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Editorial

Dear DUBUS Reader!

Wellcome to another issue of DUBUS Magazine.

We proudly present another basic article from SM5BSZ in this issue. Allthough it is not an article for constructing we think that it will be very interesting for everybody to read it and to think about consequences! We are sure that you will enjoy the other technical articles in this issue as well and we want to thank the authors for contributing to DUBUS Magazine!

We want to welcome Flavio, PY2ZX, in the DUBUS team of editors. Flavio will provide us with the latest information about VHF/UHF/SHF activity in South America.

The DX season in Europe has started already this year with a very unusual early 80 minutes sporadic E opening on 2m on April 28th.
The European EME contest part 1 produced some good activity on 1296 and 10368 MHz. We would like to ask everbody who was active to send logs to F6HYE.
We also want to congratulate all involved amateurs for the first ever 47 GHz EME QSOs. You will find the (true) details in this issue.

Sad news come from LA and VK. Our long term subscribers Jan-Martin, LA8AK and Lyell, VK2BE, are SK. Both were well known Microwave amateurs on their continents and will be missed for sure.

Please keep sending your expedition reports, activity reports and technical articles. DUBUS needs YOUR contribution.
Many thanks!

Have a nice summer and a lot of DX either analog or digital!

Vy 73 from Joe, DL8HCZ / CT1HZE
and the DUBUS team!

Liebe DUBUS Leser!

Willkommen zu einer neuen DUBUS-Ausgabe!

Wir präsentieren in dieser Ausgabe einen weiteren grundlegenden Artikel von SM5BSZ. Obwohl es keine „Bauanleitung" ist, denken wir, dass es für jeden interessant sein wird, diesen Artikel zu lesen und entsprechende Konsequenzen zu ziehen.
Wir sind sicher, dass auch die anderen technischen Artikel dieser Ausgabe interessant sein werden und wir danken den Autoren dafür, diese Artikel der DUBUS zur Verfügung gestellt zu haben!

An dieser Stelle heissen wir Flavio, PY2ZX, im Team der DUBUS-Redakteure herzlich willkommen. Er wird uns mit aktuellen Informationen über die VHF/UHF/SHF-Aktivitäten in Sud-Amerika auf dem Laufenden halten.

Die DX-Saison hat bereits mit einer ungewöhnlich frühen 80-minütigen Sporadic-E-Öffnung am 28.4. auf 2m begonnen. Die Aktivität im EU EME Contest auf 1296 und 10368 MHz war gut und wir bitten alle Aktiven, ihre Logs an F6HYE zu schicken.
Glückwünsche gehen von dieser Stelle an alle beteiligen Amateure, die die ersten 47 GHz-EME-QSOs verwirklicht haben. Die (wahre) Geschichte ist in dieser Ausgabe zu lesen.

Über die Einsendung von Expeditionsberichten, Aktivitätsberichten und natürlich technischen Artikeln würden wir uns weiterhin sehr freuen.
Nur so kann die DUBUS interessant und lebendig bleiben! Vielen Dank!

Wir wünschen eine schönen Sommer und viel DX, sei es analog oder digital!

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

Geodesic Parabola Antenna

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ja6xkq@jamsat.or.jp - http://www.terra.dti.ne.jp/~takeyasu/

Abstract
Geodesic Parabola Antenna (**Photo 1, 2**) is a kind of stressed-dish which is approximated by triangular planes. Its novel structural features are light weight, stiffness and ease of construction. This article reports background of the design and construction details.

Introduction
As the readers may be aware, the name of "Geodesic" is derived from "Geodesic Dome" structure invented by Richard Buckminster Fuller [1]. When searching for a better way to construct a stressed parabola, the author was not originally inspired by the Geodesic Dome structure, but through experiment reached the conclusion that a Geodesic dome would satisfy the requirements of a stronger, lighter structure. To "Do more with less" as proposed by Fuller.

The main advantage of this antenna is its "easy-to-construct" nature, featuring the following points.

a. No template or pre-bending work is required in construction of the frame.
b. The parabolic curvature results directly from the construction method.
c. Mesh on convex side, not on concave side of reflector.
d. Homogeneous triangle segmentation provides a robust structure and better surface accuracy.

The first three of features are derived from a collapsible (umbrella) antenna (**Photo 3, 4**) which was constructed by the author prior to the Geodesic Parabola antenna. Since both of the antennas are based on the so called "stressed dish" design [2], the features (a) and (b) carry through to this design. The feature (d) improves upon a disadvantage of conventional dish antennas whose structure consists of radial and axial frames. In the conventional design a unit segment made by radial and axial frames is trapezoidal in shape. Therefore the segment would be weak against side forces. In such a conventional structure, additional members are mandatory to reinforce the trapezoid and doing this results in a triangular segmentation. From a surface accuracy point of view, increasing the number of radial frames is a common method of improving the surface accuracy in the conventional stressed dish structure. However, this method has the negative side effect of increasing the weight and introducing unequal segmentation. This side effect results in an inefficient structure. Again, with ingenuity, we can "do more with less".

The features mentioned above are inherent in the design and are complementary to each other, each contributing to the overall superiority of the design.

Design
Design parameters of the antenna are:

f/D	=	0.35
Diameter	=	917 mm (7.3 wavelength)
Focal length	=	320 mm
Depth of dish	=	164 mm

Since the length of off-the-shelf aluminum flat bar is 1 meter, the diameter is restricted by this length. (see **Figure 1**) The size of dish would be suitable for the S-band downlink of a Phase-3 type satellite earth station. Considering the accuracy of the dish surface produced in the Geodesic design, S-band would be the highest frequency usable. The topic of surface accuracy is fully discussed in a later section.

In conventional design of a stressed dish, a large f/D number such as 0.5, (or shallow dish) is popular to make it easier for the constructor to more closely approximate a parabolic curve. This design employs a smaller f/D number resulting in a more stable, less top-heavy dish which can at the same time employ a patch feed for good illumination and minimum over-spill.
Structural design does not require mathematical analysis. It is easily done by the method of technical drawing and some simple calculation by Excel spread sheet. The Excel sheet is not ready for public release due to lack of a friendly interface for users.

Construction

Table 1 lists the materials. The readers may feel that 2 mm thickness of aluminum flat bar is too thin to maintain the structure. However, they will come to recognize the inherent stiffness of the structure as their own construction proceeds. It should be noted that the size of the screws, and therefore, the screw holes should be kept as small as possible in order to maintain resilience of the aluminum flat bar. The resilience and strength of the material must be maintained and is essential to the success of the stressed dish. With this in mind, thin wire is employed to sew the mesh, thereby eliminating the need for further holes in the frame structure.

Figure 1 shows dimensions of three ribs. As requirement on dimensional accuracy is moderate, hand-tools would be enough for mechanical work. The quantity of each rib is three pieces of Rib A, six pieces of Rib B and twelve pieces of Rib C.

Segmentation of the mesh is different from conventional fashion. Some trials resulted in using the figuration shown in **Photo 5** to make the dish surface smooth when employing the "mesh-on-convex" design. **Photo 5** also shows that the segmentation consists of three pairs of trapezoid and crescentic shapes.

Here are some tips for assembling

a. Connection of fringe ribs (Rib C) may appear a little puzzling. **Photo 6** and **Photo 7** clearly explain the order of connections.
b. As mentioned above, the structure is very stiff. If you have difficulty in aligning the aluminum flat bars during the final phase of assembling, it is recommended you use string to bow the bars temporarily.(**Photo 8**)
c. Numbers on **Photo 9** suggests the order of sewing the mesh.
d. Two pie-dishes are glued together by epoxy to reinforce the thin pie-dish, and fixed in the frame center.
e. Saddle washers should be inserted between ribs and center-hub in order to fill up gaps as shown in **Photo 10**. The curvature of ribs may be distorted without these washers when the center-hub is attached.
f. Supporting brackets are made from the same material as the ribs as shown in **Photo 11** and **Photo 12**.

Results

The accuracy of any dish surface is of great importance and will be of prime interest to readers. This has been thoroughly researched. **Photo 13** shows deviation from the ideal shape of a parabolic curve. A maximum deviation of approximately10 mm or 1/12 wavelength is measured as the peak deviation from an ideal surface. The surface displays a periodicity of approximately 200 mm, or 1.6 wavelength. These two numbers allow an accurate assessment of the surface accuracy and therefore the efficiency of the dish. According to chart (Fig 8.102) of the reference [2], it is expected that these measured values would result in approximately 2 dB degradation of antenna gain.

Figure 2 shows measured radiation pattern of patch feed. Efficiency of the parabolic antenna is calculated using this measured data by W1GHZ's software FEEDPATT.EXE [3]. The calculation result shows 65 % of efficiency, or 2 dB degradation of antenna gain as shown in **Figure 3**. It is noted that f/D=0.35 is not optimized for the patch feed. More info and source for patch feed, see [4].
The maximum gain of an ideally shaped parabolic antenna of this size is calculated as 27 dB at 2.4 GHz. Considering the degradation mentioned above, 23 dB or less can be expected from this dish. It should be noted that any gain figures for parabolic dishes can be a bit "rubbery" and should taken as a guide only.
The Geodesic dish constructed from this article can be expected to have a total mass of approximately 1.3 kg, including the patch feed and mounting brackets. Individual construction methods may of course result in a few grams either way. The author has received a report from a user that the Geodesic Parabola Antenna withstood heavy storms thanks to its light-weight, stiffness and flexibility of structure. Another user reports that the antenna is very suitable for portable operation for the same reasons.

Acknowledgment

The author would like to thank William B Magnusson, VK3JT for his peer review.

References

[1] The Buckminster Fuller Institute, http://www.bfi.org
[2] Evans, D.S. and G.R. Jessop, VHF-UHF MANUAL (3rd. Edition), RSGB 1976, pp. 8.56-8.57
[3] Paul Wade W1GHZ, http://www.w1ghz.cx/antbook/contents.htm
[4] http://www.jrmiller.demon.co.uk/products/patch.html

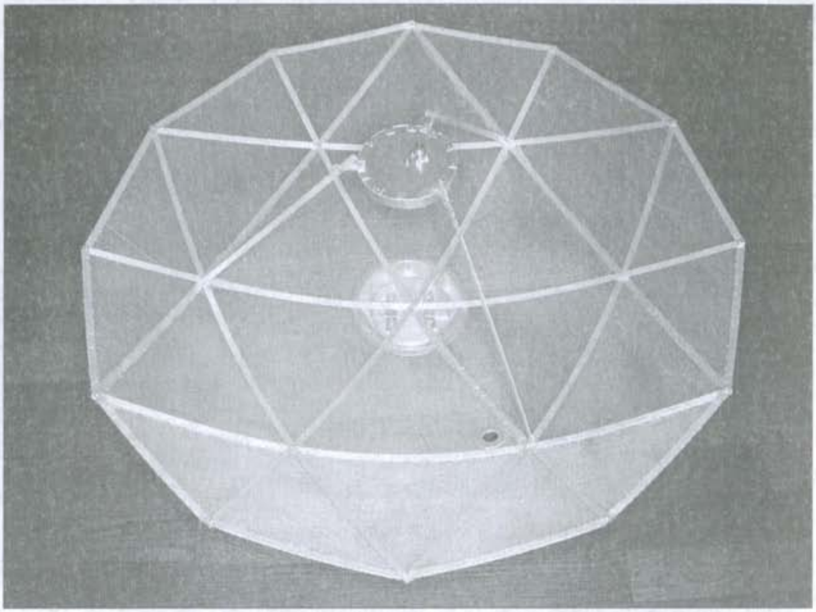

Photo 1 Geodesic parabola antenna

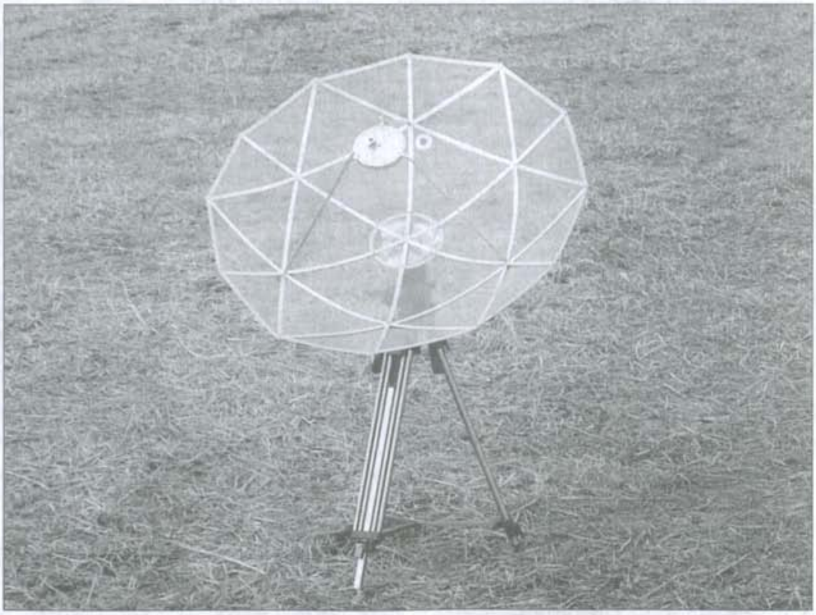

Photo 2 Geodesic parabola antenna

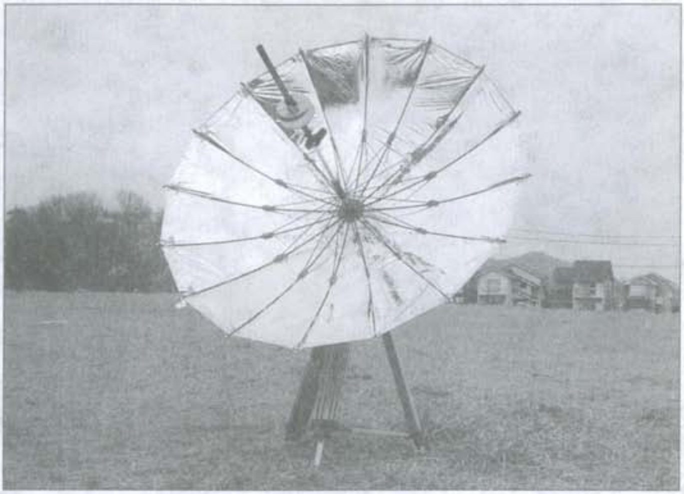

Photo 3 Collapsible (umbrella) antenna

Photo 4 Collapsible (umbrella) antenna

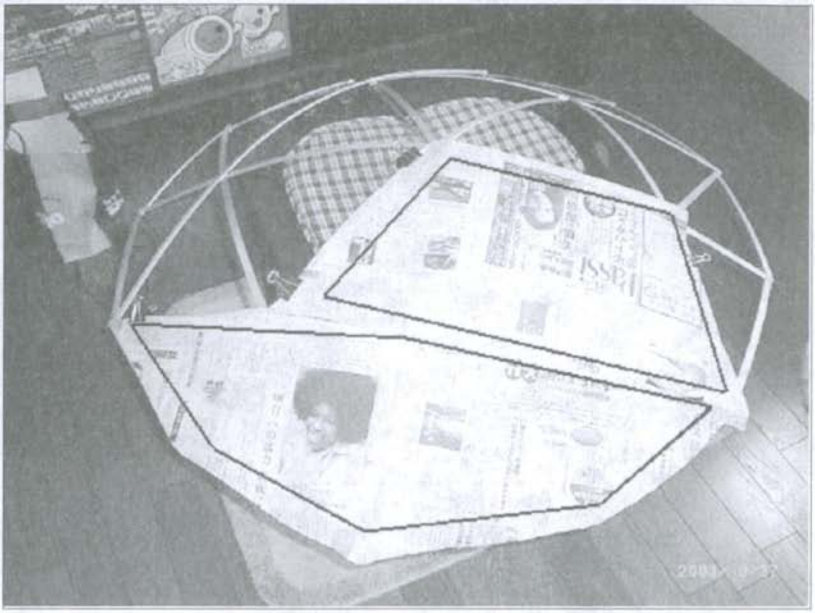

Photo 5 Segmentation of mesh

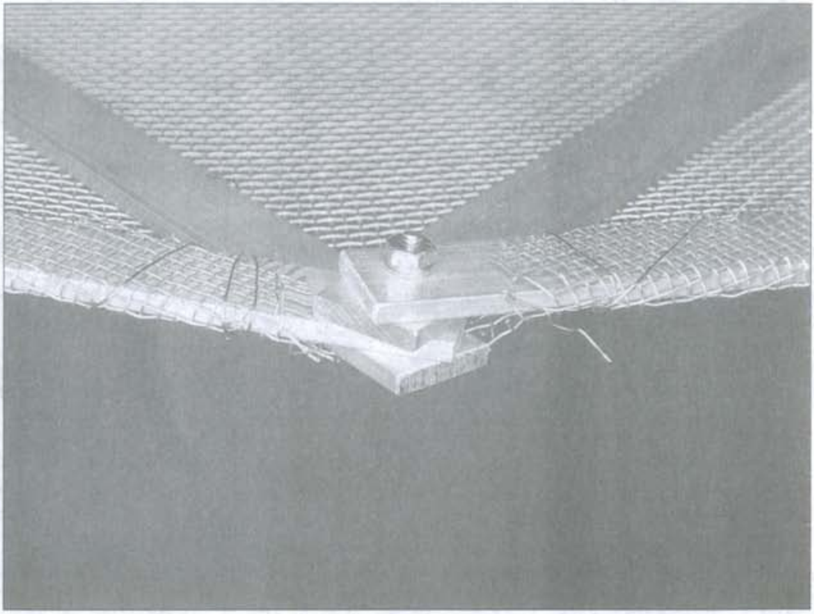

Photo 6 Connection of fringe ribs

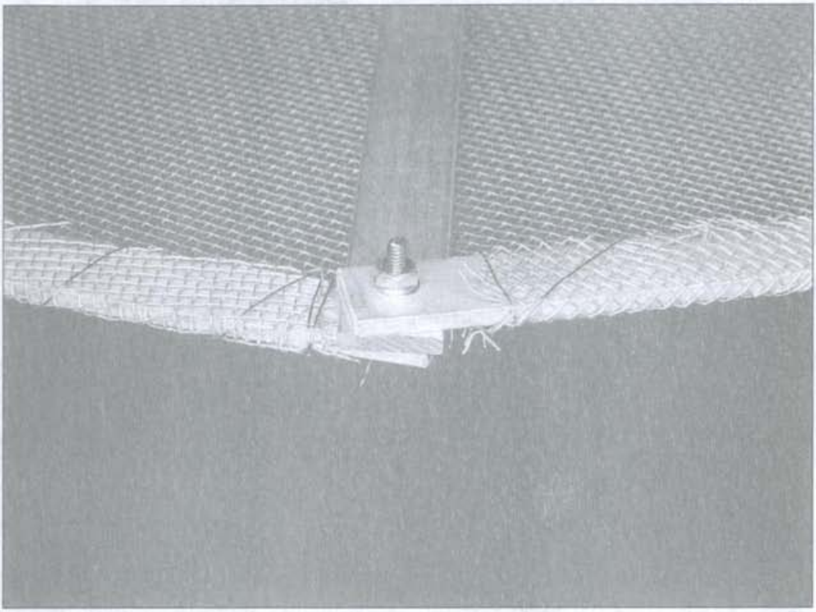

Photo 7 Connection of fringe ribs

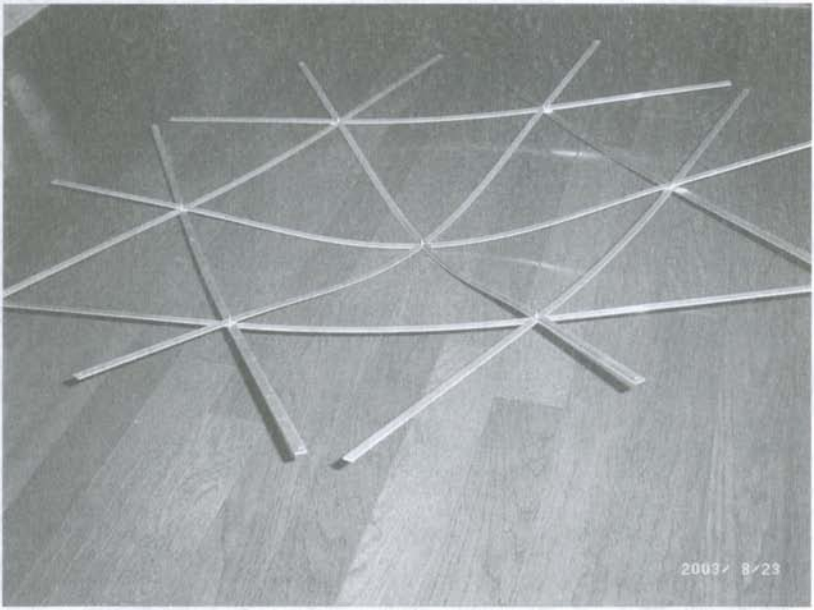

Photo 8 Frame in assembling

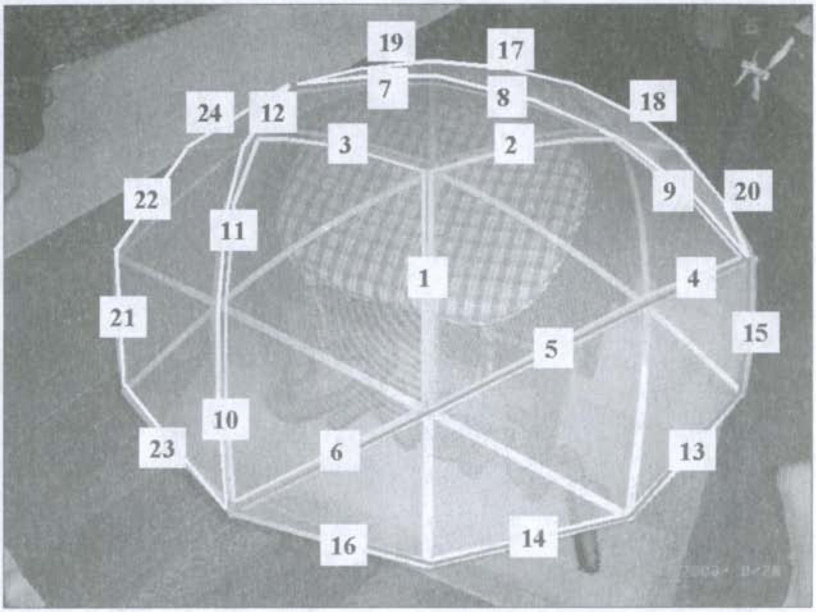

Photo 9 Order of sewing mesh

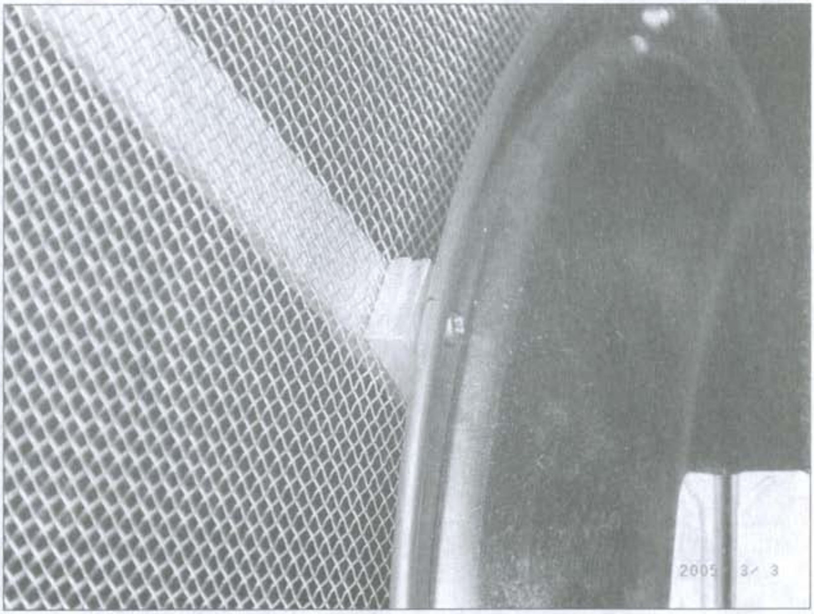

Photo 10 Center hub and saddle washers

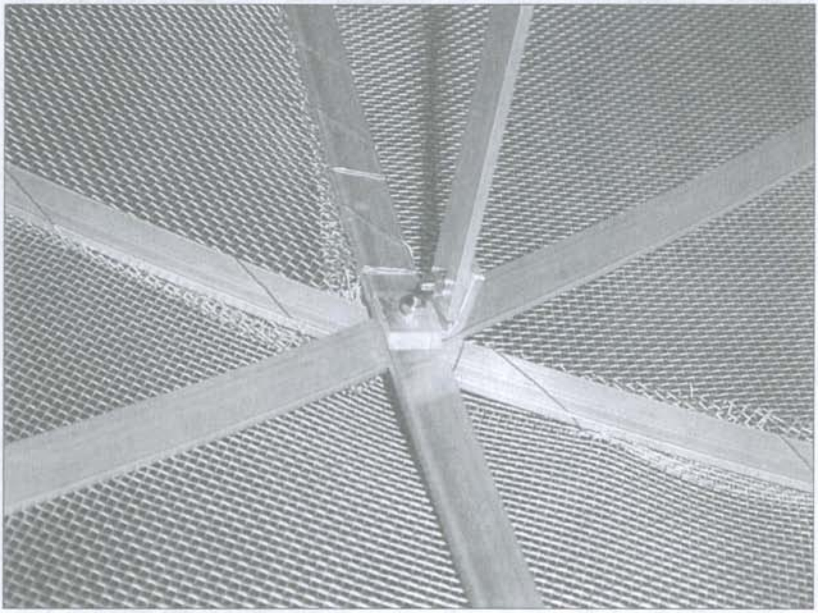

Photo 11 Supporting brackets

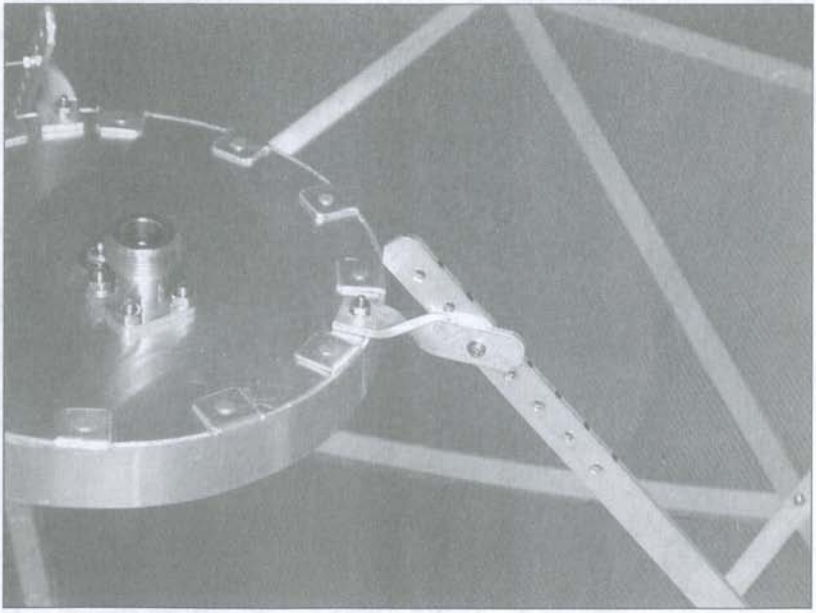

Photo 12 Supporting brackets

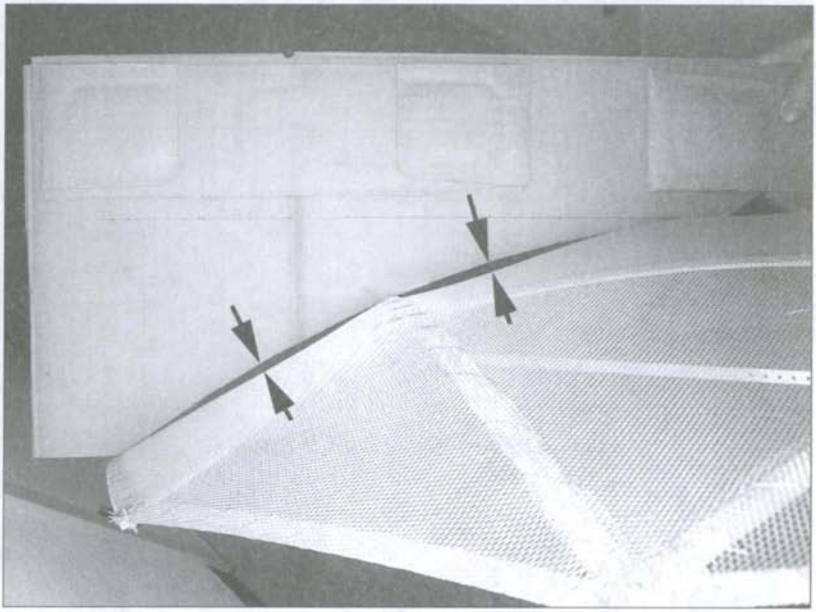

Photo 13 Accuracy of dish surface

Item – Teil	Specifications – Abmessungen	Q'ty – Stückzahl
Aluminum flat bar - Alu-Leisten	10 mm (W) * 2 mm (t) * 1000 mm (L)	14
Screen mesh - Drahtgitter	910 mm (W) * 1200 mm (L)	1
Stainless screw, nut and washer – Edelstahl-Schrauben, Muttern und Scheiben	M2 * 12 mm (L)	30 sets
Stainless wire Stahldraht	#30 (φ0.28 mm)	15 m
Pie dish as center hub Kuchenplatte oder Topfdecke o.ä.	φ 180 mm	2
Mast cramp Mastschelle	(depends on diameter of mast to be installed) (je nach Mastdurchmesser)	2 sets

Table 1 Materials

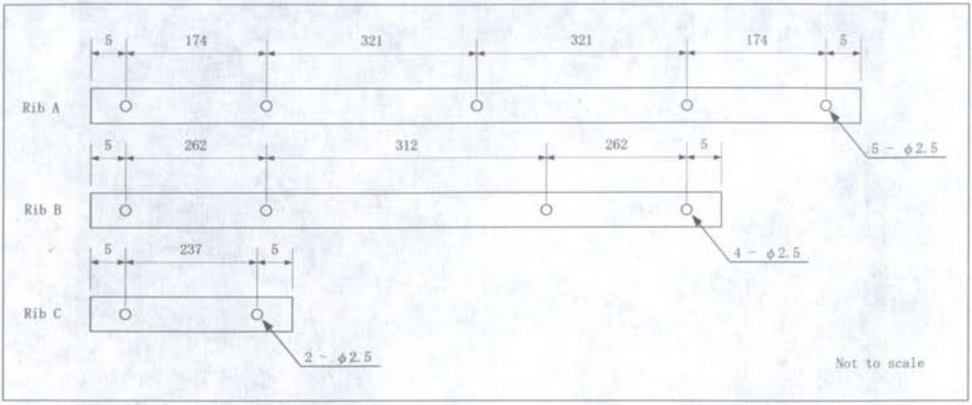

Figure 1 Dimensions of ribs

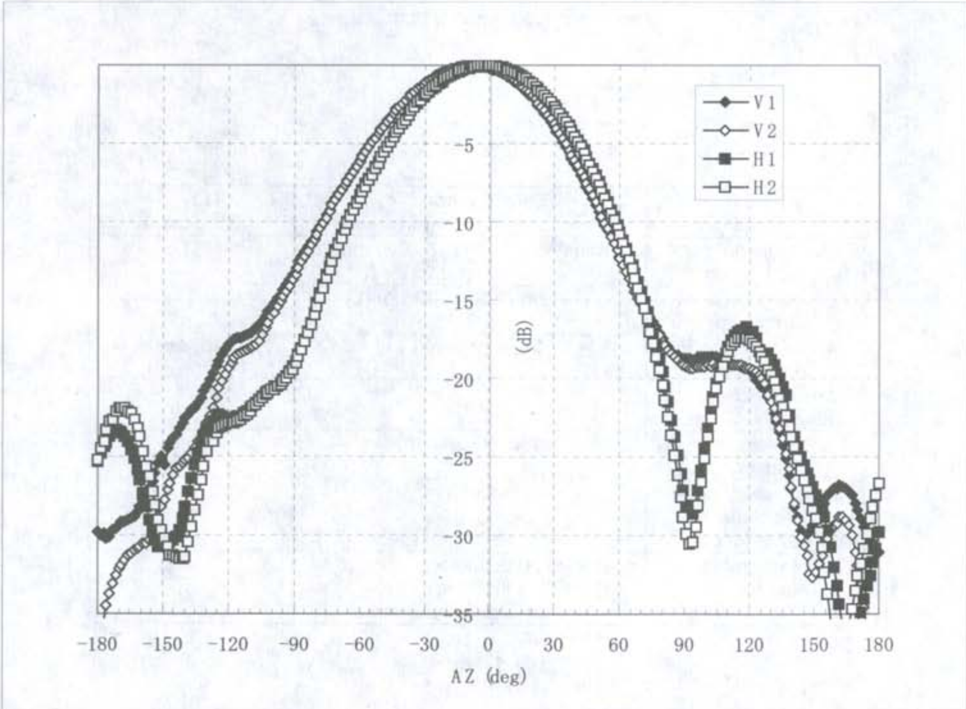

Figure 2 Measured radiation pattern of patch feed

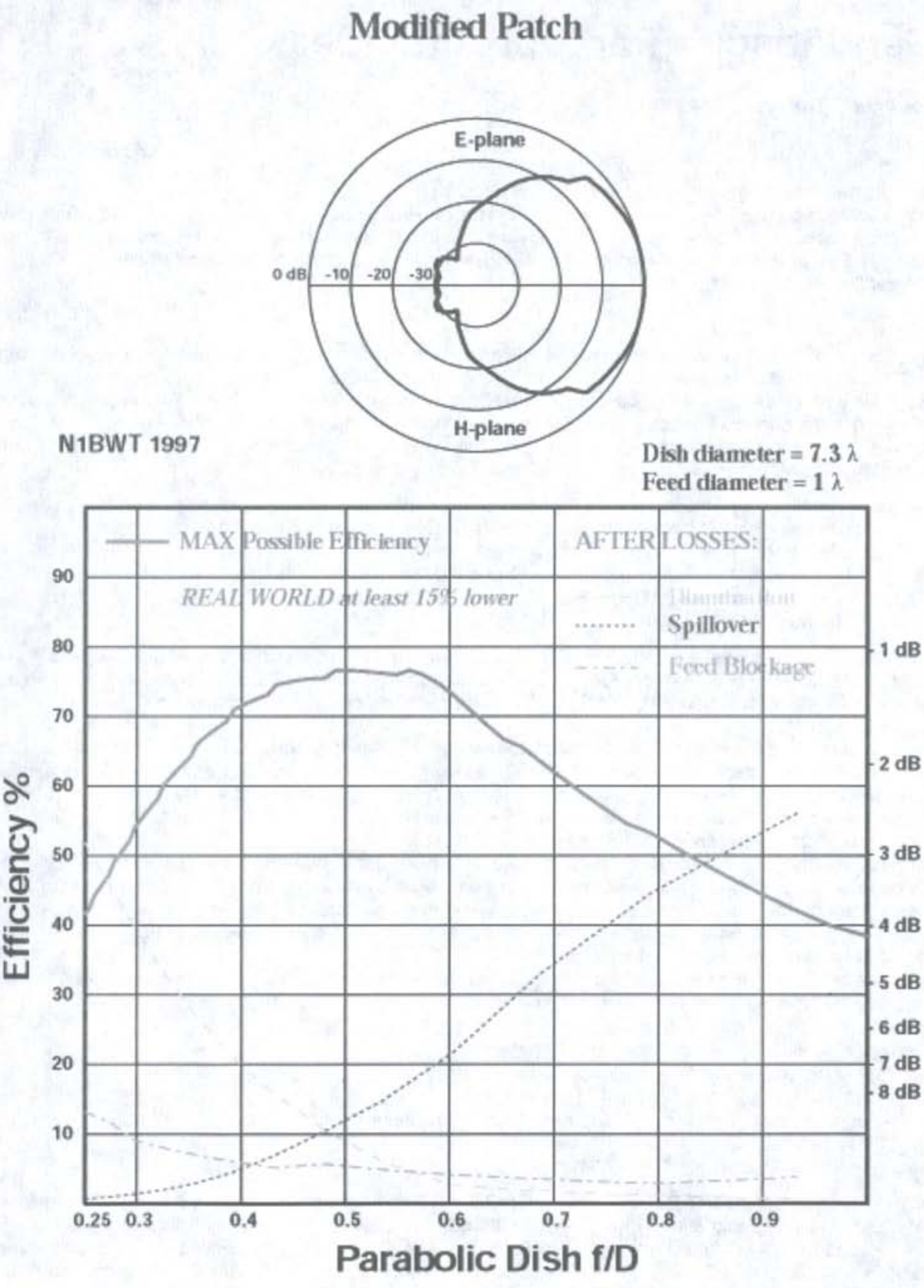

Figure 3 Calculated efficiency of patch feed

Geodätische Parabol-Antenne

Yoshiyuki Takeyasu, JA6XKQ

Zusammenfassung

Die geodätische Parabol-Antenne (Foto 1 und 2) ist eine Art von gebogenem Spiegel, der näherungsweise durch dreieckige Flächen konstruiert ist. Ihre neuartigen strukturellen Eigenschaften sind geringes Gewicht, Festigkeit und leichte Konstruierbarkeit. Dieser Artikel beschreibt die Hintergründe des Designs und der Details der Konstruktion.

Einleitung

Wie der Leser eventuell weiss, stammt der Ausdruck "Geodätisch" vom Begriff der "Geodätischen Kuppel", einer architektonischen Struktur die von Richard Buckminster Fuller [1] entwickelt wurde. Als der Autor für einen besseren Weg, eine gebogene Parabolantenne zu konstruieren, suchte, wurde er urspünglich nicht von der Geodätischen Kuppel inspiriert, aber durch Experimentieren kam er zu dem Schluss, dass eine Geodätische Kuppel die Anforderungen einer stabilen und gleichzeitig leichten Struktur erfüllt. Also „Mehr mit weniger zu machen" wie Fuller es ausdrückte.

Der Hauptvorteil dieser Antenne ist ihre Eigenschaft des einfachen Nachbaus mit folgenden Punkten:

a. Um das Gestell zu bauen, braucht man keine Schablone und keine Biege-Vorrbeiten.
b. Die parabolische Form resultiert direkt aus der Methode der Konstruktion.
c. Drahtnetz auf der konvexen Seite – nicht auf der konkaven Seite des Reflektors.
d. Homogene dreieckige Segmente liefern eine robuste Struktur und bessere Genauigkeit der Oberfläche.

Die ersten drei der Eigenschaften sind von der zusammenfaltbaren (Regenschirm-) Antenne (Foto 3 und 4) abgeleitet, die der Autor vor der Geodätischen Antenne konstruiert hat. Da beide Antennenformen auf dem sogenannten "stressed dish" Design [2] basieren, ziehen sich die Eigenschaften (a) und (b) durch dieses Design.

Die Eigenschaft (d) verbessert den Nachteil konventioneller Spiegel, deren Struktur aus radialen und axialen Sprossen besteht. Im konventionellen Design hat eine Segmenteinheit mit radialen und axialen Sprossen eine Trapez-Form. Deshalb ist das Segment schwach gegenüber seitlich einwirkenden Kräften. In solch einer konventionellen Struktur sind dann zuätzliche Elemente nötig, um den Trapez wieder zu verstärken, woraus eine dreieckige Segmentierung resultiert.

Mit Blick auf die Genauigkeit der Oberfläche ist die Erhöung der Zahl der radialen Sprossen eine übliche Methode die Oberflächengenauigkeit bei der konventionellen „stressed dish" Struktur zu verbessern.

Diese Methode hat jedoch den negativen Nebeneffekt der Gewichtserhöhung und des Mitbringens einer ungleichen Segmentierung. Diese Nebeneffekte resultieren in einer uneffektiven Struktur. Wieder, können wir mit Scharfsinn „mehr mit weniger" tun.

Die oben erwähnten Eigenschaften sind dem Design innewohnend und sich ergänzend, jede trägt zu der insgesamten Überlegenheit des Designs für sich bei.

Design

Die Design-Parameter der Antenne sind:

f/D	=	0.35
Durchmesser	=	917 mm (7.3 x Wellenlänge)
Brennweite	=	320 mm
Tiefe des Spiegels	=	164 mm

Da die Standardlänge von flachen Aluminiumprofilen als Regalware bei 1m liegt, wurde der Durchmesser auf dieses Maß begrenzt (siehe Fig. 1). Die Größe des Spiegels ist damit passend für den Empfang z.B. des S-Band-Downlinks eines Phase-3-Typ-Satelliten. Die Oberflächengenauigkeit eines geodätischen Designs emöglicht das S-Band als höchste nutzbare Frequenz. Der Punkt der Oberflächengenauigkeit wird ausführlich weiter unten diskutiert.

Bei konventionellen Design eines gebogenen Spiegels ist ein hohes f/D-Verhältnis von z.B. 0.5 (oder ein flacher Spiegel) weit verbreitet, um eine bessere Näherung and die parabolische Form zu erreichen. Das gedätische Design arbeitet mit einem kleinern f/D-Verhältnis, so dass ein stabilerer, weniger kopflastiger Spiegel entsteht, der gleichzeitig die Verwendung eines Patch Feeds für gute Ausleuchtung bei minima-

lem Überschuss zulässt.
Das strukturelle Design benötigt keine mathematische Analyse. Es ist einfach durch technisches Zeichnen und einige einfache Berechnungen per Excel-Tabelle realisierbar. Die Excell-Tabelle ist noch nicht frei zur Veröffenlichung, da noch keine anwenderfreundliche Benutzeroberfläche vorhanden ist.

Konstruktion

Tabelle 1 listet die Materialien auf. Der Leser mag denken, dass 2mm Stärke der Alu-Leisten zu wenig ist, um die Struktur zu erhalten. Er wird aber, sobald die eigene Konstruktion fortschreitet, die ihr innewohnende Festigkeit erkennen. Es soll darauf hingewiesen werden, dass die Grösse der Schrauben und der zugehörigen Löcher so klein wie möglich gehalten werden soll, um die Balastbarkeit der Alu-Leisten zu erhalten. Auf die Belastbarkeit und Stärke des Materials muss acht gegeben werden. Dies ist essentiell für den Erfolg dieses Spiegels. Deshalb wird auch mit dünnem Draht gearbeitet, um das Drahtnetz anzunähen, so dass keine weiteren Löcher in das Gestell gebohrt werden müssen.
Fig. 1 zeigt die Abmessungen der drei Rippen. Da die Anforderungen an die Maßgenauigkeit moderat sind, reicht für die mechanischen Arbeiten einfaches Handwerkszeug aus. Es werden 3 x die Rippe A, 6 x die Rippe B und 12 x die Rippe C benötigt.
Die Aufteilung des Drahtnetzes unterscheidet sich von der konventionellen Art. Einige Versuche führten zu dem Resultat, das im **Foto 5** gezeigt wird, und das die Spiegeloberfläche glatt macht, wenn mit dem „Drahtnetz auf der konvexen Seite"-Design gearbeitet wird. **Foto 5** zeigt auch, dass die Aufteilung aus 3 Paaren aus trapezoider und sichelförmiger Form besteht.

Tipps für den Zusammenbau

a. Die Verbindung der Rippen am Rand (Rippe C) mag etwas rätselhaft erscheinen. **Foto 6** und **Foto 7** erklären eindeutig die Reihenfolge der Verdindungen.
b. Wie oben erwähnt, ist die Struktur sehr fest. Falls es Schwierigkeiten beim Anpassen der Aluminium-Leisten in der Endphase des Zusammenbaus geben sollte, empfiehlt es sich die Leisten zeitweise mit einer Schnur entsprechend zu biegen. **(Foto 8)**
c. Die Zahlen im **Foto 9** schlagen die Reihenfolge beim Annähen des Drahtnetzes vor.
d. Zwei Kuchenplatten oder Deckel werden mit Epoxykleber zusammengeklebt um ihre Struktur zu festigen und dann zentral im Spiegel befestigt.
e. Unterlegstücke sollten zwischen Rippen und Mittelplatte eingefügt warden, um die Lücken zu schliessen, wie im **Foto 10** ersichtlich. Ohne diese Unterlegstücke würde die Krümmung der Rippen gestört werden, wenn die Mittelplatte befestigt wird.
f. Winkelstücke für die Halterung des Feeds werden entsprechend **Foto 11 und 12** aus demselben Material wie die Rippen hergestellt.

Ergebnisse

Die Genauigkeit der Oberfläche eines jeden Spiegels ist von großer Wichtigkeit und wird das erste Interesse des Lesers sein. Dies wurde hier gründlich untersucht. **Foto 13** zeigt die Abweichung von der idealen Form eines Parabols. Eine maximale Abweichung von etwa 10mm oder 1/12 Wellenlänge (bei 2.3 GHz) von der idealen Oberfläche wurde als Höchstes gemessen. Die Oberfläche zeigt eine Periodizität von 200mm (oder 1.6 Wellenlängen). Diese zwei Grössen erlauben eine genaue Einschätzung der Oberflächengüte und damit der Effektivität des Spiegels. Anhand der Abb. 8.102 der Referenz [2], kan man erwarten, dass diese gemessenen Werte in etwa 2 dB Verlust beim Antennengewinn resultieren.
Fig. 2 zeigt das gemessene Strahlungsdiagramm des Patch Feeds. Die Effektivität der Parabol-Antenne wurde unter Verwendeung dieser gemessenen Daten mit W1GHZ's Software FEEDPATT.EXE [3] berechnet. Der Ergebnis der Berechnung zeigt eine Effektivität von 65% oder 2dB Herabsetzung des Antennengewinns wie in **Fig. 3** gezeigt. Es sei angemerkt, dass ein f/D von 0.35 nicht für das Patch Feed optimiert ist. Der maximal erreichbare Gewinn einer idealen Parabol-Antenne dieser Grösse bei 2.4 GHz beträgt 27 dB. Unter Berücksichtigung des oben erwähntes Verlustes kann man von diesem Spiegel 23dB oder etwas weniger in der Realität erwarten. Es soll hier noch angemerkt werden, dass jegliche Gewinnangaben für Parabolspiegel etwas „dehnbar" sein können und nur als Anhaltspunkt dienen sollten.
Der Geodätische Spiegel hat, wenn er nach diesem Artikel konstruiert wird, eine Masse von etwa 1.3 kg, inklusive Patch Feed und Montagewinkel. Individuelle Konstruktionsmethoden können natürlich einige Gramm in die eine oder andere Richtung bewirken.
Der Autor hat einen Bericht eines Users erhalten, bei dem die Geodätische Parabol-Antenne dank des geringen Gewichts, der Festigkeit und Flexibilität der Stuktur starken Stürmen widerstanden hat.
Ein anderer Anwender berichtet von den guten Eigenschaften des Spiegels für portable Anwendung aus den gleichen Gründen.

Real life dynamic range of modern amateur transceivers

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Abstract

Following the recent general advances in receiver design, the receiver part of a typical amateur transceiver now has quite good ability to handle strong unwanted signals – but only if those signals are free from unwanted spurious sidebands (notably keyclicks, splatter and other transients). In contrast, the transmitters have been almost completely neglected. This article gives measured data for several different transceivers from different manufacturers, and it shows that the transmitters are becoming the most important source of inter-station interference. A major contribution to unwanted sidebands comes from ill-designed ALC circuits. The article also discusses what we can do to avoid generating interference to each other, by controlling the output power by other means than the internal ALC.

Introduction

Inter-station interference can occur when a receiver is trying to listen on a clear frequency, but there is a very strong transmitter using a frequency close by. All transmitters have unwanted sideband emissions (keyclicks, splatter and other transients – the type depends on the transmission mode). If the suppression of these sidebands is worse than the dynamic range of the receiver, then the transmitter will be mostly responsible for the interference experienced by the receiver. Modern amateur receivers have quite good dynamic range, in the order of 90 to 100 dB with the usual definitions (500 Hz bandwidth, and at frequency separations beyond a few kHz). To avoid causing interference to such receivers, the unwanted sidebands from our transmitters must be suppressed to better than -120 dBc/Hz, on the frequency to which the receiver is attempting to listen.

