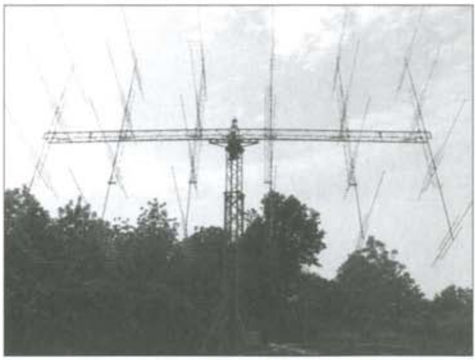
**After three years IK3MAC was back just in time for the ARI EME contest in September: 24 x 23 ele LLY and 24 x 10 ele LY**

So, should ARRL modify the contest rules? Joe, K1JT, came up with a suggestion: "Firstly, one of the most popular ARRL contests is the annual 10-meter affair. Its rules are set up so that you can enter in CW, SSB or 'mixed' (i.e., both) modes. In mixed mode you can work the same station once in each mode. Such a rule would allow everyone who wants to, to make more QSOs. At the same time, it could create 'CW only' and 'digital only' categories for those who prefer to stay with one or the other. Secondly, most ARRL contests have a 'single operator assisted' category for people who use the DX clusters. The EME contest could do likewise, rightly preserving the purity of unassisted operation for the 'heavy-weight' class."

Dave, W5UN, made his personal decision for his participation in the 2nd leg of the ARRL contest: He will use the EME Logger, the JT Logger, and any other available means available that will lead to more QSOs. The W5UN log will be submitted as an Assisted Category entry.

Such category is not currently specified by ARRL, but Dave is hoping to help force the issue of clarification at ARRL, and perhaps leading the League to creating an assisted category. Another reason behind is his desire to work as many stations as possible in the given time, and to help the smaller stations make their QSOs. Dave's experience during the first weekend with the JT mode (3 QSOs in 6 hours) has convinced him that logger assistance in spotting and schedule making during the contest is essential to making QSOs using the JT mode. Apparently a number of stations have decided to proceed similarly. No publication of QSO data on loggers while contact still in progress!

Slightly off topic Dave requests to third parties monitoring JT schedules that are in progress NOT to place data on the logger that conveys QSO progress (such as "W5UN SM7BAE OOO"). If QSOs are successful, that success should be a result of information conveyed only by the stations involved, and only via the EME circuit. That is something that applies not just for contests but in general. Even copies such as "050700 4 -23 4.3 -3 3 #" contain not only signal strength but also QSO progress information because the "#" says that one station is sending Os to the other.



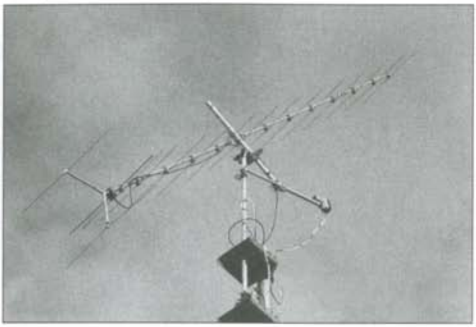
**The other big signal from Italy: I2FAK with 24 x 19 ele LLY**

## DUBUS EME Contest 2005

The discussions above already led to some results: The DUBUS EME Contest 2005 - sponsored by REF and Dubus Magazine - will not only have different sections for CW, Digital and Mixed for the first time. There are also other changes regarding an "Assisted" regulation. Have a look at the detailed rules and regulations published in this Dubus issue. 144 MHz Contest dates are May 14th 00.00 until May 15th 24.00 UTC

## YO3FFF – successful CW EME with just a 16 ele F9FT

Cristi, YO3FFF (KN24ND), reports his success in the first part of the ARRL EME contest. All the QSOs were achieved with his small setup consisting of a single 16 elements F9FT (12 dBd), MGF1302, and 1 kW output – a little more than 12 kW ERP after cable loss. Worked were IK3MAC, RU1AA ,I2FAK, HB9Q, K5GW, W5UN, KB8RQ, F3VS, RN6BN, LZ1DP, RN6BN (dupe), YU1CF, LZ2US. His final score are 12 QSO X 100 pts X 9 multi = 10.800 pts.



**The good old F9FT-16 still works nicely on EME at YO3FFF**

Heard, called but got nothing or QRZ: SV1BTR, SP7DCS, I3DLI, DK3BU, F1FLA, G3ZIG, OZ1HNE, DF7KF, K1CA, K6PF, N5BLZ. So there's enough left for the 2nd leg.

Cristi writes: "Conds were good almost all the time. There was a "silence time"(almost all signals disappeared for a while) on 9 October around 06:42 UTC, from 12:30 - 13:30 UTC and on 10 October around 10:45 UTC.

**Cristi's EME QTH**

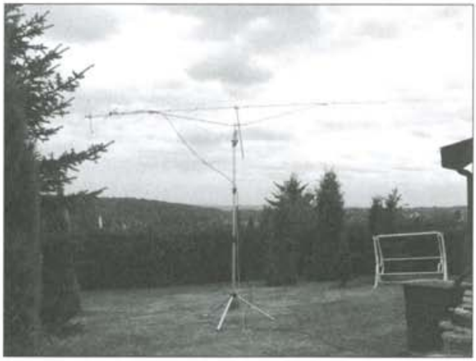
Also I noticed on 10 October at about 12:40 UTC for couple of time LZ2US's echo quite strong when YO4FRJ's (my "neighbor" 100 km away, hi) echos were not detectable. The distance between YO4FRJ and LZ2US is some 300 km). I mention that both signals come to me also on TROPO, LZ2US's very weak.

As a conclusion, again my power was not enough (1 KW). With about 2 KW I think I could count 23 QSOs in CW!). I also feel that I need to upgrade the antenna to 2x F9FT as 4 yagi stations are very hard to work random in the contest in normal condition.

The results are my best ones in a contest (the previous record was last month in ARI EME). I hope that the next leg will be as productive as this one."

## EME with the Ultimate QRP-Station

Jürgen, DJ7AL joined the the ARRL contest with a portable setup: 250 watts out and a 17 elements F9FT. Listening to some big guns with his 4 elements yagi mounted on the balcony at his flat in Dresden Jürgen copied I2FAK and RK3FG in JT65. This is particularly remarkable as there were some 25m H100-cable between antenna and IC910, moreover no preamp was used. So even with this roughly 6 dB less system sensitivity both stations were copied. TX tests with 250 watts out were not quite unsuccessful. I2FAK reported at least detecting the signal.



**DJ7AL port. EME setup at the remote garden**

Now the virus was well planted. Quickly Jürgen put together a station for use in the garden: a portable mast, F9FT-17, 250 watts amp and rx-preamp were now as close as possible to the antenna. During the first leg of the ARRL contest Jürgen more or less easily worked stations like I2FAK, HB9Q, RK3FG, DF2ZC and RU1AA. At times DJ7AL's signal was even that strong that a CW QSO would have been possible.

No question, setting up a EME station has become much easier now. A portable mast, 13-dBd-antenna, some 200 watts, a rx-preamp - and that's it. Jürgen will of course participate also in the 2nd leg of the ARRL contest. Hopefully many others will follow his excellent example...

Some weeks after the contest Jürgen came up with another story. He had completed an EME QSO with his 4 elements! The ultimate QRP: On Nov 6th 09.50Z he called Sam, RN6BN and worked him on Random.

**Amp and preamp are being placed as close as possible to the antenna – even if this means on a garden bench**

With his 4-elements and 250 W. "A dream has come true" he writes. "Actually I wanted to drive to my garden but the weather was very unpleasant – cold and wet. So I played with my 4-elements. As the trees had dropped their leaves, maybe there was a little less attenuation than in summer?"

**Unbelievable: 2m EME is now a QRP propagation – if you try with a matching partner station**

## New (or back) on 2m EME

### I6WJB (JN72)

Pierluigi is back on 2 m EME after many years. From JN72BK he started to listen in JT65 with a single 2.85 wl yagi and heard a few stations and already made some QSOs with S53J, I2FAK, N5BLZ and S52LM. When Pier installed his new PC in July he was even more successful though still using just the small yagi without elevation and his old 1-kW-amplifier. In September finally he could add elevation for the largest moon window and also a second yagi. And there are even more improvements waiting. I6WJB will add two more directors and in next spring he plans to set up 4 yagis. During ARRL contest Pierluigi made 10 CW and 14 JT65B QSOs.

### EA6VQ (JM19)

Another come-back is Gabriel, EA6VQ. In the middle of November the setup of the 8 x 17 ele M2 5WL antennas was finished. After 3 years of inactivity when a strong storm destroyed Gabriel's old 8 yagi array EA6VQ is finally back. After learning the first steps of EME with WSJT Gabriel is now QRV in CW as well as in JT65.

### HA8V (KN06)

Gabi reports his first two QSOs via moon. Both were made during the ARRL contest: W5UN and K5GW, worked in CW. Only heard were F3VS, OZ1HNE, DF7KF and IK3MAC. HA8V is QRV with some 900 watts out and 4x11 elements yagi. Gabi will also be QRV in the second leg, between 0° and 20° elevation in KN06.

### LU8YD (FF51)

Alejandro was taking part in the ARRL contest using a 10 ele yagi, an IC-706 and a mirage amp with 300 watts out. So after LU7DZ and LU6KK no. 3 from Argentina is at the doors.

### UA3MBJ (KO88SA)

Nikolaj is QRV in the WSJT modes with a GS35b and 4 x 10 ele yagis. He is on either the JT65-Logger or on the ON4KST chat (www.on4kst.info/chat144/login.php)

### KM5PO (EM12KO)

Jim has finished his 4 x 2M18XXX array. He is now QRV with a 8877 and delivers a strong signal via moon.

### RN6BN (KN95LC)

Sam is back with a decent array: 32 15-element-xpol-yagis. And they appear to be working very well as the QSO with DJ7AL shows. (See front cover for picture!)

### VK6KDD (OG99)

Though many people are using the WSJT software now – mainly for meteorscatter – they don't believe that 90% of the ms stations are also EME capable: They can work at least most of the 4-yagi-stations at rise/set. So they need to be talked into trying it and also need some guidance how to use the JT65 mode and make EME QSOs. A tough task at times, but it pays off every now and then. Joop, PA0JMV, succeeded in persuading VK6KDD (QG99) - 400 W out and a 12 elements M2 - to try it. And they completed on November 2nd. Shortly after VK6KDD had some rig damage so he won't be QRV for the next time. He plans to show up on the JT65 logger as soon as all systems are go again. Joop is a real lucky man...

### XE2AT (DL81UU)

Al popped up at the JT65 logger (www.chris.org/cgi-bin/jt44eme). He is QRV with about 150 watts out and two 3WL-yagis. His tx side might be a problem. Though, if he could arrange for just some 3 dB more XE could be within reach for most. And there are some clues...Al seems to be busy setting up a small 4-yagi-array.

## Array destroyed: SP7DCS (JO91) QRT

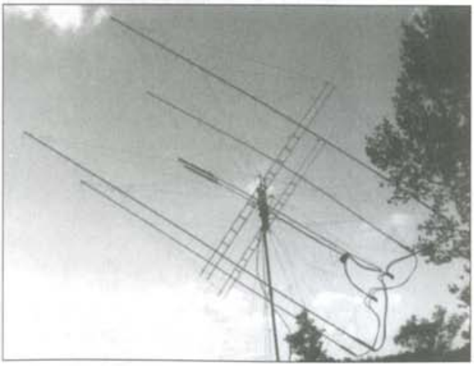
For Chris, SP7DCS, the nightmare of all EME hams came true – he lost his array: "Hello EME friends! I am very sad to announce that my 2m EME array is now destroyed. There were very strong winds and also snow storms in SP on Nov 18 and 19. As my EME QTH is 50 km from home I drove there today to check if my system is ok. I had planned for some EME activity also tonight.

Unfortunately I found my array badly damaged. My neighbours there told me that they had something like a small tornado in their village. There are broken trees, electricity wires are also damaged. This small tornado was only in an area of few kilometers. Wind picked out of the ground one (of three) of the concrete (!) bases for mast support-lines. These bases were made of concrete and also 1.5m long steel pipes. The mast had fallen down and all 4 yagis are broken. Also the H-frame is partly damaged.

It sacrified a lot of time for experiments with this array. Only this autumn, after making new phasing lines, for the first time I was totally satisfied with the performance. It worked FB, but it is a part of history now. Right now I have totally no enthusiasm to rebuild the array. I think I have not enough strength for it now. I also wonder if there is a point in building array again if cw random activity is that low.

I would like to thank all the EME community for many great moments and for many FB EME qsos ! Good luck to all EME'rs around the world!"

We all hope Chris changes his plans after some time and decides to build a new array.



**SP7DCS's array at better times**

## Software for EME

Most if not all of us use a special EME software to calculate moon path, common windows, degradation, MNR etc etc. Very often we don't need the full capability of the software, just azimuth, elevation, moon-rise and moon-set are enough, and a world map maybe to see who has moon now and who hasn't. Here a little program by Stacey E. Mills, W4SM comes in handy. It doesn't do much more than that and also is not very RAM consuming so you can always have it running while working with the PC. It is available for download at **http://www.keplerian.com/**

This program locates the Sun and Moon in real time using a full set of ephemeris factors. It gives azimuth, elevation, right ascension, declination, and range to each. Also it gives Lunar/Solar Rise/Set times for the current day. Own Latitude and Longitude are saved for future use after being entered at first start.

The new version includes an earth map, a celestial map, and a background radio noise map for the earth and moon. Earth shadows and moonlight can be adjusted as desired. Version 5.0 includes serial and DDE output for tracking in Easycomm1 or Nova formats. In DDE mode the client can also control Track_SM. The new Setup window includes compensations for three offset dish feeds, etc. Version 5.3 allows for output for equatorial mounts as local hour angle (LHA) and declination (Dec). These are adjusted such that at the meridian LHA = 180 deg. and Dec = Dec + 45 deg. in order to prevent negative values that might not be accepted by tracking hardware.

The software runs on Win98, Win2000, WinXP – and it's freeware!

## DL7MAT Silent Key

Sad news reached from Wolfgang, DL5MAE who reported that his father Albert, DL7MAT, passed away on Oct. 26 at the age of 74: "Many may have worked him via the moon during the last 18 years as EME was his favorite mode although he

wasn't that active due to other commitments.

Unforgetable is the multi-multi-effort during ARRL EME contest in 1993 with a group of 10 OPs (and himself) when we reached the 2nd place by using his callsign. Albert is the "responsible" person for the antenna farm at DL5MAE's QTH and NONE (!!!) of my VHF-expeditions would have been possible without him assisting. He even joined the EME-expeditions in SV9 in 1990 and 5B4 in 1996 himself." We all feel with Wolfgang. The EME community suffers a big loss.

### Last:

3Y0X (The Peter I Island Expedition, scheduled for January 2005) will not be qrv on EME at all.

# 70cm + up EME

**Editor: Bernd Wilde, DL7APV**

## EME 2004, fund by DL9KR

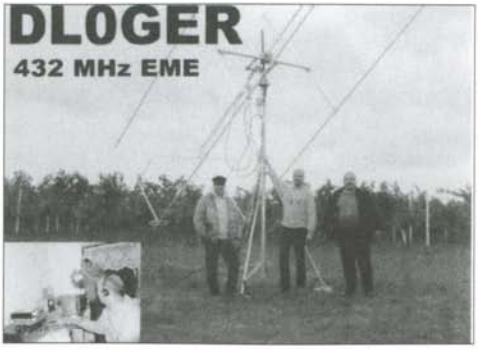
Remarks concerning the outcome of EME 2004:

Topic 1 (How to increase activity?): There are several reasons for the declining activity such as an increase of "birdies", lack of excitement due to very few newcomers and dxpeditions, general "saturation", etc.
We don't need additional media to announce planned station activities as we already have:
a) long term: DUBUS, RSGB bulletin and QST
b) monthly: 432&above NL
c) weekly: K1RQG's net & net notes, and
d) daily or shorter: OH2AQ cluster, EME logger(s), and moon- net to name just a few.
Activities in addition to the "conventional" (hi dec) AW's should be extended to weekends involving perigee, low dec and low Tsky. This could help marginal stations on one's own continent or over N/S pathes, too. "Sociable" hours (where?) probably play a minor role. -- BTW, I don't deem HB9BBD's suggestion as helpful.
Topic 5 (Standings): Conventional modes (CW/SSB) don't require any involvement of digital technology, while digital modes (e.g. JT) are not viable without computers and their sophisticated software. Thus, on purpose, RADIO technology is reduced to a secondary requirement, while such contacts are often assisted if not enabled by parallel exchanges on various dedicated loggers.
Therefore, separate standing lists really should be kept. Thus,over the years, the respective shares of modes in general and/or at individual stations can be evaluated and conclusions be drawn.
A third, "total" list may show the addition of digital and non-digital initials as both modes have the EME path in common.
A reminder: Standing lists are published by HB9Q, and more detailed at DUBUS and DF6NA. A "show of hands" in a 30 people quorum is less than marginal to decide over the structure of future standing lists.
Topic 6 (Hall of Fame): At (my) first thought, this should be reserved for SK's. OE9PMJ is certainly an excellent choice but many others come to my mind such as W1FZJ, KH6UK, W2IMU, W4HHK, OZ9CR etc. I think, we are well aware of the meritorious living.----
Creating a Fund:
A monetary fund on donation basis could support DXpeditions and/or help stations in "rare" countries to become operational on EME.
Example: ON4IQ has already enabled 2m EME at HI3TEJ by buying and transporting miscellaneous equipment to HI-land on his own expense. He still has 8 yagis for 70cm ready to go but, understandably, is not willing to cover UPS shipping (abt 250 USD). Another example: A SSPA like the Ericsson Compact 9000 (300w, built-in AC PS) in a sturdy, upholstered crate plus 4 yagis in a second crate could be the basis for DXpeditions, be it on 70cm or as addendum for 2m dxpeditions. Overweight expenses could also be absorbed by a fund. --- A number of questions arises: Criteria, committee, treasurer, where, how, fiscal aspects? --- That winds it up. Kudos to Peter G3LTF for his detailed report on the proceedings. 73, Jan DL9KR

# ARRL part 1 432/1296

**DF3RU** was active on contest, lots of problems on 23cm. 30x? on 70cm.. only about 10 contacts on 23cm.. very busy at QRL. 30W, 6 mtr dish.

**DL0GER** 432 results. We worked the following staions during the first leg of the contest: 09 Oct.
VK3UM, OH2PO, HB9Q, SM3AKW, OZ4MM, DL7APV, SK0UX, F6HKM, G3LTF, N2IQ, N9AB, SM2CEW, K1FO, DL9KR, K0RZ, KL6M, 10 OCT SV1BTR, JJ1NNJ, EA3DXU, JA6AHB, DF3RU, PA3CSG, OE5JFL.
We were on for the whole pass in the first night, where conditions were fine. Had SSB echoes at moonrise. The second night started with even better signals. VK3UM was really loud and we worked 2 JA stations. EA3DXU was an easy QSO with his 2 yagis. The night before JL1ZCG was really loud for hours but could not copy me. In the morning, after sunrise, signals got worse (vertical I suppose) and we just managed to work PA3CSG (on sked) and OE5JFL. Went QRT right after the QSO to dismantle the station. Loudest station here was N2IQ on saturday afternoon, peaking S5 on the meter (don't want to see their electricity bills, hi!)
Heard but not wkd: G4ERG, K4EME, YO4FRJ, JL1ZCG, OH2DG?, K2UYH
I found the activity extremly poor, especially of the US boys. We will not be on for the second leg due to time limitations.
DL0GER is our club call and EME operation is portable. I will try to post some pictures of the operation on a website soon. We would also like to exchange some soundfiles to hear what we sounded like on the other end. Have recorded most of the QSOs. Setup: 4x26el Bvopt2, 8mm alu open wire, GS35 amp @ 1,5kW, MGF 1302 + BFP196 preamp (NF 0,8 @ 30dB gain) all homemade.
The ATF54143 preamp (NF 0,3) does not like this cold weather for some reason and starts to oscillate. Crew: DH0SP and DL3IAE. QSL route is via DL3IAE. 73s Daniel




**DL9KR** 432 Departing to a family reunion (christening of grandson) during the western window on Saturday plus a 4 hour nap, left only 7 hours of operating time during which I worked 44x26.
Despite the apogee signals were excellent. Taking their equipment into account, SV1BTR, WA6PY and N2IQ certainly stood out. 2 "weakies" couldn't be identified though they patiently continued to call (TNX!). The YYY-approach is still not in everyone's mind. However, my brief participation was worthwhile because it produced #809 UA3DJG and #810 LA9DL. I'm looking forward to spend more time in December.

**EA3DXU** This are the first leg results, saturday 9 On 432 MHz the situation was normal conditions and free of QRM. For this reason I spend most sunday time on this band. Finally ended with 42 QSO all random (25 x 144 Mhz + 17 x 432 Mhz). This produced 3 new # 1 on 144 Mhz and 2 on 432 Mhz. Wkd: 9/10 VK3UM, OH2PO, OZ4MM, N2IQ, N9AB, SM2CEW, F6KHM. 10/10 HB9Q, DL7APV, DL0GER # 168, DF3RU, JA6AHB, G3LTF, SK0UX # 169, G4ERG, OE5JFL, K0RZ.
Hope the conditions will be better in second leg, this year the weather in Spain is very dry and all QRM sources are running at full power, hi. Equipment was as usual 2 x 38 el M2 + GS23B.
See you on the moon 73 de Josep

**G4ALH** first time on 70cm since DUBUS contest.. increased drive to amp [brick] and half way through QSO with G3LTF died, original brick back and all is well. 9 QSOs.. just finished with SM2CEW..

**G4ERG** 432 Found conditions quite good at times but activity level down on previous contests. Occasionally there was no polarity peak on a few of the bigger signals from the States. I received a T7 report from JL1ZCG, wonder if anyone else detected anything less than T9 on my signal.? Finished the weekend with 25 x 21.... Station is still:- 16 x 10el with polarity rotation, 2 x 3cx800a7.
73 to all, Peter

**G4RGK** was on a couple hours & worked 10, condx were ok.. but had high winds and had problems with az drive with the wind.. missing a lot of the big stations.. QRT with wind.

**HB9BBD** very tired.. 23cm activity was good.. more DXCC mult and more mult with Province & states.. 16 states and 24 DXCC, crashed dish feed into the service tower.. but fixed the situation.. only got jammed.. no dammaged..

**HB9Q** first leg: We have worked a total of 175 stations and 85 multipliers on 3 bands (144: 76x32, 432: 72x33, 1296: 27x20). For the detailed logs see our band-pages at www.hb9q.ch. We enjoyed very much to be QRV and to work many new initials. On 432 there was much less activity then last year (JW-DXpedition did help to boost the activity). We were only QRV CW. We spent only a couple hours on 1296, using CW only.
vy 73 Dan, HB9CRQ

**K0RZ** condx very good at times.. 36x22 for last weekend on 70cm. Reminds us that the Dec weekend is also 160 mtr cw contest.

**K1FO** On 432 I found conditions and activity good on Saturday. But on Sunday conditions and activity were poor. When I QSOd K6JEY at 1530 UTC on Sunday, he had absolutely NO polarity peak. I could find about a 2 or 3dB dip in his signal and that was it. Needless to say, Doug's signals were much weaker than normal. I had 40 QSOs with about 10 hours operating time. 73 Steve

**K4EME** fun yesterday.. but no more new ones this morning.. weak ones were down .. continually heard a lot of the stations worked yesterday.. 18 so far.. will be on this afternoon.. already worked 2 VK.. missed a few on CQs.

**K6JEY** 432 It was an interesting two days. I was on more often than I usually am. Aurora was unusually intense according to http://aurora.n1bug.net/ which may have accounted for some of the signals. Some were 7 S units above the noise on peaks with wide QSB. N2IQ was consistently the loudest. I bid adieu to my old 8938 amp "Kate Smith" and installed a new Henry 3004A to be called "Mario Lanza". You know- portly, stout, sings high notes very well, fairly classy, and always had a good time. So far works fine. 1,500 watts output with no problem. Kate is going to someone else to sing. I'll miss that great pair of lungs. I worked DL9KR, N2IQ, KL7M, OE5JH, OH2PO, HB9Q, WA6PY, K1FO, Hope everyone else had a great time. I hope to be on 1296Mhz for the last weekend and look forward to my first EME QSO's on that band. K6JEY, 70cm, 4x25el K1FO, .22db nf, 1500w, 1296, 7' Dish, .2db NF, 150w

**KE2N** 432 I seem to have had a lot of trouble hearing things this weekend. It appears that something is raising my noise floor around here by about 3 dB. Not sure if it is my electronics or somebody else's. Could hear my echo's most of Saturday but not a very good SNR. Anyway, worked the big guns on Saturday for only 11 Q's and two more on Sunday. Even the big guns sounded weaker on Sunday, although HB9Q, F6KHM, N2IQ and OH2PO were consistantly there. (K1FO and K2UYH were weak!) If you heard me, tried to call me and did not get through, drop me a line. I am trying to get a feel for how deaf my station is. Thanks Ken

**PE1ITR** 432 Here are the results in the 1st leg with my small EME station. Station: 2x28 el yagi (8,5wl) + GS35 PA. The antenna setup is a non-permanent, kind of portable setup in the backgarden with manual az and el control. It was my first experience in a eme contest and it was fun. Strange was to notice that the signals N9AB and N2IQ where very strong, but could not hear me. At the other hand the qso with KJ7F -4 yagi station-was very easy and audible on the speaker. 2004-10-09 wkd: HB9Q (cw), KJ7F (jt65b, 4 yagi station). 2004-10-10 wkd: OH2PO (cw), SM2CEW (cw), F6KHM (cw), K2UYH (jt65c, NC due to technical problems), hrd: N9AB, N2IQ. CU next time on the moon. 73 - Rob

**SK0UX** Thanks for all qso. Back home after a weekend with a minimum of sleep! This is a small summary of what we worked during the weekend On 432 and 1296 we had to change the feed, preamps and pa`s at the dish when we went from one band to the other. 432 Mhz Total of 23 qsos 21 initials (cw only). This was really the first serious attempt at 432 from SK0UX. We used our 6m dish with a patch-feed (dual polarity) that we made just a few days ago. It seems to work ok, some stations not heard at all in one polarity came up to readability 5 when changing polarity. We used 650w in the feed, that was not enough, we heard and called several more stations that could not hear us. Wkd: VK3UM, OH2PO, HB9Q, DL9KR, VK4AFL, OZ4MM, F6KHM, SM3AKW, DL0GER, OH2DG, DL7APV, JA6AHB, G3LTF, G4ERG, SM2CEW, PA3CSG, N2IQ, K1FO, KL6M, N9AB, K2UYH, DF3RU, EA3DXU. 1296 Mhz This was fun! Good activity and good conditions. We made a total of 41 qso:s during the weekend. 10 initials! (cw only) DL0SHF, OH2AXH, F5VHX, HB9SV, HB9BBD, G4CCH, GW3XYW, OK1CA, K9SLQ, IK2MMB, W2DRZ, K5JL, G3LTF, SM3AKW, K5GW, K0YW, VE9DW, K9BCT, W2UHI, PA3CSG, N2UO, PY5ZBU, WA6PY, OZ4MM, K4QI, OH2DG, JA4BLC, OZ6OL, JA8IAD, OM6AA, HA5SHF, LX1DB, K2UYH, W9IIX, WB5AFY, DL1YMK, IK3COJ, DF3RU, F6CGJ, VA7MM, OE5JFL.
73s from SK0UX crew. Hans, SM0MXO

**SV1BTR** 432 I reached my eme qth 3 hrs before the contest, fixing things just until 10 minutes before kickoff. I was sleepless for the previous 36 hrs due to travel and work commitments, so I was pessimistic if I could have my eyes+ears open for the 1st moon pass but seemed i did. I operated on 432MHz cw only. My results are 23 qso (21 cw random and 2 cw sked) = 10 initials.
Antennas are: 8*39el. 13wl H pol. My locator is KM18no since November 2003, so that makes me a new initial I suppose. On 432 conditions were excellent, many signals were in the range of 559-579 but on Sunday's moonrise signals were heavily distorted, so even if they were strong, I had trouble decoding them. Expected much more activity from US stations. 432 MHz: PA2CHR OH2PO DL9KR DL7APV # KL6M # OZ4MM F6KHM # G3LTF SM3AKW G4ERG HB9Q N2IQ SM2CEW DJ6MB # DL0GER # VK3UM # SP6JLW # JA6AHB DL1YMK # DF3RU I5CTE # N9AB # VE6TA. 73 Jimmy

**S52CW** 70cm: I was qrv only during 1st pass and found conditions quite ok in first few hours. I think that polarization was shifted later on and only a few big gun stations were heard here. On Sunday we had heavy rain with thunder storms so I was not on the air. Stations worked: DL9KR, HB9Q, OH2PO, F6KHM, OZ4MM, G3LTF, DL7APV, 7M2PDT, N2IQ, SM2CEW, K1FO, K0RZ, N9AB, KL6M. 73 de Uros

**VE6TA** 432 I was on for about 15 hours total operating time and found conditions quite good on the first moon pass, and a lot of polarity spreading on the second moon pass. Coincidentally, there was a very nice visual aurora Saturday evening. I worked a few less QSO's than last year, and a few more initials than I was counting on, so all in all a good weekend. Stations worked: OCT 9: SM2CEW, DL7APV, DL9KR, F6KHM, N9AB, N2IQ, OH2PO, K0RZ, G3LTF, G4ERG, KL6M, K1FO, HB9Q, K2UYH, VK3UM, JA6AHB. OCT 10: OE5JFL, YO4FRJ #101, SM3AKW, SV1BTR #102, OZ4MM, DL1YMK, JJ1NNJ #103.
73's to all. Grant

**WA6PY** On 432 with single cross yagi 6.5 wl QSO'd DL9KR, F6KHM, N2IQ, HB9Q, OH2PO, SM2CEW. I QSO'd DL9KR 559/549-559 at the end of QSO. At the beginning of the QSO moon was still 2 degrees below the mountain on the horizon. Moon was at 4 deg and mountain height is 6 deg. Later I heard Jan much stronger. I could not get attention of SV1BTR and N9AB.
On 1296: HB9BBD, K5GW, K9SLQ, K5JL, K2UYH, G4CCH, SK0UX, VE9DW, DL1YMK,

:0YW, W2DRZ, F6CGJ, OH2DG, OK1CA, )H2AXH, K4QI, G3LTF, JH1KRC, JA4BLC, A6CZD, OZ4MM, N2UO, PA3CSG, LX1DB, )E5JFL, IK3COJ, SM6CKU, VA7MM, W9IIX, VB5AFY, JA8IAD, JA6AHB. 73 Paul

**VB5AFY** worked 21 on 23cm.. happy and first me on contest, ready for more. 15' dish 8x7289.

**O2IS** Szigy sends info on the 1st leg of contest I m glad to report that all went well in my 15th in ow participation in the annual ARRL EME Con- ist. Conditions where quite good on Saturday, but ot the best on Sunday, especially after 0400 hen my local Moon window started (el > 40 egs). Despite some problems at the start with my Z readout, (always Murphy is around - hi), I was ble to log on 70 cm the following random QSOs: L9KR (579/559), HB9Q (569/539), OZ4MM 569/449), F6KHM (O/O), OH2PO (559/559), 3LTF (559/549), N2IQ (569/549), SM2CEW 559/O) and N9AB (O/O). CWNR were JL1ZCG ery loud and S52CW (449). Heard were JA6AHB, 0RZ, UT3LL and PA3CSG. Some of the signals ay have been covered by the multitude of PC rdies/noises of my downtown areas QTH.. I am so thinking about trying 23 cm EME someday.

SM2ILF 4x32 El 9BV 11wl

## 432 MHz

**L8OBU** qrt. I gave up amateur radio now (after 2 years of enthusiastic ar-work. Well I'm still alife nd feel fine, but started a new hobby, which eeds as much time as the old one, so decided to nish the old hobby. I wish you and the whole ME-community much fun on EME. 73s Jürgen

**L7UAE** Tom in JO62ph is operational on 70 cm ME with 4 x 6.5 wl (22 dBd) yagis with full eleva- on. His PA is 1.4 kW, but he has a cable loss of bout 3 dB due to a telescopic tower that needs exible coax cable. His preamp is mounted at the ntenna with 0.38 dB NF (~ 54 degs K). Tom is not uch of a CW operator, but is willing to take skeds on SSB and JT44/65. (He has an accurate time and frequency reference).

**DL8YHR** Frank reports that his 70 cm EME station (4x13 wl yagis and YL1050 PA) is currently not in operation. He is planning to move the station to another QTH. **Frank will be traveling next summer to 6W and 5T and wants to try 70 cm EME from these rare locations using 150 W and a 9 wl yagi.** He promises to keep us informed of his plans.

**DL9JY** wkd his first 70cm EME with VK4AFL.

**DL9KR** Until now, 2004 yielded initials with JH3QYM, OK1DFC, SP2OFW, JG2BRI, 3B9C, OZ/DL1EJA, OJ0/DL8YHR, DL0GER, SV1BTR (new qth), DL9JY, ZS6JON, UA4AQL, DL7FF, SK0UX, UA3DJG (ARRL contest), LA9DL (ARRL contest) and SM3JQU #811.
Activity was generally low during the activity weekends and the Italian EME contest. When applying for my 160m 40 zone WAZ, I learned about the availability of an **EME WAZ** which requires a minimum of 25 confirmed zones. My application on the basis of 28 zones on 432 MHz resulted in EME WAZ #2 (after OK1MS #1 for 144 MHz). 73, Jan

**K7LNP** concentrating on 70cm now, has 4 antennas & trying to get on within the next month. He has everything but an amplifier.

**M0EME** should be on 100w and 4xfo22 next activity weekends. Already worked HB9Q but procedures were not right.

**N5ITO** Dave is QRV on 432 (as well as 2 m) EME. On 432 he is using 4 x 18 KLM yagis with full AZ/EL mounting and 500 W from modified AM-6155 PA. Dave can operate both CW and JT65.

**N8CQ** (NC) has 16 x 15 yagis FO az/el/pol and GS35B amp. He has 23cm as well: 2 tube 7289 & 10' dish. gabercr@nc.rr.com

**OH3AWW** bought a house in KP11vj square and will move antennas from present location to KP21qf next summer. On 70 cm he has 2 x 31 el 10.5 wl JR yagis on a full elevation mount with 300 W PA. Cable loss is > 2 dB. He is available for on the horizon 70 cm skeds on CW and JT44/65. On 9 Oct he made his first 432 JT44 QSO with K2UYH (sync was 4 and strength –16 dB peak). Matti runs 240 W in the shack with about 120 W at the antenna (2 x 31 el yagis). During the contest he heard N2IQ on CW many times, but not even receive a QRZ in response to his calls.

**S53J** ARI EME. I was qrv both days on 432 and only wkd HB9Q - loud as usual. Only hrd DL9KR, S52CW, Rig: FT847, ANT: 4X28 2M9WLA, RX: ATF 33143, TX: GS23B, 73 Joze JN75ev

**SM3JQU** After a little more than a year of preparation initial #1 is done! Saturday morning I finally managed to get attention from HB9Q on random CW and finished my first EME qso ever. Thanks!
- So I would like to thank SM3AKW for support and advice during the past year that started when building antennas. I met Karl the first time back in 1978 or 79 and saw his arrangement for EME on 432. A dream was born but nothing was done until last summer. Thanks also to SM2BYA for encouraging hints and feedback. Just have to mention for the rest of you that Gudmund is well known in my family from the age of 15 or so, (I must have been 5 or 6 years old then) when he started to hang around and visit my uncle SM3AH.
So when I told my mother that I was hoping listening to Gudmund from Svalbard via EME she knew exactly what it meant for me.
My station is far from finished and for the moment a final PA is under construction together with an antenna switch. Still I've not heard my own echoes, "just" seen them on JT. My station so far: 4*11wl BVO (4*33el), PHEMT with unknown NF, GI-7b abt 250W at feed. After been there once I want to go back. But right now I'm just walking around with a stupid smile on my face.
73, Per (JP82qm)

**UA4AQL** is glad for his first cw QSO with DL9KR (28.Sept) on 432.

**VK2SN** I hope to be very active on 2M, 70cm and 23cm EME in about a month or two with good power and hopefully good gain. Sean Neylon

**WB7QBS**: yagis are up and feedline run, 4x22ele FO. Looking good in the air & SWR is fine, az/el.

## 432 & up (net) news

**CT1DMK** broke right foot on last day of holiday this summer.. was stuck on 70cm but due to not able to walk to antenna, could not adjust it because it was off 30 degrees.. still not recovered from broken foot so no activity on EME. Hi cannot change feeds or work at the dish.

**DL1YMK** was on 23cm & 70cm during the Dec weekend. No EME on 13cm, no horn for dish & too busy with QRL.

**JA7BMB:** Hiroshi, a JA-Samurai 5 band EMEer, has decided to concentrate his activities on only 5.7 GHz and 10.45 GHz EME from now on. He has taken his old 6-m dish, which was located on top of a large building, out of service. Hiroshi is now using a beautiful 4 m mesh dish.

**K9SLQ** Wayne writes that he wants to post a testimonial for what the 432 & Above Net has done for him and so many other new EME operators -- I am sorry to say that I have been forced to abandon 432 due to interference from a local hospital, but in the record book will go 65 initial contacts to faithful 432 operators. Thanks goes to the skeds arranged by none other than K1RQG and his net. Now that I am ready to operate 1296 EME, I'm back on the net looking for help to get the word out that K9SLQ is available for skeds anytime.

**KU4F** temporary qrt. My az/el mountg did not hold up to hurricane Jeanne. Also my fiberglass feed pole snapped in half, even though it was guyed in 2 different places with philystran. The dish came out ok. Hope to have a crane to drop dish and mount. I plan to build a much stronger mount this time. 73 Les

**PY5ZBU** Don was active on 23 cm during the contest -- I have moved my station to a farm on which I now live and finally all systems are installed, tested and working just fine. I am active on both 70 cm and 23 cm. My dish is 7 m with 1 kW at the feed on 70 cm and 800 W at the feed on 23 cm (good SSB echoes!). I am now looking for skeds to show everyone that PY5ZBU is back again!!! My grid has changed to GG54dk. My email address is the same, but my telephone number has changed and is 554130326245

**S52CW** ARI CONTEST: Poor conditions and very low activity marked this year ARI contest. I made 8 qso's with SP6LJW for #112 and dxcc #30. Worked: HB9Q, VK3UM, JA6AHB, SP6JLW, K1FO, DK3WG, DL9KR, G3LTF. 73 de Uros,

**ZS6AXT:** Ivo writes -- I have not been too active... I am just busy repairing all the stuff. In addition, I had some health problems (nothing really serious), but I was "under the weather" for quite a while. WX has not been much cooperative too! I will start soon on a mount for a 3 cm dish. I am also working on 24 GHz equipment, but not for EME. John, *ZS6JON is now representing ZS on 70 cm.* He has most of my 432 equipment and finally has it all working well. He is on CW only - hi.

## ARRL µw

**ES5PC** 13cm results: It was a busy and interesting weekend for me as using my new 4.5 m dish setup for the first time in ARRL contest. Built and in-

alled a new preamp and mounted the SSPA at e feed. Spent a lot of time making it all controlla- e from my shack about 40 m away. Finally every- ng worked fine. All stations worked random thout any skeds! The result was 16 qsos with 15 ferent stations. Worked OE9ERC also on SSB th UFB signals. The stations worked: SK0UX, H6NVQ, G3LTF, G3LQR, F2TU, OH2DG, E9ERC, OZ4MM, WA9FWD, W5LUA, SM3AKW, H2AXH, K2UYH, WA6PY, JA4BLC (2304/2424 ossband), Hrd IK2RTI, OK1CA. On Saturday orning before the moonset I heard somebody E6TA?) answering my CQ but then suddenly I st the RX because of a relay problem at the feed. was not possible to fix it before the moonset, rry about that. The weakest station worked was A9FWD. Tnx you for all the nice qsos!
hough I'm back in Stockholm now it does not ean that I'm qrt for a while. I just tested the *re- ote-control* functionality of my dish setup over e internet. To my surprise everything worked 0%! I was able to hear my echoes both on 2304 d 2320 MHz from my dish setup in Estonia over e Skype internet phone connected to the rig in r shack at home. It would be exiting to try a real o soon using this setup before it breaks! Skeds e welcome! 73! de ES5PC / SM0WCM

**TU** The bad weather in Europe and in Japan duced the participation and stations work only turdays.
l GHz: I used new transistor's Pa on the feed, wout. qrv on Oct. 30, 3.5 hours, and on Oct. , 30 min. QQO: ES5PC VE6TA SK0UX #37 H6NVQ #38 G3LTF OE9ERC OH2DG #39 I3AKW WA6PY W5LUA WA9FWD #40 OZ4MM (1CA JA6CZD #41 OH2AXH K2UYH #42 KFR LX1DB (ssb/ssb) JA4BLC. Heard IK2RTI t 30oct 22:00, because bad weather). Results: x 16, 6 initials
' GHz: qrv 2 hours for 3 qso !!! W5LUA I2AXH LX1DB (ssb/ssb). Results: 3 x 3
GHz: qrv oct 31, 3.5 hours only. Qso: IQ4DF KSX OK1UWA WA7CJO OK1CA G4NNS A6PY W5LUA DL0EF PA0EHG LX1DB i/ssb); heard OH2AXH. Results: 11 x 10
tal: 31 x 29. Contacts on all three bands: iLUA, LX1DB. It is difficult to do the utmost of tions qrv while being on several bands, but that already much better than with the old one rule. ank you with all for these qso and my excuses h those which would have called me without ccess. Station: 8 meters mesh dish, 65 Wout on cm, 40 Wout on 6 cm, 15 Wout on 3 cm.
st 73 Philippe

**KSX** was QRV during the last microwave con- t, part of the ARRL EME contest. The activity s lower than expected. We have done 13 QSOs 1 11 multi for a total of 14300 pts. All QSO was done on random activity. Station worked: DL0EF, OK1UWA, IQ4DF, WA7CJO, OK1CA, W5LUA, IK2RTI, PA0EHG, G4NNS, LX1DB, F2TU, OH2AXH, WA6PY #41. Thank you to all active stations. We hope this microwave WE will be renewed the next years, the activity will be better and the random activity will be rewarded..
Best 73. JJ F1EHN

**SV1BTR 8*39el. 13wl H pol (432)**

**G3LTF** On 13cm 12 qsos with SK0UX, ES5PC, OK1CA, OE9ERC, OH6NVQ, SM3AKW, G3LQR, F2TU, OZ4MM, K2UYH, W5LUA, JA4BLC.
Heard and called on 2320 LX1DB, Heard on 2304 and called on 2320 OH2DG*, VE6TA, KA9FWD*, OH2AXH, WA6PY, IK2RTI. The * indicates that they had no 2320 rx. Heard on 2424 JA6CZD. Total stations hrd/wkd 20. I missed K9KFR it seems.
In Dubus this year I worked 9 (one weekend shared with other bands) and in ARRL last year 13 (two weekends, shared with other bands) It will be interesting to hear the results of the 10 GHz gang but my conclusion, from the point of view of a 13cm op, is that the additional activity resulting from a dedicated weekend is pretty minimal. Thanks to everyone for their QSOs...and keep on working on your 2320 Rx capability. 73 Peter

Report of ARRL microwave contest on 10GHz band by **IQ4DF** group. 14 qso on 30/10/2004: OK1UWA, WA7CJO, OK1CA, IK2RTI, DL0EF (57 57 ssb), G4NNS, PA0EHG, 56/53 ssb, LX1DB #, DJ5MN nc no RR, DL0SHF 54/52 ssb, F2TU, 31/10/2004 OH2AXH #. During all test WX was very bad expecially sunday morning with very strong rain for more hours. Saturday nigth we had worked with a preamp with 2nd stage failure. Sunday morning we replace with new premp but all signals were compromised from strong rain. Good activity saturday and very low sunday.
73 de Rob IZ4BEH / IQ4DF

**JA4BLC** results: I worked on Sunday on 13cm: W5LUA, WA6PY, OZ4MM, OE9ERC, F2TU, ES5PC (#31), LX1DB and G3LTF. Heard but not worked was OH6NVQ. Thanks fer the OMs who listened on JA window (2424MHz). GL de Yoshiro

**K2UYH** 13 cm: It was sure fun! We had a problem the first night due to no sequencer, we lost the front end in the transverter twice and had to quit. I brought up a sequencer from home on Saturday and that solved the problem. We had about 80 watts into the feed, and our own echoes were about s4 – I think they should have been louder but we did not have time for more tuning and we were installing the stuff between rain drops. We started hearing signals when the moon was still down in the trees - around 20 degrees. The following stations were worked - thanks to all the FB op's. OH2AXH, SK0UX, W5LUA, WA6PY, SM3AKW, OH6NVQ, OZ4MM, OH2DG, ES5PC, OE9ERC, VE6TA, G3LTF, F2TU, DL0SHF (SSB), K9KFR - for a total of 15. The crew at K2UYH for this weekend were: Al K2UYH, Russ K2TXB, and Mark N2UO.

**OH6NVQ** 13cm Worked the follwing stations during the weekend. 30 Oct 04, SK0UX, ES5PC, OE9ERC, G3LTF, F2TU, OH2AXH, OK1CA. 31 Oct 04 K2UYH, OH2DG, SM3AKW, WA6PY, OZ4MM. 12 stations and 6 initials! I can not count how many liters of coffee that was consumed to stay awake :-) Missed a few, heard LX1DB vy good in the last hours of contest but, he dissappeared after the JA window! I would like a bigger dish !!! Equipm. here 3m dish, 150W and abt 6 dB gnd/cold sky noise, 12dB sun. 73's Tomas KP13IQ

**SK0UX** We managed to work 18 stations and 9 initials on 2.3Ghz. At the first quick check it looks like 15 multipliers. I do not know if this was good or bad (1st contest ever on 2.3) But I think we worked all that we heard. If someone called us and did not get a reply, please let us know. 14 of the 18 qsos were made during the first 4 hours of the contest. Needless to say, the second night was a bit slow!
Worked on 2.3: OH6NVQ, ES5PC, G3LTF, G3LQR, OK1CA #10, OE9ERC #11, SM3AKW, F2TU #12, IK2RTI #13, VE6TA, W5LUA, WA6PY, OH2DG #14, WA9FWD #15, OZ4MM, OH2AXH #16, K2UYH #17 and K9KFR for #18.
5.7 Ghz was a big disappointment, we heard nothing at all of the moon, not even AI/W5LUA. Probably we were not pointing accurately enough at the moon. We will give it another try when we have some daylight and can actually see what we are doing. Operators this weekend were SM0EPO, SM0BSO and SM0MXO. 73s Hans, SM0MXO

**WA6PY** On 13 cm QSO'd: SK0UX SM3AKW OZ4MM OE9ERC IK2RTI VE6TA W5LUA K2UYH ES5PC OH6NVQ OH2DG JA6CZD JA4BLC. Heard: OH2AXH WA9FWD.
On 10 GHz QSO'd: DL0EF F2TU WA7CJO F6KSX OK1UWA and again DL0EF. I will take 13 cm feed down for few months. 73 Paul

# 23 cm

**IK2RTI** I made a short appearance on saturday 9th October on 23 cm because I had some business. I heard several stations, but I only worked five of them, with very good signals, although the noise was strong. This let me test a two concentric helixes feed and the result was good, according to me, considering that the feed is placed together with three other W2IMU feeds for 2.3, 5.7, 10 GHz on a homemade 4.8 m dish with f/D 0.52. I'd like to know if there are other stations with this kind of feed on 23 cm. 73 Gianfranco

**W2DRZ** This is our report for the 23 cm only multi operator effort at W2DRZ. Operators were K2TXB and W2DRZ. This was our best weekend ever from this location. We ended up with 42 contacts and 30 multipliers. The station seems to be working very well with the new HB9BBD preamp and the new 500 watt power amp right at the dish. We certainly were hearing much better than ever before although there were still signals I wished I could copy - but I guess that is always the problem, I have never been satisfied that any of my VHF or microwave receiving systems was good enough. The weaker stations we worked were: W9IIX, NA4N, IK3COJ, and JA6AHB. We were right at moonset Sunday when working JA6AHB and ground noise was certainly a factor in making the copy difficult. We also heard and copied the 50 watt signal from SM6CKU, but never heard him call CQ or got an answer to ours.
There were some real strong stations as usual, but even stronger here this year. HB9BBD, DL0SHF, K5GW, HB9Q, K5JL all got a 579 from me, and there were a few of the others that were that loud later after they were worked. I'd sure like to *urge more of the US hams* to get on the air for the contest on 23 cm. Once the moon is down in Europe the band becomes a wasteland here. It was fun working Willi, LX1DB on SSB and also caught VE7BBG via JT65B for our first ever digital contact (and only attempt). And we worked 4 JA stations this year which is the most for us, but did not hear some we worked in previous years.
73 all, Russ K2TXB (operator at W2DRZ - FN02, New York State)

**DL0SHF** in ARRL Contest on 1296 MHz results:
I drove to DL0SHF early in the morning after a quite short sleep due to our baby. I used SPECTRAN as visual aid and the built-in filter when signals were marginal like OH3MCK. I am very pleased to work OH3MCK. Signal was very weak but I could copy. Funny enough 23cm EME signals can look VERY different from the ONE birdie on 1296.025 which was a clean signal. EME

signals. ALL looked spread over at least 20 Hz. Very easy to see. Some stations I had to chase along the band as they had a bad drift. If I could not have seen in spectran where the weak signal went to I would probably have lost it. Exept a few stations I called on their CQ, I stayed calling CQ around 1296.027. Alltogether I worked 37 stations. The station worked without any problems with about 1 kW at the feed of the 9,5m solid dish. I know that we had some terrible clicks on the signal making it somewhat unique. It was big fun to work so many old friends again. 73, Christoph, DF9CY

**K9SLQ's new dish that he is using on 23 cm**

# 2320 MHz

**Current status of JA stations on 13cm**

**JA8IAD** ready with 150W+ and 5m dish, clear sky

**JA6CZD** ready with 70W and 5m dish, window restriction (EL needs higher than 20deg.) to east and clear to west

**JR4ZZS** not sure but some possibility to QRV with 60W at TX into -5dB feeder and 9m dish, clear sky. I will do my best to get the club station QRV. Ken

**JR4AEP** will operate in the contest.

**JA4BLC** no 13cm feed mounted at the moment. Not sure but some possibility to QRV only on Sunday.

**JA7BMB** has stopped operation on 13cm, very sorry. GL de Yoshiro JA4BLC

**13cm in HB9** is on 2308 MHz. Stations need a special permit for EME. HB9JAW and HB9SV got the permit already and plan to become qrv.