Previous articles have dealt with unwanted sidebands due to keyclicks on CW, and splatter on SSB, and have shown that major improvements are needed [1, 2, 3]. The measurements uncovered a significant source of unwanted sidebands that are added by ill-designed ALC circuits. This article explores further, focusing mainly on the effects of poor ALC on the bandwidths of SSB and CW transmissions, and gives actual measured data for several different transceivers from different manufacturers.

Speech processing and ALC

All voice modulation methods have an amplitude limit, a level that must not be exceeded. This is valid for FM and SSB as well as for AM. It is of course possible to set the microphone gain low enough to make the largest amplitude peaks that occur when speaking into the microphone so low that they will never exceed the limit. Doing so will provide the best sound quality, but only when the RF signal is strong. The average amplitude from the microphone would be far below the limit nearly all the time, and the transmission channel would be poorly used.

As amateurs we are usually not very interested in a high fidelity in the reproduction of our voice in the loudspeaker of our QSO partner. What we want is the best possible intelligibility, at low RF signal levels and also in the presence of interference. To this end we use speech processors, one way or another. All amateurs transmitters contain speech processors of some kind, even though the user may not be aware of it because the circuitry may have a different label.

Speech processing usually means amplitude clipping. This is a simple way of making sure that the amplitude does not go above some specified limit. However, clipping will change the frequency content of the signal, and therefore a clipper needs to be followed by a filter to remove signal components outside the intended bandwidth. This is all very well known and written about in the literature. Unfortunately the manufacturers of amateur transceivers do not follow this simple rule about filtering. When they use ALC to control the maximum amplitude of the RF envelope waveform, they change the shape of the waveform but there is no filter that removes the signal components that are generated out-of-channel. Modern ALC systems have high gain and large bandwidths, and they flatten the envelope waveform abruptly which leads to wideband interference. This means that even the emissions from transceivers used at reduced power

As the RF power increases, the rectified voltage will go further in the negative direction until the output voltage of the op-amp goes below the gain control voltage by the forward voltage drop of D1. Then D1 will start to conduct and reduce the RF gain so the RF power will no longer increase, but will stay at the level set by the potentiometer. The transmitter gain can be reduced rapidly (fast attack) but with a large value for R6, it will increase slowly (slow decay).

It is pretty obvious that an ALC system like this will behave nicely if the response time for gain reduction is much faster than the envelope rise time of the RF signal sent into the transmitter. A less obvious second condition for good behaviour is that the phase shift in the servo loop formed by the RF circuits and the ALC system must remain below 90 degrees at all frequencies where the loop gain is above 1. With a slowly rising signal level, the output power will be proportional to the input power (the power that comes out from the bandwidth defining filter) up to the limit level, where there is a knee after which the input power may be increased but the output power increases very little. Thus the transfer curve is essentially two straight lines (Figure 2) and for practical purposes the upper line can be taken as horizontal. For slowly varying signals the ALC behaves exactly like an amplitude limiter, in the way it affects the envelope shape, and therefore it generates intermodulation exactly like an amplitude clipper does for signals that change amplitude slowly enough.

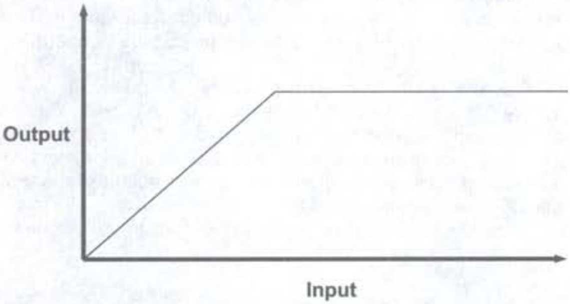

Figure 2 *ALC is a form of amplitude limiting*

If the attack time constant is made very short in relation to the rise time of the SSB or CW envelope waveform, there will be a transient at the knee point where the ALC system starts to reduce the gain. Such a transient is a splatter pulse or a keying click, and its magnitude depends on how much the gain has to be reduced. By having a very long release time constant one can ensure that the amount by which the gain needs to be lowered next time is very small. This way there will only be one interference pulse at the onset of each transmission.

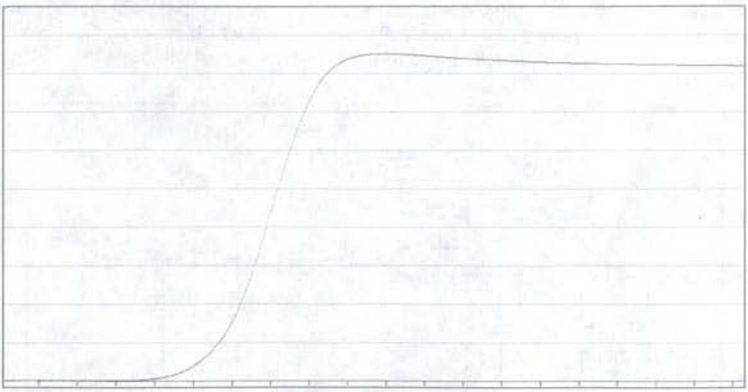

Figure 3 *First key-down transition of a TS-2000 on 144 MHz. A rare example of a transceiver in which the ALC does not cause spectral broadening*

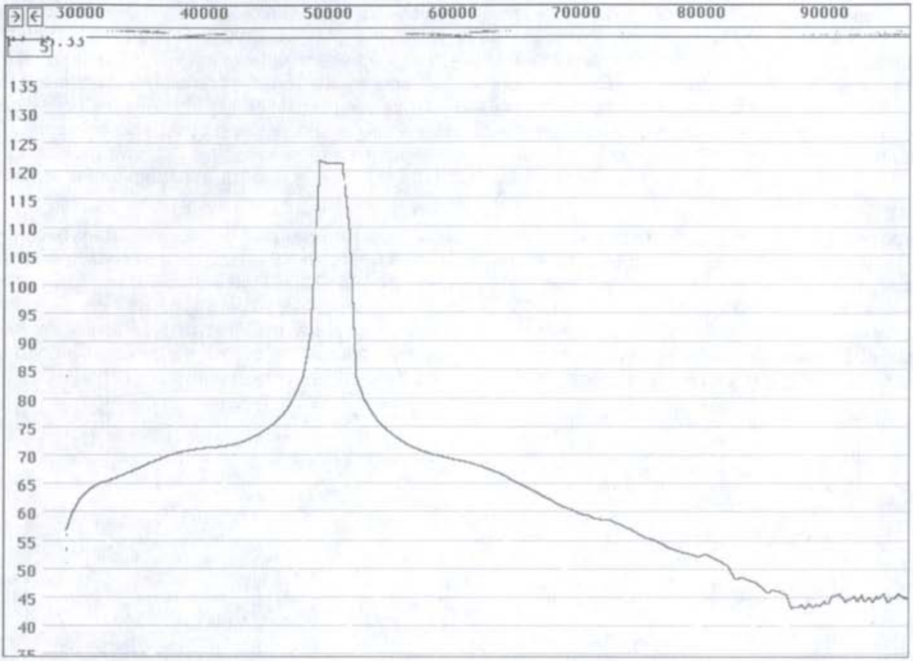

Figure 5 *First key-down transition of a TenTec Orion on 14 MHz. This is the peak-hold spectrum in 2.4 kHz bandwidth from the same Orion producing the waveform of Figure 4. Because of the ALC transient, the keying clicks are only about 20 dB below those of a transmitter with totally unfiltered cathode keying!*

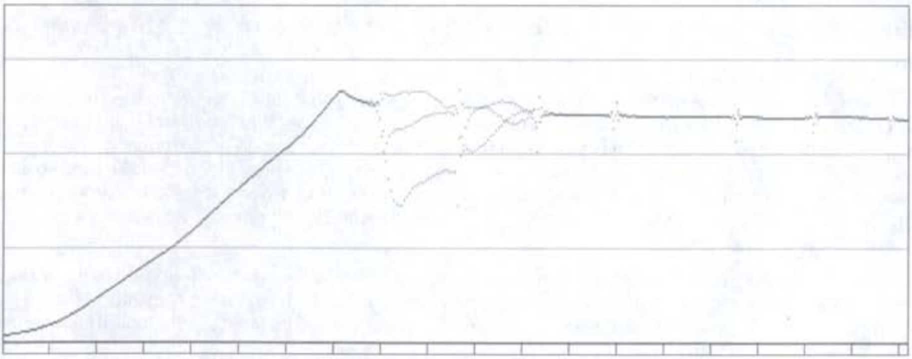

Figure 6 *First key-down transition of an FT-817 14 MHz. Note the self-oscillation in the ALC circuit.*

As mentioned above, the use of ALC for regulating the output power may have other side effects. Table 1 shows measured power levels from a IC-706MKIIG at various power settings. The pulse emitted when the PTT button is released in SSB mode may be fatal for a solid state power amplifier [4].

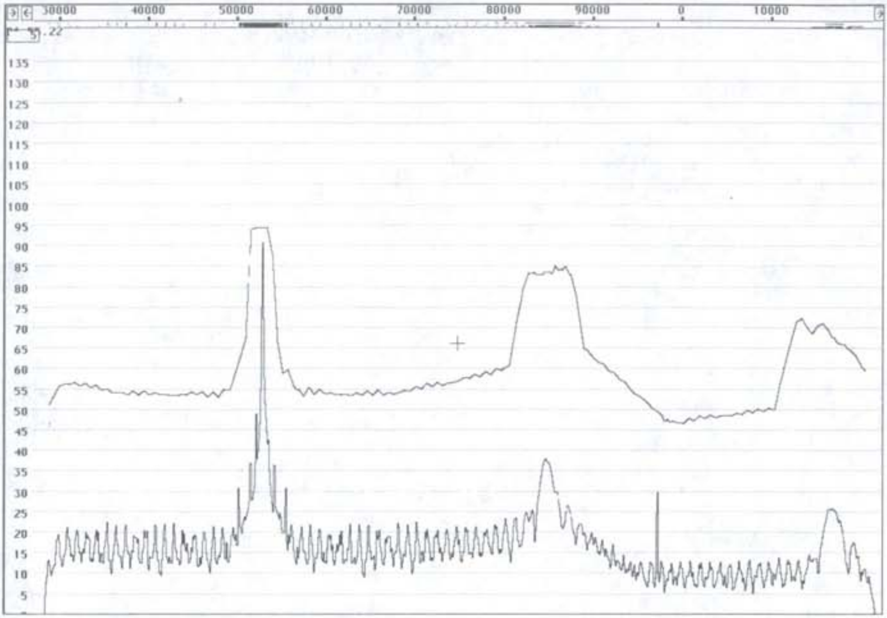

Figure 7 *Spectrum corresponding to Figure 6. This is typical of FT-817 when run at reduced power on 14 MHz. The upper curve is peak-hold in a bandwidth of 2.4 kHz and the lower curve is the average power spectrum at narrow bandwidth.*

Setting	CW peak (W)	Carrier continous (W)	SSB peak (W)	PTT off peak (W)
H	75	49	108	120
5	55	33.8	78	116
2	16.4	9.5	32.4	97
1	10.0	5.0	11.3	79
L	5.2	2.5	9.0	46

Table 1. *Power output transient levels at the antenna connector for an IC-706MKIIG.*

Effect on inter-station interference

There are two possible causes of inter-station interference on the air – receiver overload, or transients from transmitters – and it is sometimes difficult to tell which is responsible. Receiver overload has been extensively reviewed but transmitted transients have not.

State of the art in amateur transmitters is illustrated in Table 2 which shows the results of many measurements of peak hold spectra[1] in a bandwidth of 2.4 kHz. The first entry of Table 2 shows the dynamic range of a typical receiver, an IC-706MKIIG on 144 MHz. If any of the transmitter performance figures in the rest of the table is *smaller* than the receiver dynamic range figure at the head of each column, it means that the transmitter would be the dominant cause of inter-station interference, rather than receiver overload. Any transmitter performance figures that are equal to or better than this criterion are shown in **bold**... and you can see there are very few of them! Note the dramatic improvement in the IC-718 and IC-7800 that was achieved by disabling the ALC as discussed above.

[1] The values given in the table are the largest values measured at or above the corresponding frequency separation, so this table gives the frequency offset beyond which there is no wideband interference (splatter) above the level given in the table.

Model	Power or ALC	Ser.no.	Band (MHz)	Splatter level below PEP at 5kHz (dB)	10kHz (dB)	15kHz (dB)	20kHz (dB)	30kHz (dB)	40kHz (dB)	50kHz (dB)
Typical RX (IC-706MKIIG)			**144**	**56**	**61**	**66**	**70**	**74**	**77**	**79**
DX70TH		T005735	14	15	15	32	32	51	55	68
DX77		T002056	14	31	50	51	51	51	59	68
FT-1000D		3G3300126	14	39	59	**66**	66	**75**	**77**	**79**
FT-1000MP MkV		4D570081	14	33	35	35	46	46	59	66
FT-736R		9E260294	144	31	50	55	59	67	74	**81**
FT-817	0.5W	1E270433	14	15	15	15	15	15	29	29
FT-817	0.5W	1D240059	14	13	13	13	13	13	27	27
FT-817	0.5W	1E270433	144	20	20	20	20	31	31	40
FT-817	0.5W	1D240059	144	15	15	15	15	32	32	32
FT-817	5W	1E270433	14	13	13	13	13	13	26	26
FT-817	5W	1E270433	144	40	49	49	49	61	61	75
FT-817	5W	1D240059	144	36	44	44	44	56	56	67
FT-847	2W	81100231	144	19	19	19	38	38	41	41
FT-847	low	81100231	14	18	18	18	18	35	40	40
FT-847		81100231	14	27	27	27	34	42	50	54
FT-857		3J130041	144	30	50	54	60	69	75	**79**
FT-857D		4D200054	144	33	52	60	66	71	**79**	**84**
FT-897			14	34	52	**68**	**74**	**80**	**80**	**82**
IC-706MKIIG		06230	144	28	48	58	62	**75**	**81**	**84**
IC-718	alc ON	03011151	14	41	52	56	58	61	62	63
IC-718	alc OFF	03011151	14	49	58	**69**	**75**	**84**	**84**	**85**
IC-765	40W	02576	14	36	52	59	64	64	64	64
IC-765		02576	14	34	37	37	37	37	37	37
IC-7800	alc ON,	0301012	14	38	46	54	61	71	**81**	**88**
IC-7800	alc OFF	0301012	14	43	**68**	**88**	**88**	**89**	**89**	**89**
IC-910H		01533	144	32	53	64	68	69	69	69
Orion		03C10433	14	37	41	46	47	53	58	64
TR-9130		3040284	144	33	42	50	56	67	75	**82**
TS-2000		30400028	144	44	53	63	**76**	**85**	**88**	**89**
TS-2000		50600050	144	32	48	55	61	71	**86**	**89**
TS-2000	25W	50600050	144	35	48	64	**79**	**84**	**86**	**89**
TS-2000		30400028	14	31	45	57	66	**74**	**75**	**75**
TS-2000		50600050	14	32	53	59	68	**77**	**78**	**78**
TS-2000	25W	50600050	14	32	49	61	69	**79**	**79**	**79**
TS-50		41000988	14	50	**67**	**77**	**82**	**85**	**85**	**85**
TS-711E		8070268	144	17	27	32	42	53	58	67

Table 2. *Peak-hold spectra of some amateur transceivers in SSB mode. With the exception of the cases shown in* **bold**, *the transmitted signal quality is likely to be the dominant cause of inter-station interference.*

The receiver dynamic range of the IC-706MKIIG is not especially good (for example, the TM-255E is about 20 dB better in dynamic range) so it is not a very demanding standard for comparison. Even so, most transmitters in Table 2 failed to meet that standard, which shows how poor is the typical performance of today's transmitters. There is no good reason for this, because it should be much easier to make a good transmitter than to make a good receiver.

The problem, of course, is that they all use the ALC to limit the RF envelope waveform. At narrow frequency separations the linearity of the final amplifier may affect the transmitter bandwidth, but above 15 kHz the interference mainly originates in the transmitter's ALC loop. To use ALC to limit the envelope waveform of a signal that has already gone through a speech processor is ridiculous, as discussed earlier, but very common in amateur equipment. ALC might perhaps have been a clever way of controlling the power level in the vacuum tube era, but this aspect of transmitter design has stood still for 30 years. With appropriate knowledge about what the service menu functions do, or with a software update, most modern rigs can probably be run without the ALC as a speech processor. The computer inside a modern rig should be able to set the gain correctly for the constant amplitude signal that comes out from the SSB filter when a speech processor is used.

Speech Processing

Although best readability in SSB mode is obtained without speech processing, the peak power may then go as high as 100 times the average power, and practical transmitters cannot deliver such extreme power levels. In reality there always is some engineering or legal limit on the peak power – and therefore, as pointed out in the introduction to this article, speech processing is necessary for optimum intelligibility in voice communication. (Saving energy when operating from a battery is a very special case. With cleverly managed bias currents, a battery operated SSB station would be best used without speech processing for maximum battery life, but for the rest of this article it is assumed that transmitters are limited by peak power and that the total energy consumption is of no concern.)

It is well known from amateur literature that an RF clipper is much better than an audio clipper. This is not quite true, however: the RF clipper is better, but the difference is small as long as the clipping is not harder than necessary for optimum intelligibility. The drawback of audio clipping is often illustrated something like this: "Let us assume that the passband is 0.2 to 2.4 kHz, and that the signal from the microphone is 300 Hz at a given moment. An audio clipper will convert the waveform towards a square-wave that contains odd harmonics. The frequencies 900 Hz, 1.5 kHz and 2.1 kHz will fall within the audio passband and make the sound very different from the original sine-wave. An RF clipper will of course also convert the sine-wave which is present at e.g. 10.7 MHz to a square-wave but the overtones at 32.1 MHz and higher will not pass through the filters, so only the original sine-wave will remain and be transmitted, and so the output from the loudspeaker at the receive side will be exactly the original sine-wave (assuming a correct BFO setting). The only effect of RF clipping to a sine-wave is to reduce the amplitude to make it fit the power limitations of the power amplifier."

That line of argument, that a sine-wave will not be distorted by an RF clipper, may sound convincing but it is not really valid. The very purpose of the speech processor is to change – to distort – the voice waveform. Indeed, if it fails to distort the waveform, the speech processor is not doing anything! The relevant question is whether the distortion to a voice signal that an RF clipper introduces is more favourable for intelligibility than the distortion produced by an audio clipper.

The human voice is not a sine-wave. If it were, an audio AGC would be the perfect speech processing, fully equivalent to RF clipping. With short pulses sent into the microphone it does not make much difference whether clipping is made at AF or RF. Likewise, if two signals at say 800 and 900 Hz were sent into the microphone input, the third order intermodulation at 700 and 1000 Hz would be the same for RF and audio clipping. One could argue that the human voice is much more like a series of pulses than a sine-wave, and that the difference between AF and RF clipping is small. The only way to really know is to make tests with a real voice signal. I have done such tests some 30 years ago and nobody was able to say whether I was using RF or AF clipping. I did these tests at marginal signal levels only – for strong signals it is easy to hear the difference, but you have to remember that intelligibility is not the same thing as a pleasant 'hi-fi' sound. Recently I have verified these findings with computer simulations. There is a difference, but it is not large. The speech processing simulation is included in Linrad-01.25 (and later versions) as part of the setup for transmit routines. You may download it from [5] and make your own tests to find out how clipping and filtering affects intelligibility with your own voice.

The reason for bringing up the merits of audio clipping is that modern transceivers actually use RF clipping without filtering after the clipper by means of a fast ALC system. It has been used for decades, in transceivers like the FT225 for example [2], but it is and it has always been a bad idea, because of all the off-channel interference generated. All rigs designed like this should be modified to make the speech clipping to occur on the correct side of the bandwidth-defining filter. For the FT225 this is particularly easy [2] but it is pretty easy in other rigs also. Basically one can reduce the gain of the amplifier immediately after the filter until the ALC becomes inactive. There will still be something ahead of the filter that limits the signal level and serves as a clipper, but it does not matter if it is an audio amplifier, the SSB generator, an RF amplifier or mixer. Anything that limits the peak power at the right side of the filter – before the input– is fine. It is extremely easy to reduce the gain after the SSB filter. Just send some DC into the ALC input to make the ALC meter permanently show its normal peak voltage.

Carrier sideband noise

The wideband noise surrounding a strong carrier is often the limitation on VHF bands. Such sidebands are usually referred to as phase noise sidebands because it is assumed that they originate in the phase noise of a local oscillator. Transmitters are typically not even as good as the quality of the LO would allow, because inadequate noise figure of the transmit amplifiers plays an important part, and such noise modulates the amplitude as much as the phase.

As was pointed out in [6], the first article of this series, in order to make sure that no part of the transceiver

unnecessarily limits the overall performance, the two-signal receiver dynamic range (in dB for 1 Hz bandwidth) should be equal to the LO phase noise suppression (in dBc/Hz).
The transmitter sideband noise should also have the same value, if it is correctly designed and does not add needless noise from poorly designed amplifiers. Remember also that each of these performance figures is valid only at a given frequency offset from the signal frequency. Table 3 shows the two-signal dynamic range and the transmitter sideband noise levels of some typical 144 MHz transceivers, at three different frequency offsets.

	5kHz		20kHz		100kHz	
	Rx (dBHz)	Tx (-dBc/Hz)	Rx (dBHz)	Tx (-dBc/Hz)	Rx (dBHz)	Tx (-dBc/Hz)
IC706(02803)	92.6	91.0	107.7	108.3	125.8	125.4
IC706MKIIG(04668)	106.8	103.8	118.7	117.2	132.3	125.0
IC821H(01942)	97.8	95.8	113.7	113.1	129.0	127.7
IC970H(LA3FV)	102.7	100.1	123.7	121.6	140.7	132.0
FT100(9E032006)	108.6	107.6	118.9	119.0	130.6	129.4
FT817(0N110101)	103.3	101.3	118.2	117.2	132.6	130.4
FT847(LA9CM)	99.9	96.0	116.9	115.0	131.9	130.4
TM255E(51100675)	128.8	116.2	136.9	122.3	144.5	125.5
TS850S+conv(LA6MV)	112.6	113.9	125.6	129.2	138.8	133.8

Table 3. *Comparison of receiver reciprocal mixing and transmitter composite noise. The data is from the Scandinavian VHF/UHF meeting in Gavelstad Norway June 2003.*

I think it is because this kind of performance information is not made public in transceiver testing that the manufacturers see no reason to design the transmitter carefully. I am sure it would be very easy to cure problems of this kind at the design stage and that it would not lead to higher production costs.

At the 2003 Scandinavian VHF/UHF meeting I only made systematic measurements on receivers. At subsequent meetings I have mainly made measurements on transmitters, because transmitter spectral purity is becoming the limiting factor for dynamic range on VHF bands. Table 4 shows the sideband noise of various transceivers collected at several amateur meetings [7].

HF transmitters typically have lower noise at close separation than VHF transmitters. This is a natural consequence of a lower LO frequency. At large frequency separations on the other hand, VHF transmitters are typically better than HF transmitters. Maybe it is because engineers designing at VHF frequencies are more aware of amplifier noise performance, but HF engineers simply assume it will be OK.

State of the art: What is good and what needs attention

It seems to me there is a general consensus that HF receivers have adequate dynamic range [8]. HF receivers are also not often limited by the two-signal dynamic range and therefore some degradation may be harmless. On crowded HF bands the challenge is in the summed power from a large number of strong signals (including broadcast signals on 40 metres). The performance at very close frequency separation may need some attention, e.g. CW operators on the extremely crowded low-frequency bands may need a good intermodulation dynamic range at strong-signal separations as close as 0.5 kHz, and I have been told that many modern rigs fail badly at such close separations.

But HF transmitters are very unsatisfactory. The bad habit of using the ALC as a wideband modulator distorts both CW and SSB waveforms, and generates emissions that often degrade the transmitter dynamic range by 40 dB and even more. This is not quite as bad as the number indicates, because the ALC generated sidebands have a high peak to average power ratio and it is possible to hear signals that are much weaker than the splatter peaks or keying clicks – unless, of course, these peaks are strong enough and long enough to capture the AGC of the receiver.

On VHF it is different. Neither transmitters nor receivers have the dynamic range required for several operators in the same city area to operate simultaneously without mutual interference. , Even at large frequency separations, they are far from achieving this goal. However, there is no good reason why any VHF LO synthesizers should be notably worse than the best ones (for example the synthesizer used in the TM255). It is typically easy to modify the oscillator of any 144 MHz transceiver to this performance level. As an example, LA6LCA has modified the VCO in his TR9130 and the two-signal dynamic range of the modified unit is 147.8 dBHz at a frequency separation of 100 kHz and above.

I think the weak-signal VHF community would benefit greatly if the manufacturers would receive this message from the market: "We will only buy transceivers that have a transmitter and receiver dynamic range better than 140 dBHz at a separation of 100kHz as soon as at least one such unit has become available." Compared to the current state of the art, the improvement needs to be 15 to 30 dB – especially on the transmitter side – and it would make a significant difference to many of us.

Finally, there is no reason why such improvements should make the rigs significantly more expensive. The parts that are presently missing are not costly hardware, but some thought and attention from the designers.

Model	Band	Noise sideband in -dBc/Hz				
	(MHz)	5kHz	10kHz	15kHz	20kHz	50kHz
DSW40(SM4MJR)	7	130.5	130.5	130.5	130.5	130.5
DX70TH(T005735)	14	105.1	113.8	118.0	120.5	127.7
DX77(T002056)	14	101.4	112.1	117.4	120.5	128.9
IC706MKIIG(06034)	14	110.9	118.4	-	124.3	129.3
IC706MKIIG(04668)	14	112.3	118.8	-	122.2	123.7
IC706MKIIG(06230)	144	103.6	112.0	115.9	118.1	125.6
IC718(03011151)	14	111.7	118.6	122.2	124.3	130.6
IC756PROII(01690)	14	117.4	125.4	129.8	131.7	136.3
IC765(02576)	14	121.3	126.7	128.4	129.0	130.1
IC7800(0301012)	14	120.9	131.9	136.1	137.8	142.4
IC910H(01533)	144	96.9	106.2	111.1	113.7	121.3
FT1000D(3F320079)	14	108.1	116.1	-	127.9	130.4
FT1000D(3G330126)	14	107.7	115.0	117.8	120.0	124.7
FT1000MPMV,200W(4D570081)	14	114.8	123.7	126.8	128.4	130.0
FT1000MPMV,20W,AB(4D570081)	14	112.3	114.8	115.0	115.0	115.5
FT1000MPMV,20W,A(4D570081)	14	112.1	114.2	114.4	114.2	114.2
FT726R(3I050222)	144	111.3	123.6	128.2	129.5	130.7
FT736(9E260294)	144	115.7	123.7	126.7	128.4	130.8
FT817(1E270433)	14	107.3	115.2	119.6	122.8	128.8
FT817(1D240059)	144	101.7	110.6	114.8	118.0	126.7
FT817(1E270433)	144	101.0	109.6	114.2	117.4	126.0
FT847(81100231)	14	105.6	117.2	124.9	129.3	136.4
FT847(81100231)	144	94.3	107.3	112.7	116.1	125.2
FT857(3J130041)	144	101.2	111.2	116.1	119.6	126.7
FT857D(4D200054)	144	101.2	111.4	116.5	119.8	126.9
FT897	14	109.9	120.2	125.8	128.4	127.3
K2(03903)	14	114.6	117.8	118.9	119.1	120.0
K2+conv(03903)	144	113.7	119.3	121.9	123.9	128.0
MFJ9020(SM4MJR)	14	127.3	133.1	135.3	136.6	138.7
Orion(03C10433)	14	128.2	127.1	126.2	125.2	119.8
SW30+(SM4EPR)	10	134.6	136.1	136.8	137.0	137.0
TR9130(3040284)	144	116.3	125.6	129.7	132.3	135.9
TS2000(21000340)	14	109.4	117.8	-	123.1	126.2
TS2000(30400028)	14	108.6	117.8	119.6	121.1	124.1
TS2000(50600050)	14	110.3	118.3	121.5	123.0	125.4
TS2000(30400028	144	105.3	115.3	119.8	122.6	131.0
TS2000(50600050)	144	104.7	112.9	117.2	120.6	129.7
TS450S(60700160)	14	110.6	120.0	-	125.6	128.4
TS50(41000988)	14	109.6	114.2	115.2	115.9	116.7
TS711E(8070268)	144	114.0	121.1	124.3	126.0	130.8

Table 4. *Transmitter sideband noise levels*

References

[1] Leif Åsbrink, SM5BSZ, Transmitter Testing, DUBUS 2/2004 p. 9-45.
[2] http://www.sm5bsz.com/txmod/ft225eng.htm
[3] http://www.sm5bsz.com/txmod/rt0282eng.htm
[4] http://www.sm5bsz.com/dynrange/pulse.htm
[5] http://www.sm5bsz.com/linuxdsp/linroot.htm
[6] Leif Åsbrink, SM5BSZ, Receiver Dynamic Range, DUBUS 4/2003 p. 9-39 and DUBUS TECHNIK VI p. 348-378
[7] http://www.sm5bsz.com/dynrange/rig_compare.htm
[8] Peter Chadwick, G3RZP, HF Receiver Dynamic Range: How Much Do We Need? QEX May/June 2002, p36-41.

Real-life-Dynamikbereich von modernen Amateurfunk-Transceivern

Leif Åsbrink, SM5BSZ

Zusammenfassung

Durch die neuerlichen grundsätzlichen Verbesserungen beim Design von Empfängern, haben auch typische Amateur-Empfänger ziemlich gute Möglichkeiten, mit starken unerwünschten Signalen fertig zu werden – allerdings nur, wenn diese Signale frei von unerwünschten Nebenaussendungen sind (besonders Tastklicks, Splatter, u.a. Schwingungen). Im Gegensatz dazu wurden die Sender fast ganz vernachlässigt. In diesem Artikel werden gemessene Daten für diverse Transceiver verschiedener Hersteller wiedergegeben, die zeigen, dass die Sender die wichtigste Quelle für Störungen zwischen den Stationen werden. Einen Grossteil der unerwünschten Aussendungen wird von den „kranken" ALC-Schaltungen verursacht. Dieser Artikel diskutiert ebenfalls was wir tun können, um gegenseitiges Stören zu vermeiden, indem die Ausgangsleistung anders als durch die interne ALC kontrolliert wird.

Einleitung

Störungen zwischen Stationen können auftreten, wenn ein Empfänger versucht auf einer freien Frequenz zu hören und ein sehr starker Sender eine Frequenz nahe bei benutzt. Alle Sender haben unerwünschte Nebenaussendungen (Tastklicks, Splatter u.a. Schwingungen – je nach verwendeter Modulationsart). Wenn die Unterdrückung dieser Nebenaussendungen schlechter als der Dynamikbereich des Empfängers ist, dann wird der Sender überwiegend verantwortlich für die Störungen, die der Empfänger erfährt. Moderne Amateurfunk-Empfänger haben einen recht guten Dynamikbereich, der zwischen 90 bis 100 dB liegt, mit den üblichen Definitionen (500 Hz Bandweite und Frequenzabstand über einige kHz). Um Störungen bei derartigen Empfängern zu verhindern, müssen die unerwünschten Aussendungen unseres Senders um mehr als -120 dBc/Hz auf der Frequenz, auf der der Empfänger zu hören versucht, unterdrückt sein.

Vorhergehende Artikel haben sich mit den unerwünschten Aussendungen, die durch Tastklicks in CW und Splatter in SSB verursacht werden, beschäftigt. Sie haben aufgezeigt, dass bedeutende Verbesserungen nötig sind [1, 2, 3]. Die Messungen haben nun eine bedeutsame Ursache für unerwünschte Aussendungen aufgedeckt, die durch falsch entworfene ALC-Schaltungen hervorgerufen werden. Im weiteren untersucht der Artikel hauptsächlich die Effekte der schlechten ALC auf die Bandbreite von SSB- und CW-Aussendungen und gibt die aktuell gemessenen Daten diverser Transceiver verschiedener Hersteller wieder.

Sprachprozessor und ALC

Alle Arten der Sprachmodulation haben eine Amplitudenbegrenzung, d.h. eine Grenze die nicht überschritten werden darf. Dies gilt genauso für FM und SSB wie auch für AM. Natürlich ist es möglich, die Mikrofonverstärkung niedrig genug einzustellen, so dass die größten Amplitudenspitzen beim Besprechen des Mikrofons so klein sind, dass sie die Grenze nie erreichen. Auf diese Weise erreicht man die beste Sprachqualität, aber nur, wenn das HF-Signal stark ist. Die Durchnittsamplitude des Mikrofons würde fast immer weit unter der Grenze sein und der Kanal wäre schlecht ausgenutzt. Als Funkamateure sind wir normalerweise nicht an einer hohen Wiedergabetreue („High Fidelitly" – HiFi) bei der Stimmwiedergabe im Lautsprecher unseres QSO-Partners interessiert. Was wir wollen, ist die best mögliche Verständlichkeit bei niedrigen HF-Signalpegeln und auch bei Anwesenheit von Störungen. Zu diesem Zweck verwenden wir Sprachprozessoren auf die ein- oder andere Weise. Alle Amateursender haben eine Art Sprachprozessor, auch wenn der Betreiber sich dessen vielleicht gar nicht bewusst ist, weil die Schaltung eventuell anders bezeichnet wird.

Ein Sprachprozessor arbeitet normalerweise durch Abschneiden der Amplitude. Das ist ein einfacher Weg sicherzustellen, dass die Amplitude ein bestimmtes Limit nicht übersteigt. Allerdings verändert das Abschneiden den Frequenzgang des Signals, weshalb dem Clipper ein Filter folgen muss, das die Signalanteile außerhalb der erwünschten Bandbreite entfernt. Dies ist alles wohlbekannt und in der Literatur beschrieben. Leider orientieren sich die Hersteller von Amateurfunkgeräten nicht an dieser einfachen Regel des nachfolgenden Filters. Wenn sie die ALC einsetzen, um die maximale Amplitude der HF-Hüllkurve zu kontrollieren, verändern sie die Gestalt der Wellenform, aber es folgt kein Filter, das die Signalanteile, die ausserhalb des Kanals generiert werden, entfernt. Moderne ALC-Systeme arbeiten mit hoher Verstärkung und großer Bandbreite und kappen die Hüllkurve abrupt, was zu breitbandigen Störungen führt.

Dies bedeutet, dass sogar Aussendungen von Transceivern bei niedriger Ausgangsleistung weit davon entfernt sind, akzeptierbar zu sein. Zum Beispiel hat ein FT-817 auf 144 MHz sogar Probleme mit den US-Vorschriften der FCC für Aussendungen (§97.307(e)), die grosszügig Nebenaussendungen mit einer Durchschnittsleistung von bis zu -43dB in Bezug auf die Durchschnittsleistung der Hauptaussendung bei einer Leistung von 0.5 Watt erlauben. Das Problem ist alltäglich und keinesfalls auf den FT-817 beschränkt oder auf den Hersteller Yaesu. Auch ist das Problem keinesfalls neu, aber es hat sich über die Jahre vergrößert.

Zum Glück ist es oft möglich, einen gut entworfenen Sprachprozessor zu benutzen, der die Amplitude des HF-Treiber-Signals so begrenzt, dass die ALC nicht aktiviert wird. Viele Transeiver verfügen bereits über einen getrennten Sprachprozessor, so der IC-7800 and FT-1000D zum Beispiel. Dort ist es möglich, diesen so einzustellen, dass die PEP die benötigte Höhe erreicht, ohne dass überhaupt die ALC aktiviert wird. Die dafür benötigte Höhe liegt nur einige Zehntel dB unter der Höhe, die durch die ALC gesetzt wird. Aber die Aussendung wird nun deutlich sauberer. Andere Transceiver – wie z.B. der Orion – verursachen eine Menge unnötiger Störungen, die ganz einfach durch ein Software Update beseitigt werden könnten: Der eingebaute Prozessor kann alles kontrollieren, aber die TX HF-Verstärkung kann nicht von vorne von Gerät geregelt werden. Eine andere Möglichkeit, die HF-Verstärkung des Senders zu kontrollieren, ist das Zuführen einer variablen negativen Spannung an den „Externen ALC-Eingang" des Transceivers, der die interne ALC ausser Kraft setzt. Oft ist es auch einfach möglich durch eine Modifikation, den vorhandenen FM-Sprachprozessor auch für SSB zu nutzen. Dies wurde vor über 20 Jahren beschrieben [2].
Neben den Störungen außerhalb der Nutzbandbreite verursacht das ALC-System moderner Transceiver gelegentliche Impulse des Senders von sehr hoher Leistung, die weit über der angegebenen maximalen Ausgangsleistung liegen. Diese Impulse können Schäden an weiteren Geräten verursachen, Schutzschaltungen ansprechen lassen oder wenigstens Klicks und Splatter verursachen. Das Problem ist nicht auf SSB beaschränkt: Ein breiter Impuls wird in jeder Betriebsart immer dann erzeugt, wenn die ALC die Verstärkung schnell herunterregeln muss – und das passiert jedes Mal, wenn die Leistung für eine Zeitspanne niedrig war, die länger als die ALC-Abfallzeit war. Bei einigen Transceivern passiert dies nach jedem Wort in CW, bei anderen sogar nach jedem Punkt in einer schnell gesendeten Kette von Punkten. Dies führt zu einer konkreten Gefahr für Transverter und andere Geräte, die nur eine geringe HF-Eingangsleistung verkraften: Wenn die Ausgangsleistung des Transceivers nur durch einfaches Reduzieren mit dem zugehörigen Regler herabgesetzt wird, kann die ALC trotzdem Impulse sehr hoher HF-Leistung weiterhin durchlassen. Diese können dann Halbleiter entweder komplett zerstören oder deren Leistung langsam verschlechtern.

Das ALC-System

Das ALC-Sytem ist ein simples Regelsystem und die Theorie sollte von jedem Elektronik-Inngenieur problemlos verstanden werden. Der Grund für die schlechte Ausführung liegt darin, dass bei den Produkt-Tests der Amateurfunk-Zeitschriften nicht auf die außerhalb des Nutzkanals liegenden Aussendungen des modulierten Senders geachtet wird, mit Ausnahme des Zweiton-Tests, der ein statischer Test ist, sofern die ALC betroffen ist. Die maximale Leistung wird im Zweiton-Test normalerweise in Intervallen von 1 ms wiederholt, weshalb selbst eine sehr kurze ALC-Abfallzeit lang genug ist, die ALC-Spannung nahezu konstant zu halten.

Das Prinzip eines ALC-Systems ist in Abbildung 1 illustriert. Das Ausgangssignal wird durch einen Richtkoppler auf den HF-Eingang links in Abb. 1 gekoppelt. Die Diode D2 richtet das HF-Signal gleich und lädt C3 auf den Spitzenwert der HF-Spannung in negativer Richtung (abzüglich der Diodenvorspannung). Der Tiefpass R7-C2 entfernt verbleibende HF-Anteile und führt die negative HF-Spitzenspannung auf den positiven Eingang des Operationsverstärkers. Wenn die HF-Leistung deutlich unter der Leistungsgrenze liegt, die mit dem Poti eingestellt wird, wird der Operationsverstärker in die positive Richtung gesättigt und der Ausgang für die Verstärkungsregelung hat eine Spannung die durch den Spannungsteiler R2 und R3 definiert wird.
Wenn die HF-Leistung ansteigt, wird die gleichgerichtete Spannung weiter negativer werden solange bis die Ausgangsspannung des Operationsverstärkers unter die Spannung der Verstärkungsregelung durch den Vorspannungsabfall von D1 geht. Dann wird D1 leitend und reduziert die HF-Verstärkung, so dass die HF-Leistung nicht weiter ansteigt, sondern auf der Höhe bleibt, die durch das Potentiometer eingestellt ist. Die Verstärkung des Senders kann schnell reduziert werden („fast attack"), aber mit einem großen Wert für R6 steigt sie langsam (langsamer Abfall).

Es ist offensichtlich, dass ein derartiges ALC-System gut arbeitet, solange die Antwortzeit für die Reduzierung der Verstärkung viel geringer ist als die Anstiegszeit des HF-Signals, das in den Sender geschickt wird. Eine weniger offensichtliche zweite Bedingung für gutes Arbeiten ist, dass die Phasenverzögerung des Regelkeises, die durch die Kreise und das System entsteht, auf allen Frequenzen, auf denen der Gewinn der Schleife über 1 liegt, unter 90 Grad bleiben muss.
Bei einem langsam ansteigenden Signalpegel wird die Ausgangsleistung proportional zur Eingangsleistung (die Leistung, die aus dem die Bandbreite definierenden Filter kommt) ansteigen bis zu der Leistungsgrenze, wo das „Knie" ist. Nach diesem kann die Eingangsleistung anteigen, aber die Ausgangsleistung steigt nur noch ganz gering.

Folglich ergeben sich in die Kurve übersetzt (Abbildung 2) im Wesentlichen zwei gerade Linien und für die Praxis kann die obere Linie als horizontal angenommen werden. Für sich langsam ändernde Signale verhält sich die ALC, so wie sie die Form der Hüllkurve beeinflusst, exakt wie ein Amplitudenbegrenzer. Damit produziert sie bei solchen Signalen Intermodulation genauso wie ein Amplituden-Clipper.

Wenn die Anstiegszeitkonstante in Relation zur Anstiegszeit der SSB- oder CW-Hüllkurve sehr kurz gehalten wird, gibt es einen Übergang im Kniepunkt, dort wo das ALC-System anfängt die Verstärkung zu begrenzen. Dieser Übergang ist ein Splatter-Impuls oder ein Tastklick und die Stärke hängt davon ab, um wie viel die Verstärkung reduziert werden muss. Indem man eine sehr lange Abfallkonstante wählt, kann man sicher sein, dass beim nächsten Mal die Größe der nötigen Herabsetzung der Verstärkung gering ist. Auf diese Weise entsteht nur ein Störimpuls am Beginn einer jeden Aussendung.

Wird die Anstiegszeit etwas verlängert, z.B. durch Vergrößern von R7, gibt es jedes Mal, wenn die ALC anspringt, ein Überschiessen am Beginn. Wenn die Verstärkungshöhen so gewählt sind, dass die ALC immer nur die Verstärkung gering reduzieren muss, kann man eine ziemlich lange Anstiegszeit wählen, die einen hübschen abgerundeten Überschuss produziert, der die Bandbreite nicht vergrössert. Solch ein Überschuss ist völlig harmlos, wenn der Sender direkt mit der Antenne verbunden ist. Wird er allerdings mit einer Endstufe betrieben, kann diese dadurch in die Sättigung gelangen und einen sehr starken Störimpuls verursachen. Es kann sogar für die Endstufe gefährlich werden oder die Schutzschaltungen werden aktiviert, die die PA deaktivieren. Abbildung 3 zeigt den ersten Tast-Übergang bei einem TS-2000 auf 144 MHz bei voller Leistung (100W). Dies ist ein (seltenes) Beispiel eines korrekt arbeitenden ALC-Kreises.

Wenn die Verstärkung der Schleife zu hoch ist, geraten die Verstärker des Regelkreises in die Sättigung und das Regelsystem wird unlinear. Dann können Übergänge mit großer Brandbreite emittiert werden und auch der Regelkreis reagiert über, d.h. die Verstärkung wird zu stark reduziert.

Die langsame ALC-Abfallkonstante (R6/C2 in Abb. 1) wird dann nur langsam einen Wiederanstieg der Leistung auf das benötigte Mass erlauben.
Abbildung 4 zeigt den ersten Tast-Übergang eines TenTec Orion, der ein Beispiel für dieses Phänomen ist. Der Entwickler beabsichtigte sicher der ansteigenden Kurve einen schönen „Cosinus-Anstieg" oder eine S-Form zu geben, um Tastklicks zu minimieren. Die obere Ecke aber ist stark gestört durch den ALC-Übergang und das resultierende Spektrum in Abbildung 5 ist weit entfernt von dem, was man erhofft hatte.

Unglücklicherweise sind die meisten Amateurfunktransceiver nicht besser. Die Verstärkung im Regelkreis ist oft sehr hoch und die Phasenverzögerung groß, so dass Stabilitätsprobleme resultieren. Es ist eine generelle Design-Regel bei Regelkreisen, dass man nicht mehr als ein RC-Glied nimmt, um die Verstärkung-Frequenz-Funktion der Schleife einzustellen.
Wenn R7/C2 and R1/C1 ähnliche Zeitkonstanten haben, kommt der Regelkreis einem Oszillator nahe. Mehr Verzögerung durch weitere RC-Glieder verschlimmert das noch. Es ist eine gute Idee, alle RC-Glieder, außer einem, mit Zeitkonstanten zu realisieren, die mindestens 100 Mal kürzer sind als die des einen großen Glieds, das den Verstärkungverlauf des Kreises über die Frequenz bestimmt. Herstellern von Amteurfunk-Transceivern scheint diese gut bekannte Regel, einen „dominanten Pol" zu haben, unbekannt zu sein. Abbildung 6 zeigt beispielsweise die Form des ersten Tast-Übergangs eines FT-817 auf 14 MHz. Die ALC schwingt selbst mit einer Frequenz von etwa 35 kHz, was die Breitband-Übergänge produziert, die in Abb. 7 gemessen wurden.

Bei besseren Transceivern, ist der Regler zur Leistungskontrolle auf der Gerätevorderseite eine simple manuelle Verstärkungsregelung, die feste Änderungen der Höhe des HF-Treibers macht.
Bei vielen Transceivern wird aber das ALC-System verwendet, um eine dynamische Verstärkungsregelung zu realisieren, was bedeutet, dass die Verstärkungsreduzierung, die die ALC bei niedrigeren Leistungsniveaus zu leisten hat, größer ist.

Im Gegenzug bedeutet dies, dass die Verstärkung der ALC-Regelschleife größer wird bei geringerer Leistung, so dass Schwingungen entstehen können. Abbildung 6 und 7 zeigen typische Testergebnisse für den FT-817. Der IC-706MKIIG verhält sich ähnlich, die Schwingung ist im Vergleich zum FT-817 aber niedriger in der Frequenz (etwa 5 kHz), Amplitude und Dauer.
Der FT-817 ist nicht einmal stabil, wenn die Taste dauernd gedrückt ist, wie man in Bild 6 und 7 erkennen kann. Wie oben erwähnt, kann die Verwendung der ALC zur Regelung der Ausgangsleistung andere Nebeneffekte haben. Tabelle 1 zeigt die gemessenen Leistungshöhen eines IC-706MKIIG bei verschiedenen Leistungseinstellungen. Der Impuls, der gesendet wird, wenn die PTT-Taste in SSB losgelassen wird, könnte für eine Transistor-PA tötlich sein [4].

Auswirkung auf Störungen zwischen Stationen

Es gibt zwei mögliche Gründe für On-the-air-Störungen zwischen Stationen: Empfänger-Überlastung und Störprodukte aus Sendern. Manchmal ist es schwierig zu sagen, was von beiden verantwortlich ist. Die Empfänger-Überlastung wurde bereits weit beschrieben, aber die gesendeten Störprodukte nicht.
Der Stand der Technik bei Amateursendern ist in Tabelle 2 aufgezeigt, die die Ergebnisse vieler Messungen von Spitzenhaltespektren[2] bei einer Bandbreite von 2.4 kHz zeigt.
Der erste Eintrag in Tabelle 2 zeigt den Dynamikbereich eines typischen Empfängers, des IC-706MKIIG, auf 144 MHz. Wenn eine der Zahlen der Sender-Eigenschaften im Rest der Tabelle kleiner als die Zahl für den Dynamikbereich des Empfängers am Anfang der Tabelle ist, dann bedeutet das, dass der Sender - eher als Empfänger-Überlastung - der dominierende Grund für Störungen zwischen Stationen sein müsste. Alle Zahlen der Sender-Eigenschaften, die gleich oder besser als dieses Kriterium sind, werden fett wiedergegeben. Man sieht, es sind nicht sehr viele. Man beachte die dramatische Verbesserung beim IC-718 und IC-7800, die durch Sperren der ALC – wie oben diskutiert – erreicht wurde.
Der Empfänger-Dynamikbereich des IC-706MKIIG ist nicht besonders gut (z.B. ist der des TM-255E um 20 dB besser), es handelt sich also nicht um einen sehr anspruchsvollen Standard für diesen Vergleich. Und trotzdem erreichen die meisten Sender in der Tabelle 2 diesen Standard nicht, was zeigt, wie armselig die typischen Eigenschaften heutiger Sender sind. Dafür gibt es keinen plausiblen Grund, weil es viel leichter ist, einen guten Sender als einen guten Empfänger herzustellen.
Das Problem ist natürlich, dass sie alle die ALC benutzen, um die Hüllkurve der HF zu begrenzen. Bei nahen Frequenzabständen kann die Linearität der Endstufe ggf. die Bandbreite des Senders beeinflussen, aber bei mehr als 15 kHz sind die Störungen hauptsächlich in der ALS-Schleife des Senders begründet. Die ALC zu verwenden, die Form der Hüllkurve eines Signals zu begrenzen, das bereits durch einen Sprachprozessor gelaufen ist, ist lächerlich, wie oben diskutiert – aber üblich bei Amateurfunk-Geräten. Die ALC war eventuell ein cleverer Weg für die Leistungsregelung in der Ära der Vakuumröhren, aber dieser Aspekt von Sender-Design hat für 30 Jahre still gestanden. Mit angemessener Kenntnis über die Funktionsweise des Service Menues oder mit einem Software-Update, können die meisten modernen Geräte wahrscheinlich ohne die ALC als Sprach-Prozessor betrieben werden. Die Prozessoren im Inneren eines modernen Gerätes sollten imstande sein, die Verstärkung richtig für das konstante Amplitudensignal einzustellen, das aus dem SSB-Filter kommt, wenn ein Sprachprozessor benutzt wird.

Sprachprozessor

Obwohl die beste Verständlichkeit in SSB ohne Sprachprozessor erreicht wird, kann die Spitzenleistung bis zum 100-fachen der Durchschnittsleistung gehen und in der Praxis können Sender solche extremen Leistungsstufen nicht liefern. In der Realität gibt es für die Spitzenleistung immer irgendwelche konstruktionsbedingte oder gesetzliche Grenzen und deshalb – wie in der Einleitung dieses Artikels betont – ist ein Sprachprozessor bei Sprachübertragung für optimale Verständlichkeit notwendig. (Batteriebetrieb bzw. Energiesparen ist ein Sonderfall. Mit clever eingestellten Ruheströmen wird eine batteriebetriebene SSB-Station am besten ohne Sprachprozessor für maximale Lebensdauer der Batterie betrieben. Im weiteren wird in diesem Artikel aber angenommen, dass die Sender durch die Spitzenleistung begrenzt werden und dass die Höhe der Energieaufnahme ohne Bedeutung ist.)

Aus der Amateurfunk-Literatur ist bekannt, dass ein HF-Clipper viel besser als ein Audio-Clipper ist. Das ist nicht ganz richtig, jedoch ist der HF-Clipper besser, aber der Unterschied ist gering solange das Clippen nicht härter ist, als für optimale Verständlichkeit nötig ist.

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[2] Bei den in der Tabelle angegebenen Werten handelt es sich um die höchsten Werte, die für den angegebenen Frequenzabstand oder darüber gemessen wurden. D.h. diese Tabelle gibt den Frequenzabstand an, ab dem keine Breitband-Störungen (Splatter) oberhalb des Wertes der Tabelle auftreten.

Der Nachteil von Audio-Clippimg wird oft in etwa so beschrieben: "Nehmen wir an, dass das Passband 0.2 bis 2.4 kHz ist und dass das Signal vom Mikrofon zu einem bestimmen Moment 300 Hz hat. Ein Audio-Clipper wird die Wellenform zu einer Rechteckwelle umsetzen, die ungerade Harmonische enthält. Die Frequenzen 900 Hz, 1.5 kHz und 2.1 kHz fallen ins Audio-Passband und ändern den Klang der originalen Sinuswelle. Ein HF-Clipper setzt die Sinuswelle bei 10.7 MHz ebenfalls in eine Rechteckwelle um, aber die Obertöne bei 32.1 MHz und höher gelangen nicht durch die Filter, so dass nur die ursprüngliche Sinuswelle übrig bleibt und gesendet wird und aus dem Lautsprecherausgang auf der Empfängerseite die exakte originale Sinuswelle zu hören ist (vorausgesetzt der BFO ist richtig eingestellt). Der einzige Effekt des HF-Clippens auf eine Sinuswelle ist das Reduzieren der Amplitude, um die Leistungsgrenzen der Endstufe einzuhalten." Diese Argumentation, dass eine Sinuswelle nicht durch einen HF-Clipper gestört wird, mag überzeugend klingen, ist aber nicht ganz wahr.
Der eigentliche Zweck eines Sprachprozessors ist die Form der Welle der Sprach zu ändern – zu verformen. Wenn es tatsächlich nicht gelingt die Form der Welle ändern, bewirkt der Sprachprozessor gar nichts! Die relevante Frage ist, ob die Verformung des Sprachsignals, die ein HF-Clipper zufügt, mehr Verständlichkeit bringt als die Verformung, die eine Audio-Clipper produziert.
Die menschliche Stimme ist keine Sinuswelle. Wenn sie es wäre, würde eine Audio-AGC, der perfekte Sprachprozessor sein, voll äquivalent zum HF-Clipping.
Bei kurzen Impulsen, die ins Mikrofon geschickt werden, macht es kaum einen Unterschied, ob das Clippen auf NF oder HF-Ebene gemacht wird. Genauso ist, wenn zwei Signale bei z.B. 800 und 900 Hz in den Mikrofoneingang geschickt werden, die Intermodulation 3. Ordnung bei 700 und 1000 Hz gleich für HF- und Audio-Clipping.
Man kann argumentieren, dass die menschliche Stimme mehr einer Folge von Impulsen ähnelt als einer Sinuswelle und dass deshalb der Unterschied zwischen NF- und HF-Clipping gering ist.
Der einzige Weg das wirklich festzustellen ist, Tests mit einem echten Sprachsignal zu machen. Ich habe solche Tests vor etwa 30 Jahren durchgeführt und niemand war in der Lage zu sagen, ob ich einen HF- oder NF-Clipper benutzt habe. Ich habe diese Tests nur bei marginalen Signalstärken durchgeführt – bei starken Signalen ist es einfach den unterschied zu hören, man muss aber daran erinnern, dass Verständlichkeit nicht dasselbe ist wie ein schöner „HiFi"-Sound. Vor kurzem habe ich diese Ergebnisse mittels Simulationen am Computer verifiziert. Es gibt einen Unterschied, aber der ist nicht groß. Die Sprachprozessor-Simulation ist bei Linrad-01.25 (und spätere Versionen) als Teil des Setup für die Sende-Routinen enthalten. Man kann es von [5] downloaden und selber Tests machen, um herauszufinden, wie das Clippen und Filtern die Verständlichkeit bei der eigenen Stimme beeinflusst.

Der Grund für das Bringen der Vorzüge des Audio-Clippens liegt darin, dass moderne Transceiver wirklich HF-Clipper ohne nachfolgendes Filter mittels eines schnellen ALC-Systems benutzen. Das wurde für Jahrzehnte gemacht, wie in Transceivern wie z.B. dem FT225 [2], aber es ist und war immer eine schlechte Idee, weil die ganzen Störungen außerhalb des Kanals verursacht werden. Alle Geräte, die so in Design haben, sollten modifiziert werden, um das Sprach-Clippen auf der richtigen Seite des die Bandbreite definierenden Filters zu machen. Beim FT225 ist das besonders leicht [2], aber auch bei anderen Geräten ist es ziemlich einfach.
Grundsätzlich kann man die Verstärkung direkt hinter dem Filter reduzieren bis die ALC inaktiv wird. Es wird immer noch etwas vor dem Filter sein, das den Signalpegel limitiert und als Clipper dient, aber es ist egal, ob es ein Audio-Verstärker, SSB-Generator, HF-Verstärker oder Mischer ist. Alles, was die Spitzenleistung auf der richtigen Seite des Filters – vor dem Eingang – begrenzt, ist ausgezeichnet. Es ist sehr leicht die Verstärkung nach dem SSB-Filter zu reduzieren. Man muss nur etwas Gleichspannung in den ALC-Eingang geben, um das ALC-Meter dauerhaft die normale Spitzenspannung anzeigen zu lassen.

Seitenbandrauschen des Trägers

Das breitbandige Rauschen, das einen starken Träger umgibt, ist oft der limitierende Faktor auf den VHF-Bändern. Diese Seitenbänder werden üblicherweise als Phasenrausch-Seitenbänder bezeichnet, weil angenommen wird, dass sie ihren Ursprung im Phasenrauschen des Local Oszillators haben. Sender sind typischerweise nicht einmal so gut, wie die Qualität des LO erlauben würde, weil unangemessene Rauschzahlen der Sendeverstärker eine wichtige Rolle spielen und solches Rauschen die Amplitude genauso moduliert wie das Phasenrauschen.

Wie in [6], dem ersten Artikel dieser Serie, aufgezeigt wurde, sollte, damit sicher ist, dass kein Teil des Senders unnötigerweise die Gesamtleistung begrenzt, der Zweiton-Empfängerdynamikbereich (in dB für 1 Hz Bandbreite) gleich der Unterdrückung des LO Phasenrauschens (in dBc/Hz) sein. Das Seitenbandrauschen des Senders sollte den gleichen Wert haben, wenn korrektes Design vorliegt, und kein unnötiges Rauschen von schlecht entworfenen Verstärkern hinzufügen. Man erinnere sich, dass jeder dieser

Werte nur für einen gegebenen Frequenzabstand von der Signalfrequenz gilt. Tabelle 3 zeigt den Zweiton-Dynamikbereich und das Seitenbandrauschen einiger 144-MHz-Transceiver bei drei verschiedenen Frequenzabständen.

Ich glaube, dass, weil diese Art von Werten und Information nicht bei Transceiver-Tests öffentlich gemacht wird, die Hersteller keinen Grund sehen, das Design der Sender sorgfältig zu machen. Ich bin sicher, dass es sehr einfach ist, diese Art von Problemen im Status des Designens zu lösen und es nicht zu höheren Produktionskosten führen würde.

Beim Skandinavischen VHF/UHF-Treffen im Jahr 2003 habe ich nur an Empfängern systematische Messungen durchgeführt. Bei dann folgenden Treffen habe ich hauptsächlich Sender gemessen, weil die spektrale Reinheit des Sendesignals der limitierende Faktor für den Dynamikbereich auf den VHF-Bändern wird. Tabelle 4 zeigt das Seitenbandrauschen verschiedener Transceiver, was bei verschiedenen Treffen gesammelt wurde [7].

Kurzwellensender haben typischerweise weniger Rauschen bei geringem Abstand als VHF-Sender. Das ist eine natürliche Konsequenz der niedrigeren LO Frequenz. Bei größeren Frequenzabständen anderseits, sind VHF-Sender typischerweise besser als Kurzwellensender. Vielleicht, weil Ingenieure, die für VHF-Frequenzen entwickeln, sich mehr der Rauschperformance der Verstärker bewusst sind, während HF-Ingenieure einfach annehmen, dass es o.k. ist.

Stand der Technik: Was ist gut und was braucht Beachtung?

Es scheint mir, dass es eine generelle Übereinstimmung darin gibt, dass HF-Transceiver einen angemessenen Dynamikbereich haben [8]. Kurzwellenempfänger werden auch oft nicht durch den Zweiton-Dynamikbereich limitiert und deshalb wären etwas schlechtere Werte gefahrlos.
Auf überfüllten KW-Bändern liegt die Herausforderung in der addierten Leistung einer großen Zahl starker Signale (inklusive der Rundfunksignale auf 40m). Die Performance bei sehr kleinen Frequenzabständen könnte etwas Aufmerksamkeit gebrauchen, z.B. brauchen CW-OPs auf den extrem belegten niedrigen Bändern einen guten Intermodulationsdynamikbereich bei Trennung starker Signale, die bis nahe 0.5 kHz gehen. Mir wurde berichtet, dass viele moderne Geräte bei solch geringen Abständen total versagen.

KW-Sender hingegen sind sehr unzureichend. Die schlechte Angewohnheit, die ALC als Breitband-Modulator zu verwenden, stört CW und SSB-Signale und und generiert Emissionen, die den Senderdynamikbereich um 40 dB und mehr verschlechtern. Das ist nicht ganz so schlecht wie die Zahl anzeigt, weil die ALC-generierten Seitenbänder ein hohes Spitzen-Durchschnitts-Lesitungsverhältnis aufweisen und es möglich ist, Signale, die viel schwächer als der Splatter oder die Tastklicks sind, zu hören, es sei denn, natürlich, dass diese Peaks stark und lang genug sind, die AGC des Empfängers anspringen zu lassen.

Auf VHF ist es anders. Weder Sender noch Empfänger haben den Dynamikbereich, der nötig ist, dass mehrere OPs in der gleichen Region gleichzeitig ohne gegenseitiges Stören arbeiten können.
Selbst bei großen Frequenzabständen sind sie weit vom Erreichen dieses Ziels entfernt. Es gibt jedoch keinen guten Grund, warum irgendein VHF LO Synthesizer bemerkenswert schlechter als die besten sein sollte (z.B. der Synthesizer im TM255). Üblicherweise ist es einfach, den Oszillator eines jeden 144-MHz-Transcivers durch Modifikation auf dieses Niveau zu bringen. Z.B. hat LA6LCA den VCO in seinem TR9130 modifiziert und der Zweiton-Dynamikbereich des modifizierten Gerätes liegt bei Frequenzabstand von 100 kHz und mehr bei 147.8 dBHz.

Ich glaube die Gemeinde der VHF-DXer würde sehr profitieren, wenn die Hersteller folgende Message des Marktes empfangen würden: "Wir werden erst Transceiver kaufen, die einen Sender- und Empfänger-Dynamikbereich von besser als 140 dBHz bei einem Abstand von 100 kHz haben, sobald wenigstens ein solches Gerät erhältlich ist."
Verglichen mit dem gegenwärtigen Stand der Technik ist eine Verbesserung von wenigstens 15 bis 30 dB – besonders auf der Senderseite – nötig und dies würde einen signifikanten Unterschied für viele von uns ausmachen.
Letztlich gibt es keinen Grund, warum solche Verbesserungen die Geräte signifikant teurer machen sollten. Das gegenwärtig Fehlende ist keine teure Hardware, sondern etwas Nachdenken und Aufmerksamkeit der Designer.

Chaparral Style 10 GHz Feed Simulation

by Paolo Antoniazzi, IW2ACD and Marco Arecco, IK2WAQ

Introduction

This simulation work is realized using NEC-Win Pro v1.62. This is a modified NEC2 core which has been optimized for the 32 bit operating system. This software supports DMA (dynamic memory allocation) and is capable of calculating the results for thousands of segments [1]. As in a paper in 2004 from OM6AA, [8], the starting rules are: feed assembly probe orientation (vertical or horizontal) was used to define elevation and azimuth planes. Similarly, V and H polarization defines the orientation of the transmitting antenna (only vertical in our case).
We have realized many simulations on VHF Yagi antennas [2] and on 2.4 GHz helix both for P3D and WiFi applications [3, 4], and this is our first 10 GHz design.
This project, named F10CH, began in October 2004 pushed by the need of a good efficiency 10 GHz antenna starting from an existing 108 cm diameter prime-focus dish with F/D = 0.38.
By simple analysis and according to W1GHZ considerations [5, 6] only two feed types are suited for the specific application: the VE4MA and the more complex well known Chaparral™ style feed.
The final choice was the Chaparral like feeder, used in the past in TV-Sat central focus dishes and described firstly in 1972 [11].

Optimizing parabolic antennas

Simple and inexpensive, the paraboloid is the most widely used microwave antenna reflector. The illumination pattern should yield uniform phase and amplitude distribution over the surface of the dish, without spillover (no energy missing the reflector). The reflector of this antenna would not deviate from a true paraboloid. Assuming an electrically transparent structure supporting the feed and no ohmic losses in the system, the ideal antenna would be 100 % efficient, i.e., the aperture will produce the full, theoretically available gain. In the real world that is not possible and it may not even be desirable to achieve these characteristics. For example, the system engineer may want very low sidelobes, in which case he may have to pay dearly in efficiency. Losses are introduced by:

- **Phase error across the aperture**
- **Amplitude distribution taper**
- **Spillover (energy lost by radiation from the field not incident on the reflector)**
- **Aperture blockage**
- **Cross-polarization (unwanted polarization)**
- **Radome and ohmic losses**

The departure from uniform phase across the aperture of a paraboloid can be ascribed to the scattering from, and blocking due to, the primary feed and the systematic deviation from a true parabola of the reflector. Surface tolerances normally are responsible for 0.1 to 0.5 dB of loss in microwave antennas. Perfect accuracy is unattainable, and construction of a precise surface is very expensive. The generally accepted rule-of-thumb figure is that the permissible deviation is 1/32 to 1/16 wavelength.
As an example, a paraboloid reflector of circular aperture, having a diameter of 25 wavelength and typicallly tapered illumination, will have an additional side-lobe level of –20 dB when the rms deviation of the reflector is 1/32 wavelength (about 1 mm at 10 GHz) if the correlation interval is one wavelength.
The ideal paraboloid antenna would include a feed with a well-defined phase center. In practice, the familiar feed horn does not have a phase center that is well-defined for all angles subtended between the center and edge of the reflector. This shortcoming introduces a phase error that is usually greatest at the edge of the dish. The positions of the feed must be a compromise.
A uniformly illuminated circular aperture yields a radiation pattern with a first sidelobe that is about 18 dB below the main beam. To improve the first few sidelobes, to reduce spillover and to improve the front-to-back ratio of the dish, the designer employs a primary feed that provides a tapered distribution across the face of the dish. Also it is very desirable from the stand-point of efficiency to illuminate the parabola uniformly, it is very undesirable and inefficient to allow the feed to radiate in such a way that energy spills over the edge of the reflector. Losses due to taper plus spillover are typically 1.0 to 1.2 dB.

- Avoid crossing of the wires at midpoint
- The crossing point must coincide with the beginning or the end of each segment
- Segments may not overlap (external wire surfaces cannot penetrate each other)
- In the angles the wire radius cannot overlap the centre of the adjacent wire
- A large diameter change between directly connected wires may decrease accuracy particularly with small Length / Diameter ratios
- The number of wires jointed at a single point cannot exceed 30

(*) In the thin-wire kernel, the current on the surface of a segment is reduced to a filament of current flowing on the segment axis.
(**)In the extended thin-wire kernel is assumed that the current is uniformly distributed around the segment surface.

Simulating the feed

The starting point was a commercial version of the feeder made by Zinwell for the 10.7÷12.75 GHz TV-sat band. See photo of **Fig. 1**.

Fig. 1 Chaparral Feeder for TV-Sat (10.7 to 12.75 GHz)

The carrying out of the simulation file, everything hand made, began from the short-circuit side of the 20 mm diameter circular waveguide. It was started from the centre with only 4 radial in order to prevent the risk of overlap errors between contiguous segments at the axis origin (see above NEC2 rules). This choice had been combined together with the decision to fix at 0.4mm the wire diameter in the whole feeder except in the parts were the electrical features need different dimensions. Moving from the centre to the periphery the number of radials increases to 16 and so to 32 to have a good tradeoff between the maximum wire length (λ / 10) and the minimum one, limited by the wire diameter through the relation: $L / D \geq 1$ (extended thin-wire kernel selection). The concentric circular wires were spaced at 2mm each other in the whole structure to have a good grid achieved by the perfect crossing together with the relevant radials. The same pitch has been used to describe both the longitudinal and the transversal circular wires of the waveguide with the purpose:

- to have a good simulation of the conducting walls
- to perform the fine placing, always with 2mm steps, of the excitation antenna (d) from the back short of the waveguide
- to have the same fine positioning (x) for the 3 traps system, well represented in the **Fig. 2**, in order to optimise the disk illumination. The radiation angles, both azimuth and elevation, needed by the available parabola (dish diameter D_{ia} = 1080mm, dish focal length f = 405mm, dish depth in the centre c=180mm) were: $\theta = \varphi = 2 \arctan [\, D_{ia} / 2\,(f - c)\,] \approx 135°$.

To simplify the writing of the simulation file, at the end of each statement, the Nec-Vu function was used in order to evidence a possible rule violation before to proceed with the next steps. The total number of segments of a such waveguide was 2536. This number is high and so it needs the use of the option "32-Bit Auto DMA Core" that allows the calculation of structures having more than 2000 segments with Nec-Win Pro. Starting from these considerations a PC with more than 64Mbytes RAM is needed. There is a simple formula, supplied by the manufacturer, to calculate the memory needed to simulate the antennas having thousands of segments:

Requested RAM size = (number of segment)^2 x 16

To simplify the simulation file writing, the elementary wires, both radial or tangential, had been defined using the GW card (this old name comes from Fortran) and so they were duplicated until the need using the GM one.

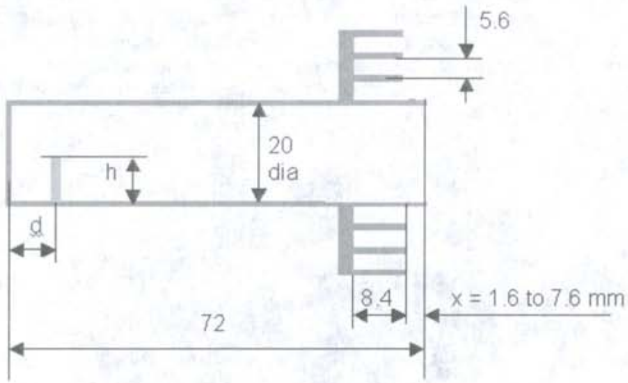

Fig. 2 Feed Dimensions used in NEC2 Simulation

To excite the TE_{11} mode into the waveguide a vertical transmitting antenna (starting from now, it will be named "probe") was used, put at a variable distance d = 6÷14mm from the back (short). The probe, for simulation purposes, was divided in 4 scaled segments having different diameters and lengths (**Fig. 3**) with the purpose to follow both the programming rules to not have a large change diameter between connected wires and to optimise the probe input impedance and the VSWR.

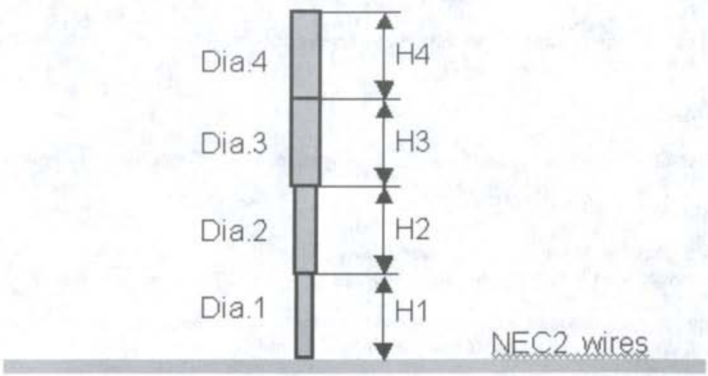

Fig. 3 NEC2 Segmentation of the Probe

With the same technique of the waveguide short, we have realized the 3 traps of the feeder using 32 radials for the inner and 64 for the outer part of them. All the 3 traps had been carried out 5.6mm wide and 8.4 mm deep (**Fig. 2**). Further info on the design of the feed are also shown in [13, 14] and [15].
Let me summarize the number of segments of each part of the simulated Chaparral: back 232 segments, waveguide (tube only) 2304 segments, probe 4 segments, first trap (the smaller) 448 segments, second trap (the middle) 864 segments, third trap (the bigger) 896 segments for a total of 4748 segments (**Fig. 4**).
A so high number of segments needs the use of a PC having a speed and a memory size adequate to perform the optimisation of the feeder in a reasonable time. In our experience a simulation time of 4 minutes is typical for a single frequency simulation using a 2400 MHz Pentium 4™ with 512 Mbytes of RAM.

After the complete optimisation of the VSWR and the input impedance (**Fig. 5 & 6**) the full probe height had been defined as h = 5.8mm @ 10.35GHz corresponding to $0.201\lambda_0$ (free space wavelength) and its distance from the short was determined as d = 10mm equivalent to $0.185\lambda_g$ (wavelength into the waveguide).
The final probe dimensions length / diameter had been specified, starting from the first segment where it has been placed the RF source: 1.2mm/0.6mm, 1.4mm/0.8mm, 1.6mm/1.0mm, 1.6mm/1.0mm (**Fig. 3**).
Remember that the position of the probe relative to the short, the length of the probe and its diameter determine the operating frequency and the impedance seen looking into the input SMA connector. For a given impedance, which will normally be 50 ohms, only certain combinations of these three parameters are possible. For the probe positioning see also [7] and [9].

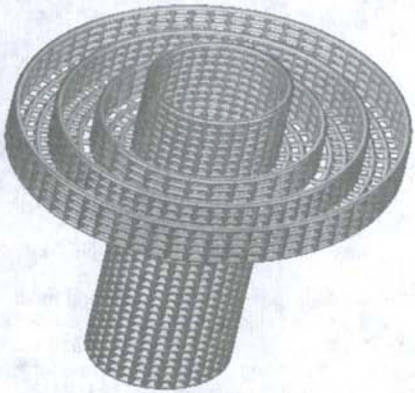

Fig. 4 3D vision of the Feed by Nec-Win Pro

Looking closely to our parabola, we find that the focus distance at the centre is smaller than the distance "d_{edg}" between the focus and the dish edge:

$$\mathbf{d_{edg} = sqrt\,[\,(D_{ia}/2)^2 + (f - c)^2\,] = 585mm}$$

so the wave that follows this second way has been submitted an additional "ΔA" free space attenuation:

$$\mathbf{\Delta A = 20\,log_{10}\,(\,d_{edg}/f\,) = 3.2dB}$$

To have a good dish illumination it is a standard way to consider the feed radiation angle until –10dB of the maximum power gain that become –6.8dB taking into account the additional loss due to the above consideration.
The feeder optimisation includes also the definition of the waveguide projection beyond the the 3 traps system to meet, as possible, the theoretical parabola illumination angle (≈ 120°). This value is x = 6mm (**Fig. 7**).
With a radiation angle less than the calculated one (θ = φ = 135°), the illumination loss increases and consequently the parabola gain falls down to make up for it the sidelobes become smaller.

The power gain of the Chaparral feed is practically flat in the whole considered frequency range (10.2 to 10.5GHz): see the relevant azimuth and elevation power gain patterns (**Fig. 8 to 13**).

Comparing the complete feeder performances and the ones of the waveguide taken separately (**Fig. 14 & 15**) two disadvantages has been evidenced in the simple waveguide case: no possibility to change the radiation angle for the best illumination of the parabola disk, the worse front to back ratio (22 to 23dB or more against only 11dB) caused by the diffraction, of the wave, on the guide edge. This is the first practical confirmation of the chosen solution validity: next one will be performed during the experimentation phase, but this will be the subject for another article.

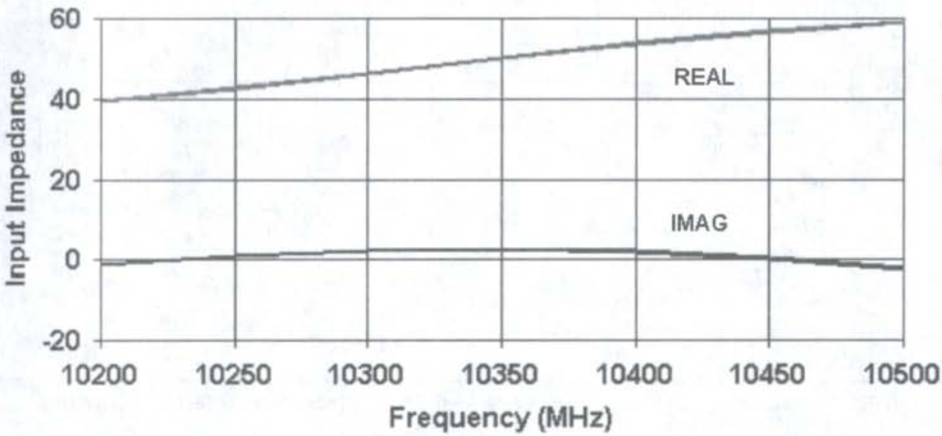

Fig. 5 Input impedance versus frequency

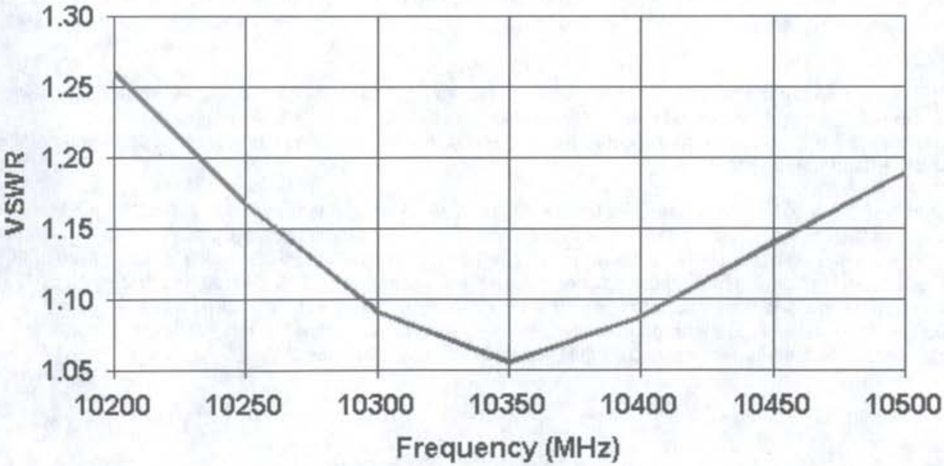

Fig. 6 VSWR versus frequency

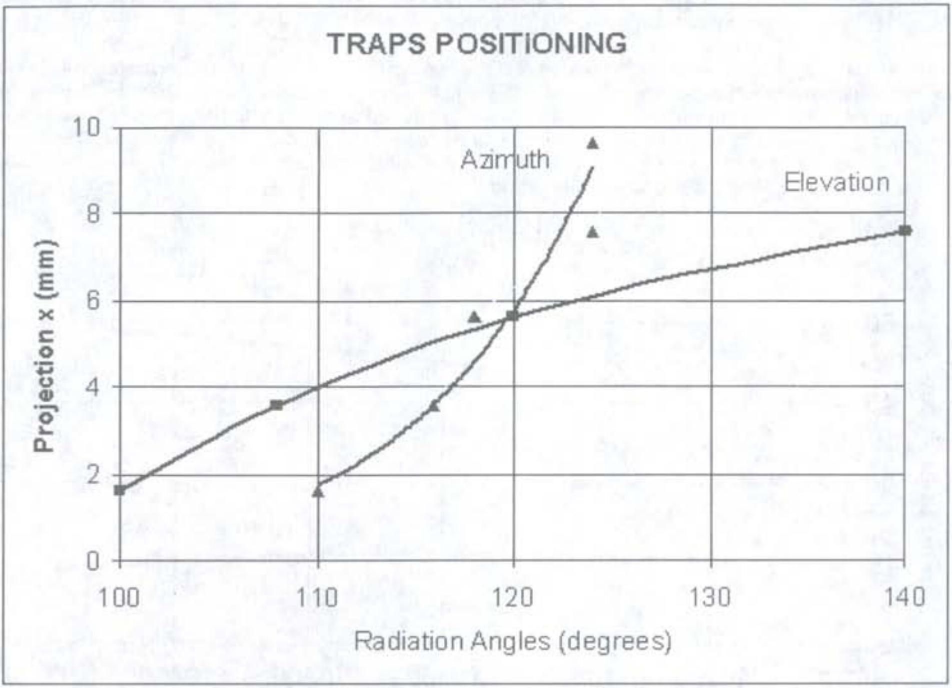

Fig. 7 Radiation bandwidth versus waveguide projection (x) referred to the traps

Conclusion

Starting from the need of an efficient paraboloid dish (not lower than 60 %) for 10 GHz experimentation and thanks to a modern simulation tool as the NEC-Win Pro, the decision was taken to accurately analyze a circular feed optimized for a direct focused dish with **F/D** of **0.38**. All the simulation patterns are relative to a circular waveguide horn with internal diameter of 20 mm driven from a vertical and nominally $\lambda/4$ probe.

The dimensions of the traps that are movable on the waveguide are similar to the values of a commercial version of Chaparral style feed used in the past for the 10.7 to 12.75 GHz TV-Sat band.
We describe briefly also some NEC2 rules particularly referred to specific problems as the segmentation and diameters of the probe.

Starting from a 108 cm paraboloid dish we selected a 7 dB edge attenuation for the radiation angles because of the about 3 dB of added space attenuation (for –10 dB amplitude taper).
From the diagram of **Fig. 7** the guide projection (x) can be optimized for F/D values different from 0.38.
The system is relatively broadband as shown from the diagrams at 10.200, 10.350 and 10.500 GHz.
The SWR is low and the imaginary part of the impedance practically flat versus frequency.
To conclude we wish to thank particularly Paul Wade, W1GHz, for the the big education engagement in the microwave field that was very usefull for us and for many other hams.

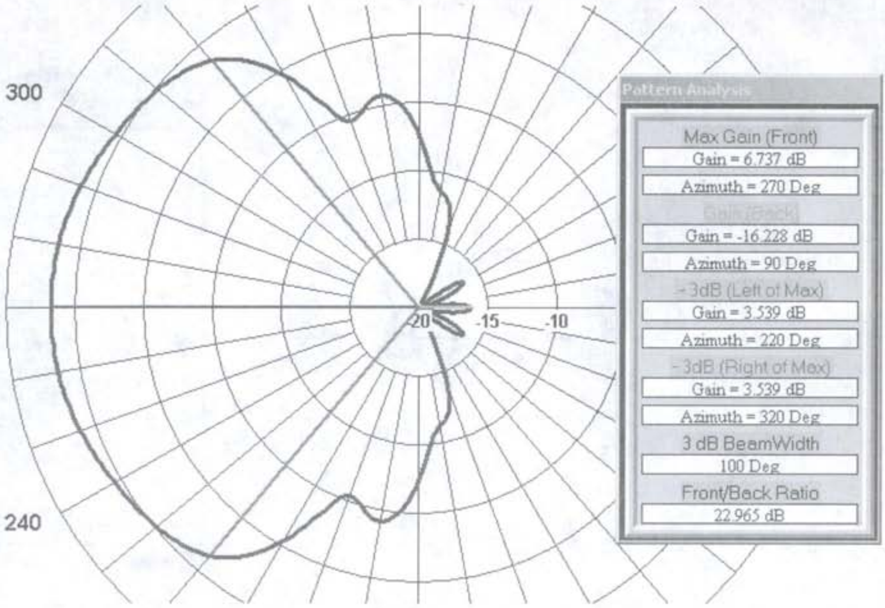

Fig. 8 Azimuth Pattern (trap projection, x = 5.6 mm) @ 10.200 GHz

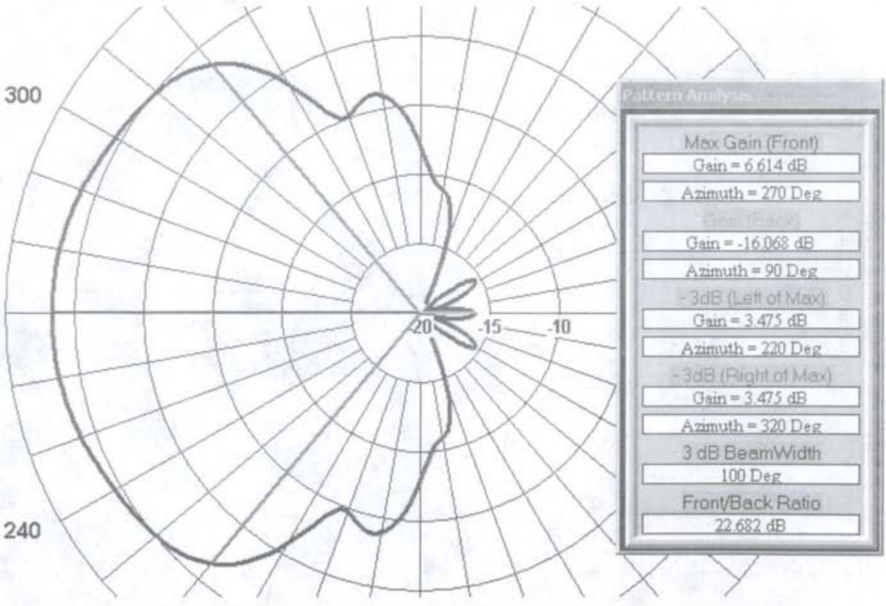

Fig. 9 Azimuth pattern (trap projection, x = 5.6 mm) @ 10.350 GHz

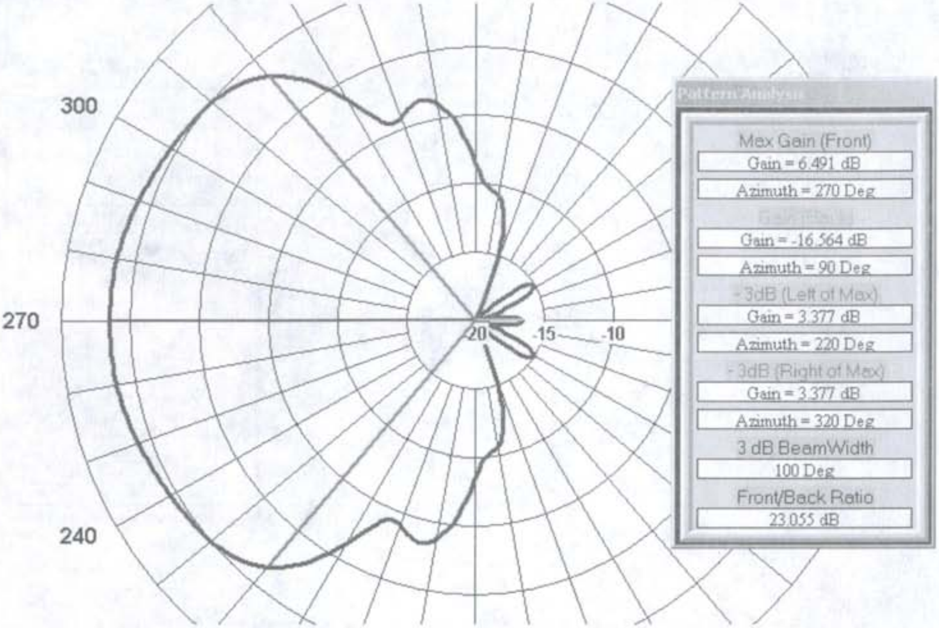

Fig. 10 Azimuth pattern (trap projection, x = 5.6 mm) @ 10.500 GHz

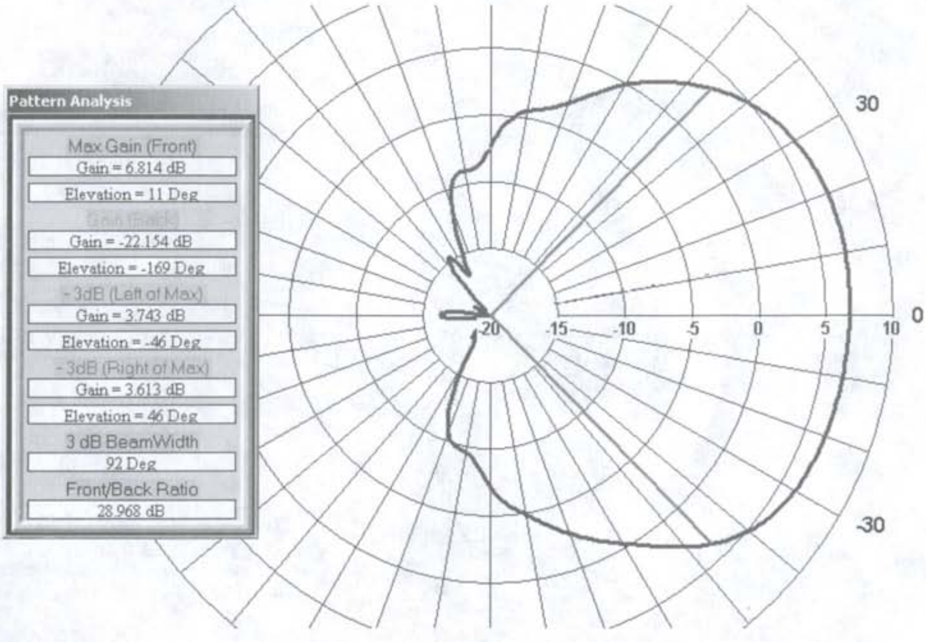

Fig. 11 Elevation pattern (trap projection, x = 5.6 mm) @ 10.200 GHz

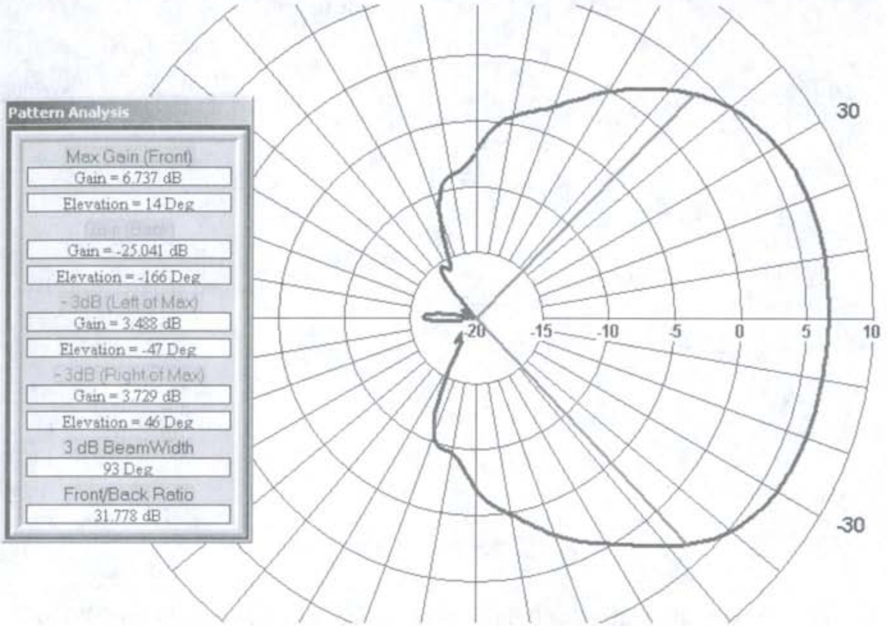

Fig. 12 Elevation pattern (trap projection, x = 5.6 mm) @ 10.350 GHz

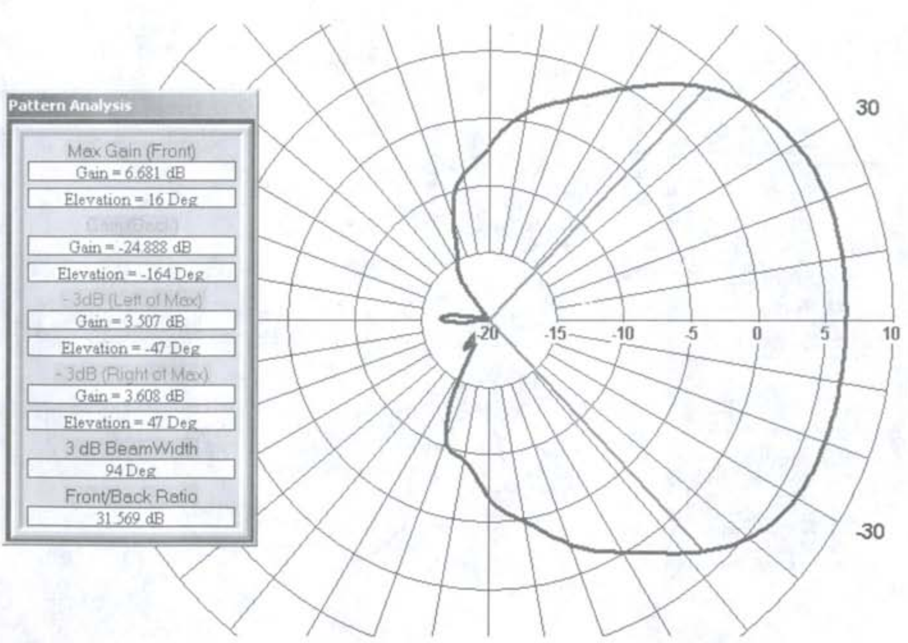

Fig. 13 Elevation pattern (trap projection, x = 5.6 mm) @ 10.500 GHz

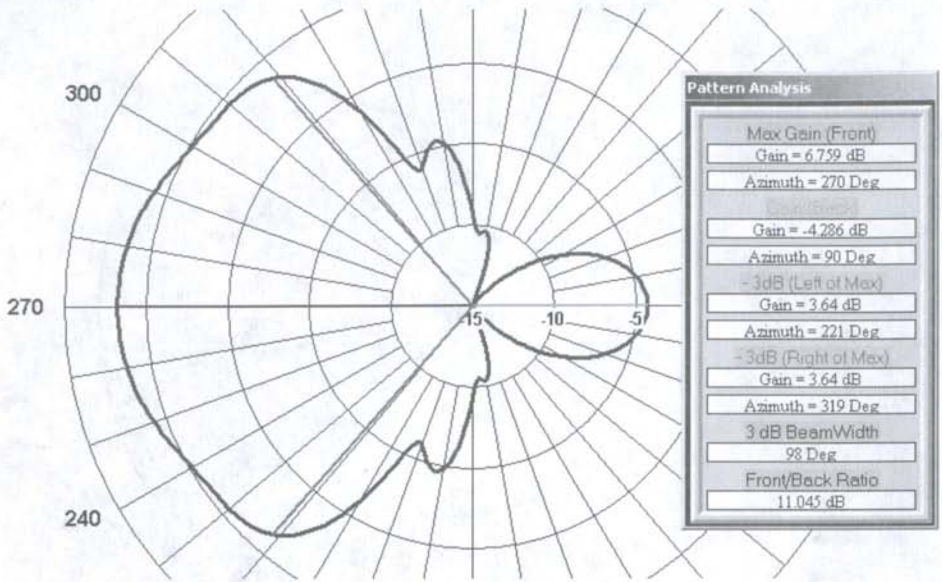

Fig. 14 Azimuth pattern of the waveguide feed without traps @ 10.350 GHz

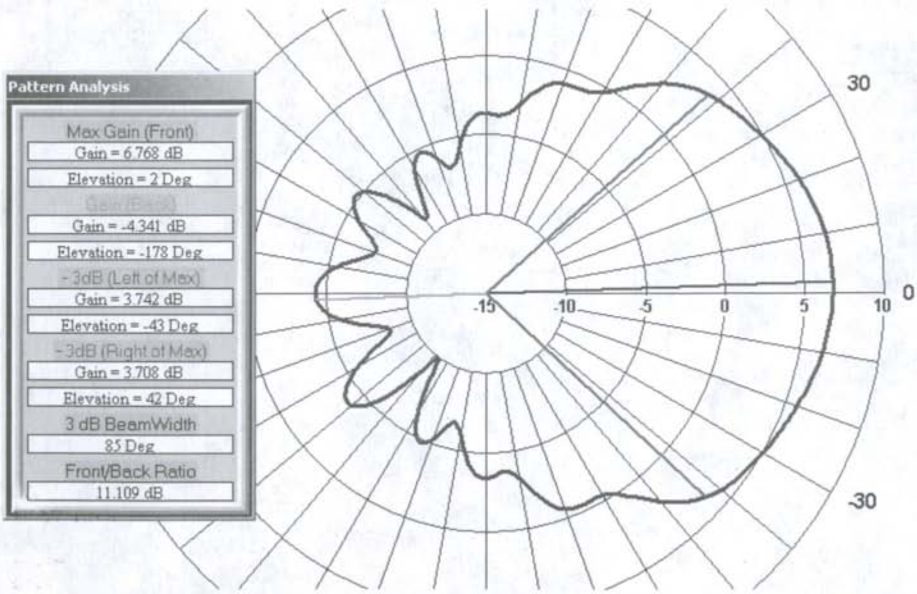

Fig. 15 Elevation pattern of the waveguide feed without traps @ 10.350 GHz

Appendix: Waveguide propagation modes

Circular waveguides are used in specific areas of radar and communications systems, such as rotating joints used at the mechanical point where the antennas rotate, but are also well known in the 10 GHz hams circle and for applications involving circular polarization waves.
The general classification of Transverse Electric (TE) and Transverse Magnetic (TM) is true for both circular and rectangular waveguides.
In the Transverse Electric (TE) mode, the entire electric field is in the transverse plane, which is perpendicular to the length of the waveguide (direction of energy travel). Part of the magnetic field is parallel to the length axis. In the Transverse Magnetic (TM) mode, the entire magnetic field is in the reverse plane and has no portion parallel to the length axis.
In the rectangular guides the modes are named $\mathbf{TE_{mn}}$ or $\mathbf{TM_{mn}}$ where the integer "m" designates the number of half waves of electric or magnetic field intensity in the "x" direction (the bigger dimension of waveguide cross section), while "n" is the number of half wave in "y" direction (the smaller size of waveguide cross section). The "z" axis is assumed as positive in the direction of propagation of the wave.
In the circular guides the same system has been used to define the modes, but changes its meaning of the subscripts: "m" represents the numbers of full cycles of field variation in one revolution around the circumference given by the cross section of the waveguide, "n" denotes the number of half waves along its diameter.
Several modes are possible in both circular and rectangular waveguides. $\mathbf{TE_{1,1}}$ is the complete mode description of the dominant mode in circular waveguides. This is also the lowest frequency mode that will propagate in the waveguide. See in the following the cutoff wavelength and cutoff frequency calculated for the three more important modes with a waveguide Diameter = **20 mm**. and a frequency of **10400 MHz.**

Mode	Cutoff Wavelength		Cutoff Frequency	
$\mathbf{TE_{11}}$	λ_{C1}	= 1.71 x D = 3.42 cm	f_{C1} = 8772 MHz	
$\mathbf{TM_{01}}$	λ_{C2}	= 1.31 x D = 2.62 cm.	f_{C2} = 11450 MHz	
$\mathbf{TE_{21}}$	λ_{C3}	= 1.03 x D = 2.06 cm.	f_{C3} = 14563 MHz	Where **D** is in cm

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Simulation eines Chaparral-Feed für 10 GHz

von Paolo Antoniazzi, IW2ACD and Marco Arecco, IK2WAQ

Einleitung

Diese Simulation wurde mit NEC-Win Pro v1.62 realisiert. Dies ist ein modifizierter NEC2-Kern, der für das 32-bit-Betriebssystem optimiert wurde. Diese Software unterstützt DMA (dynamic memory allocation) und kann Ergebnisse rechnen für tausende von Segmenten [1]. Wie in OM6AA`s Artikel von 2004 [8], sind die Sartbedingungen: Die Ausrichtung der Feed-Sonde (vertikal oder horizontal) wurde verwendet, um die Ebenen der Elevation und des Azimuth zu definieren. Genauso definieren V- und H-Polarisation die Sendeantenne (in unserem Fall nur vertikal).
Wir haben viele Simulationen von VHF-Yagi-Antennen realisiert [2] und auch von 2.4 GHz-Helix-Antennen für P3D- und WiFi-Anwendungen [3, 4]. Dies ist unser erstes Design für 10 GHz.
Dieses Projekt, das den Namen F10CH trägt, startete im Oktober 2004 angespornt durch den Bedarf einer Antenne für 10 GHz mit gutem Wirkungsgrad ausgehend von einem existierenden 108cm-Spiegel mit Primärfokus und F/D = 0.38.
Durch einfache Analyse und Überlegungen von W1GHZ [5, 6] kommen nur zwei Feed-Typen für diese spezielle Anwendung in Frage: Das VE4MA-Feed und das komplexere, gut bekannte Chaparral®-Feed. Ausgewählt wurde schließlich das Chaparral-Feed, wie es in der Vergangenheit bei TV-Sat-Spiegeln mit zentralem Fokus verwendet wurde und erstmalig 1972 beschrieben wurde [11].