# 10 GHz

**9H1ES** was active on EME for the first time for experiments during the weekend 4/5 Sept. Parabolic 2m, solid preamp hemt 0.65 db n.f, feed peramid horn pol. horz., TX TWT 21 watts using wavguide switch, i.f FT 817. Tranverter home design by ssb. 73s Fortunato

**G4NNS** This was the first test for my new antenna mount and tracking system which gives me longer on the moon than before. I was very pleased with the results with my relatively QRP set up 9W 3.7m. I worked OK1UWA, IQ4DF, WA7CJO, F6KSX, DL0EF, OK1CA and F2TU. I heard but did not work IK2RTI, PA0EHG, W7SZ. If anyone would like to test out of contest hours please let me know as the system will remain set up for the time being. 73 Brian

**PA0EHG** We where active on 3 cm in the ARRL contest. We made 5 QSO's. Stations worked are WA7CJO, OK1UWA, F6KSX, IQ4DF and DL0EF. The QSO's with IQ4DF and DL0EF where in SSB. We also heard LX1DB and I5PPE. Equipment over here: 3 mtr dish 0.7 dB noise figure and 200 Watt output. Best 73's, Hans

**SP7JSG SWL** Czeslaw SP7JSG started his first experiences with 3cm eme. His has no power yet (only 1.5w) , but he tested his RX during ARRL EME Contest Microwave Weekend. He has 3m dish and heard: 30./31.10.04 F6KSX, OK1UWA, IQ4DF, WA7CJO. Czeslaw plans to have 25W PA in spring 2005 and hopes to try qsos then...

# 47 GHz

**RW3BP** saw AD6FP's signals after computer processing them. So we are vy close to the first 2way contact now. Obviously the US guys need just a bit more power.

## Toplist

| Call | Smal | Sqr | DXC | US- | WAC | WAS | Initi- |
|---|---|---|---|---|---|---|---|
| **432** | | | | | | | |
| DL9KR | 405 | 55 | 88 | 50 | 1978 | 1987 | 811 |
| DJ6MB | 310 | 43 | 63 | 44 | 1984 | -- | 368 |
| OK1KIR | 254 | 45 | 63 | 44 | 1982 | -- | 359 |
| DL7APV | 175 | 33 | 39 | 42 | 1984 | -- | 235 |
| OE9ERC | 148 | 30 | 36 | 28 | 1993 | -- | 226 |
| **1296** | | | | | | | |
| OE9ERC | 168 | 32 | 40 | 30 | 1993 | -- | 268 |
| DJ9YW | 150 | 30 | 46 | 23 | 1998 | -- | 167 |
| OK1KIR | 148 | 32 | 39 | 28 | 1989 | -- | 190 |

Changes were minimal!

Due to the lists on the web there seems no demand for an EME list in DUBUS anymore? Only 4 changes since the list in DUBUS 1/04 (p 73). So we cut the list for this issue and show only the changed sections. (DL8HCZ)

**73 Bernd DL7APV**

# EUROPEAN WORLD-WIDE EME CONTEST 2005

## Sponsored by DUBUS and REF

The EU WW EME contest is intended to encourage world-wide activity on moonbounce. Multipliers are DXCC countries plus all W/VK/VE states.

### 1. Contest Dates & Bands:

| | | | |
|---|---|---|---|
| **First weekend,** | **APRIL 16/17,** | **00 - - 24 UTC:** | **50 MHz, 1.3 GHz, 10 GHz, 24 GHz and up** |
| **Second weekend,** | **MAY 14/15,** | **00 - - 24 UTC:** | **144 MHz, 2.3 GHz and 3.4 GHz** |
| **Third weekend,** | **JUNE 11/12,** | **00 - - 24 UTC:** | **432 MHZ and 5.7 GHz** |

### 2. Sections and Awards:

**QRP** 144MHz <100kW EIRP 432MHz <400kW EIRP 1296MHz <600kW EIRP
>= 2300MHz no separate QRP/QRO categories

**QRO** On 144, 432 and 1296MHz, stations with EIRP equal to or greater than stated above.

**PRO** Non-amateur equipment or antenna. PRO stations will have scores listed separately.

**CW** All QSOs in CW mode – no other modes used

**DIG** All QSOs in digital mode (e.g. all the "JT" modes) – no other modes used

**MIX** QSOs in CW and digital modes or any other mode

Assisted (ASS): Stations using liaison by any other means (eg DXcluster, logger, internet, telephone) must indicate this and will be marked with an asterisk after their callsign in the result tables. ASS is not a separate section. Also there are no separate multi-operator classes. Multi-operator and QRO stations will be highlighted in the general classifications. All QRP/QRO band winners and QRP/QRO multiband winners will receive a year's free subscription to DUBUS magazine. In each band/section, certificates will be sent to the top five entries and to the highest-scoring station in the southern hemisphere.

**4. Contest Exchange:** For a valid QSO, both stations must transmit and receive both callsigns+ TMO/RST/xxdB + R. There is no restriction on modes, but entrants must not cause inter-mode QRM.

**5. Logs:** Logs must be separate for each band, and should be in normal "logbook" format. Top line: Your callsign, Band Each QSO: Date/time, Callsign, Report sent, Report received, Points, Multiplier
Bottom line: Total points, Total multipliers, Total claimed score.

**5. QSO Points:** 100 points for each random QSO completed.
10 (ten) points for each sked QSO completed on 144/432/1296MHz.
100 points for each random or sked QSO completed on 2.3GHz or higher bands.

**6. Multipliers:** Each DXCC country (except W/VE/VK), or EACH INDIVIDUAL STATE worked in W/VE/VK. States and provinces can be determined after the contest using recent Newsletters, on the Web or in DUBUS.

**7. Total Scores:** Single band score = [Total of QSO points] * [Total of multipliers].
There will be one QRP winner and one QRO winner on each band.
Multiband score = [(Total sum of points on 144-1296MHz) +
(2 * total sum of points on 2.3GHz or above)] * [Total sum of multipliers on all bands]
There will be one QRP multiband winner and one QRO multiband winner. Multiband stations will also be listed as an entry on each separate band worked, and can also win single-band awards.

**8. Contest Entries:** Copy of the log for each band with details of points, multipliers and total points. The following information **MUST** also be included for each band: 1. Output power, transmit cable loss, antenna type and gain. 2. Categories: QRO/QRP - single/multi operator - ASSisted – mode CW/DIG/MIX 3. Name(s) of all operators 4. Locator/State. Other info is welcome: Comments, conditions, locator, station details, photographs, etc.

**9. Sending Your Entry:** Contest entries **MUST** be sent no later than 28 days after the end of the third weekend (i.e. in the mail or e-mail by 10 JULY 2005).
Mail address: Patrick Magnin, F6HYE, Marcorens, F-74140 BALLAISON, France
You can also e-mail your contest entry in ASCII format to: **f6hye@ref-union.org**
All email entries will be acknowledged within one week. For further questions contact: info@dubus.de

DO ***NOT*** SEND LOGS TO ANY DUBUS POST OR E-MAIL ADDRESSES!

Good Luck in the Contest!

For REF: Patrick Magnin, F6HYE For DUBUS: Joachim Kraft, DL8HCZ

# Lunar Weekend Calendar for 2005, by G3SEK

| At 2400 Sat/ 0000 Sun | Declination (deg) | Signals (dB) | Sun offset (deg) | Sky temp (K,432MHz) | Comments |
|---|---|---|---|---|---|
| Jan-01/02 | 6.2 | -0.3 | -110 | 15 | Day(AM). |
| Jan-08/09 | -27.7 | 0.9 | -22 | 166 | Moon in south. |
| Jan-15/16 | 2.8 | 0.2 | +74 | 19 | Day(PM). |
| **Jan-22/23** | **28.0** | **-0.9** | **+153** | **29** | **Night.Apogee.** |
| Jan-29/30 | 1.6 | -0.3 | -129 | 21 | Night. |
| Feb-05/06 | -28.1 | 1.0 | -42 | 149 | Moon in south. |
| Feb-12/13 | 6.9 | 0.1 | +54 | 20 | Day(PM). |
| **Feb-19/20** | **27.6** | **-0.9** | **+133** | **20** | **Night Apogee (23cm SSB)** |
| Feb-26/27 | -3.1 | -0.2 | -148 | 20 | Moon in south. |
| Mar-05/06 | -27.6 | 1.0 | -60 | 41 | Moon in south. |
| Mar-12/13 | 10.6 | 0.0 | +34 | 20 | Day(PM). |
| **Mar-19/20** | **26.6** | **-0.9** | **+114** | **20** | **Day(PM).Apogee.** |
| Mar-26/27 | -7.6 | -0.1 | -167 | 20 | Moon in south. |
| Apr-02/03 | -26.1 | 1.0 | -77 | 41 | Moon in south. |
| Apr-09/10 | 14.1 | -0.1 | +14 | 24 | Sun noise. |
| **Apr-16/17** | **25.0** | **-0.9** | **+94** | **14** | **Day(PM).Apogee.** |
| | | | | | **DUBUS: 6m, 23cm, 10 GHz** |
| Apr-23/24 | -11.6 | 0.0 | +175 | 21 | Moon in south. |
| May-00/01 | -23.4 | 1.0 | -94 | 24 | Moon in south. |
| May-07/08 | 17.5 | -0.2 | -5 | 24 | Sun noise. |
| **May-14/15** | **22.8** | **-0.9** | **+75** | **14** | **Day(PM).Apogee.** |
| | | | | | **DUBUS: 2m, 2.3/3.4 GHz** |
| May-21/22 | -15.1 | 0.1 | +156 | 26 | Moon in south. |
| May-28/29 | -19.8 | 1.0 | -110 | 20 | Moon in south. |
| Jun-04/05 | 20.8 | -0.3 | -22 | 24 | Sun noise. |
| **Jun-11/12** | **19.9** | **-0.9** | **+57** | **13** | **Day(PM).Apogee.** |
| | | | | | **DUBUS: 70cm + 5.7 GHz** |
| Jun-18/19 | -18.3 | 0.2 | +137 | 26 | Moon in south. |
| Jun-25/26 | -15.8 | 0.9 | -126 | 17 | Moon in south. |
| **Jul-02/03** | **23.9** | **-0.4** | **-40** | **24** | **Day(AM).** |
| Jul-09/10 | 16.5 | -0.9 | +39 | 13 | Day(PM).Apogee. |
| Jul-16/17 | -21.4 | 0.3 | +119 | 35 | Moon in south. |
| Jul-23/24 | -11.8 | 0.9 | -144 | 17 | Moon in south. |
| **Jul-30/31** | **26.3** | **-0.4** | **-57** | **29** | **Day(AM).** |
| Aug-06/07 | 12.7 | -0.8 | +21 | 14 | Sun noise. |
| Aug-13/14 | -24.3 | 0.4 | +101 | 35 | Moon in south. |
| Aug-20/21 | -8.0 | 0.8 | -162 | 19 | Moon in south. |
| **Aug-27/28** | **27.8** | **-0.5** | **-74** | **35** | **Day(AM).Apogee.** |
| Sep-03/04 | 8.7 | -0.8 | +4 | 15 | Sun noise. |
| Sep-10/11 | -26.7 | 0.5 | +84 | 66 | Moon in south. |
| Sep-17/18 | -4.1 | 0.8 | +178 | 19 | Moon in south. |
| **Sep-24/25** | **28.5** | **-0.6** | **-93** | **35** | **Day(AM).Apogee.** |
| Oct-01/02 | 4.7 | -0.8 | -16 | 15 | Sun noise. |
| Oct-08/09 | -28.2 | 0.6 | +67 | 166 | Moon in south. |
| Oct-15/16 | 0.0 | 0.7 | +160 | 19 | Night. |
| **Oct-22/23** | **28.5** | **-0.7** | **-113** | **29** | **Day(AM).Apogee.** |
| Oct-29/30 | 0.7 | -0.7 | -36 | 21 | Day(AM).Apogee. |
| Nov-05/06 | -28.5 | 0.7 | +50 | 149 | Moon in south. |
| Nov-12/13 | 4.6 | 0.6 | +141 | 19 | Night. |
| **Nov-19/20** | **27.7** | **-0.7** | **-133** | **20** | **Night.Apogee.** |
| Nov-26/27 | -3.1 | -0.6 | -56 | 20 | Moon in south. |
| Dec-03/04 | -27.8 | 0.7 | +32 | 41 | Moon in south. |
| Dec-10/11 | 9.6 | 0.6 | +123 | 20 | Night. |
| **Dec-17/18** | **26.4** | **-0.8** | **-153** | **20** | **Night.Apogee.** |
| Dec-24/25 | -7.0 | -0.6 | -77 | 20 | Moon in south. |

**Bold: Activity Weekend (Proposal)**

## Sun Offset *vs* Time of Day for Visible Moon

-180° -120° -30° 0° +30° +120° +180°

| Night | Day(AM) | Sun noise | Day(PM) | Night |
|---|---|---|---|---|
| -180° to -120° | -120° to -30° | -30° to +30° | +30° to +120° | +120° to +180° |

# Tropo Reports

## 2m, 70cm and up

**Editor: Wolfgang Schneider, DJ8ES**

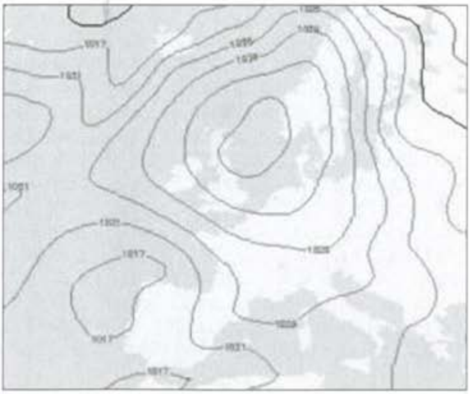
**DJ8ES@gmx.de**

## Great tropo event in September ´04

A large tropo opening occurred on $4^{th}$ – $9^{th}$ of September. This was the first tropo event on all of the VHF-, UHF- and SHF-Bands in the year 2004. Over the North Sea a centre of of high-pressure had build up enabling these DX condx. Later, this system moved in southeastern direction. From Germany, The Netherlands, Belgium and France, and also from Scandinavia, contacts to G, GM, GI, EI and OY were possible. Many reports of these contacts are listed in this issue of Dubus.

Comment from DL1EJA:
It was nice to see this excellent condx on 2m in the past days. Being back on 2m since a few days I took the chance to work some old and new friends.

G3XDY writes:
The tropo opening at the beginning of September was excellent here, with very loud signals from GM for 3 days. GM8CBQ was 59 on 23cm running 10W to an indoor antenna, and GM4LBV was 59+ on 23/13/3cm and with his beacon on 9cm. Towards the end of the opening it moved round to SM, with SM4DHN the best DX on 4 bands, but despite trying several times over a 20 minute period we heard nothing on 10GHz.



**The center of high-pressure over the North Sea**

Myself (DJ8ES, JO43) worked stations from G, GM and EI at distances of more than 1000km. The odx on 2m was EI7IW in IO63SS (1046km). Specially There was also a lot of activity on 23cm, 13cm and also 3cm. I had contacts to UK in the range up to 900km. On this frequencies I got 10 new squares!

### 2m

**DC0NAC, JO43VI, wkd on 7th Sep. (>800km):**
G4CBW (IO83UB, 805km), G0FYD (IO83LS, 848km), GW8ASD (IO83LB, 855km), G8JVM (IO82SP, 823km), G4HGI (IO83PL, 828km), G4YTB (IO83RF, 819km), G3NSY (IO82NP, 851km), MM0KOS (IO85CR, 914km), G4ASR (IO81MX, 873km), GM4VGR (IO86AC, 933km), EI3GE (IO63XD, 1052km), G0CDA (IO83SJ, 812km), GM0TGE (IO87TF, 881km), GI0PCU (IO74CS, 1027km), GM8MJV (IO85TS, 828km), GM3YOG/p (IO85XT, 809km), GI4SJQ (IO64SK, 1070km), MM5DWW (IO89ID, 1031km), M5AHO (IO87LN, 933km), GI6ATZ (IO74AJ, 1037km), EI2JD (IO63VS, 1056km), G4PBP (IO82WO, 802km), G7RAU (IO90IR, 812km), M0GHZ (IO81VK, 841km), GM4AFF (IO86ST, 868km), 2E0TIA (IO97BL, 866km), GM8GDN (IO87WB, 860km), GM4RGS (IO87WB, 860km), M1AIX (IO83QM, 822km), MW0OPS/p (IO81KP, 894km), GM8BBA (IO75XT, 931km), GM8BDE (IO85TP, 825km), 2E0NEY (IO81VK, 841km), G3UOL (IO83NW, 837km), GM4VVX (IO78TA, 1026km), GM0BQM (IO85CE, 904km), M0JKQ (IO84SN, 812km), MM0JMB (IO87IP, 950km), GM4TOE (IO87HF, 937km), G4DBX (IO83SD ,815km), GM4ILS (IO87IP, 950km), 2W1RSS (IO83JG, 863km), G4IJD (IO83TU, 804km), M1EQN (IO83NN, 838km), GM7EEY (IO87KB, 916km), GW4EVX (IO83KE, 859km), 2E0EUS (IO83RK, 817km), GW3IVK (IO83KE, 859km), G4WXZ (IO83PL , 828km), G6ZME/p (IO82SP, 823km), G1SWH (IO83QO, 822km), EI5FK (IO51RT, 1247km), G8AXW (IO83NU, 837km), GW8JLY (IO81JM, 904km), G4RRA (IO80BS, 976km), GM4BYF (IO85JV, 882km), M0SJV (IO82WM, 804km), G2ADM (IO83MQ, 843km), OY9JD (IP62OA, 1372km), G1KHX (IO81MI, 893km), GI4SNA (IO64XM, 1043km), G1WEM (IO83UB, 805km), M0JVW (IO83QK, 823km), GW0GEI (IO73TG, 940km), GW0VNR (IO83HI, 873km), GW4ROV (IO81IP, 905km), M1KGC (IO91BM, 816km), G8TIC (IO82VF, 816km), GW1UJU (IO83JF, 864km), GW8ASA (IO81EM, 931km), G4GHL (IO82UC, 825km), GW3LEW (IO71PS, 995km). Rig: 600 Watt und 2x17 ele M2.
tnx for info Andy (DG3XA)

**DF7KF JO30GU, wkd (>800km):**

| | | | |
|---|---|---|---|
| 6.9.04 17:21 | OM3RM | 53/57 | JN87WV |
| 6.9.04 17:29 | UA3YOZ | 53/59 | KO63QQ |
| 6.9.04 19:55 | RW3WR | 559/559 | KO71IM |
| 7.9.04 04:23 | OK2MWR/p | 59/59 | JN99FN |
| 7.9.04 18:25 | LA2Z | 529/539 | JO59EJ |

| | | | |
|---|---|---|---|
| 7.9.04 18:31 | SK6DK | 539/569 | JO67EH |
| 7.9.04 18:39 | LA1T | 539/559 | JO59FB |
| 7.9.04 18:52 | GM4AFF | 59/59 | JO86ST |
| 7.9.04 19:03 | GI6ATZ | 57/59 | IO74AJ |
| 7.9.04 20:25 | GM0HTT | 59/59 | IO89JC |
| 8.9.04 20:15 | GM0EFT | 59/59 | IO86PL |

New odx on tropo: RW3WR, KO71IM, 1965km
Rig: 16x 18 ele, 750W, 140m asl.
tnx for info Dithmar

**DG3GAG, JN47NX, wkd (>700km) on Sept 7th 2004:**

| | | | |
|---|---|---|---|
| 18:01 OZ9KY | JO45VX | 57 53 | 890km |
| 18:55 G4PIQ | JOØ1MU | 53 55 | 721km |
| 19:06 M1IFT | IO93NL | 55 57 | 931km |
| 19:54 GW8ZRE/P | IO83JF | 57 59 | 1045km |
| 20:16 GM4AFF | IO86ST | 59 55 | 1254km |
| 20:53 GMØHTT | IO89JC | 57 53 | 1476km |
| 21:05 G3KUM | JOØ2OD | 59 59 | 730km |
| 21:23 G4ZTR J | OØ1KW | 59 59 | 735km |
| 22:00 GM4YXI | IO87RJ | 59 59 | 1305km |
| 22:15 G1JKX | IO95CH | 53 55 | 1107km |
| 22:17 G7ANV | IO95CH | 53 55 | 1107km |

Rig: IC-706MKIIG - 200Watt - 2 x 17el.
tnx for info Erwin

**DJ8ES, JO43SX, wkd 7th September (>700km):**

| | | | |
|---|---|---|---|
| 15:52 GM3YOG/P | IO65XT | 55/59 | 1014km |
| 15:56 GØGLH | IO95FD | 55/57 | 725km |
| 16:02 GMØLVI | IO86JJ | 59/59 | 851km |
| 23:24 EI7IW | IO63SS | 59/59 | 1047km |

**DK7LZ, JO30MR, wkd in SSB (>700km):**

| | | |
|---|---|---|
| 05/09/04 09:20 OM3KEE | JN88UU | 795km |
| 06/09/04 21:34 OK2PMU | JN99AJ | 801km |
| 07/09/04 19:52 GW8ZRE/P | IO83JF | 756km |
| 07/09/04 20:54 GM4AFF | IO86ST | 921km |
| 07/09/04 21:56 GM4YXI | IO87WJ | 953km |
| 07/09/04 23:14 EI7IW | IO63SS | 980km |
| 07/09/04 23:29 GW8ASD | IO83LB | 740km |
| 08/09/04 01:37 GI6ATZ | IO74AJ | 970km |
| 08/09/04 06:28 MM5DWW | IO89ID | 1145km |
| 08/09/04 07:11 GM1LDK | IO87WE | 936km |
| 08/09/04 07:22 G1NFT | IO94FX | 746km |
| 08/09/04 08:01 GM0HTT | IO89JC | 1138km |
| 08/09/04 09:18 G6DDQ/P | IO84VI | 745km |
| 08/09/04 19:07 GM3YOG/P | IO85XT | 828km |
| 08/09/04 19:12 GM4YXI | IO87WJ | 953km |
| 08/09/04 19:22 G1JKX | IO95CF | 775km |
| 08/09/04 19:28 GM0HTT | IO89JC | 1138km |
| 08/09/04 22:17 GM4AFF | IO86ST | 921km |
| 09/09/04 20:20 LA3BO | JO59CD | 958km |

tnx for info Reinhard

**DL1EJA, JO31DS, wkd 7./ 8. Sep. (>700km):**

MMØKOS (IO85CR, 794km), LA2PHA (JO38IB, 709km), GM4JJJ (IO86GB, 797km), EI2JD (IO63VS, 866km), GM4AFF (IO86ST, 797km), GM4BYF (IO85JV, 773km), GMØHTT (IO89JC, 1010km), GM8MJV (IO85TS, 722km), MM5DWW (IO89ID, 1016km), MM3ERP (IO87RJ, 844km), EI7IW (IO63SS, 884km), GMØTGE (IO87TF, 824km), GM4YXI (IO87WJ, 826km), OY9JD (IP62OA, 1383km), MM5AJW (IO88KI, 944km), GM4WJA (IO87MN, 875km), MMØDQP (IO88KI, 944km), GM8XOC (IO87TP, 857km), GI6ATZ (IO74AJ, 867km), GMØLVI (IO86JJ, 804km), EI3GE (IO63XD, 848km), GM4ZUK/P (IO86RW, 810km), GM3YOG/P (IO85XT, 707km), GM1BAN (IO88GO, 978km). tnx for info Oliver

**DL8EBW, JO31NF, wkd:**

| | | | | |
|---|---|---|---|---|
| 11/08 11:11 OK2KZR | JN89BO | 55 | 569 | 662 |
| 11/08 23:55 OK2ZW | JN89BO | 53 | 55 | 662 |
| 12/08 09:05 F1FPL | JN05PS | 55 | 55 | 743 |
| 04/09 16:56 SK7MJ | JO65MJ | 55 | 55 | 607 |
| 05/09 04:46 GM2T | IO85RU | 55 | 59 | 819 |
| 05/09 04:49 G8SRC/P | IO91CL | 59 | 59 | 619 |
| 05/09 04:49 G3CKR/P | IO93AE | 59 | 59 | 655 |
| 05/09 05:01 SK7JM | JO65TM | 559 | 579 | 642 |
| 05/09 05:25 SP6YEN | JO81AB | 559 | 59 | 622 |
| 05/09 05:59 OL2R | JN89BO | 419 | 599 | 662 |
| 07/09 17:06 SK7CY | JO65RJ | 55 | 53 | 625 |
| 08/09 00:21 GM3YOG/p | IO85XT | 53 | 57 | 790 |
| 08/09 00:33 GM0EFT | IO86PL | 52 | 53 | 868 |
| 08/09 16:21 GM3YOG/p | IO85XT | 54 | 55 | 790 |
| 08/09 17:48 GM4ZUK/p | IO86RW | 57 | 59 | 893 |
| 08/09 17:51 G7ANV | IO95CH | 59 | 58 | 746 |
| 08/09 21:21 M5AEH | IO93BS | 55 | 56 | 671 |
| 08/09 21:38 MM5AJW | IO88KI | 53 | 58 | 1027 |
| 08/09 21:45 GM4YXI | IO87WJ | 55 | 55 | 909 |
| 08/09 22:03 MM0DQP | IO88KI | 52 | 52 | 1027 |
| 09/09 20:40 LA3BO | JO59CD | 51 | 529 | 901 |
| 06/11 15:30 OK1VBN | JN78FX | 559 | 599 | 603 |
| 06/11 15:46 OK1FFG | JN89IW | 599 | 599 | 727 |
| 06/11 15:59 OK1KT | JO70WE | 559 | 599 | 663 |
| 06/11 16:28 IV3DXW | JN65QQ | 599 | 559 | 765 |
| 06/11 16:51 OK2KJU | JN89SJ | 599 | 55 | 800 |
| 06/11 17:25 OK1KQI | JO80CI | 599 | 599 | 684 |
| 06/11 17:27 OL9W | JN99FN | 599 | 599 | 859 |
| 06/11 17:29 OK1KHQ | JN79PP | 599 | 599 | 636 |
| 06/11 17:44 OK2BMI | JN89NS | 599 | 599 | 760 |
| 06/11 18:05 OK1KQT | JO80CI | 599 | 599 | 684 |
| 06/11 18:40 OL7M | JO80FG | 599 | 599 | 703 |
| 06/11 19:24 OM3KII | JN88RT | 599 | 559 | 814 |
| 06/11 19:29 SK7MW | JO65MJ | 599 | 579 | 665 |
| 06/11 19:43 OL2R | JN89BO | 599 | 599 | 695 |
| 06/11 19:46 OL1B | JO80IB | 599 | 599 | 724 |
| 06/11 19:54 OK6DX | JO80BJ | 419 | 559 | 677 |
| 06/11 20:49 OM3KEE | JN88UU | 599 | 599 | |
| 06/11 21:14 IK5ZWU/6 | JN63GN | 559 | 599 | 928 |

MMC QSOs on 06/11 from JO30GU!

**F1CXX, JN18AT, wkd (>700km):**

| | | | |
|---|---|---|---|
| 07.09.2004 2012 | OZ2TF | JO46PE | 954km |
| 07.09.2004 2030 | DL0RSH/P | JO44PD | 776km |
| 07.09.2004 2034 | DL3TW | JO44SK | 810km |
| 07.09.2004 2037 | SK7MW | JO65MJ | 1046km |

rig: IC910H, 100W, 2x11 ele Tonna.
tnx for info Franck

**F6KUP/p, JN29OD, wkd (>700km):**

| | | | |
|---|---|---|---|
| 04/09 16:39 | EA2AAZ/P | IN93BF | 854km |
| 04/09 17:19 | F8DBF | IN78RI | 720km |
| 04/09 18:14 | DL0BWS | JO64EB | 737km |
| 04/09 19:52 | F1MOZ | IN93RS | 742km |
| 04/09 21:01 | M5ADF | IO71TO | 732km |
| 04/09 22:03 | M0LKB/P | IO84KE | 802km |
| 04/09 22 :16 | G6FSP/P | JO80FP | 823km |
| 05/09 02:31 | OL7M | JO80FG | 818km |
| 05/09 04:31 | OK1KPA | JN79US | 762km |
| 05/09 05:59 | F1BOH | JN03IN | 711km |
| 05/09 07:53 | F4BWJ | IN93MP | 773km |
| 05/09 13:16 | F1UCQ/P | JN12IW | 717km |

tnx for info Stefan

**F9OE/p, IN78QG, wkd (>700km):**

| | | | |
|---|---|---|---|
| 02/09 08.08 | PE1EHX | JO21 | 802km |
| 02/09 08:11 | PA2M | JO21 | 765km |
| 04/09 07:53 | PI25ASV | JO22 | 809km |
| 04/09 07 :54 | PA2M | JO21 | 765km |
| 04/09 08 :08 | PA3FTX | JO21 | 735km |
| 04/09 08:25 | DG6JF/P | JO33 | 1024km |
| 04/09 08:30 | PD1AIH | JO21 | 760km |
| 04/09 09:16 | ON6LY | JO21 | 765km |
| 04/09 09:22 | PA3AYD | JO21 | 837km |
| 04/09 10:01 | PE1AHX | JO21 | 802km |
| 04/09 10 :08 | PA0V | JO33 | 974km |
| 04/09 21 :26 | PA6NL | JO21 | 746km |
| 05/09 07 :11 | TM1Y | JN36 | 904km |
| 05/09 07 :36 | HB9STY/P | JN36 | 851km |
| 05/09 07:41 | F1ERG | JN27 | 709km |
| 08/09 20:29 | DK7BY | JO33 | 1019km |
| 08/09 20:49 | OZ1LPR | JO44 | 1232km |

Rig: 100W, 9el, 50m asl, 100m from the shore
tnx for info Claude

**G3NAQ, IO91HL, wkd (>700km):**

| | | | |
|---|---|---|---|
| 07/09 18:36 | OZ9KY | JO45VX | 887km |
| 07/09 18:39 | DL0RSH/P | JO44PD | 775 |
| 07/09 18:43 | OZ1EP | JO55XU | 1002 |
| 07/09 18:44 | OZ1DLD/P | JO45SK | 845 |
| 07/09 18:47 | DL6BCT | JO43LD | 726 |
| 07/09 18:49 | DJ8MS | JO63CT | 951 |
| 07/09 18:51 | DL/UT8AL | JO43HV | 725 |
| 07/09 18:57 | DH9JK | JO33UU | 794 |
| 07/09 18:40 | OZ2TF | JO46PE | 873 |
| 07/09 18:44 | DL3TW | JO44SK | 801 |
| 07/09 18:45 | OZ7CQ | JO55CE | 871 |
| 07/09 18:50 | DH9NK | JO43UW | 794 |
| 07/09 19:02 | OZ1LFA | JO54TU | 943 |
| 07/09 19:08 | OZ1ALS | JO45VA | 840 |
| 07/09 19:11 | OZ1BEF | JO46OE | 868 |
| 07/09 21:42 | DL8LAH | JO44QQ | 801 |
| 08/09 17:20 | F5JNX | JN37PV | 739 |
| 08/09 21:12 | DF2NBN | JN59OP | 911 |
| 08/09 21:20 | OK1VZP/P | JO60LJ | 1010 |
| 08/09 21:40 | OK1TEH/P | JO60LJ | 1010 |

Rig: TS830S+homebrew t'verter, 100W, 17el F9FT
tnx for info Geoff

**G4LOH, IO70JC, wkd on Oct 3rd 2004:**

0949 EA8BPX 59001 59024 IL18sk 2600km
1010 EB8BTV 53002 59007 IL18 2600km
1118 EA8BPX 59+++
1132 **CT3/CT1DIZ** 53008 55022 IM12nt 2150km
New #/DXCC ufb!!

**GI6ATZ, IO74AJ, wkd (>1000km)**

| | | | |
|---|---|---|---|
| 06/09 2244 | DG3XA/P | JO43VI | 1037km |
| 07/09 1815 | DC0NAC | JO43VI | 1037km |
| 07/09 1930 | DK3EE | JO41GU | 1006km |
| 07/09 1941 | DL8YAU | JO41HS | 1015km |
| 07/09 1955 | DL8LDN | JO43XU | 1037km |
| 07/09 2005 | DL8YHR | JO41GV | 1004km |
| 07/09 2126 | DF1CF | JN57FP | 1367km |
| 07/09 2128 | DF0CI | JO51CH | 1135km |
| 07/09 2129 | DL8AKI/P | JO51CH | 1135km |
| 07/09 21:42 | DJ3HW | JO42LH | 1015km |
| 07/09 21:53 | DL3LST | JO61FI | 1277km |
| 08/09 18:29 | DL6NAA | JO50VF | 1288km |
| 08/09 18:37 | HB9AMH/P | JN37OE | 1221km |
| 08/09 21:53 | DF2OO | JN39GO | 1006km |

Rig: PA 2*4CX250B, 400 watts, 13ele boomer.
tnx for info Gordon

**HA8V, KN06HT, wkd (>700km):**

| | | | | |
|---|---|---|---|---|
| 03/09/04 | 14:24 | I6BQI | JN72BK | 708km |
| 03/09/04 | 11:07 | DG3FK | JN59OP | 765km |
| 04/09/04 | 16:10 | DL0UL | JN48UO | 840km |
| 04/09/04 | 18:11 | DL1BUT | JO72GH | 752km |
| 04/09/04 | 20:01 | IK5ZWU/6 | JN63GN | 729km |
| 04/09/04 | 21:21 | DK1KC/P | JN58QH | 713km |
| 04/09/04 | 22:12 | DL1ARJ/P | JO60AR | 764km |
| 04/09/04 | 22:59 | OK2KKW | JO60JJ | 700km |
| 04/09/04 | 23:03 | DL0FO | JN59NU | 779km |
| 04/09/04 | 23:39 | I4GBZ | JN54VV | 716km |
| 05/09/04 | 00:13 | DL1NFL | JO50VF | 753km |
| 05/09/04 | 02:16 | DF0MTL | JO61JF | 753km |
| 05/09/04 | 02:27 | DL0HEU | JN47NX | 874km |
| 05/09/04 | 02:36 | DL0HZZ | JO61CA | 772km |
| 05/09/04 | 02:36 | DK0WM | JO61CA | 772km |
| 05/09/04 | 03:23 | DK0HA | JN48WQ | 830km |
| 05/09/04 | 03:57 | DL0GTH | JN50JP | 837km |
| 05/09/04 | 04:55 | DG3FK | JN59OP | 765km |
| 05/09/04 | 05:45 | IK4ADE | JN54OE | 789km |
| 05/09/04 | 07:38 | I1BPU/2 | JN44OR | 914km |
| 05/09/04 | 10:36 | DL4SAV | JN58BR | 812km |

Rig: 900w, 4x11el. Yagi 35m agl. tnx for info Gabi

**I4YNO, JN54KP, wkd (>700km):**

| | | | |
|---|---|---|---|
| 16.05.2004 | 12.07 | OK2PIN | JN99AJ |
| 22.05.2004 | 11.13 | ZA/PA2CHR | JN91SG |
| 27.05.2004 | 19.45 | HA8V | KN06HT |
| 27.05.2004 | 19.55 | YU1IO | KN04IQ |
| 01.06.2004 | 19.09 | OK1KT | JO70WE |
| 01.08.2004 | 09.31 | YU1EV | KN04CN |
| 29.08.2004 | 10.26 | OK1WCF | JO80BJ |
| 05.09.2004 | 09.24 | 4N5M | KN03DI |
| 05.09.2004 | 10.31 | LX/PA2CHR/p | JO30AC |
| 05.09.2004 | 10.42 | LX7I | JN29XV |

Rig: FT-1000MP Mk V Field + tvtr + 3CX800A7, phemt preamp, 20 el. Shark. tnx for info Alex

**OE8GVK/3, JN88GR, wkd 4./5. Sept. (>700km)**

| | | | | |
|---|---|---|---|---|
| 04.09.04 | 19:10 | I6WJB | JN72CK | 722km |
| 04.09.04 | 21:06 | DF7KF | JO30GU | 755km |
| 04.09.04 | 22:36 | DH8IAB | JO30NO | 708km |
| 04.09.04 | 22:58 | SK7JM | JO65TM | 780km |
| 05.09.04 | 02:03 | HB9STU/P | JN36GU | 775km |
| 05.09.04 | 04:25 | F6KSL | JN28QJ | 822km |
| 05.09.04 | 04:37 | DK2MN | JO32PC | 754km |
| 05.09.04 | 04:42 | DL2KCK | JO31OA | 715km |
| 05.09.04 | 05:04 | DL0RTA | JO30EM | 758km |
| 05.09.04 | 09:24 | LZ1ZP/P | KN22GR | 910km |
| 05.09.04 | 09:53 | I1BPU/2 | JN44OR | 714km |

Rig: 400W, 12el. M2. tnx for info Gert

**ON5AEN, JO10VW, wkd (>700km):**

| | | | |
|---|---|---|---|
| 06/09 22:40 | LA3BAA | JO38QB | 826km |
| 06/09 22:53 | MM3ERP | IO87RJ | 828km |
| 06/09 22:54 | MM0KSS | IO87WB | 783km |
| 07/09 17:09 | OE2CAL | JN67NT | 760km |
| 07/09 17:15 | SK7MW | JO65MJ | 791km |
| 07/09 17:46 | OZ1IEP | JO55XU | 769km |
| 07/09 18:08 | GM0VLI | IO86JJ | 762km |
| 07/09 18:10 | GM0TGE | IO87TF | 807km |
| 07/09 18:19 | GM4JJJ | IO86GB | 745km |
| 07/09 18:22 | GI6ATZ | IO74AJ | 761km |
| 07/09 18:41 | GM4AFF | IO86ST | 771km |
| 07/09 18:48 | OZ6ABA | JO57DJ | 833km |
| 07/09 18:56 | MM5DWW | IO89ID | 1017km |
| 07/09 19:00 | GM0HTT | IO89JC | 1011km |
| 07/09 19:05 | GM4WJA | IO87MN | 857km |
| 07/09 19:21 | GM4BYF | IO85JV | 720km |
| 07/09 19:49 | OZ9ZZ | JO46QK | 714km |
| 07/09 20:46 | OY9JD | IP62OA | 1390km |
| 07/09 20:50 | GM4YXI | IO87WJ | 815km |
| 07/09 20:56 | MM3ERP | IO87RJ | 828km |
| 07/09 22:00 | MM0DQP | IO88KI | 937km |
| 07/09 23:02 | MM3DDS | IO87VI | 813km |
| 08/09 20:19 | GM4ZUK/P | IO86RW | 785km |
| 18/09 08:49 | F1MOZ | IN93RS | 861km |
| 18/09 08:53 | F1CJW | JN04FH | 778km |
| 18/09 08:58 | EA1BAB/P | IN73XK | 1022km |
| 19/09 08:44 | OK1KNG | JN69VN | 727km |

Rig: FT-225RD, PA GS35B, Ant DJ9-2-4.6L.
tnx for info Hans

**OR4A, JO10UU, wkd 4./ 5. Sep. (>1000km):**
LA0BY (JO59KC, 1023km), SM6ONH (JO68MN, 1043km), LA9CY (JO59MB, 1024km), SK0UX (JO99BM, 1323km), LA5VNA (JO59JQ, 1078km), LA1DBA (JO59CE, 1013km), LA6MV (JO59FJ, 1040km), LA2PHA (JO58FK, 1045km).
tnx for Info Hans

**PA0JUS, JO22OO, wkd (5. – 7. Sep.):**
TM8MB (JN35KV, 757km), SK0CT (JO89XJ, 1093km) I2FAK (JN45OB, 889km), OK2PMU (JN99AJ, 966km), OY9JD (IP62OA, 1269km), MM0DQP (IO88QI, 808km). Rig: 100W, 9el yagi.
tnx for info Juda

**RA3AQ, KO85je, wkd:**

| | | | |
|---|---|---|---|
| 06/09/04 06:04 | OK2BLE | 539/539 | JN99fn |
| 06/09/04 06:27 | OK2BFH | 559/559 | JN99at |
| 06/09/04 06:37 | SP5WCK | 55/58 | KO12cj |
| 06/09/04 06:40 | OK2BLE | 57/57 | JN99fn |
| 06/09/04 07:12 | OK2BFH | 59/59 | JN99at |
| 06/09/04 07:16 | SP5AI | 53/55 | KO02 |

**RA3WDK, KO81BR, wkd on 6th Sept. (>800km)**

| | | | |
|---|---|---|---|
| 20:25 | US5WU | KO20di | 840km |
| 20:27 | SP6GZZ | JO80jo | 1350km |
| 21:31 | DL6NAA | JO50vf | 1704km |
| 21:44 | OK2BLE | JN99fn | 1265km |
| 21:45 | OK2BFH | JN99fn | 1265km |

In the beginning nobody from the West did hear me on 2m, though RW3WR (KO71im) already worked with Germans.
After 20UTC weak signals from US5WU with 559 (only 850 km), but than SP6GZZ with 559 and QRB 1350km appeared. One hour later heard DL6NAA, JO50vf, on 144.035 in CW and a signal reaching up to 599! 1704 km my Tropo ODX! Then at 21:45 UTC OK2BLE (JN99) and OK2BFH with 559 and 1270 km followed. My rig: 60 watts and 11 el DL6WU. tnx for info Ivan

**RN6BN, KN95LC, wkd:**
28/10 1603 UA9SL 559 559 LO71ns 1399km

**RW3PF, KO93CD, wkd 4./5. Nov. 2004:**

| | | | | | |
|---|---|---|---|---|---|
| 16:56 | UT3BW | 56 | 55 | KN29UA | 986 km |
| 17:10 | UR5NOY | 57 | 56 | KN48KV | 806 |
| 17:53 | UT5OH | 58 | 58 | KN28XG | 1019 |
| 18:04 | U5YM | 569 | 569 | KN28XG | 1019 |
| 18:12 | ER1AN | 569 | 559 | KN46KX | 956 |
| 18:44 | US5WU | 55 | 56 | KO20DI | 1008 |
| 19:08 | UR5SKB | 55 | 55 | KO28IW | 1056 |
| 19:17 | UR5TW | 59 | 59 | KN39MK | 880 |
| 19:27 | UT7NW | 56 | 57 | KN49FF | 808 |
| 19:30 | UR5YGC | 57 | 59 | KN38KM | 948 |
| 19:32 | US5WDL | 56 | 56 | KN19SG | 1109 |
| 20:40 | YO8RNF | 59 | 59 | KN37EW | 1017 |
| 21:21 | UR5BFA | 59 | 59 | KO20UC | 927 |
| 21:23 | UR5YCU | 56 | 56 | KN38RM | 914 |
| 06:03 | UT5ZA | 57 | 53 | KN66AX | 815 |
| 06:31 | YO8RNF | 59 | 59 | KN37EW | 1017 |
| 07:14 | ER1AN | 599 | 599 | KN46KX | 956 |
| 07:26 | U5YM | 59 | 59 | KN28XG | 1019 |
| 07:31 | UR5NHG | 59 | 59 | KN49JQ | 758 |
| 07:49 | YO4GJH | 59 | 55 | KN35XG | 1148 |

Rig: 4x10el BVO-3WL, GI7B. tnx fr info Peter!

**UA3YOZ, KO63QQ, wkd 2m:**

| | | | |
|---|---|---|---|
| 05/09/04 17:43 | SP3IWQ | 59/59 | JO94gm |
| 05/09/04 19:04 | ES6DO | 599/599 | KO27wx |
| 05/09/04 19:41 | SP2WHE | 57/52 | JO94ht |
| 05/09/04 20:11 | LY2BAW | 59/59 | KO25ka |

| | | | |
|---|---|---|---|
| 05/09/04 20:12 | EW6AW | 59/59 | KO45wb |
| 05/09/04 20:38 | ES6RQ | 59/59 | KO28wa |
| 06/09/04 05:09 | LY3AX | 55/55 | KO25db |
| 06/09/04 05:47 | OK2BLE | 599/599 | JN99fn |
| 06/09/04 05:50 | OK2BFH | 599/599 | JN99at |
| 06/09/04 06:15 | OK2VDV | 57/55 | JO80nc |
| 06/09/04 17:06 | DK3WG | 59/59 | JO72gi |
| 06/09/04 17:28 | DF7KF | 59/59 | JO30gu |
| 06/09/04 17:28 | SP3VSC | 59/59 | JO92df |
| 06/09/04 17:59 | LY2SA | 59/59 | KO14ll |
| 06/09/04 18:30 | SP9APC | 59/53 | JN99qu |
| 06/09/04 19:11 | DL6NAA | 559/559 | JO50vf |

**UR5LX, KO50, wkd 6. September (>700km):**

| | | | |
|---|---|---|---|
| 03:29 | OK2BFH | 559/559 | JN99fn |
| 03:31 | OK2BLE | 559/599 | JN99fn |
| 20:33 | DL2ARD | 529/529 | JO60ar |
| 20:35 | SP8AWL | 559/599 | KO11gg |
| 20:54 | US5WU | 559/589 | KO20di |
| 21:56 | DL6NAA | 579/579 | JO50vf |
| 21:59 | DF0HF | 559/579 | JO50sf |

tnx for info Sergej

## 70cm

**DB5KN, JO31NB, wkd (>500km)**

| | | | |
|---|---|---|---|
| 10.08.04 | SK7MW | JO65MJ | 623km |
| 10.08.04 | G3YDY | JO01FQ | 469km |
| 10.08.04 | G4DEZ | JO03AE | 539km |
| 10.08.04 | G8HGN | JO01FO | 468km |
| 10.08.04 | OZ9KY | JO45VX | 574km |

Rig: 125W + 2x19ele F9FT. tnx for info Mike

**DL8EBW, JO31NF, wkd 70cm:**

| | | | | | |
|---|---|---|---|---|---|
| 03/10 04:07 | OK1VFA | JO80DG | 59 | 59 | 659 |
| 03/10 12:13 | SK7MW | JO65MJ | 55 | 53 | 607 |

**GI6ATZ, IO74AJ, wkd 7th Sep. (>700km)**

| | | | | |
|---|---|---|---|---|
| 21:43 | DJ3HW | 52/55 | JO42LH | 1015km |
| 21:44 | PH7PCF | 55/59 | JO22JP | 736km |
| 22:14 | PA2M | 52/53 | JO21IP | 775km |
| 22:46 | DJ5BV | 559/559 | JO30KI | 978km |
| 22:58 | PA2DW | 55/57 | JO22GD | 741km |

Rig: IC706MKII, 30w, 21el F9FT.
tnx for info Gordon

**HA2004EU, KN06HT, wkd (>500km)**

| | | | |
|---|---|---|---|
| 01/05/04 15:50 | OL3Z | JN79FX | 575km |
| 02/05/04 09:33 | DK1KC/P | JN58QH | 713km |
| 02/05/04 10:16 | DK0OG | JN68GI | 630km |
| 02/05/04 10:27 | OE5D | JN68PC | 570km |
| 02/05/04 12:06 | OL4A | JO60RN | 671km |
| 02/05/04 13:01 | SN6W | JO80FQ | 528km |

tnx for info Gabi (HA8V)

**HA8V, KN06HT, wkd (>500km):**

| | | | |
|---|---|---|---|
| 05/06/04 19:00 | LZ9W | KN22GS | 545km |
| 05/06/04 22:20 | S53D | JN76BD | 503km |
| 05/06/04 22:43 | DJ2NR | JO50VF | 753km |
| 05/06/04 22:47 | DH8NAS | JO50VF | 753km |
| 06/06/04 10:13 | S58W | JN65XM | 533km |
| 06/06/04 11:21 | DK3WG | JO72GI | 756km |
| 20/06/04 12:03 | I4LCK/4 | JN54PD | 785km |
| 20/06/04 12:26 | DK3WG | JO72GI | 756km |
| 03/07/04 22:58 | LZ1KWT | KN32AS | 620km |
| 04/07/04 07:29 | DK0OG | JN68GI | 630km |
| 04/07/04 09:15 | LZ9W | KN22GS | 545km |
| 04/07/04 12:38 | S55M | JN65XM | 533km |
| 02/10/04 14:56 | LZ9X | KN22NR | 576km |
| 03/10/04 04:54 | DJ7LH/P | JN58FP | 787km |
| 03/10/04 05:14 | LZ9W | KN22GS | 545km |
| 03/10/04 08:22 | DK0GNO | JO60QU | 695km |
| 03/10/04 08:26 | DG6QF | JO61OA | 715km |
| 03/10/04 08:43 | IK4ADE | JN54OE | 789km |
| 03/10/04 09:46 | OL3Z | JN79FX | 575km |
| 03/10/04 10:35 | DK0OG | JN68GI | 630km |
| 03/10/04 10:55 | OE5D | JN68PC | 570km |
| 03/10/04 11:13 | OK1KIK | JO70TQ | 565km |
| 03/10/04 11:26 | OK1KKD | JO60WD | 620km |
| 03/10/04 11:37 | DH1NFL | JO50VF | 753km |
| 03/10/04 11:47 | DL5MAE | JN58VF | 681km |
| 03/10/04 12:02 | DK3WG | JO72GI | 756km |
| 03/10/04 12:34 | SP5PIP/5 | KO01OX | 576km |
| 03/10/04 13:05 | SN5R | KO01IP | 538km |

Rig: 80w, 4x 23el K1FO, 35m agl.
tnx for info Gabi

**IZ2FOB, JN45MQ, wkd 3th Oct. (>500km)**

| | | | | |
|---|---|---|---|---|
| 06.28 | DLØGTH | JO5ØJP | 59/59 | 566km |
| 06.53 | S51ZO | JN86DR | 59/59 | 569km |
| 06.55 | 9A5KK | JN86GF | 59/59 | 582km |
| 07.37 | EA3BB/P | JN12IG | 59/59 | 633km |
| 08.50 | LX/PA1TK/P | JO3ØBB | 57/55 | 533km |
| 09.18 | S57O | JN86DT | 59/59 | 571km |
| 09.57 | DLØKC | JO5ØNL | 58/54 | 555km |
| 11.53 | EA5YB/3 | JN12IK | 59/59 | 621km |
| 12.11 | IØJXX | JN61GV | 59/59 | 506km |
| 12.18 | DLØRTA | JO3ØEM | 59/59 | 572km |
| 12.52 | OK2KKW | JO6ØJJ | 55/59 | 593km |
| 13.55 | DH1NFL | JO5ØVF | 59/59 | 545km |

Rig: 4x21ft , 500W. tnx for info Roberto

**OZ1FF, JO45BO, wkd (>700km):**

| | | | |
|---|---|---|---|
| 27/07/2004 14:26 | S51ZO | JN86DR | 1137km |
| 10/08/2004 17:01 | SMØFZH | JO99HI | 752km |
| 10/08/2004 18:37 | G4YTL | IO92MB | 713km |
| 10/08/2004 19:00 | OK1VT | JN79IX | 765km |
| 10/08/2004 19:16 | G4BRK | IO91DP | 782km |
| 07/09/2004 21:30 | GI4SNA | IO64XM | 908km |
| 12/10/2004 17:01 | SMØFZH | JO99HI | 752km |
| 12/10/2004 19:20 | DF9IC | JN48IW | 742km |

tnx for info Kjeld

**RW3PF, KO93CD, wkd 4./5.11. on 70cm:**

| | | | | | |
|---|---|---|---|---|---|
| 17:36 | UT6UG | 56 | 55 | KO50EI | 623 |
| 20:20 | ER1AN | 559 | 559 | KN46KX | 956 |
| 21:09 | US5WU | 579 | 599 | KO20DI | 1008 |
| 06:17 | UY0UP | 44 | 55 | KO50FJ | 615 |

Rig: 4x24el OPT-70, GI7B. tnx fr info Peter!