Optimierung von Parabol-Antennen

Elnfach und nicht teuer ist der Parabol der meist verbreitete Mikrowellen-Antennen-Reflektor. Das Ausleuchtungsmuster sollte im Ergebnis eine einheitliche Pase und Amplitudenverteilung über die Oberfläche des Spiegels ergeben, ohne Splillover, d.h. ohne Energieverlust durch Überschuss.
Der Reflektor dieser Antenne weicht nicht von einem echten Parabol ab. Unter Annahme einer elektrisch transparenten Struktur als Feedhalter und ohne irgendwelche ohmschen Verluste im System, hätte eine ideale Antenne 100% Wirkungsgrad, d.h. die Öffnung produziert den vollen theoretisch erreichbaren Gewinn. In der Realität ist das nicht möglich und es mag sogar gar nicht erstebenswert sein, diese Eigen-

schaften zu erreichen. Z.B. will der Designer sehr kleine Nebenzipfel, muss er das teuer mit dem Wirkungsgrad bezahlen. Verluste entstehen durch:

- **Phasenfehler über der Spiegel-Öffnung**
- **Abnahme der Amplituden-Verteilung**
- **Spillover (Energieverlust durch Strahlung, die nicht auf den Reflektor fällt)**
- **Blockierung der Spiegelöffnung**
- **Cross-Polarisation (unerwünschte Polarisation)**
- **Radome und ohmsche Verluste**

Die Abweichung von der einheitlichen Phase über der Öffnung eines Parabols kann beschrieben werden durch die Streuung ausgehend vom primären Feed und die Blockierung durch selbiges und die systemische Abweichung des Reflektors von einer wahren Parabolform. Oberflächentoleranzen sind normalerweise für 0.1 bis 0.5 dB Verlust bei Mikrowellenantennen verantwortlich. Perfekte Genauigkeit ist unerreichbar und die Konstruktion einer prezisen Oberfläche ist sehr teuer. Die allgemein akzeptierte Daumenregel besagt, dass die zulässige Abweichung 1/32 bis 1/16 der Wellenlänge sein darf.
Beispielsweise hat ein Parabol-Reflektor mit kreisrunder Öffnung von einem Durchmesser von 25 Wellenlängen und typisch konischer Ausleuchtung einen zusätzlichen Nebenzipfel von -20 dB, wenn die Effektiv-Abweichung des Reflektors 1/32 der Wellenlänge ist (ca. 1mm bei 10 GHz), sofern das Korrelationsintervall eine Wellenlänge beträgt. Die ideale Parabol-Antenne sollte ein Feed mit einem genau definierten Phasenzentrum besitzen. In der Praxis hat das bekannte Feed-Horn kein Phasenzentrum, das genau definiert ist für alle entgegengesetzten Winkel zwischen Zentrum und Kante des Reflektors. Dieses Manko produziert einen Phasenfehler, der normalerweise an den Kanten des Spiegels am größten ist. Die Positionen des Feed müssen ein Kompromiß sein.
Eine gleichförmig ausgeleuchtete zirkulare Öffnung ergibt ein Strahlungsdiagramm mit einem ersten Nebensipfel, der etwa 18 dB unter dem Hautstrahl liegt. Um die ersten Nebenzipfel zu verbessern, den Spillover zu reduzieren und das Vor-Rück-Verhältnis des Spiegels zu verbesseren, verwendet der Designer eine primäres Feed, das eine abfallende Verteilung über die Spiegelfläche ermöglicht.
Aus Sicht der Effektivität ist es auch sehr erstrebenswert, den Parabol gleichförmig auszuleuchten. Nicht erstrebenswert und nicht effektiv ist es, ein Feed zuzulassen, das so strahlt, dass die Energie über die Kanten des Reflektors hinweg strahlt (Spillover). Verluste durch abfallende Verteilung und Spillover liegen typisch bei 1.0 bis 1.2 dB. Energie, die vom Parabol reflektiert auf die Halterung des Feed fällt, wird generell in beliebige Richtungen reflektiert und ist verloren. Die Größe dieses Effekts hängt vom Verhältnis der blockierten Öffnung zur gesamten Öffnung ab. Der Verlust durch Blockierung kann näherungsweise beschrieben werden durch:

Gewinnverlust (dB) = $10 \log_{10} (1 - B)$

Wobei B das Verhältnis von blockierter Flächer der Öffnung zur Gesamtfläche der Öffnung ist.
Ein Offset-Parabolreflektor kann die Blockierung der Öffnung komplett vermeiden. Die Komplexheit eines solchen Feed macht es aber nur unter speziellen Bedingungen verwendbar.
Andere Verluste würden den erzielten Gewinn durch das Vermeiden der Blockierung überschreiten.
Durch das Feed-Diagramm und die Geometrie von Feed und Reflekor wird etwas Energie mit falscher Polarisation abgestrahlt. Die Energie dieser Cross-Polsarisation ist verloren, was den Gewinn angeht (01. bis 0.2 dB) und reduziert folglich die gesamte Effektivität der Antenne.
Die Materialen der Antenne sind nicht perfekt und ein kleiner Teil des HF-Signals wird in den Wandungen des Wellenleiters und auf der Oberfläche des Reflektors in Wärme umgewandelt. Dieser Verlust ist normalerweise klein und im Wesentlichen unabhängig vom Design des Feed.
Abschließend: Für viele Jahre wurde als Standard für Parabolantennen ein Horn-Feed im Fokuspunkt angesehen. Heutzutage kann Hilfe erhalten werden durch moderne Simulationen und Herstellungstechniken. Eine Abschätzung der Verluste bei modernen Antennen für 10 bis 12 GHz (2 bis 3 m Durchmesser) ist in **Tabelle 1** aufgeführt. Eine bedeutende Analyse der Verluse bei Mikrowellen-Parabolen is auch in [10] zu finden.
Nicht paraboloide Oberflächen und präzise geformete Subreflektoren sind nötig, um über 70% Effektivität zu erreichen. Aber es ist keine so schwierige Angelegenheit, einen 10 GHz-Spiegel mit 60% Effektivität mit einem Chaparral-Feed zu realisieren. An diesem Punkt gehen wir zur Simulation.

Einige Regeln für die Simulation mit NEC2

Mit 2- bis 4 Jahren Erfahrungen mit Antennensimulation sollte jedes neue Projekt quasi leicht zu bearbeiten sein.... Einige Regeln sind wichtig bei NEC2, um eine gute Genauigkeit der Ergebnisse zu erzielen. Für NEC Win-Pro Benutzer ist der User Manual [12], das in dem Paket enthalten ist, sehr nützlich. Einige gut bekannte wichtige Punkte sind:

- Segment-Längen ≤ 0.1 lambda
- Segment-Längen-Durchmesser-Verhältnis ≥ 4 für 1% Fehler (Dies ist die voreingestellte Option des Simulationsprogramms: Thin-wire-Kernel-Näherung der Integration des elektischen Feldes (*))
- Segment-Länge / Durchmessr ≥ 1 für 1% Fehler (erweiterte Thin-wire-Kernel-Näherung aktiviert unter Verwendung der EK-Karte im Daten-Deck (**))
- Vermeidung des Kreuzens von Drähten im Mittelpunkt
- Der Kreuzungspunkt muss übereinstimmen mit dem Anfang oder Ende eines jeden Segments.
- Segmente sollen nicht überlappen (externe Drahtoberflächen können sich nicht penetrieren).
- In den Ecken kann der Drahtradius nicht mit dem Zentrum des angrenzenden Drahtes überlappen.
- Ein großer Wechsel der Durchmesser zwischen direkt verbundenen Drähten kann die Genauigkeit herabsetzen, besonders bei kleinen Längen-Durchmesser-Verhältnissen.
- Die Nummer der Drähte, die an einem Punkt verbunden sind, darf nicht 30 übersteigen.

(*) Beim thin-wire Kernel ist der Strom auf der Oberfläche eines Segments reduziert auf einen Stromfaden, der auf der Axe des Segmentes fließt.
(**) Beim erweiterten thin-wire Kernel wird angenommen, dass der Strom gleichmäßig über die Segment-Oberfläche fließt.

Simulation des Feed

Ausgangspunkt war eine kommerzielle Version eines Feeds von Zinwell für das Satelliten-Band von 10.7 bis 12.75 GHz. Siehe Foto in **Fig. 1**.

Die Ausarbeitung des Simulations-Files, alles in Handarbeit gemacht, fing mit der Kurzschlußseite des zirkularen 20mm Wellenleiters an. Gestartet wurde vom Mittelpunkt mit nur 4 Radialen, um das Risiko von Überlappungsfehlern zwischen benachbarten Segmenten am Ursprung der Achse zu vermeiden (siehe NEC2-Regeln onben). Diese Wahl wurde mit der Entscheidung zusammen kombiniert, den Drahtdurchmesser im ganzen Feed auf 0.4mm festzulegen, außer in den Teilen, wo die elektrischen Eigenschaften andere Dimensionen benötigten. Geht man vom Zentrum zur Peripherie, erhöht sich die Anzahl der Radials auf 16 und weiter auf 32, um einen guten Kompromiß zwischen der maximalen Drahtlänge (λ / 10) und der minimalen zu haben, die limitiert wird vom Drahtdurchmesser durch die Relation: $L / D \geq 1$ (erweitetes thin-wire Kernel ausgewählt). Die konzetrischen kreisförmigen Drähte wurden in 2mm Abstand in der ganzen Struktur gelegt, um ein gutes Gitter durch perfekte Kreuzung mit den relevanten Radials zu haben. Der selbe Abstand wurde verwendet, um auch die longitudinalen und transversalen zirkularen Drähte des Wellenleiters zu beschreiben, mit dem Zweck:

- eine gute Simulation der stromführenden Wandungen zu haben
- die feine Plazierung der Antennen-Einspeisung (d) von der Rückseite des Wellenleiters aus, immer in 2mm-Schritten, zu vollziehen
- dieselbe feine Positionierung (x) für das 3-Trap-System zu haben, gut sichtbar in der **Fig. 2**, um die Ausleuchtung zu optimieren. Die Strahlungswinkel für Azimuth und Elevation, die von dem vorhandenen Parabolspiegel (Spiegel-Durchmesser D_{ia} = 1080mm, Brennweite f = 405mm, Tiefe im Zentrum c=180mm) benötigt wurden, waren: $\theta = \varphi = 2 \arctan [D_{ia} / 2 (f - c)] \approx 135°$.

Um das Schreiben des Simulations-Files zu vereinfachen, wurde am Ende jeden Statements die Nec-Vu-Funktion verwendet, um eine mögliche Regelverletzung aufzudecken bevor mit den nächsten Schritten weiter gemacht wurde. Die gesamte Anzahl an Segmenten eines solchen Wellenleiters war 2536. Diese Zahl ist hoch und deshalb braucht man die Option "32-Bit Auto DMA Core", die die Berechnung von Strkturen mit mehr als 2000 Segmenten mit Nec-Win Pro erlaubt. Hiervon ausgehend ist ein OC mit mindestens 64MB RAM nötig. Es gibt eine einfache Formel, die vom Hersteller angegeben wird, um den benötigten Speicherplatz für die Simulation von Antennen mit tausenden von Segmenten zu berechnen:

Benötigte RAM-Größe = (Zahl der Segmente)^2 x 16

Um das Schreiben des Simulationsfiles zu vereinfachen, wurden die elementaren Drähte, radiale und tangentiale, unter Verwendung der GW-Karte (dieser alte Name stammt von Fortran) definiert. Somit wurden sie dupliziert bis „GM-Eins" benötigt wurde.

Um den TE_{11}-Mode im Wellenleiter zu erregen, wurde eine vertikale Sendeantenne ("Sonde" genannt) verwendet, die mit einem veränderbaren Abstand d von 6 bis 14mm vom geschlossenen Ende platziert werden konnte. Die Sonde wurde für Simulationszwecke in 4 Segmente von unterschiedlichen Durchmesseern und Längen **(Fig. 3)** aufgeteilt, um den Programmier-Regeln zu entsprechen keinen großen Wechsel des Durchmessers zwischen den verbundenen Drähten zu haben und um die Eingangsimpedanz und das VSWR der Sonde zu optimieren.

Mit derselben Technik des Kurzschlusswellenleiters haben wir die 3 Traps des Feeds (die zusätzlichen Ringe, die sich um die Öffnung herum befinden), realisiert indem 32 Radials für den inneren und 64 für den äußeren Teil benutzt wurden. Alle drei Traps wurden 5.6mm breit und 8.4mm tief ausgeführt (**Fig. 2**). Weitere Informationen zum Design gibt es auch in [13, 14] and [15].

Hier zusammengefaßt die Zahl der Segmente für die einzelnen Teile des simulierten Chaparral: Rückseite 232 Segmente, Wellenleiter (nur das Rohr): 2304 Segmente, Sonde: 4 Segmente, 1. Trap (der kleinste): 448 Segmente, 2. Trap (der mittlere) 864 Segmente, 3. Trap (der größte) 896 Segmente. Insgesamt ergeben sich 4748 Segmente (**Fig. 4**). Eine so große Zahl von Segmenten erfodert einen PC, der eine angemessene Geschwindigkeit und ausreichend Speicherplatz hat, um das Feed in angemessener Zeit optimieren zu können. Es wurde eine Simulationszeit von 4 Minuten für eine einzelne Frequenz mit einem 2400 MHz Pentium 4® mit 512 MB RAM benötigt.

Nach der kompletten Optimierung des VSWR und der Eingangsimpedanz (**Fig. 5 & 6**) wurde die volle Sonden-Höhe mit h = 5.8mm @ 10.35GHz definiert, was korrespondiert mit $0.201\lambda_0$ (Freiraum-Wellenlänge) und der Abstand vom Ende wurde mit d = 10mm bestimmt, äquivalent zu $0.185\lambda_g$ (Wellenlänge im Wellenleiter).
Die endgültigen Abmessungen von Länge/Durchmesser der Sonde wurden spezifiziert ausgehend vom ersten Segment, wo die HF-Quelle plaziert wurde: 1.2mm/0.6mm, 1.4mm/0.8mm, 1.6mm/1.0mm, 1.6mm/1.0mm (**Fig. 3**).
Man erinnere sich, dass die Position der Sonde relativ zum geschlossenen Ende, die Länge der Sonde und ihr Durchmesser die Arbeitsfrequenz bestimmt, sowie die Impedanz, die von der Eingangs-SMA-Buchse gesehen wird. Für eine vorgegebene Impedanz, die normalerweise 50 Ohm beträgt, sind nur ganz bestimmte Kombinationen dieser drei Parameter möglich. Für die Positionierung der Sonde siehe auch [7] und [9].
Bei genauerer Betrachtung unseres Parabols stellen wir fest, dass der Fokus-Abstand im Zentrum geringer ist als der Abstand "d_{edg}" zwischen Fokus und den Rändern des Spiegels.

$$d_{edg} = \mathrm{sqrt}\left[\left(D_{ia} / 2 \right)^2 + \left(f - c \right)^2 \right] = 585\mathrm{mm}$$

So hat die Welle, die diesem zweiten Weg folgt eine zusätzliche Freiraumdämpfung "ΔA" erfahren:

$$\Delta A = 20 \log_{10} \left(d_{edg} / f \right) = 3.2\mathrm{dB}$$

Um eine gute Ausleuchtung des Spiegels zu erreichen, ist es Standard den Strahlungswinkel des Feed bis -10dB des maximalen Leistungsgewinns einzubeziehen, was dann –6.8dB unter Einbeziehung des zusätzlichen Verlustes obiger Betrachtung ergibt.
Die Optimierung des Feed schließt auch die Definition der Projektion des Wellenleiters über die 3 Traps hinaus ein, um, wenn möglich, den theoretischen Ausleuchtungswinkel des Parabols ($\approx 120°$) zu erreichen. Dieser Wert ist x = 6mm (**Fig. 7**).
Mit einem Strahlungswinkel von weniger als dem kalkulierten ($\theta = \varphi = 135°$), nimmt der Ausleuchtungsverlust zu und der Gewinn des Parabols fällt consequent. Zum Ausgleich werden die Nebenzipfel kleiner.
Der Gewinn des Chaparral Feed ist glatt über den ganzen betrachteten Frequenzbereich (10.2 bis 10.5 GHz): Siehe die relevanten Gewinn-Diagramme für Azimuth und Elevation (**Fig. 8 to 13**).

Vergleicht man die komplette Perfomance des Feed gegenüber einem reinen einzelnen Wellenleiter (**Fig. 14 & 15**) ergeben sich für den Fall des einfachen Wellenleiters zwei Nachteile: Keine Möglichkeit, den Strahlungswinkel zu verändern, um die beste Ausleuchtung des Spiegels zu erreichen und das schlechte Vor-Rück-Verhältnis (22 bis 23dB oder mehr zu nur 11 dB) hervorgerufen durch die Beugung der Welle an der Kante des Wellenleiters.
Dies ist die erste praktische Bestätigung der Gültigkeit der gewählten Lösung. Die nächste wird während der Experimentierphase erreicht. Aber die wird Thema eines weiteren Artikels.

Folgerung

Ausgehend vom Bedarf eines effektiven (nicht geringer als 60%) Parabolspiegels für 10 GHz und dank eines modernen Simulationswerkzeugs wie NEC-Win Pro, wurde entschieden, ein zirkularen Feed, der für einen direkt fokussierten Spiegel mit F/D 0.38 optimiert ist, genau zu amalysieren. Alle Simulationsbilder sind relativ zu sehen zu einem zirkularen Wellenleiterhorn mit einem Innendurchmesser von 20mm gespeist von einer vertikalen nominalen lambda/4 Sonde.
Die Abmessungen der Traps, die auf dem Wellenleiter beweglich sind, sind ähnlich derjenigen einer kommerziellen Ausführung im Chaparral-Stil, das in der Vergangenheit für das 10.7 bis 12.75 GHz TV-Satellitenband verwendet wurde.

Es werden kurz auch einige Regeln für NEC2 beschrieben, die sich insbesondere auf die spezifischen Probleme wie die Segmentation und die Durchmessern der Sonde beziehen.
Ausgehend von einem 108cm Parabolspiegel haben wir eine 7dB Abschwächung an den Rändern für den Strahlungswinkel aufgrund der etwa 3dB zusätzlichen Freiraumdämpfung – für 10 dB Amplituden-Abnahme – gewählt. Aus dem Diagram der **Fig. 7** kann die Projektion des Wellenleiters (x) für F/D-Werte, die von 0.38 verschieden sind, optimiert werden. Das System ist ziemlich breitbandig wie anhand der Diagramme für 10.200, 10.350 und 10.500 GHz ersichtlich ist. Das SWR ist niedrig und der imaginäre Teil der Impedanz ist praktisch niedrig gegenüber der Frequenz. Abschließend möchten wir speziell Paul Wade, W1GHZ, für das große Engangement für die Wissensbildung im Bereich der Mikrowellen danken, was für uns und viele andere Amateure sehr nützlich war.

Anhang: Ausbreitungsarten in Wellenleitern

Zirkulare Wellenleiter werden in speziellen Bereichen von Radar- und Kommunikationssystemen eingesetzt, wie z.B. rotierenden Verbindungen an mechanischen Punkten, wo sich Antennen drehen. Sie sind aber auch bei bei den 10-GHz-Funkamateuren gut bekannt und für Anwendungen, die zirkular polarisierte Wellen einschließen. Die generelle Einteilung in Transverse Electric (TE) und Transverse Magnetic (TM) ist für zirkulare und rechtwinklige Wellenleiter gültig.
Im Transverse Electric (TE) Modus befindet sich das komplette elektrische Feld in der queren Ebene, die senkrecht zur Längsrichtung des Wellenleiters (Richtung des Enrgieflusses) verläuft. Ein Teil des magnetischen Feldes verläuft parallel zur Längsachse. Im Transverse Magnetic (TM) Modus, befindet sich das komplette magnetische Feld in der umgekehrten Ebene und hat keinen Anteil, der parallel zur Längsachse verläuft.
In rechtwinkligen Wellenleitern heißen die Modi $\mathbf{TE_{mn}}$ oder $\mathbf{TM_{mn}}$, wobei die Zahl "m" die Anzahl der Halbwellen der elektrischen oder magnetischen Feldintensität in der "x"-Richtung (das größere Mass im Querschnitt des Wellenleiters) ist, während "n" die Anzahl der Halbwellen in der "y"-Richting (der dem kleineren Maß des Querschnitts) ist. Die "z"-Achse wird als positive in der Richtung der Ausbreitung der Welle angenommen. Bei zirkularen Wellenleitern wurde dasselbe System verwendet, um die Modes zu definieren, aber die Bedeutung der Indizes ändert sich: "m" seht für die Zahl der ganzen Zyklen der der Feldänderung über eine Umdrehung des Umfangs im Querschnitt des Wellenleiters, "n" bezeichnet die Anzahl der Halbwellen über den Durchmesser. Diverse Modes sind in zirkularen und rechtwinkligen Wellenleitern möglich. $\mathbf{TE_{1,1}}$ ist die vollständige Mode-Beschreibung des dominierenden Modus in zirkularen Wellenleitern. Dies ist auch der Mode für die niedrigste Frequenz, die im Wellenleiter übertragen wird. Im folgenden ist die Sperr-Wellenlänge und Sperr-Freqeuenz für die drei wichtigsten Modes für einen Wellenleiterdurchmesser von = **20 mm** und eine Frequenz von **10400 MHz** aufgelistet.

Mode		**Sperr-Wellenlänge**	**Sperr-Frequenz**	
$\mathbf{TE_{11}}$	λ_{C1}	= 1.71 x D = 3.42 cm	f_{C1} = 8772 MHz	
$\mathbf{TM_{01}}$	λ_{C2}	= 1.31 x D = 2.62 cm.	f_{C2} = 11450 MHz	
$\mathbf{TE_{21}}$	λ_{C3}	= 1.03 x D = 2.06 cm.	f_{C3} = 14563 MHz	mit **D** in cm

References / Referenzen

[1] http://www.nittany-scientific.com
[2] P. Antoniazzi and M. Arecco, Measuring Yagis, Electronics World, December 1998, p.1002-1006
[3] P. Antoniazzi and M. Arecco, Measuring 2.4 GHz Helix Antennas, QEX, May/June 2004, p.1-9
[4] P. Antoniazzi and M. Arecco, Low-Profile Helix for 2.4 GHz – Simulation and Measurements, RADCOM, Dec. 2003, p.61-63
[5] Paul Wade, W1GHz, Microwave Antenna Handbook, 1994-2004, Cap.6.3
[6] Paul Wade, W1GHz, Understanding Circular Waveguide-Experimentally,QEX, Jan-Feb 2001, p.37-48
[7] RSGB, Microwave Handbook, Vol. 3, 1992, p.18-11 to 18-13
[8] Rastlislav Galuskak, OM6AA, Septum Feed Revisited, DUBUS, Vol.4/2004, p.11-30
[9] Ivo Chladek, ZS6AXT, Practical and Cheap Solution of Circular waveguide for 10 GHz, DUBUS, Vol.1/2004, p.49-53
[10] Reference Data for Radio Engineers, H.W.Sams & Co, Seventh Edition, 1989, p.32-52 to 32-55
[11] R. Wohlleben, H. Mattes, O. Lochner, Simple Small Primary Feed for Large Opening Angles and High Aperture Efficiency, Electronics Letter, Sept.21, 1972, p.181-183
[12] NEC-Win Professional User's Manual, Nittany Scientific,Inc., 1997 and Update 2004
[13] G3PHO, The Chaparral Scalar Feed Horn, RSGB, Microwave Newsletter, June 1997, p.6-8
[14] Matjaz Vidmar, YT3MV, TV Sat. Receive System, Part.1, VHF Communications, 4/1986, pp.196-199
[15] Hans Schluter, Rear-feed radiator with Corrugated Horn, VHF Communications, 1/1988, pp.8-9

50 MHz 500 W IRF510 based amplifier

by Peter Frenning, OZ1PIF

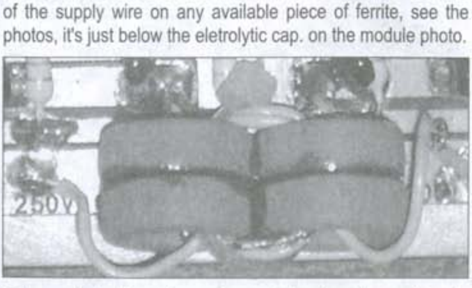
This amplifier project was based on a prototype circuit developed for the HF-bands by OZ3SW, Steen Møller. The HF project was eventually scrapped because of widely varying gain from 160m to 10m.

It looked sufficiently interesting, for me to mature the basic circuit design into a singleband 50MHz amplifier.
The basic building block is a 4+4 push-pull configuration, biased at 500mA, delivering 250W out for 10W in at 40V/10A. To make life easy on yourself, use devices from a single batch, as these are most likely to be closely matched. I've used devices from Intersil (Fairchild). These are no longer being produced, but there should be an ample supply in the distribution channel. The FQP7N10 device looks to be a very suitable (and somewhat better) alternative, but have not (yet!) been tested, one interesting comparison would be IMD3 figures! I'm currently trying to obtain sample devices to build a test amplifier.

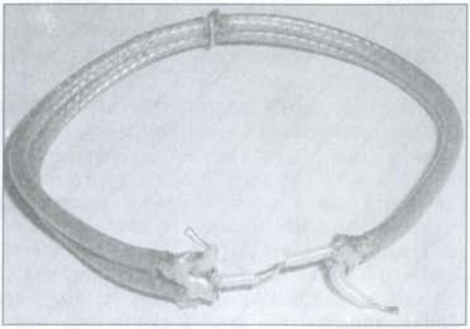
The individual IRF510s are mounted on the heatsink using Aluminium Oxide heat-transfer isolation bricks and silicone grease, for sufficiently low coupling between the MOSFETs and the heatsink to insure stability.

The input transformer (9:1) uses 4C65 cores, and the output transformer (1:4) uses thin air!

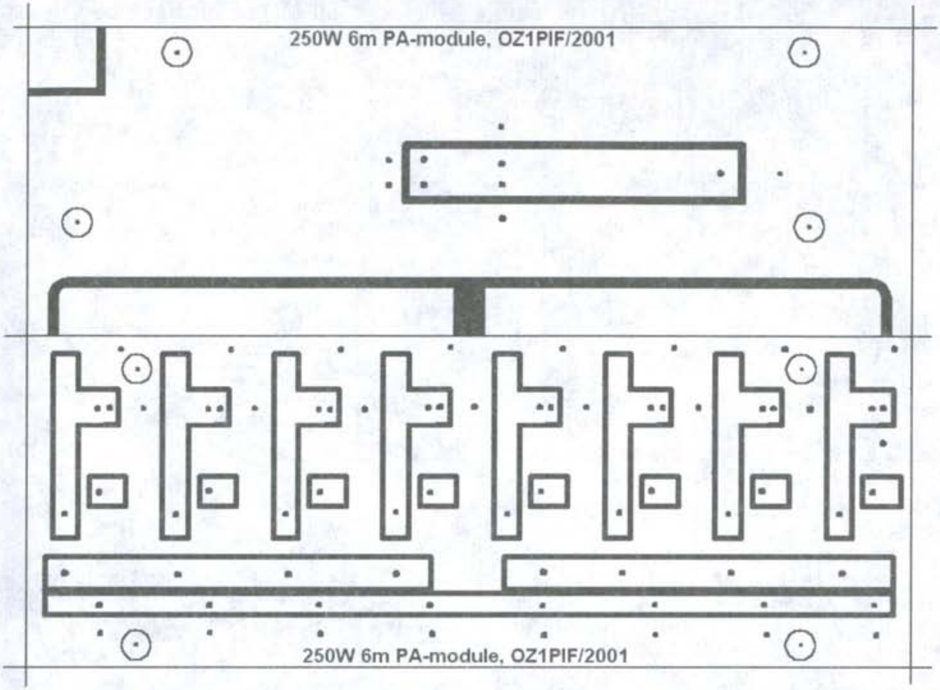
L4 is just a choke, and thus fairly uncritical, a couple of turns of the supply wire on any available piece of ferrite, see the photos, it's just below the eletrolytic cap. on the module photo.



T1 is made by threading a piece of wire three times (the primary) through a piece of coax outer conductor (the secondary) around four 4C65 (I have used 4 x Ferroxcube core material TN14/9/5 (4C65); Part No: 4322 020 9718 an equivalent Amidon would be material type 61 part No: FT50-61) cores glued together using cyanoacrylate (superglue), thus creating a 9:1 impedance transformation and a very reasonable input match. See also fig. 4 & 5 in AN749-PDF, a classic work by Helge Granberg.



The output transformer is made from two pieces of teflon coax (RG316) 14.5cm in length, the outer conductors joined at the middle and the ends, for the primary, and the inner conductors in series as two windings (the secondary) giving a 1:4 ratio and a close match to 50 Ohms (fine tune with C41), the B+ supply must be as near the midpoint of the primary as possible!
A very thorough description of the construction of HF-transformers can be found in: Motorola application note AN749 http://home24.inet.tele.dk/oz1pif/AN749.pdf
The combiner used, is a simple 1/4lambda combiner made from 75 Ohm coax, input splitter made the same way. This works fine if the two modules are closely matched, and if you can accept the loss of both halves, in the event of a failure in either one. Here it's no problem because of the very cheap semiconductors (less than four €/module). If this compromise for some reason is unacceptable there are many other, and more failure tolerant, solutions available in the litterature.
The end result is then passed through a low loss elliptical LP filter with a 70dB notch at 2nd harmonic and 80dB at 3rd. See appendix for details.
Bias is 500mA per module; IMD3 has not been measured, but reports on the band have been uniformly good.
More than 2000 QSOs have been made so far with this amp. Only mishap was during an F2 opening to NA in 2001, when i forgot to reduce TCVR output to 20W, I still made 4 and a ½ QSOs before things went avry (12 of 16 IRF510 blew loudly and smelly) These were quickly replaced (at less than 30c a piece!) and no one ever commented on the output, despite the vast overdrive.
This event taught me never to rely on manual throttling of drive to an amplifier - things will go wrong, and Murphy taught us that it'll happen when most inopportune, e.g. when in the middle of a humongous pile-up for the rarest of DXs! This amplifier now has a power attenuator built-in, to reduce the 100W from my FT-847 to the 20W required for full output. (As do my other amplifiers - all of them!) An added benefit is the reduction of splatter produced by the overshoot from the

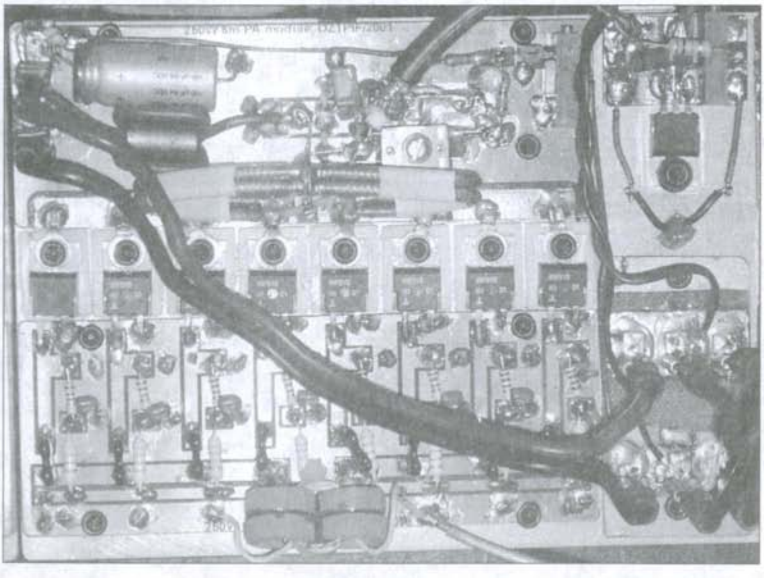


tranceivers output regulator, the more you throttle back the worse it gets - some modern tranceivers produce spikes of more than 150W on VHF - and the FT-847 is far from the worst of the bunch!

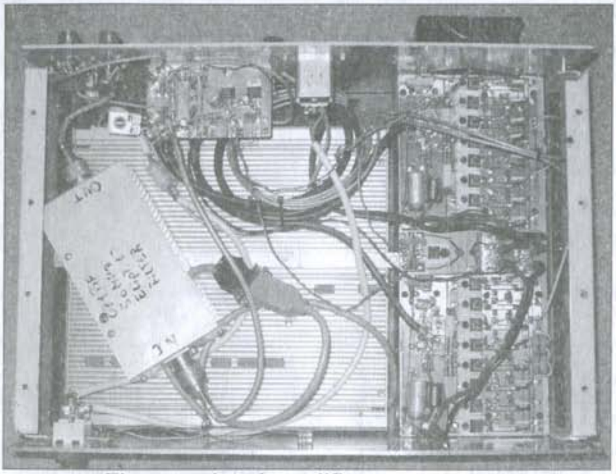
You can, of course, combine an arbitrary number of the 250W modules to obtain your desired output level, my reason for deciding on 500W was the availability of a suitable powersupply.

PCB layout

Size of PCB: 118mm x 85mm split along the horizontal line. Etched on double sided material. All drill holes for component mounting to be countersunk on the back-side, the rest are being used for "through plating" to connect the ground areas on both sides of the PCB.

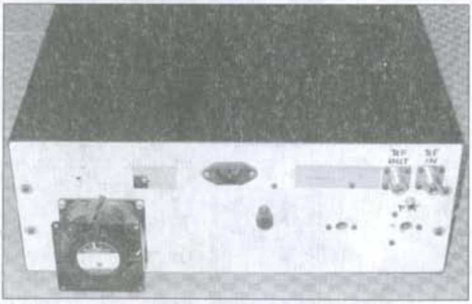


The finished module - since the PCB design, I have added the bias circuit in the upper right corner - dead bug fashion. The small circuit added to the heat-sink, next to the bias circuit, is a fan-speed controller. (see http://home24.inet.tele.dk /oz1pif/Fancontrol.htm)



The completed amplifier

The large finned object is a surplus commercial 800W switch mode PS. On top of that the elliptical LP filter. The small PCB over the PS, contains 12- and 24V regulators and changeover relays (not seen, but cheap 20A washing machine type, but still better than -20dB return loss at this frequency!) The grey RS-232 cable connects contol LEDs on the front to the PS. The coils of coax cable are the splitters and combiners.



Last, but not least, the whole thing - ready to plug in - weighs just under 12.5Kg (< 30 pounds, if you don't understand metric), ideal for /P use or DXpedition travel - and that's with the present heavy duty steel cabinet, I could probably shave off another 3-4 Kg with an Aluminium enclosure. Total costs for all PA's parts (without PSU) are arround 250 Euro.

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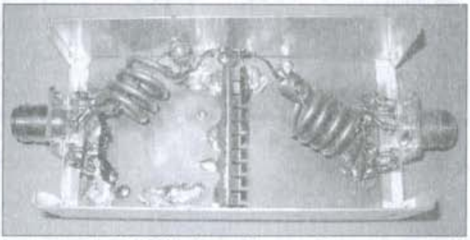
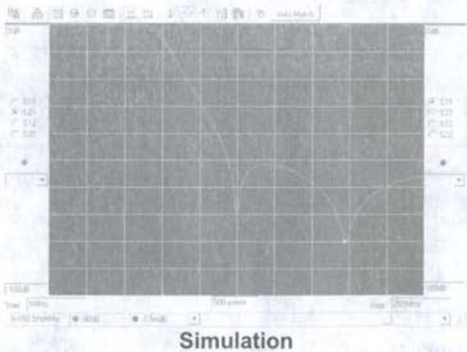
50 MHz Elliptical Low Pass Filter

L1 = 165 nH (3mm silvered Cu wire)
L2 = 195 nH (3mm silvered Cu wire)
C1 = 60pF (1000V NPO)
C2 = 15pF (8pF Johnson trimmer par. 10pF ceramic 500V)
C3 = 100pF (4 x 100pF/1000V NPO, in series/parallel)
C4 = 5pF (piece of copper foil on a lead "flapper")
C5 = 47pF (1000V NPO)

Simulation made with RFsim99, trace in the left upper corner is RL = 27dB at 50MHz; 2nd Harmonic -70dB; 3rd Harmonic -80dB; insertion loss < 0.15dB. Real-life measurement is almost identical to the simulation.

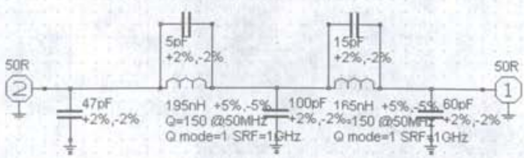


50 MHz Low Pass Filter

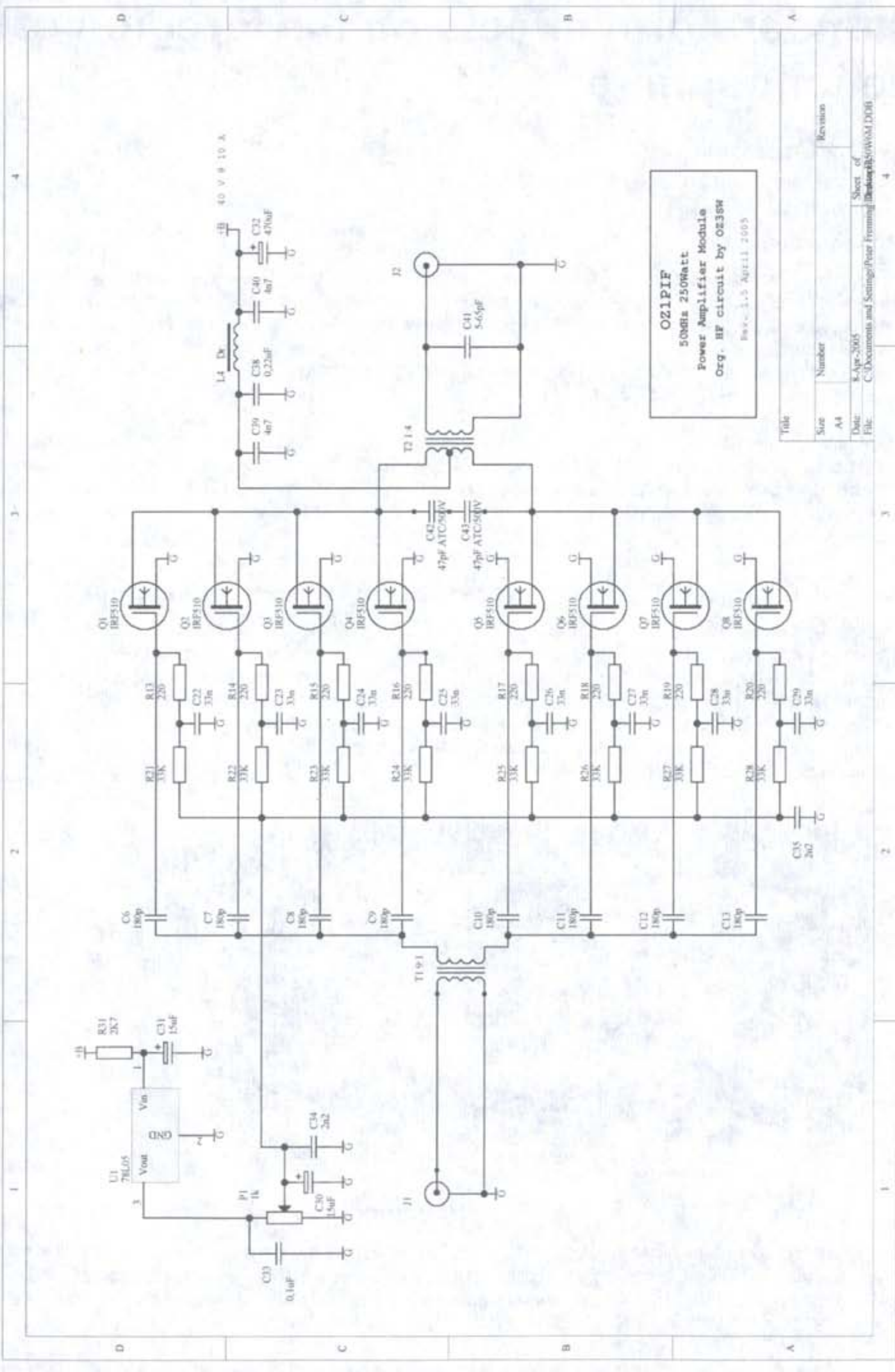


Simulation

Appendix



Circuit



Circuit diagram – 50 MHz Amplifier

Thunderstorm effects on the F region of the ionosphere

by Volker Grassmann, DF5AI

1 Introduction

In [13] we have discussed the possibility of 144 MHz sporadic E propagation triggered by dynamical processes in the lower atmosphere which are associated with thunderstorms. We have in particular discussed the model of atmospheric convection breaking the tropopause which causes the generation of atmospheric gravity waves which finally propagate from the lower atmosphere into the upper atmosphere. Arriving at E region heights, the gravity waves may stimulate or support the generation of wind shears which are accepted one cause of sporadic E. That model appears plausible to many scientists but, as far as we can see, it isn't yet verified in all aspects.

This paper may be considered a supplement to [13] extending our view from the E region to the F region of the ionosphere. Contrary to the E region, thunderstorm effects on the F region of the ionosphere are generally accepted by ionospheric scientists since the 1970s. In fact, theoretical and experimental investigations provide clear evidence of F region phenomena associated with gravity waves originating from the lower atmosphere. However, the amount of scientific resources is enormous, i.e. this paper can only provide a brief and imperfect review of only some details.

2 A short look at travelling ionospheric disturbances and spread-F irregularities

By analysing the so-called *travelling ionospheric disturbances* (TID) in the equatorial F region, RÖTTGER found an evident correlation between the TID occurrence and the tropical rainfall activity which he interprets by convective thunderstorms which cause heavy rainfall and, on the other hand, also cause gravity waves propagating from the lower into the upper atmosphere [4], [7] – those gravity waves finally manifest the TIDs' signature in the ionograms. WHITEHEAD (1971) has even proposed a spatial resonance mechanism (see [5] and the references cited therein) between the plasma drift velocity in the ionosphere and the phase velocity of atmospheric gravity waves resulting in a quasi-periodic modulation of the equatorial spread-F structures associated with a considerable amplification of the TID amplitude.

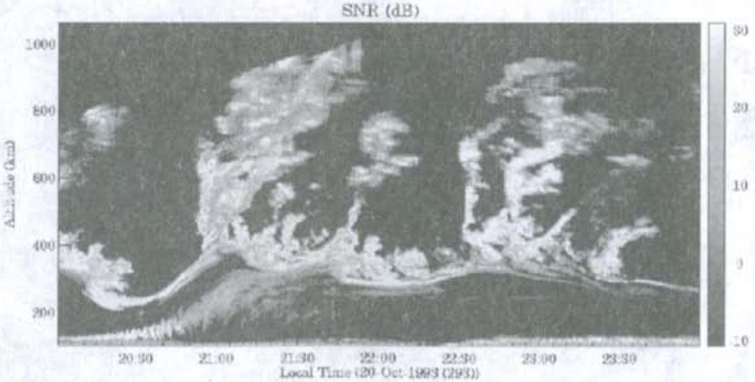


Fig. 1. Radar map showing echo traces due to backscatter from equatorial spread-F irregularities at altitudes higher than 200 kilometers, from [12].

The evidence that gravity waves initiate equatorial spread-F irregularities comes in particular from observations carried out with the Jicamarca radar located close to the magnetic equator near Lima, Peru (see, e.g. [11]). The radar transmits at 50 MHz with 1 megawatts pulse power from a 300m x 300m phased-array pointing nearly vertically. **Fig. 1** shows one of the spectacular events recorded by KELLEY et al. (1981), see, e.g., [8] and [12] and the references cited therein.

Penetrative cumulus convection caused by thunderstorms is however only one source of gravity waves observed in the F region of the ionosphere, i.e. other sources need to be considered as well. In the equatorial zone, the dawn/dusk terminator moves with supersonic speed through the ozone layer and it is believed that this feature may excite gravity waves propagating in a shock-front through the atmosphere. It is also believed that the electrical currents forming the equatorial electrojet (EEJ) may also generate gravity waves due to Joule heating and Lorentz forces. The non-linear breaking of atmospheric tides is also considered a possible source of gravity waves and other sources have been discussed as well. In [4], all this possible sources are analysed in order to explain the above mentioned correlation between the TID occurrence and the tropical rainfall activity together with the fact that the majority of TIDs appear to originate from the tropical rain forest located north of the HF radar system which was used in the TID measurements (all this measurements were carried out in Huancayo, Peru). RÖTTGER finally considers penetrative cumulus convection as the most probable source of the medium-scale TIDs observed in the equatorial regions [4].