## 23cm + up

**DB5KN, JO31NB, wkd 23cm (>500km)**

| | | | |
|---|---|---|---|
| 06.06.04 | OK1ES | JO70GU | 521km |
| 06.06.04 | OE2M | JN67NT | 565km |
| 06.06.04 | DK0OG | JN68GI | 493km |
| 06.06.04 | M1MHZ | IO92WV | 538km |
| 08.06.04 | G8OHM | IO92AJ | 644km |

Rig: 100W + 48ele DL6WU. tnx for info Mike

**G3XDY, JO02OB, wkd Sep/Oct ´04:**

**23cm (>600km):**

OZ1CTZ (JO46OE, 693km), SK7MW (JO65MJ, 860km), SM7GEP (JO77IP, 1061km), OZ8AFC (JO45WV, 708km), SM6DJH (JO58PI, 946km), M6VXB (IO97AQ, 657km), DG2DAA (JO62GU, 772km), DL7YC (JO62PK, 822km), DK1KR (JO53HW, 663km), DM2AFN (JO61WB, 881km), GM8CBQ (IO87WD, 604km), GM6VXB (IO97AQ, 657km), SM4DHN (JP6ØVA, 1176km), SM6DJH (JO58PI, 946km), SM6CEN (JO57XO, 922km), SM6HYG (JO58RG, 947km), SK7MW (JO65MJ, 860km), DF9IC (JN48IW, 633km), DLØGTH (JO5ØJP, 683km), DF9IC (JN48IW, 633km), DK6AS (JO52JJ, 653km), DK9IP (JN48EQ, 631km), OK2KKW (JO6ØJJ, 826km)

**13cm (>400km):**

DB5KN (JO31NB, 424km), OZ1CTZ (JO46OE, 693km), SM7GEP (JO77IP, 1061km), GM4LBV (IO86RQ, 568km), DK1KR (JO53HW, 663km), DJ8ES (JO43SX, 596km), SM4DHN (JP6ØVA, 1176km), DL3YEE (JO42GE, 500km), DK2MN (JO32PC, 415km), DLØVR (JO31LG, 406km), DL3IAS (JN49EJ, 585km)

**9cm (>300km):**

DB5KN (JO31NB, 424km), DK2MN (JO32PC, 415km), PA6C (JO33FB, 372km), PAØBAT (JO31FX, 359km), DLØVR (JO31LG, 406km), DL3IAS (JN49EJ, 585km)

**6cm (>300km):**

DB5KN (JO31NB, 424km), SM4DHN (JP6ØVA, 1176km), PI4TUE (JO21RK, 301km), DK2MN (JO32PC, 415km), PA6C (JO33FB, 372km), PAØBAT (JO31FX, 359km), DLØVR (JO31LG, 406km), F1PYR/P u. F1DBE/P (JN19BC, 335km)

**3cm (>300km):**

DH8AG (JO31RL, 435km), OZ8AFC (JO45WV, 708km), OZ1CTZ (JO46OE, 693km), OZ1FF (JO45BO, 600km), GM4LBV (IO86RQ, 568km), DK1ZD (JO44WE, 624km), PAØWMX (JO21XI, 336km), PI4TUE (JO21RK, 301km), DK2MN (JO32PC, 415km), PAØBAT (JO31FX, 359km), PA6C (JO33FB, 372km), DLØVR (JO31LG, 406km), F1PYR/P (JN19BC, 335km), F1DBE/P (JN19BC, 335km), DL4BBU/P (JO31LP, 397km), DH8AG (JO31RL, 435km)

tnx for info John

**HA8V, KN06HT, wkd (>300km):**

| | | | |
|---|---|---|---|
| 05/06/04 17:27 | S51ZO | JN86DR | 330km |
| 05/06/04 21:15 | HA1FV/P | JN87FI | 321km |
| 05/06/04 21:16 | HG1RJD/P | JN87FI | 321km |
| 05/06/04 21:18 | HA1KYY | JN87FI | 321km |
| 05/06/04 21:19 | HA1KVP/P | JN87FI | 321km |
| 20/06/04 07:19 | S50C | JN76JG | 450km |
| 20/06/04 07:36 | YO8KRR/P | KN27OD | 350km |
| 20/06/04 11:44 | S51ZO | JN86DR | 330km |
| 20/06/04 13:36 | 9A2L | JN86HF | 312km |
| 20/06/04 13:54 | S59R | JN76OM | 415km |
| 03/07/04 19:40 | OE1SOW | JN88FF | 350km |
| 03/07/04 19:58 | YU1B | JN93RU | 341km |
| 03/07/04 21:29 | S51ZO | JN86DR | 330km |
| 03/07/04 21:47 | S59R | JN76OM | 415km |
| 04/07/04 04:47 | S50C | JN76JG | 450km |
| 04/07/04 08:39 | YU1EXY | KN04UC | 313km |
| 04/07/04 09:36 | OE3JPC | JN87EW | 344km |
| 04/07/04 11:04 | 9A2HW | JN75XV | 372km |
| 04/07/04 11:24 | OL2R | JN89BO | 455km |
| 02/10/04 16:08 | OM3W | JN99BB | 312km |
| 03/10/04 06:56 | HA1KYY | JN87FI | 321km |
| 03/10/04 07:25 | S51ZO | JN86DR | 330km |
| 03/10/04 07:40 | S59R | JN76OM | 415km |
| 03/10/04 13:12 | OL2R | JN89BO | 455km |

Rig: 25W, 4x 19el loop, 35m agl. tnx for info Gabi

**I4XCC, JN63GV, wkd 3cm >300km:**

| | | | |
|---|---|---|---|
| 01/08/2004 15.32 | OK1JKT/P | JO60RN | 744km |
| 01/08/2004 18.02 | DL3MBG | JN67JX | 454km |
| 03/08/2004 15.35 | 9A1Z | JN86EL | 415km |
| 03/08/2004 15.45 | S57EA/P | JN76HE | 303km |
| 05/08/2004 16.39 | DL6NCI | JO50VI | 720km |
| 05/08/2004 16.43 | DL3MBG | JN67JX | 454km |
| 05/08/2004 16.46 | DC8EC | JN57UX | 458km |
| 07/08/2004 13.42 | 9A3AQ | JN75WS | 335km |
| 08/08/2004 10.22 | S52LO | JN76OM | 359km |
| 15/08/2004 19.16 | 9A3PA | JN85EG | 340km |
| 16/08/2004 15.25 | OE5VRL/5 | JN78DK | 522km |
| 17/08/2004 18.40 | DL6NCI | JO50VI | 720km |
| 17/08/2004 18.45 | OK1DIG | JO60XJ | 730km |

tnx for info Claudio

**OZ1FF, JO45BO, wkd**

**1296 MHz (>600km):**

| | | | |
|---|---|---|---|
| 06/09/2004 09:49 | F6DKW | JN18CS | 859km |
| 06/09/2004 20:56 | GØFYD | IO83LS | 745km |
| 07/09/2004 06:25 | G4EAT | JOØ1HR | 655km |
| 07/09/2004 18:10 | GM6VXB | IO97AQ | 658km |
| 07/09/2004 18:15 | G4KIY | IO92WN | 635km |
| 07/09/2004 18:20 | GØSEG | IO93IQ | 641km |
| 07/09/2004 18:22 | G7NCG | JOØ2AM | 628km |
| 07/09/2004 18:24 | G4EAT | JOØ1HR | 655km |
| 07/09/2004 18:37 | GM4LBV | IO86RQ | 671km |
| 07/09/2004 19:58 | G4XUM | IO83SB | 741km |
| 07/09/2004 22:03 | G4BRK | IO91DP | 782km |
| 07/09/2004 22:42 | G3FYX | IO81RM | 836km |
| 19/10/2004 18:37 | DF9IC | JN48IW | 742km |
| 19/10/2004 18:41 | DB6NT | JO5ØTI | 629km |
| 19/10/2004 19:20 | DL3IAS | JN49EJ | 690km |

| | | | |
|---|---|---|---|
| 19/10/2004 19:35 | SM3LBN | JP8ØIO | 749km |
| 19/10/2004 20:36 | G3XDY | JOØ2OB | 600km |

**2320 MHz (>600km):**

| | | | |
|---|---|---|---|
| 07/09/2004 18:47 | **GM4LBV** | **IO86RQ** | **671km *)** |
| 07/09/2004 19:22 | G4BRK | IO91DP | 782km |
| 07/09/2004 20:03 | G4XUM | IO83SB | 741km |

***) first contact GM – OZ on 13cm**

**10368 MHz (>300km):**

| | | | |
|---|---|---|---|
| 24/08/2004 17:18 | SM6BTT | JO58PI | 361km |
| 24/08/2004 17:32 | PA3CEG | JO33FB | 302km |
| 24/08/2004 17:37 | DL3YEE | JO42GE | 381km |
| 24/08/2004 18:05 | SM6AFV | JO67GQ | 356km |
| 24/08/2004 18:20 | DL1SUN | JO53PN | 305km |
| 24/08/2004 18:51 | DJ8MS | JO63BR | 331km |
| 24/08/2004 19:30 | DL4IB | JO64AB | 304km |
| 24/08/2004 19:39 | SM6UBC | JO57TR | 319km |
| 24/08/2004 19:49 | SK7MW | JO65MJ | 310km |
| 24/08/2004 20:31 | SM7ECM | JO65NQ | 314km |
| 07/09/2004 06:31 | G3XDY | JOØ2OB | 600km |
| 07/09/2004 18:26 | G4EAT | JOØ1HR | 655km |
| 07/09/2004 18:42 | GM4LBV | IO86RQ | 671km |
| 07/09/2004 19:18 | G4BRK | IO91DP | 782km |
| 07/09/2004 20:10 | G4XUM | IO83SB | 741km |
| 28/09/2004 17:18 | SM6BTT | JO58PI | 361km |
| 28/09/2004 17:52 | SM6AFV | JO67GQ | 356km |
| 28/09/2004 19:55 | PA3CEG | JO33FB | 302km |
| 28/09/2004 20:33 | SM7ECM | JO65NQ | 314km |
| 28/09/2004 20:44 | SK7MW | JO65MJ | 310km |

tnx for info Kjeld

**PA0JUS, JO22OO, wkd (5. – 7. Sep.):**
**1296Mhz:**
G7NCG (JO02AM), G4KIY (IO92WN), G4MAP (IO82XH), GM4ZUK/p (IO86RW)
Rig: 15W 1,5m dish

**2320Mhz:**
GM4LBV (IO86RQ), G4MAP (IO82XH)
Rig: 5W 1,5m dish

**10368Mhz:**
GM4LBV (IO86RQ), G1SLE (IO93IF), DJ8ES (JO43SX, hrd 41)
Rig: 1W 48cm dish

**24048MHz:**
PA0EZ (JO22OF)
Rig: 75mW 48cm dish. tnx for info Juda

**SP3JBI, JO91BR, wkd on 10 GHz in CW via Rain Scatter > 300km:**

| | | | |
|---|---|---|---|
| 03/07 17:00 | SP9FG | JN99XF | 307 km |
| 03/07 19:28 | OE5VRL/5 | JN78DK | 457 |
| 03/07 19:49 | OK1UVY | JO60QC | 379 |
| 03/07 19:58 | OE3A | JN77XX | 445 |
| 03/07 20:03 | OK1YA | JO70GC | 309 |
| 03/07 20:13 | OM3LQ | JN88UU | 321 |
| 03/07 20:18 | OL4A | JO60RN | 350 |
| 03/07 20:22 | OK1VHF | JO70EB | 322 |
| 19/07 17:33 | OK1JKT/P | JO60RN | 350 |
| 19/07 17:37 | DM2AFN | JO61WB | 304 |
| 20/07 18:33 | OK1JKT/P | JO60RN | 350 |
| 20/07 18:43 | OE5VRL/5 | JN78DK | 457 |
| 20/07 18:53 | OK1VAM | JN79IX | 309 |
| 20/07 19:06 | DL6NCI | JO50VI | 468 |
| 17/08 16:35 | DL6NCI | JO50VI | 468 |
| 17/08 17:09 | DB6NT | JO50VJ | 466 |
| 17/08 17:20 | DM2AFN | JO61WB | 304 |
| 02/10 20:10 | SP9FG | JN99XF | 307km, Tropo |

Rig: 2W + 60cm dish. Tnx fr info Zenek!

## Last Minute Report from Nov. 17th 2004

**G4LOH, IO70JC, reports:**
I was just chatting with Mau IK2YXK, on WWconverse and thought I should try sending for a minute on 144185 MHz to listen for early meteors from the apparently approaching Leonids storm.... amazing.... no ms but 539 on tropo. No-one else was on, the map showing recent contacts at ON4KST was blank, but there he was.
17-11-2004
16:28 IK2YXK 539 559 JN45op, 53/55 on ssb also
The duct was very selective, only stations within a few km of Mau in Italy appeared all evening:
16:40 IK2GSO JN45np
18:21 IW2DAL JN45nn
18:56 IW2DAL 59+20dB FM
20:11 IW2NOR JN45on
20:18 I2FAK JN45on
20:26 IK2FIL JN45om
21:49 IW2BNA JN45on
21:56 IW2MXY JN45no
All at 1200km +/- not very much.
No other Italian stations were heard, just this duct to about 20km radius of Milan. Tropo skeds with I5WBE (JN53) and I4XCC (JN63) showed only ms. The duct did reach well into France though, nearby stations in Brittany to mid France were not evident on the band so I guess this was an elevated duct. Also the signal strengths did not change much as night fell and the land cooled.
Other highlights were:
16:46 HB9MEY 55 55 JN47bm
17:27 F5SDD JN23rf
19:09 EA1DAX IN53
19:10 EA1DKV IN53th
17:16 F6HZL 55 55 JN23qu
The beacon F5XAV JN24gb was heard for the first time and was good strength all evening, also F5XAL JN12ll was 529 all evening which is impressive given the Pyrenee's mountains in the path. I was also delighted to reach:
20:41 F6HTJ JN12kq 1030km, right behind the mountains with just a modest yagi and 40W.

# 6m News

## Reports, Expeditions, Infos

### Editor: Joachim Kraft, DL8HCZ

Not much to report about from DL after July.

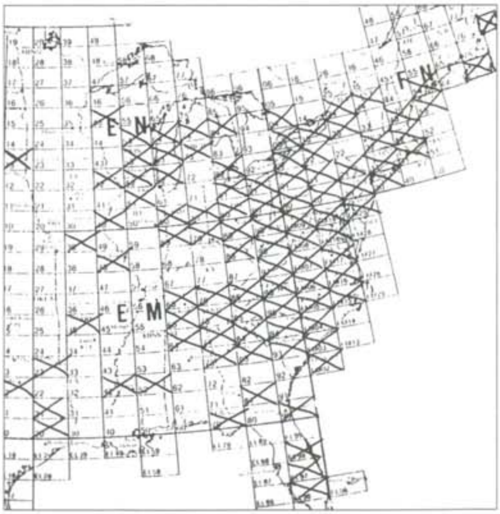
Since the beginning of September I was qrv again from CT as **CT1HZE (IM57nh)** and was able to listen to ZD8VHF almost every evening in Sept./Oct. via TEP on 6mts in the timeframe from 1930 to 2230 UTC.

But there is another opening that is worth reporting: On **July $5^{th}$ 2004** there has been an exceptional triple hop sporadic-E opening from CT to the U.S. and Canada from **1900 to 2330** UTC. There have been several of these openings to the U.S. and the Carribean this summer with many short openings to the usual W1, 2, 3 area but with some very good wide spread openings on June $27^{th}$, July $3^{rd}$, $4^{th}$, $5^{th}$ and $6^{th}$ to W1, 2, 3, 4, 5, 6, 8, 9, 0, VE1, 2 and 3. The opening on July $5^{th}$ resulted in >160 QSOs from CT1HZE and the many incoming direct QSLs showed that this has been an exceptional opening because on the cards there were so many comments as: "TNX for first QSO with IM57", "TNX for first QSO with CT" and even "TNX for first QSO with Europe"! Most of these comments came from stations in W8/W9. During this opening CT1HZE had a tremendous pile-up from this area and the QSLs showed that even many small stations with 20 W and a 3 Element Yagi or so worked me. Even mobile stations like VE3IKV/m from FN04 were workable. In order to show the good activity of U.S. stations on six even close to the sunspot minimum here the list of stations wkd by CT1HZE on July $5^{th}$, 2004:

1423-1447: W4SO EL96, K4MM EL97, K4RX EM70, KC4PX EL98, N4IS EL96, K4UTE EM90, K5UR EM35, W4BP EL96, N4GM EL96, KA9CFD EN40, NW5E EL98, W5KN EM20.

1900-2330: KS4S FM04, K2WU FM19, N2NB FN30, K3TKJ FM29, K3CHP FM29, N3DB, W4WA EM84. K3KO FN06, WA4NJP EM84, K5AND EM74, K8MFO EN90, K6EID EM73, W8OI EM88, K4UX FM16, K5ZG EN70, K4QI FM03, K4MWB FM05, K4CHT EM86, AD4F EM75, K4WS EM86, K3BTX FN00, AA1K/M, KY5R EM64, W2UDT FN20, N4VA FM18, K1XJ KN31, N8OB EN80, W3COP FN10, K2PLF FM19, W4KVS EM94, K4SO FM18, AI3W FM19, N3OC FM19, W4DR FM17, K3SX EM74, N4XD FM05, K3TC FM19, W8GG EM88, K8MD EN82, W0VHF FN12, WA8WV EM98, WB8KCL EN81, W8RJL FM16, WD2SIH FN31, K8FLY EN63, WN3V FN10, W8DCH EN80, K3XA FM18, W4CBX EM86, N2AU FN12, K8ATQ EN91, K8IU FN20, K2RW FN20, N2FY EM85, N3YX EN91, N8CJ EN84, AG2A FN30, K3CK FM18, K3WW FN20, W5KI FM29, N4UB FM09, K8MD EN82, W3BBO FN02, W4FQT FM18, WV1K FN41, W2MPK FN23, K1RA FM18, WA8RCN EN91, W9VHF EM89, K8OOK EN73, WB9GYT EN62, W4WTA EM83, K1PXE FN31, K8RYU EM99, N3LL EN90, K9LJN EN52, KE3I FM9, AF9R EN52, K9RZZ EN62, W9RN EN52, WA1MKE EN70, W8TU EN82, KY5R EM64, N3LL EN90, N8UUP EN82, WB9CIF EM69, NM9P EM69, K1VW FN31, N4UB FM09, WA8JOC EM79, AF4HX EM85, K2LZQ FN20, K9RJ EN51, WA0KBZ, K3HX FN00, W9IU EN60, W9JN EN54, K1WHS FN43, N8FF FM15, N4MI FM17, K1RC EN42, N4VC EM66, N4AH FM02, N4BT/2 FN31, K3ONW FM09, W8AU EN90, K1BO EM95, K5GMX FN31, VE3IKV/M FN04, WA2AEY FN23, N8II FM19, KD2I FM29, W9JUV EN62, N9US EN52, N3AM FM19, W3YY FM18, W4TO EM75, NR0X EN42, N4TJ FM04, KF2HC FN20, K5TF EM73, N0PB EM39, VE3FIT FN03, AI3W FM19, KB3IIA FN10, K8GC EN74, WA1RKS, W4LK EM93, W3LPL FM19, K3UL FN11, WB2TPS FN30, WA3WUL, W5UN EM23, N8IN EN82, K3FN FN31, N4JB EM96, K1XJ FN31, VA3NQ FN13, W2BPI FN13, K8GUN FM09, W1TE FN42,W2QO FN02, K4XP EM84, W8JGU EN91, K8HS EN82, AA4U EM64, N3UX FM19, KM0T EN13, N4CH FM07, W1QK FN31, KB1EFS FN42, W4ML FN07, K0IQ, WB9WHQ EN45, W1BS FN32, AE3T FN20, K2GVE FN30, K1QT FN42, W1ARA FN42, W2CNS FN13, K7BV/1.

On July $6^{th}$ at 2330 C6AGN was wkd during another good opening to W1, 2, 3, 4, 5 and 8.




**Map: Almost 100 Grid Squares from the U.S. were wkd by CT1HZE (IM57nh) on 6m via Sporadic-E in the openings on June $27^{th}$, July $3^{rd}$, $5^{th}$ and $6^{th}$.**

**November 2004 Auroras:**

**K1TOL worked OZ4VV on AuE**

Lefty Clement, K1TOL in Turner, Maine said he had a tremendous thrill on November 7 when he worked OZ4VV and MM0AMW on 6 meters. This is only the third time in 30 years on 6 meters that he has worked Europe via Auroral-E skip without the assistance of the F2 layer. The OZ QSO was his furthest yet. He was also hearing European commercial television signals S9, and heard via a European chat cluster that G4IGO and an SM6 heard him for a five minute period. (de ARLP)

**KH6SX worked KL7FZ on Aurora**

On November 8th at 06:30 UTC the first ever Aurora QSO from Hawaii took place when KH6SX worked KL7FZ (Alaska). The QSO was classified as Aurora from the reporters. Anyway we guess to consider AuE.

## Expeditions and News:

**3Y0P** Peter Isl.: The multinational expediton 3Y0X wil be qrv from around January 21st to Februay 4th also on 6 mts.

**5A** Libya: 5A3A, Ali, may be qrv on 6m next year.

**5H** Tanzania: JE3MAS is qrv again for another year as 5H3HK also on 6m.

**5U** Niger: 5U7JB (US-Op) ist qrv on 6m for a longer period. Loc. JK13, QSL via ON5NT.

**7X** Algeria: 7X0AD (JM16jr) and 7X2RO (JM16) became qrv on 6m for the first time in June. QSOs since June 2nd are accepted now for DXCC.

**C3** Andorra: C31JI is qrv on 6m since June 2004. Loc. JN02.

**CP** Bolivia: CP1FQ. Rene, one of the very few CP`s who made 6m-DX-QSOs in the past, is SK

**CY9** St. Paul: VY2SS (CY9SS) and others will be qrv from June 7th to around July 7th 2005 on 6m with a good station. Loc.: FN97.

**D2** Angola: 4L4FN, Ed, is qrv as D2PFN for a longer period and got his 4 ele yagi for 6m.

**EM** Antarctica: UX2HO ist qrv again as EM1HO for one year. Also 6m with 100w and 3 ele yagi.

**EY** Tadjik: EY/F5LYF + EY/F5NHJ are qrv also on 6m until March 2005. QSL via F5NHJ

**FM** Martinique: F5JKK is qrv on 6m since August as FM5JC from Martinique. He showed up on six in mid September with 100 w and a 5 ele yagi. His Locator is FK94LO.

**FR/G** Glorioso: F5OGL, F5CW, F5IRO, F5PTM etc. plan a big expedition for several weeks in May 2005 incl. 6m.

**FP** St. Pierre: VE3IKV plans a 6m trip through several squares in eastern Labrador (FO.., GO..) during summer 2005. May be he will also go to FP.

**FT1Z** Amsterdam Isl.: FT1ZL, is qrv until the end of 2004 on 6m. Loc.: MF82. So far he has not made any QSOs on 6m and his 6m antenna was destroyed lately. So probably no chance anymore for 6m. Anyway may be the cycle timing was not too helpful either...

**HI** Dom. Rep.: HI3TEJ is qrv with 100w + 5 ele on 6m. Loc. FK49. QSL via ON4ANT, now ON4IQ.

**HK0** San Andres: W6JKV, N0JK a.o. consider a 6m dxpedition during summer 2005.

**HZ** Saudi Arabia: There is a new amateur radio law in HZ. 6m operation is no longer permitted!

**J3** Grenada: W7XU, K5AND and ON4IQ plan to be qrv QRO from June 24th to July 3rd 2005 on 6m

**J6** St. Lucia: J69EN, a resident OP, is quite active on 6m. He is in FK94LA.

**JW** Svalbard: SP9EMF is qrv as JW0IB from JQ77 until June 30th 2005 also on 6m.

**S2** Bangladesh: S2/EI3IO plans to be qrv in May/ June 2005 on 6m.

**SV/A** Mount Athos: SV2ASP/A ist qrv on 6m.

**TN** Congo: CT3HK is qrv on 6m as TN3S until October 2005. Obviously he NOT active on six!

**VK** Australia: PE1OZH moved to VK and is very active as VK4KDD/6 on 6m.

**V3** Belize: W6JKV plans to be qrv with QRO on 6m in the end of June 2005.

**VP2M** Montserrat: VP2MEG is qrv with 100w and a 4 ele yagi on 6m. He is a resident.

**VP2V** British Virgin Isl.: VP2VE, Lee E. Reisenweber became a SK on February 21st 2004. Lee was quite active on 6 m in 2001/2002. He was last heard on HF in Oct. 2003. His locator was FK78qk and QSL via WA2NHA.

**VP8** Falkland: G3WOS plans to be qrv on 6m EME in JT1 mode in March/April 2005. He will probably be also active from Ascension as ZD8SIX

**YA** Afghanistan: G4KUX continues his YA4F activity on 6m until at least April 2005.

**ZA** Albania: ZA/IK0OKY is qrv on 6m until August 2006. QSL via IW0BET.

**ZD8** Ascension: G8WVW is qrv until March 2006 as ZD8I. In the end of October Ian erected his 5 ele yagi temporarily 2m a.g.l. and worked to EA, CT, 9H, FM and PJ2.

# 4m News

### Reports, Expeditions, Infos

### Editor: Joachim Kraft, DL8HCZ

GW3HWR reports that the **MFJ-906 6m tuner** also works quite o.k. on 70 MHz. He writes:

"I use a MFJ-906 for the ATU. this is a 'PI' coupler with a 2-needle power and VSWR meter, intended for 50MHz but quite usable at 70MHz.

The inductor has 7 turns of about 20swg at about

12mm inside diameter and spaced to be 50mm long; if you are making your own, I suggest 5 turns would serve better at 70MHz; the capacitors look about 100pF and are near their minimum settings at 70MHz."

**FT847:** The sensitivity of this rig on 4m is extremely low. You need a preamp to get results. A software mod for improving the sensitivity does not result in more sensitivity but more noise. The S/N ratio keeps as is is and the 6m RX is also affected. Allthough the TX delivers almost 10 watts output with around 100 watts input the signal quality is reported to be quite problematic.

**SP-4000:** SSB Electronic offers a masthead preamp for the 4m band.

**YO4FYQ from KN44** was wkd on 4m from the U.K. in July. The OP states that he has a licence and 5 w and a 5ele.

**OH:** A release of the 4m band in Finland is not expected before 2005. OH5XO (KP41) and OH1ZAA (KP01) are qrv for 6m/4m x-band. OH1ZAA is already planning a 4m-beacon in the KP31 area.

**OX-OX:** The first ever OX to OX QSO on 4m took place on July 30th 2004 between OX3LX and OX3RA as a local QSO in FM.

**I: I0JX** had a 4m beacon running for a few hours by mistake. The beacon was heard in the U.K...

He still tries to get a 4m licence but says the military does not agree at the moment.

**Scandinavian Activity Contest - 4m section**

From January 1st 2005 the Scandinavian Activity Contest will take place on 4m every third Thursday from 19.00 to 23.00 ME(S)Z.

**New time-duplex repeater in central England**

An unattended 'store and forward' single-frequency voice relay was switched on at 1330UTC on Saturday 16 October, operating on 70.4375MHz using the callsign MB7FM, with a maximum 'store' time of 120 seconds. Locator IO91PS, with 10dBW ERP from a dipole antenna at 32 metres above ground.

**Voice Relay also in Ireland**

Another of voice relay (see MB7FM) is qrv on 70.350 MHz in FM from southern Ireland (40km north west of Cork) IO52) with a vertical. The maximum lenght of recording is 45 seconds.

**New beacon GB3CFG**

A new 4m beacon was supposed to be switched on in Nov/Dec from Northern Ireland. Call: GB3CFG, QRG: 70.027 MHz, Loc.: IO74CR. Antenna: 2 x 3 ele with QTF 45 and 135 deg. Pwr: 20 W.

**ZB2/G0JJL Expedition June 2005**

G0JJL plans to be in Gibraltar in June 2005 for about 10 days and intends to operate specifically on 4m ssb/cw also 4m/6m crossband with a decent aerial setup and 100W on 4m.

**ZB3B qrv 4m FM**

Ronald ZB3B (IM76HE), is qrv now on 4m with a FM only rig and a vertical.

**G4ASR, IO81MX, reports:**

9 November: 1450-2100utc Aurora:

1451 GB3MCB 53A heard IO70 040deg

1452 GB3ANG 54A heard IO86 010deg

1458 70.100MHz GM4BYF 55A 53A IO85JU

1502 70.100MHz G3JYP 53A 55A IO84SN

1538 70.201MHz GD0TEP 59A 57A IO74SD

1542 70.191MHz EI3IO 55A 55A IO63WF

1547 70.201MHz G3NAQ 55A 57A IO91HL

2000 70.100MHz OZ3ZW 41A heard JO54RS

Also heard the stations of G3UKV (IO82) and G4FUF (JO01). Been looking for OZ stations throughout the opening. OZ2LD was worked by G3JYP at 1710utc (whilst I was having dinner!) OZ3ZW popped up at 2000utc around the same time as Au-Es on 50MHz.

10 November: Aurora

Open before 0800utc through to 0900UTC.

Re-opened 1300-1415utc.

0815 GB3ANG 57A hrd IO86MN 030deg

0835 GB3MCB 53A hrd IO70 045deg

1352 GD0TEP 59A hrd IO74SD 045deg 70.100

1357 OZ3ZW 52A hrd JO54RS 040deg 70.105

The auroral opening faded out in IO81MX around 1415utc, followed later by a long Sporadic-E opening to Slovenia from 1700-1830utc.

1705 S51DI 59 59 JN76VL 70.450 FM 1485km

1740 S51DI 59 hrd JN76VL 20.205 SSB

S51DI was heard working many G-stations on 70.450MHz FM.

11 November: 0950-100utc

Another Sporadic-E opening on 70MHz although there were no DX stations active! 50MHz was open to I, S5, T9, YO, 9A from IO81MX at the same time.

0956 S55ZMB 539 hrd JN76VK 70.029+

Rig.: 4CX250B and 6 Ele. Yagi.

# Sporadic E 144 MHz - Reports

**All reports 59 59 unless otherwise notified.**

## August 11th, 2004

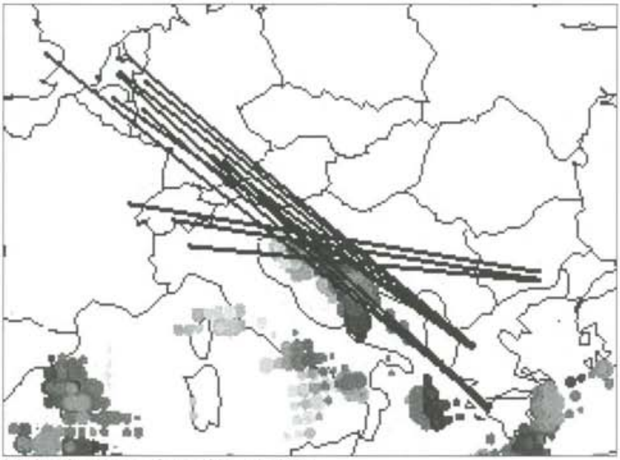
**DK2CF, JO41CG, wkd:**
1127-1135 UTC
OH1AYQ KP12JB 1475 km
OH8NXE KP25SB 1815 km
LA8KV JP52QQ 1280 km

(Ed: Quite amazing that this opening was not detected by other stations as activity was quite high due to the Perseid shower. Anyway I guess that the QSO with at least LA8KV was via a long MS burst. DL8HCZ)

**DF8KK , JO30nv, wkd:**
1703 SV3GKE KM08VF 1818km
1715 SV2DCD KN00NF 1604km

**DH4FAJ, JN49ex:**
On 10th of November I listened with ic821 on 144.070 on Aurora signals at 17.00 UTC. Then I turned on the FT857d on 144.300 to listen for some Au signals in SSB. 17:20 some signal on 144.300 very loud. I did not belief to hear SV2DCD with 59+. 2 calls and the QSO was complete! Very surprised about Es in November!
1720 SV2DCD KN00NF 1471km

**DL1GGT, JN58ao, wkd:**
1707 SV3GKE KM08VF
1719 SV2DCD KN00NF



**Lightning map from November 10th 2004** – strong activity over the Adriatic See all day and quite in the center of the path of the Sporadic-E. Just coincidence? Or a trigger together with the simultaneous strong disturbance of the earth`s magnetic field?

they have been here 59 for half an hour with deep QSB. Vy nice ES in November.

**DL8EBW, JO31nf, wkd:**
1715 SV2DCD KN00 57 58 1630
1722 SV3GKE KM08 55 59 1845

**G4FUF JO01, wkd:**
1720 SV2DCD KN00NF

**HB9SJV, JN36bk, wkd:**
1714 LZ1ZP KN22id
Rig : 100W + 11 ele 1000m asl

**IW2NOR, JN45on, wkd:**
1713 LZ1ZP 57 59 KN22id 1297
1715 LZ1GC 58 59 KN21 1400

## November 10th, 2004

**DG1KJG, JO30, wkd:**
1713 SV2DCD KN00NF

**DG9YIH, JO32, wkd:**
1716 SV3GKE KM08

**DF6NA, JN49xs, wkd:**
1715 SV3GKE KM08vf

Rig: Kenwood TS2000 and "enough power", 2X17ele

**I8MPO, JN70fp, hrd:**
1713 hrd DJ5BV calling somebody on 144.300 via Es for less than one minute.

**LZ1ZP, KN22id, wkd:**
I have never worked so late Es on 144Mhz! Everything started here around 15.45 when I heard first signals on 50MHz. Than very fast Es on 6 covered a huge area from 4X to G - some stations were 59 +60 dB and some short distance contacts were made with 9A (abt 700 km). At 16.53 I worked HB9SJV and discused with him (with a joke..) abt the possibility to work on 144 MHz. Around 16.55 I checked BC band - what a surprise, band was full with Italian stations up to 108 MHz even more it was a mixture of sounds (one upon another) like during fast rising MUF!! Than...
1710 IW2NOR Hrd
1713 HB9SJV 59/59 JN36
1714 IW2NOR 59/57 JN45
1724 F1DLT 59/52 JN27
That's it. Nice job at the start of the winter! Rig 100W 11ele

**PA2CHR, JO22xa, wkd:**
1714 SV2DCD KN00NF 55 59
1718 SV3GKE KM08VF 55 59
Very unusual ES in November.

**PA3DZL, JO21, wkd:**
1730 SV2DCD KN00NF

**PA3FPQ, JO22xe**
1721 SV3GKE KM08VF.
Heard SV2DCD.

**PA5DD, JO22IC, wkd:**
1718 SV2DCD KN00NF 1820km

**SV2DCD, KN00NF, wkd**
1710-1735: DJ7PW, DL5PN, DJ5BV, DL3IAS, PA2CHR, DL8EBW, DF8KK, PA3CNX, PA0JMV, DH4FAJ, PA5DD, DL1GGT, PA3DZL, DL4SDM, DL7QY, ON7BJ, DL0UL, DL5MCG and DG4F?I ??
Rig: 300w + 2 x 11 ele.

# Meteor-Scatter

**144 MHz Reports, Editor: DL8LAQ**

### DJ8ES (JO43SX) wkd in FSK441

2004-08-01
1020 SM3RPQ JP74BT 27 27 #236
2004-08-06
1725 RU1AC KP5ØEJ 27 27
1750 LY2SA KO14LL 27 27
1920 RW3PF KO93CD 27 27 #237
2004-08-07
0555 HA6VV/P JN97WH 27 27
0715 EA3DXU JN11CM 38 27
0737 EA2AGZ IN91DV 37 27 #238
0905 EI5FK IO51RT 27 27 #239
0948 ES6LBN KO37AW 27 27 #240
1025 ES8A KO28FD 27 27
1045 RX1AS KO59FX 37 27 #241
2004-08-08
1505 OH9O KP18RB 37 27 #242
2004-08-10
0535 RW3WR KO71IM 27 27 #243
1900 RZ3AF KO85BP 37 27 #244
1935 RV3AO KO87VG 27 26 #245
2258 IWØUEI JN4ØGR 27 26
2355 RA3WDK KO81BR 27 26 #246
2004-08-11
0100 OH9O KP28AB 27 27 #247
2030 LZ1KWT KN32AS 27 27 #248
2120 UA3PC KO84PC 27 27 #249
2215 YU7AA JN95KU 27 27 #250
2245 RA3QTT LOØ1GQ 27 27 #251 2080km
2327 EA6/DL7AJA JMØ8pw 38 38 #252
2004-08-12
0720 RU1AA KO48VR 27 27 #253
0725 SM2CKR KPØ3DQ 59 39 #254 SSB-QSO
0810 YL/DJ4UF KO17NH 27 28 #255
0850 IT9BLB JM68QE 59 37 #256 SSB-QSO
0917 IW2HAJ JN45NO 37 39 SSB-QSO
1140 SM2ILF KPØ4MM 27 38 #257
1222 SM2CEW/P KPØ6SA 2728 #258
73, Wolfgang.

### DL8EBW (JO31NF) wkd in FSK441:

2004-08-20
0430 0445 LA4XGA JP33 26 27 3 1 0,2 C-RFS
2004-08-26
0355 0410 F/DF2ZC IN77 26 26 3 2 0,5 C
1717 1732 G0KZG/MM JP10 26 27 5 - 0,4 CR#
2004-08-27
0356 0405 LA4XGA JP33 27 27 3 - 0,2 C-RFS
2004-08-28
0525 0541 G0KZG/MM JO09 2726 6 4 0,5 CR#
2004-08-29
0501 0517 G0KZG/MM JO19 2726 5 2 0,6 CR#
1756 1827 G0KZG/MM JO18 3826 6 2 8,0 NC-R
2004-08-30
0510 0532 G0KZG/MM JO08 2626 10 4 1,1 CR
2004-09-03
0429 0500 LA4XGA JP33 26 26 4 2 0,1 C-RFS
2004-09-10
0429 0452 LA4XGA JP33 26 26 6 2 0,4 C-RFS
2004-09-24
0300 0338 9A/OK1YA JN82 26 26 4 2 0,4 C
0359 0419 LA4XGA JP33 26 27 3 0 0,4 C-RFS
2004-10-15
0428 0448 LA4XGA JP33 26 27 4 1 0,2 C-RFS
2004-10-20
0458 0515 I8/DF2ZC JM89 27 27 3 2 0,3 C
2004-10-21
0431 0443 S51AT JN75 27 27 2 1 0,2 NC-R
0500 0515 IK2FIL JN45 26 - 1 1 0,6 NC-SC
2004-10-29
0427 0445 LA4XGA JP33 27 27 8 1 0,6 C-RFS

Remarks: # = new SQUARE for me in a complete QSO; SC = Sidescatter-QSO (my antenna beaming to radiant); RFS = regular friday morning ms-sked each week to LA4XGA, 1300km; R = random QSO. 73, Guy.

### I4YNO (JN54KP) wkd in FSK441:

Only the most interesting QSOs listed!
2004-06-10
1828 OH9O/0 KO09CX 27 26 tnx new # 392
2004-06-16
0520 LY2BUU KO15XH 37 27 tnx new # 393
2004-06-30
0736 ES0Q KO17AV 27 26
2004-08-21
2305 SV2JL KN10IO 26 27 tnx new # 395
2004-08-22
1205 LA2AB JO59FV 26 27

I think that WSJT brought a new wave of enthusiasm among MS-fans, but not only. Now I am looking forward to try JT65. 73 de Alex

### I8/DF2ZC wkd FSK-MS on 23.10.2004 from JM87BX

| | | | | |
|---|---|---|---|---|
| 0505-0515 EA3DXU | 27/-- | JN11CM | NC | 1254 km |
| 0515-0530 PA0JMV | R27/27 | JO21PM | C | 1728 km |
| 0530-0545 EA3DXU | 27/-- | JN11CM | NC | 1254 km |
| 0545-0612 DH7FB | 27/R26 | JO62SM | C | 1628 km |
| 0612-0614 DL7FF | R27/26 | JO62TJ | C | 1614 km |
| 0617-0619 DF7KF | R27/27 | JO30GU | C | 1618 km |
| 0620-0629 S51MQ | R27/27 | JN75NT | C | 874 km |
| 0629-0640 ON4IQ | R27/26 | JO20BU | NC | 1716 km |
| 0640-0642 DL0UL | R27/27 | JN48XK | C | 1264 km |
| 0642-0650 DJ7OF | R37/27 | JO51HQ | NC | 1583 km |
| 0650-0653 DL1GGT | R27/27 | JN58AO | C | 1278 km |
| 0651-0700 ON4IQ | R27/26 | JO20BU | C | 1716 km |
| 0703-0711 OE3FVU | R27/26 | JN78VE | C | 1134 km |
| 0711-0717 DK3WG | R28/27 | JO72GI | C | 1602 km |
| 0717-0722 ON4GG | R26/26 | JO20AR | C | 1708 km |
| 0725-0735 PA2CHR | R27/26 | JO22XA | C | 1750 km |
| 0735-0741 I4YNO | R26/26 | JN54KP | C | 861 km |
| 0755-0802 IV3GTH | R26/26 | JN65ST | C | 896 km |
| 0802-0828 DL4DWA | R27/27 | JO61QH | C | 1497 km |
| 0826-0835 F5JNX | 27/R26 | JN37PV | C | 1315 km |

0835-0846 EA3DXU R27/27 JN11CM C 1254 km
0846-0902 DK3EE R27/27 JO41GV C 1656 km
0900-0930 OK1FFD R27/27 JO60CF C 1396 km
0942-0956 DL1RNW R26/26 JO62GH C 1617 km
1012-1100 DF8IK R26/26 JO30JT C 1605 km
1042-1100 IW4EHZ R26/27 JN54 C
hrd IK2DDR 1b, IK0BZY 1b

**LA0BY in JO59FW wkd:**

2004-01-02
2054 2112 HA2004EU JN96JO 27 27 FSK random
2338 0008 S53J JN75EV 27 26 FSK random
2004-01-03
1208 1218 DJ9CZ JO31BC 27 27 FSK random
1508 1532 EI5FK IO51RT 27 26 FSK
1542 1558 SP9LCV JO90KF 27 27 FSK random
1810 1850 RX1AS KO59FX 28 27 FSK random
2246 2304 RK1B/1 KO69DI 26 27 FSK random
2308 2313 RU1AA KP40XD 27 28 FSK random
2004-01-04
1020 1030 ON4KHG JO10XO 28 27 FSK random
1050 1058 GW7SMV IO81LN 27 26 FSK
1216 1233 GW3LEW IO71PS 27 27 FSK
1420 1452 G0RRJ IO91FE 26 26 FSK random
2004-01-06
2210 2235 OH9O KP17SV 26 26 FSK
2004-06-05
1122 1134 OH90 KP38RK 27 26 FSK
2004-06-07
2220 2310 TF/SM6CMU IP13AU 2627 FSK random
2004-06-08
0605 0620 OH8K KP35LC 27 27 FSK random
2004-06-11
1338 1346 OH8K KP45 27 26 FSK random
2004-06-12
1114 1131 OM3KDX KN19DB 27 27 FSK
2004-06-13
0605 0617 HA6NQ JN98WA 27 26 FSK
2004-06-23
0830 1000 UT2HI KN69QC 27 27 CW 1828km
2004-06-29
0444 0512 OH8K KP51BW 27 26 FSK random
2004-06-30
1540 1558 OH8K KP52BS 27 26 FSK random
2004-07-20
0520 0602 OH9NDD KP26UM 27 27 FSK random
2004-07-31
0710 0732 RU3ACE/3 KO74FL 27 27 FSK random
2135 2208 UX5UL KO50FL 27 27 FSK
2004-08-08
1514 1531 OH9O KP18RB 27 27 FSK random
2004-08-10
1220 1242 OH7HXH KP53HG 27 27 FSK random
2004-08-11
0735 0758 OH9O KP28AB 27 27 FSK random
1108 G7RAU IO90IR 59 59 SSB random
2004-08-12
1500 1524 RA3WDK KO81BR 27 26 FSK 1828km
1915 1945 RU1AC KP50EJ 38 38 FSK random
2105 2125 RK3WWF KO72QI 27 27 FSK
2133 2150 RU1AA KP48VR 28 27 FSK random
2200 2300 LZ1BB/p KN33QC 27 27 FSK 2193km
2320 2346 UR5TW KN39MK 27 27 FSK random
2004-08-13
0715 0736 OH9O KP16WN 27 27 FSK random
0744 0806 OK2ZW JN89HI 48 27 FSK random
Heard in FSK on 12. Aug.: RA3QTT, RW3PF, RA3AQ, RV3AO, RW3WR, RA3LW, IW5ACZ.
Note my QTH is not ideal towards East. I was surprised to hear/work so many RA3 stn. The contact with LZ1BB was possible only thanks to WSJT, weak and short reflections over a large distance. RIG: IC-821H, PA 2 x MRF245, 180 W, 9-ele-yagi at 100 m asl.

**LA0BY in JO59IX wkd via MS on 144 MHz:**

(Perseids assumed peak)
2004-08-11
2300 2314 RX3QFM KO91FM 39 55 SSB 1954km
2340 RZ3QD KO91OO 39 59 SSB random 1989
2004-08-12
0309 DL5MAE JN58VF 49 49 SSB random
0525 0528 IK1SPR JN34TQ 37 38 SSB random
0553 0555 DF1CF JN57FP 38 38 SSB random
0718 DL0GER/p JN49CC 39 39 SSB random
0724 0730 F6FHP IN94TR 37 37 SSB random 1850
0829 F6DRO JN03TJ 37 27 SSB random 1943
0843 0847 F9OE JN18BP 39 57 SSB random
0849 0851 F8DBF IN78RI 37 37 SSB random
0959 F4DXX IN97LH 27 27 SSB random
1016 EI3GE IO63XD 37 37 SSB random
1033 G4ASR IO81MX 28 28 SSB random
RIG: IC-821H, PA 2 x MRF245, 180 W, 2 x 9-ele-yagi at 500 m asl. Note: First time since long not on expedition this year. What a change! When was the peak of the Perseids? Not easy to tell... The advent of WSJT has obviously not only killed HSCW, but seems to have reduced also SSB activity now. That is a pity because the long bursts are all wasted for WSJT. On the other hand there is very good activity on FSK-MS now, also from RA3 or other parts of Eastern Europe.

**LA0BY in JO59BA wkd via MS on 144 MHz:**

2004-08-04 07550815 OM7CM JN98NR 28 27 FSK
2004-08-04 08150825 HA3UU JN96JO 27 39 FSK
2004-08-04 08420902 YU7EW KN05HP 27 27 FSK
2004-08-04 09020910 HA6ZB KN07BV 37 27 FSK
2004-08-04 09381000 EA3AXV JN01TJ 37 27 FSK
2047km. All QSOs random! Rig: IC-281H, PA 2 x 4CX250B, 500W, 2 x 9-ele-yagi at 50 m asl. 73, Stefan.

**OK1DFC (JN79GW) wkd in FSK441:**

2004-11-07
2202 ES1RF KO29IF 27 26
2004-11-08
1914 OH6KTL KP02OP 26 27
1915 OH6QU KP03SD 26 27 #384
2022 RU3GX KO92SO 26 26 #385
2036 RW3WR KO71IM 37 26
2103 RW3PF KO93CD 26 27

| | | | | | |
|---|---|---|---|---|---|
| 2211 | OH4GGW | KP31PQ | 26 | 26 | |
| 2229 | SM3PXO | JP73GI | 26 | 26 | |
| 2255 | YL3GDF | KO26XM | 27 | 27 | |
| 2315 | OH4HXK | KP21UM | 26 | 27 | 73, Zdeno. |

**RA3IS (KO67HF) wkd in FSK441 on 144 MHz:**

| | | | | | |
|---|---|---|---|---|---|
| 2004-08-12 | | | | | |
| 1700 | OK2ZW | JN89HI | 26 | 26 | NC |
| 1800 | SM5FMX | | 26 | 26 | |
| 1843 | DJ9YE | JO43HV | 27 | 27 | 22dB |
| 2004 | DL8EBW | JO31NF | 27 | 26 | 19dB |
| 2027 | PA2CHR | JO21WX | 27 | 27 | 17dB |
| 2045 | DK1KO | JO53CT | 27 | 27 | 14dB |
| 2130 | OZ1LPR | JO44UW | 26 | 27 | 6dB |
| 2133 | DF2ZC | JO30RN | 27 | 26 | 21dB |
| 2200 | DF7KF | JO31GU | 26 | 27 | NC |
| 2200 | PA1T | | 27 | 27 | 21dB |
| 2230 | OZ1IEP | JO55XU | 26 | 26 | NC |
| 2255 | PA3BIY | JO22EB | 26 | 26 | 20dB |
| 2004-08-13 | | | | | |
| 0004 | PA2DW | | 26 | 27 | NC |
| 0640 | OZ1IEP | JO55XU | 27 | 26 | 21dB |
| 0820 | SP6GZZ | JO81HI | 27 | 27 | |
| 0820 | DL6BF | JO32QI | 27 | 26 | |
| 0900 | DG0KW | JO64MH | 27 | 27 | at 0855z |
| 1800 | HB9FAP | JN46EW | 27 | 27 | 18dB 8s |
| 1900 | DL9MS | JO54WC | 26 | 26 | NC |
| 1955 | DJ9FG | JO52UD | 27 | 27 | 22dB |
| 2045 | DC9YC | JO31PI | 27 | 26 | |
| 2100 | DL9MS | JO54WC | 27 | 26 | 17dB |
| 2130 | DF7KF | JO31GU | 27 | 27 | NC |
| 2141 | PA0JMV | JO21PM | 27 | 27 | |
| 2200 | DJ9MG | JO52TC | 27 | 27 | 22dB |
| 2200 | DL7FF | JO62TJ | 27 | 27 | 20 sec burst |
| 2210 | DK0OG | JN68GI | 27 | 27 | NC |
| 2315 | OK1DFC | JO60RN | 27 | 26 | 21dB |
| 2004-08-14 | | | | | |
| 0020 | OK1MZM | JN69PR | 27 | 27 | 18dB |
| 0106 | DG6JF/P | JO31MM | 27 | 27 | |
| 0130 | PA3DOL | JO22MT | 27 | 26 | |
| 0142 | PA3COB | JO32MF | 27 | 27 | 20dB |
| 0800 | S57TW | JN75EX | 27 | 27 | 20dB |
| 0813 | DL2ARD | JO60AR | 27 | 26 | |
| 0850 | HA3UU | JN96JO | 27 | 29 | |
| 2040 | YU1EV | KN04CN | 27 | 27 | 14dB |
| 2150 | OE6IWG | JN77PK | 27 | 27 | 23dB |
| 2004-08-15 | | | | | |
| 0530 | S53J | JN75EV | 27 | 27 | |
| 0630 | HA8CE | KN06EN | 27 | 27 | |
| 0700 | HA6NQ | JN98 | 27 | 26 | |
| 0700 | PA5KM | | 27 | 26 | |
| 0710 | DF7KF | JO31GU | 27 | 26 | |
| 0740 | DL9MS | JO54WC | 27 | 27 | NC |

**RA3LW (KO54MQ) wkd in FSK441:**

| | | | | | | |
|---|---|---|---|---|---|---|
| 2004-07-27 | | | | | | |
| 2100 | 2115 | OK1DCF | JO80 | 26 | 27 | C |
| 2120 | 2130 | HA5OV | JN79 | 27 | 27 | C |
| 2125 | 2145 | SP3VSC | JO92 | 29 | | NC |
| 2004-08-06 | | | | | | |
| 0200 | 0300 | PA0JMV | JO21 | 26 | 27 | C |
| 0300 | 0400 | DL2ARD | JO60 | 29 | 27 | C |
| 2250 | 2300 | YU1EV | KN04 | 29 | 27 | C R |
| 2325 | 2335 | S57TW | JN75 | 49 | 27 | C R |
| 2004-08-07 | | | | | | |
| 0010 | 0020 | DG6JF/P | JO33 | 27 | 27 | C R |
| 0105 | 0125 | SM7FMX | JO65 | 27 | | NC R |
| 2150 | 2200 | PA3FSA | JO23 | 27 | 27 | C R |
| 2201 | 2210 | HA6NQ | JN98 | 39 | 38 | C R |
| 2331 | 2346 | OZ1PIF | JO65 | 27 | 27 | C R |
| 2004-08-08 | | | | | | |
| 2100 | 2200 | PE1GNR | JO31 | | | NIL |
| 2111 | 2120 | DL9AN | JO62 | 49 | 27 | C R |
| 2122 | 2140 | OK1FFD | JO60 | 29 | 27 | C R |
| 2200 | 2300 | PE1AHX | JO21 | 27 | 26 | C |
| 2300 | 2400 | RZ4HF | LO43 | | | NIL |
| 2345 | 2400 | IZ4AIK | JN63 | 26 | 26 | C R |
| 2004-08-09 | | | | | | |
| 0000 | 0030 | SP6GWB | JO80 | 27 | 27 | C |
| 0033 | 0035 | HA6ZB | KN07 | 29 | 27 | C R |
| 2000 | 2100 | RW9FT | LO89 | | | NIL |
| 2200 | 2300 | RZ4HF | LO43 | | | TRX is spolied |
| 2300 | 2400 | OH2HEJ | KP20 | | | TRX is spolied |
| 2004-08-10 | | | | | | |
| 2300 | 2400 | DL8EBW | JO31 | 27 | 26 | C |
| 2004-08-11 | | | | | | |
| 0000 | 0030 | OK2ZW | JN89 | 27 | 27 | C R |
| 0035 | 0040 | HA6ZB | KN07 | 27 | 37 | C R |
| 2100 | 2200 | ON4KHG | JO10 | | | NIL |
| 2212 | 2217 | DJ5HG | | 39 | 27 | C R |
| 2220 | 2229 | DJ9YE | J043 | 29 | 28 | C R |
| 2235 | 2300 | DJ7OF | JO51 | 27 | 27 | C? R |
| 2311 | 2324 | OE6IWG | JN77 | 29 | 28 | C R |
| 2004-08-12 | | | | | | |
| 0300 | 0400 | ON4KHG | JO10 | | | NO QRV, SRI |
| 2250 | 2256 | OZ2IEP | JO55 | 27 | 27 | C R |
| 2306 | 2314 | ON7EH | JO20 | 29 | 27 | C R |
| 2004-08-13 | | | | | | |
| 0053 | 0058 | RZ6BU | KN84 | 29 | 27 | C R |
| 2135 | 2204 | HB9FAP | JN47 | 27 | 27 | C R |
| 2250 | 2258 | DK0OG | JN68 | 29 | 27 | C R |
| 2345 | 2350 | S53J | JN75 | 29 | 27 | C R |
| 2004-08-15 | | | | | | |
| 2100 | 2120 | OK1MZM | JO | 26 | 26 | C |
| 2128 | 2136 | DF7KF | JO30 | 26 | 26 | C |
| 2200 | 2222 | OK1FFD | JO60 | 27 | 26 | C |
| 2216 | 2222 | HA6NY | JN98 | 27 | 26 | C R |
| 2004-08-16 | | | | | | |
| 0330 | 0405 | S51AT | JN75 | 26 | 27 | C |

73's! de Misha, RA3LW.

**YU7EW (KN05HP) wkd in FSK441:**

| | | | | | | |
|---|---|---|---|---|---|---|
| 2004-06-25 | 0638 | RA3XAL | KO74TR | 26 | 26 | #485SQ |
| 2004-07-17 | 0850 | RN6BN | KN95LC | 27 | 27 | |
| 2004-07-23 | 2151 | ES1RF | KO29IJ | 26 | 26 | |
| | 2218 | UA3ARC | KO85SO | 27 | 37 | |
| 2004-07-29 | 2157 | RW1AY/1 | KO68UK | 27 | 27 | #487SQ |

| | | | | | |
|---|---|---|---|---|---|
| 2004-07-31 | 1708 | RA3AQ/3 | KO74FL | 27 26 | |
| | 2033 | RX3QFM | KO91OO | 27 27 | |
| 2004-08-01 | 0747 | RZ3QD | KO91OO | 27 27 | |
| | 1922 | ES6RQ | KO28WA | 27 27 | |
| 2004-08-02 | 2234 | OH6KTL | KP02OJ | 27 27 | 1865km |
| | 2308 | UX5UL | KO50FL | 27 27 | #488SQ |
| 2004-08-03 | 1931 | RW3WR | KO71LM | 26 26 | |
| | 2106 | UA3ARC/6 | LN08VI | 27 26 | |
| | 2214 | IS0/IK0BZY | JM49UW | 2727 | |
| 2004-08-04 | 0844 | LA0BY | JO59FW | 27 27 | |
| | 2238 | PE1AHX | JO21OS | 27 27 | |
| 2004-08-05 | 2240 | F5NWK | IN97EJ | 27 27 | |
| 2004-08-07 | 0740 | ES6LBN | KO37AW | 27 27 | |
| | 0940 | DJ5HG | JO53IM | 27 26 | |
| | 2140 | RU1AA | KP40XD | 27 27 | |
| 2004-08-08 | 2250 | EW6GB | KO45CN | 27 27 | |
| 2004-08-10 | 2240 | RA3QTT | LO01GQ | 27 27 | |
| 2004-08-11 | 0946 | IS0GQX | JM49OH | 27 27 | |
| 2004-08-12 | 1108 | OH7HXH | KP53HG | 26 27 | 2061k #490 |
| | 2157 | ES5DO | KO27WX | 38 28 | |
| 2004-08-13 | 0753 | UA1ARX | KO48VR | 27 27 | |
| | 2240 | RV3AO | KO87VG | 27 27 | |
| 2004-08-14 | 0740 | RW3WR | KO71LM | 27 27 | |
| 2004-08-14 | 0956 | DL3YEL | JO41EV | 27 27 | |
| 2004-08-15 | 1950 | RU3ACE | KO95KG | 27 27 | |
| | 2047 | RK3FG | KO86HP | 27 27 | |
| 2004-08-17 | 0851 | DL7QY | JN59BD | 27 27 | |
| 2004-08-28 | 1223 | DJ9CZ | JO31BC | 27 27 | |
| 2004-08-31 | 0649 | G8VYK | JO01FO | 27 26 | |
| 2004-09-01 | 1801 | PA5KM | JO11WL | 27 27 | |
| 2004-09-02 | 0709 | DJ9CZ | JO31BC | 27 27 | |
| 2004-09-26 | 0809 | LA5KO | JO59FH | 27 27 | |
| | 1907 | PA0PVW | JO22VA | 27 27 | |
| | 1914 | PE2RMI | JO23MH | 27 27 | |
| | 2015 | PA3FSA | JO23RF | 27 26 | |
| | 2141 | DL/UT8AL | JO43HV | 27 27 | |
| 2004-09-27 | 1209 | DG9YIH | JO32QI | 27 27 | |
| | 1224 | PA3BIY | JO22EB | 27 27 | |
| | 1235 | DK4TG | JO31FF | 27 27 | |
| | 1248 | PA1GYS | JO22WW | 27 27 | |
| 2004-09-30 | 2105 | OZ8ZS | JO55RT | 27 27 | |
| | 2128 | DL4EBV | JO31HK | 27 27 | |
| 2004-10-01 | 0616 | G8VYK | JO01FN | 27 27 | |
| 2004-10-04 | 1856 | PE1AHX | JO21OS | 27 27 | |
| 2004-10-06 | 0930 | PA2DW | JO22GD | 27 27 | |
| | 0945 | F1EBK | JN18BW | 27 27 | |
| | 1112 | PD0ORT | JN23RE | 27 27 | |
| 2004-10-09 | 0802 | G0UWK | IO83VC | 27 26 | 1843km |
| | 0851 | DK3EE | JO41GV | 27 27 | |
| 2004-10-10 | 0551 | RA3DHK | KO95JH | 27 27 | |
| | 0707 | PA5KM | JO11WL | 27 27 | |
| 2004-10-14 | 0719 | F4CYZ | JN38SF | 27 26 | |
| 2004-10-17 | 0618 | DK8ZJ | JO54AG | 27 37 | |
| 2004-10-21 | 0620 | I8/DF2ZC | JM89BC | 26 26 | #491SQ |
| 2004-10-22 | 0615 | G8VYK | JO01FO | 27 27 | |
| | 0916 | PA1LA | JO32BM | 27 26 | |
| 2004-10-23 | 0718 | DK3EE | JO41GV | 27 27 | |
| | 0733 | DJ9MG | JO52TC | 27 27 | |
| | 2233 | IW4EHZ | JN54ML | 27 27 | |
| 2004-10-24 | 0532 | DK3EE | JO41GV | 27 27 | |
| | 0640 | ON4ARF | JO10MV | 27 27 | |
| 2004-10-25 | 1019 | DK9YE | JO43HV | 27 27 | |
| | 1912 | DK7BY | JO42KH | 27 27 | |

Tnx all for QSO. 73, Pista

## SM2CEW/P expedition to KP06SA on Aug. 12th 2004, all QSO's FSK441

| | | | | | |
|---|---|---|---|---|---|
| 0907 | RK3AF | KO75 | 37/27 | CR | |
| 0912 | RX1AS | KO59 | 37/27 | CR | |
| 0926 | ES6RQ | KO28 | 39/39 | CR | |
| 0930 | OK1DFC | JN79 | 37/27 | CR | |
| 0947 | SP2JYR | | 37/27 | CR | |
| 0951 | DK3BU | JO33AO | 39/27 | CR | |
| 0957 | RU1AC | KP50 | 39/27 | CR | |
| 1005 | OZ1LPR | JO44UW | 39/27 | CR | |
| 1028 | PA2CHR | JO22XA | 39/28 | CR | |
| 1035 | DF2ZC | JO30 | 39/27 | CR | |
| 1053 | SP3VSC | JO92DF | 39/27 | CR | |
| 1117 | OK2ZW | JN89 | 39/27 | CR | |
| 1137 | DF8IK | JO30 | 27/27 | CR | |
| 1145 | PA5DD | JO22IK | 27/36 | CR | |
| 1218 | DJ8ES | JO43 | 28/27 | CR | |
| 1239 | PA3BGM | JO33 | 39/27 | NC R | no RRR rcvd |
| 1255 | PA1GYS | JO22WL | 39/27 | CR | |

Station: IC211E + QQE06/40 PA abt 80W output

Ant: 2 x 7el hb yagis. Power from portable generator

Reflections were absolutely excellent during the short expedition to KP06. This time period must have been the peak of the shower at my location. I was using a GPRS connection to the internet for cluster access, and just announced my CQ FQ one time and from then on the frequency was full of reflections every receive period for hours. My GPRS connection was not very good in KP06 so I lost the cluster ever so often, but it was helpful when connected to be able to control the pileup at times via cluster spots. FSK441 is not brilliant when there is a pileup, and at shower peaks I rather prefer SSB. I listened on 144.200 but there was extremely low activity so I went back to FSK441. I had to QRT at 1300 because of some minor problems with the PA so I went back home to KP15CR for some 432 skeds. Unfortunately I only heard short reflections on 432 MHz and completed no QSO's. 73, Peter, SM2CEW

**SM2CEW/p in KP06SA**

# II0W: One weekend QRV from JN51XX

First of all, we would like to thank the Director of the "Natural Reserve of Macchiatonda" who has made possible this activity from this rare square.

We want to explain to all VHF fans that JN51 is a very difficult square to work from and to activate because the only piece of land in this grid is in this a natural reserve area located near Santa Marinella, about 45 km west of Rome.

The reserve is a square in front of Tirrenian Sea with a dimension of 2 x 4 km, but only 1 km close to the sea is located in JN51. We noted on our GPS, that the road (SS1 Aurelia) in front of the reserve is in JN52 square and the land around the reserve contains 2 Military Bases (maybe some land of them are in JN51). So you understand now that the only possibility to activate JN51 is to have a permit to enter in the Reserve, or a /MM activation.

The park's guards and the director told us that this would be the last activation maybe for the next 10 years, because amateur radio activity is disturbing the wildlife of the reserve (noise and gas from the power generator, antennas and poles that disturb bird's, etc..)

We report these words because we see that many VHF DX-expeditioners want to activate this rare grid. But now you can understand that the only good way to activate this locator in the future is via the sea (/MM).

In 2003 we activated this grid during the IARU 50 MHz contest and we had the luck to complete 720 qsos on 6m and 110 qsos on 2m with also a good Sporadic-E opening to EA7, CN and CT on 2m, but we made only 2 qsos on MS; So this year we thought to give more emphasis to 2m FSK441. Anyway we didn't find good MS conditions during our stay.

Our 2m rig was a 13 element yagi with 100 watt. We were qrv all weekend 19./20. June 2004 starting at 12:30 utc on Saturday till 22:00z and again from 04:50 utc till 14:00 utc on Sunday, calling almost all time on 144.375 MHz.

To our surprise we got very bad conditions especially on the evening to night and in the early morning. When we started on Saturday afternoon we found very good conditions with 5 stations calling us at the same time, but after 4 completed qsos in 1 hour conditions were going down; during saturday evening from 20 till 22 utc we had only 2 pings, and so in the sunday morning (we thought that something was broken), but again in the early sunday afternoon we heard many bursts from 2-3 stations calling us at the same time.

We think that we have done a good work but the final judgement is your opinion. Unfortunately we worked MS in a strange period (not in a good shower peak). We could only imagine what good thing could be done during Perseids or Quadrantids ... but at the moment it is only a dream!

Members of the II0W are: IW0BET John, IW0FFK Marco, IW0GIV Ray, IW0GPN Alex and IZ5EME Marco.
QSL via direct or bureau to IW0BET.

73 de Alex, IW0GPN

**II0W (JN51XX) wkd on 2m FSK-MS:**

| | | | | | | |
|---|---|---|---|---|---|---|
| 19.06.04 | 1321 | 144 | DK1KO | 27 | 26 | FSK441 |
| 19.06.04 | 1326 | 144 | G4FUF | 27 | 27 | FSK441 |
| 19.06.04 | 1350 | 144 | DF2ZC | 27 | 27 | FSK441 |
| 19.06.04 | 1416 | 144 | PA0V | 27 | 26 | FSK441 |
| 19.06.04 | 1526 | 144 | DF7KF | 27 | 27 | FSK441 |
| 19.06.04 | 1936 | 144 | DL6KR | 27 | 27 | FSK441 |
| 20.06.04 | 1124 | 144 | EA3DXU | 27 | 27 | FSK441 |
| 20.06.04 | 1223 | 144 | DK3BU | 27 | 26 | FSK441 |
| 20.06.04 | 1233 | 144 | PA1GYS | 27 | 27 | FSK441 |
| 20.06.04 | 1359 | 144 | PA0JMV | 27 | 27 | FSK441 |

Hrd: PE1AHX, DG6JF/P, DL5GAC, PA3DOL, PA0O, DL8EBW, DF8IK, DC9YC, DL4DWA and RK2FWA.

**The II0W team**


**II0W antenna farm in JN51XX**


**IW0GPN operating II0W**

# PA1TK/MM
# 2m - Maritme Mobile - Expedition to JO12MI – September 2004

After very nice result back in 1996 as PA3FPS/mm with some 100 watts again it was time to plan for the IARU VHF contest! The only problem was the weather. On August 31 there were still high waves up to 350 cm, not nice for going MM for contesting! Finally there came a go-ahead from the owner of the the ship the MV Welsinge. At 10.00 a.m. on Saturday, Sept. 4th 2004, we left Ijmuiden, during the trip to JO12MI there was time enough to install the equipment and antennas.

Promptly at 14.00 I was qrv without the expected big pile-up, but during the first hour 72 qso's were made, quite nice. Lots of stations did work a new square, however due to heavy qrm from UK coastal stations I missed myself two stations from OH and could not get their calls! Frustrating!

Results: In 18 hours 630 QSOs, best DX: SK6QW JO68WR 982km.

**PA1TK/MM Antenna System**

Working conditions: Yeasu FT 847 with GS35B amplifier into 9 elements F9FTyagi and 2 times TashK antennas (omnirirectional modified Malteserkreuz).

**Best qso's on 2m above 700km:**
20040904; 1533; SM7WT; JO65QQ; 770km
20040904; 1607; LA4YGA; JO48AE; 722 km
20040904; 1704; OE9MON/9; JN47VN; 719 km
20040904; 1852; DK1KCF/P; JN58QH; 743 km
20040904; 1937; LA6VBA; JO48MQ; 799 km
20040904; 2001; LA0BY; JO59KC; 896 km
20040904; 2025; SM6V; JO57WQ; 817 km
20040904; 2110; OZ2M; JO65FR; 720 km
20040905; 0458; SM7/DL3JIN/P; JO75BJ; 801 km
20040905; 0510; SM6MPA; JO67AT; 834 km
20040905; 0820; SM6ONH; JO68MN; 934 km
20040905; 0924; SK6QW; JO68WR 982 km
20040905; 0934; SM6MD; JO68VB; 930 km
20040905; 0945; DF0YY; JO62GD; 647 km
20040905; 1231; LA6MV; JO59EJ; 906 km

Vy 73 de Theo, PA1TK/MM, (ex PE1ALA)

**PA1TK/MM on MV Helsinge in Sept. 2004**

**The /MM shack in JO12**

# TF/G4ODA + GM4ODA/p – 2004 Report

G4ODA, Keith, writes about his 2004 activity from Iceland and Foula Island (IP80):

Well there is really not a lot to say. Not really a DXpedition – just a holiday with radio as a side show. Main object was to drive around Iceland to take some photos, do some walking and look at the sites. But each night tried to camp somewhere different with reasonable take off in case of any E's – also monitored 50 MHz when driving just in case.

In TF the main licence permits 1 KW on HF, 500 W on 2m and 70cm but only 100 W on 50 MHz (and no 70 MHz).

I did take TS2000 + 3CX800 PA and 12 El. Beal for 144 MHz MS but it was often not possible to run generator on campsite and MS conditions were poor so only 3 QSOs this year.

On 50 MHz I just had an IC706 as mobile rig and vertical. I could carry a 3 element beam pre-built on roof rack and be qrv with that in 2 or 3 minutes if the band opened – or extend it to 5 el. lif needed.

Not as many openings this year as last but 1 or 2 quite good ones. So tried to give as many squares away as I could.

Foule (IP80) was a different matter. It is served by a very small boat – my land rover is to heavy to be lifted onto it. So here I took smaller hand luggage. – K2, transverters for 6, 4 + 2, small 3CX800 to cover all 3 bands and light-weigth yagis.

Also rented a cottage so no tent taken. But the cottage was very poor for VHF, ground rose quickly to south and east. Did manage to have agood look around the island – small area but steep hills – and I certainly plan to go back again, better organized and from a better take off.

### 6m-Logbook: TF/G4ODA - 2004

**IP14MA June 11th** 1027-1150 19 x G, 2 x ON

**HP85TN June 14th** 1853-1920 11 x G, 2 x GM, 3 X GW, 2 x ON, 2 x EI, 1 x F

**HP75VN June 15th** 1749-1856 43 x G, 11 x PA, 3 x ON, 2 x EI, 8 x GW, 2 x GM, 9 x F, 4 x I, 2 x EH, 7 x DL (DG5YIL, DK2EH?, DF8XR, DL7QY, DJ6XV, DF9OX, DC9YC), 1 x OE, 1 x OK, 3 x 9A;

**IP16MD, June 19th** 0925-1143: 214 QSOs with: F, G, GM, ON, GW, PA, 1 x LX, EI, 1 x EH, DL (DL1EJA, DB6LJ, DJ9KG, DJ6MB);

**IP26AM, June 19th** 1610-1842: 71 QSOs with: G, I, EI, GM, GW, F, ON, PA, DL (DJ6MB, DL9GS, DL8YHR, DD3DJ);

**IP15UP, June 22nd** 0930-1035: 5 x GM, 3 x OZ, 1 x OH (OH2TP), 1 x PA, 2 x G;

**IP14UX, June 22nd** 1435: LA1NG JP66.

**IP35ED, June 22nd** 2120-2129 7 x SM0 + SM5 from JO89/99 and June 23rd 0927: OH1MLZ KP10;

### 6m-Logbook: GM4ODA/p, IP80XD:

June 27th 1006-1022: EH8FC IL28, EH1YO IN73, EH4TK IN70 1327-1432: 7 x S5, 3 x I, 1 x OE, 4 x OK, 1 x DL (DL3LFA), 1 x YU, T77EB, 1840-1845 1 x EH1, 1 x I2, 2140-2145 3 x F, 1 x I5; June 28th 1704-2045: 46 QSOs with F, I, CN8TW IM63, EH7, EH1, PA, G, EI;

June 29th 1807-1833: 11 x SP, OH7PI, 9A2SB, YU1EU

June 30th 1610-1634: F5LRL, IK1ZOF, ON4KST, OH8HTG
2200-2340 via MS: G1ZJP

July 1st 1617-1747: 3 x EH, 3 x I, 1 x HB9, 6 x F, 2 x G;

### 2m MS Log:

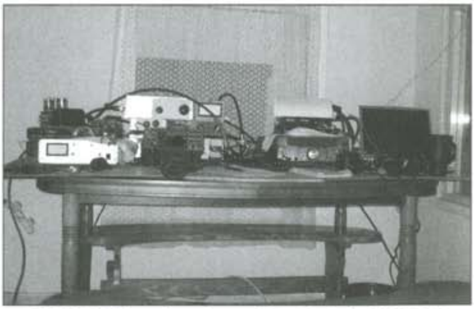
### TF/G4ODA, HP84GT, wkd on June 13th:

| | | | | |
|---|---|---|---|---|
| 1305 | G1ZJP | R26 | R26 | JO01 |
| 1625 | EI5FK | R26 | R26 | IO51 |

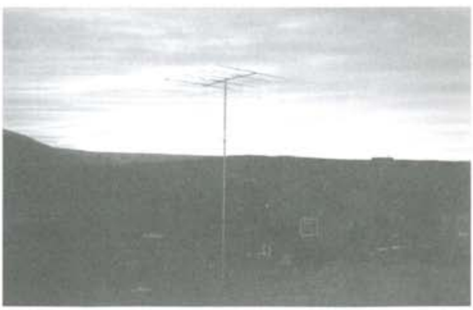
### TF/G4ODA, IP26AM, wkd on June 19th:

| | | | | | |
|---|---|---|---|---|---|
| 2230 | EI5FK | R26 | 26 | IO51 | |
| 2320 | DJ9YE | R27 | 26 | JO43 | NC |
| | DG6JF/p | - | 26 | hrd | |

Ferry to Foula Isl., IP80



GM4ODA/p shack on Foula Isl., IP80XD



4m/6m Yagi on Foula Isl.

# G0KZG/MM Activity Report 2004

Andy Adams, G0KZG, was qrv again maritime mobile from the CEFAS ENDEAVOUR on 2m and 6m during summer 2004 and made about 850 QSOs during two cruises from many wet squares around the U.K. Here his QSO report for 2004. All QSOs in 2m unless otherwise notified.

**1st cruise:**

May 31st/June 1st: 10 Tropo QSOs with G from IO94JV and IO95IA.

June 4th: 5 Tropo QSOs with G/M from IO94MQ.

June 5th: 5 Tropo QSOs with PA/ON from JO03TN + UN:

June 6th: 3 Tropo QSOs with PA from JO02VW.

June 6th: 79 Tropo QSOs with G, DL, PA, F, ON, GW, GI6ATZ IO74 from **JO12AU**.
2100-2200 FSK MS: I2FAK 26 27 NC due linear fault

June 7th: 2 Tropo QSOs with PA from JO11BW.
June 7th: 43 Tropo QSOs with G, PA, DL, ON, GW, EI5FK IO51 from JO12DA

June 8th: 1 Tropo QSO with PA from JO01UU.

June 10th: 2 Tropo QSOs with GW + F from JO00LU.

June 14th: 5 Tropo QSOs with G, GW from IO70VH.

June 15th: 1952-2111z: 35 Tropo QSOs with G, GW, EI, F, ON4KHG (JO10), F6DKW (JN18), EA1DDU + EB1DHT (IN73) from **IO60XJ**.

June 16h: FSK-MS from **IO61VD**:

| | | | |
|---|---|---|---|
| 0250-0309 PA0C | 26 26 | 1500ms S5 | C |
| 0309-0357 PA2DW | 26 26 | 540ms S5 | C |
| 0357-0414 PE1HWO | 27 27 | 180ms S5 | C |
| 0440-0450 OZ1LPR | 27 27 | 440ms S5 | C |
| 0452-0512 DJ9YE | 27 27 | 200ms S5 | C |

June 22th to 29th: 3 Tropo QSOs from IO83, 73, 71 and 8 Es-QSOs on 6m with ES, I, CT, EH, SM on 6m from IO72, IO74 and IO83.

June 29h: FSK-MS from **IO60XF/XB**:

| | | | |
|---|---|---|---|
| 1835-1911 PA2DW | 26 26 | 1440ms S9 | C (XF) |
| 1912-1952 PE1HWO | 26 27 | 140ms S5 | C (XB) |

June 29th, 2006-2015z: 4 Tropo QSOs from **IN69XV**:
EI5FK, GW3LEW, G4LOH, **EA8BPX (IL18sk) 52 52, 2539km**

June 29th, 2022-2103z: 8 Tropo QSOs from **IN79AW/CV**:
F, G, GW, EI and **EA8BPX (IL18sk) 52 52, 2546km !**

July 3rd: 34 Tropo QSOs from **JO12BB** with DL, G, PA, ON, OZ, EI7M/p (IO62), 1 6m-QSO with PA.

July 4th: 4 Tropo QSOs from JO13AM with G/GW.

July 4th: 1750-1834: 45 **6m**-QSOs via Es and Tropo from **JO04VB** with: I, PA, DL, HB9, ON, 9A, EH, 7X, YU1, Z3

July 5th: 72 Tropo-QSOs from **JO15KH** with:
PA, GW, G, DL, ON, F.

July 6th: 51 Tropo QSOs from **JO04MN** with:
PA, DL, G, GW, F, ON

July 7th: 4 Tropo QSOs from **JO04EG** with:
DL, PA, OZ and via FSK-MS:

| | | | |
|---|---|---|---|
| 0405-0413 DL9AN | 27 27 | 500ms S5 | C |
| 0416-0448 IK0BZY | 27 26 | 1s S6 | C |
| 0528-0539 HA6NQ | 26 26 | 420ms S4 | C |

**2nd cruise:**

August 24th: FSK-MS from **IP90PG**:

| | | | |
|---|---|---|---|
| 1955-2023 PA3BIY | 26 27 | 200ms S4 | C |

August 25th: FSK-MS from **IP91KB**:

| | | | |
|---|---|---|---|
| 0503-0528 DF8IK | 27 27 | 300ms S4 | C |
| 0530-0545 OZ1IEP | 27 26 | 320ms S4 | C |
| 0545-0551 OZ1LPR | 27 27 | 580ms S5 | C |
| 0556-0606 ON7EH | 27 27 | 420ms S5 | C |
| 0609-0640 DL5MCG | 27 27 | | NC |

August 25th: FSK-MS from **JP01GG**:

| | | | |
|---|---|---|---|
| 1832-1856 OZ1IEP | 26 26 | 160ms S3 | C |
| 1857-1917 DH3YAK | 26 26 | 3s S3 | C |
| 1917-1927 DJ9YE | 26 27 | 280ms S3 | C |
| 1927-1936 PA5DD | 27 28 | 280ms S5 | C |
| 1954-2012 DL4DWA | 27 27 | 220mS S5 | C |

August 26th: FSK-MS from **JP01OF**:

| | | | |
|---|---|---|---|
| 0458-0502 DL8GP | 27 27 | 840ms S5 | C |
| 0505-0528 DF8IK | 27 27 | 260ms S5 | C |
| 0528-0539 PA3DZL | 26 27 | 220ms S3 | C |
| 0539-0553 PE1GNP | 26 26 | 140ms S3 | C |
| 0556-0611 ON7EH | 26 27 | 360ms S3 | C |

August 26th: FSK-MS from **JP10MD**:

| | | | |
|---|---|---|---|
| 1700-1713 DF7KF | 27 27 | 380ms S5 | C |
| 1714-1734 DL8EBW | 27 26 | 220ms S5 | C |
| 1829-1836 OZ1IEP JO55 | 55 55 | Tropo | |
| 1849-1902 DJ9YE | 27 27 | 160ms S5 | C |
| 1902-1927 DF8IK | 26 27 | 280ms S4 | C |
| 1911 OZ1LPR JO44 | 55 52 | Tropo | |
| 1928-1939 I2FAK | 27 27 | 580ms S5 | C |
| 1939-1945 DH3YAK | 26 26 | 340ms S6 | C |

August 27th: FSK-MS from **JP10MA/BG/BA**:

| | | | |
|---|---|---|---|
| 0502-0512 DL8GP | 27 27 | 460ms S6 | C |
| 0539-0550 G4FUF | 27 27 | 180ms S5 | C |
| 0550-0608 S53J | 27 27 | 220ms S5 | C |
| 0608-0630 S53VV | 27 26 | | NC |
| 1658-1712 DL8GP | 27 27 | 1200ms S6 | C |

August 27th: FSK-MS from **JP00JG**:
1715-1738 G4YTL 27 26 240ms S5 C
1800-1823 DF8IK 26 26 440ms S4 C
1823-1841 DL4DWA NC
1823-1914 DC9YC 26 26 280ms S4 C
1914-1933 DH3YAK 26 26 220ms S4 C
1934-1948 PA0JMV 26 27 280ms S5 C
1948-2008 DG6JF/p 26 27 380ms S4 C

August 28th: FSK-MS from **JO09HJ**:
0500-0507 PA5DD 26 27 700ms S4 C
0507-0525 G4YTL 27 26 260ms S5 C
0526-0538 DL8EBW 27 26 1500ms S5 C
0541-0554 DF8IK 26 26 280ms S4 C
0555-0559 S53J 26 26 240ms S4 C
0600-0611 DL8GP 27 27 260ms S5 C
0612-0623 S53VV 27 26 480ms S5 C
0624-0640 I2FAK 26 - NC

August 28th: FSK-MS from **JO09TH**:
1701-1717 DH3YAK 26 26 380ms S5 C
1717-1737 G4FUF 26 27 280ms S6 C
1737-1753 ON4IQ 27 27 640ms S6 C
1754-1807 DF7KF 27 27 320ms S5 C
1816-1855 DJ7OF 26 27 580ms S5 C

August 29th: FSK-MS from **JO19AG**:
0448-0500 PA0JMV 26 27 160ms S5 C
0500-0517 DL8EBW 26 27 400ms S5 C
0518-0537 PA2KW 26 27 220ms S4 C
0610-0616 ES6RQ 26 27 340ms S5 C

August 29th: FSK-MS from **JO18IG**:
1714-1745 I2FAK 27 27 280ms S4 C
1722-1953 Tropo: OZ1IEP JO55, LA4YGA JO48, OZ1LPR JO44, LA2PHA JO38, OZ1DLD JO45, PA3CEE/p JO33, PA1GYS JO22.
1940-1952 S53J 27 27 2s S5 C
2000-2010 DC9YC 27 27 380ms S5 C
2010-2030 HA6NY 27 27 NC

Aug. 30th FSK MS from **JO18IA**:
0506-0533 DL8EBW 26 26 1460ms S3 C

August 30th: **Aurora from IO99JG:**

| | | | |
|---|---|---|---|
| 1644 | DL9MS | JO54WG | 57A 57A |
| 1657 | PD0RFU | JO32 | 55A 55A |
| 1702 | MM0CEZ | IO75XU | 55A 55A |
| 1708 | GM4VVX | IO78TA | 57A 57A |
| 1714 | DC6BB | JO33UK | 55A 55A |
| 1718 | OZ1LPR | JO44UW | 57A 55A |
| 1723 | PA5DD | JO22IC | 57A 58A |
| 1727 | GW0GEI | IO73TG | 53A 55A |
| 1737 | DK7BY | JO33RQ | 55A 55A |
| 1745 | PA2DW | JO22 | 53A - NC |

August 31th: FSK-MS from **IO89WC**:
0458-0511 DJ9CZ 27 26 340ms S5 C
0511-0522 DL4DWA 27 27 420ms S5 C
0524-0549 I2FAK 26 26 280ms S4 C
0550-0601 DF8IK 27 27 3050ms S4 C
0605-0619 DK4TG 26 26 440ms S4 C
0620-0625 DJ7OF 27 27 440ms S4 C

August 31th: FSK-MS from **IO97IB**:
1719-1752 DG9YIH 26 26 120ms S4 C

Sept 1st: Tropo from **JO04DD**:
9 QSOs to G, GM, EI, GI

Sept 2nd: Tropo from **JO14JG**:
6 QSOs to G, EI, PA, OZ.

Sept. 2nd: Tropo from **JO04SC**:
78 QSOs to PA, DL, OZ, G, GW, ON, F6DKW JN18, and EI5FK IO51 (already from JO04SB).

Sept. 2nd: FSK-MS from **JO04SB**:
1927-1950 I2FAK 26 27 1400ms S7 C
1993-2007 F6DRO 26 27 440ms S5 C
2010-2019 ES6RQ 27 27 480ms S6 C

Sept. 8th: Tropo from **JO12AN**:
60 QSOs with G, PA, DL, ON, F, GW, GM, GI4SJK (IO64), EI2JD (IO63).

Sept. 9th: Tropo from **JO13DW**:
38 QSOs with G, PA, DL, LA, GM, OZ

Sept. 10th: Tropo from **JO13BS**:
4 QSOs with PA, DL, G.

Sept.10th: FSK-MS from **JO13BS**:
1710-1731 SP2IQS 27 27 380ms S5 C
1743-1755 ES6RQ 27 27 360ms S5 C
1758-1805 SP6GWB 27 27 660ms S6 C
1911-1951 S53VV 27 27 NC

Sept. 11th: FSK-MS from **JO13BT**:
0504-0548 OK2POI 26 - NC
0548-0616 S53VV 26 26 320ms S4 C
0616-0629 I2FAK 26 27 620ms S4 C

Sept. 12th: Tropo from **JO05MB**:
40 QSOs with PA, DL, G, GM, ON, OZ. And via FSK-MS:
1900-1905 ES6RQ 27 27 640ms S5 C

Sept. 13th: Tropo from **JO15HN**:
10 QSOs with PA, DL, G, ON, OZ. And via FSK-MS:
0508-0520 I2FAK 26 26 440ms S4 C

Sept. 13th: Tropo from **JO15KP**:
22 QSOs with DL, PA, OZ, G, SK7MW JO65 and via FSKMS:
1801-1830 DH7FB 27 27 280ms S5 C
1832-1848 SP2IQW 27 27 280ms S5 C
1848-1855 ES6RQ 26 26 320ms S5 C
1856-1903 OH6MAZ 27 26 380ms S5 C
1903-1913 RX1AS 27 26 460ms S5 C
1914-1926 SP6GWB 26 27 240ms S4 C
1935-1955 S53VV 27 27 360ms S5 C

Sept. 14th: Tropo from **JO15JO**:
2 QSOs with G and 1 x PA from JO15LQ and via FSK-MS:

| | | | | |
|---|---|---|---|---|
| 0503-0518 | S57TW | 27 27 | 540ms S5 | C |

Sept. 15th: Tropo from **JO14GC**:
32 QSOs with G, DL, PA, ON, OZ, GM, SK7MW (JO65).
And via FSK-MS:

| | | | | |
|---|---|---|---|---|
| 1837-1900 | RX1AS | 26 27 | 360ms S5 | C |

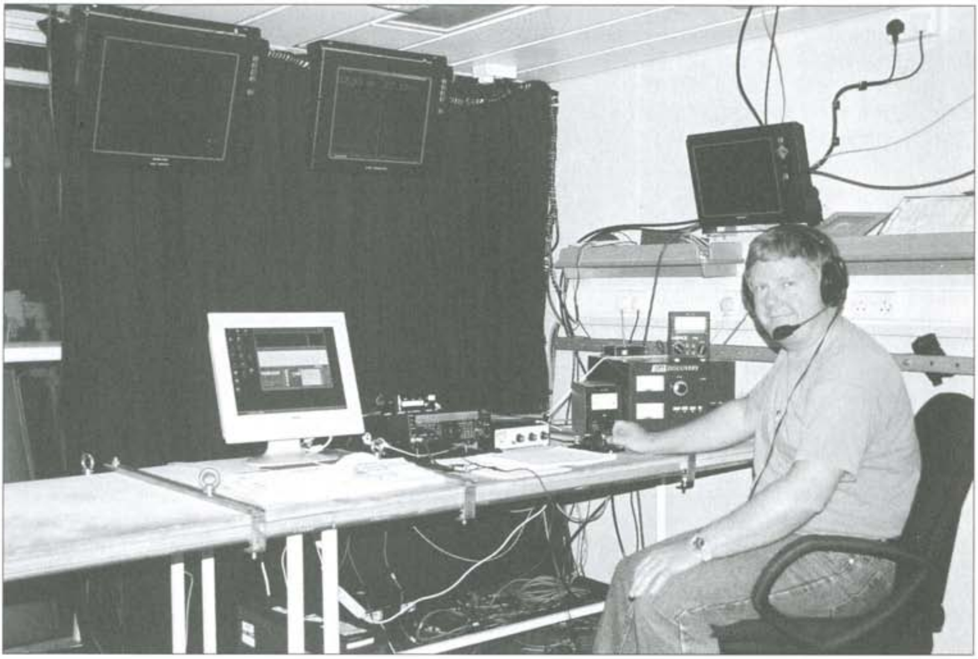
Sept. 30th FSK MS from **JO08RE**:

| | | | | |
|---|---|---|---|---|
| 0540-0545 | G4FUF | 26 26 | 400ms S4 | C |
| 0546-0606 | DH3YAK | 26 26 | 100ms S3 | C |
| 0607-0614 | DF7KF | 26 26 | 1380ms S3 | C |

Sept. 30th: Aurora from **IO99JG**:

| | | | |
|---|---|---|---|
| 1650 | DL6DAF | JO52BB | 55A 55A |
| 1753 | PA3CEE | JO33JI | 55A 55A |

**G0KZG/MM will be qrv again in 2005, of course!**
**TNX Andy, for sending log and pictures!**



**Top: G0KZG/MM - Shack**

**Bottom: CEFAS ENDEVOUR with 11 ele. Yagi for 2m**

# Meteor Shower Calendar

by Guido Jünkersfeld, DL8EBW

## January to March 2005

| Name | Date | Max. | ZHR | RA | DEC | v (km/sec) | Source |
|---|---|---|---|---|---|---|---|
| **Quadrantids** | **01.01.-05.01.** | **03.01. 11z** | **120** | **230** | **+49** | **41** | **IMO05 *1** |
| Corvids | 29.12.-25.01. | 13.01. | 10 | 185 | -20 | | BMS50 |
| alpha-Craterids | 27.12.-22.01. | 13.01. | 10 | 160 | -14 | | BMS50 |
| delta-Cancrids | 01.01.-24.01. | 17.01. | 4 | 130 | +20 | 28 | IMO05 |
| kappa-Cygnids | 14.01.-20.01. | 17.01. | 10 | 295 | +51 | | BMS50 |
| alpha-Leonids | 28.12.-13.02. | 29.01. | 10 | 159 | +06 | | BMS50 |
| Cap./Sagittarids | 13.01.-04.02. | 01.02. | 15 | 299 | -15 | | IMO05 |
| alpha-Centaurids | 28.01.-21.02. | 07.02. | 6 | 210 | -59 | 56 | IMO05 |
| alpha-Aurigids | 15.01.-20.02. | 5.-10.02. | 12 | 074 | +43 | | BMS50 |
| chi-Capricornids | 29.01.-28.02. | 13.02. | 10 | 315 | -24 | | IMO05 |
| delta-Leonids | 15.02.-10.03. | 24.02. | 2 | 168 | +16 | 23 | IMO05 |
| alp.-beta-Perseids | 23.02.-12.03. | 28.02. | 10 | 047 | +45 | | BMS50 |
| zeta-Bootids | 10.03.-12.03. | | 10 | 218 | +12 | | BMS50 |
| gamma-Normids | 25.02.-22.03. | 13.03. | 8 | 249 | -51 | 56 | IMO05 |
| 16-Draconids | 14.03.-14.03. | 14.03. | 7 | 250 | +54 | | BMS50 |
| Virginids | 25.01.-15.04. | 24.03. | 5 | 195 | -04 | 30 | IMO05 |
| beta-ursa-Majorids | 23.03.-27.03. | 25.03. | var. | 161 | +58 | | BMS50 |

**Kommentar:** Liebe Meteorscatter-Funkfreunde, anbei der MS-Kalender für das erste Quartal 2005. Für den ersten Zeitraum im Jahr gibt es kaum größere Meteoriten-Schauer.
Die Quadrantiden (*1) gehören zu den 4 größten jahreswiederkehrenden Schauern. Sie läuten quasi das Frühjahr ein und damit auch die Zeit der geringeren Meteoritenaktivitäten. Im Februar geht es dann in die Zeit, wo wir kaum noch sporadischen Meteoriten verzeichnen und selbst die Schauermeteoriten gehen in deren Anzahl noch mit unter. Die QUA (wie die Quardrantiden von der IMO bezeichnet werden), werden das diesjährige 6-8 stündige Maximum wohl am 03.01. in den Morgenstunden (ca. 1100UT) ausbilden...
Von hier aus ein frohes Weihnachtsfest und recht viel Erfolg für das Neue Jahr 2005!
Auf Wiederhören, von wo auch immer, 73 Guy DL8EBW

**Comment:** In the first quarter of the year there are almost no bigger showers. Only the Quadrantids on January 3rd are one of the four biggest showers of the year. This year`s maximun is expected on Jan 3rd around 1100z. Merry Christmas and many success for 2005! 73, Guy, DL8EBW

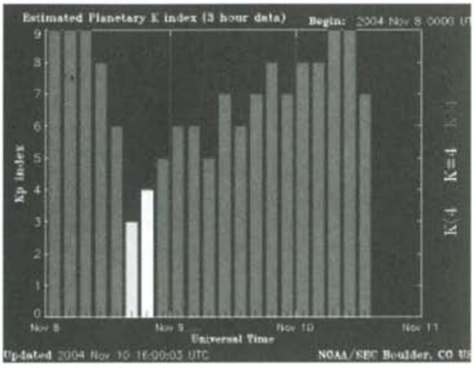
**Legend / Erklärungen**
Name: Name of the meteor shower / Name des Meteoritenschauers
Date: Days of activity / Zeitraum der Schaueraktivität
Max.: Day of the Maxiumum / Maximum des Schauereintritts
ZHR: Numer of meteors per hour during the maximum
Anzahl der zu erwartenden eintretenden Metoriten im Maximum pro Std
Coordinates: RA/DEC: Rectascension / Declination of the shower`s radiant /
Himmelskoordinaten: RA/DEC: Rektaszenion/Deklination des Radianten
v in [km/sec]: speed of the meteors / Eintrittsgeschwindigkeit in die Erdatmosphäre in km / sec.
IMO05: Source Int. Meteor Organisation, list for 2005 / Datenquelle: IMO Aufstellung für 2005
BMS50: Source: British Meteor Society, Meteorbook 1950 / Old data, but these showers are still active and the actual radiant can be calculated from RA and DEC.
Stammdaten aus dem British-Meteorbook, Grundlage 1950! Zurecht könnte man sagen, die Daten entsprechen nicht dem akt. Stand (sp. Peak-Daten), aber die Schauer sind nach wie vor aktiv und der Radiant kann durch die Himmelskoordinaten (RA/DEC) nach wie vor ausreichend genau berechnet werden!