3 Implications to VHF dxing: Es and TEP propagation

Thus, the model of thunderstorm effects on sporadic E in [13] is very similar to the findings which appear accepted in F region dynamics. Compared to F region studies, the amount of scientific resources dealing with thunderstorm effects on the E region is however much smaller but, nevertheless, some scientific resources are indeed available, see, e.g., [4] and the references cited therein. RÖTTGER in particular cites studies from DATTA but, unfortunately, we couldn't access this document (Ind. J. Pure Appl. Phys., 9, 394, 1971) which apparently provides some indication of thunderstorm-triggered sporadic E events in the tropical atmosphere. From this perspective, the model in [13] does not appear revolutionary at all – with one exception though: all this scenarios are discussed in the tropical atmosphere because severe thunderstorms are best observed in this part of the world. The model in [13] however adopts the results in order to explain sporadic E events in mid-latitudes. Thus, if radio amateurs can document thunderstorm effects on mid-latitude sporadic E (the June 27, 2004 event may lead in this direction, see [13]), ham radio may indeed contribute to ionospheric research.

A final word is given with respect to transequatorial radio propagation (TEP) on very high frequencies: As a consequence of the abobe mentioned spatial resonance mechanism between the ionospheric plasma and gravity waves travelling through it, electron density gradients are produced which may trigger or modulate the generation of smaller-scale spread-F irregularities moving upward in bubbles [5]. Note that plasma bubbles are also considered a possible explanation of transequatorial radiowave propagation on HF and VHF, see, e.g., [1], [9], [10] (RÖTTGER's investigations on TIDs indeed result from his TEP experiments in the 1970s, see, e.g., [2], [3], [6]). Thus, meteorological effects, thunderstorms and gravity waves in the tropical atmosphere will very likely play a role also in ham radio studies dealing with TEP in 144 MHz and above.

4 References

[1] Transäquatoriale UKW-Ausbreitung
Harrison R. L., VK2ZTB
UKW-Berichte, 90-108, 1972

[2] Die Untersuchung von Irregularitäten in der F-Schicht der äquatorialen Ionosphäre mit Hilfe der transäquatorialen Kurzwellenausbreitung
Röttger J.
Dissertation, Georg-August-Universität Göttingen, 1974

[3] Transäquatoriale Kurzwellenfunkverbindungen
Röttger J.
cq-DL 2, 84-88, 1975

[4] Travelling disturbances in the equatorial ionosphere and their association with penetrative cumulus convection
Röttger J.
J. Atmos. Terr. Phys., 39, 987-998, 1977

[5] Drifting patches of equatorial spread-F irregularities – experimental support for the spatial resonance mechanism in the ionosphere
Röttger J.
J. Atmos. Terr. Phys., 40, 1103-1112, 1978

[6] Transäquatoriale DX-Verbindungen auf 144 MHz
Röttger J., DJ3KR
cq-DL, 5, 198-200, 1979

[7] Equatorial spread-F by electric fields and atmospheric gravity waves generated by thunderstorms
Röttger J.
J. Atmos. Terr. Phys., 43, 453-462, 1981

[8] Gravity waves seeding ionospheric irregularities
Röttger J.
Nature, 296, 111-112, 1982

[9] VHF and UHF propagation modes
Grayer G., G3NAQ
The VHF/UHF DX Book, White I., G3SEK (editor), RSGB, 1995

[10] Equatorial propagation
Cracknell R, G2AHU
http://www.uksmg.org/equitorialpropagation.htm

[11] The Jicamarca Radio Observatory
http://jicamarca.ece.cornell.edu/

[12] Incoherent and coherent scatter radars: Jicamarca examples
Woodman R.F.
http://cedarweb.hao.ucar.edu/workshop/tutorials/2004/woodman04.pdf

[13] Thunderstorm effects on sporadic E propagation in 144 MHz
Grassmann V. (DF5AI), Cremer S. (DL1DBC), Langenohl U. (DK5YA), Munters A. (PE1NWL), Sampol (EA6VQ), Kraft (DL8HCZ)
Dubus 1, 9-44, 2005

Gewittereinflüsse auf die ionosphärische F-Region

von Volker Grassmann, DF5AI

Hinweis: Die angegebenen Abbildungs- und Literaturverweise beziehen sich auf die englischsprachige Version dieses Aufsatzes.

1 Einleitung

In [13] wird die Entstehung von 144 MHz Sporadisch–E Fernverbindungen mit dynamischen Vorgängen in der unteren Atmosphäre in Verbindung gebracht, die ihrerseits auf Gewitter zurückgeführt werden können. Dabei wird angenommen, dass troposphärische Konvektionsprozesze beim Durchbrechen der Tropopause Schwerewellen auslösen können, die sich von der unteren bis schließlich in die obere Atmosphäre ausbreiten. Erreichen die Schwerewellen das Höhenniveau der ionosphärischen E-Schicht, so können sie dort die Entstehung von Windscherungen begünstigen, welche als ein möglicher Mechanismus bei der Entstehung von Sporadisch-E Schichten gelten. Das Modell wird von Atmosphärenwissenschaftlern offenbar als plausibel angesehen, nach unserer Einschätzung kann es jedoch noch nicht in allen Einzelheiten als verifiziert gelten.

Dieser Aufsatz gilt als Ergänzung zu [13], wobei das Augenmerk von der E- nunmehr auf die F-Region in der Ionosphäre gelenkt wird. Im Gegensatz zur E-Schicht gelten Gewittereinflüsse auf die F-Schicht seit den siebziger Jahren als eine allgemein anerkannte Tatsache. Tatsächlich können theoretische und experimentelle Untersuchungen den Nachweis erbringen, dass zahlreiche Phänomene in der F-Region durch Schwerewellen hervorrufen werden, die in der unteren Atmosphäre ihren Ursprung finden und dort in einem engen Zusammenhang mit Gewittern stehen. Der Umfang der wissenschaftlichen Quellen ist in der Tat außerordentlich umfangreich, weshalb dieser Aufsatz nur einen groben und unvollständigen Überblick über nur einige wenige Details vermitteln kann.

2 Ein kurzer Blick auf „travelling ionospheric disturbances" und „Spread-F Irregularitäten"

RÖTTGER fand bei der Untersuchung der so genannten *travelling ionospheric disturbances* (TID) in der äquatorialen F-Schicht eine eindeutige Korrelation zwischen dem Auftreten von TIDs und der tropischen Niederschlagsintensität, welche er durch gewitterbedingte Konvektionsprozesse deutet, die einerseits heftigen Regenfall und andererseits Schwerewellen erzeugen, die sich von der unteren in die obere Atmosphäre ausbreiten [4], [7] – diese Schwerewellen bilden sich in den Ionogrammen schließlich als TIDs ab. WHITEHEAD (1971) hat ferner einen räumlichen Resonanzeffekt vorgeschlagen (siehe [5] und die dortigen Literaturangaben), bei welchem die Driftgeschwindigkeit des ionosphärischen Plasmas und die Phasengeschwindigkeit der Schwerewellen in eine resonante Wechselwirkung treten, so dass die sogenannten *Spread-F* Strukturen in den Ionogrammen eine quasiperiodische Modulation und die Amplitude der TIDs eine deutliche Verstärkung erfahren.

Bildunterschrift zu Abb. 1: Rückstreuechos von Spread-F Irregularitäten in der äquatorialen F-Schicht oberhalb von 200 Kilometer Höhe, aus [12].

Der Beweis für die Erzeugung von Spread-F Irregularitäten durch atmosphärische Schwerewellen wurde insbesondere durch das Jicamarca Radar erbracht, welches am magnetischen Äquator in der Nähe von Lima, Peru, stationiert ist (siehe z.B. [11]). Das Radar sendet auf 50 MHz und strahlt 1 Megawatt Pulsleistung über eine 300m x 300m große Antennenfläche nahezu senkrecht in die Atmosphäre ein. Abb. 1 zeigte eine der von KELLEY et al. (1981) veröffentlichten spektakulären Messergebnisse, siehe [8] und [12] und die dort jeweils angegebenen Literaturangaben.

Die von Gewittern hervorgerufenen konvektiven Vorgänge gelten jedoch nur als eine mögliche Quelle von Schwerewellen in der F-Region. In der äquatorialen Atmosphäre durcheilt die Tageslichtgrenze das Höhenniveau der Ozonschicht mit Überschallgeschwindigkeit, worin ebenfalls ein möglicher Auslöseprozess für Schwerewellen vermutet wird, welche sich sodann als Stoßwelle durch die Atmosphäre ausbreiten. Das Stromsystem des äquatorialen Elektrojets wird als eine weitere Quelle von Schwerewellen angesehen, hervorgerufen durch Lorentzkräfte bzw. durch das Freisetzen Joule'scher Wärme. Ebenso vermutet man im nichtlinearen Zusammenbrechen von atmosphärischen Gezeitenbewegungen einen möglichen Auslösemechanismus für Schwerewellen, neben weiteren hier nicht erwähnten Quellen. In [4] werden die erwähnten Auslösemechanismen diskutiert, um die erwähnte Korrelation zwischen dem Auftreten von TIDs und der tropischen Niederschlagsintensität deuten zu können. Weiterhin schien die Mehrzahl der TIDs ihren Ursprung in jenem Regenwaldgebiet zu finden, welches sich nördlich von der Radaranlage befand, mit welcher die TID-Messungen durchgeführt wurden (jene Messungen fanden in Huancayo, Peru, statt). RÖTTGER schließt aus den Befunden, dass konvektive (also mit Gewittern in Verbindung stehende) Prozesse die wahrscheinlichste Quelle für Schwerewellen in der äquatorialen F-Region darstellen [4].

3 Schlußfolgerungen für die Es und TEP Ausbreitung

Das in [13] diskutierte Modell von Gewittereinflüssen auf die Entstehung von sporadischen E-Schichten erscheint daher vergleichbar mit den Ergebnissen, die in der F-Schicht gefunden wurden und dort als gesichert anerkannt sind. Im Vergleich zu den umfangreichen Untersuchungen zur ionosphärischen F-Schicht ist der Umfang der wissenschaftlichen Quellen zu Gewittereinflüssen auf die E-Schicht jedoch deutlich geringer – einige wissenschaftliche Untersuchungen stehen dennoch zur Verfügung, siehe z.B. [4] und die dort angegebenen Quellen. RÖTTGER zitiert insbesondere eine Arbeit von DATTA, welche offenbar Hinweise auf von Gewittern ausgelöste Sporadisch-E Schichten vermittelt - leider war das Dokument (Ind. J. Pure Appl. Phys., 9, 394, 1971) bisher jedoch nicht erhältlich. In dieser Hinsicht erscheinen die Ausführungen in [13] keineswegs revolutionär – von einer Ausnahme abgesehen: Die bisher diskutierten Szenarien nehmen stets auf die äquatoriale Atmosphäre Bezug, denn heftige Gewitterstürme treten hier besonders häufig in Erscheinung. Das in [13] diskutierte Modell überträgt die Ergebnisse jedoch auf die E-Schicht in mittleren Breiten. Falls es Funkamateuren also tatsächlich gelingen sollte, von Gewittern hervorgerufene Sporadisch-E Ereignisse dokumentieren und nachweisen zu können (das Ereignis vom 27. Juni 2004 mag in diese Richtung weisen, siehe [13]), so würde der Amateurfunk auf diese Weise in der Tat einen Beitrag zur Atmosphärenforschung leisten können.

Abschließend sei ein Hinweis auf die Untersuchung von transäquatorialen Kurzwellen- und UKW-Funkverbindungen gegeben: In Folge des oben erwähnten Resonanzmechanismus zwischen dem ionosphärischen Plasma und den sich darin ausbreitenden Schwerewellen werden u.a. Gradienten in der Elektronendichteverteilung hervorgerufen, die kleinräumige Spread-F Irregularitäten auslösen oder modulieren können, welche sich schließlich in blasenförmigen Strukturen in senkrechter Richtung in die höhere Atmosphäre ausbreiten. Man beachte, dass jene Plasmablasen („plasma bubbles") auch zur Deutung von transäquatorialen Fernverbindungen im Kurzwellen- und UKW-Bereich herangezogen werden, siehe z.B. [1], [9], [10] (tatsächlich wurden RÖTTGERs TID-Untersuchunge durch seine in den siebziger Jahren durchgeführten TEP-Experimente motiviert, siehe z.B. [2], [3], [6]). Meteorologische Einflüsse, Gewitter und Schwerewellen in der tropischen Atmosphäre werden daher mit einiger Wahrscheinlichkeit auch eine bedeutende Rolle bei Amateurfunkuntersuchungen zur transäquatorialen UKW-Ausbreitung spielen.

Agilent MGA-665P8 GaAs Enhancement-Mode PHEMT 0.5 – 6 GHz Low Noise Amplifier

Data Sheet

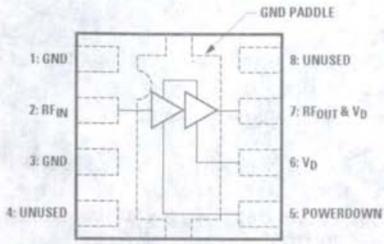
Surface Mount, 2.0 x 2.0 x 0.75 mm 8-lead LPCC

Description

Agilent's MGA-665P8 is an economical, easy-to-use GaAs MMIC Low Noise Amplifier (LNA) with a unique active-low power-down function. The LNA has low noise figure and high gain achieved through the use of Agilent Technologies' proprietary GaAs Enhancement-mode PHEMT process. It is housed in a miniature 2.0 x 2.0 x 0.75 mm 8-pin Leadless-Plastic-Chip-Carrier (LPCC) package. The compact footprint and low profile coupled with low noise, high gain and high linearity makes the MGA-665P8 an ideal choice as an LNA for broadband general-purpose applications. Its excellent broadband isolation also makes it a good buffer amplifier.

The output of the MGA-665P8 provides a very good broadband match to 50 Ω. Its input requires a simple external LC network to provide a low noise figure and good input return loss. Power supply voltage is applied to both the output terminal and a separate V_D terminal. A simple external bias insertion circuit consisting of a shunt inductor and a series dc block capacitor is sufficient to apply power supply voltage to the output of the MGA-665P8. The MGA-665P8 provides typical device performance of 1.45 dB noise figure, 16 dB gain and an OIP3 of +18.1 dBm at 5.25 GHz, at a bias point of 3 V and 20.5 mA.

Pin Configuration, Top View



POWER DOWN FUNCITON:
LOGIC LOW (0-1 V): POWER ON
LOGIC HIGH (2-3 V): POWER OFF

NOTES:
1. PINS 1, 3, AND PADDLE NEED TO BE PROPERLY GROUNDED TO OBTAIN SPECIFIED PERFORMANCE.
2. SUPPLY VOLTAGE, V_D, NEEDS TO BE APPLIED AT PINS 6 & 7. SUPPLY AT PIN 7 TO BE APPLIED USING A BIAS TEE OR EQUIVALENT.

Features

- Active-low power-down funct
- Single +3 V supply operation
- Low noise and high gain MMI
- Output 50 Ω match
- Excellent isolation
- Minimal match and external biasing components
- Housed in miniature 2 x 2 x 0.7 LPCC package
- Pb-free & MSL-1 package

Specifications

- 0.5 to 6 GHz operation
- At 3 V, 20.5 mA, 2.4 GHz:
  NF = 1.2 dB
  Gain = 18.4 dB
  OIP3 = 19 dBm
- At 3 V, 20.5 mA, 5.25 GHz:
  NF = 1.45 dB
  Gain = 16 dB
  OIP3 = 18.1 dBm

Agilent ATF-52189 High Linearity Mode[1] Enhancement Pseudomorphic HEMT in SOT 89 Package

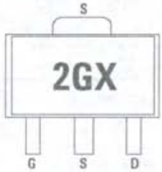
Data Sheet

Description

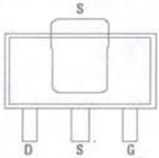
Agilent Technologies's ATF-52189 is a single-voltage high linearity, low noise E-pHEMT FET packaged in a low cost surface mount SOT89 package. The device is ideal as a medium-power, high-linearity amplifier. Its operating frequency range is from 50 MHz to 6 GHz.

ATF-52189 is ideally suited for Cellular/PCS and WCDMA wireless infrastructure, WLAN, WLL and MMDS application, and general purpose discrete E-pHEMT amplifiers which require medium power and high linearity. All devices are 100% RF and DC tested.

Pin Connections and Package Marking



Top View



Bottom View

Notes:

Package marking provides orientation and identification:

"2G" = Device Code

"x" = Month code indicates the month of manufacture.

D = Drain

S = Source

G = Gate

Features

- Single voltage operation
- High Linearity and P1dB
- Low Noise Figure
- Excellent uniformity in product specifications
- SOT 89 standard package
- Point MTTF > 300 years[2]
- MSL-1 and lead-free
- Tape-and-Reel packaging option available

Specifications

2 GHz, 4.5V, 200 mA (Typ.)

- 42 dBm Output IP3
- 27 dBm Output Power at 1dB gain compression
- 1.50 dB Noise Figure
- 16.0 dB Gain
- 55% PAE at P1dB
- LFOM[3] 12.5 dB

Applications

- Front-end LNA Q2 and Q3, Driver or Pre-driver Amplifier for Cellular/ PCS and WCDMA wireless infrastructure
- Driver Amplifier for WLAN, WLL/ RLL and MMDS applications
- General purpose discrete E-pHEMT for other high linearity applications

Notes:

1. Enhancement mode technology employs a single positive V_{gs}, eliminating the need of negative gate voltage associated with conventional depletion mode devices.
2. Refer to reliability datasheet for detailed MTTF data.
3. Linearity Figure of Merit (LFOM) is OIP3 divided by DC bias power.

Agilent Technologies

ATF-52189 Absolute Maximum Ratings[1]

Symbol	Parameter	Units	Absolute Maximum
V_{ds}	Drain–Source Voltage[2]	V	7
V_{gs}	Gate–Source Voltage[2]	V	-5 to 1.0
V_{gd}	Gate Drain Voltage[2]	V	-5 to 1.0
I_{ds}	Drain Current[2]	mA	500
I_{gs}	Gate Current	mA	46
P_{diss}	Total Power Dissipation[3]	W	1.5
$P_{in\ max.}$	RF Input Power	dBm	+27
T_{ch}	Channel Temperature	°C	150
T_{stg}	Storage Temperature	°C	-65 to 150

Thermal Resistance[2,4]
θ_{ch-b} = 52°C/W

Notes:

1. Operation of this device above any one of these parameters may cause permanent damage.
2. Assuming DC quiescent conditions.
3. Board (package belly) temperature T_B is 25°C. Derate 19.25 mW/°C for T_B > 72°C.
4. Channel-to-board thermal resistance measured using 150°C Liquid Crystal Measurement method.

ATF-52189 Electrical Specifications

T_A = 25°C, DC bias for RF parameters is Vds = 4.5V and Ids = 200 mA unless otherwise specified.

Symbol	Parameters and Test Conditions		Units	Min.	Typ.	Max.
Vgs	Operational Gate Voltage	Vds = 4.5V, Ids = 200 mA	V	—	0.62	—
Vth	Threshold Voltage	Vds = 4.5V, Ids = 16 mA	V	—	0.28	—
Ids	Drain to Source Current	Vds = 4.5V, Vgs = 0V	μA	—	14.8	—
Gm	Transconductance	Vds = 4.5V, Gm = ΔIds/ΔVgs; ΔVgs = Vgs1 – Vgs2 Vgs1 = 0.55V, Vgs2 = 0.5V	mmho	—	1300	—
Igss	Gate Leakage Current	Vds = 0V, Vgs = -4V	μA	-20.0	0.49	—
NF	Noise Figure	f = 2 GHz f = 900 MHz	dB dB	— —	1.50 1.25	— —
G	Gain[1]	f = 2 GHz f = 900 MHz	dB dB	14.8 —	16.0 16.5	17.8 —
OIP3	Output 3rd Order Intercept Point[1]	f = 2 GHz f = 900 MHz	dBm dBm	38.5 —	42.0 42.0	— —
P1dB	Output 1dB Compressed[1]	f = 2 GHz f = 900 MHz	dBm dBm	25.5 —	27.0 27.2	— —
PAE	Power Added Efficiency	f = 2 GHz f = 900 MHz	% %	40.0 —	55.0 50.0	— —
ACLR	Adjacent Channel Leakage Power Ratio[1,2]	Offset BW = 5 MHz Offset BW = 10 MHz	dBc dBc	— —	-58.0 -66.0	— —

Notes:

1. Measurements at 2 GHz obtained using production test board described in Figure 1.
2. ACLR test spec is based on 3GPP TS 25.141 V5.3.1 (2002-06)
   - Test Model 1
   - Active Channels: PCCPCH + SCH + CPICH + PICH + SCCPCH + 64 DPCH (SF=128)
   - Freq = 2140 MHz
   - Pin = -8 dBm
   - Channel Integrate Bandwidth = 3.84 MHz

Mitsubishi offers new Power-MOSFETS for HF, VHF and UHF. They are probably the substitute for the not any more availale bipolar transistors. Some of them are available in the cheap SOT package. All data sheets and S-parameters are on the webpage for download at:
http://www.mitsubishichips.com/Global/common/cfm/eProfile.cfm?FOLDER=/product/hf/sirfpower mosfet/hfvhfuhf900m/hfvhfuhf900m

Mitsubishi hat inzwischen seine Reihe von HF, VHF und UHF Leistungs-MOSFETS komplettiert. Sie sind wohl als Ersatz für die nicht mehr lieferbaren Bipolartransistoren gedacht. Einige der Typen sind in dem preisgünstigen SOT Gehäuse eingebaut. Alle Datenblätter und S-Parameter können geladen werden von der Web-Page:
http://www.mitsubishichips.com/Global/common/cfm/eProfile.cfm?FOLDER=/product/hf/sirfpower mosfet/hfvhfuhf900m/hfvhfuhf900m

Mitsubishi High Frequency Devices / HF/VHF/UHF/900MHz

Type No.	Max. ratings VDSS (V)	Max. ratings Pch (W)	Vdd (V)	f (MHz)	Pin (W)	Po (W)	nd (%)	Package outline
RD00HHS1	30.0(max)	3.1(max)	12.5	30.0	0.004	0.3(min)	55.0(min)	SOT-89
RD00HVS1	30.0(max)	3.1(max)	12.5	175.0	0.005	0.5(min)	50.0(min)	SOT-89
RD01MUS1	30.0(max)	3.6(max)	7.2	520.0	0.03	0.8(min)	50.0(min)	SOT-89
RD02MUS1	30.0(max)	21.9(max)	7.2	520.0	0.05	2.0(min)	50.0(min)	SLP
RD06HHF1	50.0(max)	27.8(max)	12.5	30.0	0.15	6.0(min)	55.0(min)	TO-220S
RD06HVF1	50.0(max)	27.8(max)	12.5	175.0	0.3	6.0(min)	55.0(min)	TO-220S
RD07MVS1	30.0(max)	50.0(max)	7.2	520.0	0.7	7.0(min)	50.0(min)	SLP
RD100HHF1	50.0(max)	176.5(max)	12.5	30.0	7.0	100.0(min)	55.0(min)	Ceramic(Large)
RD12MVS1	50.0(max)	50.0(max)	7.2	175.0	1.0	11.5(min)	55.0(min)	SLP
RD15HVF1	30.0(max)	48.0(max)	12.5	520.0	3.0	15.0(min)	50.0(min)	TO-220S
RD16HHF1	50.0(max)	56.8(max)	12.5	30.0	0.4	16.0(min)	55.0(min)	TO-220S
RD30HUF1	30.0(max)	75.0(max)	12.5	520.0	3.0	30.0(min)	50.0(min)	Ceramic(Small)
RD30HVF1	30.0(max)	75.0(max)	12.5	175.0	1.0	30.0(min)	55.0(min)	Ceramic(Small)
RD45HMF1	30.0(max)	125.0(max)	12.5	900.0	15.0	45.0(min)	45.0(min)	Ceramic(Large)
RD60HUF1	30.0(max)	150.0(max)	12.5	520.0	10.0	60.0(min)	50.0(min)	Ceramic(Large)
RD70HHF1	50.0(max)	150.0(max)	12.5	30.0	3.5	70.0(min)	55.0(min)	Ceramic(Large)
RD70HVF1	30.0(max)	150.0(max)	12.5	175.0	6.0	70.0(min)	55.0(min)	Ceramic(Large)

Complete data sheets and s parameters are on the web for download at:
http://www.mitsubishichips.com/Global/common/cfm/eProfile.cfm?FOLDER=/product/hf/sirfpower mosfet/hfvhfuhf900m/hfvhfuhf900m

Microwave Japan

Seiji Fukushima, Ph.D, JH6RTO

134 GHz Distance Record Updated

After the previous issue deadline, a new 134GHz distance record was established. On 26-02-2005 at 1320 JST, JA1KVN/1, Bunpei, (N36:42:25.2, E139:53:05.4) and JA1ELV/1, Nori, (N36:13:52.8, E140:06:20.0) succeeded in the 56.4km communication on 134GHz on SSB, CW, and FM. They used a 60cm and a 50cm dish. WX: sunny, 12C, 25% at JA1KVN/1 and sunny, 4C, 35% at JA1ELV/1. Their previous record was 37.36km.

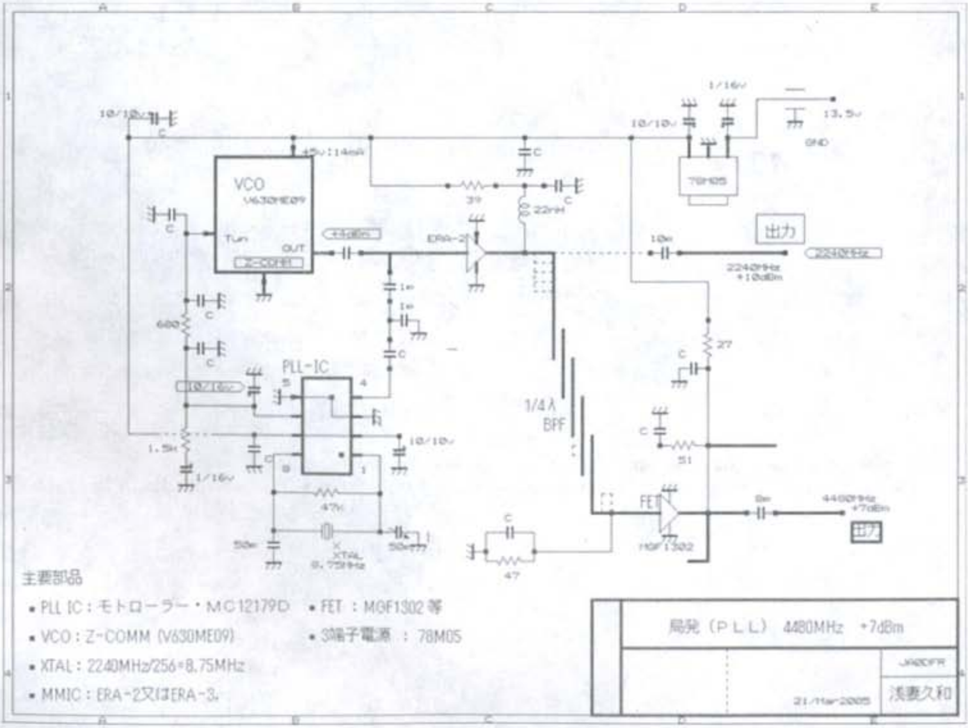
Brian, WA1ZMS, informed me that a Japanese 134GHz record might be a world record since no QSO has been reported in the rest of world at this time. Congratulations to Bunpei and Nori.

Editor's address: S. Fukushima, 1182-2506 Hase, Atsugi 243-0036 Japan. Email jh6rto@m.ieice.org
URL http://www.geocities.com/ah0r/

Local oscillator using only 5 IC's by Hisakazu, JA0DFR

Using a VCO V630ME09 manufactured by Z-Communications, a simple LO circuit was made. Let us look at the circuit diagram. The V630ME09 is a key element that generates a signal of 2240MHz with a +4dBm power. The VCO is phase-locked by a PLL-IC, Motorola's MC12179D. After the 2240MHz local signal is amplified by ERA-2, the power is increased to +10dBm. Another pass is connected to a 4480MHz band pass filter to generate second harmonic. The final amplifier is an MGF1302, which outputs a 4480MHz, +7dBm signal.

The last IC, which has not been mentioned, is a voltage regulator, 78M05. Then, we can homebrew such a simple LO for transverters or down converters. Its characteristics are summarized as 2240MHz, +10dBm or 4480MHz, +7dBm, spurious -57dBc, 13.5V, 125mA. More details are here but the text is in Japanese:
http://jh0yqp.jpn.org/exp/MAKE/dfr/pll_vco/pll_vco.html



Circuit diagram of JA0DFR`s LO

Microwave Europe

Editor: Simon Lewis, GM4PLM

Hello and welcome to another microwave column. After a period of nice weather this week has seen the first major storms of the spring/summer season and with of course comes the chances of rainscatter! The microwaves are definitely bad weather bands! Some long distance paths have been worked so I hope we will see some nice reports arriving in the inbox soon! Speaking of which I would really appreciate your input into the column or is everyone reading the Internet only these days? Please find some time to write a little about what you have been doing, building or working on, there are plenty of others interested in your activities! So on with what little news we have!

IO51/EI Dxpedition

F1HDF and F6DPH plan to be QRV from IO51 at the end of September on all bands from 144MHz to 24GHz (and maybe 47GHz). The planned dates are: 23, 24 and 25th September 2005. Best 73 Dom, F6DRO

New Reflock II available

Luis Cupido CT1DMK has announced a new version of his popular Reflock, Phase Lock board. This updated design incorporates the latest available CPLD from Altera and has the capability of operating directly up to 250MHz with no prescaler and beyond 1GHz with the prescaler fitted on the board.

The size of CPLD used now allows for enhanced resolution on 1pps circuit with the capability of connecting to a PIC processor (Atmel.. or whatever is your favorite) and additional functions like lock detection and full numeric loop performance monitoring are possible. This design was done in cooperation with Steven Bible N7HPR who did all diagrams and PCB design. Performance tests are being conducted by Steve N7HPR, John N8UR, Tom N8ZM and CT1DMK. It is expected that soon TAPR will make REFLOCK II available for the people via their site. All documentation is being prepared right now. Configuration files and information can be found on his pages.

http://w3ref.cfn.ist.utl.pt/cupido/reflock.html

First PA – OZ QSO 24 GHz

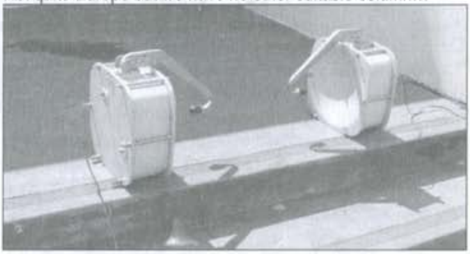
On April 3rd 2005 the first ever QSO on 24 GHz took place between Danmark and The Netherlands. PA3CEG in JO33FB was able to work OZ8AFC/p (and OZ1CTZ/p as second OP) in JO45GC (Romoe Isl.) at 0658 UTC over a distance of 265 km. PA3CEG worked with 0.6 W and 90cm dish, NF 2.1 dB. OZ8AFC worked with 3W and 40cm dish and NF 1.5 dB.

13cm band in Italy

According to the San Marino IARU conference in Italy the 13cm band was changed from 2304 to 2320 MHz last year. On March 5th 2005 DL4MEA/p (JN58) worked I4CVC (JN54) on 2320 MHz via Tropo. This is a first DL-I on 2320 MHz but on 2304 Italy was worked from DL back in 1973. We don't think it makes sense to count the different 13cm allocations as different bands for new first's lists.

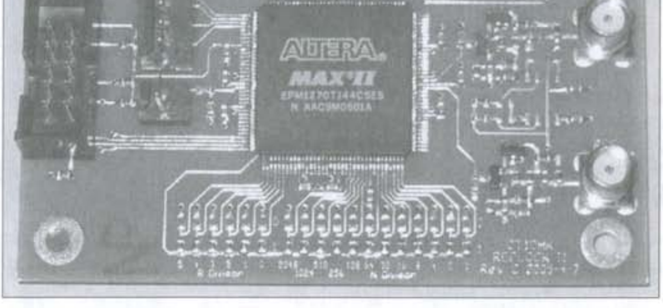
ZS6AXT – 24 GHz Activity

Not quite Europe but we have no other suitable column...



ZS6AXT's 24 GHz Stations

Ivo, ZS6AXT, has finished his portable equipment for 24 GHz Tropo operations and together with ZS6JON he already made the first QSOs. They try now to break the ZS distance record. His two transverters are in boxes from Plessey 23 GHz link, one side is a 30cm dish. TX is a balanced mixer with WG filter, followed by a 2,5W amplifier from U.S. IF is 432 MHz. Thus on the back is just 432 MHz connector, leads for 12V PSU and connector for T/RX control.



Left: CT1DMK's Reflock II board

First European QSO on the 122 GHz band

On March 28th at 1659z after many preparing experiments the first 2-way QSO in CW/SSB took place on the 122 GHz band which is a quite new one in Germany. Involved stations were Karl Ochs, DJ6BU and Walter Iller, DH6FAE, both well know Microwave OPs.

The QSO took place directly after a rain shower at a humidity of 93%. The distance at the first test was only about 1 km in order to train the handling of the offset dishes with their only 0,3° beamwidth at 122 GHz. RST 579 in CW and 53 in SSB were exchanged. Interesting are the different technical parameters of the two stations:

DJ6BU`s station:

CW-TX: Quintupler vom 24 GHz to 122.25 GHz with russian beamlead varactor diode 3A 643A-3 (RF power 30mW); 7,7cm Ø precision dish with 35dBD of gain

RX: Mixer with zero bias beamlead detector diode HSCH 9161 at approx. 3mW LO power at 40 GHz, IF= 144MHz, 45cmØ offset dish with 50,3dBD gain

DH6FAE`s station

TX/RX: Mixer with GaAs beamlead Schottky barrier diode HSCH 9101, 80mW LO power at 40GHz when TX mode with 144MHz IF, 5mW reduced LO power in RX mode. The LO power is produced with a commercial 38 GHz amplifier module ARCOM 38 PA 003! 45cmØ offset dish with 50,3dBD of gain.

Another QSO took place on April 2nd 2005 at 1242 UTC at only 28% rel. humidity over a distance of 5.7 km: RS DH6FAE in SSB 54, RST DJ6BU in CW 569

Another for the present final test was made on April 4th at 1531 UTC. The humidity was 31% and the distance 10,5 km. Finding the partner`s station with the help of the telescopic sights was difficult and took some time because no concise buildings or power poles were nearby. The QTH from DJ6BU was JO40QM, DH6FAE was in JO40SN.

RS DH6FAE in SSB 52 with QSB to 51

RST DJ6BU in CW 539 with QSB to 529

Conclusion

Using the existing concept of a SSB transverter and a 45cmØ offset dish with the transverter module mounted in the focal point at any time SSB QSOs are possible at distances around 10 km when the WX is dry and cold.

Improved RX sensitivity should be possible with a better mixer diode. Using CW on both ends already now higher distances should be quite possible according to the test`s results.

A possibility for improving the CW-TX is to triple from 40 GHz instead to quintuple from 24 GHz.

The realization of both stations was possible with the especially for the new 122 GHz band made mixing and multiplier boards by Michael Kuhne, DB6NT. The boards are available from DB6NT now. See www.db6nt.de

An assembly concept was designed from Jürgen Dahms, DCØDA in the end of 2004, that stood the test with the above QSOs.

Many thanks to both DJ6BU and DH6FAE for their preparatory work and checkout of the 122 GHz band on behalf of all microwave amateurs in DL.

Vy 73 + 55 de DCØDA, Jürgen Dahms

Fig 1: DJ6BU`s 122 GHz station in JO40QM
The white cross (right in the middle) shows the LNB mount from the offset dish with the small horn radiator (left in front). The long mixer module for 122 GHz is connected with a circular waveguide (right side behind). On the second tripod in the background is located a beacon TX for 122 GHz. The small precision dish is mounted in a weatherproof box under a lamination sheet.

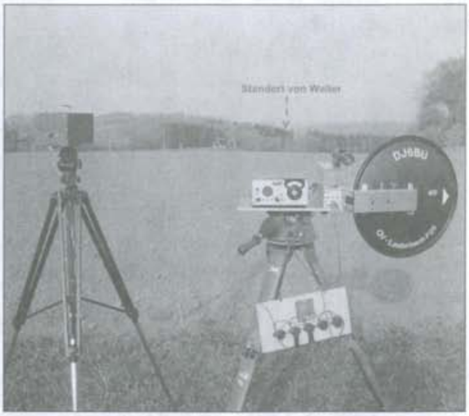


Fig 2 shows the complete station assembly from DJ6BU with the marked QTH from DH6FAE in JO40SN

VHF South America

Editor: Flávio Archangelo, PY2ZX

Greetings from South America

In my first presence as columnist, I send many thanks to Mr. Joachim and other Dubus members for opening this opportunity for spreading the news from South America. According to the yearly IARU statistics this part of the continent has more than 80.000 hams over 13 very different countries. Six meters DX operators can be found in many areas, but the rate with stations able to work weak signals drastically decreases when frequency increases. A lot of information and integration is still needed in South America for more accurate data. Maybe this job in Dubus can help us on that field. I hope that you like the journey and found interesting grids, skeds and partners for future DX experiences.

Brazilian 144 MHz Contest

Promoted by GBVU (Grupo Brasil de VHF e UHF), the "Concurso Brasileiro de 144 MHz" (CB144) will happen from 24 to 26 of June 2005. It's the most important VHF event in the country, involving several good portable stations in high mountain and portable spots. Headed by Carlos Alberto Laimgruber (PY2HCD, well known 2 meters experimentator), the event is open for foreign hams. Cross border point-to-point contacts are encouraged for better understanding of propagation effects, like the southern PY - ZP - CX - LU zone. The PY national wide winners of the former editions: PY2ANE in 2001, the Japy DX Group (the same of 8P the TEP contact we informed about in last edition of Dubus) as PU2OCZ/PY2 in 2002, the very competitive ZZ5WEB team in 2003 and the newer PY4LA team in 2004. More contests for 50, 430 and 1200 MHz are in project. Rules, results and other info at www.fasternet.com.br/gbvudx or gbvudx.org.

Microwave on the Tropics

Orlando Luis Costa Neto (PY2ANE in GG66SH) repeated again with Cláudio Fernando Leite (PP5CFL in GG52TN) in April, 2005 the PY 1,2 GHz distance QSO record. Here some steps:

- PY2ANE/PY2 (GG65NS) and PY2RN/PY2 (GG76GE), QSO path all over the sea in December, 19; 1999, 1700 Z, mode USB at 1269 MHz. PY2ANE: 2 watts and 10 ele. Quagi, PY2RN: 2 watts and 54 ele. Loop Yagi (Horizontal). The distance was 151 km.
- PY2ANE (GG66SH) and PY5AQ (GG54HO), cross-border contact between the states of Paraná and Sao Paulo reaching 357 km in August, 28; 2003; 2240z, mode FM at 1278 MHz, signals between 53 and 57 for 20 minutes, PY2ANE with 2 watts and PY5AQ used 10 watts, both with 20 turns Helix RHCP. This contact was repeated 6 times between September 2003 and August 2004.
- PY2ANE (GG66SH) and PP5CFL (GG52TN), QSO between the states of Sao Paulo and Santa Catarina in September 09; 2003; 1740z. Mode FM at 1273 MHz, signals between 51 and 55 for 15 minutes. PY2ANE with 2 watts and PP5CFL with 10 watts, both with 20 elements Helix RHCP. The distance made of **461 km** is the current 1.2 GHz PY record.
- PY2ANE repeated the latter QSO on April 15, 2005 now using 20 Watts and 1,5 m parabolic dish with circular feeder (RHCP) while PP5CFL still using his old configuration. The time was 00:20 UTC and the frequency 1296,3 MHz, mode FM, signals between 55 and 56 during 60 minutes of opening.

Orlando describes the main problems of microwave activity in the country: the difficulty to find equipment, low number and updated articles in Portuguese language, a lack of operators and persistence required for such experiences.
So more than the distances, which seem modest considering the records of others countries, these steps reflect a remarkable experimental job towards more weak signal operation in that region.
PY2ANE has full capability for all mode 23 cm operation (including WSJT). For more information, the e-mail of Mr. Orlando is py2ane@hotmail.com. You can find him also on the 23cm mailing list, recently created by Eduardo Erlemann, PY2RN: http://br.groups.yahoo.com/group/23cm

PY - FK 6 meter's path

Caiper (PY3KN, GF49mw), heard on Jan 7, 2005 around 02:30Z for 15 minutes the FK8SIX beacon on 50.080 MHz (RG37fr), almost 13.000 km. Rolf, PY1RO, comments: "That is a path quite unlikely by F2 at the time of day and year/cycle, so my guess is it was multi-hop Es. The time of year is also precisely right for its occurrence". The listener Todd Emslie (Sydney, Australia) sent more information on that path: "It might be instructive to look at the IPS ionosonde data for Jan 7. Perhaps the average foEs (MHz) was above average for that day. Based on

ICDX member DX logs, the early Jan. period was reasonably active for Es". Another Australian DX listener, Tony Mann, sent: "The path passes through the region of highest summer Es probability in the southern hemisphere (according to Prof E. K. Smith's study). And it is all over water so the 5 "ground" reflections would have had the minimum signal loss. The mid-path passes near high latitudes (55 S), which is only 45 S geomagnetic over the southern Pacific - about the same as Sydney. Early January is near the peak for (southern hemisphere) Es". Tony said that "Multi-Es" propagation at a similar distance over water (7700 miles to K6QXY) has been observed from 48.24 MHz Nakhon Ratchasima, Thailand to the US west coast on at least two occasions: 13 July 2001 and 7 July 2003". All agree that monitoring the TV carriers close to the 6 meter band could be good propagation indicators for transpacific Es or F2: 45.24, 45.25, 45.26, 46.17 and 46.24 MHz Australian - New Zealand TV with 100 kW, or even 50.74 or 50.76 MHz WFM. This interesting chat came from VHF-DX and ICDX Mailing Lists.

New Argentinean beacon

LU5EGY is a new Argentinean beacon on 6 meter qrv from GF05 since April 2005. The frequency is 50,038 MHz with 15 Watts output. The information came from Hamilton Teófilo Horta (PY2NI) via VHF-DX and LU-Chat Mailing lists.

WSJT Operators

Here 2 new WSJT stations in Brazil who could be interesting for EME experiences and South American-MS:

PY2BVF - Benito - py2bvf@itelefonica.com.br
GG66TB - Santos - São Paulo - Brazil
All Mode, 2 m with 4 X 10 ele 1KW, 70 cm with 2 x 28 ele 800 W.
(Benito is updating his station with more antennas, elevator rotator and 903 MHz, 1.2 GHz and 2.4 GHz capabilities)

PY2OC - Luiz Tresso - py2oc@yahoo.com.br
GG66OT - Jundiaí - São Paulo - Brazil
All mode, 6 m with 8 ele 100 W, 2 m with 12 ele 160 W. (Luiz is the coordinator of Japy DX Group)

Communication received

Our thanks to Martins, PY2HN, (IOTA/DIB expeditionary, former Editor of ham radio magazines) and André, PY5EW, (Araucaria DXG member), celebrating this new space in Dubus. You can send also your e-mail, the address is **py2zx@mandic.us**

PY2HN, ZZ2PKJ, PY2ZX, PU2OCZ

Editor Flávio, PY2ZX

PY3KN, GF49, 6m DXer

2-m-EME News

Bernd Mischlewski, DF2ZC
e-mail: DF2ZC@web.de

Around 2-m-EME

The new era of EME?!

The release of WSJT 4.9 earlier this year with the newly implemented "deep search algorithm" meant once again a quantum leap for the EME traffic. Another 4 dB increased sensitivity which come with this new version result in lower technical requirements for EME capable stations on 144 MHz. With only 100 watts out and 13 dBd antenna gain — resulting in 2 kW ERP — EME traffic is now possible with most of the 4 yagi stations. By increasing the output by another 3 dB to 4 kW ERP, experience shows that that kind of equipment can now be compared to a standard 4 yagi CW EME system. Consequently, making an EME dxpedition has become less stressful regarding equipment and shipping. This results in - often unexpectedly - new DXCCs popping up.

In this issue of the EME column you'll read reports on the recent V51/ZS5Y and KC4/W1MRQ activities - the latter is still continuing until the end of August - and also on the VK0MT activity from Macquarie Island. EME has definitely left the area of exotics and now comes as a standard propagation for 144 MHz radio traffic.

DL8EBW works with a single 12M2 with fixed elevation at 10°

Only, there is a problem. And that is not the ideologic discussions on moon-net how to treat digital mode QSOs against grid/DXCC achievements in analog modes. Often the impression is that some people feel like needing to comment without having ever tried the WSJT modes on EME. No, it's different: There are so many stations EME capable but only they don't know or don't believe. The technical specifications now allow every meteorscatter capable station to successfully work EME. Guido, DL8EBW, who unquestionable is one of the most active meteorscatter stations since the early 80s has proved this by starting to work EME with a single 12 elements M2 and some 500 watts output. Until the end of April 2005 he has completed with 23 stations down to two and even one yagi only. EME is standard propagation now, please talk to your ham friends, convince them to try it out. It will work!!!

What is a valid EME contact?

Speaking of the WSJT package there is one concern by many regarding the validity of such QSOs. In the last issue of DUBUS an article by Peter, G3LTF, was published dealing with the problem "What constitutes a digital QSO". To my understanding the answer is pretty simple: A QSO is a QSO when the vital QSO data are exchanged without the help of any other communication platform than the actual QSO frequency and procedures. You must receive both callsigns and also the signal report meant for you and a confirmation "roger". This applies to analog and digital modes, it's basic logic.

The point is that a QSO is invalidated if QSO data is exchanged before the QSO is complete. This means one must not exchange QSO data on a web logger, HF frequency or telephone etc etc whilst the QSO is in progress. This means not only lines like "I have good copy on you, transmitting Os now" invalidate, also more subtle lines like "I found you now" or "have you –23". This is important not only for the two hams currently trying to make the contact but also for third parties. Nobody should paste a line such as
"123900 4 -24 3.2 88 6 # GM4JJJ DF2ZC OOO" or even "123900 4 -24 3.2 88 6 #" only as for the experienced user this shows that one station is sending Os to the other (the "#" indicates this"). Only, this is and always was a general problem not typical of digital modes only. The difference with digital modes is that it is so much easier to clip and paste.

A very good example for "rules of engagement" are the rules (particularly 2 and 3) posted on the J3/K5AND website. Again, this should be common practise anyway:

1. Don't call us if you don't hear us, its just wasting of time when you run the multi kilowatt but don't copy J3/K5AND. Wait till faradays turn and than call.
2. Posting QSO information prior to completion of your QSO will render it invalid and the QSO will be taken out of the log. This includes posting on chatpages, internet and so on.
3. Posting someone else's QSO information during a QSO on chats, logger and so on will not only invalidate your fellow ham's QSO but will put you on a permanent black list. (you will get a single notice).
4. When we are in QSO with someone, and you absolutely need to start calling do it at least 500Hz up or down the other stations frequency. If not, it is considered as poor operating practice and willfull interference and you'll go the the blacklist.