# Aurora Reports

**Editor: Stefan Heck, LA0BY**
**LA0BY@darc.de**

### Editors note:

Until a few days ago it looked like we had to drop this column for the current DUBUS magazine issue. But then the Sun came to unrest and sparked off an impressive amount of particles, and most of them directed to Earth. You all know what this means, just look at the NOAA K-index diagram as copied from the N3KL website on 10.11.2004:




It shows several long periods with very severe storming (K=9). When writing this we were again right in one of these periods. This is good for editing the Aurora column, because there is not much to work from Oslo. But you guys seem very busy ...
73, Stefan (LA0BY)

**----------------- 70 MHz reports ----------------**

### G4ASR in IO81MX wkd on 70 MHz:

| | | | | | |
|---|---|---|---|---|---|
| 2004-11-09 | | | | | |
| 1451 | GB3MCB | IO70 | 53A | hrd | 040° |
| 1452 | GB3ANG | IO86 | 54A | hrd | 010° |
| 1458 | GM4BYF | IO85JU | 55A | 53A | |
| 1502 | G3JYP | IO84SN | 53A | 55A | |
| 1538 | GD0TEP | IO74SD | 59A | 57A | |
| 1542 | EI3IO | IO63WF | 55A | 55A | |
| 1547 | G3NAQ | IO91HL | 55A | 57A | |
| 2000 | OZ3ZW | JO54RS | 41A | hrd | |
| 2004-11-10 | | | | | |
| 0815 | GB3ANG | IO86MN | 57A | hrd | 030° |
| 0835 | GB3MCB | IO70 | 53A | hrd | 045° |
| 1352 | GD0TEP | IO74SD | 59A | hrd | 045° |
| 1357 | OZ3ZW | JO54RS | 52A | hrd | 040° |

tnx for report, David

**----------------- 144 MHz reports ----------------**

### EI5FK in IO51RT wkd on 144 MHz:

| | | | | | | |
|---|---|---|---|---|---|---|
| 2004-11-07 | | | | | | |
| 2050 | MM3ERP | IO87RJ | 57A | 59A | SSB | 730km |
| 2114 | MM0CEZ | IO75XU | 55a | 53a | | 537km |
| 2137 | MM0DQP | IO88KI | 53a | 57a | SSB | 804km |
| 2145 | GM1BAN | IO88GO | 51A | 54A | SSB | 820km |
| 2152 | GM0HTT | IO89JC | 53a | 53a | SSB | 877km |
| 2004-11-08 | | | | | | |
| 0053 | G3UTS | IO94CU | 55a | 52a | | 561km |
| 0059 | OZ6OL | JO65DJ | 54a | 54a | | 1425km |
| 0114 | OK2PM | JN99AO | 52a | 53a | | 1877km |
| 0116 | G4DBL | IO91JH | 57a | 58a | | 510km |
| 0119 | PE1IKX | JO11TL | 57a | 59a | | 839km |
| 0124 | DL1FAA | JO61MF | 52a | 53a | | 1489km |
| 0127 | SP6IWQ | JO80HK | 54a | 57a | | 1754km |
| 2004-11-09 | | | | | | |
| 1619 | G4DHF | IO92UU | 53a | 55a | | 572km |
| 1630 | GW4FRX | IO82MR | 51a | 54a | | 393km |
| 1639 | G3UTS | IO94CU | 52a | 55a | | 561km |
| 1645 | EI3GE | IO63XD | 52a | 52a | | 225km |
| 1658 | SM6FUD | JO68JA | 53a | 53a | | 1519km |
| 1719 | SP6GZZ | JO80FX | 53a | 59a | | 1728km |
| 1944 | G4KWQ | IO92AQ | 52a | 52a | | 458km |
| 1946 | G4RRA | IO80BS | 54a | 59a | | 344km |
| 1954 | SP1CNV | JO84CF | 54a | 55a | | 1668km |
| 1957 | SP3MGM | JO73QE | 53A | 59A | | 1618km |
| 1958 | GMØNAI | IO75RU | 55A | 55A | | 520km |
| 2016 | PA2DW | JO22GD | 52a | 55a | | 895km |
| 2059 | OK1DFC | JN79GW | 52a | 57a | | 1626km |
| 2122 | PA5KM | JO11WL | 53a | 55a | | 856km |
| 2004-11-10 | | | | | | |
| 1430 | GW3LEW | IO70PS | 57a | 59a | | 290km |
| 1433 | SP6GWB | JO80 | 55a | 55a | | 1754km |
| 1435 | DL1RNW | JO62GH | 52a | 55a | | 1437km |
| 1437 | OK1VHF | JO70EB | 54a | 55a | | 1610km |
| 1440 | DL2DXA | JO61VC | 55a | 55a | | 1543km |
| 1443 | G0EWN | IO93FK | 55a | 56a | | 505km |
| 1445 | G3JKX | IO82TQ | 53A | 55A | | 431km |
| 1447 | G3TA | IO81XS | 54A | 57A | | 447km |
| 1505 | MM0CEZ | IO75XU | 55a | 58a | | 537km |
| 1509 | G3LTF | IO91GG | 55A | 58A | | 493km |
| 1514 | G3JHM | IO91LC | 55a | 56a | | 525km |
| 1518 | GI4SJQ | IO64SK | 53a | 55a | | 323km |
| 1525 | G3WCS | IO83RH | 54a | 57a | | 438km |

Rig: 400 W, 17-ele-M2. tnx for report, Charles

### G4ASR in IO81MX wkd on 144 MHz:

| | | | | | | |
|---|---|---|---|---|---|---|
| 2004-11-09 | | | | | | |
| 1522 | DL1HN | JO43XN | 53A | 54A | 050° | |
| 1605 | MM0CEZ | IO75XU | 55A | 57A | 030° | |
| 2004-11-10 | | | | | | |
| 1318 | DJ9YE | JO43HV | 57A | 57A | 050° | |
| 1324 | GW3LEW | IO71PS | 56A | 57A | 050° | |
| 1405 | DL1RNW | JO62GH | 53A | 55A | 060° | |
| 1408 | OK1DFC | JN79GW | 54A | 57A | 065° | 1243km |
| 1410 | PE1GUR | JO22EH | 55A | 55A | 065° | |
| 1412 | HA5OV | JN97NJ | 54A | 55A | 065° | 1660km |
| 1415 | ON9CKW | JO20EU | 54A | 57A | 065° | |
| 1420 | PA0IJM | JO32GP | 53A | 55A | 055° | |
| 1423 | HA8V | KN06HT | 53A | 56A | 065° | 1790km |
| 1442 | DF6XD | JO31TS | 53A | 55A | 065° | |
| 1445 | DK3QZ | JO31LP | 57A | 57A | 065° | |
| 1452 | PA0AKN | JO31BT | 53A | 57A | 055° | |

| | | | | | |
|---|---|---|---|---|---|
| 1454 | PA1LN | JO32LS | 53A | 53A | 055° |
| 1456 | G4CKH | JO02UK | 53A | 55A | 055° |

tnx for report, David

### GI6ATZ in IO74AJ wkd on 144 MHz:

2004-07-25

| | | | | | |
|---|---|---|---|---|---|
| 1140 | G8XVJ | IO83RJ | 57A | 57A | 250km |
| 1144 | G7DGH | IO83NN | 57A | 57A | 222km |
| 1145 | GW3VEW | IO71PS | 53A | 55A | 304km |
| 1147 | SM1SBI | JO97FK | 57A | 57A | 1550km |
| 1149 | ON4ARF | JO10MV | 57A | 57A | 720km |
| 1152 | OZ1BEF | JO46OE | 52A | 59A | 979km |
| 1157 | G4LRT | IO92LJ | 59A | 59A | 394km |
| 1158 | M1IFT | IO93NL | 57A | 57A | 348km |
| 1200 | PE9DX | JO33MD | 59A | 59A | 864km |
| 1202 | M1EQN | IO83NN | 53A | 55A | 222km |
| 1227 | ON4GG | JO20AR | 59A | 59A | 788km |
| 1228 | DL8YE | JO31M | 55A | 56A | |
| 1230 | SP2IQW | JO94GM | 55A | 56A | 1576km |
| 1231 | DL8BEH | JO42AH | 59A | 55A | 956km |
| 1232 | DC7BK | JO43XH | 55A | 55A | 1049km |
| 1233 | PA9RX | JO32MD | 52A | 55A | 898km |
| 1236 | DC6IA | JO30IV | 53A | 57A | 937km |
| 1237 | DL2ELM | | 53A | 52A | |
| 1239 | PE1RLF | JO32CG | 59A | 57A | 841km |
| 1240 | G8RWG | JO01BN | 59A | 59A | 515km |
| 1241 | DJ2JS | JO31SL | 59A | 59A | 959km |
| 1242 | GW7SMV | IO81LN | 59A | 59A | 371km |
| 1243 | MW0CFQ | IO71RT | 55A | 59A | 302km |
| 1244 | G4IJD | IO83TU | 59A | 59A | 241km |
| 1244 | F4AZF | JN38IW | 59A | 55A | 1061km |
| 1246 | G1ZJP | IO92WV | 59A | 59A | 419km |
| 1247 | DC9YC | JO31PJ | 57A | 57A | 948km |
| 1248 | DL4YR | JO31KS | 55A | 55A | 904km |
| 1249 | PA3BRJ | JO32LF | 55A | 55A | 890km |
| 1251 | DL8BEH | JO42AH | 55A | 59A | 956km |
| 1252 | PD2JVE | JO22VJ | 55A | 55A | 809km |
| 1255 | F6HRO | IN88JQ | 53A | 53A | 662km |
| 1258 | PD4R | JO22XE | 57A | 58A | 828km |
| 1259 | F1GDV | JN29AU | 55A | 57A | 848km |
| 1301 | ON7CL | JO20JU | 57A | 57A | 824km |
| 1302 | F9OE | IN78QG | 55A | 57A | 687km |
| 1304 | PD2RPT | | 53A | 57A | |
| 1305 | PA1BDO | JO21FT | 57A | 58A | 876km |
| 1307 | DG9YIH | JO32QI | 57A | 55A | 912km |
| 1308 | ON4DCM | JO11PC | 57A | 58A | 721km |
| 1310 | PD0CIF | JO32GP | 53A | 56A | |
| 1314 | PE1GUR | JO22TH | 57A | 59A | 802km |
| 1316 | DK2YCT | JO32RG | 57A | 57A | 920km |
| 1317 | F1CVU | JN09 | 53A | 53A | 1037km |
| 1320 | OZ1KEF | JO56BC | 55A | 55A | 1034km |
| 1322 | G4RUW | IO91IJ | 52A | 59A | 457km |
| 1323 | DK5QN | JO42FA | 59A | 59A | 994km |
| 2212 | OZ1SKY | JO56DG | 52A | 55A | 1046km |
| 2222 | EI3GE | IO63XD | 59A | 59A | 139km |
| 2224 | PA1BVM | JO21RI | 52A | 55A | 836km |
| 2227 | SM7FMX | JO65KN | 55A | 53A | 1205km |
| 2310 | GM0HTT | IO89JC | 59A | 59A | 550km |

2004-07-26

| | | | | | |
|---|---|---|---|---|---|
| 0019 | LA0BY | JO59IX | 55A | 54A | 1176km |
| 0025 | EI5FK | IO51RT | 59A | 57A | 335km |

2004-07-27

| | | | | | |
|---|---|---|---|---|---|
| 1331 | DG5BD | JO43HM | 53A | 58A | 957km |
| 1333 | DK7LH | JO43BB | 59A | 59A | 937km |
| 1334 | DK7LZ | JO30MR | 59A | 59A | 967km |
| 1335 | DL3TS | JO30PX | 57A | 57A | 969km |
| 1335 | DL6BCT | JO43LD | 55A | 59A | 988km |
| 1337 | PE1JAT | JO22LO | 52A | 55A | 748km |
| 1338 | DL8YAU | JO41HS | 57A | 57A | 1015km |
| 1340 | F1EBE | JN09NN | 53A | 53A | 821km |
| 1342 | F1ORL | JN08VP | 55A | 59A | 833km |
| 1344 | PE1RBG | JO22RM | 59A | 59A | 783km |
| 1344 | PD0PSO | JO21VU | 55A | 59A | 832km |
| 1345 | G0EZY | IO91SV | 57A | 56A | 460km |
| 1346 | G0MJS | IO93BR | 57A | 55A | 277km |
| 1347 | F6BGR | JO00 | 57A | 59A | 639km |
| 1349 | F0EJW | IN78VK | 55A | 55A | 674km |
| 1350 | OK1VDJ | JN79SS | 57A | 57A | 1549km |
| 1351 | SQ3HMD | JO72WU | 53A | 55A | 1444km |
| 1354 | DL2DN | JN48MX | 57A | 59A | 1193km |
| 1355 | PD0MNF | JO30AV | 57A | 59A | 897km |
| 1357 | PD1ART | JO32AU | 59A | 59A | 809km |
| 1359 | ON5GY | JO21LH | 59A | 58A | 808km |
| 1402 | F3VX | IN97PK | 55A | 55A | 856km |
| 1403 | DG3FK | JO41PG | 59A | 59A | 1079km |
| 1405 | PD4JP | | 55A | 57A | |
| 1406 | ON7PO | JO10PU | 57A | 57A | 737km |
| 1406 | DB5ET | JO31OG | 59A | 55A | 949km |
| 1407 | F1AKK/P | JN29PQ | 55A | 58A | 929km |
| 1409 | SQ9CWO | JO90 | 52A | 55A | 1734km |
| 1411 | PA3GDN | JO21MN | 57A | 57A | 800km |
| 1413 | PE1EWR | JO11SL | 57A | 58A | 714km |
| 1413 | DM2SR | JO53HR | 55A | 57A | 1082km |
| 1416 | PA1DYK | | 59A | 57A | |
| 1417 | DO4MC/P | JO41UA | 52A | 59A | 1117km |
| 1419 | PD0ORT | JO23RE | 59A | 59A | 761km |
| 1420 | DF5DG | JN58EB | 55A | 55A | 1333km |
| 1421 | OK2OVJ | JN59LK | 52A | 55A | 1280km |
| 1423 | DC6HQ | JO32QF | 53A | 58A | 916km |
| 1424 | F0DPU | JN18FW | 59A | 57A | 901km |
| 1426 | PA0KT | JO22CB | 59A | 59A | 724km |
| 1427 | F6GYJ | JN18CU | 55A | 59A | 834km |
| 1429 | DL1NBM | JN49MV | 52A | 55A | 1136km |
| 1431 | ON4ZN | JO21FB | 52A | 55A | 792km |
| 1436 | DL7UHF | JO62SM | 55A | 55A | 1303km |
| 1438 | DO1EL | JO31JL | 53A | 57A | 912km |
| 1439 | F1DUZ | IN97NJ | 55A | 57A | 856km |
| 1442 | F5NXU | IN97MR | 57A | 59A | 819km |
| 1444 | F6CCH | IN98BU | 53A | 55A | 677km |
| 1446 | F6BEE | JN08WR | 55A | 55A | 830km |
| 1447 | OK2UFB | JN99AS | 53A | 55A | 1709km |
| 1449 | SP9KUP | JN99HK | 53A | 57A | 1763km |
| 1453 | DH8AF | JO31 | 55A | 55A | 923km |
| 1454 | F1UBW | IN98GS | 55A | 55A | 698km |
| 1456 | ON7LAO | JO20CK | 59A | 59A | 817km |
| 1458 | DM2CKK | JO50ET | 52A | 55A | 1170km |
| 1459 | DK1VI | JN45HH | 59A | 56A | 1448km |
| 1501 | EI7CD | IO63WG | 59A | 59A | 126km |
| 1503 | DL2BRW | JO72GV | 52A | 55A | 1357km |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1508 | PE2MAR | JO22KK | 53A | 55A | | 749km |

All contacts in SSB. Rig: Icom 251E + Mutek 2*4CX250B 400 watts 13 Ele boomer. tnx for report, Gordon

### HA8V in KN06HT wkd on 144 MHz:

| | | | | | | |
|---|---|---|---|---|---|---|
| 2004-11-09 | | | | | | |
| 1517 | G4KWQ | IO92AQ | 52A | 52A | 330 | 1740km |
| 2004-11-10 | | | | | | |
| 1356 | RW1ZC/2 | KO04FQ | 59A | 57A | 15 | 876km |
| 1401 | SK7MW | JO65MJ | 59A | 55A | 350 | 1090km |
| 1405 | DJ9YE | JO43HV | 56A | 55A | 20 | 1157km |
| 1411 | OZ1LO | JO55VC | 57A | 55A | 20 | 1109km |
| 1422 | G4ASR | IO81MX | 56A | 53A | 330 | 1791km |
| 1434 | G3WCS | IO83RH | 58A | 55A | 330 | 1794km |
| 1437 | G4KWQ | IO92AQ | 56A | 53A | 330 | 1740km |
| 1442 | G3LTF | IO81GG | 55A | 54A | 330 | 1815km |

Rig: TM255E + GS35B 90W 4 x 11el. Yagi 35m a.g.l.
tnx for report, Gabi

### I4YNO in JN54KP wkd on 144 MHz:

| | | | | | |
|---|---|---|---|---|---|
| 2004-07-25 | | | | | |
| 1549 | G4SWX | JO02PB | 55A | 55A | 15 |
| 1603 | DK3EE | JO41GU | 55A | 55A | |
| 1608 | PA1T | JO33JF | 55A | 59A | |
| 1615 | DF2JQ | JO31HL | 55A | 57A | |
| 1619 | DL5YM | JO62XN | 55A | 57A | |
| 1622 | DJ5HG | JO53IM | 55A | 55A | |
| 1630 | PA0JMV | JO21PM | 55A | 55A | |

Rig: FT1000MP, 3CX800, 20-ele-yagi. tnx for report, Alex

### LA0BY in JO59FW wkd on 144 MHz:

| | | | | | | |
|---|---|---|---|---|---|---|
| 2004-11-07 | | | | | | |
| 2102 | PA5DD | JO22IC | 55A | 55A | 0 | 941km |
| 2202 | SM4BDQ | JP80FG | 51A | 53A | 10 | 334km |
| 2212 | YL2OK | KO37AS | 55A | 55A | 30 | 926km |
| 2217 | SP1NQN | JO84ML | 55A | 55A | 30 | 724km |
| 2218 | LY2BJ | KO25ER | 57A | 59A | 30 | 945km |
| 2223 | SP3VSC | JO92DF | 59A | 59A | SSB | 984km |
| 2227 | SP5ZCC | KO02PF | 53A | 55A | 30 | 1086km |
| 2235 | PA1LA | JO32LS | 55A | 57A | 30 | 825km |
| 2247 | RA3LE | KO64AR | 53A | 53A | 30 | 1411km |
| 2249 | SP2QBQ | JO94FL | 59A | 55A | SSB | 774km |
| 2314 | ES1AJ | KO29HK | 57A | 59A | SSB | 795km |
| 2319 | MM3ERP | IO87RJ | 57A | 55A | SSB | 801km |
| 2331 | DL5CF | JO51RO | 59A | 59A | 30 | 929km |
| 2332 | DM2DXG | JO51MV | 55A | 56A | 30 | 895km |
| 2334 | SP6IWQ | JO80HK | 54A | 57A | 30 | 1125km |
| 2340 | SP8RHP | KO10FF | 53A | 55A | 30 | 1318km |
| 2343 | SP7Q | JO91RS | 57A | 59A | 30 | 1066km |
| 2346 | DL2ROM | JO62RI | 57A | 59A | 30 | 863km |
| 2351 | SP6GZZ | JO80FX | 59A | 59A | 30 | 1064km |
| 2357 | SP7HKK | JO91QI | 56A | 59A | 30 | 1104km |
| 2004-11-08 | | | | | | |
| 0012 | ES5PC | KO38HJ | 57A | 57A | 30 | 935km |
| 0022 | DL8YE | JO31MH | 59A | 59A | 10 | 982km |
| 2130 | YL2LW | KO26CW | 55A | 55A | 30 | 865km |
| 2138 | GM0TGE | IO87TF | 53A | 55A | 340 | 801km |
| 2140 | GI6ATZ | IO74AJ | 55A | 55A | 330 | 1161km |
| 2143 | DL1SUN | JO53PN | 57A | 57A | 0 | 711km |
| 2144 | MM0CEZ | IO75XU | 55A | 55A | 330 | 967km |
| 2150 | DK8ZJ | JO54AG | 57A | 55A | 10 | 631km |
| 2159 | SM5DYC | JO89HW | 54A | 55A | 20 | 343km |
| 2201 | SM5AHD | JO89VG | 56A | 57A | 20 | 419km |
| 2203 | SM4AIQ | JO79BH | 55A | 59A | 20 | 218km |
| 2205 | SM5AQI | JO88CN | 53A | 53A | 20 | 361km |
| 2250 | SM3DGG | JP80MP | 53A | 57A | 10 | 371km |
| 2004-11-09 | | | | | | |
| 1423 | LY2BH | KO25DR | 53A | 59A | 30 | 941km |
| 1444 | DK3EE | JO41GU | 55A | 55A | 30 | 907km |
| 1721 | DL1VPL | JO61UA | 53A | 56A | 40 | 1012km |
| 1722 | SP1FPG | JO73GN | 55A | 59A | 40 | 751km |
| 1724 | DL6DAF | JO52BD | 53A | 55A | 40 | 867km |
| 1725 | DL3CW | JO52ST | 55A | 54A | 40 | 795km |
| 2004-11-10 | | | | | | |
| 1458 | DJ9YE | JO43HV | 59A | 57A | 40 | 681km |
| 1507 | DK7BY | JO33RJ | 57A | 57A | 10 | 750km |
| 1529 | DM2SR | JO53HR | 55A | 53A | 10 | 690km |
| 1532 | SM7CZL | JO65PU | 56A | 55A | 20 | 484km |

Rig: IC-821H, PA 200W, 9-ele-yagi
Activity seemed poor, despite the good conditions.

### LZ1BB in KN12SS wkd on July 27th on 2m:

| | | | | | |
|---|---|---|---|---|---|
| 1534 | DF2ZC | JO30RN | 55A | 52A | 1497km |

RIG: FT817, PA 15W, HB9CV 1m above car roof (!)
Hrd also DK5DQ, DF6NA, DK9OY, ON4KHG, PA3CSG and I & HA stn. My first ever Aurora QSO of which I dreamed for 26 years, finally I made it. Congrats and tnx for report, Harry

### MM0CEZ in IO75XU wkd on 144 MHz:

| | | | | |
|---|---|---|---|---|
| 2004-11-09 | | | | |
| 1545 | DL1EJA | JO31DS | 55a | 55a |
| 1545 | PA2AKN | JO31BT | 55a | 59a |
| 1547 | PA2M | JO21IP | 59a | 59a |
| 1551 | PA3FPQ | JO22X | 59a | 59a |
| 1553 | DJ9CZ | JO31BC | 57a | 57a |
| 1600 | GW3MFY | IO81FL | 53a | 55a |
| 1605 | PA2DW | JO22GD | 55a | 54a |
| 1606 | G4ASR | IO81MX | 55a | 55a |
| 1608 | G4DHF | IO92UU | 59a | 59a |
| 1611 | OZ8FR | JO55SK | 54a | 55a |
| 1613 | DF2ZC | JO30RN | 55a | 55a |
| 1615 | PA2CHR | JO22XA | 59a | 55a |
| 1625 | DF8IK | JO30JN | 55a | 52a |
| 1630 | G4AJC | IO91VJ | 52a | 52a |
| 1634 | G8VYK | JO01FO | 53a | 55a |
| 1638 | ON4DPX | JO10NN | 53a | 55a |
| 1644 | G3NSY | IO82NP | 55a | 55a |
| 1646 | G3YYD | IO91TR | 57a | 58a |
| 1649 | DK7BY | JO33RJ | 55a | 57a |
| 1652 | DL8EBW | JO31NF | 55a | 55a |
| 1653 | ON4GG | JO20AR | 57a | 55a |
| 1656 | F5APQ | JO00XU | 53a | 55a |
| 1702 | DF9QT | JO31OR | 52a | 53 |
| 1703 | ON4LN | JO20IV | 55a | 55a |
| 1705 | G4DCV | IO91OF | 55a | 55a |
| 1708 | G4DBL | IO91JH | 55a | 55 |
| 1715 | SP2JYR | JO92GP | 52a | 55a |
| 1717 | F6DKW | JN18CS | 55a | 55a |

| | | | | | |
|---|---|---|---|---|---|
| 1721 | SP6GWB | JO89HK | 52a | 51 | |
| 1722 | ON9CKW | JO20EU | 57a | 59a | |
| 1728 | DH1NFL | JO51VF | 52a | 52A | |
| 1951 | G0ORY | IO92KP | 54a | 55a | |
| 1953 | G0CUH | IO70LG | 53a | 55a | |
| 1957 | EI7IX | IO53FT | 59a | 55a | |
| 2021 | PA5KM | JO11WR | 54a | 55a | SSB |
| 2022 | PA1TK | JO22IJ | 55a | 55a | |
| 2038 | G7RAU | IO90IR | 59a | 59a | |
| 2039 | G3JKX | | 57a | xxx | |
| 2045 | PE1GUR | JO22TH | 53a | 55 | |
| 2048 | DL8YE | JO31MH | 54a | 54a | |
| 2004-11-10 | | | | | |
| 1115 | G4FUF | JO01GN | 59a | 59a | |
| 1122 | PA5DD | JO22IC | 59a | 59a | |
| 1133 | PA0JMV | JO21PM | 59A | 59A | |
| 1138 | G3UTS | IO94CU | 55a | 55a | |
| 1140 | G4DEZ | JO03AE | 59a | 59a | |
| 1144 | GW3LEW | IO71PS | 55a | 57a | |
| 1146 | G4BWG | IO90WU | 55a | 55a | |
| 1148 | DL1DAX | JO31RM | 59a | 59a | |
| 1153 | DL4MO | JO50EN | 52a | 53a | |
| 1207 | OZ3TT | JO66CB | 57a | 55a | |
| 1221 | DK3BU | JO33NO | 59a | 59a | |
| 1316 | DJ9YE | JO43HV | 57a | 59a | |
| 1323 | OZ2TF | JO46PE | 57a | 55a | |
| 1326 | PA2DW | JO22GD | 57a | 55a | |
| 1337 | G4DBL | IO91JH | 55a | 55a | SSB |
| 1339 | G3WCS | IO83RH | 57a | 57a | SSB |
| 1352 | F1GDV/P | JN29AU | 57a | 57a | SSB |
| 1355 | G4AEP | IO91NJ | 55a | 55a | SSB |
| 1356 | MM0JMB | IO87IP | 57a | 58a | SSB |
| 1405 | PE1AHX | JO21OS | 59a | 59a | SSB |
| 1419 | DL0VV | JO64AD | 57a | 57a | |
| 1422 | DK9TF | JO31NF | 57a | 55a | |
| 1428 | DJ9DL | JO31NC | 52a | 54a | |
| 1429 | SK6DK | JO67EH | 55a | 58a | |
| 1450 | G4HGI | IO83PL | 57a | 59a | |
| 1507 | EI5FK | IO51RT | 58a | 57a | |
| 1517 | DK7BY | JO33RJ | 55a | 58a | |
| 1532 | ON4BBD | JO21NA | 52a | 55a | |
| 1534 | ON4LN | JO20IV | 54a | 56a | |
| 1536 | PA3DZL | JO21HM | 57a | 57a | |
| 1542 | G0EWN | IO93FK | 53a | 54a | |

Rig: FT1000MP, 400 W, 2 x 10-ele-quad. tnx for report

## OK1DFC in JO70 wkd on 144 MHz:

| | | | | | |
|---|---|---|---|---|---|
| 2004-11-08 | | | | | |
| 0557 | LA3BO | JO59CD | 55a | 56a | 1060km |
| 0600 | LY2IC | KO14WW | 55a | 57a | 841km |
| 0604 | OZ8FR | JO55SK | 55a | 55a | 644km |
| 0606 | PA3BIY | JO22BN | 55a | 55a | 780km |
| 0616 | PA5DD | JO22IC | 55a | 56a | 728km |
| 0627 | SM7SPG | JO66MD | 53a | 55a | 697km |
| 0629 | SM7BLO | JO67SB | 55a | 57a | 795km |
| 0632 | SM6OPX | JO59RG | 55a | 55a | 1056km |
| 0637 | RW3WR | KO71IM | 55a | 55a | 1425km |

tnx for report

## OK2PM in JN99AO wkd on 144 MHz:

| | | | | | |
|---|---|---|---|---|---|
| 2004-11-07 | | | | | |
| 2345 | SM4IVE | JO79SD | 53A | 55A | 1072km |
| 2356 | GM4BYF | IO85JV | 53A | 55A | 1583km |
| 2004-11-08 | | | | | |
| 0002 | OZ6OL | JO65DJ | 57A | 57A | 751km |
| 0006 | G4KWG | IO92AQ | 54A | 56A | 1431km |
| 0025 | GI6ATZ | IO74AJ | 55A | 55A | 1717km |
| 0044 | LY2BJ | KO25ER | 57A | 59A | 803km |
| 0115 | EI5FK | IO51RT | 53A | 53A | 1876km |

Rig: FT736R, 80 W, 9-ele-yagi. tnx for report, Karel

## PA5DD in JO22IC wkd on 144 MHz:

| | | | | | |
|---|---|---|---|---|---|
| 2004-11-07 | | | | | |
| 2100 | SM0KAK | JO89XK | 56A | 59A | 1161km |
| 2103 | LA0BY | JO59FW | 55A | 55A | 942km |
| 2105 | DJ9YE | JO43HV | 52A | 55A | 331km |
| 2112 | SM5CUI | JO89WW | 52A | 54A | 1193km |
| 2114 | SK6HD | JO68SD | 55A | 59A | 876km |
| 2116 | SM6OPX | JO58RG | 53A | 52A | 810km |
| 2255 | RA3LE | KO64AR | 57A | 57A | 1824km |
| 2307 | G4DHF | IO92UU | 55A | 59A | 348km |
| 2327 | RX1AS | KO59FX | 53A | 55A | 1809km |
| 2332 | LY2BJ | KO25ER | 54A | 58A | 1346km |
| 2334 | G3LTFI | O91GG | 53A | 55A | 433km |
| 2335 | SM5CUI | JO89WW | 59A | 59A | 1193km |
| 2341 | OH6QU | KP03SD | 42A | 53A | 1577km |
| 2344 | SM0EJY | JO89SC | 54A | 57A | 1119km |
| 2350 | GI4SRQ | IO64RI | 57A | 58A | 788km |
| 2353 | OK1VHF | JO70EB | 56A | 57A | 713km |
| 2004-11-08 | | | | | |
| 0006 | GW3MFY | IO81FL | 55A | 59A | 570km |
| 0011 | DK2JP | JO73DB | 54A | 55A | 657km |
| 0014 | ES1RF | KO29IF | 57A | 57A | 1477km |
| 0016 | SM0NZY | JO89WI | 55A | 57A | 1151km |
| 0038 | SP1NQN | JO84ML | 56A | 59A | 862km |
| 0048 | OK1HWU | JO70 | 52A | 55A | 740km |
| 0051 | SP6GZZ | JO80FX | 53A | 55A | 822km |
| 0109 | SP6IWQ | JO80HK | 56A | 57A | 850km |
| 0111 | SP7Q | JO91RS | 55A | 57A | 1012km |
| 0113 | HB9DFG | JN37SM | 54A | 55A | 548km |
| 0116 | SP8RHP | KO10FF | 53A | 59A | 1253km |
| 0118 | EI4DQ | IO51WU | 59A | 59A | 877km |
| 0121 | SP7HKK | JO91QI | 55A | 59A | 1013km |
| 0125 | G4DBL | IO91JH | 59A | 58A | 415km |
| 0601 | LY2IC | KO14WW | 56A | 59A | 1303km |
| 0602 | SP2FAV | JO94MA | 55A | 57A | 981km |
| 0609 | OK1TEH | JO70FD | 54A | 59A | 715km |
| 0612 | SP4BY | KO13OD | 52A | 55A | 1252km |
| 0614 | SP3MGM | JO73QE | 54A | 59A | 731km |
| 0615 | GM3WYL | IO75WW | 54A | 52A | 716km |
| 0617 | OK1DFC | JN79GW | 56A | 55A | 729km |
| 0619 | RA3LBK | KO65QA | 54A | 57A | 1909km |
| 0621 | UA1WCF | KO55JR | 53A | 59A | 1746km |
| 0623 | LA5SKA | JO48EG | 56A | 59A | 726km |
| 0632 | OZ8FR | JO55SK | 59A | 57A | 584km |
| 0636 | SM4IVE | JO79SD | 55A | 57A | 1036km |
| 0639 | G0CUH | IO70LG | 53A | 55A | 707km |
| 0641 | DM2BHG | JO51MW | 56A | 55A | 435km |

| | | | | | |
|---|---|---|---|---|---|
| 0644 | DJ4TC | JO63PN | 56A | 57A | 600km |
| 0645 | OZ3PO | JO65BM | 57A | 59A | 619km |
| 0648 | SM7SPG | JO66MD | 55A | 59A | 706km |
| 0650 | DJ9CS | JO54DG | 57A | 57A | 445km |
| 0652 | SM6CCO | JO78FM | 55A | 57A | 943km |

tnx for report, Uffe

### RA3WDK in KO81BR wkd on 144 MHz:

2004-11-07

| | | | |
|---|---|---|---|
| 1708 | RX1AS | KO59fx | |
| 2105 | RA1AY | KP50ea | |
| 2121 | ES1RF | KO29if | |

2004-11-08

| | | | |
|---|---|---|---|
| 0040 | ES5PC | KO38hj | |
| 0042 | SM4IVE | JO79sd | |
| 0044 | RW1AY | KO59cu | |
| 0046 | RV3DE | KO95kl | |
| 0054 | RW4HW | LO43qm | |
| 0106 | RX9SA | LO71ns | |
| 0114 | LY2BJ | KO25ea | |
| 0115 | RW3PF | KO93cd | |
| 0118 | RA3IS | KO76wt | |
| 0157 | RX1AS | KO59fx | |
| 0509 | OZ8FR | JO55sk | |
| 0513 | RX3AA | KO85po | |
| 0519 | RA1AY | KP50ea | |
| 0521 | RA3FO | KO86ri | |
| 0522 | UA3TCF | LO26iu | |
| 0542 | LY2IC | KO14ww | |
| 0544 | RA3LBK | KO65qa | |
| 0547 | UA4UK | LO14ma | |
| 0551 | RX3AA | KO85po | |
| 0603 | DK1KR | JO53hw | |
| 0607 | RW3WR | KO71im | |
| 0642 | RU3ACE | KO95kg | |
| 1537 | UA1AJY | KO49vw | |

2004-11-09

| | | | |
|---|---|---|---|
| 1544 | ES6RQ | KO28wa | |
| 1958 | RX1AS | KO59fx | |
| 2005 | OH3BYZ | KP21ua | |
| 2013 | YL2OK | KO37au | |
| 2018 | RA3IM | KO56um | |
| 2029 | OH5TS | KP30ln | |
| 2035 | LA4YGA | JO48ae | ODX 1920km |
| 2101 | ES6DO | KO27wx | |

Rig: 50 W, 11-ele-yagi. tnx for report, Ivan

### RN6BN in KN95LC wkd on 144 MHz:

2004-11-08

| | | | | | |
|---|---|---|---|---|---|
| 0058 | RA3AQ | KO85JE | 57A | 57A | 1131km |
| 0105 | RW3PF | KO93CD | 57A | 57A | 896km |

2004-11-09

| | | | | | |
|---|---|---|---|---|---|
| 2024 | RA3QTT | LO01GQ | 55A | 55A | 741km |
| 2029 | UT8AL | KO61WP | 55A | 55A | 818km |
| 2051 | RU3GX | KO92SO | 59A | 57A | 835km |
| 2052 | RX3QFM | KO91OO | 59A | 59A | 723km |
| 2053 | UA4AQL | LO20JB | 59A | 57A | 703km |

tnx for report, Sam

### RW3PF in KO93CD wkd on 144 MHz:

2004-11-07

| | | | | | |
|---|---|---|---|---|---|
| 1647 | UA1AJY | KO49VW | 57A | 57A | |
| 1649 | RX1AS | KO59FX | 59A | 59A | |
| 1718 | ES1RF | KO29IF | 56A | 57A | |
| 2225 | SM4IVE | JO79ID | 59A | 59A | |
| 2229 | SM0KAK | JO89XK | 57A | 59A | |
| 2235 | YL2OK | KO37AS | 55A | 57A | |
| 2253 | LY2BJ | KO25ER | 59A | 57A | |
| 2258 | RA1AY | KP50EA | 59A | 59A | |
| 2301 | RW3AA | KO85TN | 59A | 59A | |
| 2303 | SM4BDQ | JP80FG | 55A | 57A | |
| 2305 | RA3IS | KO76WT | 59A | 59A | |
| 2307 | RW1AY | KO59CU | 55A | 55A | |
| 2313 | RZ4HF | LO43QM | 59A | 59A | |
| 2328 | DL1SUN | JO53PN | 57A | 57A | |
| 2335 | DL5CF | JO51RO | 58A | 57A | |
| 2336 | SP1FJZ | JO84EE | 55A | 59A | |
| 2338 | PA0V | JO33II | 55A | 57A | 2086km |
| 2339 | DL7FF | JO62TJ | 59A | 59A | |
| 2341 | DL2ROM | JO62RI | 55A | 55A | |
| 2346 | SM0EPO | JO89XM | 59A | 59A | |
| 2348 | SP8RHP | KO10FF | 59A | 59A | |

2004-11-08

| | | | | |
|---|---|---|---|---|
| 0009 | UR5LX | KO70WK | 59A | 59A |
| 0016 | DM2DXG | JO51MV | 57A | 57A |
| 0030 | SP1NQN | JO84ML | 57A | 59A |
| 0039 | UA4AQL | LO20QB | 55A | 59A |
| 0041 | DL1BKK | JO43NA | 55A | 57A |
| 0058 | RA4AOR | LN29LA | 57A | 59A |
| 0105 | RN6BN | KN95LC | 57A | 59A |
| 0111 | OH3XR | KP11TH | 59A | 59A |
| 0112 | SP6IWQ | JO80HK | 57A | 57A |
| 0114 | OK1TEH | JO70FB | 55A | 55A |
| 0116 | SP7HKK | JO91QI | 59A | 59A |
| 0126 | SP2MKO | JO93CD | 55A | 59A |
| 0146 | UA4RF | LO64DW | 57A | 57A |
| 0159 | RX9FB | LO88EA | 57A | 57A |
| 0211 | RW4WE | LO66PU | 59A | 57A |
| 0215 | LY3OD | KO24OR | 57A | 57A |
| 0218 | UA9FU | LO87DX | 59A | 59A |
| 0222 | RA9FMT | LO87BW | 59A | 59A |
| 0230 | RW4HW | LO43QM | 55A | 57A |
| 0237 | RW9FT | LO89TD | 55A | 55A |
| 0333 | RA3FO | KO86RI | 59A | 59A |
| 0504 | RX3AA | KO85PO | 59A | 59A |
| 0305 | UA1WCF | KO55JR | 59A | 59A |
| 0315 | RW3TI | LO16WG | 57A | 59A |
| 0332 | ES6DO | KO27WX | 57A | 59A |
| 0336 | LY2IC | KO14WW | 59A | 59A |
| 0338 | UA4UK | LO14MA | 59A | 59A |
| 0344 | UA9SL | LO71NS | 55A | 59A |
| 1013 | RA3MU | KO97XP | 57A | 57A |
| 1015 | OH3BYZ | KP21VU | 59A | 59A |
| 1019 | ES4EQ | KO39CE | 57A | 59A |
| 1042 | RA1TM | KO67PX | 55A | 56A |
| 1055 | RA1QA | KO99WF | 59A | 59A |
| 1110 | UA4NM | LO48UP | 58A | 57A |
| 1114 | RA3IM | KO56UM | 57A | 57A |

| | | | | |
|---|---|---|---|---|
| 1132 | RA1TT | KO68XJ | 58A | 59A |
| 1219 | UA1AMT | KP50ED | 57A | 59A |

Rig: 4 x 10-ele, GI7B. tnx for report, Peter

## ----------------- 432 MHz reports ----------------

### DL1SUN in JO53PN wkd on 432 MHz:

2004-11-07

| | | | | | | |
|---|---|---|---|---|---|---|
| 2334 | RA3LE | KO64AR | 55a | 51a | 40° | 1352km |

2004-11-08

| | | | | | | |
|---|---|---|---|---|---|---|
| 0003 | SP2QBQ | JO94FL | 55a | 55a | 50° | 479km |
| 0008 | G3XDY | JOØ2OB | 57a | 57a | 35° | 697km |
| 0020 | RW3PF | KO93CD | 55a | 55a | 45° | 1776km |

2004-11-09

| | | | | | | |
|---|---|---|---|---|---|---|
| 2010 | SK6W | JO78FT | 57a | 55a | 25° | 615km |
| 2014 | LA4YGA | JO48AE | 57a | 57a | 25° | 552km |
| 2015 | SK6QW | JO68WR | 55a | 55a | 25° | 596km |
| 2019 | SK6AL | JO67DX | 57a | 57a | 25° | 495km |
| 2035 | SMØFZH | JO99HI | 55a | 55a | 30° | 785km |
| 2040 | SM6X | JO67SU | 55a | 55a | 30° | 497km |
| 2044 | SM7EOI | JO86FP | 55a | 55a | 30° | 475km |
| 2046 | OZ1FF | JO45BO | 55a | 55a | 30° | 305km |
| 2048 | OZ1DLD/P | JO45SK | 55a | 559 | 45° | 237km |

tnx for report, Norbert

### LA0BY in JO59FW wkd on 432 MHz:

2004-11-09

| | | | | | | |
|---|---|---|---|---|---|---|
| 1949 | SM7EOI | JO86FP | 54A | 55A | 20 | 507km |
| 1951 | SK4BX | JO79OF | 55A | 55A | 20 | 279km |
| 2029 | SM0FZH | JO99HI | 59A | 57A | 20 | 463km |

Hrd several other stn, but difficult to work because of Doppler and weak sigs. **I noticed we lack a good Aurora beacon on this band. With such low activity the Aurora is not easy to notice.** Rig: IC-821H, PA 120W, 17-ele-yagi at 10 deg el.

### PA5DD in JO22IC wkd on 432 MHz:

2004-11-07

| | | | | | |
|---|---|---|---|---|---|
| 2259 | RA3LE | KO64AR | 55A | 55A | 1824km |

tnx for report, Uffe

### RW3PF in KO93CD wkd on 432 MHz:

2004-11-08

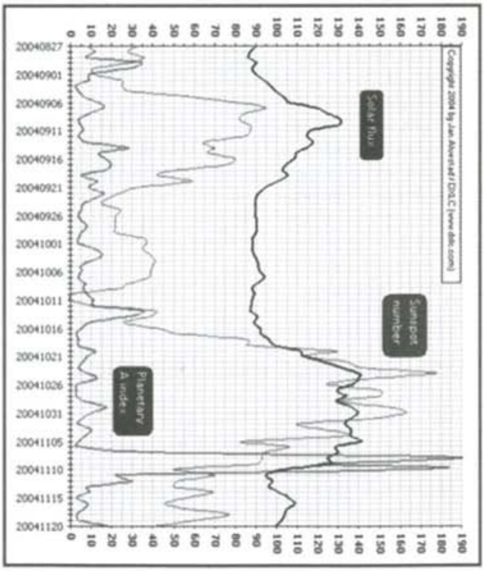
| | | | | | |
|---|---|---|---|---|---|
| 0024 | DL1SUN | JO53PN | 55A | 55A | 1782km |

Rig: 4 x 24-ele, GI7B. tnx for report, Peter

### SK4MPI, JP70nj, Beacon Reports via Aurora on 2m:

| Date | Time | from area |
|---|---|---|
| 21.8. | 2155 | SM2 (KP15) |
| 30.8. | 1220-2200 | OH4, OH6, LA (JO59), DL (JO62) |
| 31.8. | 1400-1630 | LA(JP33), OH6 (KP02) |
| | 2010 | OH1 (KP00) |
| 5.9. | 1700-1720 | SM2 (KP15), OH1 |
| 6.9. | 1640-1730 | OH6 (KP02), OH7 (KP53), ES |
| 14.9. | 1300 | OH6 (KP02) |
| | 1540 / 1930 | SM2 (KP15) |
| 16.9. | 1700 | OH6 (KP02) |
| | +1930 | SM2 (KP15) |
| 17.9. | 1350 | OH6 (KP0) |
| | 2150-2230 | SM2 (KP15), UA1 (KO59) |
| 22.9. | 1415-1645 | DL (JO53), OH6 (KP02),UA1 (KO59) |
| 27.9. | 1750-1800 | OH6 (KP02), UA1 (KO59) |
| 2.10. | 1520-1600 | SM2 (KP15), UA1 (KO59) |
| 3.10. | 1355-1800 | SM2 (KP15), DL (JO43),OH6 (KP02) |
| 4.10. | 1700 | SM2 (KP15) |
| 5.10. | 1935 | SM2 (KP04) |
| 8.10. | 1520-1610 | SM2 (KP15), OH1 (KP00) |
| 13.10. | 1355-1640 | DL (JO53), UA1 (KO59), GM (IO89) |
| 14.10. | 1225-1935 | SM2 (KP15), OH6 (KP02), YL |
| 20.10. | 1440-1600 | DL (JO53), UA1, SM3 (JP82) |
| 24.10. | 1735-1805 | SM2 (KP15), UA1 (KP59) |
| 29.10. | 1705-1930 | UA1 (KP59), |
| 31.10. | 1320 | SM2 (KP15) |
| 2.11. | 1525 | OH8 |
| 3.11. | 2050-2130 | G (IO92), SP2 (JO93), PA (JO33) |
| 4.11. | 1815 | UA1 (KO59) |
| 7.11. | 1610-1740 | DL (JO43), OH1 (KP00), G (IO92) |
| | 2050-2400 | G (IO92), PA (JO33), SP (JO92)... |
| 8.11. | 0000-1300 | OH6 (KP02), PA (JO33), UA1(KP59) |
| | 2100-2400 | PA (JO22), GM (IO87), DL (JO33) |
| 9.11. | 0000-0500 | OH6 (KP02), G (IO92)... |
| | 1140-2400 | OZ (JO47), DL, PA, SP, UA1... |
| 10.11. | 0440-1730 | OH6 (KP06), UA1 (KP68), OZ(JO47) |
| 12.11. | 1855-2100 | SM2 (KP15), OH7 (KP53) |
| 16.11. | 1750 | SM2 (KP15) |
| 20.11. | 1250-1850 | SM2 (KP15), UA1 (KO59),DL (JO53) |
| 21.11. | 1210-1300 | SM2 (KP15), LA (JP33), OH6 (KP02) |
| | 2005 | SM2 (KP15) |
| 24.11. | 2045-2200 | SM2 (KP15) |
| 25.11. | 1350 | OH4 (KP21) |

+ = Report of SK2VHF JP94 * = LA2VHF JP53




**Geomagnetic activity 27.8. - 21.11.2004**

Note the Planetary A index exceeding 180 twice (!) - ed.

# More Aurora QSOs on 70cm are possible

*Norbert Richter, DL1SUN*

In the last big Auroras of October and November 2003 it was possible to work very big distances up to 2000km on 2m and 70cm. I'm shure that we all could have made a lot more QSOs.

In the last more than 30 years I have often worked Aurora on 2m. Since the end of the 80's even tried a little to work on 70cm. After the changes in Eastern Germany I have got an IC402 and made ~100W at a 7 Lamda DL6WU homemade yagi. I started to work Aurora successfully on 70cm too and till today I took part in more than 25 Auroras where it was possible to work on this band too and made more than 200 QSOs. My DX radius in Aurora is ~1300km to north, ~1800km to east, ~1050km to south and ~1350km to west.

On 2m my DX radius in Aurora is ~1300km to north, ~2000km to east, ~1100km to south and ~1350km to west.

More is possible to north- and southwestern areas but there is the Atlantic Ocean. 1460km to northwest (Faroer Islands) should be possible into these directions, too.

Even some unusual Aurora QSOs are possible and may be observed more often as expected (1). In November 2003 again some German stations worked via Aurora on 2m SM2CEW over 1850km! Now this happened again on July 27th 2004. And pay attention on 2m after an Aurora because something else is possible. On August 25, 1987 after a nice but unspectacular Aurora two hours later my RX was still on 144.050 MHz. Suddenly I heard a machine gun in CW with RST 599+++ (really without any scatter). It took a little time to understand: UA1ZCL from KP78TX with his EME array called CQ. I was very happy to work him and so did a lot of us.

In October 2003 on 2m sometimes we heard the russian stations one hour with Tropo and Aurora tone, but we had no Tropo and the duration were to long for MS.

November 10th 2004 with the 2m Sporadic-E after several days with Aurora is another remarkable event. (See p. 79)

In 1991 on 70cm I was surprised, because after my CQ I heard stations calling me very wide away down from my CQ QRG. Very much more than I 've known from 2m before. And the RIT adjustment was not enough to hear the station with an optimum of audio. So I changed my QRG ~1khz down and the other stations used their RIT or 2nd VFO or had a digital scale and changed QRG between RX and TX, but we made QSOs. Today I'm shure that method made QSOs with QRP stations or weak DX stations impossible, because they were out of my RIT and to weak to hear them on the side of my filter. In 1996 when I changed my transceiver on 70cm to another one with a 2nd VFO I started to work another QSO procedure.

I talked with some friends (wellknown DX'ers) in Southern Germany about it, doppler and offset and because they worked first time Aurora on 70cm they didn't know about it and so I'm shure do even a lot of us.

Volker Grassmann, DF5AI wrote about it and you will find a lot of very good articles on his webpage especially "Doppler effect in auroral Backscatter" (1).

Here are some of my expieriences I made in practice in my area in JO53PN and it is not only important for 70cm. Everybody should check these procedures at his QTH to make his own plan to be more successful in Aurora (5). Note: The possibilities are not the same from different QTH (1).

## Equipment

I made my first QSOs on 2m with 8W and 6el yagi and on 70cm had 25W and 10el yagi. Later, some years ago as a QRO man I played with 700W and 10m long yagis.

Today I'm using on 2m 2x 3WL yagis and 100W and on 70cm 2x 9WL yagis and 100W. More power and more gain helps a lot but pay attention and read about QTF and elevation. In November 2003 on 70cm I had a QSO with some QRP stations via Aurora. The higlight was OZ2M. He has had 1W at a 9el yagi indoor.

## Mode

CW works very good on 2m and 70cm, but I even worked a lot of Aurora in SSB on 2m. SSB should be also possible on 70cm but I think the partners don't know the procedure with the doppler and the possibility of the extreme bad readability of a signal which depends on both QTF's.

It should be possible to work in FM like we know from 3cm rainscatter. On 3cm RS there is no scatter in the audio of a FM signal. I didn't try and don't want to push FM activity.

But for no-CW operators it's in 3cm RS a possibility to make a QSO, because SSB sometimes is not readable during very strong scatter wich depends on both QTFs.

## QTF and Elevation

In all the years on 2m in my area I observed the maximum of SK4MPI between 330 to 030 deg, sometimes there were two maximums. I worked stations from the same country with the maximum of strength of signal in different directions between 270 to 090 deg. It is not possible to say: With this QTF I will work this country, because e.g. it could be possible to work I and S5-stations with ~330deg as I did late in the evening in November 2003. I worked this area before only via eastern QTFs ~60deg.

The only problem is: actually the location of special moving scatter areas, their dimensions, homogenity and density and the QTF of both stations.

The available pictures of satellites on the internet are not quickly enough refreshed and I think the Beam Finder Analysis software helps a lot to understand but needs some more input especially of unusual QSOs to get more accuracy (1).

If I switched over during an opening from 2m to 70cm the QTFs always were correspondend with 2m in that special opening and time and if the antennas had been optimized on 2m just before by both stations.

On 2m in major Auroras (M, X-flare) the audibility of SK4MPI or other scandinavian stations decreased (in northern direc-

tions) but I was able to work hungarian and italian stations on 2m from 60 to 90deg or on 70cm southern german stations.
To understand this it is very interesting to have a look at (1) and the picture of the USAF Defense Metrological Sat F15 OLS Visible Imagery from the opening in October 2003 (4).

Owners of vertical stacked longyagis should use elevation as I know from DJ4TC in JO63PN. He elevateed often up to 40deg. He was able to make an Aurora DX QSO which was impossible without (even he did so on 2m).
Stations nearby the scatter areas with low beamwidth of the antenna have to change QTF/ elevation more and carefully to find the maximum of the partner or to illuminate the right scatter area as a far station or ones with wide beamwidth of the antenna. Elevation could even make it possible to illuminate higher located Aurora areas than expected (>100km).

Since a couple of years I have no elevation system but all my antennas from 2m to 3cm are fixed elevated. That's not only good to reduce EMC and to have friendly neighbours it is very good for all propagation modes but you have to do it carefully. On 2m and 70cm 5 degrees is quite good. On 3cm two washers put under the lower fixation of the antenna clamp, that will be enough to make 1,5 deg (an old pocket computer with trigonometric functions did a good job).

## Doppler and Offset

The doppler in Aurora for the observer is the frequency difference between the Tropo and Aurora signal. All what Volker, DF5AI, wrote about helps to understand this phenomenon in practice (1), (2).
Even by my experiences:
the doppler could be positive and negative
it seems the doppler is not always constant
it seems the doppler is much bigger if the aurora is "bigger".

To get the actual doppler, look for some stations with Tropo and Aurora signals in an opening. But don't be suprised because it could be different in a number of Hz and in sign with the same QSO partner and in the same opening.
Why? The same reasons as before have influence: actually the location of special moving scatter areas, their dimensions, homogenity and density and the QTFs of both stations. In major Aurora it is possible to hear a station with positive and negative doppler. In practice on 2m the doppler is from time to time some hundred Hz up to 1kHz but on 70cm up to 3kHz.

The offset is the result of "wrong" QRG of the station B in relation to the "Tropo" CQ QRG of station A and only the CQ calling station A get it or an observer. Offset is twice doppler. That means the offset could be on 2m up to 2kHz and on 70cm up to 6kHz in practice.

For instance: On 70cm RA3LE is calling cq on 432.060MHz.
DL1SUZ will hear him due to a negative doppler of 2kHz on 432.058 and without RIT or 2nd VFO he will call him on 432.058 MHz . So RA3LE will hear DL1SUZ on 432.056 MHz if he use a RIT or a 2nd VFO.

That means the doppler is 2 kHz, and the offset, RA3LE or an observer will get, is 4 kHz.
If both stations try it without 2nd VFO or RIT, they will step always 4 KHz over the band, because both stations will change own TX QRG to QRG where the other is calling.

I did some crazy QSOs like this with some OM, who didn't know about this problem. If you miss a station after it calls you, look for it some kHz away... (use the 2nd VFO) or the QSO will fail.

This knowledge of doppler and offset is also very important to be successful in pile ups or to reduce QRM for other stations.
During the major Aurora in the end of October 2003 I called for a long time CQ on 2m and all stations came back +600Hz away from my Tropo QRG. I used the RIT and fron time to time checked with the 2nd VFO. Later on 70cm all stations came back -4 kHz. I used my 2nd VFO.
During the major Aurora in November 2003 I called a long time CQ on 2m and with the same situation as before but all came back +400Hz away from my Tropo QRG. I used the RIT and from time to time checked with the 2nd VFO. Later on 70cm all stations came back +2 kHz. I used my 2nd VFO.
It seemed that the doppler was constant for a lot of hours in Hz and sign. I worked EI5FK on 70cm with positiv doppler and I heard just before DL1EJA in QSO with the same QTF ~300deg with both dopplers! After the QSO I turned my antenna and heard SK4MPI on 2m with negative doppler in western QTF and with positive doppler in eastern QTF.

Often I have observed CQ calling DX stations and it seemed that they didn't work with a 2nd VFO or RIT. This could be not the only problem but even again: actually the location of special moving scatter areas, their dimensions, homogenity and density, the QTF of both stations and how the doppler was observed by the DX station in previous QSOs. May be there has been an opposite doppler in QSOs before.

It could be more or no much difference in QRG, too. All as I wrote above depend on different ears of the operators. One likes a deep sound of Aurora the other a higher (like tropo CW 400Hz or 800Hz or in SSB the middle of audio bandwidth much deeper or higher).
And there could be a problem with pile up's, too. DX stations could be called from 10 stations at the same time.
Because the signals are very broad, to be successfull it could be a good idea to call 1..2kHz away from the others...

## Note:

A QRO-station makes a very broad and strong signal and does not need this accuracy of QRG management all the time. The - signal like breath of a large locomotive - will be even heard some kHz away.

On 23cm Aurora is possible, but the very small vertical and horizontal beamwidths of our antennas don't allow to find the maximum easily. I'm shure it needs elevation.
A large offset could be in practice more than 25kHz. The CQ

calling station should search in minimum 25 kHz up and down the QRG (three times the 70cm doppler).

### Note:

Rainscatter the so called Aurora of the "little man":
A lot of friends thought rainscatter QSOs on 23cm are impossible. But I did it sometimes, switched from 3cm over all bands down to 23cm. It works especially good in forwardscatter with very clear audio. 23cm is a bad weather band too. In big RS the "only" 23cm stations should try.

I'm sure often there is a difference between the theoretical and measurable doppler by EISCAT and the real doppler in Amateur Radio in all cases I wrote.
So what should we do in advance to get more 70cm QSOs during Aurora?

### Sked from 2m to 70cm:

both stations should be shure that the 2m and 70cm antennas of their own systems pointing exactly (parallel). Both stations turn the antenna on 2m to the maximum of signal strengh of the partner and just switch over to 70cm.

Note: 10 deg antenna off are 3db in minimum. Some rotator controllers are not linear. Test it with Tropo beacons on both bands all 360deg.

### CQ calling stations:

Search carefully in a range of 6kHz up and down for answering stations (on 2m 2 kHz).
1. you will get much more success with a 2nd VFO to work answering QRP and weak DX stations.
2. help the calling stations: spot in the DX cluster TX QRG, QTF and offset RX.

## *S51ZO 432.060 59A/050 JN86/JO53 offset -4*

Means that you have called CQ on 432.060 in QTF 50deg and worked S51ZO. You heard him on 432.056 because you used 2nd VFO. The other you calling station has to call on 432.058 (offset is twice doppler).
The offset information is even good to help other stations to call CQ more than 6KHz away from your QRG
3. change QTF in steps of 10deg from time to time to make so called "unusual QSOs" possible (on 2m 20deg)

### Calling stations

1. should try it sometimes at first without any RIT and 2nd VFO
2. if you are not successful observe the DX station, DX cluster and look for the partners to make your own plan
3. if you are not successful to get attention transmit 1 to 2 KHz away, up or down in opposite to the observed doppler that you should know now (on 2m 0,5 to 1kHz ).
4. if you are not successful try it again not in opposite to the observed doppler.
5. if you are successful let other stations know: spot in the DX cluster RX QRG, QTF and split TX

## *RA3LE 432.058 59A/060 KO64/JO53*

Means that you have worked CQ calling RA3LE in QTF 60deg, heard him on 432.058 and you have called him on 432.058 whithout RIT and 2. VFO

## *RA3LE 432.058 59A/060 KO64/JO53 split +1*

Means that you have worked CQ calling RA3LE in QTF 60deg, heard him on 432.058 and you have called him due QRM etc. on 432.059 whith RIT or 2nd VFO
6. change QTF in steps of 10deg from time to time to make unusual QSOs possible (on 2m 20 deg)

To achieve more Aurora QSOs on 70cm the increasing activity helps because in Eastern Europa more equipment is available. Further more some good tools help like cluster, internet with lot of information and online magnetometers, SAM, SOHO, CANOPUS etc. and may be a little what I wrote here, too.

Norbert, DL1SUN in JO53PN

### References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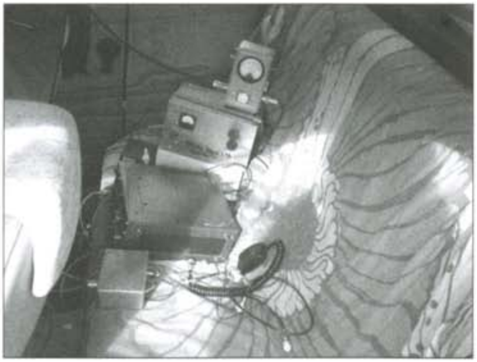

**SM2CEW/p car shack in KP06SA on Aug 12th 2004**

# New Products

**Editor: Joachim Kraft, DL8HCZ**

## Neu bei UKW-Berichte:

### Antennen-Katalog 2004


Die überarbeitete Version des „Antennen"-Kataloges des Spezial-Versenders UKW-Berichte ist in der Ausgabe 2004 erschienen. Nach Herstellern sortiert findet man Stations- und Richtantennen von den Herstellern: M²-USA; FLEXAYAGI; TONNA-F9FT; KONNI; PROCOM-Denmark und anderen. Neben Mikrowellen - Komponenten, Mobilantennen, Geräte-Aufsteckantennen findet man auch Breitband- und logarithmisch-periodische Antennen jeweils mit Daten und Bildern. Der neue Katalog kann kostenlos angefordert werden bei:

UKW-Berichte, Fachversand für Funkzubehör, Eberhard L. Smolka, Jahnstr. 7, D-91083 Baiersdorf, Tel. +49 9133-77980, Fax +49 9133 779833 eMail: info@ukwberichte.com

www.ukw-berichte.de

(Engl.: The new Antenna Catalogue 2004 is available for free from UKW-Berichte. The catalogue contains all kind of antennas from different manufacturers).

## Neu von Hilberling

### KW-/UKW-Transceiver PT-8000A

Die Rendsburger Firma Hilberling GmbH, die von OM Hans Hilberling, DK7LG, geleitet wird, hat für das Jahr 2005 die Serienfertigung eines neuen Amateurfunktransceivers angekündigt. Das Gerät trägt die Bezeichnung PT-8000A und befindet sich zur Zeit noch in der Entwicklung. Der Transceiver umfasst neben den Kurzwellenbändern auch den Bereich 50-54 MHz (6m) und 144-148 MHz (2m). Genauere Details zum Transceiver werden nach Abschluss der Entwicklung veröffentlicht. Zumindest auf KW soll das Gerät 600 Watt Output machen.

Info: Hilberling GmbH, Kieler Straße 53, 24768 Rendsburg
Tel.: (04331) 27286, Fax 27287, info@hilberling.de

(Engl.: North German manufacturer Hilberling has announced a new amateur radio transceiver for the year 2005. The PT-800A contains the HF bands plus 6m and 2m. On HF the rig will have 600 W RF output. More details later on.)

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## AMLD-1 und -2 SMD-Mischer für großen Dynamikbereich von Synergy

Auf der diesjährigen European Microwave Week in Amsterdam stellte die Firma Synergy Microwave Inc. zwei neue Mischermodelle vor, die sich durch Ihren hohen IIP3 von über +40dBm auszeichnen. Die neuen, aktiven FET-Mischer sind besonders für Hochpegel-Anwendungen im VHF-Bereich geeignet. Das Modell AMLD-2 ist für eine feste ZF von 62MHz ausgelegt, der Nutzsignalbereich läuft von 0,1MHz bis 32MHz (LO=62-94MHz). Der AMLD-2 arbeitet mit einem LO-Pegel von 0dBm, kann aber von -4dBm bis +10dBm betrieben werden. Mit einem Intercept-Punkt dritter Ordnung von +44dBm (typisch, min. +40dBm) und einem 1dB-Kompressions-punkt von +24dBm eignet sich dieses Modell für hohe Dynamikanforderungen. Das Modell AMLD-1 ist für einen LO-Pegel von +10dBm und eine Zwischenfrequenz von 40MHz optimiert (RF=0,1MHz-30MHz, LO=40MHz-70MHz) und bietet ebenso ein IIP3 von mindestens +40dBm. Beide Modelle überzeugen durch sehr gute Isolationswerte von 25db bis 40dB (selbstverständlich sind auch kundenspezifische Ausführungen möglich). Datenblätter zu den beiden Modellen sind von TSS (Tel. +49 7309 96750, Fax 967520, info@tssd.com) erhältlich.

## USB Switch Controller von TAMS für Agilent N1810 Serie

Für die populäre N1810 Schalterserie von Agilent bietet die Firma TAMS Inc. einen per USB-Schnittstelle steuerbaren Controller an. Damit gelingt es, auch komplexe Aufgaben bequem per Software zu programmieren. Unterstützt werden sowohl USB 2.0 als auch USB 1.1 Anbindung, der Controller macht dabei von der höheren Geschwindigkeit von USB 2.0 Gebrauch. Mit Hilfe von Hochsprachen (Microsoft C, Visual Basic .NET) oder graphischen Programmierumgebungen (HP VEE oder LabView) können auch komplexe Schaltabläufe programmiert werden. Readback der Schalterstellung wird natürlich unterstützt, so dass das Steuerprogramm flexibel auf verschiedene Zustände reagieren kann. Der TAMS 1887 Controller ist als 19-Zoll-Rack ausgeführt und kann bis zu 12 Switches der Modelle N1810, N1811 und N1812 unabhängig steuern, bei komplexeren Aufgaben können weitere Controller unabhängig eingesetzt werden. Die Verbindung zum jeweiligen Switch erfolgt über D-Sub-9-Kabel. Sowohl die 5Volt als auch die 24Volt-Ausführung der Switches wird unterstützt. Informationen erhalten Sie bei TSS, Postfach 1261, D-89259 Weißenhorn (Tel.: +49 7309 96750, info@tssd.com)

# News & Comments

Editor: Joachim Kraft, DL8HCZ
info@DUBUS.de

## Beacon News

### CT1ART improved

The CT1ART beacon on 144.406 MHz has got a new TX and has a clear CW signal now. Loc. IM67ah.

### DB0ANU Info

DB0ANU, JN59HH, 564 m a.s.l. is qrv on the following QRGs now: 3400.810 MHz with 10w and 60cm dish to 330 deg.
5769.810 MHz with 10w and slot (omni),
10368.810 MHz with 10w and slot (omni), (Edi, DL6NCO)

### DB0FAI QRT

DB0FAI, 144.490 MHz, is temp. QRT since October 4th for maintainance.

### DB0NCO qrv on 24 GHz

DB0NCO ist qrv on 24048.905 MHz from JN59NB. 0.8 W and slot (omni). 746 m a.sl.

### DB0OS beacon info

DB0OS is qrv now from JO40CW on the new QRG **432,445** MHz with 0,3W slot 270° 730m a.s.l. Originally 432.417 MHz was proposed. The beacon is also qrv on **10.368,945** MHz since Sept. 23rd with 2W, 12 x slot, 270°, 780m a.s.l. The QRGs 1296.945 and 2320.945 MHz are also still actice from 730 m a.sl.

### F5TND/B 6m beacon

F5TND runs a beacon on 50.300 MHz from his shack when he is not on the band himself. Loc.: IN96OL, 10W, 7 ele., SW.

### I2M call change

I2M has got the new callsign IQ2CY/B. The beacon is still running on 144.419 MHz from JN55AD.

### SK7MHL on new 24 GHz QRG

SK7MHL is qrv on 24048.970 MHz since October 19th from JO65OR with 1 W ERP, omni, 100 m a.s.l.

### F5XAR qrv again

The French transatlantic beacon F5XAR is qrv again on 144.405 MHz. Loc. IN87KW.

### 2m Beacon on D4

There is a good chance that we will have a 2m beacon on Cape Verde Islands (D44, Loc. HK76) in the near future. Tim, G4LOH, plans to organize everything. More info to follow.

### JW5SIX qrv again

JW5SIX is qrv again since October from Hopen island, KQ26MM, on 50.0455 MHz

### LU1DMA/B qrv

LU1DMA/B is qrv on 50.069 MHz from GF14EX with 10w into a turnstile antenna. LU1DMA confimed the locator to DUBUS.

### LU7YS/B qrv again

LU7YS/B is qrv again from FF49 now on 50.086 MHz.

### N3LL/B qrv again

N3LL/B is qrv again since October from EN90WI on 50.0675.

### DF0ANN on new 70cm QRG

DF0ANN is qrv now on the new 70cm QRG 432,465 MHz.

### VE2YAT/B new 6m beacon

VE2YAT/B is a new beacon on 50.025 MHz, Loc.: FO40SI, 3 Watt, 2 ele quad.

### VE9BEA/B new 6m beacon

VE9BEA/B is a new beacon on 50.024 MHz. Loc. FN66.

### F1AVY Laser Beacon QRV

A permanent laser beacon is running now from F1AVY`s QTH in JN25IV. The output power is 10 mW on 780 nm (laser printer diode). The laser is beamed on the polar star (North and about 45° elevation at Lyon).
The looped signal is "CQ laser from F1AVY JN25IV" in "JASON" code from PC audio card (Jason: Alberto I2PHD program). The center Jason VLF carrier signal frequency is 75Hz. The data rate is less than three characters / minute and "Jason" can extract signal - 15 dB / noise in perfect conditions at 5 km with low clouds, decoding limit seems at - 25 dB with some coherent characters on the screen at 20 km in the best conditions.
Some cloud scattering signals were received from more than 20km away with a 25cm mirror, OSD1-5T PIN photodiode, K3PGP receiver and FFTDSP processing.
The echoes seem the best from low stratocumulus base (ASL about 1200 m) just after rain.

## Expeditions, Stations, OP`s

### 7X0AD qrv 2m FSK-MS

7X0AD (JM16) is qrv now also via FSK-MS on 2m since the beginning of November.

### IW0UEI/MM Expedition plans to JN30, JN31, JM39 and JM38

IW0UEI is planning already for the summer as follows: Perseids period is sure at 90% for 3 days in JN31XA and 3 days in JN30XN, conditions 100W and 7 ele (home made long 1,1wl abt); for the last days in August 2005 some (2 or 3) days in JM39XA and JM38XX are planned. For the moment it is only an idea but Tony will have more news in May 2005.

## OJ0YC expedition delayed

The originally for September 2004 planned OJ0YC-Expedition was cancelled and is now planned for the end of July in 2005. Ops are OZ1AA, OH6GDX, SM3WMV and KU5B. They will be qrv on 6m and 2m incl. FSK-MS. May be also 70cm.

## Albania

ZA/IK0OKY is qrv until August 2006 on 6m, 2m and 70cm from JN91WH. Rig.: FT100D, dipole for 6m, 5 ele for 2m and 10 ele for 70cm. QSL via IW0BET.

## G0KZG/MM 2005

Andy Adams, G0KZG/MM, plans to be qrv again on 2m and 6m in 2005. Details will follow later on.

## JN81 qrv 2m MS

IW7BEC is qrv on 2m via CW and FSK-MS from JN81GF. Rig: 100w and 14 dBD Yagi.

## JM89 qrv 2m MS

Since September I8TUS is qrv on 2m FSK MS from IM89DE.

## FM5JC qrv

F5JKK is qrv until August 2007 from Martinique as FM5JC. Locator is FK94LO. Eric is already qrv on 6m. Later on he will put up 2m station for DX operation.

## EA1AK/7 now EA7TN

EA1AK/7 (IM66) has got the new call EA7TN. He is on 2m.

## IH9YMC on 2m

IH9YMC a resident on Pantelleria (IM56) is qrv on 2m and interested in Meteor-Scatter.

## Mazedonia - KN01 qrv

HA1CA is qrv now for 2 years as Z38C. He will soon erect stations for 2m and 70cm. QSL via HA1RS.

## Z32UC now Z35Z

Z32UC, Dime, has got the new call Z35Z. He is in KN02 and active via 2m MS.

## CY9 - St. Paul 2005

VY2SS (CY9SS) and others will be qrv from June 7th to around July 7th 2005 on 6+ 2m with good stations. Loc. FN97.

## SV on 2m EME

SV6DBL is qrv on 2m EME with 4 x 17 ele and 1.3 KW.Locator is KM09KO.

## EY8MM on EME

EY8MM plans to become qrv on 2m EME with 2 yagis and 200w. May be he will try 70cm EME also later on.

## 5T/6W Expedition 2005

DL8YHR plans to be active from Mauretania (5T) and Senegal (6W) during summer 2005 (June/July). He will be active on 6m for Es and on 2m (and 70cm) via EME.

## 9Z on 2m EME

9Z4BM (Trinidad and Tobago) plans to become active via 2m EME in WSJT with 180w and one yagi.

## D4, PJ2, PJ7, FM, FS on 2m EME

ON4IQ plans to activate these countries until July 2005 on 2m via FSK-EME (17 Ele. + 3CX800). More countries to follow. He will be active on 6m also (but no EME).

## RW1ZC/MM qrv again

Alex, RW1ZC/MM, finally was still on hold after a long delay in the end of November in Kaliningrad (UA2, KO04). He was supposed to head for North Africa and work /MM for several months. Alex was qrv in the meantime on 2m FSK-MS from KO04 for several weeks. Tropo-QRG always 144.300 MHz. Rig 100w + 8 ele.

## VA3LK SK

Larry Kayser, VA3LK/WA3ZIA, of Westport, Ontario, Canada, died unexpectedly October 5. He was 64. Kayser was widely known throughout the Amateur Radio community for his technical expertise as well as his operating skill and accomplishments. In February 2001, Kayser and Laurie Mayhead, G3AQC, made ham radio history by completing the first two-way transatlantic Amateur Radio exchange on 136 kHz. His latest project was the planning of a serious attempt of a 144 MHz transatlantic QSO.

## DL1SDN SK

Dieter Stumpp, DL1SDN, became a silent key in October 2004. He was 43 years old. He was very active on 2m Meteor Scatter from the 1980's from JN48. In the past years he was very active on HF collecting DXCC countries.

## F6BSJ SK

F6BSJ Silent Key: Jean-Marie Maublanc, F6BSJ, died on April 24th 2004 at the age of 56 years after fighting against cancer. He has been very active from the "CG" square on 2m including EME and Meteor Scatter. In the recent years his main interests were DX on 10 GHz and on 6m.

# News

## SQ Update

A revised version of the QRA database program SQ, described in DUBUS 3/04, is now available. Version 2.1 fixes problems with the import and export of ADIF format files.
A new exe file (for existing installations) and a complete install package (for new users) are available for free download from the author's website: www.marsport.demon.co.uk/sq/sq.htm
Roger Blackwell G4PMK, g4pmk@marsport.demon.co.uk

## Laser Record

On April 21st, 2004 at 19 UTC DB6NT had a contact of about 106 km with DG0EB with laser 660 nm (red) with 56...59 signals (QSB) in AM mode.

DG0EB / DG8EB were on the Fichtelberg (JO60LK) and DB6NT / DB2NP were on the Wetzstein (JO50RK). Output power about 5mW to a 120 mm lens. The previous record was held with 104 km by a French team.

## VHF-DATABASE of the VHF-DX-Group DL-West, Vers. 2.10 10/2004

A year is over again and I am able to spread around the new version of the VHF-DATABASE (2.10 10/2004) to privat users as also to all interest DX-cluster sysops (dxc-types: CLX, SPIDER, AK1A or DXNet). Every PRIVATE-USER can get his own VHF-DATABASE. The DATABASE is available for a donation of 5 EURO or 5 Dollar (if possible please stamps with small values or a banknote). Please pass the donation to: VHF-DX-Group DL-West, c/o DL8EBW, G. Juenkersfeld, Gustav-Freytag-Str. 1, 42327 Wuppertal / Germany together with your e-mail address, where I am able to transfer the DATABASE-files to you (mailbox minimum cap. have to be 2MB!). The USER-DATABASE files can be reloaded into standard spreadsheet programs as well as into the VQLog (EA6VQ Logbookprogram), the contest programs OHTest (written by OH6HFX) and TUCNAK (written by OK1ZIA)! Also DG0KW, Klaus, has written a VIEWER for it. All links to above programs are available at http:\\www.dl8ebw.de

Every PRIVATE USER will be registered. So I am able to give around news about the DATABASE as soon as there is any change or update! As I said, an update will be necessary from time to time - so please do send us your updates and also the dates of your ham-friends! Specialy the call / locator part have to be updated very often!!! Hope you will enjoy these new VHF-DATABASE and it will help a bit in the day to day dx work... 73 de DL8EBW, Guy, guy@dl8ebw.de

## MWS 2005

### M[ost] W[anted] 50 + 144 MHz S[quares] + DXCCs Europe

Data survey for the 50 and 144 MHz M[ost] W[anted] S[quares] as well as DXCC countries europe 2005, by Alex IW0GPN, Guido DL8EBW and Chris PA2CHR together with the German magazine "FUNK-TELEGRAMM".

Since 1993 we were running this survey and it is quite nice to see year by year that a lot of vhf-dx-peditioners use and check it for finding a good and wanted square for their expeditions. Again this year we will run this survey.

Please check the following rules and send us your information. Start is on Dec. 19th 2004 and deadline is March 5th 2005. So we will be able to spread out the results in the beginning of April 2005. So everybody will have a good chance to find a recommended square to activate in the next season. Here the rules:

Everybody can send in as many most wanted squares as he wants for one callsign. Of course it will be necessary that the wanted squares have to be in a reachable area from the senders QTH. We recommend:

| | | |
|---|---|---|
| TROPO | 50 MHz: 500 km; | 144 MHz: 800 km |
| WET-SQR | 50 MHz: 500 km; | 144 MHz: 800 km |
| MS/ES | 50 MHz: 3500 km; | 144 MHz: 2000 km |
| DXCC | 50 MHz: 3500 km ; | 144 MHz: 2500 km |

Example: if you are qrv on 144 MHz tropo you might send a list of squares in range of 800 km around your QTH, if you qrv also MS/ES you might send squares in range of 2000 km. Also all "wet" squares are possible to activate but shall be within your tropo range. It is your decision if you count only "not worked square", or if you add the squares pending on confirmation. The prefered method to send your entry in is through a MWD formated file, that can be made from at least several log-programs. If your logbook program does not support the MWD format (created by Bo, OZ2M), or you do not use a PC based logbook program, you could alternatively submit your entry as an ANSI file (a simple textfile with name: "call".log - you also can request your last years file to change it, if you have been taking part in past year's survey): E.g.

dl8ebw.log (Filename)

[Squares] IO79 IO96 IO98 IP04 IP14 JP91 KN47 KO77
[DXCCs] 1A SV/A [End of file]

Please send in your entry for 2005 to:

VHF-DX-Gruppe DL-West c/o DL8EBW, G. Juenkersfeld
via snailmail: Gustav-Freytag-Str. 1, D-42327 Wuppertal
via AX25 BBS: DL8EBW@DB0FHN.#BAY.DEU.EU
via AX25 cluster: DBØSUE-7
via eMail: mws@dl8ebw.de (for 144MHz) or
via eMail: iw0gpn@tiscali.it (for 50MHz)
via eMail: c.ploeger@planet.nl (for DXCCZs)

The results of the inquiry will be published in FUNK-TELEGRAMM, DUBUS, PR and in different VHF-reflector pages on the internet in the begin of april 2005.

Thanks very much to all for the input in advance.

73 de DL8EBW, Guy, c/o VHF-DX-Group DL-West

(Bo, OZ2M, will start a Most Wanted VUSHF DX survey 2005 for 70 MHz, 432 MHz and up on March, 1st 2005 on the web: www.qsl.net/oz2m/ham)

## News from DL

In the meantime some modifications to the expected changes of the German amateur radio law were made. Now we may expect a **secondary allocation of 50.080 to 51.000 MHz** for amateur radio in the future.

Also some changes for some allocations in the higher GHz range are expected:

The secondary allocation from **119.98 – 120.02 GHz will be shifted to 122.25 – 123.00 GHz.**

The **145 GHz band (142 – 149 GHz, primary) will be deleted and a new band from 134 – 141 GHz** will be allocated.

Also **amateur radio via Laser** will be possible in the future again. Allthough all frequencies above 275 GHz generally are not allocated it is officially mentioned that the frequencies 444 – 453 GHz, 510 – 546 GHz, 711 – 730 GHz, 909 – 926 GHz, 945 – 951 GHz and all QRGs above 956 GHz can be used by amateur radio stations. This means that Laser-QSOs will be official amateur radio QSOs aftere the new regulations are adopted. Bad news is that it was not possible to remove from the draft that **all beacons above 30 MHz will be limited to 15 W ERP** in the future!

## Threat for the 23cm-band!?

A surprising information comes from Ireland (EI) where 1300 to 1304 MHz was released on a secondary base on Oct. 31st for FM repeater use. Is this another indication for the 23-cm-band changes which we have to expect due to Galileo? – There are rumours now that the E6-channel (1240-1300 MHz) that so far has been reserved for commercial use (Galileo "PRS") is wanted by the military!! In DL several 23cm beacons and repeaters had to close down in 2003/2004 because the military did not give permission any more. Coincidence?

## 50 Years of EME

On July 24th 1954 for the first time an EME voice reception took place on VHF. It was the voice from James Trexler a NAVY engeneer and chief of the "Operation Moon Bounce" that was the first reflected off the moon and received back again successfully on earth. Already in the years before 1954 the NAVY sent radar signals to the moon and was surprised about the strength of the reflections. The results inspired the NAVY for a possible use of the moon as a passive repeater. After the success in 1954 a complete system for voice, teletype and picture transmission via the moon was developed. This was used by the Pentogon for worldwide communication with the U.S. troups with the advantange of being quite independent from ionospheric short wave propagation. Later when communication via satellites became available this replaced the moon system. – The first ever EME reception of amateur radio signals took place on July 3rd 1965 when KP4 hams used the Arecibo telescope on 432 MHz. So we will have a 40 year anniversary next year. – Some sources say that in January 1953 Ross Bateman, W4AO, and Bill Smith, W3GKP were working on the 2-meter band when they heard their own echoes come back very weakly to their antenna after reflection on the Moon. So this took place even before the military EME voice reception! (DL8HCZ)

## HZ - Saudi Arabia: restrictions

There is a new amateur radio law in HZ now. According to this law the only permitted VHF bands are 2m and 24 GHz and up! So NO 6m and 70cm allocations at the moment!

## 2m TEP from KP4 to ZD8!

A very late report comes from Ted, G4UPS, who confirmed that he has heard KP4EOR (FK78) in autumn 1981 via TEP on 144 MHz when he was active as ZD8TC on Ascencion Island (II22). This is almost crossing the (south) atlantic ocean and should encourage OPs in SW EU to try with SA!

# Dates

## Scandinavian Activity Contest 2005

From January 1st 2005 the Scandinavian Activity Contest (OZ, LA; SM, OH) takes place as follows:

| | | |
|---|---|---|
| 1. Tuesday | 144 MHz | 19-23 ME(S)Z (like before) |
| 2. Tuesday | 432 MHz | 19-23 ME(S)Z (like before) |
| 3. Tuesday | 1.2 GHz | 19-23 ME(S)Z (like before) |
| 4. Tuesday | 2.3 GHz + up | 19-23 ME(S)Z (like since 2002) |
| 1. Thursday | 28 MHz | (like since 1.1.2004) |
| 2. Thursday | 50 MHz | 19-23 ME(S)Z NEW from 1.1.2005 |
| 3. Thursday | 70 MHz | 19-23 ME(S)Z (OZ/OY/OX), NEW |

## EME Conference 2006


The 12th International EME Conference will take place in Würzburg (southern DL, JN49) from August 25th to 27th 2006. The conference is organized by Rainer, DF6NA. Check for latest info on the web: www.eme2006.com

## Dorsten GHz Meeting 2005

The 28th GHz Meeting in Dorsten will take place on February 12th 2005. Same location as previous years.

## Weinheim VHF Meeting 2005

The next Weinheim VHF Meeting will take place on September 10th/11th 2005. Now there will be only one group (from the A20 club) that will organize the meeting. So fortunately there will be no more chaos with two dates etc. in the future. Location will be again the Karl-Kübel-School in Bensheim on Saturday and the A-20-club on Sunday.

## G3WOS 6m BBQ 2005

The 2005 6m pig roast BBQ at G3WOS's UK QTH in the UK will take place on Saturday 6th August 2005 There will be several of interesting talks - hopefully including a review of one of the hot 2005 summer DXpeditions - to pass the long hot summer day... Take a look at last year's event - http://www.gare.co.uk/6m_bbq.htm and if you would like to come along in August 2005 please send me an email and indicate whether this would be definite or a possibility.
73 Chris G3WOS, email: chris@gare.co.uk

## Tampere Six Meters Forum 2005

The Tampere Six Meters Forum in Finland is being held on the 13th of August 2005.

## Microwave Update 2005

The Microwave Update Conference 2005 will take place from Oct. 27th to 30th at Sheraton Cerritos Hotel, Towne Center, 12725 Center Court Drive, Cerritos, CA 90703, USA.
Details on the web: www.ham-radio.com/sbms/

## SVHFS Conference 2005

The 9th Annual SVHFS Conference will be held in Charlotte, NC, on April 29 & 30, 2005. /www.svhfs.org/conf_2005.htm

# Comments

## VHF DX Event Database

Recently, we discussed the potential benefits from a, say Worldwide VHF DX Event Database. This database would file all sporadic E, Aurora, MS, TEP and other types of VHF dx

QSOs around the world. Joachim, DL8HCZ, editor of the Dubus magazine, considers a dx datapool an important project and he can imagine that Dubus would sponsor it. Gabriel, EA6VQ, argues that this project would however put too much workload on an individual, i.e. he suggests a joint effort by an international group of radio amateurs. Sabine, DL1DBC, offers assistance in software development, i.e. in database engineering and user interfaces. Are there any volunteers in the ham community willing to develop the detailed concept? (From www.df5ai.net). - Currently we are still in the brainstorming stage. Any ideas and comments would be most welcome! Please contact info@dubus.de (DL8HCZ)

## 144 MHz Transatlantic Propagation Considerations

### by Walter G. Obenhofer, NQ2O

I have been following the subject of 144MHz Transatlantic Propagation for some time. I have noticed the great efforts made by European Groups to establish TA Beacons.

These efforts are commendable, especially in the light of great dedication and personal time spent on the project. However one can also see a tremendous amount of club support to the groups from individuals, local and national level. Another especially noteworthy fact is the enormous international cooperation on the European and African Continent to a common goal. Many attempts have been made by individuals to bridge that gap under more or less favorable conditions, be it equipment, locations, weather or personal sacrifice. I tip my hat, to all, with great respect. It seems to follow that one would see a similar enthusiasm and effort on this side of the Atlantic as well. Somehow though, it seems that there is no such efforts underway. If there is, it is one of the best-kept secrets. Communication held in communicato should describe it adequately. Actually, not exactly new here. To be fair one has to mention the efforts by some neighbors to the North, the Canadian Maritimes. It takes no less effort there and the Canadian Hams deserve the same consideration and respect afforded to the Europeans colleagues. I wonder though, if there might not be a hidden problem in all these efforts? I have noted the beacon frequencies and looked at the band plans for Region I and Region II. The beacons are located according to Region I band plans but collide with the band plan in Region II. Here in Region II that part of the band is assigned to digital transmissions and heavily used as such. Thus, reception of beacons or Qso's could prove to be extremely difficult even under favorable conditions. The TA Beacons being located in an FM part of the band and 200KHz + above our standard operating SSB/CW segment is not an overly big inducement to listen intently for them. My considerations do not take into account what agreement our Canadian neighbors might have with the RAC or possible participants to the South, outside, of the US. Analyzing past attempts to bridge the gap one sees a pattern of repeats in methods. Shortest distance to bridge; Highest points plus shortest distance; Higher power plus the above, or larger antennas and all the above. Mixed with all the mechanical efforts were high activity times on the band such as a contest on the other continent. There is no doubt that the attempts were carefully planed, the best equipment available used and great operating skills utilized. None of the operations would have materialized had the participants hesitated to take risks for fear of failure or disappointment. While it was clear from the beginning that propagation will play a large role it also became clear that propagation is the most formidable part of any undertaking. Clearly, more and exhaustive propagation studies are needed to bridge the Atlantic and possibly even on a more regular basis.

May I suggest a possible alternative to the present approach? Suppose a series of receivers were built, capable of receiving at least one, better two or more beacon signals at the same time. Record time, date, signal strength, temperature and geographical location. Store this info on a media that could later be retrieved and analyzed. The data could be scanned before storage for pertinent info such as the presence of a clear CW sign or other info to ascertain the presence of a signal. Thus allowing for maximum collection of info before overflow or loss of such. How and were to deploy these receivers. I believe that it should be possible to interest some Shipping Companies, in the name of science, to allow the placement of such receivers on their Ocean going Freighters. Many companies cross the Atlantic daily to and from North American Ports. Halifax, Quebec, Montreal, Ca. Boston, NYC, Philadelphia, Savannah, Miami USA and others in between. Many Commercial Fishing Vessels operate in and outside the territorial areas of North America. Beacon data could then be analyzed according to geographical location of the vessel, when signal acquired or lost, time of day and prevailing weather condition. Offering the shipping companies free and positive publicity for their cooperation, and especially a fair share of the glory, should almost guaranty success.

In addition to Ocean going Vessels, Air Cargo Carriers might be a useful source of information also. Radios placed on Airplanes could provide information about propagation that ship borne radios cant. Example, Airplanes traveling 10 000 meters above ground have a considerable further reach on certain frequencies versus earth bound vessels. The possibility to compare earthbound data with airborne data is opening new doors. By employing moving targets across the Atlantic, at all times, would fill a void that otherwise would not be able to be filled. The in between areas are just too large to place stepping-stones for incremental exploration. The writer firmly believes that a bridging of the Atlantic on 144 MHz is possible. The efforts, the skills and determination of the European Ham Community are legendary and success can't far behind. He wishes that the same could be said about the Western side of the Atlantic.

## Last

EA1DDO wrote on eham.net about DUBUS on Oct. 9th: Rating: 5/5 - Top best VUSHF magazine - Time owned: more than 12 months. - It is the best VUShf bands magazine. Has a lot of state of the art articles, projects, bands activity, from 2/6 meters tropo up to 249 Ghz, EME, FAI, Meteor Scatter, Aurora, etc. Information from all parts of the world, plus beacons list, high tech advertisments, news, etc. The best information source for beginers and specialist. A "must" for the VUShfer. 73, Max - EA1DDO/HK1DX (TNX Max!)

**Next DUBUS Deadline: March 1st 2005**

# DUBUS Toplists

## 50 MHz Toplist

| NR | Call | WW Loc | Wkd Sqr | DXCC | Tropo | Aurora | MS | Es | (ODX) F2 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | K1TOL | FN44 | 1205 | 169 | 0 | 0 | 0 | 0 | 0 |
| 2 | ON4IQ | JO20 | 1151 | 212 | 1180 | 1952 | 1975 | 9007 | 16802 |
| 3 | VE1YX | FN74 | 1130 | 170 | 0 | 0 | 0 | 0 | 0 |
| 4 | ON4GG | JO20 | 1125 | 221 | 813 | 1757 | 1695 | 8317 | 16727 |
| 5 | DL7QY | JN59 | 1095 | 215 | 741 | 1665 | 2186 | 0 | 27926 |
| 6 | SM7FJE | JO65 | 1084 | 201 | 0 | 0 | 0 | 0 | 0 |
| 7 | PY5CC | GG54 | 1061 | 219 | 0 | 0 | 0 | 0 | 0 |
| 8 | PA0HIP | JO21 | 1061 | 213 | 0 | 0 | 0 | 0 | 0 |
| 9 | G0JHC | IO83 | 1054 | 205 | 0 | 0 | 0 | 0 | 0 |
| 10 | IK0FTA | JN61 | 1053 | 222 | 0 | 0 | 0 | 0 | 0 |
| 11 | IK2GSO | JN45 | 1051 | 215 | 0 | 0 | 0 | 0 | 0 |
| 12 | W5OZI | EM00 | 1040 | 152 | 0 | 0 | 0 | 0 | 0 |
| 13 | SM7AED | JO65 | 1018 | 198 | 0 | 0 | 0 | 0 | 0 |
| 14 | W3EP | FN31 | 1014 | 145 | 0 | 0 | 0 | 0 | 0 |
| 15 | PA0RDY | JO22 | 1011 | 190 | 750 | 1804 | 2041 | 0 | 16536 |
| 16 | G4IGO | IO80 | 986 | 200 | 578 | 1308 | 2528 | 7301 | 16188 |
| 17 | EH8BPX | IL18 | 968 | 178 | 0 | 0 | 0 | 0 | 0 |
| 18 | G4UPS | IO80 | 965 | 186 | 0 | 0 | 0 | 0 | 0 |
| 19 | G3WOS | IO91 | 945 | 206 | 0 | 0 | 0 | 0 | 0 |
| 20 | SP6GZZ | JO81 | 939 | 173 | 515 | 1394 | 1826 | 8103 | 14443 |
| 21 | DL9USA | JO71 | 929 | 188 | 0 | 0 | 0 | 0 | 0 |
| 22 | DL7AV | JN58 | 928 | 202 | 0 | 0 | 0 | 0 | 0 |
| 23 | SV1DH | KM17 | 904 | 228 | 0 | 0 | 0 | 0 | 0 |
| 24 | ON4AOI | JO21 | 894 | 193 | 0 | 0 | 0 | 0 | 0 |
| 25 | F5JKK | IN87 | 881 | 189 | 0 | 0 | 0 | 0 | 0 |
| 26 | PA7MH | JO22 | 872 | 182 | 0 | 0 | 0 | 0 | 0 |
| 27 | SP6GWB/P | JO80 | 866 | 172 | 696 | 1774 | 1880 | 8583 | 17887 |
| 28 | TI5KD | EJ79 | 866 | 135 | 0 | 0 | 0 | 0 | 0 |
| 29 | DL8PM | JO40 | 858 | 177 | 0 | 0 | 0 | 0 | 0 |
| 30 | ON4KST | JO20 | 856 | 163 | 801 | 1415 | 1509 | 8374 | 16498 |
| 31 | F8OP | JN26 | 853 | 170 | 631 | 1023 | 1369 | 5508 | 13547 |
| 32 | I0JX | JN61 | 846 | 209 | 0 | 0 | 0 | 0 | 0 |
| 33 | IZ5EME | JN52 | 845 | 180 | 583 | 0 | 1712 | 5216 | 15152 |
| 34 | OZ3ZW | JO54 | 844 | 173 | 0 | 0 | 0 | 0 | 0 |
| 35 | OK1DDO | JO60 | 843 | 169 | 620 | 1423 | 1340 | 6100 | 16266 |
| 36 | GW3MFY | IO81 | 842 | 188 | 0 | 0 | 0 | 0 | 0 |
| 37 | G3IMV | IO91 | 842 | 185 | 0 | 0 | 0 | 0 | 0 |
| 38 | SP4MPB | KO03 | 839 | 185 | 710 | 1836 | 1507 | 8029 | 17649 |
| 39 | SM6CMU | JO57 | 832 | 175 | 762 | 1830 | 1780 | 7795 | 15728 |
| 40 | ON4PS | JO20 | 829 | 164 | 752 | 1740 | 1902 | 6520 | 16358 |
| 41 | DL6AMI | JO50 | 828 | 172 | 0 | 0 | 0 | 0 | 0 |
| 42 | SP6MLK/P | JO80 | 821 | 125 | 1051 | 1610 | 1511 | 8557 | 27874 |
| 43 | OZ8ABE | JO45 | 821 | 166 | 0 | 0 | 0 | 0 | 0 |
| 44 | 9H1BT | JM75 | 820 | 229 | 0 | 0 | 0 | 0 | 0 |
| 45 | I0WTD | JN61 | 820 | 208 | 0 | 0 | 0 | 0 | 0 |
| 46 | PA7FM | JO21 | 817 | 167 | 0 | 0 | 0 | 0 | 0 |
| 47 | DL8HCZ | JO53 | 777 | 115 | 365 | 1250 | 1356 | 3350 | 15957 |
| 48 | DL6BF | JO32 | 771 | 164 | 1193 | 1326 | 0 | 4955 | 11582 |
| 49 | DL3AMA | JO51 | 770 | 160 | 519 | 1431 | 1600 | 4001 | 14810 |
| 50 | PA2V | JO22 | 764 | 155 | 0 | 0 | 0 | 0 | 0 |
| 51 | GJ4ICD | IN89 | 758 | 167 | 0 | 0 | 0 | 0 | 0 |
| 52 | DJ6MB | JO30 | 754 | 162 | 0 | 1058 | 0 | 2685 | 16042 |
| 53 | OZ1IEP | JO65 | 739 | 143 | 1986 | 1318 | 0 | 5832 | 0 |
| 54 | DL1EJA | JO31 | 732 | 161 | 0 | 0 | 0 | 0 | 0 |
| 55 | IZ1EPM | JN35 | 724 | 184 | 0 | 0 | 0 | 0 | 0 |
| 56 | G3ZYY | IO70 | 720 | 185 | 0 | 0 | 0 | 0 | 0 |
| 57 | YO7VS | KN14 | 718 | 164 | 0 | 0 | 0 | 0 | 0 |
| 58 | PA9KT | JO33 | 715 | 177 | 0 | 0 | 0 | 0 | 0 |
| 58 | WA1ECF | FN41 | 714 | 108 | 0 | 0 | 0 | 0 | 0 |
| 60 | EH3LL | JN01 | 709 | 169 | 0 | 0 | 0 | 0 | 0 |
| 61 | PE9DX | JO33 | 700 | 167 | 0 | 0 | 0 | 0 | 0 |
| 62 | EH9IB | IM85 | 696 | 161 | 0 | 0 | 0 | 0 | 0 |
| 63 | F9DI | JN23 | 695 | 179 | 284 | | | 2432 | |
| 64 | OZ1DPR | JO45 | 694 | 145 | 0 | 0 | 0 | 0 | 0 |
| 65 | PE1HWO | JO21 | 682 | 150 | 835 | 2110 | 1674 | 6061 | 15177 |
| 66 | F5DE | JN05 | 678 | 155 | 860 | 1074 | 1651 | 3638 | 15789 |
| 67 | S52SK | JN76 | 670 | 188 | 0 | 0 | 0 | 0 | 0 |
| 68 | IW1AZJ | JN35 | 664 | 166 | 445 | 800 | 1341 | 3221 | 15261 |
| 69 | PA2TAB | JO32 | 659 | 152 | 857 | 1370 | 1809 | 5797 | 15339 |
| 70 | OK1FFD | JO60 | 654 | 148 | 580 | 1231 | 1380 | 7450 | 14773 |
| 71 | OK1KT | JO70 | 650 | 144 | 0 | 1545 | 1486 | 4377 | 15999 |
| 72 | CT1EEB | IN50 | 644 | 186 | 0 | 0 | 0 | 0 | 0 |
| 73 | DF7RG | JN68 | 643 | 136 | 652 | 1576 | 824 | 4864 | 14802 |
| 74 | I4XCC | JN63 | 630 | 140 | 707 | 0 | 1427 | 4456 | 18627 |
| 75 | LZ1AG | KN22 | 626 | 159 | 375 | 0 | 1390 | 3941 | 10628 |
| 76 | F5PAU | IN88 | 624 | 108 | 0 | 0 | 0 | 0 | 0 |
| 77 | OK2ZW | JN89 | 618 | 138 | 1681 | 0 | 0 | 0 | 15580 |
| 78 | IK5JWQ | JN52 | 616 | 151 | 820 | 0 | 1485 | 5908 | 15237 |
| 79 | PA3ECU | JO32 | 612 | 133 | 0 | 0 | 0 | 0 | 0 |
| 80 | YL3AG | KO26 | 591 | 131 | 691 | 1817 | 0 | 8115 | 14305 |
| 81 | DL2DR | JO31 | 577 | 115 | 1003 | 0 | 0 | 4769 | 12047 |
| 82 | DL6NCI | JO50 | 570 | 157 | 708 | 1294 | 505 | 7815 | 14239 |
| 83 | DL7HG | JO62 | 568 | 115 | 0 | 0 | 0 | 0 | 15600 |
| 84 | 7Q7RM | KH74 | 548 | 119 | 0 | 0 | 0 | 0 | 0 |
| 85 | DJ6XV | JO31 | 560 | 111 | 512 | 1007 | 1130 | 4805 | 11502 |
| 86 | PA5DD | JO22 | 541 | 135 | 0 | 0 | 0 | 0 | 0 |
| 87 | SP2IQW | JO94 | 535 | 113 | 0 | 0 | 1470 | 4034 | 10964 |
| 88 | OK1VBN | JN78 | 512 | 92 | 455 | 1496 | 897 | 8790 | 14645 |
| 89 | ES1CW | KO29 | 503 | 104 | 959 | 1968 | 2116 | 6337 | 13090 |
| 90 | HB9SJV | JN26 | 518 | 140 | 527 | 769 | 1475 | 5785 | 27696 |
| 91 | ES6RQ | KO28 | 501 | 107 | 393 | 1870 | 0 | 5181 | 12058 |
| 92 | LY2SA | KO14 | 478 | 107 | 407 | 1503 | 904 | 4031 | 12947 |
| 93 | OZ7IS | JO65 | 475 | 126 | 410 | 1294 | 850 | 3100 | 0 |
| 94 | YO2IS | KN05 | 465 | 109 | 412 | 1253 | 1404 | 7775 | 15931 |
| 95 | S53J | JN75 | 462 | 89 | 0 | 0 | 0 | 0 | 0 |
| 96 | ES2RJ | KO29 | 458 | 88 | 971 | 1923 | 2052 | 4642 | 13682 |
| 97 | ON1IM | JO11 | 456 | 106 | 223 | 1278 | 1302 | 5607 | 16205 |
| 98 | OK1FAV | JO60 | 444 | 96 | 0 | 579 | 1093 | 6250 | 12924 |
| 99 | ES2WX | KO29 | 443 | 85 | 562 | 1924 | 1847 | 4651 | 13682 |
| 100 | ES1AJ | KO29 | 439 | 94 | 415 | 1710 | 1850 | 3340 | 13694 |
| 101 | ES1RF | KO29 | 438 | 95 | 340 | 1250 | 0 | 2800 | 11549 |
| 102 | ES2QN | KO29 | 437 | 81 | 848 | 2380 | 1963 | 5689 | 13098 |
| 103 | YO4FRJ | KN34 | 436 | 116 | 250 | 0 | 0 | 7306 | 27184 |
| 104 | PA2CHR | JO22 | 431 | 119 | 740 | 1403 | 0 | 5212 | 9322 |
| 105 | DL4ALI | JO50 | 431 | 87 | 464 | 628 | 1850 | 3969 | 12195 |
| 106 | DG1VL | JO61 | 429 | 84 | 430 | 1336 | 0 | 4697 | 14635 |
| 107 | OE1SOW | JN88 | 424 | 103 | 0 | 0 | 0 | 0 | 11921 |
| 108 | DL9GU | JN49 | 402 | 0 | 721 | 450 | 0 | 8500 | 15625 |
| 109 | ES2NA | KO29 | 393 | 80 | 883 | 1870 | 1983 | 4647 | 11576 |
| 110 | OK1MP | JO70 | 390 | 82 | 1125 | 1077 | 1753 | 3541 | 13452 |
| 111 | ES2RW | KO29 | 382 | 55 | 410 | 1896 | 0 | 3827 | 9515 |
| 112 | OK1IBL | JO60 | 377 | 77 | 530 | 1320 | 1717 | 6941 | 11816 |
| 113 | ES1II | KO29 | 367 | 81 | 335 | 1569 | 1410 | 3325 | 13978 |
| 114 | DL8GAP | JN48 | 365 | 73 | 365 | 0 | 0 | 6924 | 13801 |
| 115 | DL3YEE | JO42 | 354 | 79 | 540 | 1056 | 1300 | 2700 | 14920 |
| 116 | HB9AOF | JN36 | 350 | 82 | 500 | 0 | 0 | 5400 | 10663 |
| 117 | DK9KX | JO30 | 341 | 190 | 0 | 0 | 0 | 0 | 0 |
| 118 | DL1SUZ | JO53 | 338 | 71 | 546 | 1434 | 865 | 5921 | 11859 |
| 119 | SM3BIU | JP73 | 336 | 77 | 907 | 1704 | 1982 | 4414 | 0 |
| 120 | HB9Q | JN47 | 335 | 87 | 0 | 0 | 0 | 0 | 0 |
| 121 | ES4EQ | KO39 | 334 | 63 | 392 | 1869 | 0 | 4750 | 13005 |
| 122 | PE1OGF | JO21 | 332 | 76 | 0 | 0 | 0 | 0 | 0 |
| 123 | SM7JUQ | JO65 | 331 | 84 | 372 | 1349 | 1062 | 3900 | 14070 |
| 124 | F8CS | JN27 | 313 | 68 | 336 | 0 | 0 | 7454 | 9753 |
| 125 | ES6QB | KO37 | 310 | 74 | 450 | 625 | 0 | 5145 | 13410 |
| 126 | ES3BR | KO29 | 309 | 55 | 387 | 1900 | 1600 | 4536 | 11530 |
| 127 | DC9YC | JO31 | 306 | 68 | 666 | 1154 | 0 | 5112 | 11921 |
| 128 | I3ZVN | JN55 | 304 | 69 | 532 | 0 | 0 | 5742 | 8422 |
| 129 | ES1MW | KO29 | 298 | 60 | 315 | 650 | 0 | 3972 | 9619 |
| 130 | DF1EQ | JO31 | 295 | 0 | 279 | 0 | 0 | 2769 | 11510 |
| 131 | ES5AM | KO38 | 289 | 53 | 452 | 1754 | 1981 | 4500 | 12923 |
| 132 | HB9STY | JN36 | 280 | 65 | 367 | 0 | 1431 | 4448 | 7810 |
| 133 | ES2QH | KO29 | 279 | 60 | 372 | 1740 | 1710 | 2542 | 13682 |
| 134 | CT1HZE | IM57 | 276 | 60 | 0 | 0 | 0 | 0 | 0 |
| 135 | DL7YS | JO62 | 275 | 64 | 342 | 461 | 1086 | 3547 | 8767 |
| 136 | DK2BJ | JO30 | 275 | 55 | 471 | 805 | 0 | 3194 | 8274 |