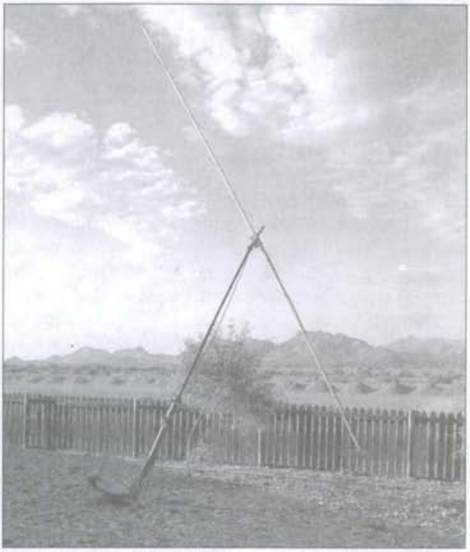
Reading Peter's remarks one could think he believes that WSJT – and that's what we are talking of basically – does know beforehand what it decodes. In other words, not everything the program shows on the display is really decoded. That is my impression of Peter's notes, it doesn't necessarily mean he really thinks so. At least, there are some ham clubs refusing to count WSJT QSOs with version 4.9 and up valid contacts for awards etc etc. because responsible persons have the impression that not all data was fully decoded by the software but added by the help of the "call3.txt" file which contains many callsigns known to be active on EME. As with in many other areas of human life – personally I think in the political sector this is the main problem – people talk of things they never tried, don't know and even have not taken the work of making themselves understand what's behind the subject they're talking (and deciding) about. Re WSJT there is no question that everything the program decodes is indeed decoded from the signals received on the air and not added by some subroutine in the software. The call3.txt file – Joe, K1JT, explained it perfectly many times – is nothing but a help for the deep search routine in WSJT 4.9x to reduce the number of possible callsign/report combinations the software is digging for in the noise. If all theoretically possible combinations were used, today's PCs couldn't handle this in an appropriate amount of time. It's as simple as that. Personally I feel the cheat factor was and is much higher in CW QSOs..."was this a report? I believe yes...I'll tx ROs now". I have monitored a number of QSOs where one station sent even RRRs to the other whilst this one still sent callsigns only. The good thing with WSJT is that one can prove that a QSO was good by saving the corresponding WAV files. So what constitutes a QSO? As above – exchange of the vital QSO data without any help from third parties and internet chats/HF paths/telephones. 73 Bernd DF2ZC

The Valley of millions of dBs at V51/ZS5Y. Only EME was possible.

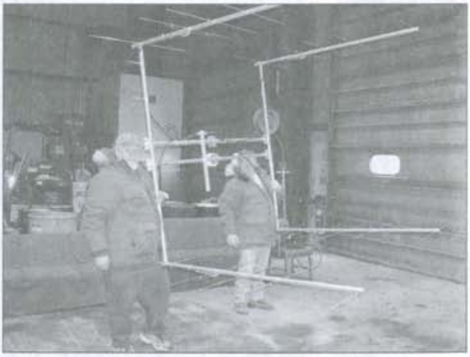
V51/ZS5Y working in Namibia

Leaving for a business trip to Namibia at the end of February, Derek packed a small portable station in his car and traveled 2.000 kilometers from his home in KF59JR to Rosh Pinah in North-West Namibia (JG82JA). With a 2M12 yagi (13 dBd), and about 150 watts output he wanted to try some EME on 2m during his leisure time. Given the circumstances this didn't look very promising at first sight: The moon was relatively close to Earth but traveled in front of a very noisy area of space. Though, when Derek became QRV on March 5th the first QSO was a very easy one. Not surprisingly he completed with Mr Big (RN6BN) with his powerful array of 32 yagis. But just the next station worked was a "normal" one with F6FHP with his 4 long yagis.

With the progress of the next week — and lower background noise — the activities became more and more successful. Derek's efforts definitely paid off — and also his many spent hours at the rig with no response and particularly the sacrified lunch breaks during which he traveled back from his work to the guest house to run EME skeds. Until March 11th 9 more QSOs were logged. And like so often, Joop, PA0JMV, was the smallest station worked.



Derek reports complete QSOs with the following stations: RN6BN, F6FHP, SM7BAE, ON4IQ, S52LM, W5UN, KB8RQ, K1CA, RA3AQ, DF2ZC and PA0JMV. Many of these stations sure will celebrate their countries first QSO with Namibia on 144 MHz. At not doubt, the biggest handicap was the small power at V51/ZS5Y. Receiving the partner stations was almost no problem for Derek. Only the few watts output (2700 watts ERP) didn't make it quite easy. Derek needs to travel to other Southafrican countries every now and then. So watch for more EME activities by ZS5Y, maybe also with 3 dB more output.



The antenna at KC4/W1MRQ is built, from right: W1MRQ and helper Tom Froom

Antarctica via moon!!!

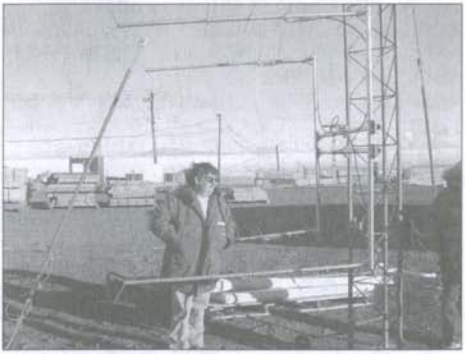
On April 3 Ernie, KC4/W1MRQ, worked his first 144 MHz EME QSO from McMurdo Station in RB32HD on Antarctic soil. (http://astro.uchicago.edu/cara/vtour/mcmurdo/). He will stay there until the end of August and as often as his dense work schedule permits he plans to be QRV for skeds. Also he can be found on the N0UK EME logger at times. W1MRQ's equipment consists of: FT847, 120 Watts brick amplifier and 4 x 5 element DPM144-5 yagis. The estimated ERP is some 2300 watts. Unconfirmed rumours say he might even arrange for a little more output power.

Ernie started his "Project Penguin 2005" as he calls it about two years ago, with the help from the K1WHS contest group and some more friends. The extreme weather conditions in Antarctica would not allow for a huge and high antenna construction. Therefore Ernie decided to build this small system low over the ground. All these complicating factors make a rather restricted operating window.

The shack at KC4/W1MRQ

He writes: "I want to get in as many as I can this winter. Just to put things into perspective from my standpoint here, I work 54 hours per week, 6 days a week. That doesn't allow much time for other activities, even personal things. The biggest problem will be the weather." The activity cornerstones are:

- KC4/W1MRQ will be QRV 10 days either side of the full moon until the end of August.
- KC4/W1MRQ will be available weekdays between 0630 and 0930Z only. Working or sleeping other times
- KC4/W1MRQ will be available all day Sunday and the first Saturday of each month.



Ernie, KC4/W1MRQ standing at his antenna with the Antarctic continent in the background (at 235 degs.)

Important: Skeds can be cancelled at the very last minute for most likely wx problems. The wx in Antarctica changes very fast. Stations should check their email and the N0UK Logger for last minute info. In case Ernie can't be QRV due to weather conditions he will send email and post on the logger.

Sked requests can be sent to W1MRQ@yahoo.com, QSLs via K1CA.

VK0MT Macquarie Island

On March 17, 2005, the first ever EME QSO (JT65B) was made from Macquarie Island, when David, VK0MT, (Loc. QD95KM) worked W5UN at 0630Z, followed by a QSO with KB8RQ shortly afterwards. Thanks to Rex, VK7MO, who had talked him into trying EME and also loaned equipment, some more stations could complete with VK0MT. Furthermore there were some near misses because David was running only 120 watts to a single 10 element 2.3 wl yagi (ERP ~ 1 kW). Sadly he had to leave the island at the end of March.

At this stage there are no prospects of other hams on the Island in 2005. The Macquarie Island station is operated by the Australian Antarctic Division. The island population comprises only around 25 research scientists and support staff plus a few million penguins and a several thousand seals. The only practical way one can spend time on the Island is as a member of the Australian Antarctic Division program.

One of the support staff is the communications Officer who maintains all the satellite coms, VHF links on the Island and Computer networks for the scientists. Just sometimes we all are lucky and the Communications Officer is also a Ham.

EME very much down under: VK0MT

The period of stay is ususally 12 months but since David has left now, there will be no hams on the Island for the next 12 months. What a pity that VK0MT only discovered the thrill of EME the last two weeks of his stay — and immediately got hooked. So let's hope for next year...

Upcoming DXpeditions

The reports above draw a clear picture: EME traffic is now possible with only 2 kW ERP on 144 MHz. This has a big influence on the effort to make an expedition to some distant place. Much less material is now needed. Like with Derek, it can now even fit in the trunk of a car.

There following expeditions are confirmed but there are some more which still are in the preparation status. 2005 could bring many stations closer to DXCC...

CY9SS – Sable Isl.

CY9SS will be active on 2 meters, including EME (plus all HF bands and 6 meters) June 7 to July 7, 2005.

Asia

Frank DL8YHR, who is always good for a surprise has plans to activate an Asian DXCC in summer, probably July/August.

J3 / Grenada

The J3/K5AND expedition runs from June 24th to July 3th 2005. With Johan, ON4IQ, they have an expereinced EME operator in the group.

LA/DL2NUD

LA/DL2NUD will be qrv from many rare squares in the far north on 2m mainly via MS in FSK441A from June 4th to 26th. Squares include KP..7, KP..8, KP..9, JP..9, JP..8, JP..7 and KQ 20, 30 and 40! Rig: 17 ele M2, TS200 and Beko HLV 1200. Hermann is also willing to try EME. Skeds in the VHF net on 14345 kHz when on site

OK / Greenland

OZ1DJJ will be qrv again during the summer from OX east-coast and try some 2m EME as well.

PR8 / Brasil

CT1DYX has left Portugal and now lives in Brasil, Locator GI16GL. He will be active as PR8/CT1DYX and plans to become qrv on 2m EME in FSK with 150 w and 2 yagis.

ZK2 / South Cook

Between about 05 and 30 May Bob Sutton, ZL2RS, will be active as ZK1EME on 2e EME from Rarotonga (southern Cook Islands). There may also be some 6M EME activity.
ZK1EME equipment (all except radio is home made):
2 x 3.2wl X-Pol yagis (BV design modified by VE7BQH)
PA with 8877 (o/p limited by driver and psu)
GaAsFET pre-amp (very low NF), IC-706MK2G.
The holiday house is right on the lagoon edge at the northern side of the island (locator BG08ct), so expect some good ground gain on both moonrise and nmoonset during northerly declinations!
Operation will be mostly on JT65b ... no skeds or internet, but "spots" on the N0UX EME Link and elsewhere would be most appreciated. I will take CW skeds during the low degredation days (send your 30 minute sked requests, but remember that I will only check my e-mail every 3-4 days). Frequencies will be announced after the station is assembled and any birdies are known. Operation can potentially be from moonrise to moon-set each day, but probably not during primetime TV hours (03:00z – 09:00z) due to the hi-band VHF TV system on the island. Note that the window to Europe is very limited, so I kindly ask North America to standby until moonset in Europe and give the guys there a fair chance.
73, Bob ZL1RS / ZK1EME
ST2RS QSL note - some ST2RS QSLs have been sent out. Further replies will be sent in June when I return to New Zealand. zl1rs@yahoo.com - bob.sutton@paradise.net.nz

Stations

AL7EB has got a new callsign and is now active as KL7UW from BP40IQ in 2m EME with 4 x 20 ele. And 170 w.

2m- results from the R/U-stn April 05:

RU1AA JT65B QSO with EI7IX, EI5FK, OK1TEH, SW8KOM, W8LON, XE2AT, ZS5LEE, KU7Z, OH4HXK, W4WSR, K3MF, W8PAT, DL8EBW, DF5NK, G4DEZ, NJ0U, VK2AWD, DL5MCG, G3WZT, F4CYZ, G0UWK, VK3HZ, VE3KRP, DG3GAG and N9XG.
RV3IG JT65B with RN6BN, HB9Q, W5UN, KB8RQ, DJ9CZ, DJ7OF, ZS6WAB, GW3XYW, DF7KF, UA4AQL, K2BLA, RU1AA, S52LM and JM1GSH
UA9SL JT65B with UX5UL, G4IGO, S53J, S54T, DL8EBW, DG3AAG, K7XQ, KU7Z, JK1KTY, K0RI, RA0FCA, G0UWK, OK1TEH, F6HVK and SV8CS.
UR5LX - JT65B wkd PA5KM

DK3WG - JT65B with VK2KU (new qth), N9XG, SV8CS, OH4HXK and 1. May with KC4/W1MRQ (-28...-22 dB), my field #63.

2m- results from the R/U-stn March 05:

RU1AA wkd JT65B WA8RJF, GW3XYW, VE7DXG, ZS5Y, WB2SIH, N8OC,AA9MY, KD5HIO, VE1RG, FIEBK, IK2FWR and DL1RNW.
RA3IS JT65B with G4FUF
RK3FG - wkd in cw with SV6DBL #179, JT65B new SM4SJY, LA8G, K3IB, S57EA, VK2AWD, KI0LE, S57MSL, JK1KTY, DH2UAK, G4IGO, SV8CS, AL7EB, GW3LEW, KU7Z, OH1NOR, ES2CM and DL6MFK (#366 total).
RK6MC wkd CW IK3MAC, RU1AA, RN6BN, I2FAK, KB8RQ and SV1BTR, he rebuilt the antenna now.
UA9SL wkd in JT65B LY2BAW, RA3IS, DL4DWA, DJ9CZ, K3IB, DJ7OF, VE1RG, F5LRL, F1EBK, DH4FAJ, PE1LWT, AA9MY, OH1NOR, OZ1IEP, UA9YLU, GW3XYW, DH2UAK and G4DEZ.

DK3WG JT65B with ZL3TY (-17dB)

2m- results from the R/U-stn Feb. 05:

RA3IS wkd with JT65M JM1GSH, EA6VQ, RA3AQ, AA7A, WA8LCT, DL8YHR, OK1DFC, I6WJB, S57TW, W4SW, W0HP, N9LR and W7EME.
RK3FG wkd in JT65B with OZ1LPR, 5B8AD, G4EZP, K0AWU, W4WSR, VE7DXG, NJ0U, WB2SIH, W7IUV, W9RVG, W8LON, DL4DWA, DL1RNW and KC4PX.
UA3MBJ wkd in SSB RN6BN and added in JT65B VK7MO (30.01.), SV3KH and IK1UWL.
UA4AQL wkd JT65B N3FZ, K0AWU, DJ9CZ, W4WSR, OZ1LPR, N9NX, EI4DQ, UA9YLU and KC4PX.
UA9FAD wkd JT65B ST2RS, IK1UWL N9XG, W5UWB, KE7NR and ZL3TY.
UR5LX wkd with JT65B ST2RS, IK1UWL, 5B8AD, G4FUF, W5UWB, K2BLA, F6FHP, W8BYA, I6WJB, F1AFJ, OH1JCS, GW3XYW, ON4GG, SV3KH and EI4DQ.
(tnx to DK3WG for info!)

70cm & up EME News
Editor: Bernd Wilde, DL7APV

Intro

The dates for the 2005 **ARRL EME** Competition will be as follows:

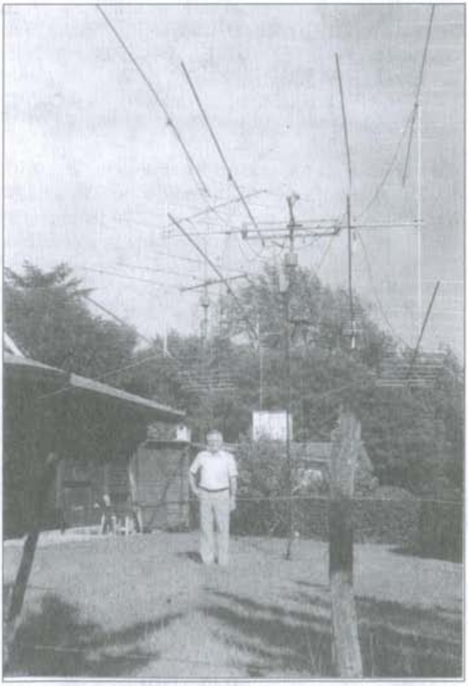
50 MHz - 1296 MHz – Oct. 22-23 & Nov. 12-13
2304 MHz and Above - September 24-25

Hopefully this year **everyone** will follow the rules, so that we get a **fair** competition.

EME found

Tnx for all donations, so far we had only 5 donators! Nobody will help future expeditions?? Please think about it again!!

I have ordered a 500W Solid state amp. But I will do this not as a one-man show, so everyone who will wkd some new # by expeditions is called to help. Give me a note.



LU7DZ

From May K2UYH EME-NL

EME CONTROVERSIES: I am afraid too much has been said already about the recent controversies surrounding EME operation. But I fear there are many new comers and some old timer as myself who do not fully understand the issues. It is important to realize that there are several separate, but related questions, which I will try to explain. The most basic deals with how the new digital modes (DMs) will be treated for awards (WAS, WAC, DXCC, initial counting, contests, etc). I think most of us accept that the DMs are a distinct form of modulation as CW, SSB, RTTY and should be treated as such. The problem is that in the past no one was concerned about mixed modes awards. CW had such an advantage over any other mode in weak signal performance that it was obvious the first awards would be primarily for CW QSOs. The new DMs offer better weak signal performance than CW, so it is now possible that awards, the first 70 cm DXCC for example, could be achieved with a number of DM QSOs.

A second question concerns whether DM contacts fit the definition of what constitutes a QSO. This question is not new. In the past, mainly because of lack of CW ability, people have tried to substitute simple codes (a repeat on-off sequence for calls) to represent large amounts of information. This technique has been referred to as block encoding. Extreme block encoding is clearly not acceptable, but as hams we have always used some block encoding. The Q-signals, 73, EME O and M reports are all forms of block encoding. SM2CEW argues eloquently that the short codes used in JT65 for ORs, Rs and 73s are trivial and that "detecting the presence of two tones or their alternating period is not a secure reporting system." The form of modulation used in WSJT is FSK and it is just as unique, if not more so than the "On and OFF" keying of normal CW. The real question is how much block encoding is acceptable. I must admit that I had reservations when I first heard about JT65's short hand messages, but the truth is that there is no more block encoding than in a normal EME QSO. A more complicated question is the use of a library of calls sequences and correlation to search for a call set buried in the noise. Some operators are concerned that if the *answer* is in the computer beforehand, it just might pop out by chance or worse. G3LTF has argued that this technique should be investigated by an independent committee to insure that it does not violate the rules defining a QSO. Peter is very concerned that we achieve a consensus on what constitutes a QSO and that difference over this issue could break theme community apart. K1JT, the originator of WSJT, replies that there are thousands of calls in the library and that a chance detection has virtual zero probability. From my experiences with JT65, I tend to side with K1JT, but I also know any system can be abused and that caution should be applied.

The third issue relates to what is called an *Assisted Class*. In low band DX contests an *Assisted Class* station can use Internet spotters during the contest to locate rare DX stations. In ARRL VHF/UHF contests the use of the Internet for assistance during the contest is prohibited. During the 2004 ARRL EME Contest a number of stations used the Internet for assistance and in some cases even said in their contest reports that they were using the Internet, yet the ARRL accepted their logs. This decision is the cause of the latest uproar. Most of the stations using Internet assistance were operating DM, and thus this controversy's association with DM operation, even though the use of the Internet with CW would also violate the rules. **K2UYH**

We should now bring our focus back to the major thing: operating EME, being QRV!!! apv

432 MHz

K3MF, Wayde in FM19xp (MD) is one of the newcomers to 432 who operates both CW and JT65. I now have 4 x 19 RIWs and am also running an K2RIW PA with 600 W output. I worked N9AB and W7AMI both on JT65B during the March AW. I will be adding 4 more antennas to the system in the near future.

LU7DZ, Eduardo is now **71 years old**, a real oldtimer!!. He is qrv since **1950 and on EME since 1986!!!** Rig is FT847 + 800w PA on SW, 500W PA on 6m, GS35B PA on 2m 1,5KW, GS23B PA on 432 1,5KW. Ant. 1,8MHz vertical 14m with hat top, 40/80m 41m window, 20m-10m 3el. Beam, 18-24 MHz window, 6m 5ele, 2m 4x14el. 70cm 4x22el. All PA and antennas are homebrew. He is living in a small village in the mountains, 800m asl. His forefathers came from northern Belgium. Eduardo is open for skeds, please mail to:
lu7dz@yahoo.com.ar He has no internet at his QTH, so his answers will be delayed one or two days.

M0EME was active on the 15/16 and managed to work N9AB on CW for #2 he was a steady signal sometimes peaking very clear for a second or two then dropping back down I think I was the smallest ERP station he has worked CW and he is definitely the smallest I've worked so far. I'm trying to get JT65 going on my PC. 73 Paul, 4 times FO19, FT847, MGF1302, 100 Watts at feed, Spectran. http://myweb.tiscali.co.uk/m0eme

PE1ITR had a great weekend, wkd on 432 MHz 9 stations on 19/3: DL9KR cw, KL6M cw; 20/3 S53RM jt65b, KE2N jt65b, G4ERG cw, OZ4MM cw, W7AMI jt65b, KE7NR jt65b and DL7UAE jt65b. The smallest station wkd was KE7NR we used both sides 2x28el Yagi. Total initial number is now #18. 73 Rob 2x28 Yagi IC-910h GS35b and 0,35db pre-amp.

UT2EG in his Shack

S53RM: Here is a list of stations I worked in March. My home made YL1055 amplifier works perfectly. I still have not modified dipoles on my home made 8 x 8.5wl BV OPT X yagi array on fiberglass boom with open wire (8mm Al) feed system. Hope to succeed in near future. Any SKED JT65 or CW? *NC1I, KE7NR, *SM2CEW, *OZ4MM, *G3LTF, KI0LE, *G4ERG, DK3SE, EA3DXU, *PA3CSG, N9AB, KE2N, DL7UAE, PE1ITR, SM2ILF QSO's marked with * are CW. 73 Sine - S53RM

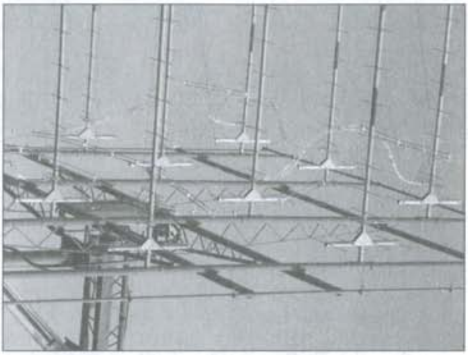
SV1AWE: Bob has joined the fraternity of 70 cm EME enthusiasts -- I will be active on CW and JT. My station consists of 4 x 21 el FT yagis and 0.35 dB NF LNA, but for the moment my power is only 50 W. Soon I will upgrade to LZ2US power level (1.5 kW in late May). My locator is KM17vu in the city of Athens – with its QRM. I have full elevation, but preferred elevation at moonrise and moonset >15 degs due to noise. Tnx to my good friend SV1BTR for his help and encouragement. He is the only reason that I am QRV!

UT2EG (KN67PW) wkd so far :

22.01.2005		
NC1I	539/559	Random
23.01.2005		
SV1BTR	O/339	Random
DL9KR	559/449	Random
KL6M	439/339	Random
K1FO	439/559	Random
29.01.2005		
NC1I	539/559	Random
DL7APV	449/449	Random
30.01.2005		
SM3BYA	O/O	Random
K5JL	549/449	Random
18.02.2005		
UA3PTW	559/559	Random
RW3PX	O/O	Random
19.02.2005		
SM2CEW	439/339	Random

HB9Q	529/559	Random
S53RM	O/O	Random
20.02.2005		
N9AB	O/539	Random
26.02.2005		
DK3WG	O/539	Sked

Antenna 16X17 el. DJ9BV rotate polarization
Preamp - 0.5 dB, Amplifier- GS35B



Closer view to UT2EGs new array

VK3UM
Activity is at a low ebb on 70cm at present noting of course the 23cm DUBUS contest this weekend. Sun noise measured at 0130z 16/4 was 20.0dB equivalent to a sfu of 175 and at 0045z 17/4 it was 17.5dB equivalent to a sfu of 95. 16/4...From 0400 - 0530z (moon rise) only VK4AFL 55n/55n V/h-v and N9AB 55n/55n V/V were present. Faraday was ~ 90° up to 6.5° el and then about 75° up to 10° el .. Libration very little. Fading .. very little. From 0930 - 1244z (moon set) 16/4 DL9KR 44n/57n V/H and 57n/57n H/H, SM2CEW 55n/56n H/H (me at Peter V), I5CTE 44n/44n H/H, DL7UDA 53n/O H/H and a couple of others called right on my moon set one of whom I think was JJ1NNJ. JT65 on 030 (±10kHz wide!) and later on 034.

How about getting above 100 for F1D emissions or run your amp in other than class C? Faraday was reversed to what I normally receive from Eu and seemed about 45° most of the time. Fading was deep at times over a ~30 sec period and libration obvious on weak signals. 17/4 .. Called CQ from 0450 - 0650z (moon rise) Nil! Faraday ~90° and seemingly sharp. Fading very little, Libration Nil.

Got very tired of listening to my echoes! Moon set 1000 - 1245z DL9KR 57n/57n H/H. Hrd also VK4AFL 55n. Faraday ~45° Libration and fading minimal. If nothing else it was very nice and quite satisfying to be able to rag chew and swap notes with Jan and Peter. 73 Doug (VK3UM)

432 & up (net) news

New call of **AL7EB is: KL7UW**

DJ5RE (DL0AO) has no more possibilities to work EME and is qrt now, Thanks for all from Tom.

DL4KG: after giving up EME on 70 cm, I am willing to set up a small station on 23m cm. I already have a 100 W amplifier and a yagi. Now I looking for a low noise preamp which is not too expensive. I want to try it with JT65 on 23 cm in the future...
73 de Gerald

GD0TEP (**GD4IOM**) I've acquired a 3004 amplifier, I assume it's safe to say that some in a couple of months, people would be looking for GD on 70cm?? Cheers, Andy

I wish to inform that Ken **JR4AEP** is now coming back EME from new QTH (JR4ZZS). He is an owner of JR4ZZS, club station and has got the licence to operate same equipments as JR4ZZS. Be careful to count initials. GL de Yoshi, JA4BLC

Pat - **K7LNP** - DN30XP, will be on 432 EME very soon.

NC1I QRT on EME
After nearly 25 years of 70 cm EME activity I have made my last EME QSO. I put much effort into repairing my mount this past winter and was very excited to return to EME after a three year absence. The 48 yagi array seemed to work as good as the day I first completed it over 10 years ago.

I quickly learned that activity was nowhere near what it had been just several years earlier. Random activity was very sparse. I spent countless hours during what I thought would be good activity times calling CQ only to hear just my own echoes booming back.

I was completely unaware of the ongoing "debate" over the new modes. After subscribing to Moonnet I became sickened by the constant bickering regarding this. Some seemed to make it personal. There was far more energy going into the battle of the modes than there was going into EME operation. The bickering seems to have reached new levels over the last several days.

Hopefully the EME community can come together on this or it will not survive. I know that by giving up I am part of the problem but my time is to valuable to spend listening to my own echoes most of the time. More importantly, when my favorite hobby is raising my blood pressure it is time to move on to something else. Frank, NC1I

NC1I's 48 x15 rear mounted K1FO arry

N8CQ is still working on combining the 2 GS-15B amps. Thanks to NC1I for being a beacon for Gary to get up and running on 70cm EME and hopes that Frank reconsiders.

WA6PY: In March I QSO'd OZ4MM and G4ERG on 432 using dual dipole feed extended to be a kind of yagi antenna with 4.2 m boom. G4ERG is the smallest station I worked on 432 with my simple antenna. During EU Contest, I started on 10 GHz. I was quite late on the band on Saturday 16 April, heard IQ4DF and WA7CJO calling CQ. I QSO'd WA7CJO, but IQ4DF vanished. Then I switched to 1296 and QSO'd RW1AW F6KHM SM3AKW G3LTF F6CCJ HB9JAW K0YW W2UHI ON7UN OZ6OL IK1MMB VA7MM N2UO. On 17 April I was shortly on 1296 and QSO'd DF3RU and K2UYH, I heard DJ9YW IK2FZR KA0Y, but I could not continue due to the work commitments. VY 73 Paul WA6PY

OA4B - Peru soon qrv on EME

The members of the Radio Club **Peruano** are now putting the finishing touches on their 432 EME station. 73 Jack N6XQ

Hello eme friends, here the 70cm and 23cm (~) - result from the R/U-stn.

Feb. 2005:

RK6MC wkd HB9Q (539/539), UA3PTW, G4ERG and S53RM.

DK3WG wkd in cw sked S53RM 549/539 and UT2EG 539/539 #410.

March 2005:

RW1AW ~ made his first 23cm QSO with DJ9YW 559/O

RK6MC made cw QSOs with DL9KR O/559, SV1BTR, NC1I, HB9Q 539/539, UA3PTW, G4ERG, N9RB (AB?), OZ4MM, S53RM, S53J, K2UYH, KL6M and DK3WG.

DK3WG glad to work RK6MC #411.

April 2005:

RW1AW ~ glad to work OZ6OL 559/449, SM2CEW 559/549, F2TU 569/559, G4CCH 569/559, ON7UN 569/O, G3LTF 559/439, K2UYH 559/549 and KA0Y 569/559.

DK3WG wkd SV1BTR 549/O
73, gl via moon Jurgen, DK3WG

23cm

EA3BB Team is completely satisfied after the EME test on 16 April afternoon, all the equipment was running 100% Ok and we completed 6 CW random QSO heard other stations but was not posible for us to get the call, all QSO was done quite eassy some on first call or after one QRZ period, the conclusion is our Tx signal was quite good (linear amplifier GS34 is really producing 250W) and the 1296 Mhz stations, have a very good Rx better than our 8 yagi. worked were:
OZ4MM first ever QSO for EA3BB team on 1296
HB9Q not very strong but eassy
OE9ERC good signal but big drif
HB9BBD the strongest signal on the band
F6KHM also very strong and the most activ station on the band , heard in all QRG Hi
HB9SV very strong and easy QSO
Finally at 20 UTC we stoped the activity to dismantle our 8 yagi EME portable station, weere not able to hear any USA station? Is the activity in USA so low ?
If all runs OK, next activity will be in August in a new 1296 DXCC: Andorra –C31TLT. Team members are EA3AYX, EA3AEN, EA3BB and EA3DXU. 73 for all de Josep EA3DXU

HB9JAW On Friday April 15th I made a quick 23cm horn installation, in order to make a few EME QSO's again after a Year of absence. On saturday 20ut I left my job to see if I can hear anything and work someone. Signals were there and strong, but where was my (anyway) little CW knowledge? Gone! Strange! Here is the report, hi: April 16th 21.13ut to 23.20ut W2UHI 589/589, LA8LF 559/ not complet, K0YW 579/599, K5JL 569/569, SM3AKW 559/569, ON7UN 579/559 #, F6KHM 579/589, F6KHM 57/57 OZ4MM 589/579, OZ6OL 559/569, OE9ERC 579/589, G3LTF 579/579, IK2MMB 559/579, RW1AW 539/569#, WA6PY 539/569, DL1YMK 559/559 heard SM2CEW, VE6TA April 17th 15.28ut to 1620ut, then QRT because off windalarm and job commitments OH2AXH 569/579#, HB9SV 579/589, ZS6AXT 559/579, ES6RQ 529/559#, heard OE5JFL? 73 de Michel HB9JAW

IW2FZR this is my log from contest. I want to thank all for the pleasant competition. Dubus Contest Report 16 and 17 April, 2005

OZ4MM	559/O	F6KHM	559/O
K5JL	559/559	K9SLQ	559/539
HB9BBD	569/549	OE9ERC	569/549
HB9SV	579/559	SM2CEW	549/559
G3LTF	539/529	OZ6OL	519/519
K2UYH	559/549		

Station Information: Output 150 W at feed, Antenna Dish 4 meter dia. 31.5 dBi, nf 1 dB CW, random only, Op: Dario, JN56BE. 73 de IW2FZR

JH1KRC: European EME Contest 2005 on 23 cm brought a lot of fun to me. This was the 1st time I took part in this contest. I made 25 valid QSOs. I only made 3 initials, but it was great. We need more small stations to participate in this contest. I worked on 16 April partial VE6TA?, K5JL (559/569), K9SLQ (579/579), JA6AHB (549/559) – back on after a big earthquake hit his QTH, JA8IAD (549/559), G3LTF (559/449), OE9ERC (569/569), F6CGJ (559/559), ON7UN (559/559), IK2MMB (549/549), SM3AKW (549/549), partial JA4AEP (559/-), OZ4MM (549/559) and F6KHM (549/339, and 17 April K0YW (559/569), N2UO (549/549), JR4ZZS (569/559), WB5AFY (549/559) for initial #43, VE6TA (449/549), KL6M (O/O) #44 - a good but tough QSO, HB9BBD (579/579), OZ6OL (449/559), HB9Q (569/549), PA3CSG (559/569), ZS6AXT (449/569) #45 and my 1st Africa and HB9SV (589/579). Mike
jh1krc@syd.odn.ne.jp

JR4ZZS: Yoshiro (JA4BLC) operated JR4ZZS with JR4AEP during the EWW EME Contest. They worked on **1296** K9SLQ, JA8IAD, VE6TA, JH1KRC, K0YW and JA6AHB. The wind was strong during the weekend and they had major troubles keeping the dish aimed at the moon. Before the contest they replaced the position encoders from 720 pulse/rev incremental to 12 bit absolute encoders. Automatic computer tracking is not yet finished. JH3ERQ has helped us greatly. We also SWL'd on **10 GHz** both day. We heard DL0EF calling CQ and a few other unidentified signals in EU window. Our equipments on 3 cm were 2.5 m solid dish, VE4MA linear pol feed (vertical) and DB6NT converter without a preamp. JR4AEP has moved his station to JR4ZZS and uses the same equipment as JR4ZZS. Ken worked OZ4MM, OZ6OL, F6KHM, OE9ERC, SM3AKW, G3LTF, ZS6AXT, HB9BBD and OH2AXH in the contest under his own call during the contest.

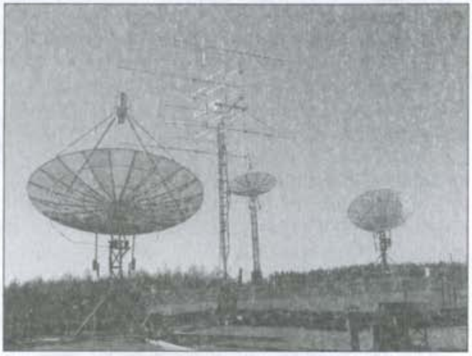
LU8EDR: Daniel lu8edr@uolsinectis.com.ar writes that he is definitely QRT on 23 cm EME -- My 7.2 m dish was removed last week. There are many reasons. I lost my job one year ago, and the RF stuff is now much too expensive and very hard to find down here. I am moving my effort to 222 and working with LW9ELE (250 Km from here), a friend with the same internal flame. We are already measuring sun noise.

OM6AA: Rasto was active during EWW EME Contest on 23 cm: I was using my old set up – 3 m dish and older VE4MA feed due to lack of time. I am very busy at work right now, so I was not able to try the Septum feed described in DUBUS 4/04 magazine. I QSO'd on 16 April at 1155 OZ4MM (559/429), 12.27 OE9ERC (559/549), 1258 F6KHM (559/O), 1342 HB9Q (559/539), 1404 G3LTF (449/339), 2034 F6CGJ (559/449), 2106 K0YW (559/529) and 2135 ON7UM (559/O). I called HB9JAW for about 40 min without any reply. K9SLQ replied with a QRZ to my long calling. I also heard DF3RU, ZS6AXT, JR4ZZS, HB9SV, W2UHI, SM3AKW, IK2MBB and K5JL. The next day I added at 1251 HB9BBD (579/569), 1314 OZ6OL (439/339) and 1401 PA3CSG (449/439). I heard JA6AHB. All QSOs were on random, CW. Note I have a new e-mail address –see below. My old one was cluttered up with tons of SPAM. om6aa@stonline.sk 73 Rasto

OZ4MM: Stig's contest report: I ended first weekend on 1296 with 55 contacts and 33 multipliers. I couldn't be on fulltime and thus missed many of the regular stations, but still found good activity through the weekend. The level of signals seemed down on Saturday, but was better on Sunday. Does anyone have any idea as to why? I added initials with EA3BB, RW1AW and DL4DTU. I heard and called W7UPF, but he disappeared. I also heard W7BBM.

ON7UN: We had great fun this weekend during the AW / Dubus / REF contest. Following stations where worked:
JA8IAD #, F6CGJ, F6KHM, ZS6AXT #, OE9ERC, G3LTF, JH1KRC, F1ANH #, IK2MMB, SM3AKW #, HB9Q, JA6AHB #, OZ4MM, DL1YMK, HB9BBD, OH2AXH, OZ6OL, RW1AW, K9SLQ, N2IQ, LA8LF, N2UO, GW3XYW, HB9SV, K0YW , NA4N #, DK0ZAB #, WB5AFY #, F5HRY #, G3LQR #, W2UHI, K5JL, OM6AA #, VA7MM #, HB9JAW #, SM2CEW, WA6PY#, VE6TA, OE5JFL#, DL3RU #.
Total claimed , 40 Q 26 Mult 104.000 points.
Equipment worked as expected, but i still need to improve the receive. I am working on a double convertion transverter 1296 – 28, 1 LO @ 79,25 MHz, x 4 x 12, first IF 345, second IF 28 MHz . The feedhorn has to be further improved. Tnx all for the fine weekend, work you soon agn!
Best 73's Eddy ON7UN www.on7un.net

RW1AW is now QRV on 23 cm as well as 70 cm in a big way and will add 13 and 3 cm shortly – My new QTH is KP50da, the old loc was KP50eb. It took Alex nearly two years to complete new Shack and several new antennas. On 29 March I made my first 23 cm EME QSO with DJ9YW (559/O). I used a HB 3 m dish (f/d=0.51) and 140 W into a W2IMU long feed with 0.35 dB NF LNA. On 6 April I worked DJ9YW (559/449) again after switching to a larger 3.7 m (f/d = 0.35) dish with a VE4MA long feed, new 0.27 dB NF LNA and 180 W at the feed. The PA is 8 x M57762 Mitsubisi hybrids for 260 W out to 30 m of 7/8" Heliax. During the pre AW, I QSO'd G4CCH (569/559), ON7UN (569/O), K2UYH (549/549) and HB9BBD (559/569). For the EWW Contest, I completed installation a 6 m HB dish 5 hours after start – hi! Using it, I made 38 random QSOs with 120 W to the feed. I had some very FB contest reports including KA0Y (589/569) and OE9ERC (589/579) – 23 cm is a very nice band!



RW1AW`s antenna farm

I am also nearing completion of a 2 x GS15 PA, which should give 700 W on 1296. In May I should be on 13 cm EME for the 2nd leg of the EWW Contest. The little 3m dish will be for future expeditions like R1MVJ, /RW2F. QSL address:

RW1AW, Boreisha Alexander, 194358 St. Petersburg, pr.Enghelsa 141-1-12, Russia
rw1aw@skylink.spb.ru

RW1AW in his Shack

UR5LX: Sergey was active in the EWW 1296 EME Contest on 17 April from 1400 to 2100. He QSO'd F6KHXM, F6CGJ for initial #30, HB9BBD, G3LTF, OH2AXH and OZ4MM. Sergey heard and many times called ON7UN with good copy, but no answer. He is open for skeds on CW or JT65B on 1296 with his 3.2 m dish. 250 W PA and FHX35LG LNA. ur5lx@vhf-dx.net

VA7MM The chain saws have been fired up at station VA7MM. In the past month three massive, noisy, cedar trees over 80 feet tall blocking the eastern horizon have been razed to the ground. The resulting lower noise level enables VA7MM to now work European stations about 2 hours earlier than previous and in addition to the cavity amplifier, we now have a crackling cedar log fire warming the station. VA7MM was active in the 2005 European EME contest with the following stations contacted on CW: F6KHM, F6CGJ, K9SLQ, ON7UN, OE9ERC, G3LTF, OZ4MM, W2UHI, K0YW, WA6PY and K2UYH. VE7BBG was contacted on JT-65B. New initials include ON7UN and W2UHI for a total of 41 initials since the station became active on 23cm band EME November 2003. Event operators were Mark Mattila, VE7CMK and Toby Haynes, VE7CNF. va7mm@rac.ca

VE6TA Here are my results during the 23cm leg of the Dubus event. Had some time constraints trying to keep the boss happy and struggled at times with the libration fading on a few stations. Worked the following: K9SLQ, K5JL, JH1KRC, IK2MMB, W2UHI, K0YW, F1ANH, LA8LF, ZS6AXT, OZ6OL, SM2CEW, F6CGJ, F6KHM, OZ4MM, OE9ERC, ON7UN, RW1AW (init #99), N2IQ, WB5AFY, JR4ZZS, JA8IAD(init #100 on 1296 and #400 on all eme bands), JA6AHB, HB9BBD, OH2AXH, K2UYH, G3LTF, DF3RU, SM3AKW. I heard but did not work the following stations: WA6PY, N2UO, PY5ZBU, VA7MM, HB9SV, KA0Y, W7BBM, KL6M, DJ9YW, HB9JAW. Total score amounts to 28 x 20 mults. Probably the strongest group of signals I have heard on EME. Everyone must really have the big amps working well these days. I will be changing the feed to 13 cm when time permits and hope to be QRV there for the next leg. 73's to all. Grant VE6TA 2 x GS-15b's 5 meter .3 f/d dish.

ZS6AXT: After exactly one year of absence on EME I managed to get back on with great help from ZS6JON. The removal of my old EL drive was real nightmare, but we managed. The fitting of a new linear actuator was quite easy. The antenna relay and preamp were replaced and the wiring modified. The resulting Sun noise was a bit over 15 dB. I then tried echoes and these were OK. On Saturday we had rather lousy weather with rain that cleared up later in the evening. I worked on 23 cm: F6KHM, G3LTF, OZ4MM, F6CGJ, OZ6OL, JA6AHB, ON7UN for initial #194, SM3AKW, F1ANH, IW2FZR partial, OE9ERC, JR4AEP, LA8LF, IK2MMB, DL1YMK, HB9SV, OH2AXH, GW3XYW, RW1AW #195, HB9Q, N2IQ, K9SLQ #196, OH2DG, K5JL, W2UHI, K0YW, WB5AFY #197 and VE6TA. During the second half of the pass my HV PSU dropped in voltage, one half of the rectifier did not work, thus I had only about 120 W! Still I was getting good reports. On Sunday I repaired the HV PSU. We had heavy thunderstorm before the moonrise, but fortunately it cleared and weather was OK. I worked HB9BBD, PA3CSG, OE5JFL, JH1KRC #198, HB9JAW, RW1AW (dup), SM2CEW, DF3RU, N2UO, G3LQR, KA0Y and K2UYH. The total was 39 stations with 6 initials. CWNR were ES6RQ (many times), LA9NEA, IK2COJ, NA4N, JA8IAD and DK0ZAB. Pitty, I was hoping to get my # count to 200! But my result of 38 x 23 was an all time best on 23 cm. Conditions were a bit crazy on Saturday. I believe due to aurora. And of course, QRM here and there was bad. I know, it is contest, but the big guns should be bit more careful, when they change their frequency. The only "QRL?" I heard was from F1ANH. I now have to replace the 13 cm preamp, and hope to get a new more accurate EL sensor to be ready for 13 cm operation next month. I hope to improve my initials there too, if our weather cooperates! So far we had probably the worst season with heavy thunderstorms, and the preamps damaged twice - the first time after 15 years of operation! I am now looking for a good design of 10 GHz horn for my dish f/D 0.375. I hope to have it erected this year. All the other equipment is ready.

10GHz

F5JWF wkd during the DUBUS EME contest on 10GHz. Few station were heard on Saturday 16th with very bad snowing condition. I worked only IQ4DF with O report on each side. OK1UWA, OK1CA, DL0EF were heard with really good 0 signal I have tried to call them witout any success VK3XPD was also heart but with more marginal level. On Sunday 17th still snowing and worse 230VAC public network failure for 12hours !!! So I started again the contest on sunday at 18H30GMT. I worked OK1KIR, WA7CJO and HB9BHU. Rig: 3.7m and 20W TWT. Good experience for my first EME contest on 3cm!
Thanks anyway to all contacted people who took time to decode my few dB above the noise signal. Best 73's de F5JWF / Philippe

EME Hell Writing by IQ4DF team

Some time is passed since we have completed a 10GHz two-way Hell Writing QSO with I5PPE located in Firenze. That was accomplished at 19:40z of Saturday October 23rd 2004, while we were operating our Bagnara di Romagna (JN45vj) station; here you can listen to some recording (video/audio) taken during the QSO. This event happened just the day before our traditional yearly Italian Microwave Mini-Congress, hosted and organized by our CRBR Association (IQ4DF), and held in Mordano a village nearby the IQ4DF station.
We also took advantage of the presence of a lot of EME'rs friends (I3DLI, S55UUU, IK2MMB) which were already on-site to attend to the next day's Microwave Congress. We believe that this QSO has been the *first ever two-ways EME QSO utilizing such method*; this is not only about the 10GHz band, but also on any other ham-radio band. Before it eventually gets too late, we'd like to undoubtedly be recognized with the paternity of such event. Finally on the 23rd of October 2004 the QSO was fully accomplished exchanging not only the callsign and reports but also the QRA locator (10M!) on both ways. Hell Writing was already known and utilized during World War II on short wave bands, but it has never been utilized for Moonbouncing purposes. Here http://www.crbr.it/modules.php?name=Downloads&d_op=getit&lid=32 you can see a powerpoint presentation with few slides about this experience and event, it is unfortunately a 6Mb heavy document.
During 10 GHz Dubus-REF Contest, Saturday we (IQ4DF Club) had QSO with DL0EF (ssb), G4NNS, F5JWF, DL2LAC, SP7JSP, HB9BHU, WA7CJO, OK1KIR, WA7CJO (ssb), OK1CA; Sunday SP7JSG and OK1KIR. 73 Vico, I4ZAU

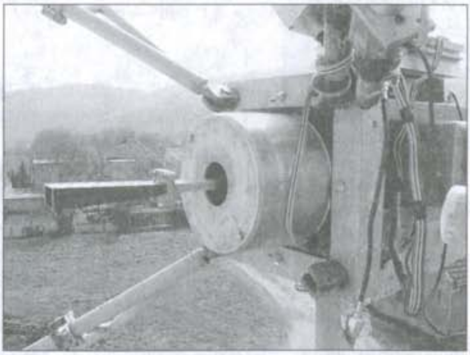
LA8LF has started building a station for 10 GHz and 24 GHz EME.

OK1KIR sets up new antenna, 4.5 m dish, f/D 0.42 with el/az mounting. We were in April 10 GHz part of DUBUS contest after long break caused by flood in August 2002.
New transverter 10368/10450 MHz, PA TWT RW 2135 ~ 50 W output, its power supply and horn feed are mounted in the focal point. 21 years experience with old antenna give us lesson - if linear polarization then with rotation. It paid off during the DUBUS contest. VK3XPD was for Europe 90° turned and WA7CJO about 30° to max signal. His polarization changed during orbit. The very same applies for all non Europe stations. We haven't seen this problems when circular polarization was used, same as on 1296, 2300 and 5760 MHz.
Own echos are FB on both 10368 and 10450 MHz and change of the band is just one switch.
In contest - apogee - we worked on 16.4 at 20.55 WA7CJO O/O, 21.03 HB9BHU O/O, 21.25 DL0EF

559/529, 21.33 IQ4DF 549/529, 22.53 OK1CA O/O-559 and on 17.4. at 11.23 OK1UWA O/519 (in rain), 13.23 VK3XPD O/O for #24 and **the first VK-OK 3cm QSO** (it is our jubilee 100 first OK to QSO on UHF/SHF bands) and new ODX 15931 km, at 17.46 IQ4DF 54/539, 17.47 DL2LAC O/O and at 20.08 F5JWF M/O for #25.