# 144 MHz Toplist (without EME)

| NR | Call | WW Loc | Wkd Sqr | DXCC | Tropo | Aurora | MS | Es | (ODX) Iono / AE |
|---|---|---|---|---|---|---|---|---|---|
| 1 | DK1KO | JO53 | 722 | 0 | 2124 | 2057 | 2271 | 3285 | 2122 |
| 2 | DK3WG | JO72 | 683 | 72 | 2243 | 2034 | 2295 | 2782 | 1954 |
| 3 | PA3BIY | JO22 | 664 | 64 | 1550 | 2026 | 2205 | 3143 | 0 |
| 4 | DL8EBW | JO31 | 651 | 67 | 1454 | 1918 | 2225 | 2305 | 0 |
| 5 | DF8LC | JO53 | 600 | 70 | 2105 | 2045 | 2226 | 3291 | 0 |
| 6 | PA0RDY | JO22 | 568 | 67 | 1582 | 1979 | 2272 | 2819 | 0 |
| 7 | SM6CMU | JO57 | 566 | 0 | 1760 | 1928 | 2280 | 2577 | - / 1760 |
| 8 | DL8HCZ | JO53 | 566 | 60 | 1615 | 1976 | 2096 | 3527 | 1500 |
| 9 | PA2CHR | JO22 | 557 | 69 | 1514 | 2171 | 2240 | 3212 | 1732/1971 |
| 10 | OH5LK | KP30 | 548 | 0 | 1962 | 2041 | 2235 | 2891 | 0 |
| 11 | I2FAK | JN45 | 535 | 0 | 1935 | 1512 | 2405 | 2995 | 1645 |
| 12 | HA1YA | JN87 | 526 | 75 | 1548 | 1941 | 2183 | 2885 | 2010 |
| 13 | I4XCC | JN63 | 526 | 77 | 1188 | 1826 | 2364 | 3248 | 1746 |
| 14 | PA3FOC | JO21 | 522 | 59 | 1373 | 2010 | 2209 | 2326 | 0 |
| 15 | SP6GZZ | JO81 | 520 | 0 | 1670 | 1794 | 2017 | 2717 | 0 |
| 16 | SP9EWU | JO90 | 517 | 63 | 1710 | 1927 | 2154 | 2871 | 0 |
| 17 | DK6AS | JO52 | 516 | 0 | 1460 | 1885 | 2510 | 2260 | 0 |
| 18 | SP4MPB | KO03 | 515 | 59 | 1886 | 1959 | 2090 | 2697 | - / 1886 |
| 19 | DD0VF | JO61 | 510 | 62 | 1736 | 1701 | 2045 | 2617 | 0 |
| 20 | DK0OG | JN68 | 510 | 67 | 1708 | 1975 | 2172 | 3322 | 1543 |
| 21 | DL3AMA | JO51 | 505 | 61 | 1785 | 1803 | 1925 | 2403 | 0 |
| 22 | PA3DZL | JO21 | 504 | 62 | 1405 | 1851 | 2167 | 3107 | 0 |
| 23 | DH3YAK | JO31 | 498 | 61 | 1424 | 1162 | 2105 | 2650 | 0 |
| 24 | YU7EW | KN05 | 490 | 67 | 2460 | 1868 | 2179 | 2430 | 2082 |
| 25 | DJ7OF | JO51 | 489 | 63 | 1512 | 1518 | 2152 | 2156 | 0 |
| 26 | PA3ECU | JO32 | 484 | 58 | 1721 | 2106 | 2018 | 3238 | 0 |
| 27 | LY2WR | KO24 | 483 | 57 | 2051 | 2075 | 2347 | 3007 | 0 |
| 28 | ON4IQ | JO20 | 469 | 67 | 1420 | 1965 | 2150 | 2725 | 0 |
| 29 | DL8LAQ | JO43 | 465 | 0 | 1377 | 1858 | 2104 | 3304 | 0 |
| 30 | ON4GG | JO20 | 464 | 68 | 1420 | 1965 | 2150 | 2124 | 0 |
| 31 | YU7MS | KN05 | 467 | 62 | 1319 | 1856 | 2160 | 2438 | 2130 |
| 32 | IZ5EME | JN52 | 458 | 65 | 1590 | 0 | 2090 | 2893 | 2030 |
| 33 | RA3LE | KO64 | 455 | 1 | 2137 | 2134 | 2173 | 2524 | 1516 |
| 34 | SK6HD | JO68 | 451 | 0 | 1911 | 1857 | 2172 | 2479 | 0 |
| 35 | OH7PI | KP32 | 451 | 0 | 1902 | 1926 | 2151 | 2489 | 0 |
| 36 | PE1HWO | JO21 | 448 | 64 | 1500 | 1403 | 2279 | 2618 | 0 |
| 37 | OK2ZW | JN89 | 445 | 56 | 1417 | 1775 | 2113 | 2471 | 0 |
| 38 | ES6RQ | KO37 | 438 | 49 | 1500 | 1982 | 2518 | 1842 | 0 |
| 39 | F8OP | JN26 | 432 | 63 | 1228 | 1196 | 2028 | 2720 | 0 |
| 40 | OK2VMD | JN89 | 428 | 58 | 1662 | 1765 | 2031 | 3605 | 0 |
| 41 | OK1KT | JO70 | 421 | 58 | 1411 | 1545 | 1900 | 2808 | 0 |
| 42 | YO2IS | KN05 | 417 | 67 | 1360 | 1916 | 2130 | 2556 | 0 |
| 43 | PA4VHF | JO32 | 416 | 0 | 1536 | 1337 | 2085 | 2086 | 0 |
| 44 | ES2WX | KO29 | 415 | 40 | 1370 | 1950 | 2270 | 2071 | 0 |
| 45 | IW1AZJ | JN35 | 411 | 62 | 1115 | 1188 | 2151 | 2780 | 0 |
| 46 | PA5DD | JO22 | 408 | 55 | 1452 | 2054 | 2145 | 2385 | 1667/2037 |
| 47 | OK1FM | JN69 | 403 | 56 | 1843 | 1438 | 2200 | 2150 | 0 |
| 48 | LY2SA | KO14 | 402 | 51 | 1906 | 1846 | 2220 | 2372 | 0 |
| 49 | HB9Q | JN47 | 391 | 66 | 1404 | 1288 | 2060 | 2959 | 0 |
| 50 | OK1JKT/P | JO60 | 389 | 52 | 1701 | 1764 | 2121 | 2269 | 0 |
| 51 | F8CS | JN27 | 387 | 54 | 1161 | 1468 | 2124 | 3231 | 0 |
| 52 | I4YNO | JN54 | 386 | 67 | 1357 | 1065 | 2242 | 2250 | 0 |
| 53 | OE6IWG | JN77 | 453 | 68 | 1221 | 1110 | 2220 | 2126 | 1214 |
| 54 | ON4KHG | JO10 | 376 | 54 | 1507 | 1936 | 2247 | 2348 | 0 |
| 55 | YL3AG | KO26 | 374 | 39 | 1552 | 1912 | 0 | 2452 | 0 |
| 56 | UT5ER | KN78 | 370 | 0 | 1975 | 2014 | 2135 | 2525 | 1634 |
| 57 | F6DKW | JN18 | 369 | 53 | 1526 | 1823 | 2051 | 2780 | 0 |
| 58 | S50C | JN76 | 369 | 62 | 1463 | 1817 | 2233 | 3356 | 1608 |
| 59 | DL1KDA | JO30 | 366 | 59 | 1388 | 1924 | 2101 | 2339 | 0 |
| 60 | SM7JUQ | JO65 | 365 | 41 | 1902 | 1646 | 1921 | 2332 | 0 |
| 61 | DL6BF | JO32 | 363 | 50 | 1542 | 1932 | 1814 | 2332 | 0 |
| 62 | IK1PAG | JN35 | 361 | 57 | 1186 | 0 | 2254 | 2725 | 0 |
| 63 | DL7YS | JO62 | 360 | 53 | 1512 | 1528 | 1826 | 2136 | 0 |
| 64 | PA0WWM | JO22 | 359 | 56 | 1303 | 1839 | 1997 | 2394 | 0 |
| 65 | ES2RJ | KO29 | 358 | 40 | 1190 | 1861 | 2000 | 2127 | 0 |
| 66 | YT1VV | JN94 | 337 | 50 | 1407 | 826 | 1727 | 2294 | 1982 |
| 67 | OE3OKS | JN87 | 356 | 59 | 1441 | 1273 | 1867 | 2788 | 0 |
| 68 | YU7VA | KN05 | 355 | 61 | 1316 | 1399 | 1954 | 2446 | 0 |
| 69 | SM3BIU | JP73 | 353 | 32 | 1460 | 1844 | 2260 | 2242 | 0 |
| 70 | UR5BAE | KN29 | 351 | 53 | 1994 | 1924 | 1866 | 2492 | 0 |
| 71 | LA0BY/p | JO59 | 350 | 44 | 2043 | 1661 | 2196 | 2676 | 0 |
| 72 | F1FIH | JN23 | 350 | 58 | 1305 | 999 | 1926 | 2934 | 0 |
| 73 | YU1WP (sk) | JN94 | 346 | 53 | 1422 | 1850 | 2236 | 2825 | 1953 |
| 74 | PA2DW | JO22 | 345 | 59 | 1230 | 1950 | 2150 | 2250 | 0 |
| 75 | YU7EF | KN05 | 345 | 58 | 1135 | 987 | 2248 | 2440 | 2373 |
| 76 | YU1PV | JN94 | 344 | 52 | 1319 | 1650 | 2137 | 2440 | 1982 |
| 77 | DK1KR | JO53 | 341 | 0 | 1481 | 2103 | 0 | 2375 | 0 |
| 78 | OK2BFH | JN99 | 340 | 46 | 2092 | 1929 | 1699 | 3790 | 0 |
| 79 | OZ1IEP | JO65 | 339 | 52 | 1638 | 1542 | 2177 | 2328 | 0 |
| 80 | PE1OGF | JO21 | 338 | 58 | 1391 | 1602 | 1959 | 2259 | 1856 |
| 81 | G3LQR | JO02 | 337 | 0 | 1776 | 2031 | 0 | 2406 | 0 |
| 82 | YT1W | JN94 | 337 | 50 | 1407 | 826 | 1727 | 2294 | 1982 |
| 83 | OK1DKS | JO70 | 334 | 56 | 1230 | 1308 | 0 | 3530 | 0 |
| 84 | F5HRY | JN18 | 331 | 55 | 1276 | 1695 | 2038 | 2758 | 0 |
| 85 | ON4PS | JO20 | 323 | 53 | 1449 | 1878 | 2082 | 2364 | 0 |
| 86 | HB9DFG | JN37 | 323 | 56 | 1367 | 1360 | 1942 | 2987 | 1450 |
| 97 | PA0BAT | JO31 | 322 | 52 | 1535 | 2041 | 2498 | 2366 | 0 |
| 88 | OK1FFD | JO60 | 322 | 54 | 1388 | 1808 | 1991 | 2197 | 0 |
| 89 | DB6BX | JO32 | 321 | 55 | 1534 | 1541 | 1921 | 2126 | 0 |
| 90 | ON1IM | JO11 | 320 | 42 | 1420 | 1310 | 1865 | 2306 | 0 |
| 91 | OK1MG | JO70 | 319 | 50 | 1522 | 1685 | 1549 | 2631 | 0 |
| 92 | ON4KST | JO20 | 314 | 54 | 1435 | 1612 | 1940 | 2383 | 0 |
| 93 | DL1SUZ | JO53 | 313 | 47 | 1238 | 1661 | 1963 | 2309 | 0 |
| 94 | PA2TAB | JO32 | 312 | 53 | 1302 | 1239 | 2103 | 2183 | 0 |
| 95 | OK1DFC/P | JO60 | 310 | 52 | 1775 | 2453 | 2289 | 2453 | 0 |
| 96 | DG1VL | JO61 | 310 | 48 | 1373 | 1223 | 1817 | 2325 | 0 |
| 97 | ES2XM | KO29 | 308 | 37 | 1389 | 2198 | 0 | 2222 | 0 |
| 98 | RW3PF | KO93 | 306 | 39 | 2039 | 2171 | 2605 | 2543 | 0 |
| 99 | SP6GWB/P | JO80 | 306 | 47 | 1780 | 1581 | 1875 | 2437 | 0 |
| 100 | G4LOH | IO94 | 304 | 46 | 3130 | 2143 | 2045 | 2480 | 1831 |
| 101 | ES4EQ | KO39 | 302 | 39 | 1541 | 1840 | 2240 | 2245 | 0 |
| 102 | OK1AXH | JO70 | 300 | 0 | 2142 | 1486 | 1366 | 1768 | 0 |
| 103 | DF1IAZ | JN49 | 299 | 54 | 1038 | 1177 | 2069 | 1996 | 0 |
| 104 | OM7AQ | JN98 | 296 | 50 | 1484 | 1982 | 2085 | 2483 | 0 |
| 105 | HA8V | KN06 | 296 | 43 | 1062 | 1807 | 2062 | 2162 | 0 |
| 106 | SP2JXN | JO94 | 289 | 41 | 1650 | 1690 | 0 | 2634 | 0 |
| 107 | YO4FRJ | KN34 | 289 | 49 | 908 | 0 | 0 | 2215 | 0 |
| 108 | DK2BJ | JO30 | 287 | 49 | 1476 | 1934 | 1593 | 2231 | 0 |
| 108 | DH0GHU | JN38 | 284 | 49 | 1170 | 1170 | 2117 | 3067 | 0 |
| 110 | ES3GZ | KO28 | 281 | 35 | 1495 | 1720 | 2134 | 2101 | 0 |
| 111 | ES5WE | KO38 | 278 | 32 | 1406 | 1695 | 1934 | 2530 | 0 |
| 112 | DH8GV | JO33 | 273 | 42 | 1565 | 1102 | 1102 | 2450 | 0 |
| 113 | PA0ZM | JO32 | 268 | 45 | 1156 | 1771 | 2061 | 2246 | 0 |
| 114 | YU7KB | JN94 | 268 | 42 | 1072 | 0 | 2137 | 2367 | 1634 |
| 115 | OK1IBL | JO60 | 266 | 50 | 1438 | 1462 | 2003 | 3398 | 0 |
| 116 | GM4JJJ | IO86 | 261 | 44 | 3253 | 1804 | 1868 | 2858 | 0 |
| 117 | DJ8ES | JO43 | 258 | 41 | 1306 | 1423 | 2080 | 2177 | 0 |
| 118 | F5HGO | JN05 | 257 | 46 | 1782 | 781 | 2104 | 2486 | 1540 (FAI) |
| 119 | G3LTF | JO02 | 255 | 0 | 2842 | 1824 | 1876 | 3032 | 1382 |
| 120 | RK3AF | KO85 | 253 | 35 | 1244 | 1870 | 2202 | 2605 | 0 |
| 121 | YU1GT | KN04 | 252 | 42 | 1650 | 1410 | 1310 | 2160 | 0 |
| 122 | LZ1AG | KN22 | 252 | 43 | 915 | 0 | 1779 | 2534 | 0 |
| 123 | ES1RF | KO29 | 252 | 30 | 1184 | 1820 | 1978 | 2084 | 0 |
| 124 | DK1VI | JN49 | 251 | 50 | 1270 | 1215 | 1604 | 3165 | 0 |
| 125 | DH9NBB | JN49 | 249 | 54 | 1363 | 1228 | 1846 | 2039 | 0 |
| 126 | DC9YC | JO31 | 247 | 44 | 1548 | 1724 | 1849 | 1822 | 0 |
| 127 | G3XDY | JO02 | 246 | 41 | 1693 | 2049 | 1835 | 2135 | 0 |
| 128 | OK1VMS | JO70 | 246 | 51 | 1692 | 1423 | 0 | 2587 | 0 |
| 129 | F5PAU | IN88 | 246 | 46 | 1630 | 0 | 0 | 2425 | 0 |
| 130 | YU7BCL | KN05 | 246 | 49 | 968 | 1712 | 2110 | 2293 | 1958 |
| 131 | HA8MV | KN06 | 245 | 38 | 1062 | 1736 | 2026 | 2162 | 0 |
| 132 | OK1PG | JO70 | 243 | 50 | 1773 | 1243 | 0 | 3488 | 0 |
| 133 | YU7BCX | KN05 | 242 | 42 | 1017 | 1172 | 1965 | 2425 | 1868 |
| 134 | DG3XA | JO43 | 240 | 42 | 1371 | 965 | 1832 | 2333 | 0 |
| 135 | F5DE | JN05 | 239 | 44 | 1891 | 1671 | 2066 | 2399 | 1610 (FAI) |
| 136 | OK2QI | JO80 | 238 | 50 | 1475 | 1686 | 1380 | 2050 | 0 |
| 137 | OK1KEI | JO70 | 236 | 36 | 1861 | 1259 | 1482 | 2067 | 0 |
| 138 | YZ1KU | KN04 | 234 | 45 | 1039 | 1214 | 1849 | 2299 | 1634 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 139 | OK1VBN | JN78 | 225 | 45 | 1578 | 1682 | 1915 | 2209 | 0 |
| 140 | YZ7MON | JN95 | 220 | 43 | 1004 | 0 | 1837 | 2279 | 1536 |
| 141 | ES5EJ | KO38 | 218 | 30 | 1422 | 1804 | 0 | 2070 | 0 |
| 142 | OK1DDO | JO60 | 218 | 46 | 1329 | 1500 | 1720 | 2418 | 0 |
| 143 | ES0IW | KO19 | 216 | 32 | 1545 | 1687 | 0 | 1861 | 0 |
| 144 | IK4PMB | JN54 | 213 | 46 | 1150 | 0 | 2015 | 2446 | 0 |
| 145 | DL2DR | JO31 | 212 | 39 | 1158 | 980 | 0 | 2057 | 0 |
| 146 | CT1DYX | IN51 | 211 | 0 | 0 | 0 | 0 | 0 | 0 |
| 147 | DL3YEE | JO42 | 210 | 45 | 1574 | 1450 | 1690 | 2348 | 0 |
| 148 | OK1DIG | JO60 | 208 | 42 | 1420 | 1684 | 1840 | 2218 | 0 |
| 149 | ES0NW | KO19 | 207 | 30 | 1060 | 1720 | 1797 | 1965 | 0 |
| 150 | DL0UL/P | JN48 | 207 | 37 | 1026 | 0 | 1839 | 2019 | 0 |
| 151 | OK1IAS | JO60 | 205 | 41 | 1392 | 1957 | 0 | 2466 | 0 |
| 152 | OK1SC | JO70 | 204 | 0 | 1490 | 1673 | 0 | 1729 | 0 |
| 153 | YU7ON | KN04 | 203 | 37 | 914 | 0 | 1897 | 2273 | 1485 |
| 154 | OE5VRL/5 | JN78 | 202 | 0 | 1665 | 1750 | 1990 | 2157 | 0 |
| 155 | OH0NC | JP90 | 201 | 26 | 1544 | 1982 | 1647 | 2493 | 0 |
| 156 | PA0JUS | JO22 | 200 | 38 | 1409 | 1050 | 0 | 2167 | 0 |
| 157 | ES8RO | KO28 | 199 | 27 | 1802 | 1800 | 0 | 1780 | 0 |
| 158 | UA4AQL | LO20 | 199 | 23 | 1124 | 1994 | 2158 | 2195 | 0 |
| 159 | IT9VDQ | JM68 | 197 | 45 | 1676 | 0 | 2169 | 2491 | 0 |
| 160 | ES0SM | KO08 | 196 | 31 | 1578 | 1767 | 1991 | 0 | 0 |
| 161 | DK2DB | JN48 | 195 | 0 | 1239 | 1136 | 0 | 3106 | 0 |
| 162 | F1HDF/P | JN18 | 194 | 0 | 1452 | 0 | 0 | 2425 | 0 |
| 163 | ON4ZN | JO21 | 194 | 36 | 1390 | 1183 | 0 | 2194 | 0 |
| 164 | ES1OX | KO29 | 194 | 18 | 1016 | 1449 | 1158 | 2121 | 0 |
| 165 | PA3AOH | JO31 | 191 | 41 | 1457 | 1341 | 1722 | 2345 | 0 |
| 166 | ES7RDR | KO27 | 189 | 31 | 1200 | 1750 | 1000 | 2101 | 0 |
| 167 | ES0HD | KO18 | 187 | 23 | 1550 | 1918 | 0 | 0 | 0 |
| 168 | HB9MIO/P | JN37 | 185 | 0 | 1316 | 975 | 0 | 2183 | 0 |
| 169 | DG3HS | JO53 | 184 | 35 | 1152 | 1091 | 0 | 2306 | 0 |
| 170 | ES5RY | KO38 | 183 | 32 | 1198 | 1695 | 2002 | 1409 | 0 |
| 171 | DK5WO | JO30 | 177 | 35 | 1474 | 1219 | 0 | 1993 | 0 |
| 172 | SP2IQW | JO94 | 174 | 28 | 1611 | 1611 | 997 | 1877 | 0 |
| 173 | OK1KOK | JO80 | 173 | 27 | 1486 | 1062 | 0 | 1920 | 0 |
| 174 | HB9AOF | JN36 | 173 | 45 | 1201 | 670 | 1675 | 2166 | 0 |
| 175 | OK1VEI | JO70 | 170 | 32 | 1677 | 1197 | 1398 | 0 | 0 |
| 176 | ES1AO | KO29 | 169 | 25 | 1162 | 1176 | 1792 | 2136 | 0 |
| 177 | DL3IAS | JN49 | 167 | 43 | 988 | 1123 | 1829 | 2171 | 0 |
| 178 | OK1KRY | JN69 | 166 | 40 | 1437 | 977 | 0 | 1830 | 0 |
| 179 | SP9FG | JN99 | 164 | 31 | 1647 | 1283 | 0 | 1798 | 0 |
| 180 | ES1JL | KO29 | 163 | 17 | 1379 | 1596 | 0 | 0 | 0 |
| 181 | YU7DP | KN05 | 162 | 38 | 958 | 1110 | 1882 | 2417 | 1599 |
| 182 | OK1CDJ | JO70 | 159 | 42 | 1580 | 0 | 2066 | 2655 | 0 |
| 183 | DL9MCC | JN58 | 159 | 36 | 1248 | 1414 | 2063 | 2095 | 0 |
| 184 | ES1AW | KO29 | 158 | 25 | 1230 | 1680 | 0 | 1924 | 0 |
| 185 | OK1CA | JO70 | 156 | 0 | 1540 | 1065 | 950 | 2096 | 0 |
| 186 | DJ6XV | JO31 | 156 | 34 | 1337 | 992 | 0 | 2007 | 0 |
| 187 | ES0BI | KO18 | 154 | 21 | 1439 | 1823 | 1528 | 0 | 0 |
| 188 | ES2QN | KO29 | 152 | 22 | 1175 | 1460 | 0 | 2116 | 0 |
| 189 | OZ7IS | JO65 | 152 | 38 | 1128 | 1294 | 1901 | 1845 | 0 |
| 190 | ES6PZ | KO38 | 151 | 20 | 1101 | 0 | 0 | 2532 | 0 |
| 191 | CT1FAK | IN50 | 149 | 25 | 2129 | 0 | 2250 | 2488 | 968 |
| 192 | DK0PX | JN48 | 147 | 0 | 1161 | 0 | 1815 | 1649 | 0 |
| 193 | ES1CW | KO29 | 142 | 21 | 1192 | 1570 | 0 | 2143 | 0 |
| 194 | DL0GTH | JO50 | 139 | 23 | 1124 | 0 | 0 | 0 | 0 |
| 195 | F1PYR | JN19 | 137 | 34 | 1450 | 0 | 0 | 2113 | 0 |
| 196 | OK2UFB | JN99 | 136 | 27 | 1526 | 0 | 0 | 1983 | 0 |
| 197 | RW4AK (sk) | LO20 | 136 | 0 | 1126 | 1480 | 2158 | 2301 | 0 |
| 198 | ES5QA | KO38 | 135 | 35 | 1665 | 1788 | 1555 | 2236 | 0 |
| 199 | OK1DTG/P | JO70 | 127 | 27 | 1351 | 1352 | 0 | 0 | 0 |
| 200 | YU7AZX | KN04 | 126 | 30 | 914 | 0 | 1389 | 2173 | 1484 |
| 201 | OZ1FF | JO45 | 125 | 35 | 974 | 1239 | 1520 | 2357 | 0 |
| 202 | OV4VW | JO45 | 124 | 28 | 1275 | 1007 | 1400 | 2225 | 0 |
| 203 | F1PYW | JN38 | 124 | 30 | 936 | 888 | 1522 | 1958 | 0 |
| 204 | HB9S/P | JN36 | 123 | 24 | 1135 | 0 | 0 | 0 | 0 |
| 205 | S53J | JN75 | 123 | 27 | 1123 | 1036 | 983 | 1984 | 0 |
| 206 | OK1VDA | JO70 | 123 | 30 | 938 | 641 | 0 | 2220 | 0 |
| 207 | F6FGO | JN25 | 118 | 31 | 1390 | 0 | 0 | 2218 | 0 |
| 208 | OL5Z | JN89 | 118 | 26 | 1061 | 1621 | 0 | 0 | 0 |
| 209 | OK2KJU | JN89 | 115 | 32 | 1318 | 1766 | 0 | 1494 | 0 |
| 210 | DL0SP/P | JO62 | 115 | 23 | 1315 | 785 | 0 | 1608 | 0 |
| 211 | OK2KKW | JO60 | 115 | 24 | 1040 | 0 | 0 | 0 | 0 |
| 212 | OE1SOW | JN88 | 112 | 32 | 0 | 1286 | 0 | 2250 | 0 |
| 213 | DL5NEN | JN59 | 106 | 30 | 748 | 0 | 1767 | 1640 | 0 |
| 214 | OK1TEH | JO70 | 103 | 30 | 1191 | 1474 | 0 | 2058 | 0 |
| 215 | CT1HZE | IM57 | 102 | 15 | 1250 | 0 | 1600 | 2200 | 0 |
| 216 | I3ZVN | JN55 | 98 | 32 | 1212 | 0 | 0 | 2237 | 0 |
| 217 | OK2PHM | JN89 | 97 | 20 | 829 | 1265 | 0 | 2262 | 0 |
| 218 | CT1DDW | IN60 | 95 | 20 | 2100 | 0 | 0 | 2500 | 0 |
| 219 | YU1EBC | JN94 | 94 | 28 | 907 | 0 | 1427 | 2179 | 1766 |
| 220 | LA/DL7YS/P | JO37 | 93 | 22 | 1207 | 0 | 1673 | 0 | 0 |
| 221 | DK0FLT | JN59 | 93 | 18 | 975 | 0 | 0 | 0 | 0 |
| 222 | CT1DIN | IN60 | 91 | 18 | 1218 | 0 | 0 | 2338 | 0 |
| 223 | OK1UDX | JN79 | 91 | 19 | 537 | 0 | 0 | 0 | 2197 |
| 224 | DK2MN | JO32 | 87 | 19 | 858 | 0 | 0 | 0 | 0 |
| 225 | CT1CAD | IM67 | 85 | 18 | 1304 | 0 | 0 | 2249 | 0 |
| 226 | YU1AAV | KN04 | 71 | 21 | 828 | 0 | 0 | 2031 | 0 |
| 227 | OK1HRR | JO70 | 66 | 16 | 762 | 0 | 0 | 1890 | 0 |
| 228 | G7LRQ | IO91 | 60 | 19 | 1088 | 0 | 0 | 0 | 0 |
| 229 | OK2DTF | JN79 | 60 | 16 | 805 | 0 | 1607 | 1533 | 0 |
| 230 | SP6MLK/P | JO80 | 58 | 16 | 853 | 756 | 0 | 1446 | 0 |
| 231 | DG7SFL | JN49 | 57 | 11 | 759 | 0 | 0 | 1750 | 0 |
| 232 | OK1VVW | JO70 | 55 | 15 | 913 | 0 | 1339 | 1096 | 0 |
| 233 | YZ1EW | JN94 | 53 | 21 | 811 | 0 | 0 | 2182 | 0 |
| 234 | F5OIH/P | JN08 | 49 | 8 | 666 | 0 | 0 | 0 | 0 |
| 235 | IW3HTU | JN55 | 43 | 13 | 1180 | 0 | 0 | 0 | 0 |
| 236 | F1JKY | JN25 | 41 | 10 | 798 | 0 | 400 | 991 | 0 |
| 237 | ON6JY | JO20 | 39 | 12 | 929 | 0 | 0 | 0 | 0 |
| 238 | IZ0BXT | JN63 | 37 | 12 | 804 | 0 | 0 | 1946 | 0 |
| 239 | YZ1MGN | KN04 | 14 | 6 | 489 | 0 | 0 | 1653 | 0 |

## 432 MHz Toplist (without EME)

| NR | Call | WW Loc | Wkd Sqr | DXCC | Tropo | Aurora | MS | Es | (ODX) Iono |
|---|---|---|---|---|---|---|---|---|---|
| 1 | RA3LE | KO64 | 261 | 1 | 2031 | 1855 | 1440 | 0 | 0 |
| 2 | DJ9BV | JO43 | 219 | 1 | 2154 | 1863 | 1440 | 0 | 0 |
| 3 | DK3WG | JO72 | 218 | 43 | 1547 | 1591 | 0 | 0 | 0 |
| 4 | PA0EZ | JO22 | 211 | 37 | 1787 | 1445 | 0 | 0 | 0 |
| 5 | PA0RDY | JO22 | 207 | 38 | 1979 | 1807 | 1376 | 0 | 0 |
| 6 | G3LQR | JO02 | 206 | 0 | 2031 | 1613 | 0 | 0 | 0 |
| 7 | PA0WWM | JO22 | 202 | 38 | 1547 | 1836 | 0 | 0 | 0 |
| 8 | HA1YA | JN87 | 192 | 43 | 1438 | 1221 | 0 | 0 | 0 |
| 9 | DL8QS | JO43 | 189 | 35 | 1513 | 1513 | 0 | 0 | 0 |
| 10 | OZ7IS | JO65 | 191 | 33 | 1663 | 1048 | 1294 | 0 | 0 |
| 11 | OK1AXH | JO70 | 181 | 0 | 1861 | 1239 | 0 | 0 | 0 |
| 12 | PA3DZL | JO21 | 181 | 36 | 1405 | 1851 | 1864 | 0 | 0 |
| 13 | G3XDY | JO02 | 180 | 30 | 1589 | 1619 | 0 | 0 | 0 |
| 14 | DB6NT | JO50 | 174 | 33 | 1823 | 0 | 0 | 0 | 0 |
| 15 | DB6BX | JO32 | 174 | 34 | 1550 | 662 | 0 | 0 | 0 |
| 16 | DL7QY | JN59 | 173 | 0 | 1640 | 1848 | 1292 | 0 | 0 |
| 17 | DJ6MB | JO30 | 171 | 0 | 1278 | 1733 | 0 | 0 | 0 |
| 18 | LY2WR | KO24 | 169 | 26 | 1995 | 1593 | 1935 | 0 | 0 |
| 19 | F6DKW | JN18 | 169 | 24 | 1519 | 0 | 0 | 0 | 0 |
| 20 | DK1KO | JO53 | 167 | 0 | 1643 | 694 | 0 | 0 | 0 |
| 21 | DL3YEE | JO42 | 167 | 35 | 1574 | 1728 | 0 | 0 | 0 |
| 22 | DK6AS | JO52 | 164 | 0 | 1569 | 775 | 0 | 0 | 0 |
| 23 | SP6MLK/P | JO80 | 162 | 31 | 1780 | 0 | 0 | 0 | 0 |
| 24 | SM7ECM | JO65 | 162 | 27 | 1609 | 1073 | 0 | 0 | 0 |
| 25 | DF8LC | JO53 | 161 | 0 | 1615 | 1361 | 0 | 0 | 0 |
| 26 | PA2CHR | JO22 | 158 | 36 | 1445 | 1751 | 1099 | 0 | 0 |
| 27 | OZ2OE | JO45 | 156 | 27 | 2216 | 1020 | 0 | 0 | 0 |
| 28 | PA4FP | JO33 | 156 | 32 | 2114 | 1010 | 0 | 0 | 0 |
| 29 | DK1KR | JO53 | 156 | 0 | 1400 | 1827 | 0 | 0 | 0 |
| 30 | SP6GWB/P | JO80 | 155 | 30 | 1780 | 759 | 0 | 0 | 0 |
| 31 | SM6ESG | JO67 | 154 | 26 | 1436 | 712 | 0 | 0 | 0 |
| 32 | OK2BFH | JN99 | 153 | 31 | 1914 | 0 | 0 | 0 | 0 |
| 33 | YL3AG | KO26 | 150 | 20 | 1571 | 1041 | 0 | 0 | 0 |
| 34 | PA5DD | JO22 | 148 | 31 | 1498 | 1828 | 1808 | 0 | 0 |
| 35 | DH3NAN | JO50 | 147 | 0 | 1437 | 1008 | 0 | 0 | 0 |
| 36 | OK1CA | JO70 | 146 | 0 | 1670 | 0 | 0 | 0 | 0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 37 | PA3AOH | JO31 | 148 | 27 | 1530 | 573 | 0 | 0 | 0 |
| 38 | PA0BAT | JO31 | 143 | 29 | 1535 | 890 | 0 | 0 | 0 |
| 39 | OH5LK | KP30 | 142 | 0 | 1386 | 1196 | 0 | 0 | 0 |
| 40 | ES2WX | KO29 | 140 | 17 | 1232 | 1415 | 0 | 0 | 0 |
| 41 | OK1KEI | JO70 | 138 | 27 | 1682 | 1185 | 0 | 0 | 0 |
| 42 | OZ1IEP | JO65 | 138 | 28 | 1470 | 0 | 0 | 0 | 0 |
| 43 | SP9FG | JN99 | 137 | 26 | 1660 | 0 | 0 | 0 | 0 |
| 44 | OH0NC | KP00 | 136 | 20 | 1598 | 920 | 0 | 0 | 0 |
| 45 | OK1VEI | JO70 | 136 | 21 | 1532 | 811 | 0 | 0 | 0 |
| 46 | SP9EWU | JO90 | 135 | 30 | 1589 | 1558 | 1664 | 0 | 0 |
| 47 | OK1KIR/P | JO60 | 133 | 28 | 1773 | 0 | 0 | 0 | 0 |
| 48 | PA0JUS | JO22 | 133 | 26 | 1340 | 0 | 0 | 0 | 0 |
| 49 | OK1VMS | JO70 | 131 | 32 | 1434 | 972 | 0 | 0 | 0 |
| 50 | ON4PS | JO20 | 129 | 24 | 1599 | 721 | 0 | 0 | 0 |
| 51 | PA3ECU | JO32 | 128 | 27 | 1385 | 808 | 0 | 0 | 0 |
| 52 | OE5VRL/5 | JN78 | 125 | 1 | 1524 | 1031 | 0 | 0 | 0 |
| 53 | LY2SA | KO14 | 123 | 20 | 1669 | 946 | 0 | 0 | 0 |
| 54 | SM6CMU | JO57 | 124 | 23 | 1640 | 670 | 0 | 0 | 0 |
| 55 | PA0ZM | JO32 | 122 | 25 | 1358 | 1693 | 0 | 0 | 0 |
| 56 | DK0OG | JN68 | 121 | 32 | 1493 | 901 | 0 | 0 | 0 |
| 57 | OK2KKW | JO60 | 120 | 26 | 1186 | 0 | 0 | 0 | 0 |
| 58 | ON4ZN | JO21 | 120 | 22 | 1173 | 0 | 0 | 0 | 0 |
| 59 | F5PAU | IN88 | 119 | 24 | 1630 | 0 | 0 | 0 | 0 |
| 60 | DF4UE | JN48 | 119 | 1 | 1195 | 0 | 0 | 0 | 0 |
| 61 | G3LTF | JO01 | 116 | 0 | 2842 | 1602 | 0 | 0 | 0 |
| 62 | OK2QI | JO80 | 114 | 25 | 1410 | 0 | 0 | 0 | 0 |
| 63 | DL3AMA | JO51 | 114 | 22 | 1015 | 1219 | 0 | 0 | 0 |
| 64 | DL0UL/P | JN48 | 113 | 22 | 1238 | 0 | 0 | 0 | 0 |
| 65 | DL6BCT | JO43 | 113 | 0 | 1152 | 0 | 0 | 0 | 0 |
| 66 | DJ6XV | JO31 | 113 | 19 | 1128 | 976 | 0 | 0 | 0 |
| 67 | SP6GZZ | JO81 | 112 | 0 | 1549 | 870 | 0 | 0 | 0 |
| 68 | PE1OGF | JO21 | 112 | 18 | 1288 | 0 | 0 | 0 | 0 |
| 69 | DH9NBB | JN49 | 109 | 24 | 1363 | 0 | 0 | 0 | 0 |
| 70 | DL2DR | JO31 | 109 | 21 | 1158 | 0 | 0 | 0 | 0 |
| 71 | F1HDF/P | JN18 | 108 | 0 | 1204 | 0 | 0 | 0 | 0 |
| 72 | DL0GTH | JO50 | 106 | 20 | 1113 | 0 | 0 | 0 | 0 |
| 73 | DL4KG | JO31 | 105 | 21 | 1273 | 0 | 0 | 0 | 0 |
| 74 | DG3XA | JO43 | 105 | 17 | 1131 | 0 | 0 | 0 | 0 |
| 75 | F5HRY | JN18 | 104 | 18 | 1222 | 583 | 0 | 0 | 0 |
| 76 | OK1DFC/P | JO60 | 104 | 22 | 1179 | 0 | 0 | 0 | 0 |
| 77 | DK5WO | JO30 | 104 | 20 | 1150 | 0 | 0 | 0 | 0 |
| 78 | DC4XH | JO43 | 104 | 20 | 1133 | 808 | 0 | 0 | 0 |
| 79 | ES6RQ | KO37 | 103 | 19 | 1452 | 1148 | 0 | 0 | 0 |
| 80 | DJ8ES | JO43 | 103 | 16 | 1160 | 0 | 0 | 0 | 0 |
| 81 | OK1AIY/P | JO70 | 102 | 0 | 1490 | 0 | 0 | 0 | 0 |
| 82 | ON1IM | JO11 | 102 | 20 | 1410 | 0 | 0 | 0 | 0 |
| 83 | DL1KDA | JO30 | 102 | 22 | 1286 | 999 | 1334 | 0 | 0 |
| 84 | OK1DKS/P | JO60 | 102 | 23 | 1118 | 0 | 0 | 0 | 0 |
| 85 | PE1HWO | JO21 | 101 | 20 | 1315 | 369 | 0 | 0 | 0 |
| 86 | DL1SUZ | JO53 | 101 | 18 | 1218 | 707 | 0 | 0 | 0 |
| 87 | OZ1FF | JO45 | 99 | 20 | 1128 | 633 | 0 | 0 | 0 |
| 88 | ON4GG | JO20 | 98 | 23 | 1407 | 0 | 0 | 0 | 0 |
| 89 | F5HGO | JN05 | 98 | 17 | 1237 | 0 | 0 | 0 | 0 |
| 90 | ON4IQ | JO20 | 96 | 23 | 1407 | 0 | 0 | 0 | 0 |
| 91 | DH8GV | JO33 | 95 | 19 | 1259 | 0 | 0 | 0 | 0 |
| 92 | LA0BY/p | JO59 | 94 | 15 | 1831 | 790 | 0 | 0 | 0 |
| 83 | DL6BF | JO32 | 94 | 15 | 882 | 894 | 0 | 0 | 0 |
| 94 | OK1KRY | JN69 | 93 | 23 | 1350 | 0 | 0 | 0 | 0 |
| 95 | DK2DB | JN48 | 92 | 0 | 1331 | 0 | 0 | 0 | 0 |
| 86 | ES2XM | KO29 | 92 | 11 | 1271 | 1259 | 0 | 0 | 0 |
| 97 | S50C | JN76 | 91 | 18 | 977 | 0 | 0 | 0 | 0 |
| 98 | OK1KPA | JN79 | 89 | 0 | 1176 | 0 | 0 | 0 | 0 |
| 99 | DK0PX | JN48 | 89 | 0 | 1168 | 0 | 0 | 0 | 0 |
| 100 | OK1OKL | JO60 | 88 | 0 | 1199 | 0 | 0 | 0 | 0 |
| 101 | ES2RJ | KO29 | 87 | 17 | 1261 | 1123 | 0 | 0 | 0 |
| 102 | DK1VI | JN49 | 87 | 21 | 1125 | 936 | 0 | 0 | 0 |
| 103 | F1PYR | JN19 | 87 | 15 | 1035 | 0 | 0 | 0 | 0 |
| 104 | IZ5EME | JN52 | 86 | 20 | 1458 | 1670 | 374 | 0 | 0 |
| 105 | DG1VL | JO61 | 86 | 16 | 1245 | 0 | 0 | 0 | 0 |
| 106 | HB9MIO/P | JN37 | 84 | 0 | 1096 | 0 | 0 | 0 | 0 |
| 107 | HB9AOF | JN36 | 84 | 15 | 926 | 0 | 0 | 0 | 0 |
| 108 | ES0HD | KO18 | 83 | 19 | 1565 | 614 | 0 | 0 | 0 |
| 109 | OK1KOK | JO80 | 81 | 22 | 1486 | 0 | 0 | 0 | 0 |
| 110 | OK1MG | JO70 | 81 | 21 | 1329 | 691 | 0 | 0 | 0 |
| 111 | DL7YS | JO62 | 81 | 18 | 1100 | 0 | 0 | 0 | 0 |
| 112 | I4YNO/4 | JO54 | 81 | 17 | 897 | 0 | 0 | 0 | 0 |
| 113 | DL9MCC | JN58 | 80 | 20 | 1338 | 0 | 0 | 0 | 0 |
| 114 | DF1EQ | JO31 | 80 | 0 | 1249 | 0 | 0 | 0 | 0 |
| 115 | ES4EQ | KO39 | 80 | 16 | 1160 | 907 | 0 | 0 | 0 |
| 116 | ES0IW | KO19 | 79 | 17 | 1342 | 906 | 0 | 0 | 0 |
| 117 | DL5NEN/P | JN59 | 76 | 16 | 964 | 0 | 0 | 0 | 0 |
| 118 | OM7AQ | JN98 | 76 | 17 | 922 | 1503 | 0 | 0 | 0 |
| 119 | DH3YAK | JO31 | 75 | 13 | 1165 | 0 | 0 | 0 | 0 |
| 120 | OK1FFD | JO60 | 74 | 23 | 1339 | 0 | 0 | 0 | 0 |
| 121 | DG6GP | JN48 | 74 | 13 | 1024 | 0 | 0 | 0 | 0 |
| 122 | OK1KRQ/P | JN69 | 73 | 16 | 1091 | 0 | 0 | 0 | 0 |
| 123 | DF5JJ | JO43 | 72 | 13 | 680 | 1437 | 1511 | 0 | 0 |
| 124 | OK1SC | JO70 | 71 | 0 | 1310 | 758 | 0 | 0 | 0 |
| 125 | OK2PWY | JN89 | 70 | 17 | 1135 | 0 | 0 | 0 | 0 |
| 126 | OL5Z | JN89 | 70 | 15 | 761 | 0 | 0 | 0 | 0 |
| 127 | DL0SP/P | JO62 | 69 | 13 | 1018 | 0 | 0 | 0 | 0 |
| 128 | YO4FRJ | KN34 | 69 | 26 | 746 | 0 | 0 | 0 | 0 |
| 129 | OK1DTG/P | JO70 | 68 | 14 | 1436 | 0 | 0 | 0 | 0 |
| 130 | DK2MN | JO32 | 67 | 13 | 715 | 0 | 0 | 0 | 0 |
| 131 | RW3PF | KO93 | 66 | 15 | 678 | 1875 | 0 | 0 | 0 |
| 132 | DD0VF | JO60 | 66 | 18 | 1106 | 0 | 0 | 0 | 0 |
| 133 | SM7JUQ | JO65 | 65 | 15 | 1232 | 0 | 0 | 0 | 0 |
| 134 | UR5BAE | KN29 | 64 | 18 | 1517 | 0 | 0 | 0 | 0 |
| 135 | HB9CRQ | JN47 | 63 | 16 | 1010 | 0 | 0 | 0 | 0 |
| 136 | DL3IAS | JN49 | 63 | 12 | 886 | 0 | 0 | 0 | 0 |
| 137 | ES5WE | KO38 | 62 | 11 | 1406 | 0 | 0 | 0 | 0 |
| 138 | SK6HD | JO68 | 62 | 0 | 811 | 0 | 0 | 0 | 0 |
| 139 | DG7SFL | JN49 | 61 | 10 | 947 | 0 | 0 | 0 | 0 |
| 140 | F6FGO | JN25 | 60 | 11 | 1016 | 0 | 0 | 0 | 0 |
| 141 | ES0NW | KO29 | 59 | 17 | 1213 | 675 | 0 | 0 | 0 |
| 142 | ES0SM | KO08 | 59 | 20 | 1202 | 925 | 0 | 0 | 0 |
| 143 | DK2BJ | JO30 | 59 | 16 | 1053 | 0 | 0 | 0 | 0 |
| 144 | OK2UFB | JN99 | 56 | 20 | 1232 | 0 | 0 | 0 | 0 |
| 145 | DH0GHU | JN38 | 56 | 12 | 852 | 0 | 0 | 0 | 0 |
| 146 | HA8MV | KN06 | 56 | 15 | 831 | 1500 | 0 | 0 | 0 |
| 147 | OK1VBN | JN78 | 56 | 14 | 723 | 753 | 0 | 0 | 0 |
| 148 | F5DE | JN05 | 56 | 8 | 744 | 0 | 0 | 0 | 0 |
| 149 | YO2IS | KN05 | 55 | 15 | 1020 | 1741 | 1030 | 0 | 0 |
| 150 | LA/DB1DI/P | JO37 | 55 | 12 | 1013 | 0 | 0 | 0 | 0 |
| 151 | OK1PG | JO70 | 54 | 18 | 1773 | 0 | 0 | 0 | 0 |
| 152 | ES3GZ | KO28 | 52 | 10 | 1035 | 0 | 0 | 0 | 0 |
| 153 | RB5EF | KN78 | 50 | 0 | 1805 | 0 | 0 | 0 | 0 |
| 154 | SP2JXN | JO94 | 49 | 15 | 1149 | 0 | 0 | 0 | 0 |
| 155 | OK1TEH | JO70 | 49 | 15 | 912 | 0 | 0 | 0 | 0 |
| 156 | S53J | JN75 | 49 | 9 | 688 | 0 | 0 | 0 | 0 |
| 157 | ES1JL | KO29 | 48 | 11 | 1324 | 0 | 0 | 0 | 0 |
| 158 | DK0FLT | JN49 | 48 | 14 | 695 | 0 | 0 | 0 | 0 |
| 159 | ES1RF | KO29 | 47 | 10 | 875 | 682 | 0 | 0 | 0 |
| 160 | F5OIH/P | JN08 | 46 | 5 | 651 | 0 | 0 | 0 | 0 |
| 161 | DL5NEN | JN59 | 46 | 13 | 630 | 0 | 0 | 0 | 0 |
| 162 | SM3BIU | JP73 | 45 | 3 | 917 | 763 | 0 | 0 | 0 |
| 163 | GM4JJJ | IO86 | 44 | 15 | 1457 | 297 | 0 | 0 | 0 |
| 164 | I3ZVN | JN55 | 43 | 13 | 1197 | 0 | 0 | 0 | 0 |
| 165 | OZ4VW | JO45 | 43 | 11 | 976 | 0 | 0 | 0 | 0 |
| 166 | OE1PLW | JN88 | 42 | 12 | 1114 | 0 | 0 | 0 | 0 |
| 167 | OK2KJU | JN89 | 42 | 13 | 731 | 0 | 0 | 0 | 0 |
| 168 | OK1KT | JO70 | 40 | 7 | 1289 | 757 | 0 | 0 | 0 |
| 169 | OK1HRR | JO70 | 40 | 13 | 765 | 0 | 0 | 0 | 0 |
| 170 | OK2PHM | JN89 | 39 | 9 | 746 | 0 | 0 | 0 | 0 |
| 171 | G7LRQ | IO91 | 37 | 15 | 1208 | 0 | 0 | 0 | 0 |
| 172 | OK2VMU/P | JN99 | 36 | 11 | 880 | 0 | 0 | 0 | 0 |
| 173 | ES1AO | KO29 | 35 | 12 | 1131 | 0 | 0 | 0 | 0 |
| 174 | DF0RU | JO62 | 35 | 9 | 682 | 0 | 0 | 0 | 0 |
| 175 | ES0ZA | KO19 | 33 | 8 | 1077 | 0 | 0 | 0 | 0 |
| 176 | ES1DF | KO29 | 32 | 7 | 511 | 0 | 0 | 0 | 0 |
| 177 | ES1CW | KO19 | 32 | 7 | 500 | 688 | 0 | 0 | 0 |
| 178 | F1FIH | JN23 | 30 | 16 | 796 | 0 | 0 | 0 | 0 |
| 179 | ES0IC | KO18 | 30 | 7 | 673 | 0 | 0 | 0 | 0 |
| 180 | OK1DIG | JO60 | 28 | 28 | 640 | 0 | 0 | 0 | 0 |