OK1KIR new dish

We plan to be QRV on all 13cm bands in next part of contest. OK1KIR team, Tonda OK1DAI, Vlada OK1DAK, Jiri OK1DCI and Jan OK1VAO



OK1KIR feed 10GHz

SP7JSG: I am very happy to inform you that Czeslaw SP7JSG made his first 3cm eme qso with IQ4DF. It was the **first ever 3cm EME qso in SP**! Many congratulations for Czeslaw. You can listen to the end of qso and see station details on:
http://kolos.math.uni.lodz.pl/~maciekm/sp7jsg/
Czeslaw was so excited that he recorded only a part of qso, hi!
In Dubus/REF contest he wkd DL0EF #2 first SP-DL via 3cm EME, IQ4DF. He now knows that his feed system needs to be corrected. He will optimize it soon. Czeslaw's email is: jsg@kki.net.pl
You can write any comments to him to this address. Vy 73! de Chris, SP7DCS

VK3XPD: I'm finally ready for a contact on 10 Ghz EME. The CW will be difficult for me but I hope we can keep trying !! Station details : GPS locked, calling on 10368.100 Mhz unless advised otherwise, 75 Watts into a 10 foot dish, HORIZONTALLY Polarised.. so into Europe is OK - sadly USA (Horiz also) will miss out until either of us can swap POL'N.
Timing : Below are the UTC Moon Rise & Set times for my QTH for the next few UTC days. Since I'm in the suburbs of Melbourne.. I will need a minimum of 5-10 Degrees Elevation for USA QSO's to get away from near field obstructions. Contact: Telephone me on 0011-613-98896101 or Email me at alandevlin@bigpond.com 73 Alan
Also if you are going to phone him remember we are 10 hours ahead of UTC!!

Digital

N9AB has some proposals to optimize JT oparation: Most CW activity on 70cm falls within a 15 KHz band segment, but JT65 activity is now spread out over 100 KHz (extending above the normal EME subband). This makes random digital activity very difficult and essentially requires "assisted" operation. Ideally, if a single CQ calling frequency was used, the computer program could simply scan the channel and help make random QSO's more achievable.

- Would the following be useful?
- A single CQ calling frequency (or a least a limited number of channels during contests)
- Sequence standardization for calling CQ
- General Questions:
- Would increased random activity encourage new stations to try digital modes?
- If there were more random JT65 operation, would it actually encourage EME activity (both CW and digital)?
- Are there standard JT65 calling frequencies on 2 & 6 meters?

Any DXpeditions planning to include 70cm (occasionally 6 or 2 meter EME operations are included on major DXpeditions)?

Your comments please. Regards, Andy N9AB

ARRL contest results

	Single Op All Band
1	OZ4MM
2	G3LTF
3	WA6PY
	Single Op Multiband 50-1296 MHz Only
1	SV1BTR
2	DF3RU
3	OE5EYM
	Single Op Multiband 2304MHz & UpOnly
1	F2TU
	Single Operator 432 MHz
1	N2IQ
2	DL9KR
3	N9AB
	Single Op 1296 MHz
1	HB9BBD
2	G4CCH
3	K9SLQ
	Single Op 2304 MHz
1	ES5PC
2	OH6NVQ
	Single Op 5760 MHz
1	WD5AGO
	Single Op 10 GHz
1	OK1UWA
	Multiop Multiband 50-1296 MHz Only
1	HB9Q (HB9CRQ, HB9DBM,ops)
2	S53J (S56TZJ, S56TZK, ops)
3	YO4FRJ (+YO9AFE)
	Multioperator 432 MHz
1	OH2PO (OH2HYT, OH6DD,ops)
2	DL7APV (+DL7AIG)
3	SP6JLW(+SP5NHF, SP6GWN, SP6OPN)
	Multioperator 1296 MHz
1	SKØUX (SMØMXO, ES5PC, SMØLPO, SMØERR, SMØKAK, SMØSBI,ops)
2	OH2AXH (+OH2LRE, OH2LH, OH2BDQ)
3	W2DRZ (+K2TXB, AK3R, KA2ONY)
	Multioperator 10 GHz
1	WA7CJO (+W7GNP)
2	IQ4DF (I4ZAU, I4TMA, IK4PNJ, IZ4BEH, IW4CJM,ops)
3	F6KSX (F6ECX, F5SE, F1EN, ops)

More detailed results see ARRL homepage.
From April 2005 QST

Last

THE **EME NET** CAN BE REVIEWED, HEARD live on sundays at http://taring.org as an mp3 stream. The previous two Sundays are available as prerecorded mp3s at any time.

PS If you have some unwanted **critters** gaining entry to your shack (like a 4' tiger snake) suggest you use steel wool stuffed into the cable ducts. (away from any possible moisture). It can be obtained in long rolls (here) and very easy to install and remove for cable modifications. I have done that now! (to the EME shack) VK3UM

An interesting article about **23cm and Galileo** is on the web at:
www.southgatearc.com/articles/galileo.com

C3 Andorra Expediton Update

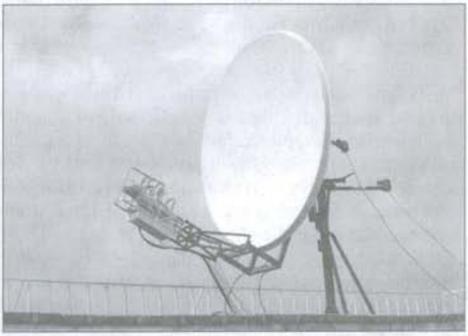
EA3DXU`s group has got the permission for 23 cm EME from Andorra. The will be qrv from August 24th 0000z to Aug 27th moonset in CW and JT65C.

73 Bernd DL7APV

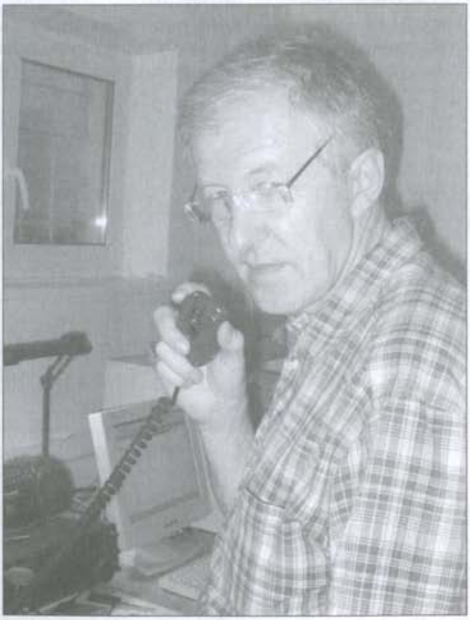
REMINDER
EU WW REF/DUBUS EME Contest
3rd Weekend on June 11/12 for
432 MHz and 5.7 GHz !

First EME QSOs on 47 GHz

A group of EME OPs was working very hard over the last couple of years to achieve a complete EME QSO on the 47 GHz band. Involved were Gary, AD6FP, Sergej, RW3BP, Barry, VE4MA, Al, W5LUA and Gunter, VE7CLD. On July 24th 2004 RW3BP copied his own echoes for the first ever EME signals on 47 GHz. RW3BP was using more than 100 w output and a 2.4 m offset dish resulting in around 50 MW (!) ERP. On the RX side RW3BP uses a 3.6 dB NF homebuit preamp with a CHA2157 chip from United Monolithic Semiconductors. He has aprox. 10dB sun noise and 1 dB moon noise.

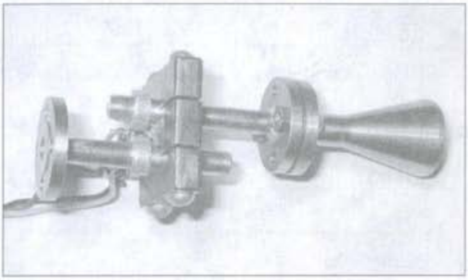


RW3BP`s 47 GHz dish with W2IMU horn

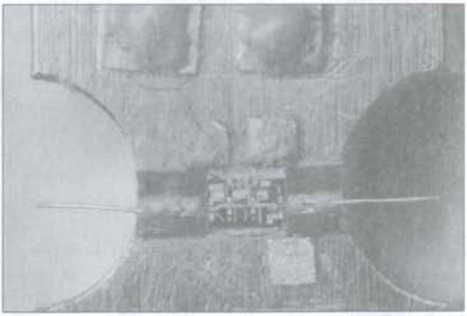


Sergej, RW3BP

RW3BP – 47 GHz Transverter at feedhorn



RW3BP 47 GHz preamplifier



RW3BP preamplifier close view

EME characteristics on 47 GHz

The rough surface of the moon produces a aurora like sounding. Spreadind can be several hundred Hz making the use of very narrow bandwidth IF filters impossible. Doppler shifts are up to +120 kHz on rising moon and -120 kHz on setting moon. The antenna`s beamwidths are less than half of the 0.5 deg subtended angle of the moon. 47 GHz is not so strong affected by humidity like 24 GHz, anyway athmospherical losses at low antenna elevation levels are a limiting factor.

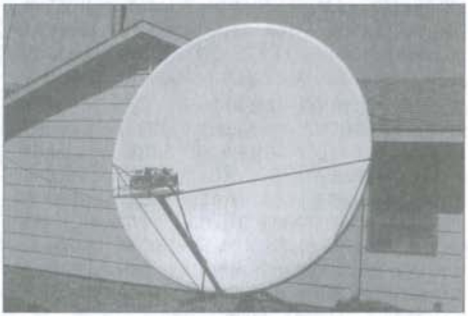
47 GHz EME Diary

On August 8th 2004 first one way contact took place: Barry VE4MA copied RW3BP`s TTTTT.

On November 2nd 2004 RW3BP copied TTTT from Gary AD6FP. On November 27th 2004 RW3BP copied both callsigns from AD6FP. **On January 23rd 2005 the first two way CW QSO was completed with AD6FP.** On February 19th another two way CW QSO took place with W5LUA and on April 16th a CW QSO was made with VE4MA in the EU EME contest. These QSOs are first ever contacts between UA and the U.S. and Canada, of course. AD6FP's station consists of a 1.8 m offset fed dish and 30 watts. At W5LUA and VE4MA 2.4m offset fed dishes and 30 watt TWTs were used. Noise figures of all stations are in the 3.5 to 4.7 dB range.

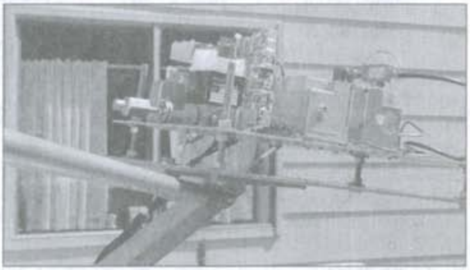
Since the doppler shift can be as much as 100 + kHz at 47 GHz, one must continuously adjust the receive frequency to keep the station centered in the passband. Precision frequency control was obtained by using GPS controlled, Rubidium locked, or TV sync controlled phase locked local oscillators. Various techniques were in use to keep the Doppler shifted frequency in the passband of the receivers including a DSP software "Millimetre wave CW Exchanger" specially designed for 47 GHz EME. (tnx to RW3BP for info!) We hear that W5LUA has started collecting 76 GHz stuff already...

AD6FP`s 1.8m dish for 47 GHz

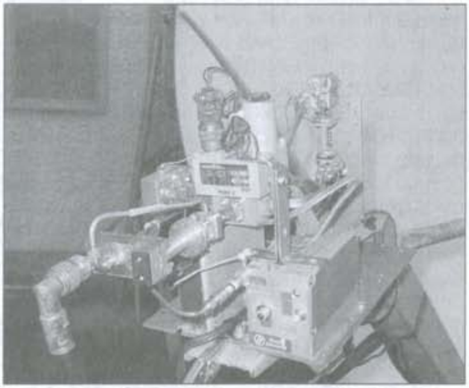


W5LUA`s 2.4m dish

VE4MA and his 2.4 m dish



W5LUA`s 47 GHz transverter



VE4MA`s 47 GHz transverter

Liquid Nitrogen cooling:
1.5 dB NF/ 77K (4dB /290 K)

Tropo Reports

2m, 70cm and up

Editor: Wolfgang Schneider, DJ8ES

DJ8ES@gmx.de

2m

LA0BY in JO59IX wkd on 144 MHz (>1000km):

09.12.2004, 20:00 – 23:30 UTC

DB8KJ (JO30CM, 1090km), DL7ATR (JO30DO, 1079km), DL5KCI (JO30CR, 1067km), DL3JFA (JO60EL, 1062km), DH6SN (JO30BU, 1055km), DC6IA (JO30IV, 1041km), DM2CHK (JO50MP, 1039km), DB6EM (JO31ED, 1019km), DJ5DM (JO31FF, 1009km), DL9EAJ (JO31DH, 1003km)

10.12.2004, 18:00 – 21:30 UTC

F6AQI (IN96DW, 1661km), F4DZF (JN16GB, 1639km), F4DXX (IN97LH, 1603km), F6APE (IN97QI, 1586km), F5NXU (IN97MR, 1558km), F2GL (IN97ST, 1534km), F1CIA (IN97XW, 1509km), F/ON5KO/P (IN98QL, 1472km), F8BRK (IN99VF, 1383km), F6DKW (JN18CS, 1360km)

Now the show became really interesting. It seems the duct was at higher altitudes, as LA6MV did not hear any F-stations. Quite a large area covered, but best ducts to IN97 and JO70 area. Heard beacon F5XAM in JO10EQ for many hours.
tnx for info Stefan

OZ1IEP, JO55XU, wkd (>700km):

04/01 18:11	ON4IQ	JO20AR	54/ 57	774km
04/01 18:21	DF9IC	JN48IW	56/ 53	800km
04/01 18:38	ON5AEN	JO10VW	53/ 52	768km
04/01 19:40	DG3NDN	JN59LL	55/ 55	712km
04/01 20:56	OH1NOR	KP00XL	51/ 51	778km
01/02 18:18	DF9IC	JN48IW	51/ 51	800km
01/02 18:48	DK7FU	JN49FT	54/ 53	711km
01/02 18:54	DL0EE	JN49GK	53/ 52	749km
01/02 19:49	ON5AEN	JO10VW	56/ 56	768km
01/02 20:10	DG2NDN	JN59LL	51/ 52	712km
01/02 21:55	OH1NOR	KP00XL	53/ 54	778km
01/03 18:51	ON5AEN	JO10VW	51/ 52	768km
01/03 20:57	DG3NDN	JN59LL	52/ 55	712km
01/03 21:09	ON4IQ	JO20AR	54/ 53	774km
01/03 21:33	DL0NF	JN59PL	54/ 55	710km
05/04 17:44	ON4PS/P	JO20KQ	52/ 52	742km
05/04 17:48	ON5AEN	JO10VW	52/ 52	768km
05/04 17:52	DF9IC	JN48IW	53/ 53	800km

tnx for info Carl

PA5DD (JO22IC) wkd Jan – Mrz ´05 (>600km):

OZ1IEP (JO55XU, 633km), SK7MW (JO65MJ, 660km), SM7UYS (JO65MN, 670km), SK7CY (JO65NS, 686km), SK6DK (JO67EH, 761km), OZ2PBS (JO55XJ, 602km), OZ8ZS (JO55RT, 606km), OZ3TT (JO66CB, 659km), OZ1MG (JO65CO, 629km). tnx for info Uffe

RW1ZC/MM, HL90, hrd:

20.4.2005 1830 CT1ART/B IM67ah 579, >2000km

YU7EW (KN05HP) wkd on 144 MHz:

09/12/04 16.18	DH8NAS	JO50VF	831km
09/12/04 17.08	DH1NFL	JO50VF	831km
09/12/04 17.19	DL3ANK	JO52NL	1025km
09/12/04 17.20	DK2EA	JO50OF	865km
09/12/04 18.43	DL6NAA	JO50VF	831km
09/12/04 18.47	DD0VF	JO61WB	781km
09/12/04 18.59	DK1FG	JN59OP	832km
10/12/04 16.36	DL6NAA	JO50VF	831km
11/12/04 11.18	OK1JKT	JO60OK	766km
11/12/04 11.42	DL1VPL	JO61UA	785km

tnx for info Pista

70cm

G3XDY, JO02OB, wkd (>600km):

09/01/2005	F6FHP	IN94	823km
11/01/2005	DF9IC	JN48	633km
08/03/2005	OZ1FF	JO45	600km
08/03/2005	DF9IC	JN48	633km
08/03/2005	SK7MW	JO65	860km

tnx for Info John

LA0BY in JO59IX wkd on 432 MHz (>1250km):

10.12.2004, 18:00 – 22:30 UTC

F4DZF (JN16GB, 1639km), F4DXX (IN97LH, 1603km), F6APE (IN97QI, 1586km), F5NXU (IN97MR, 1558km), F8BRK (IN99VF, 1383km), F6DKW (JN18CS, 1360km), F6CBH (JN19BH, 1306km), OK2POI & OK2VSO (JN99AJ, 1266km), F5PEJ (JN09XT, 1259km)

Nice, the condx on 70 cm were sometimes better than on 2 m, but lower activity. Super duct to IN97 area, lasting for many hours. Heard beacon OK0EP but not many OK's were QRV on 70 cm. No contacts LA-F were reported on DX Cluster!
tnx for info Stefan

OZ1FF, JO45BO, wkd (>700km):

09/11/2004 18:01	SMØFZH	JO99HI	752km
09/11/2004 18:08	SM4RPP	JO79HH	566km
09/11/2004 18:31	ON4DPX	JO1ØNT	628km
09/11/2004 18:37	DG1KJG	JO3ØNT	537km
09/11/2004 18:44	DB6NT	JO5ØVJ	629km
09/11/2004 18:54	SK1BL	JO97HK	675km
09/11/2004 21:09	DJ5BV	JO3ØKI	590km
09/11/2004 21:18	SM7EOI	JO86FP	529km
09/11/2004 21:21	DF9IC	JN48IW	742km
09/11/2004 21:30	SK4BX	JO79OF	584km
09/12/2004 15:22	GW4DGU	IO71SW	920km
09/12/2004 20:03	DL6NAA	JO5ØVF	646km
14/12/2004 18:00	SMØFZH	JO99HI	752km
14/12/2004 18:40	DF9IC	JN48IW	742km
14/12/2004 18:43	DF6NA	JN49XS	660km
14/12/2004 19:24	SMØSBI	JO99CF	725km
14/12/2004 19:27	SK6W	JO78FM	501km
14/12/2004 20:01	SM4RPP	JO79HH	566km

14/12/2004 20:03	SM4DHN	JP6ØVA	594km
14/12/2004 20:22	SK4BX	JO79OF	584km
14/12/2004 20:26	ON4BBF	JO11VA	585km
14/12/2004 20:35	SM7EOI	JO86FP	529km
11/01/2005 18:00	SMØFZH	JO99HI	752km
11/01/2005 18:27	DF9IC	JN48IW	742km
11/01/2005 18:47	DB6NT	JO5ØVJ	629km
08/02/2005 18:01	SMØFZH	JO99HI	752km
08/02/2005 18:10	SM4RPP	JO79HH	566km
08/02/2005 18:18	SMØSBI	JO99CF	725km
08/02/2005 18:28	DF9IC	JN48IW	742km
08/02/2005 18:43	ON4DPX	JO1ØNT	628km
08/02/2005 18:55	DB6NT	JO5ØVJ	629km
08/02/2005 20:44	SA7W	JO86FP	529km
08/03/2005 18:00	SM4RPP	JO79HH	566km
08/03/2005 18:18	DF9IC	JN48IW	742km
08/03/2005 18:59	ON4PS	JO2ØKQ	588km
08/03/2005 20:29	G3XDY	JOØ2OB	600km
08/03/2005 21:14	SK4BX	JO79OF	584km

tnx for info Kjeld

OZ1IEP, JO55XU, wkd (>700km):

26/12 08:04	PA5DD	JO22IC	55/55	631km
26/12 08:35	PE1RCW	JO22MP	52/52	573km
26/12 09:32	SM3BEI	JP81NG	41/53	672km
26/12 09:53	PE1RLF	JO23CG	57/53	576km
26/12 10:13	SM3LBN	JP80IO	55/55	596km
26/12 10:16	DF9IC	JN48IW	51/51	800km
26/12 10:46	SK0CT	JO89XJ	52/53	531km
11/01 18:00	PA5DD	JO22IC	55/55	631km
11/01 18:10	DD0PX	JO30WR	54/55	631km
11/01 18:14	DB6NT	JO50VJ	55/55	607km
11/01 18:32	DK2MN	JO32PC	55/55	516km
11/01 18:47	DF9IC	JN48IW	52/52	800km
11/01 19:08	SK4AO	JP70TO	53/53	570km
11/01 19:12	SK0CT	JO89XJ	55/55	531km
11/01 19:25	DL6NAA	JO50VF	54/55	625km
11/01 19:54	DK7FU	JN49FT	51/52	711km
11/01 21:01	SM3BEI	JP81NG	52/52	672km
11/01 21:09	SM4DXO	JP70VO	52/52	573km
11/01 21:13	OH0JFP	KP00AB	41/52	667km
11/01 21:37	SM0FMY	JO89XI	55/55	528km
11/01 21:46	SM0FZH	JO99HI	59/59	555km
08/02 18:02	PA5DD	JO22IC	58/58	631km
08/02 18:03	PI4TUE	JO21RK	52/52	651km
08/02 18:16	DB6NT	JO50VJ	56/56	607km
08/02 19:14	DK7FU	JN49FT	52/ 55	711km
08/02 19:15	DF9IC	JN48IW	51/51	800km
08/02 19:53	OH0JFP	KP00AB	52/52	667km
08/02 20:15	SM4BRD	JP70LW	51/51	591km
08/02 20:16	SM0SBI	JO99CF	58/ 59	529km
08/02 21:40	SM3BEI	JP81NG	53/55	672km
08/02 21:41	SM0FZH	JO99HI	58/58	555km
08/02 21:43	SK4AO	JP70TO	54/55	570km
08/02 21:43	SM4L	JP70WS	53/55	592km
08/02 21:43	SM4DXO	JP70VO	54/55	573km
08/03 18:06	PA5DD	JO22IC	59/57	631km
08/03 18:06	DK2MN	JO32PC	56/56	516km
08/03 18:20	DB6NT	JO50VJ	59/59	607km
08/03 18:39	DD0PX	JO30WR	54/57	631km
08/03 19:31	PA5KM	JO11WL	59/59	720km
08/03 20:13	SM0FMY	JO89XI	53/54	528km
08/03 20:13	SK0CT	JO89XJ	52/54	531km
08/03 20:14	OH0JFP	KP00AB	53/55	667km
08/03 20:24	SK4AO	JP70TO	54/55	570km
08/03 20:26	SM3LBN	JP80IO	53/55	596km
08/03 20:27	SM4DXO	JP70VO	54/55	573km
08/03 21:37	PE1IWT	JO32KF	53/54	522km
08/03 21:39	DF6YL	JO31WS	55/55	527km
08/03 21:46	DF9IC	JN48IW	51/51	800km
08/03 21:48	SM3BEI	JP81NG	52/52	672km

tnx for info Carl

PA5DD (JO22IC) wkd Jan – Mrz ´05 (>500km):
OZ6CQ (JO55DI, 517km), OZ2PBS (JO55XJ, 602km), OZ1IEP (JO55XU, 633km), OZ7IS (JO65DQ, 638km), SK7MW (JO65MJ, 660km)
tnx for info Uffe

23cm + up

G3XDY, JO02OB, wkd

23cm (>500km):

15/01/2005	F8ALX	JNØ6	612km
15/02/2005	DF9IC	JN48	633km
05/03/2005	DF9IC	JN48	633km
05/03/2005	DK6AS	JO52	653km
05/03/2005	DL3YEE	JO42	500km
05/03/2005	DKØXA	JO43	602km
06/03/2005	DF2VJ	JN39	504km
06/03/2005	DKØSF/P	JN49	676km
18/03/2005	GM4LBV	IO86	568km
20/03/2005	DL3YEE	JO42	500km
20/03/2005	DF9IC	JN48	633km
02/04/2005	GM4LBV	IO86	568km
02/04/2005	OZ6OL	JO65	816km

13cm (>400km):

20/03/2005	G4ALY	IO70	416km
02/04/2005	GM4LBV	IO86	568km

9cm (>300km):

20/03/2005	DL3YEE	JO42	500km

6cm (>300km):

20/03/2005	F6DWG/P	JN19	302km
20/03/2005	DL3YEE	JO42	500km
20/03/2005	G4ALY	IO70	416km

3cm (>300km):

15/01/2005	F6DKW	JN18	373km
15/01/2005	LX1DB	JN39	445km
06/03/2005	DJ5BV	JO30	438km
18/03/2005	F6DKW	JN18	373km
20/03/2005	F6DWG/P	JN19	302km
02/04/2005	GM4LBV	IO86	568km

tnx for info John

Comment by G3XDY:
There was some good tropo to France on 15th January. After several tests LX1DB was worked on 3cm when conditions peaked, the LX1DB 3cm beacon (at a better QTH) was loud for much of the evening. On 2nd April we had some sea ducting which gave QSOs by reflection with GM4LBV on

23/13/3cm. I was beaming between 096 and 120 degrees, he was beaming 150 degrees, which puts the reflection points on the coast of the Netherlands. Signals on the direct path were much weaker. I also heard his 9cm beacon whilst beaming East.

G4RGK (IO91ON) wkd 23cm:

08.12.04 2036	DH9NBU	58 / 58	JO40XI
09.12.04 0840	DH8AG	59 / 59	JO31RL
09.12.04 0946	DL1SUN	559/559	JO53PN
09.12.04 0959	DF7JS	559/579	JO31JM
09.12.04 1317	DK1KR	59 / 59	JO53HW
09.12.04 1508	PE1BTV	53 / 59	JO22HK
09.12.04 1547	DM2ECM	55 / 54	JO62GJ
09.12.04 1547	DL7YS	56 / 57	JO63NM
09.12.04 1548	DF9QX	59 / 59	JO42HD
09.12.04 1551	OZ3ZW	57 / 59	JO54RS
09.12.04 1633	DK6AS	59 / 59	JO52JJ
09.12.04 1634	DK1KR	59 / 59	JO53HW
09.12.04 1635	DL7YC	55 / 55	JO62PK
09.12.04 1636	DC6LN	55 / 59	JO43JB
09.12.04 1639	PA3GFY	59 / 59	JO23SB
09.12.04 1652	DF6WE	559/579	JO31GO
12.12.04 1924	DL6NAQ/P	55 / 53	JO40XI
12.12.04 1933	OE5VRL/5	539/549	JN78DK
12.12.04 1935	DK0FLT	559/559	JN59FW
12.12.04 2140	DB6NT	55 / 56	JO50TI

rig: IC275, homemade tvtr, Cavity-Amp, 35 el yagi
tnx for info

OZ1FF, JO45BO, wkd (>700km):
23cm (>500km):

16/11/2004 18:48	DF9IC	JN48IW	742km
16/11/2004 19:54	SKØUX	JO99BM	737km
16/11/2004 20:03	SK4BX	JO79OF	584km
16/11/2004 20:13	G3XDY	JOØ2OB	600km
16/11/2004 20:41	SM4RPP	JO79HH	566km
16/11/2004 21:07	SM7LCB	JO86GH	529km
09/12/2004 13:37	DM2AFN	JO61WB	632km
09/12/2004 15:31	GW4DGU	IO71SW	920km
09/12/2004 16:11	ON4DPX	JO1ØNT	628km
09/12/2004 16:32	G4FEV	IO92RG	677km
09/12/2004 16:41	GØRRJ	IO91FE	806km
09/12/2004 20:07	DH1NFL	JO5ØVF	646km
10/12/2004 05:48	GØRRJ	IO91FE	806km
21/12/2004 18:54	DF9IC	JN48IW	742km
21/12/2004 19:01	DB5KN	JO31NB	509km
21/12/2004 19:11	DL3HRT	JO61AB	568km
21/12/2004 19:48	SK4BX	JO79OF	584km
21/12/2004 20:03	SM3LBN	JP8ØIO	749km
18/01/2005 18:46	DF9IC	JN48IW	742km
18/01/2005 19:40	SM4RPP	JO79HH	566km
18/01/2005 20:53	SM4FXR	JO79OF	584km
15/02/2005 18:56	DF9IC	JN48IW	742km
15/02/2005 19:44	SKØUX	JO99BM	737km
15/03/2005 20:03	DL3HRT	JO61AB	568km

13cm (>300km):

09/12/2004 13:43	DM2AFN	JO61WB	632km
09/12/2004 16:35	G4FEV	IO92RG	677km
09/12/2004 16:53	GØRRJ	IO91FE	806km
09/12/2004 19:35	G4PBP	IO82WO	746km
09/12/2004 19:40	DB1EPO	JO31HG	492km
09/12/2004 20:09	DH1NFL	JO5ØVF	646km
09/12/2004 20:28	PA3AWJ	JO21GW	471km
10/12/2004 05:58	GØRRJ	IO91FE	806km
10/12/2004 06:07	G4BRK	IO91DP	782km
25/01/2005 18:33	SM6AFV	JO67GQ	356km
25/01/2005 19:18	SK7MW	JO65MJ	310km
25/01/2005 21:31	SM7ECM	JO65NQ	314km
22/02/2005 18:35	SM6EAN	JO57WQ	326km
22/02/2005 19:06	SM7MW	JO65MJ	310km
22/02/2005 19:18	SM6AFV	JO67GQ	356km
22/02/2005 20:44	SM7ECM	JO65NQ	314km
22/03/2005 18:16	SM6BTT	JO58PI	361km
22/03/2005 18:32	PA3CEG	JO33FB	302km
22/03/2005 18:51	SM6AFV	JO67GQ	356km
22/03/2005 21:08	SK7MW	JO65MJ	310km
22/03/2005 21:27	SM7ECM	JO65NQ	314km

3cm (>300km):

09/12/2004 16:00	G8ACE	IO91IB	802km
09/12/2004 17:10	PAØEHG	JO22HB	456km
09/12/2004 18:58	G4BRK	IO91DP	782km
09/12/2004 19:12	MØGHZ	IO81VK	824km
09/12/2004 21:18	GØEWN	IO93GK	663km
09/12/2004 21:47	G3PHO	IO93GJ	665km
10/12/2004 09:29	DL4BBU/P	JO31LP	447km
10/12/2004 09:46	DH8AG	JO31RL	461km
10/12/2004 10:30	SM7GEP	JO77IP	462km
25/01/2005 21:36	SM7ECM	JO65NQ	314km
22/02/2005 19:20	SM6AFV	JO67GQ	356km
22/03/2005 18:21	SM6BTT	JO58PI	361km
22/03/2005 18:34	PA3CEG	JO33FB	302km
22/03/2005 18:53	SM6AFV	JO67GQ	356km
22/03/2005 21:09	SK7MW	JO65MJ	310km
22/03/2005 21:29	SM7ECM	JO65NQ	314km

tnx for info Kjeld

PA5DD (JO22IC) wkd 23cm:

15/01/05 18:03	OZ6OL	JO65DJ	620km
15/01/05 18:04	OZ2LD	JO54TU	552km
15/01/05 18:14	SK7MW	JO65MJ	660km
15/01/05 18:30	OZ1FF	JO45BO	451km
15/01/05 18:43	SM7ECM	JO65NQ	681km
15/01/05 18:53	SK7MW	JO65MJ	660km
15/01/05 19:30	OZ9KY	JO45VX	545km
15/01/05 19:35	DL3HRT	JO61AB	521km
15/01/05 20:01	OZ2OE	JO45VV	538km
15/01/05 20:16	G4BRK	IO91DP	442km
15/01/05 20:23	G4EAT	JO01HR	282km
15/01/05 20:55	SM7ECM	JO65NQ	681km
18/01/05 18:30	SM7ECM	JO65NQ	681km
18/01/05 18:33	SK7MW	JO65MJ	660km
18/01/05 18:39	OZ1FF	JO45BO	451km
18/01/05 20:10	M0GHZ	IO81VK	480km
18/01/05 20:12	G3XDY	JO02OB	238km
18/01/05 20:18	G4BRK	IO91DP	442km

and wkd on 13cm:

18/01/05 20:13	G3XDY	JO02OB	238km
18/01/05 20:22	G4BRK	IO91DP	442km

25/01/05 18:40	SM7ECM	JO65NQ	681km
22/02/05 18:35	SM7ECM	JO65NQ	681km
22/02/05 18:44	SK7MW	JO65MJ	660km
15/03/05 20:20	G4BRK	IO91DP	442km
22/03/05 18:51	SK7MW	JO65MJ	660km

tnx for info Uffe

SM7LCB, JO86GH, wkd (>1000km)
23cm (10.12.2004):
16:34 G4EAT (1155km), 16:38 DK3BU (672km), 16:53 DH1NFL (747km), 16:57 PA5DD (899km), 17:00 G3XDY (1101km), 17:04 DK6AS (573km), 17:16 G4DDK (1099km), 17:19 G3LTF (1273km), 17:21 DL3HRT (655km), 17:25 G3LQR (1082km), 17:27 PA3GFY (793km), 17:28 DL3YEE (693km), 17:50 DL4DTU (615km), 17:59 PA3AWJ (920km), 18:09 PA0EHG (907km), 18:12 SK0CT (353km), 18:19 DL3JIN (639km), 18:24 DK2AM (633km), 19:04 DL7YC (480km), 19:08 DL7VTX (462km), 19:11 DJ2DA (600km), 19:28 DM2ECM (507km), 19:33 SP1MAH (238km), 19:36 DH2UAK (514km), 19:44 DG2DAA (463km), 19:47 OZ5KM (420km), 19:49 OZ2OE (421km), 21:20 DG0RG (451km), 21:30 PA3DOL (836km), 22:12 DL1SUN (454km), 22:30 ES2RJ (608km), 22:54 OE5VRL (889km), 23:23 DF9QX (692km), 23:25 DL1SUZ (435km)
3cm (10.12.2004):
17:37 DL4DTU (615km), 20:00 OZ1FF (276km), 20:37 SM1HOW (178km), 21:24 DG0RG (451km), 21:52 DL1SUN (454km)
tnx for info Ulf

DG3XA, Andy, during IOTA-Activity

Personality – DG3XA

DUBUS wants to introduce active dxers from europe and overseas. Today: DG3XA – Andy.

After I have got my licence ticket in 1989 I concentrated on VHF. With the former legal power ot 75 watts output and 4 x 9 ele Yagi antennas on a BP60 tower I was able to collect DX experiences.

After changing to 2 long DJ9BV yagis for each 144 and 432 MHz with each 8.4m booms and full elevation I was very active via the satellites AO10 and AO13. I reached QSOs with around 120 DXCC's

The main focus from 1990 until 2000 have been the major VHF contests. With our clubstation DF0CB several times good rankings were achieved and many a was surprised about our signal from North DL.

Since the year 2000 I take part on almost all Nordic Activity Contests on Tuesday's evenings. I managed to reach some first places. Since 2 years I use the clubstation DC0NAC (Nordic-Activity-Contest) for this purpose.

Furthermore I am member of the DIG (5215) and have collected more than 30 awards. I can also show the UKW Trophy on 144 MHz with the number 179. I like taking part in these short local contests in DL and have won almost everyone on 144 and 432 MHz.

My current rig consists of an fully equiped IC 910 H and PA's from BEKO. The HLV600 for 2m and die HLV 280 for 70cm. On my portable site I use 2x 17 ele M2, 3x3 ele and sometimes another group for 2m.
On 23cms I start collecting first experiences with only 10 watt and 2x22 ele from M2.

During summer time I am often on expeditions. 1995 I have been qrv for the first time from Liechtenstein and 2003 another time with a group from DL from 2349 m a.s.l. We managed alltogether around 1000 QSOs on VHF.

I have made IOTA activities on 144 MHz from the islands of Römö, Helgoland and Rügen plus another lighthouse activity in 2003 and 2004 on 2m. 450 stations were worked this way.

RS Report for 2004

by Jonathan Naylor, ON/G4KLX

Introduction

The summer of 2004 will be remembered by most people as being one to forget, weather wise. This lack of good weather appears to have affected the RS season also, with the number of reported QSOs less than in previous years.

The rain scatter season for 2004 will not be regarded as a classic. Unlike previous years, very few exceptional contacts were made. True, the path between Italy and mid-Germany/Czech Republic was open again, but this appears to be an annual fixture rather than anything exceptional. It is ironic that this path, which was only discovered as recently as 2003, is no longer regarded as special. Certainly the rest of the reported QSOs are anything but special.

This report is based on less data than usual as one of the established log reporters failed to post any logs on the Internet, this were Henry DG1VL. Therefore my report is based on the logs from Rainer DF6NA [1], Claudio I4XCC [2], Karel OK1JKT [3], Kjeld OZ1FF [4] and Uffe PA5DD [5]. Together they reported 195 unique QSOs during the period which means that some of the following analysis is based on less data than I would have liked

Activity by Location

Of the 195 QSOs logged, there were 99 unique callsigns. These can be divided by country as seen in table 1 below.

Country	Number	
Austria	4	20.5%
Croatia	2	1.0%
Czech Republic	5	2.6%
Denmark	3	1.5%
England	1	0.5%
France	7	3.6%
Germany	51	26.0%
Holland	8	4.1%
Hungary	1	0.5%
Italy	4	20.5%
Luxembourg	1	0.5%
Poland	3	1.5%
Slovakia	3	1.5%
Slovenia	1	0.5%
Sweden	2	1.0%
Switzerland	3	1.5%

Table 1, Activity by Country

There are no big surprises here. Germany is still the most populous country for RS activity, as it is for just about every form of amateur radio activity. It would appear that activity in the Czech Republic has dropped compared to previous years, but that may simply be an artefact of the data. It is good to see the numbers in Switzerland returning to their previous values, with two new callsigns compared to previous years, with Arnold HB9AMH being a constant presence. The activity from my new home country is embarrassing. I know that activity is England and France is higher than it appears here, but the pattern there is of mostly portable operation during activity periods which do not normally coincide with good RS openings.

The distribution of the activity can be seen in figure 1 below.

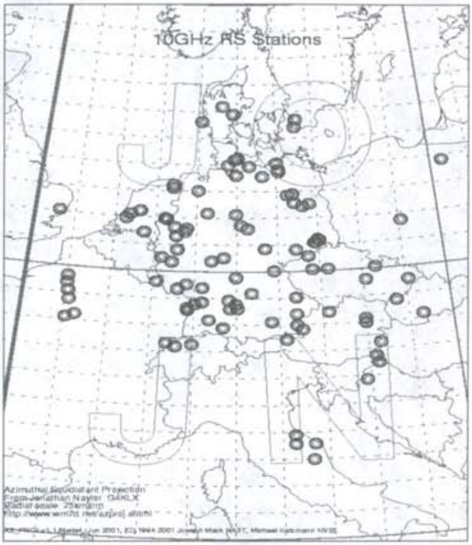


Figure 1, Locations of Active Stations

Activity by Mode

The distribution of modes is interesting, CW is still king of RS. This is as it should be since it is by far the most effective mode for RS, it will be interesting to see what the removal of the CW requirement in most European countries will eventually do to this pattern. Will we eventually see the rise of a new data mode for use in RS instead of CW? Table 2 gives the data below.

Mode	Number	
CW	150	76.5%
SSB	45	23%
FM	1	0.5%

Table 2, Modes Used

Andy, G4JNT. is pushing to design a data mode that can be used in both weak signal tropo work as well as RS. The idea being that CW is still very effective, but not so good for unattended random beacon monitoring. He has been doing work with wide shift (850 Hz) RTTY on 3cms as a guide to what is feasible. Something better than RTTY, incorporating some of the technology seen in JT65 will probably be the result. However I believe that CW will remain the prime mode for weak signal and RS work on microwaves for many years to come.

Activity by Date

The first recorded RS QSO in the logs analysed appeared on the 1st of May, this is late compared to most years when the first week in April is usually expected to produce the first QSOs. Considering the rest of the year, this fits in with the generally dreadful pattern of 2004.

Other factors may be at play here, Karel did not appear to become active until the 1st of May and that may have had a large affect on the results. The peak at the beginning of May is caused by the activity from the microwave contest that occurs then, and it shows as a spike. However the main period of activity is covered in the data and the results appear in figures 2.

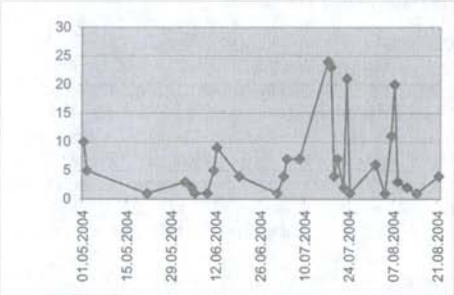


Figure 2, QSOs by Date

Surprisingly, despite the relative lack of extreme DX in 2004, there is a QSO by I4XCC with OM3BH at 669kms. Since the scatter point for this is quite well south, it is conceivable that the RS season may start earlier, but certainly allows for better distances earlier in the season. The activity in southern Europe is still relatively low and it is possible that more activity will show more opportunities for good DX earlier in the RS season.

The May microwave contest also has its part to play in the graph, causing high activity and many stations operating from good locations. The July contest, normally blessed with good RS conditions failed to deliver in 2004 and it doesn't show up as any noticeable peak.

Activity by Time

These graphs are always more problematic since activity is restricted by operators having to go to work for a living. Normally this is not too much of an issue as most RS openings, at least those north of the Alps, don't really start get interesting

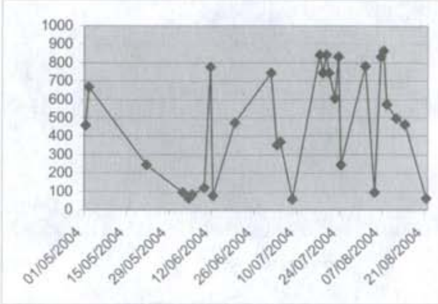


Figure 3, DX by Date

until late afternoon/early evening. Figure 4 appears to be proof of that, with the majority of the QSOs appearing at around 1600 UTC which is 1800 CEST, about the time that many operators are getting home.

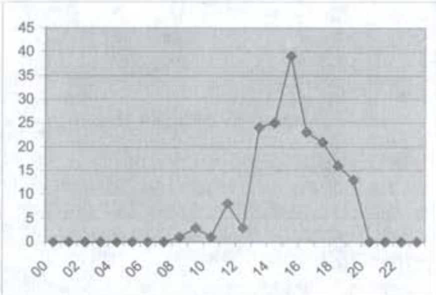


Figure 4, QSOs by Time

However figure 5 below, says some interesting things. Some good DX is being worked at times well before the normally expected peak. Also after the majority of the activity has disappeared, good DX is being worked. Looking at the raw data shows that the path between I4XCC and OK1JKT has been open as early as 1312 UTC and as late as 2209 UTC, truly remarkable.

The best DX QSOs reported were in the region of 850kms between OK1JKT with stations in JN18 and JN19. Interestingly F6DKW in JN18 was worked a number of times at a distance of 833kms. This is not a record, but it goes to show what can be done at the peak of the season, which according to these QSOs was at the end of July and the beginning of August, rather late in comparison to previous years. Unlike the QSOs with I4XCC these happened at the expected late afternoon/early evening time.

The I4XCC to OK1JKT Path

For the QSOs between I4XCC and OK1JKT, it would be great to know where the scatter points were located, thankfully QTFs were logged for just

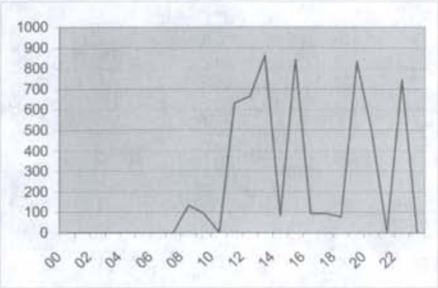


Figure 5, DX by Time

over half of the QSOs. This information is given in table 3 below.

Time	OK1JKT to I4XCC (degrees)	I4XCC to OK1JKT (degrees)
13:58	173	20
14:05	167	1
15:08	200	34
16:41	197	348
22:09	171	5

Table 3, I4XCC to OK1JKT Bearings

Without calculating the scatter points, it can be seen that no one scatter point or region is in use. The distance involved is large, but not beyond normal RS propagation so it would appear that no, or very little, tropo enhancement is evident.

The path appeared to open many times during the season. A total of ten QSOs were made and their dates, as well as the times of their first and last QSOs on a given day. Someone with access to weather maps for the given days could probably make more sense of the raw data presented here. Table 4 below gives the relevant information.

Date	Number	First	Last
2004-07-01	1	14:05	14:05
2004-07-17	2	15:08	16:30
2004-07-18	1	22:09	22:09
2004-07-19	2	13:12	13:58
2004-07-20	1	16:41	16:41
2004-07-23	1	19:19	19:19
2004-08-01	2	15:30	17:15

Table 4, Dates and Times for the Path

Further Study

It is good that people are logging QTFs and passing them during QSOs. I hope that one day it will be possible to use the data so far collected to plot the locations of the prime scatter points. It is a well known fact certain areas attract storms, usually hilly or mountainous areas, and it would be good to be able to plot which ones are particularly interesting for amateur use.

The trans Alpine scattering point are still not fully understood or bring exploited it would appear. This is not helped by the lack of activity in Italy, if activity were somehow to be increased then it would be very interesting to see what opportunities would be available for DX, outside the expected season, as well as unusual times.

Conclusion

It is hoped that 2005 will be a better season than 2004 was, if only so we can enjoy more sunshine ! But even in a relatively poor season it is still possible to see evidence of paths that are not being fully utilised.

References

1. http://www.df6na.de
2. http://members.lycos.co.uk/i4xcc/
3. http://www.qsl.net/ok1jkt
4. http://www.oz1ff.dk
5. http://home.hccnet.nl/uffe.noucha

Microwave North America

The big event this quarter were the three 47GHz EME QSO's that VE4MA, W5LUA, and AD6FP had with RW3BP W5LUA and VE4MA are using 2.4 Meter offset feed dishes, AD6FP used a 1.8 Meter slightly higher accuracy offset feed dish. Beamwidths were almost exactly the same diameter as the moon. All three stations used 30 watt TWT's and 4 dB NF LNA's. While all three stations monitored Sergi's signals in DSP, his 100 Watt+ signals were copiable by ear for all the North American Stations. RW3BP used DSP software he has developed that integrated complete calls. Calls were sent at 12 Words per Minute and showed about 300 Hz of Doppler Smear. All stations could maintain 100 Hz frequency accuracy for 10 minutes at a time to allow the DSP software to integrate the signals. Even the IF's were automatically tuned by computer to correct for Doppler Shift.. At this time the North American stations are several dB short of making a North America to North America QSO. But better preamps and DSP techniques are in work. There also seems to be a drop in moon noise just after a new moon. Look for more QSO's in the near future, and don't be surprised if the QSO's are when there is a New Moon at Perigee. Polarization: All stations used linear polarization. Sergi used vertical linear polarization, the North American stations used Horizontal Linear polarization. With the stations roughly 90 degrees apart in latitude, this gave the stations the same relative polarization off the moon. VE4MA, W5LUA and AD6FP all used WR-22 waveguide transfer relays to switch between TX and REC. RW3BP used separate feed horns for TX and REC with his transverter mounted on a sliding tray. Between TX and REC the entire transverter was moved several cm putting the correct feed horn at the focus of the dish.

Congratulations to Sergej, Al, Barry, and Gary for their excellent technical accomplishment. And I can confirm rumors that they are now collection 80 GHz parts. (WA5VJV)

(Ed: this text was received after deadline, sri for the unusal position!)

6m News

Reports, Expeditions, Infos

Editor: Joachim Kraft, DL8HCZ

Expeditions and News:

1S0 Philippine Spratly Islands: 4F2KWT etc were qrv in March and April as DX0K also on 6m. They had some good openings into JA/HL. They even tried EME but no success.

3DA Swaziland: K5LBU etc. will be qrv also on 6m from July 9th to to 17th.

5A Libya: IW5DHN said that he may be active from 5A this summer.

5T Mautitania: Nicolas, 5T5SN, acitivated the new 5T5DUB beacon on 50.028 MHz in the end of March from his home QTH. QTH will change to a better one soon. Locator will remain IK28AC.

6O Somalia has a 6m allocation allowing 3 KW PEP. Just perfect for an expedition...

9Q Rep. Congo: SM5DIC is qrv until the end of 2005 as 9Q0AR. Loc. JI75. QSL via SM5BFJ.

9V Singapur: PF5X is qrv as 9V1DX until October 2007 also on 6m. Rig:100w + 5/8 vertical.

Africa: G4KUX considers after being back to G from YA another long term QRL in an African country like 9L, C5 or ET.

A6 U.A.E.: A61Q - a resident - is very active on 6m now. Loc. LL75. QSL via EA7FTR.