## 1296 MHz Toplist

| NR | Call | WW | Wkd | DXCC | ODX |
|---|---|---|---|---|---|
| 1 | PA0EZ | JO22 | 141 | 24 | 1460 |
| 2 | PA0WWM | JO22 | 136 | 24 | 1298 |
| 3 | G3XDY | JO02 | 133 | 25 | 1561 |
| 4 | F6DKW | JN18 | 127 | 23 | 1452 |
| 5 | DB6NT | JO50 | 125 | 24 | 1283 |
| 6 | PA0RDY | JO22 | 124 | 27 | 1286 |
| 7 | OK1AXH | JO70 | 118 | 1 | 1444 |
| 8 | G3LQR | JO02 | 118 | 1 | 1274 |
| 9 | SM7ECM | JO65 | 117 | 19 | 1541 |
| 10 | HB9AMH/P | JN37 | 114 | 1 | 1351 |
| 11 | PA0BAT | JO31 | 102 | 22 | 1368 |
| 12 | DL3YEE | JO42 | 102 | 19 | 1136 |
| 13 | SP6GWB/P | JO80 | 101 | 24 | 1580 |
| 14 | SM6ESG | JO67 | 101 | 19 | 1445 |
| 15 | DB6BX | JO32 | 99 | 25 | 1125 |
| 16 | OZ2OE | JO45 | 96 | 17 | 1425 |
| 17 | PA3DZL | JO21 | 94 | 21 | 1254 |
| 18 | SP6MLK/P | JO80 | 92 | 23 | 1580 |
| 19 | OE5VRL/5 | JN78 | 92 | 18 | 1524 |
| 20 | OK1KIR/P | JO60 | 92 | 22 | 1208 |
| 21 | OK2BFH | JN99 | 91 | 20 | 1713 |
| 22 | F5HRY | JN18 | 91 | 16 | 1222 |
| 23 | F5PAU | IN88 | 89 | 19 | 1630 |
| 24 | G6DER | IO93 | 89 | 20 | 1306 |
| 25 | PA5AO | JO31 | 88 | 21 | 1376 |
| 26 | PA5DD | JO22 | 88 | 18 | 1302 |
| 27 | SM0DFP | JO89 | 87 | 16 | 1155 |
| 28 | DL7QY | JN59 | 86 | 18 | 1261 |
| 29 | OK1DFC/P | JO60 | 86 | 17 | 1177 |
| 30 | DK1KR | JO53 | 86 | 1 | 1097 |
| 31 | PA4FP | JO33 | 86 | 17 | 957 |
| 32 | OZ7IS | JO65 | 85 | 18 | 1205 |
| 33 | DK0OG | JN68 | 83 | 19 | 1161 |
| 34 | OK1VEI | JO70 | 82 | 14 | 1313 |
| 35 | DL1SUN | JO53 | 81 | 15 | 1087 |
| 36 | DK6AS | JO52 | 81 | 17 | 1421 |
| 37 | OK1KEI | JO70 | 81 | 16 | 1316 |
| 38 | F1HDF/P | JN18 | 80 | 9 | 886 |
| 39 | HB9AOF | JN36 | 77 | 15 | 975 |
| 40 | DL6NAQ | JO40 | 76 | 20 | 1252 |
| 41 | DC9YC | JO31 | 74 | 16 | 1046 |
| 42 | DL1BKK | JO43 | 74 | 16 | 995 |
| 43 | DL0UL/P | JN48 | 74 | 17 | 962 |
| 44 | OK1AIY/P | JO70 | 73 | 1 | 1490 |
| 45 | OK1VMS | JO70 | 73 | 19 | 1302 |
| 46 | PA0JUS | JO22 | 72 | 16 | 1265 |
| 47 | HB9MIO/P | JN37 | 72 | 1 | 1000 |
| 48 | DH3NAN | JO50 | 71 | 1 | 1143 |
| 49 | DH9NBB | JN49 | 71 | 13 | 1016 |
| 50 | OK1CA | JO70 | 70 | 1 | 1421 |
| 51 | PA0ZM (sk) | JO32 | 69 | 16 | 1329 |
| 52 | DK5WO | JO30 | 69 | 16 | 1137 |
| 53 | PA2CHR | JO22 | 68 | 18 | 1352 |
| 54 | DL2DR | JO31 | 68 | 13 | 1158 |
| 55 | DL8BDU | JO43 | 68 | 15 | 905 |
| 56 | DC4XH | JO43 | 67 | 14 | 1090 |
| 57 | DL0GTH | JO50 | 67 | 16 | 1073 |
| 58 | DL4OL | JO52 | 67 | 16 | 995 |
| 59 | DF1EQ | JO31 | 67 | 1 | 908 |
| 60 | G3LTF | JO01 | 66 | 1 | 1417 |
| 61 | DL2DR | JO31 | 66 | 12 | 1251 |
| 62 | OK2KKW | JO60 | 66 | 18 | 1128 |
| 63 | ON4PS | JO20 | 65 | 14 | 1098 |
| 64 | RA3LE | KO64 | 64 | 1 | 1618 |
| 65 | OK1OKL | JO60 | 63 | 1 | 1177 |
| 66 | DH9NBB | JN49 | 63 | 13 | 1016 |
| 67 | OZ1FF | JO45 | 63 | 13 | 981 |
| 68 | DJ6XV | JO31 | 63 | 11 | 946 |
| 69 | SP9FG | JN99 | 62 | 17 | 1492 |
| 70 | OK1DKS/P | JO60 | 62 | 13 | 1207 |
| 71 | DJ8ES | JO43 | 62 | 20 | 1025 |
| 72 | DF5JJ | JO43 | 62 | 13 | 897 |
| 73 | DK5WO | JO30 | 61 | 15 | 1079 |
| 74 | DL1SUZ | JO53 | 61 | 14 | 968 |
| 75 | OK1FFD | JO60 | 60 | 14 | 1058 |
| 76 | ON4GG | JO20 | 60 | 10 | 982 |
| 77 | DL0UL/p | JN48 | 59 | 17 | 837 |
| 78 | OH0NC | KP00 | 57 | 13 | 1592 |
| 79 | DK3RV | JO31 | 57 | 14 | 1252 |
| 80 | ON4ANT | JO20 | 57 | 9 | 914 |
| 81 | F1PYR | JN19 | 56 | 6 | 1034 |
| 82 | DC8UG | JO30 | 56 | 10 | 900 |
| 83 | DL3IAS | JN49 | 55 | 12 | 1079 |
| 84 | DG5NEX | JN49 | 55 | 11 | 1061 |
| 85 | DC0DA | JO31 | 55 | 1 | 1034 |
| 86 | LY2WR | KO24 | 53 | 14 | 1026 |
| 87 | PE1HWO | JO21 | 52 | 14 | 1315 |
| 88 | DL7APV | JO62 | 51 | 12 | 1112 |
| 89 | DL3NQ | JN49 | 51 | 10 | 920 |
| 90 | DK0FLT | JN59 | 51 | 12 | 684 |
| 91 | DL1KDA | JO30 | 50 | 12 | 940 |
| 92 | DK3FB | JO31 | 50 | 13 | 922 |
| 93 | DF1EQ | JO31 | 50 | 11 | 887 |
| 94 | DJ1KP | JO40 | 50 | 14 | 698 |
| 95 | SP9EWU | JO90 | 48 | 12 | 946 |
| 96 | DK2MN | JO32 | 48 | 10 | 692 |
| 97 | DK0PX | JN48 | 47 | 1 | 942 |
| 98 | F6CGB | JN18 | 46 | 1 | 700 |
| 99 | HA1YA | JN87 | 44 | 14 | 862 |
| 100 | S50C | JN76 | 43 | 12 | 626 |
| 101 | IZ5EME | JN52 | 42 | 10 | 1036 |
| 102 | DL4EAU/p | JO51 | 42 | 8 | 882 |
| 103 | DJ6MB | JO30 | 42 | 1 | 876 |
| 104 | YL3AG | KO26 | 42 | 11 | 867 |
| 105 | DL3NI | JO31 | 41 | 12 | 798 |
| 106 | F5HGO | JN05 | 41 | 5 | 796 |
| 107 | OK1KEI/P | JN79 | 41 | 10 | 740 |
| 108 | ES2RJ | KO29 | 40 | 9 | 765 |
| 109 | DG0CAL | JO52 | 39 | 9 | 1160 |
| 110 | OK1KRQ/P | JN69 | 39 | 11 | 962 |
| 111 | DK2DB | JN48 | 39 | 1 | 873 |
| 112 | LA/DB1DI/P | JO37 | 38 | 9 | 1013 |
| 113 | DK2BJ | JO30 | 38 | 10 | 886 |
| 114 | DG1VL/P | JO61 | 37 | 7 | 723 |
| 115 | ON4KHG | JO10 | 37 | 6 | 642 |
| 116 | I0LVA/0 | JN62 | 35 | 1 | 1152 |
| 117 | G7LRQ | IO91 | 35 | 10 | 746 |
| 118 | ES2WX | KO29 | 35 | 9 | 692 |
| 119 | OH5LK | KP30 | 33 | 1 | 1349 |
| 120 | DG6GP | JN48 | 33 | 7 | 732 |
| 121 | DH3YAK | JO31 | 33 | 5 | 715 |
| 122 | ES4EQ | KO39 | 33 | 9 | 636 |
| 123 | ES6RQ | KO37 | 33 | 9 | 600 |
| 124 | HA8V | KN06 | 31 | 11 | 630 |
| 125 | I4YNO/4 | JN54 | 30 | 9 | 754 |
| 126 | DK1VI | JN49 | 30 | 10 | 717 |
| 127 | ES5WE | KO38 | 29 | 7 | 1249 |
| 128 | DL7YS | JO62 | 29 | 7 | 535 |
| 129 | I3ZVN | JN55 | 28 | 9 | 1197 |
| 130 | LA0BY/p | JO59 | 27 | 7 | 1098 |
| 131 | IW3FZQ/4 | JN54 | 27 | 7 | 732 |
| 132 | ES0SM | KO08 | 26 | 8 | 873 |
| 133 | F6FGO | JN25 | 26 | 4 | 839 |
| 134 | OK1DTG/P | JO70 | 24 | 8 | 742 |
| 135 | OK2QI | JO80 | 23 | 7 | 1275 |
| 136 | F1FIH | JN23 | 23 | 6 | 605 |
| 137 | OK1VBN | JN78 | 22 | 9 | 950 |
| 138 | G4LDR | IO91 | 22 | 5 | 593 |
| 139 | HA8MV | KN06 | 22 | 9 | 576 |
| 140 | OK1PG | JO70 | 21 | 9 | 985 |
| 141 | PE1OGF | JO21 | 21 | 6 | 588 |
| 142 | OK2BFF/P | JO80 | 21 | 8 | 536 |
| 143 | ON1IM | JO11 | 20 | 5 | 650 |
| 144 | OK2VMU/P | JN99 | 20 | 7 | 570 |
| 145 | DL0SP/P | JO62 | 20 | 5 | 430 |
| 146 | OK1KRY | JN69 | 19 | 7 | 865 |
| 147 | OK1KPA | JN79 | 19 | 1 | 783 |
| 148 | OK2BBF | JN89 | 19 | 8 | 563 |
| 149 | F5DE | JN05 | 19 | 2 | 440 |
| 150 | OL5Z | JN89 | 18 | 6 | 694 |
| 151 | OZ4VW | JO45 | 18 | 6 | 676 |
| 152 | F5OIH/P | JN08 | 17 | 5 | 517 |
| 153 | IW3HTU | JN55 | 16 | 4 | 838 |
| 154 | S53J | JN75 | 16 | 6 | 410 |
| 155 | DL5NEN | JN59 | 16 | 16 | 320 |
| 156 | ES1RF | KO29 | 15 | 5 | 506 |
| 157 | DG7SFL | JN49 | 15 | 3 | 358 |
| 158 | OK1TEH | JO70 | 15 | 4 | 343 |
| 159 | ES1AJ | KO29 | 14 | 5 | 531 |
| 160 | ES2XM | KO29 | 14 | 5 | 478 |
| 161 | DF0RU | JO62 | 14 | 3 | 373 |
| 162 | ES2WR | KO29 | 13 | 5 | 694 |
| 163 | ES0Z | KO18 | 13 | 5 | 453 |
| 164 | YO4FRJ | KN34 | 13 | 4 | 382 |
| 165 | SM7JUQ | JO65 | 12 | 7 | 1061 |
| 166 | ES1NJ | KO29 | 12 | 4 | 507 |
| 167 | OM7AQ | JN98 | 12 | 5 | 426 |
| 168 | ES1MW | KO29 | 11 | 4 | 507 |
| 169 | ES0W | KO18 | 11 | 5 | 443 |
| 170 | OK1SC | JO70 | 10 | 1 | 440 |
| 171 | OK2PWY | JN89 | 10 | 6 | 357 |
| 172 | OK2KJU | JN89 | 10 | 6 | 347 |
| 173 | OK2PHM | JN89 | 10 | 1 | 341 |
| 174 | IT9VDQ | JN68 | 9 | 1 | 899 |
| 175 | ES1OX | KO29 | 9 | 5 | 772 |
| 176 | ES1DW | KO29 | 9 | 5 | 330 |
| 177 | DG3XA/P | JO43 | 8 | 4 | 664 |
| 178 | YO2IS | KN05 | 8 | 5 | 472 |
| 179 | OK1HRR | JO70 | 8 | 2 | 292 |
| 180 | DL3AMA | JO51 | 8 | 3 | 162 |
| 181 | ES1TCA | KO29 | 7 | 2 | 246 |
| 182 | ES2NA | KO29 | 6 | 4 | 349 |
| 183 | OK1ZVP | JO60 | 6 | 1 | 263 |
| 184 | ES0NW | KO19 | 5 | 2 | 190 |

## 2320 MHz Toplist

| Nr | Call | Loc | Sqr | Dxcc | ODX Tropo/RS |
|---|---|---|---|---|---|
| 1 | PA0EZ | JO22 | 85 | 15 | 1120 |
| 2 | DB6NT | JO50 | 75 | 15 | 1119 |
| 3 | PA0WWM | JO22 | 74 | 16 | 1155 |
| 4 | PA0RDY | JO22 | 65 | 15 | 1000 |
| 5 | G3LQR | JO02 | 58 | 1 | 1006 |
| 6 | G3XDY | JO02 | 57 | 13 | 1176 |
| 7 | SM6ESG | JO67 | 56 | 8 | 1085 |
| 8 | SM7ECM | JO65 | 53 | 10 | 942 |
| 9 | PA0BAT | JO31 | 53 | 14 | 923/682 |
| 10 | OE5VRL/5 | JN78 | 52 | 13 | 1291/495 |
| 11 | OK1KIR/P | JO60 | 51 | 10 | 1115 |
| 12 | F5HRY | JN18 | 50 | 6 | 877 |
| 13 | DL7QY | JN59 | 47 | 10 | 1018 |
| 14 | G6DER | IO93 | 46 | 18 | 1265 |
| 15 | PA5DD | JO22 | 45 | 11 | 1155/397 |
| 16 | DL3YEE | JO42 | 45 | 14 | 993 |
| 17 | OK1AIY/P | JO70 | 44 | 1 | 1296 |
| 18 | DL6NAQ | JO50 | 44 | 11 | 860 |
| 19 | PA4FP | JO33 | 44 | 12 | 727 |
| 20 | DL0GTH | JO50 | 42 | 7 | 1052 |
| 21 | DL1BKK | JO43 | 42 | 10 | 760 |
| 22 | PA3DZL | JO21 | 36 | 11 | 928 |
| 23 | OZ2OE | JO45 | 36 | 8 | 914 |
| 24 | DJ1KP | JO40 | 36 | 11 | 698 |

| | | | | |
|---|---|---|---|---|
| 25 | DC8UG | JO30 35 | 8 | 900 |
| 26 | DF1EQ | JO31 34 | 6 | 889 |
| 27 | OK1OKL | JO60 34 | 1 | 830 |
| 28 | F1PYR | JN19 34 | 6 | 750 |
| 29 | DL0UL/P | JN48 33 | 11 | 961 |
| 30 | DK0OG | JN68 33 | 8 | 721 |
| 31 | HB9MIO/P | JN37 32 | 1 | 744 |
| 32 | OZ7IS | JO65 31 | 9 | 860 |
| 33 | DC0DA | JO31 31 | 1 | 775 |
| 34 | DC9YC | JO31 30 | 10 | 858 |
| 35 | DL3NQ | JN49 29 | 8 | 890 |
| 36 | DL3YEE | JO42 29 | 10 | 520 |
| 37 | DH9NBB | JN49 27 | 7 | 654 |
| 38 | DL4OL | JO52 27 | 5 | 433 |
| 39 | DK0PX | JN48 26 | 1 | 853 |
| 40 | DL2DR | JO31 26 | 7 | 823 |
| 41 | DK2MN | JO32 25 | 6 | 635 |
| 42 | I0LVA/0 | JN62 25 | 1 | 612 |
| 43 | OK2BFH | JN99 24 | 9 | 1026 |
| 44 | DL1SUZ | JO53 24 | 7 | 747 |
| 45 | PA5AO | JO31 23 | 7 | 785 |
| 46 | OK1KEI/P | JN79 23 | 7 | 740 |
| 47 | DL3IAS | JN49 23 | 6 | 604 |
| 48 | DK2DB | JN48 22 | 1 | 873 |
| 49 | DL8BDU | JO43 22 | 5 | 635 |
| 50 | OK1DKS/P | JO60 22 | 4 | 602 |
| 51 | DL3NI | JO31 21 | 5 | 788 |
| 52 | SP6GWB/P | JO80 21 | 5 | 650 |
| 53 | F1HDF/P | JN18 20 | 3 | 621 |
| 54 | OK1DFC/P | JO60 20 | 6 | 549 |
| 55 | SM0DFP | JO89 20 | 4 | 520 |
| 56 | I3ZVN | JN55 19 | 7 | 603 |
| 57 | DJ8ES | JO43 19 | 7 | 1025 |
| 58 | G3LTF | JO01 19 | 1 | 902 |
| 59 | ON4PS | JO20 19 | 6 | 574 |
| 60 | HB9AMH/P | JN37 18 | 1 | 933 |
| 61 | DL4EAU/p | JO51 18 | 5 | 810 |
| 62 | DK1KR | JO53 17 | 7 | 864 |
| 63 | LA/DB1DI/P | JO37 17 | 7 | 825 |
| 64 | S51WI | JN75 17 | 5 | 533 |
| 65 | DG5NEX | JN49 16 | 4 | 455 |
| 66 | OZ1FF | JO55 15 | 6 | 624 |
| 67 | DM2AFM | JO61 15 | 4 | 612 |
| 68 | HA1YA | JN87 15 | 5 | 476 |
| 69 | DF6VB | JO31 15 | 4 | 415 |
| 70 | OK1KRQ/P | JN69 15 | 4 | 350 |
| 71 | DK6AS | JO52 14 | 4 | 620 |
| 72 | PA0JUS | JO22 13 | 5 | 800 |
| 73 | SP9FG | JN99 13 | 5 | 747 |
| 74 | OK2BFF/P | JO80 13 | 6 | 418 |
| 75 | DJ6XV | JO31 12 | 3 | 396 |
| 76 | IZ5EME | JN52 10 | 3 | 552 |
| 77 | G4LDR | IO91 10 | 2 | 444 |
| 78 | IW3FZQ/4 | JN54 10 | 3 | 403 |
| 79 | OK1KEI | JO70 9 | 4 | 786 |
| 80 | IW3HTU | JN55 9 | 2 | 542 |
| 81 | OK2VMU/P | JN99 9 | 4 | 376 |
| 82 | F6CGB | JN18 8 | 1 | 407 |
| 83 | S50C | JN76 8 | 5 | 346 |
| 84 | OK1CA | JO70 8 | 1 | 291 |
| 85 | SP6MLK/P | JO80 8 | 3 | 272 |
| 86 | F1FIH | JN23 8 | 1 | 239 |
| 87 | DB1BX | JO32 7 | 3 | 422 |
| 88 | OM7AQ | JN98 7 | 4 | 412 |
| 89 | DG6GP | JN48 7 | 2 | 388 |
| 90 | DG1VL/P | JO61 7 | 2 | 262 |
| 91 | OK1PG | JO70 6 | 4 | 855 |
| 92 | OV4VW | JO45 6 | 2 | 548 |
| 93 | DL7APV | JO62 5 | 4 | 529 |
| 94 | OK1KRY | JN69 5 | 3 | 189 |
| 95 | OK2QI | JO80 4 | 2 | 305 |
| 96 | F5PAU | IN88 4 | 1 | 260 |
| 97 | OL5Z | JN89 4 | 3 | 158 |
| 98 | OK1VBN | JN78 3 | 3 | 158 |
| 99 | DL1KDA | JO30 3 | 2 | 98 |
| 100 | G8BKE/P | IO80 1 | 1 | 114 |

## 3400 MHz Toplist

| | | | | |
|---|---|---|---|---|
| 1 | DB6NT | JO50 44 | 7 | 747 |
| 2 | PA0EZ | JO22 31 | 8 | 835 |
| 3 | PA0WWM | JO22 28 | 6 | 850/660 |
| 4 | PA0BAT | JO31 27 | 5 | 729/729 |
| 5 | DL6NAQ | JO40 25 | 4 | 860 |
| 6 | PA5DD | JO22 24 | 7 | 867/645 |
| 7 | G3LQR | JO02 23 | 1 | 924 |
| 8 | G3XDY | JO02 22 | 5 | 980/206 |
| 9 | DL3YEE | JO42 21 | 5 | 501/455 |
| 10 | PA0RDY | JO22 19 | 3 | 643 |
| 11 | DC0DA | JO31 17 | 1 | 660 |
| 12 | G6DER | IO93 16 | 7 | 859 |
| 13 | PA4FP | JO33 16 | 5 | 733 |
| 14 | DK2MN | JO32 16 | 3 | 422 |
| 15 | DL6NCI | JO50 16 | 3 | 413/321 |
| 16 | DL1BKK | JO43 15 | 3 | 703 |
| 17 | DL3NQ | JN49 15 | 5 | 641 |
| 18 | DL7QY | JN59 15 | 2 | 565 |
| 19 | DF1EQ | JO31 14 | 3 | 532 |
| 20 | DK0OG | JN68 14 | 3 | 476 |
| 21 | DL4EAU/p | JO51 13 | 3 | 845 |
| 22 | DC8UG | JO30 13 | 6 | 724 |
| 23 | DL2DR | JO31 13 | 3 | 470 |
| 24 | HB9MIO/P | JN37 12 | 1 | 463 |
| 25 | DK2DB | JN48 11 | 1 | 331 |
| 26 | DL3IAS | JN49 10 | 2 | 414 |
| 27 | DK0PX | JN48 9 | 1 | 632 |
| 28 | DL0UL/P | JN48 9 | 1 | 239 |
| 29 | DM2AFN | JO61 8 | 2 | 662 |
| 30 | DL0GTH | JO50 7 | 2 | 466 |
| 31 | DB1BX | JO32 7 | 3 | 438 |
| 32 | DG1VL/P | JO61 7 | 2 | 320 |
| 33 | DL0UL/p | JN48 7 | 1 | 208 |
| 34 | OK1AIY/P | JO70 6 | 1 | 768 |
| 35 | OZ2OE | JO45 6 | 4 | 772 |
| 36 | OK1KEI/P | JN79 6 | 2 | 306 |
| 37 | DJ8ES | JO43 5 | 3 | 578 |
| 38 | DJ6XV | JO31 5 | 3 | 396 |
| 39 | S51WI | JN75 3 | 1 | 98 |
| 40 | OK1DFC | JO60 2 | 2 | 59 |
| 41 | G8BKE/P | IO80 1 | 1 | 114 |
| 42 | OZ4VW | JO45 1 | 1 | 20 |
| 43 | SP6GWB/P | JO80 1 | 1 | 2 |
| 44 | SP6MLK/P | JO80 1 | 2 | 1 |

## 5760 MHz Toplist

| | | | | |
|---|---|---|---|---|
| 1 | F5HRY | JN18 54 | 8 | 686 |
| 2 | F1PYR/P | JN19 53 | 9 | 893/696 |
| 3 | DB6NT | JO50 51 | 16 | 1083 |
| 34 | PA0EZ | JO22 49 | 9 | 1028 |
| 5 | SM7ECM | JO65 49 | 9 | 960/647 |
| 6 | OE5VRL/5 | JN78 41 | 10 | 901/734 |
| 7 | PA0BAT | JO31 39 | 11 | 884/729 |
| 8 | HB9AMH/P | JN37 38 | 9 | 929 |
| 9 | SM6ESG | JO67 37 | 7 | 1390 |
| 10 | PA5DD | JO22 36 | 9 | 867/599 |
| 11 | DL3YEE | JO42 34 | 10 | 993/583 |
| 12 | PA0WWM | JO22 34 | 9 | 863/589 |
| 13 | HB9MIO/P | JN37 34 | 1 | 694 |
| 14 | G3XDY | JO02 33 | 9 | 1240/540 |
| 15 | F1HDF/P | JN18 30 | 4 | 638 |
| 16 | F1GHB/P | IN88 27 | 4 | 779 |
| 17 | DL6NCI | JO50 27 | 9 | 600/521 |
| 18 | G3LQR | JO02 23 | 1 | 949 |
| 19 | I3ZVN | JN55 19 | 7 | 573 |
| 20 | DK0OG | JN68 18 | 4 | 476 |
| 21 | DL1BKK | JO43 18 | 8 | 689 |
| 22 | OK1KEI/P | JN79 18 | 7 | 466 |
| 23 | SP6GWB/P | JO80 17 | 5 | 1024 |
| 24 | OK1KIR/P | JO60 17 | 3 | 393 |
| 25 | SM0DFP | JO89 16 | 6 | 1086 |
| 26 | OK1UWA/P | JO70 16 | 1 | 998 |
| 27 | S51JN/P | JN65 16 | 5 | 557 |
| 28 | S51WI | JN75 15 | 4 | 586 |
| 29 | HA1YA | JN87 15 | 6 | 461 |
| 30 | DL3IAS | JN49 15 | 5 | 458 |
| 31 | G6DER | IO93 14 | 8 | 947 |
| 32 | OK1AIY/P | JO70 14 | 1 | 736 |
| 33 | DL0UL/P | JN48 14 | 5 | 660 |
| 34 | I0LVA/0 | JN62 14 | 1 | 557 |
| 35 | DK2MN | JO32 14 | 3 | 422 |
| 36 | G4LDR | IO91 13 | 4 | 444 |
| 36 | PA4FP | JO33 12 | 4 | 733 |
| 38 | DC0DA | JO31 12 | 1 | 660 |
| 39 | OZ7IS | JO65 12 | 4 | 593 |
| 40 | DM2AFN | JO61 12 | 6 | 524 |
| 41 | DL3NQ | JN49 12 | 4 | 383 |
| 42 | OK2BFH | JN99 11 | 5 | 756 |
| 43 | DC8UG | JO30 11 | 5 | 724 |
| 44 | DK2DB | JN48 11 | 1 | 315 |
| 45 | DL0UL/p | JN48 11 | 4 | 308 |
| 46 | DL7QY | JN59 10 | 3 | 565 |
| 47 | DG1VL/P | JO61 10 | 4 | 525 |
| 48 | OK1OKL | JO60 9 | 1 | 611 |
| 49 | DK0PX | JN48 9 | 1 | 409 |
| 50 | IW3FZQ/4 | JN54 9 | 4 | 291 |
| 51 | DL2DR | JO31 9 | 3 | 201 |
| 52 | IW3HTU | JN55 8 | 3 | 542 |
| 53 | LA/DB1DI/P | JO37 7 | 5 | 746 |
| 54 | DL0GTH | JO50 7 | 2 | 674 |
| 55 | F6CGB | JN18 7 | 1 | 407 |
| 56 | SP6MLK/P | JO80 6 | 4 | 339 |
| 57 | OK1DKS/P | JO60 6 | 1 | 318 |
| 58 | DC8EC/P | JN57 6 | 1 | 278 |
| 59 | OZ2OE | JO45 5 | 5 | 679 |
| 60 | DJ8ES | JO43 5 | 5 | 578 |
| 61 | DF1EQ | JO31 5 | 3 | 461 |
| 62 | DJ6XV | JO31 5 | 2 | 176 |
| 63 | DB1BX | JO32 5 | 2 | 150 |
| 64 | OK2VMU/P | JN99 4 | 2 | 376 |
| 65 | OK1KRY | JN69 3 | 2 | 175 |
| 66 | S50C | JN76 3 | 1 | 126 |
| 67 | F6CGB/P | JN24 2 | 1 | 375 |
| 68 | G8BKE/P | IO80 2 | 1 | 242 |
| 69 | OK2QI | JO80 2 | 1 | 108 |
| 70 | ES2WX | KO29 2 | 2 | 89 |
| 71 | OK1KRQ/P | JN69 1 | 1 | 96 |
| 72 | OK1SC | JO70 1 | 1 | 10 |

## 10368 MHz Toplist

| | | | | |
|---|---|---|---|---|
| 1 | F6DKW | JN18 97 | 14 | 1452/885 |
| 2 | PA0EZ | JO22 82 | 14 | 1028 |
| 3 | F5HRY | JN18 78 | 10 | 877/757 |
| 4 | DB6NT | JO50 73 | 19 | 1083 |
| 5 | PA0WWM | JO22 73 | 14 | 850/811 |
| 6 | OE5VRL/5 | JN78 71 | 14 | 1135/786 |
| 7 | F1PYR/p | JN19 71 | 12 | 893/811 |
| 8 | OK1JKT/P | JO60 71 | 16 | 853/889 |
| 9 | PA0BAT | JO31 69 | 13 | 884/729 |
| 10 | F1HDF/P | JN18 69 | 11 | 867 |
| 11 | F6DWG/p | JN19 67 | 11 | 902/826 |
| 12 | DK1KR | JO53 65 | 12 | 168/725 |
| 13 | SM7ECM | JO65 64 | 11 | 1110/711 |
| 14 | DM2AFN | JO61 64 | 18 | 923 |
| 15 | DL6NCI | JO50 63 | 15 | 671/959 |

| | | | | |
|---|---|---|---|---|
| 16 | HB9AMH/P | JN37 62 | 12 | 998 |
| 17 | DF2CK | JO71 60 | 15 | 479/881 |
| 18 | PA5DD | JO22 59 | 12 | 867/681 |
| 19 | G3XDY | JO02 58 | 14 | 1240/881 |
| 20 | G4EAT | JO01 57 | 13 | 1003/922 |
| 21 | DL3YEE | JO42 56 | 13 | 993/700 |
| 22 | DJ1KP | JO40 56 | 15 | 696 |
| 23 | DG1KJG | JO30 56 | 12 | 659/644 |
| 24 | G3WDG | IO92 55 | 1 | 1135 |
| 25 | DL4EAU/P | JO51 55 | 13 | 827/480 |
| 26 | DK8ZP | JO40 55 | 15 | 777 |
| 27 | G4KGC | IO92 53 | 1 | 1135 |
| 28 | G3LQR | JO02 52 | 1 | 1006 |
| 29 | I6XCK/6 | JN63 52 | 1 | 768 |
| 30 | DF5JJ | JO43 52 | 11 | 611/761 |
| 31 | OK1VAM/P | JO60 50 | 15 | 404/830 |
| 32 | I6CXB/6 | JN63 52 | 1 | 751 |
| 33 | PA5AO | JO31 52 | 9 | 724/721 |
| 34 | DL4WO | JO60 50 | 15 | 797 |
| 35 | OZ1FF | JO45 48 | 12 | 967/861 |
| 36 | DG1VL/P | JO61 48 | 11 | 807 |
| 37 | DL1SUN | JO53 48 | 8 | 768/711 |
| 38 | G4DDK | JO02 47 | 12 | 1005/654 |
| 39 | DK0OG | JN68 46 | 13 | 563/761 |
| 40 | HB9MIN/P | JN37 45 | 1 | 939 |
| 41 | DL3IAS | JN49 45 | 11 | 690 |
| 42 | SM6ESG | JO67 44 | 7 | 1275 |
| 43 | SP6GWB/P | JO80 44 | 10 | 829/753 |
| 44 | OK1DIG | JO60 44 | 12 | 551/689 |
| 45 | DJ5BV | JO31 44 | 12 | 684 |
| 46 | DL3NQ | JN49 43 | 9 | 715 |
| 47 | S51ZO | JN86 42 | 11 | 476/672 |
| 48 | DC8EC | JN57 41 | 12 | 661 |
| 49 | IW6CVN/6 | JN63 40 | 13 | 832/824 |
| 50 | HB9MIO/P | JN37 40 | 1 | 744 |
| 51 | DK2MN | JO32 40 | 9 | 632 |
| 52 | G4BRK | IO91 39 | 1 | 1115 |
| 53 | I4XCC | JN63 39 | 11 | 729/788 |
| 54 | DK0FLT | JN59 39 | 10 | 683 |
| 55 | S51JN/P | JN65 39 | 14 | 637 |
| 56 | DL0UL/P | JN48 38 | 8 | 658 |
| 57 | I0LVA/0 | JN62 37 | 8 | 850 |
| 58 | LX1DU | JN29 37 | 1 | 700 |
| 59 | OK1KEI/P | JN79 37 | 10 | 639 |
| 60 | HA1YA | JN87 36 | 7 | 794 |
| 61 | DH9NBB | JN49 36 | 9 | 654 |
| 62 | G3GNR | IO70 34 | 1 | 1275 |
| 63 | HB9RG | JN47 34 | 1 | 761 |
| 64 | OK1AIY/P | JO70 34 | 1 | 736 |
| 65 | F6DRO | JN03 33 | 6 | 904/668 |
| 66 | OK2BFH | JN99 33 | 7 | 769/669 |
| 67 | F1GHB/P | IN88 33 | 5 | 669 |
| 68 | G4LDR | IO91 32 | 9 | 1118 |
| 69 | SM0DFP | JO89 32 | 6 | 769/536 |
| 70 | DL6NAQ/P | JO40 32 | 8 | 656 |
| 71 | DC9YC | JO31 32 | 9 | 599 |
| 72 | G4DDK | JO02 31 | 1 | 901 |
| 73 | SP6MLK/P | JO80 31 | 10 | 752/352 |
| 74 | DL1BKK | JO43 30 | 9 | 844 |
| 75 | OK1DFC/P | JO60 30 | 7 | 668 |
| 76 | DL1SUZ | JO53 30 | 5 | 362/572 |
| 77 | DL0GTH | JO50 30 | 7 | 240 |
| 78 | EA6/DF5JJ | JM19 29 | 7 | 1090 |
| 79 | IW6AEG/6 | JN63 29 | 1 | 751 |
| 80 | OZ1IPU | JO57 28 | 7 | 941 |
| 81 | OK1KIR/P | JO60 28 | 6 | 658 |
| 82 | OK1OKL | JO60 27 | 1 | 795 |
| 83 | F6CGB | JN18 27 | 1 | 677 |
| 84 | S50C | JN76 27 | 9 | 505 |
| 85 | DJ8ES | JO43 26 | 7 | 798/575 |
| 86 | OZ2OE | JO45 26 | 6 | 789 |
| 87 | PA4FP | JO33 25 | 8 | 865 |

| | | | | |
|---|---|---|---|---|
| 88 | SP3JBI | JO91 25 | 6 | 307/668 |
| 89 | OK1VAM | JN79 25 | 6 | 630 |
| 90 | DK0PX | JN48 25 | 1 | 567 |
| 91 | S51WI | JN75 24 | 6 | 586/343 |
| 92 | DK4GD/P | JN48 24 | 1 | 566 |
| 93 | ON4KHG | JO10 24 | 6 | 565/496 |
| 94 | G0RRJ | IO91 24 | 5 | 442/442 |
| 95 | G3LTF | JO01 23 | 1 | 902/435 |
| 96 | ON7WR | JO20 23 | 9 | 756 |
| 97 | I3ZVN | JN55 23 | 8 | 573 |
| 98 | OK1DST | JN79 23 | 7 | 402 |
| 99 | DC0DA | JO31 22 | 1 | 816 |
| 100 | DL2DR | JO31 22 | 7 | 603 |
| 101 | OK2KKW | JO60 22 | 4 | 416/336 |
| 102 | DL1CF | JO42 22 | 6 | 0 |
| 103 | G8DKK | IO91 21 | 6 | 577/522 |
| 104 | DJ5VW | JO31 21 | 5 | 474 |
| 105 | DC8UG | JO30 20 | 6 | 753 |
| 106 | DB1BX | JO32 20 | 7 | 705 |
| 107 | DL4VCG | JN39 20 | 1 | 533 |
| 108 | PA2DW | JO22 19 | 6 | 700 |
| 109 | DF9QX | JO42 19 | 1 | 504 |
| 110 | DK2DB | JN48 19 | 1 | 432 |
| 111 | LA/DB1DI/P | JO37 18 | 6 | 825 |
| 112 | S57EA | JN76 18 | 8 | 361/626 |
| 113 | DL5NEN/P | JN49 18 | 6 | 466 |
| 114 | F6HTJ/p | JN12 17 | 1 | 1175 |
| 115 | ON7YK | JO20 17 | 5 | 489 |
| 116 | DJ6XV | JO31 17 | 3 | 285 |
| 117 | OK2PWY | JO80 16 | 5 | 558/594 |
| 118 | IW3FZQ/4 | JN54 16 | 5 | 557 |
| 119 | F5PAU | IN88 16 | 2 | 430 |
| 120 | OK1KRQ/P | JN69 16 | 3 | 325 |
| 121 | HB9AMH | JN37 15 | 1 | 567 |
| 122 | DL7QY | JN59 15 | 4 | 492 |
| 123 | OK1UWA/P | JO70 15 | 1 | 434 |
| 124 | F6CGB/P | JN12 14 | 1 | 1191 |
| 125 | IW5ADB | JN53 14 | 1 | 1053 |
| 126 | G4PMK | IO93 14 | 1 | 958 |
| 127 | OZ1FF | JO45 14 | 7 | 740 |
| 128 | SP9FG | JN99 13 | 5 | 611/518 |
| 129 | OZ1DOQ | JO65 13 | 5 | 472 |
| 130 | DF1IAZ | JN49 12 | 2 | 515 |
| 131 | OH0NC | KP00 12 | 4 | 269 |
| 132 | GW4LXO | IO81 12 | 1 | 309 |
| 133 | G4KNZ | IO91 12 | 1 | 247 |
| 134 | OK1DKS/P | JO60 11 | 2 | 616 |
| 135 | G4LRT | IO92 8 | 1 | 824 |
| 136 | IW3HTU | JN55 8 | 2 | 542 |
| 137 | IW3QCV | JN65 8 | 2 | 532 |
| 138 | F5HRY/P | JN08 8 | 2 | 491 |
| 139 | DL1KDA | JO30 8 | 4 | 477 |
| 140 | DG5NEX | JN49 7 | 2 | 426 |
| 141 | DF6VB | JO31 7 | 2 | 336 |
| 142 | DJ4YJ/p | JN57 7 | 2 | 293 |
| 143 | DF1EQ | JO31 7 | 1 | 283 |
| 144 | DF1EQ/P | JO31 7 | 1 | 283 |
| 145 | DG0CAL/p | JO52 7 | 1 | 255 |
| 146 | DL1JIN/p | JO60 6 | 3 | 345 |
| 147 | ES0SM | KO08 5 | 2 | 384 |
| 148 | LA8AK | JO38 5 | 1 | 212 |
| 149 | OK2QI | JO80 4 | 1 | 303 |
| 150 | G8BKE/P | IO80 4 | 1 | 242 |
| 151 | F5OIH/P | JN08 4 | 1 | 149 |
| 152 | OK2VMU/P | JN99 3 | 2 | 376 |
| 153 | PA0JUS | JO22 3 | 2 | 245 |
| 154 | DH3NAN | JO50 3 | 1 | 134 |
| 155 | OZ4VW | JO45 3 | 1 | 52 |
| 156 | OK1KRY | JN69 1 | 1 | 78 |
| 157 | GM0ICF | IO75 1 | 1 | 53 |
| 158 | DL0SP/P | JO62 1 | 1 | 28 |
| 159 | SM4SJY | JP70 1 | 1 | 160 |

## 24 GHz Toplist

| | | | | |
|---|---|---|---|---|
| 1 | DB6NT | JO50 13 | 6 | 288/403 |
| 2 | DL6NCI | JO50 12 | 3 | 280/280 |
| 3 | PA0BAT | JO31 11 | 3 | 403/403 |
| 4 | OE5VRL/5 | JN78 11 | 3 | 289/289 |
| 5 | PA0EZ | JO22 10 | 4 | 391 |
| 6 | DC8EC/P | JN57 10 | 4 | 304 |
| 7 | HB9AMH/P | JN37 10 | 3 | 286 |
| 8 | HB9MIO/P | JN37 10 | 2 | 172 |
| 9 | IW3EHQ/P | JN66 8 | 1 | 461 |
| 10 | I0LVA/0 | JN62 8 | 3 | 444 |
| 11 | DJ1KP | JO40 8 | 1 | 273 |
| 12 | DC0DA/P | JO41 8 | 1 | 132 |
| 13 | OK1AIY/P | JO70 7 | 2 | 281 |
| 14 | G4DDK | JO02 7 | 3 | 268/112 |
| 15 | SM6ESG | JO67 7 | 3 | 242 |
| 16 | EA6/DF5JJ | JM19 7 | 2 | 226 |
| 17 | DL3YEE/P | JO42 7 | 2 | 197/98 |
| 18 | DK0OG | JN68 7 | 2 | 193 |
| 19 | S51JN/P | JN65 6 | 3 | 293 |
| 20 | DL3NQ | JN49 6 | 3 | 287 |
| 21 | IW3FZQ/4 | JN54 6 | 3 | 250 |
| 22 | PA5DD | JO22 6 | 3 | 212 |
| 23 | PA0WWM | JO22 6 | 4 | 210/210 |
| 24 | I3ZVN | JN55 6 | 2 | 210 |
| 25 | F1PYR/P | JN19 6 | 1 | 189 |
| 26 | PA5AO | JO31 6 | 2 | 166 |
| 27 | OK2BFF/p | JO80 6 | 2 | 160 |
| 28 | DH9YAU/p | JO41 6 | 1 | 132 |
| 29 | G3LQR | JO02 5 | 1 | 261 |
| 30 | F1HDF/P | JN18 5 | 1 | 230 |
| 31 | OK1KIR/P | JO60 5 | 2 | 227 |
| 32 | OK1UEI | JO70 5 | 2 | 186 |
| 33 | OK1OKL | JO60 5 | 1 | 185 |
| 34 | DL4WO/p | JO61 5 | 2 | 184 |
| 35 | OK1JKT | JO60 5 | 2 | 167/63 |
| 36 | DF2CA/p | JN58 5 | 1 | 143 |
| 37 | DK2MN | JO32 5 | 2 | 132 |
| 38 | DJ4YJ/p | JN57 4 | 1 | 243 |
| 39 | DK8ZP | JO40 4 | 1 | 213 |
| 40 | F6DWG/p | JN19 4 | 1 | 189/68 |
| 41 | OK1UWA/P | JO70 4 | 1 | 188 |
| 4 | OK1DFC/P | JO60 4 | 2 | 185 |
| 43 | DK8ZP | JO40 4 | 1 | 178 |
| 44 | SM7ECM | JO65 4 | 2 | 168/168 |
| 45 | DK0PX | JN48 4 | 1 | 168 |
| 46 | DM2AFN | JO61 4 | 1 | 167 |
| 47 | F1GHB/P | IN88 4 | 1 | 158 |
| 48 | G3GNR | IO70 4 | 1 | 154 |
| 49 | DF6VB | JO31 4 | 1 | 120 |
| 50 | DG1VL/P | JO61 4 | 2 | 113 |
| 51 | DK3RV/p | JO42 4 | 2 | 108 |
| 52 | DL2DR | JO31 4 | 2 | 98 |
| 53 | F5HRY | JN18 4 | 1 | 96 |
| 54 | DG2MF/p | JN58 4 | 1 | 32 |
| 55 | OK1KEI/P | JN79 3 | 2 | 189 |
| 56 | G4KNZ/P | JO02 3 | 1 | 173 |
| 57 | IW3HTU | JN55 3 | 1 | 160 |
| 58 | DL0GTH | JO50 3 | 1 | 108 |
| 59 | GW8BKE/P | IO71 2 | 1 | 170 |
| 60 | DF1EQ | JO31 2 | 1 | 133 |
| 61 | F6CGB/P | JN37 2 | 1 | 91 |
| 62 | DC9YC | JO31 2 | 2 | 87 |
| 63 | DL1JIN/p | JO60 2 | 2 | 59 |
| 64 | DF5JJ | JO43 2 | 1 | 55/55 |
| 65 | OZ2OE | JO45 2 | 1 | 52 |
| 66 | DK2DB | JN48 2 | 1 | 48 |
| 67 | SM0DFP | JO89 2 | 1 | 36 |
| 68 | ON7YK | JO20 2 | 2 | 34 |
| 69 | F6DRO | JN03 2 | 1 | 60 |
| 70 | SP9FG | JN99 2 | 1 | 33 |

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|---|---|---|---|---|---|
| 71 | OZ1FF | JO45 | 2 | 1 | 19 |
| 72 | G8BKE/P | IO80 | 1 | 1 | 139 |
| 73 | F5OIH/P | JN08 | 1 | 1 | 90 |
| 74 | CT1DMK | IN50 | 1 | 1 | 84 |
| 75 | CT1FP | IN50 | 1 | 1 | 82 |
| 76 | DJ6XV | JO31 | 1 | 1 | 75 |
| 77 | DJ5VW | JO31 | 1 | 1 | 61 |
| 78 | OK1OGS/P | JN69 | 1 | 1 | 60 |
| 79 | F6CGB | JN18 | 1 | 1 | 55 |
| 80 | DF1EQ/p | JO31 | 1 | 1 | 29 |
| 81 | DL7QY | JN59 | 1 | 1 | 13 |
| 82 | SP6GWB/P | JO80 | 1 | 1 | 2 |
| 83 | SP6MLK/P | JO80 | 1 | 1 | 1 |

## 47 GHz Toplist

| | | | | | |
|---|---|---|---|---|---|
| 1 | HB9MIO/P | JN37 | 8 | 1 | 166 |
| 2 | DC0DA/P | JO41 | 7 | 1 | 131 |
| 3 | IW3FZQ/4 | JN54 | 6 | 1 | 188 |
| 4 | OE5VRL/5 | JN78 | 5 | 2 | 201 |
| 5 | I3ZVN* | JN55 | 5 | 1 | 179 |
| 6 | HB9AMH/P | JN37 | 5 | 3 | 166 |
| 7 | DF6VB/p | JO31 | 4 | 1 | 120 |
| 8 | DH9YAU/p | JO41 | 4 | 1 | 108 |
| 9 | DF6VB/p | JO42 | 4 | 1 | 105 |
| 10 | DF2CA/p | JN58 | 4 | 1 | 14 |
| 10 | DG2MF/p | JN58 | 4 | 1 | 14 |
| 12 | IW3EHQ/P | JN65 | 3 | 1 | 111 |
| 13 | DK3RV/p | JO42 | 3 | 1 | 108 |
| 14 | DL2DR | JO31 | 3 | 1 | 95 |
| 15 | DL3YEE | JO42 | 3 | 1 | 45 |
| 16 | OK1OKL | JO60 | 2 | 2 | 96 |
| 17 | OK1UWA/P | JO70 | 2 | 1 | 96 |
| 18 | OK1AIY-P | JO60 | 2 | 1 | 96 |
| 19 | DB6NT | JO50 | 2 | 2 | 95 |
| 20 | DL6NCI | JO50 | 2 | 2 | 83/12 |
| 21 | DK0OG | JN68 | 2 | 2 | 74 |
| 22 | DK0PX | JN48 | 2 | 1 | 62 |
| 23 | PA0BAT | JO31 | 2 | 2 | 51 |
| 24 | DK2MN | JO32 | 2 | 2 | 30 |
| 25 | DC8EC/P | JN57 | 2 | 1 | 29 |
| 26 | PA5DD | JO22 | 2 | 1 | 20 |
| 27 | DF1EQ/P | JO30 | 2 | 1 | 10 |
| 28 | F1PYR/P | JN19 | 2 | 1 | 0 |
| 29 | DL/HB9AMH/P | JN48 | 1 | 1 | 184 |
| 30 | GW8BKE/P | IO71 | 1 | 1 | 93 |
| 31 | IW3HTU | JN55 | 1 | 1 | 87 |
| 32 | G8BKE/P | IO90 | 1 | 1 | 79 |
| 33 | DL1JIN | JO60 | 1 | 1 | 59 |
| 34 | F6DWG/p | JN19 | 1 | 1 | 47 |
| 35 | F1GHB/p | IN88 | 1 | 1 | 39 |
| 36 | G4DDK/p | JO01 | 1 | 1 | 39 |
| 37 | OK1KIR/P | JO60 | 1 | 1 | 5 |
| 38 | OK1AIY/P | JO70 | 1 | 1 | 5 |
| 39 | DF1EQ/p | JO30 | 1 | 1 | 2 |
| 40 | SP6MLK/P | JO70 | 1 | 1 | 1 |
| 41 | CT1FP | IN50 | 1 | 1 | 1 |
| 42 | CT1DMK | IN50 | 1 | 1 | 1 |

## 76 GHz Toplist

| | | | | | |
|---|---|---|---|---|---|
| 1 | HB9MIO/P | JN37 | 4 | 1 | 114 |
| 2 | DF2CA/p | JN58 | 4 | 1 | 4 |
| 2 | DG2MF/p | JN58 | 4 | 1 | 4 |
| 4 | DF6VB/p | JO31 | 3 | 1 | 57 |
| 5 | DB6NT | JO50 | 2 | 1 | 77 |
| 6 | DC0DA/P | JO50 | 2 | 1 | 48 |
| 7 | G8BKE/p | IO80 | 1 | 1 | 79 |
| 8 | G8BKE/P | IO91 | 1 | 1 | 33 |
| 9 | DH9YAU/p | JO41 | 1 | 1 | 15 |
| 6 | OK1AIY/P | JO70 | 1 | 1 | 12 |
| 7 | DC8EC/P | JN57 | 1 | 1 | 5 |
| 8 | HB9AMH/P | JN37 | 1 | 1 | 1 |

## 145 GHz Toplist

| | | | | | |
|---|---|---|---|---|---|
| 1 | DB6NT | JO50 | 2 | 1 | 3 |
| 2 | DL6NCI/p | JO50 | 1 | 1 | 58 |
| 3 | IW3EHQ/P | JN65 | 1 | 1 | 2 |
| 4 | DC0DA/P | JO41 | 1 | 1 | 1 |
| 4 | DL1JIN/p | JO50 | 1 | 1 | 1 |
| 4 | G4FRE | JO01 | 1 | 1 | 1 |
| 4 | G4FRE/P | JO01 | 1 | 1 | 1 |

## 241 GHz Toplist

| | | | | | |
|---|---|---|---|---|---|
| 1 | DB6NT | JO50 | 1 | 1 | 2 |
| 2 | HB9MIO/P | JN37 | 1 | 1 | 1 |

**Disclaimer**

**All entries WITHOUT any EME-QSOs!**

**All entries are claimed by the OPs. There is NO control of the data by DUBUS!**

**Ranking on 6m:**
**1.) Squares 2.) DXCCs**

**Ranking on 2m and above:**
**1.) Squares 2.) Tropo-ODX (on 23cm and up: Tropo or RS-ODX)**

**DXCC entry on GHz was set to 1 when no info was sent.**

**The DUBUS toplists from now on are alltime tables and no entries will be deleted anymore.**

**Stations NOT using any "digital" mode may be marked with an asterisk after the callsign if they wish.**



**PLEASE RENEW FOR 2005 NOW**

**THANK YOU!**

# Inhalt / Contents 2004

## Reports (Technique, Operation Technique, Propagation, Software)



## Parts and Products

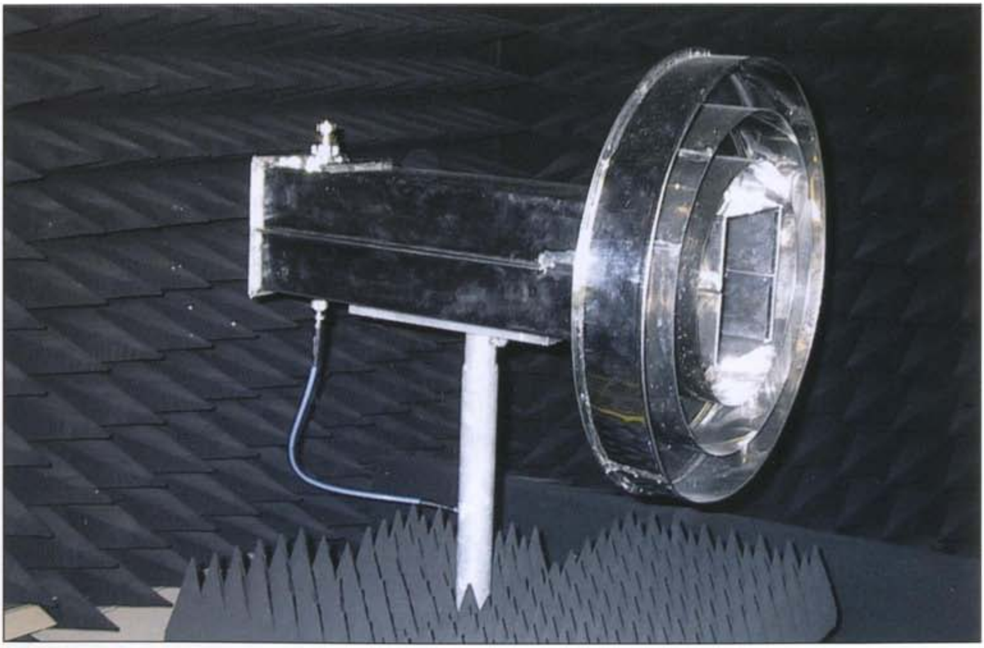


## News, Activity Reports, Contests etc.

DUBUS, Grützmühlenweg 23, 22339 Hamburg, PVSt., DPAG, Entgelt bezahlt, C11159

In this issue:

# Modified Septum Feed by OM6AA



This is the final issue of the year 2004.

**Please renew your subscription for 2005 now.**

Thank you!

Dies ist die letzte Ausgabe des Jahrgangs 2004.

**Bitte das Abo für 2005 ab 1. Januar verlängern.**

Danke!