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

CN Maroc: HB9HLM plans to be qrv again as CN2DX on October.

CY0 Sable Isl.: W8GEX, K8LEE + W9IXX will be qrv from July 27th to August 3rd as CY0AA, incl. 6m. QSL via K8LEE.

CY9 St. Paul: VY2SS and others will be qrv from June 7th to July 7th 2005 on 6m as CY9SS with a QRO station. Loc.: FN97. www.cy9ss.com

EY Tadzik: EY8MM reports that he will be soon qrv from a new hilltop QTH in MM48 on 6m with a 7 ele Yagi and 1KW. He reports also that EY8CQ has no 6m antenna at the moment and EY7AF is qrv but only with a vertica.

FM Martinique: F5JKK is qrv on 6m since August 2004 as FM5JC from Martinique for 3 years. Locator is FK94LO.

FP Miquelon: FP/K9OT+KB9LIE will be qrv from July 29th to August 7th also on 6m with 100w + Yagi. QSLs via HCs.

FP/N6RA will be qrv from June 9th to 21st mainly for 6m. QSL via HC.

FR/G Glorioso: F5OGL, F5JKK, F5CW, F5IRO, F5PTM etc. plan a big expedition now for October/November incl. 6m with WSJT-EME. QSL via F5OGL.

HR Honduras, Utila Isl.: HR9/W7AV, K6JEN +KB7TX will be qrv on 6m from June 18th to 30th. There will be a breakable beacon with the call HR9/W7AV on 50.110 MHz. w7av@olypen.com .

HS Thailand: Hiroo, ex XW0X, has moved from Loas to Thailand. Anyway there is no 6m allocation in HS yet.

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. – WB9CIF, K9JE/J68AR and N9AG/J68AS plan to be qrv from June 18th to July 7th on 6m with 600w + 7 ele from a good QTH to EU. Loc. Ist FK94mc. May be also /p operation from FK93 if condx are good.

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

OJ0 Market Reef: OZ1AA, OH6GDX, SM3WMV + KU5B plan to be active as OJ0YC in the last week of July also on 6m (100w+ 5 Ele.) Tropo: 50.120, JT6M 50.220 MHz. QSL via OH6GDX.

OX Greenland: OZ1DJJ will be active during this summer in July / August as OX3LX from the east-coast (HP15EO) on 6m (1 KW and 5 or 7 ele. And on 4m.

PR8 Brasil, **GI16GL**: PR8/CT1DYX is qrv on 6m from his new residential QTH in the Amazonas area. He has left Portugal for ever.

S2 Bangladesh: S2/EI3IO plans to be qrv from June 17th to 19th on 6m. S21AM a resident plans to be qrv with 100w and 5 ele.

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

TT Chad: PA5M is qrv as TT8M until at least mid August. Loc. KK03JT. QSL via PA7FM.

V3 Belize: W6JKV will to be qrv with QRO on 6m from June 23rd to July 6th as V31IV.

VO Labrador: VE3IKV plans a 6m trip through several squares in eastern Labrador (FO.., GO..) during the first two weeks of July. Call VD2X. QSL via HC.

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

VP8 Falkland: A local group is planning a 6m EME activity. They also plan to erect a 6m beacon with the callsign VP8VHF.

VQ9 Diego Garcia: G4FJK is qrv as VQ9JK until the end of 2005 on 6m. Loc.: MI62EQ.

YA Afghanistan: G4KUX went qrt as YA4F in March 2005. – LA5IAA is qrv for the next 2 years as T68G and may be active also on 6m.

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

ZB2 Gibraltar: ZB2/G0JJL will be qrv on 6m and 4m from June 4nd to 14th. No MS.. Email: john@gibraltar.f9.co.uk

ZD8 Ascension: G8WVW is qrv until June 2006 as ZD8I. Loc. II22TB.

IN69 From July 25th to August 1st G0JVG and otheres will be qrv from Scilly Isl. Om 6m they will have a 7 ele yagi and PA.

IO43 EI7IX plans to be active again this summer with short trips. 6m, 4m and may be 2m.

IO66 Lunga Isl.: MM0BQI/p will be qrv from June 2nd to 5th on 6m.

IP80 G4ODA and G1GSN will be qrv from June 5.-17. as GM4ODA/p and GM1GSN/p from Foula Island. They will be active from a better QTH than in 2004. 6m, 4m, 2m and may be 70cms.

JP32 LA7THA is qrv from his home on 6m until the beginning of June and again from mid August.

He plans some activity from **JP22XF** as LA7THA/m on short term notice when condx are good.

JP... LA/SM6CMU will be qrv in July again from northern LA (Lofoten area). May be he will also try for JW (Bear Isl) if he can get a ferry in August

KP27, KP08, KP09 The OH8K group will be active from June 4th to 12th. 6m QRG will be 50.172 MHz.

KP39 + 49 OH8K plans to activate these squares during Perseids in mid August.

/MM G0KZG/MM, Andy, will be active again from June 17th to July 17th from the North Sea. He will be active also on 6m this time.

/MM PC7CW/MM (also M0HEN/MM), Theo, has changed plans and will not be active from the Baltic and Mediterranean Seas in June and July.

/MM + IO37 etc: A group from GM will try to activate Rockall island (IO37) between June 14th and 21st. Call: **MS0IRC/p**. On the way from the Orkneys to Rockall the will be active as **MM0CWJ/MM** from **IO47, IO58** etc. The are active on 6m. QSLs via G0HXN. Infos on the web at:
www.therockalltimes.co.uk/rockall/history.html

/MM LA7THA/MM will be qrv from June 8/9th. For 5 weeks on 6m from the north sea heading JW (JQ94) and Barent Sea. Rig: 100w and loop / long wire.

/MM LA5WJA and LA7DFA/MM plan to be active in late June (probably June 17th to 24th) from JP33, 43, 54 and 44 on 6m. May be also JP34. For latest info check www.qsl.net/la7dfa

Beacons

UN1SIX, MN83KE, 50.021 MHz is qrv again since the end of February.

F5TND/B, IM96OL, F5TND runs a temporary beacon on 50.207 MHz, with 100w and 18 ele yagi beaming 260 deg for US/Carribean.

I8EMG, JM89BJ, 50.056 MHz is a new beacon.

IT9X/B, JM78SG, 50.057 MHz, 10w, Loop, qrv since March 2005.

ZD7VC/B, IH74DB, 50.007 MHz, will be qrv soon.

AH8A/B, AH45OP, American Samoa, will be qrv soon.

VP8SIX, GD08, beacon project for 2005/2006 by a group of OPs on the Falkland Isl.

HP1DCP/B, 50012.5, FJ09FA, 5 W, Dipole N/S, new beacon qrv since April 2005.

UT7UV/A is a new beacon on 50.082,5 MHz. KO40VK, 10W, ¼ GP, 20m a.g.l.. Will change to 8W and 5/8 GP, 35 m a.g.l. in the near future.

Algarve beacon: CT1EPS and EA7KW plan to erect a 6m beacon this summer. Locator: IM67 The beacon will have good power and will be beaming to the U.S.

LU5EGY/B is a new beacon on 50.038 MHz from GF05.

SR5SIX is qrv on 50.023 MHz from KO02LL with 3 w and a dipole (SW/NE) again since April 2005 after a break of a couple of years.

4m News

Reports, Expeditions, Infos

Editor: Joachim Kraft, DL8HCZ

6O Somalia has a 4m allocation (70.0 – 70.5 MHz) allowing 3 KW PEP. Just perfect for an expedition...

ZB2/G0JJL Expedition June 2005

G0JJL plans to be in Gibraltar from June 4 to 14th and intends to operate on 4m ssb/cw and also 4m/6m crossband with a decent aerial setup and 100W on 4m. Adrian plans to go there for another 2 weekends during the summer Es season.

IP80 G4ODA and G1GSN will be qrv from June 5.-17. as GM4ODA/p and GM1GSN/p from Foula Island. They will be active also on 4m.

4m in YO, LZ, YU

is not permitted yet. Anyway YO4FYQ is very active on 4m with 70 W and a 4 ele Yagi. He states that there may be a chance for licences in 4 or 5 years. Also at least one other YO2-station was active on 4m last summer. LZ2HM (KN22) was also active last year and YU7EF and YU1EU (both KN04) were also active.

OX – Greenland

OZ1DJJ will be qrv as OX3LX from HP15EO in July / Ausgust also on 4m He will erect the new 4m beacon OX4M in HP15EO. The proposed QRG is 70.012 MHz.

Sporadic E
144 MHz – Reports

All QSOs with "59 59" reports unless otherwise noted, hrd = also with 59, times UT

April 28th, 2005

A big surprise: About 80 minutes of Sporadic E in the end of April are not so common! For a Thursday at 1352-1517 UT activity was quite o.k. but much more would have been possible for sure because many stations were not prepared for an opening yet… Wkd distances down to 1100 km indicate quite a high MUF already. First QSO of the 2005 season seems to be DL6BF – IS0GQX at 1352.

DB4BIN, JO42co, wkd:
1402 IS0GQX JM49OH 1479km
Rig: 100W + 9 ele

DF5DL, JN58tb, wkd:
1443 EA5AFP IM98VX

DK5DQ, JO31ph, wkd:
1417 IWØULG JM49NH 1341
1419 ISØGQX JM49OH 1342
1436 IWØUEI JN4ØGR 1180
Not sure if IS0PGF heard me completely on 145.500
in FM... Many qsb on his signal.

DL1EAP, JO31ik, wkd:
1432 IW0UEI JN40GR
1435 IW0ULG JM49NH hrd
1445 IS0GQX JM49OH
Rig: 12ele M², 500W

DL6BF, JO32qi, wkd:
1352 IS0GQX JM49IS
- first 2m-ES QSO of 2005
1412 IW0ULG JM49NH
1432 IW0UEI JN40GR
1434 IS0XDA hrd 53 JM49NG

EA4EOZ, IN80, wkd
I've heard about a dozen of HA stations, HA0HO and HA5LV with booming signals. Best DX for me HA0HO, with 2174Km. Conditions here 2x5/8 + 5 watts

EB1EHO, IN73dm
1420 YZ7NOU JN94TX 2015
1421 YZ1KU KNØ4ET 2076
1425 9A3QB JN95HN 1934
1426 YU7AS KNØ5DJ 2064
1427 YU7EW KNØ5HP 2089
1428 9A2QG JN95CI 1902
1429 YU7BCL KNØ5FW 2074
1429 9A6JNJ JN85TK 1856
1434 YU7MS KNØ5FJ 2077
1435 S51CAB JN76HB 1624
1436 S57TA JN76GF 1619
1438 YU1EV KNØ4FR 2083
1443 S57C JN75 1655+-
1448 S57SA JN76 1659+-
1449 S57EA JN76HE 1625
1455 9A2KK JN85OV 1823
1456 9A4VW
100w ant 3.5wl

EA5AGR, IM88wv, wkd:
1409 HA6NM JN98PB 59+ 1996
1409 HA6NB JN98PB 1996
1418 OE8HOQ JN76DO 1586
1421 HAØHO KNØ7SU 2144
1424 OK2PMX JN99A 1977
1425 OK1POI JN99BL 1987
1428 OK2PM JN49AO 1437
1429 SP9AI JN99MT 2063
1440 SP9KDA JO9ØEU FM2079
1445 DL3FLA JN67LU
1450 SP6HED JO8ØI 1955
1450 SP6IWQ JO8ØHK 1950
1451 SP9KDA JO9ØEU 2079
1452 SQ9CWO JO9ØFV 2087

EI5FK, IO51rt, wkd:
1409 I8MPO IO70FP 57 55 2147km The only one for me today, high winds to 90 km did not allow raising of mast, very happy as last years ES on 2m commenced here July 2nd

F5MGD, JN07aw, wkd:
1400 IZ8EDJ JN70
1411 I7CSB JN71
1415 IK5YJY 52/59 JN53
1417 I8MPO JN70
1420 IK7XLW JN80
1422 IK7UXY JN90

F5VHX, JN04ft, wkd:
1409 IK6XGR JN63
1412 IW4ARD JN64
1413 IW4EGP JN64
1414 IK4ICZ JN64
1414 IW4BET JN54
1415 I4BME JN54
1418 YZ7NOU JN94
1422 YZ1KU KN04
1423 9A6JNJ JN85
1427 YU7AS KN05
1429 YU7EW KN05
1429 YT7AT ????
1430 9A2QG JN95
1432 YU7MS KN05
1432 YU1EV KN04
1436 9A3QB JN95
1436 9A3IJ JN95
1438 S51CAB JN76
1440 YT7EK JN95
1440 YU7BCL KN05
1441 9A2KK JN85
1445 S57C JN75
1450 9A4VM JN85

F6FHP, IN94tr, wkd:
1445 IK6XGR JN63MP
1448 IW4EGP ? hrd
1425 YZ1KU KN04ET
1428 YZ7NOU JN94TX
1431 YU7BCL KN05FW
1432 9A3QB JN94HN
1433 YU7AS KN05DJ
1433 9A2QG JN95FH
1435 YT7AT KN04HV
1435 YU1EV KN04FR
1436 YU7MS KN05FJ
1437 9A6JNJ JN85HK
1439 YU7EW KN05HP
1449 YU7AOP KN05EJ
1450 S51CAB JN76HD
1451 S57C JN75QX
Most stations with solid S9, I heard the last weak signals from YU/9A till 1510z.

F9OE, IN78qg, wkd:
1415 I7CSB JN71QQ
1425 IK7UXY IN90DC hrd only
1435 IK6XGR JN63MP
Rig: 100 W and 9ele

G4FUF, JO01GN, wkd:
1413 9H1AW JM75
1417 IH9/IW9ZVU JM56XT
1438 IT9PMZ JM68PE
1439 I8MPO JN70FP
1441 IK7YNY JM99DX

G4LOH, IO70JC, wkd:
1359 IZ8EDJ JN7ØLO 1887
1403 I8MPO JN7ØFP 1852
1403 IK8BIZ JN7Ø 1898+-
1403 IK8ETN/P JM89CH 2066km FM
1403 IW8PGV FM

1413 IK8YOQ JN7ØGR 1851
1418 IK5YJY JN53PG
1418 IC8FAX JN7ØCN 1842
1419 I7CSB JN71QQ 1838
1419 IWØGEY JN61FX 1629
1420 IK7XLW JN8Ø 2028+-
1426 IZ7ERA JN8ØET 1964
1431 IK7UXY JN9ØDC 2139
1432 IZ7EQV 59 59 1672+-
1442 IK7XLW JN8ØFT 1969
1442 IK7XJW JN9ØCK 2111
1448 SV8CS KMØ7 55 NC 2466

G4RRA, IO80bs, wkd:
1404 I8MPO 57 57 JN70FP
1407 IZ8EDJ JN70LO
1408 IK8BIZ 55 55 JN70
1413 IC8FAX JN70CN
1415 IZ0CBD JN61FO
1417 IW0GEY JN61FX
1419 IK8YOQ JN70HR
1442 I7CSB JN71QQ
I also heard IK7XLW and IK7UXY but either side of .300 was complete bedlam, so failed to work them. The opening lasted about an hour here, I also tried on FM but nothing!
Rig: 2x10 ele, 400 watts

G8GXP, IO93fq, wkd:
1425 IW9AZJ JM68OD
1429 9H1AW JM75EX
1440 IT9VFP in FM 145.500
Loud signals but very heavy qsb, except on IW9AZJ who was 59+ for 55mins solid.

GJ0JSY, IN89xe, wkd:
1408 IZ8EDJ JN70
1409 I8MP0 JN70
1412 IK8BIZ JN
1413 IK8YOQ JN70
1416 IK7UXY ??
1434 IK7XLW JN80
1437 I7CSB JN71
1447 IK7XWJ JN90
Rig: 120w + 17 ele double quad

HA6NM, JN98pb, wkd:
1405 EA5AFP IM98VX
1412 EA5AGR IM88WV

HA6NN, JN98vc, wkd:
1356 EA5AFP IM98vx 53 59
1410 EA5AGR IM88wv hrd 57
Rig: 50W, DL6WU

IKØWGF, JN52vc, wkd:
1420 G3PGM IO80xs

1423 F1MRP JN18dl
1426 G3JHM IO91gj
1432 G0BVD IO82uc
1436 G4DCV IO91

IS0XDA, JM49oh, wkd:
1427 PA2CHR 55 59 JO22XA
1430 PD3UX 55 55 JO22LE
1435 PA0PVW JO22VA
1438 PA3CEG 51 55 JO33FB
1440 PC1T 55 55 JO33GA
1441 PA1YL 55 55 JO33FB
1443 PA1GYS 59 57 JO22WW
Hrd more DJ-DK, but not in log.
Rig: TS790, Ant GP vert 6/8 lambda, 25 watt ERP.

IW0UEI, JN40gr, wkd:
1433-1450z: PC1T, DL6BF, PA3CEG, DL1EAP, PA3C, DC6IA JO30, DL1YAW JO41, DK3EE JO41GV, DK5DQ, PA3COB, PA1GYS, DC6BB, PE1GNP, PA1LA, DG5YIL, DL0SE JO31, DC9YC JO31.

IK7UXY, JN90dc, wkd:
1421 F5VGG IN88EO 1972
1422 F5MGD JNØ7AW 1693
1422 F6EAS IN98LV 1810
1423 F1BKM IN98MV 1804
1430 F8BEJ 1593+-
1430 F6AID IN88IV 1961
1431 FØCYF IN98DC 1820
1431 G4LOH IO7ØJC 2139
1433 GJØJSY IN89XE 1890
1439 F4SGU IN97GV 1794
1443 F6CIU JNØ8GE 1671
1449 F5XY IN88HV 1966
1453 G8ARM IO7ØGN 2175

OK1COM, JN79gx, wkd:
1433 EA5AFP IM98VX 1686km
1442 EA5TE IM99TL 1652km
Rig: 80W, 8dB log per.

OK1DFC, JO60tm, wkd:
1417 EA5AFP IM98VX 1683 very strong S9+40dB
1432 EB5EIB IM98VX1683
1441 EA5TE IM99TL 1650
1441 EA5/F1UJS JM08UP 1613 2W out and 2el. colinear only
1444 EA3TA JN11AM 1344
1450 EB5HRX IM99TL 1650

OK1FPR, JO80ce, wkd:
1426 EA5AFP IM98VX
1437 EB5EIB IM98VX
1442 EA3TA JN11AM

OK2PM, JN99ao, wkd:
1439 EA3TA JN11AM 1530
1419 EA5TE IM99TL 1834
1412 EA5AFP IM98VX 1862
1426 EA5AGR IM88WX 1981
Rig: 100W + 9ele

OK2PMX, JN88iw, wkd:
1411 EA5AFP IM98vx
1420 EA5TE IM99tl
1422 EA3TA JN11am
1423 EA5AGR IM88wv

OK2POI, JN99bl, wkd:
1416 EA5AFP IM98VX 1864 on back of my ant
1419 EA5TE IM99TL 1836
1427 EA5AGR IM88WV 1991 max. in QTF 225! (direct QTF is 241!)

ON4IMM, JO11ub, wkd:
1418 9H1AW 55 55 IM75EX
1421 IW9AZJ 59 57 JM67RO most of the QSO over my head

PA1LA, JO32ls, wkd:
1412 IS0GQX 57 JM49
1440 IW0UEI JM49
nice opening, but low activity

PA2CHR, JO22xa, wkd:
1417 IS0GQX JM49OH
1421 IW0ULG 59 55 JM49NH
1423 IS0XUM 55 59 JM49NG
1426 IS0XDA 55 59 JM49OH

PA5DD, JO22IC, wkd:
1414 IW9AZJ JM68OD 1686
1421 IS0QGX JM49OH 1463
1429 IW0ULG JM49NH 1462

PD0EBF, JO21lq
1437 IS0GQX JM49OH #DXCC

PD0RFU, JO32lt
IS0GQX JM49OH 55 55 #sqr
hrd IS0SDA, IW0ULG
Rig: 150 watt, 2 x 19 ele

PD2JVE, JO22vj, wkd:
1430 IW0ULG and IS0GQX

PD3UX, JO22le
1430 IS0XDA 55 #DXCC
1433 IS0GQX 55

PE1AHX, JO21os, wkd:
1420 IS0GQX JM49OH
hrd IW0UEI

Rig: 400W and 3wl.

SP2JYR, JO92gp, wkd:
1435 EA5/F1UJS 55 57 JM08up
1442 EA5AFP IM98ux

SP6GWB, JO80hk, wkd:
1428 EA5/F1UJS JM08up
1431 EB5EIB IM98vx
1433 EA5AFP IM98vx
1437 EA5AGR IM88wv
1439 EA5TE IM99tl
1439 EA3TA JN11am
1451 EB5HRX IM99tl
Rig: 4x16 el DJ9BV + GS35

SP6IWQ, JO80hk, wkd:
1428 EA5/F1UJS 59 JM08UP
1431 EB5EIB 59 IM98VE
1434 EA5AFP 59 IM98VX
1436 EA5TE 59 IM99TL
1439 EA3TE 59 JN11AM
1447 EA5AGR 59 IM88WV
1450-1510 hrd EB5HRX QSB
Rig: 100w + 16 ele

S51CAB, JN76hd, wkd:
1435 EB1EHO IN73DM 1626
1439 F5VHX 59 55 JN04FT 1113 km
1450 F6FHP IN94TR 1180
Rig: 100w + 15el, Op S52AA

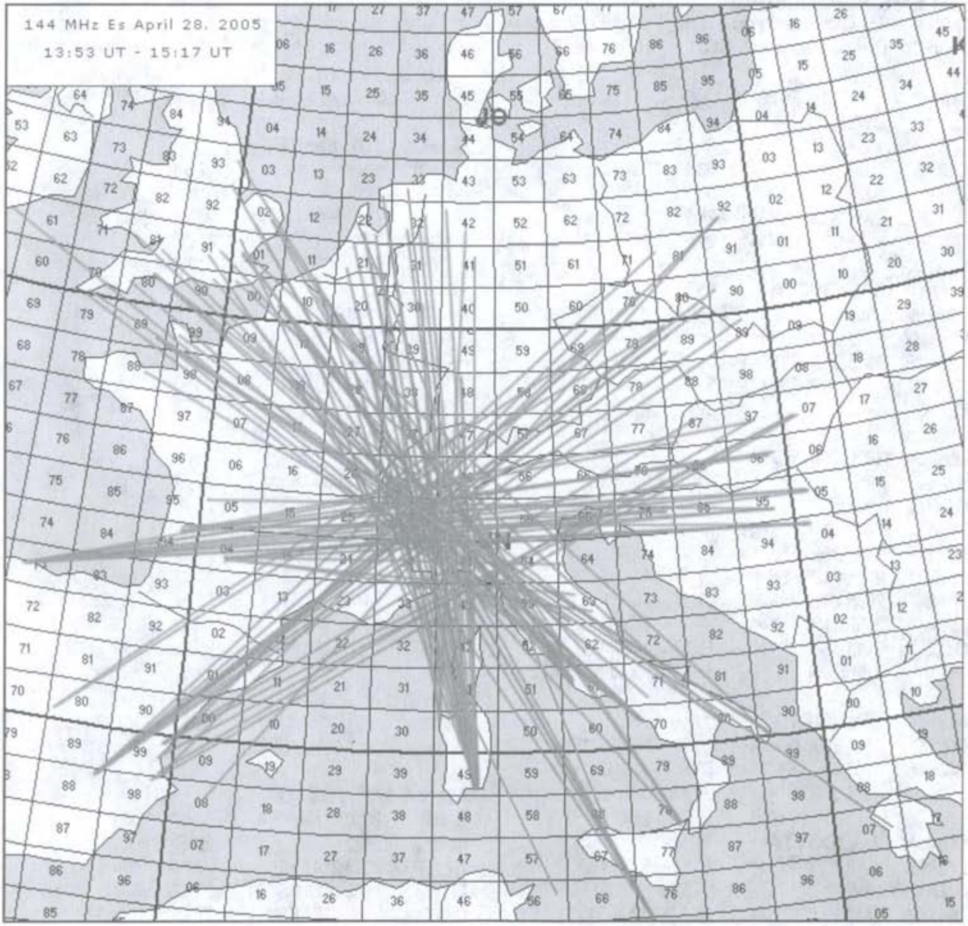
S57C, JN75qx
1445 EB1EHO 55 51 IN73DM
1448 F5VHX 55 59 JN04FT
1453 F6FHP IN94TR
Rig: 12 ele + 500w

YU7EW, KN05hp, wkd:
1427 EB1EHO IN73dm 2088 km
1429 F5VHX 59 55 JN04ft 1577 km
1433 F1RHS JN03pv 1534 km
14.38 F6FHP IN94tr 1643 km
Rig: GI7B + 10 ele fixed QTF270

At 1416z DG3GAG, JN47 reported IS0GQX, JM49 with 59 with a QRB even below 1000km indicating a MUF many MHz above 144 MHz.

tnx to DK5YA for the map!

Map 2m Es April 28th



G0KZG/MM Report Spring 2005

Andy Adams, G0KZG, was qrv again on 2m maritime mobile in March 2005 from the sea southwest of Cornwall.

Andy writes: "Unfortunately, I was unable to operate for the last 5 day cruise prior to me leaving the ship. The scientists for that trip were insisted that my equipment was removed from the room on the ship that I use, as they were afraid it would cause interference to their instruments? It was not worth dismantling all my equipment, and then setting it up again somewhere else just for 5 days.

My next active trip will be 17th June 2005 - 17th July 2005 - working around the southern part of the UK and Ireland. I hope also to be active on 6m.

Best 73's, Andy - G0KZG

2m Log G0KZG/MM

QSOs SSB/CW via Tropo and FSK441 via Meteor-Scatter, underlined SQR = "100% wet"

March 9th 2005, IN79KV

Call	UTC	RST TX RX	Locator
G0CUH	1957	59 59	IO70LG
G4RRA	2000	55 57	IO80BS
EI5FK	2011	51 53	IO51RT
OZ1LPR	2030 2050 FSK441	26 27	280mS S4
LA4YGA	2102 2122 FSK441	26 27	360mS S4

March 10th, IO60JA

G3JHM	0508	559 559	IO91LC
PE1AHX	0515 0545 FSK441	26 26	NC
OZ1LPR	0545 0607 FSK441	26 27	2690mSS5 C
I6WJB	0625 0658 FSK441	27 27	NC NO RRRR
EI5FK	1909	59 53	IO51RT

March 11th, IO61OT

G0CUH	1852	57 --	IO70LG
G4KWQ	1904	57 57	IO92AQ
DC9YC	1934 1944 FSK441	27 26	320mS S5
SP2JYR	1947 2009 FSK441	27 26	4s S5
DL7FF	2014 2035 FSK441	27 27	480mS S5
SP6GWB	2035 2050 FSK441	27 27	400mS S5
S53J	2050 2120 FSK441	27 --	NC
G4DEZ	2115	55 57	JO03AE
G8VHI	2116	55 55	IO92FM

March 12th, IO61AS

DF2ZC	0517 0600 FSK441	26 26	NC No RRR
G3JHM	0533	559 569	IO91LC
S53J	0617 0655 FSK441	27 27	380mS S5

March 12th, IO51TA

EI5FK	1819	55 54	IO51RT
G4DEZ	1828	52 52	JO03AE
LA4YGA	1847 1932 FSK441	26 27	320mS4

March 12th, IO50TV

G4HGI	1934	54 54	IO83PL
G4DEZ	1945	51 51	JO03AE
OZ1LPR	1956 2016 FSK441	27 27	400mS S5
G0CUZ	2016	56 55	IO82WM
G3JHM	2018	539 539	IO91LC
G7RAU	2025	559 579	IO90IR
G4RGK	2027	519 559	IO91ON
EI5FK	2035	56 55	IO51RT
G8VHI	2053	53 53	IO92FM
OK1DFC	2059 2108 FSK441	27 26	360mS S6
SP6GWB	2108 2123	27 26	220mS S6
DC9YC	2123 2137 FSK441	27 26	340mS S5
SP2JYR	2138 2157 FSK441	26 –	NC / NIL

March 13th, IO50VJ

DF2ZC	0455 0504 FSK441	26 26	1560mS S4
G4FUF	0458	559 559	JO02
PA1GYS	0507 0518 FSK441	26 27	300mS S4
G3JHM	0529	539 539	IO91LC
DL8GP	0534 0547 FSK441	27 27	400mS S5
PE1AHX	0548 0558 FSK441	27 27	280mS S5
DG5AAG	0559 0619 FSK441	27 27	300mS S5
OZ8ZS	0621 0637 FSK441	27 27	420mS S5
PA0JMV	0638 0655 FSK441	27 27	340mS S5

March 13th, IO50TT

G4RRA	1805	57 59	
G4IGO	1810	519 559	IO80NW
DF8IK	1819 1900 FSK441	26 26	200mS S4
G0CUH	1833	57 57	
F8DBF	1844	519 559	IN78RI
EI5FK	1902	55 --	IO51RT
DJ7OF	1909 1929 FSK441	26 27	160mS S4
PA2CHR	1931 1950 FSK441	27 27	400mS S5
G4LOH	1950	59 59	IO70JC
EI7IX	2004	53 53	IO53
EI5FK	2009	59 59	IO51RT

March 14th, IO60GW

DJ9YE	0458 0520 FSK441	26 27	420mS S4
DF8IK	0529 0550 FSK441	27 26	300mS S5

March 14th, IO61OV

OZ8ZS	1812 1849 FSK441	27 27	1160mS S5
G4DEZ	1841	57 57	JO03AE
EI5FK	1843	55 52	IO51RT
OE5MPL	1853 1932 FSK441	26 26	280mS S3

March 14th, IO62PA

EI5FK	2001	55 52	IO51RT
DF6YL	2005 2028 FSK441	26 26	400mS S5

March 14th, IO61OX

G4RRA	2030	56 57	IO80BS
G4DEZ	2032	53 57	JO03AE
OZ1LPR	2039 2105 FSK441	27 27	260mS S5
PA1GYS	2105 2123 FSK441	27 27	380mS S6
DK1BY	2126 2131 FSK441	27 26	340mS S5

PE1AHX	2132 2137 FSK441	26 --	HRD
OZ1IEP	2137 2148 FSK441	27 27	600mS S6

March 18th, IO70LQ

F8DBF	1842	53 53	IN78
G3YPQ	1849	57 59	
G4RRA	1904	59 59	IO91OF
G4LOH	1937	59 59	IO70JC
G7RAU	1941	54 59	IO90IR
F1CKB	1948	57 59	IN97SL

March 19th, IO70AD

EI5FK	1744	59 59	IO51RT
F9OE	1750	57 59	IN78QG
G0CUH	1759	58 59	IO70LG

March 19th, IO60XB

F0EJW	1807	55 55	IN78VK
G8ARM	1809	55 55	
G7RAU	1812	559 599	IO90IR
G0GMS	1815	559 559	IO82XT
EI5FK	1817	54 54	IO51RT
F6FAI	1820	56 59	IN88MM
F6KEQ	1823	53 57	IN98
F6CBH	1826	56 56	JN19BH
GU8FBO	1830	59 59	IN89QK
2E0ELC	1836	59 57	IO80AI

March 19th, IN69XW

F6DKW	1845	56 55	JN18CS
G6HIE	1846	53 55	IO90ST
G3JHM	1848	57 59	IO91LC
G7RAU	1849	55 55	IO90IR
F6CBH	1849	55 55	JN19BH
G8ARM	1850	56 55	IO70GD
F6KEQ	1851	54 55	IN98OB
GU8FBO	1900	59 59	IN89QK

March 19th, IN79AW

GU8FBO	1905	59 59	IN89QK
G3JHM	1905	58 58	IO91LC
G6HIE	1907	52 52	IO90ST
F6DKW	1910	53 52	JN18CS
G3NVO	1911	56 57	IO91JK
G4AEP	1912	54 57	IO91NJ
EI2HI	1912	56 55	IO51PQ
F6CBH	1914	55 55	JN19BH
G8ARM	1915	57 58	IO70GD

(Ed.: March 19th: Acitvity from 4 different squares within 90 minutes, a new record!?)

March 20th, JO01SB

OO5GY	1954	56 57	JO21
PD3UX	2001	58 ---	JO22LE
PA2DB	2004	59 59	JO22MD
PD2WDR	2004	53 53	JO21CU
ON2VY	2009	55 59	JO10FT
PA3BIY	2012	55 58	
G1YLE	2017	59 59	JO02OB

LA7THA/MM - Report

Rune, LA7THA, was qrv maritime mobile in April on 6m off the CN coast, west of Portugal and west of France with 70 W and a long wire. Unfortunately the sporadic E season had not yet startet and only 2 Tropo QSOs with CT1HZE were made from IM47 and IM48. Rune's ship is the "RAMFORM VIKING", a seismic vessel that was buit in 1998. Rune will be qrv again in June / July on 6m from the North Sea and probably going north heading JW and Barent Sea. For sure this will be a much better time for Es and QSOs with EU stations are very possible from very rare wet squares.

Background info:

Shell and other big global players are leasing the RAMFORD VIKING for the acquisition of 3D seismic data. For these purposes compressed air pulses generated behind the vessel send sound waves deep into the earth. Sound is then reflected by underground rock layers generating a complex set of echoes. The returning echoes are recorded by 24000 microphones, towed behind the boat in 10 cables called streamers, each 5km in length. The streamers are spread out behind the boat covering a total area of over 2 square km. The boat records the echoes from many thousand such sound pulses over the 1000 square km area of the survey.

The recordings, which are processed by powerful computers, reveal a picture of underground rocks in detail. The pictures are used by geologists to estimate the most likely location of undiscovered gas reserves and define the best location for exploration wells. The lease for the ship is about US$100 000 per day, according to energy industry sources.

LA7THA/MM

Meteor Shower Calendar

by Guido Jünkersfeld, DL8EBW

July to September 2005

Name	Date	Max.	ZHR	RA	DEC	v (km/s)	Source
24-Vulpeculids	30.06.-13.07.	4.-7.07.	var.	303	+24		BMS50
pi-Sagittariids	02.07.-19.07.	6.-10.07.	9	285	-21		BMS50
Caprocornids	04.06.-02.08.	08.07.	10	311	-14		BMS50
kappa-Aurigids	03.07.-17.07.	10.07.	20	094	+28		BMS50
Pegasids	07.07.-13.07.	09.07.	3	340	+15	70	IMO05
alpha-Oriionids	**09.07.-15.07.**	**12.07.**	**50**	**087**	**+12**		**BMS50 *1**
nu-Geminids	**09.07.-18.07.**	**12.07.**	**60**	**098**	**+21**		**BMS50 *1**
lambda-Geminids	**04.07.-29.04.**	**12.07.**	**30**	**110**	**+15**		**BMS50 *1**
beta-Cancrids	**09.07.-15.07.**	**12.07.**	**20**	**122**	**+13**		**BMS50 *1**
July Phoenicid	**10.07.-16.07.**	**13.07.**	**var.**	**032**	**-48**	**47**	**IMO05 *1**
beta-Capricornids	10.07.-25.07.	15.07.	14	314	-14		BMS50
sigma-Cassiopeids	12.07.-21.08.	15.07.	7	002	+56		BMS50
Pisces Austrinids	15.07.-10.08.	28.07.	5	341	-30	35	IMO05
S.Delta Aquarids	**12.07.-19.08.**	**28.07.**	**20**	**339**	**-16**	**41**	**IMO05 *2**
a-Capricornids	03.07.-15.08.	30.07.	4	307	-10	23	IMO05
gamma-Pegasids	12.07.-15.09.	1.-10.08.	10	005	+11		BMS50
S.iota-Aquarids	25.07.-15.08.	04.08.	2	334	-15	34	IMO05
Aquar-Capricornids	11.07.-15.08.	06.08.	11	327	-11		BMS50
N.delta-Aquarids	15.07.-25.08.	08.08.	4	335	-05	42	IMO05
delta-Cassiopeids	20.07.-12.08.	10.08.	10	018	+59		BMS50
Perseids	**17.07.-24.08.**	**12.08.**	**100**	**046**	**+58**	**59**	**IMO05 *3**
upsilon-Pegasids	01.08.-17.08.	12.08.	10	350	+19		BMS50
kappa-Cygnids	03.08.-25.08.	17.08.	3	286	+59	25	IMO05
N.iota-Aquarids	11.08.-31.08.	19.08.	3	327	-06	31	IMO05
gamma-Leonids	14.08.-12.09.	25.08.	low	155	+20		IMO05
alpha-Aurigids	25.08.-05.09.	01.09.	7	084	+42	66	IMO05
alpha-Hydrids	01.09.-02.09.	01.09.	9	030	-62		BMS50
epsilon-Perseids	21.08.-16.09.	3.-7.09.	10	062	+37		BMS50
pi-Cetids	28.08.-10.09.	05.09.	8	051	-16		BMS50
delta-Aurigids	05.09.-10.10.	09.09.	5	060	+47	64	IMO05
Piscids	01.09.-30.09.	19.09.	3	005	-01	26	IMO05
kappa-Aquarids	08.09.-10.10.	21.09.	3	339	-02		5IY97
Sextantids	09.09.-09.10.	27.09.	med.	152	0		IMO05

Kommentar / Comments: *1 In der Zeit um den 12.-13. Juli streift auch in diesem Jahr die Erde wieder viele kleinere Schauer. Diese sind durch die hohe Anzahl der kleinen Meteoriten geprägt und speziell geeignet für MS-Versuche über Standard-Distanzen (1300-1500km). – Arround July 12/13th many small meteors allow MS contacts over standard distances (1300 to 1500 kms). -

***2** Ein kleiner, aber auf große Distanzen, sehr effektiver Schauer. So gelangen dort in den letzten Jahren sehr oft QSOs zwischen 2000-2300km, bei denen man sich vorher nicht den großen Erfolg ausgerechnet hatte! Allerdings ist dieser Schauer nicht jedes Jahr ergiebig. – A small shower but over the last years very good for QSOs up to 2300 kms. Anyway not every year the results are so good. -

***3** Die Perseiden (bekannt als Laurentiustränen) sind sicherlich einer der attraktivsten MS-Schauer im ganzen Jahr, da es im Maximum immer wieder zu langen Bursts kommen kann, die speziell die SSB-MS-Freunde aufhorchen lassen. Das erste Maximum wird in den Frühabendstunden des 12.8. erwartet und damit sollte speziell die Nacht vom 12. auf den 13.8. komplett genutzt werden können. Zudem sind einige noch auf Ihren Urlaubsreisen und werden kurzfristig aus seltenen Feldern qrv. – The Perseids are for sure the most attractive shower of the year and especially the SSB-MS OP's will like it. This year's 1st maximum is expected for the early evening hours of August 12th. 73 de Guy, DL8EBW. Legend: 4/04, p.90

Aurora Reports

Editor: Stefan Heck, LA0BY
LA0BY@darc.de

LA0BY in JO59 wkd on 144 MHz:

2005-01-17 (from JO59FW)

1625	DL9MS	JO54WC	57A	56A	350	654km
1630	GM4VVX	IO78TA	55A	58A	330	874km
2240	PA5DD	JO22IC	59A	58A	330	941km
2331	OZ5UKF	JO75MD	55A	55A	50	599km
2346	DK5DQ	JO31PG	57A	57A	310	984km
1647	MM5AJW	IO88KI	55A	57A	340	793km
1658	DJ6OL	JO53AP	56A	57A	30	700km
1705	SP1FPG	JO73GN	54A	55A	50	751km
1710	DK8ZJ	JO54AG	57A	59A	30	631km
1719	GM4PPT	IO75SK	53A	44A	310	1015km
1726	PA5WT	JO22SG	54A	56A	340	905km
1734	LA2RZ	JP20OD	55A	57A	350	292km
1737	PA1GYS	JO22WW	56A	55A	350	827km
1741	PD0RFU	JO32LT	55A	55A	350	821km
1745	YL3AG	KO26AW	55A	55A	350	856km
1748	G3LQR	JO02QF	53A	55A	330	1024km

2005-01-21 (from JO59FW)

1951	OH6QU	KP03SD	52A	53A	350	686km
1955	DK1KR	JO53HW	55A	59A	350	667km
2233	DL1SUN	JO53PN	56A	59A	60	711km
2240	DL7ULM	JO62SN	53A	55A	60	842km
2242	YL2HA	KO26CV	56A	58A	50	867km
2253	SP7Q	JO91RS	55A	57A	60	1066km
2255	SP7HKK	JO91QI	55A	59A	60	1104km
2300	GM0TGE	IO87TF	55A	59A	350	801km
2313	ES7GN	KO28TI	52A	55A	40	881km
2316	LY2BJ	KO25ER	53A	57A	40	945km
2318	PA1LA	JO32LS	52A	52A	30	825km

2005-04-05 (from JO59IX)

1646	LA8G	JP53GJ	55A	55A	30	380km
1700	OH6QR	KP22BN	55A	55A	30	771km
1701	OH4LA	KP20LG	56A	55A	30	788km
1702	OH6A	KP03SD	55A	55A	30	672km
1704	LA8G	JP53GJ	57A	59A	30	380km
1706	SK2AT	KP03BU	52A	55A	30	654km
1708	OH5LK	KP30ON	55A	55A	30	910km
1710	OH6PA	KP02PL	54A	43A	30	630km
1714	OH1F	KP01TK	53A	53A	30	615km
1716	SK6W	JO78FM	59A	59A	30	268km
1719	SK4AO	JP70TO	59A	56A	30	280km
1721	SM4DXO	JP70VO	55A	55A	30	289km
1724	OH0AZ	JP90XI	55A	55A	30	513km
1725	SM5ILE	JP70WC	53A	57A	30	287km
1729	SM3AKW	JP92AO	55A	55A	30	488km
1730	OH2KW	KP20IJ	53A	53A	30	774km
1736	SM2A	KP04NP	53A	55A	30	746km
1744	OH1NOR	KP00XL	56A	57A	30	623km
1744	SM4KMN	JP70JX	55A	55A	30	250km
1748	SK3BP	JP81MH	55A	55A	30	376km
1751	SK0UX	JO99BM	57A	58A	30	418km
1754	SM5CUI	JO89WW	55A	55A	30	399km
1756	SK6EI	JO68VK	55A	55A	30	245km

2005-05-03 (from JO59IX)

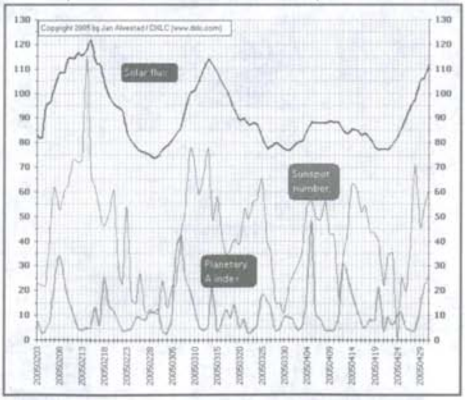
1725	SK2AT	KP03BU	55A	55A	20	654km
1729	OH6A	KP03SD	54A	55A	20	672km
1737	OH5LK	KP30ON	55A	55A	30	910km
1739	SK0UX	JO99BM	55A	53A	30	418km
1741	SM3AKW	JP92AO	55A	55A	30	488km
1743	SK6EI	JO68VK	57A	55A	30	245km
1744	OH1NOR	KP00XL	53A	55A	30	623km
1753	SK4AO	JP70TO	56A	57A	20	280km

RIG: IC-821H, PA 180W RF, 1 or 2 x 9-ele-yagi

SK4MPI, JP70nj, Beacon Reports, 2m Aur:

Date	Time	from area
25.2.	1805	OH6 (KP02)
26.2.-22.3.		SK4MPI QRT
7.3.*	1745	OH5 (KP30)
9.3.*	1545	OH5 (KP30)
14.3.x	1308	OH5 (KP30)
14.3.*	1325	OH5 (KP30)
23.3.	1925	OH5 (KP30)
25.3.	1530-1630	OH6 (KP02), SM2 (KP15)
	2205	SM2 (KP15)
25.3.*	2220	SM2 (KP15)
30.3.	1710	SM2 (KP15)
4.4.	1730-1805	UA1 (KP50), DL (JO53)
5.4.	0050-0400	PA (JO32), UA1 (KP50), OH6(KP02)
	1350-1700	OH5 (KP30), LA (JP43), SM (KP04)
11.4.	1840-2020	OH6 (KP02), ES (KO28)
12.4.	0330-0430	OH6 (KP02), SM2 (KP15)
	1220-1535	OH6 (KP02), SM2 (KP15), DL(JO53)
13.4.	0400	SM2 (KP15)
	1325-1715	LA (JP43), OH7(KP53), DL (JO53)
	2050	DL (JO53)
15.4.	1730	OH6 (KP02)
20.4.	1245-1505	OH5 (KP30), LA (JP43), OZ (JO65)
30.4.	1305-1630	LA (JP53), SM (JP83), SM2 (KP15) UA1 (KP50), OH6 (KP02)
1.5.	0450	SM2 (KP15)
	1415-1720	SM3 (JP83), DL (JO53), OH6 KP02, SM2 (KP15), LA (JP43), OH4 (KP21)

* = Report of OH7VHF KP52 x = Report of OH2VHF



Geomagnetic activity 03.02.05 - 01.05.2005

News & Comments

Editor: Joachim Kraft, DL8HCZ
info@DUBUS.de

Beacons

Proposal: TS2DUB 2m beacon

A new 2m beacon will be operational from the capital of Tunesia Tunis (Locator JM56) very soon. The call is TS2DUB.

Location of the Tunis 2m beacon TS2DUB and the Tunis 2m FM repeater 3V8TUN

Proposal: CU8DUB 2m beacon

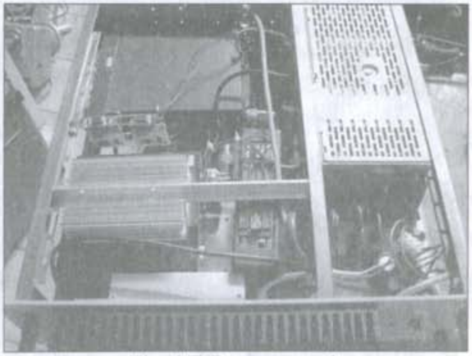
A new 2m beacon will be qrv soon from the Azores Islands (CU) in the Atlantic Ocean. The beacon will be located on Flores Island (Locator HM49KL). The QTH is perfect for Europe but no coverage of western directions. Power will be around 50 W RF and antenna a 4 elemant yagi beaming to Europe. QRG will be 144.420 MHz.

Location of the Flores 2m beacon in the middle of the North Atlantic Ocean.

5T5DUB and 5T5SN/B

The 5T5DUB 6m beacon became operational on March 23rd 2005 and was reported already on the next day from EA, CT, and I. In April the beacon was heard several times by FM5JC and FJ5DX. The beacon was operating with 20 W RF from 5T5SN's home using a 7 ele M2....

The 2m part will be operational on 144.306 MHz in May when the complete beacon rack will be installed on top of the Novotel the second highest building in Noukachott the capital of Mauretania.



The 5T-Beacon rack

KL7GLK/B Transatlantic beacon qrv

The KL7GLK transatlantic beacon will be qrv on 144.289 MHz during June/July with 100 W out and a 12 dBD Yagi towards Europe. This will be at least a 1KW ERP. Locator is FM28.

DB0DUB project

DB0DUB now is a real 2m beacon project. (See DUBUS 1/2005 title page and N&C). DL7AJA plans to realize a JT65/CW-beacon on 144.437 MHz in JO40AQ running high ERP into several promising directions like EI/GM, EA3, I, SM.

DB0FAI qrv again

The DB0FAI beacon is qrv again since March 26th 2005 with 1 KW ERP and 16 ele Yagi on 144.490 MHz. (DL5MCG)

DB0ELS: New 10 GHz beacon

DB0ELS is a new beacon on 10368.900 MHz. Locator is JO43FF. Power 200mW, 11dB Slot, 26m a.g.l. The beacon is qrv since September 2004 and war reportet LF on .893

DB0INN not QRV

The beacon DB0INN that is listed in many beacon lists on many QRGs has never been qrv yet and will probably not realized in the close future.

IQ1SP/N QRV

The beacon IK1LBW/B, JN44VC, is qrv again now with the callsign IQ1SP/B. 1 W and omnidirectional antenna.

EA5VHF/B QRV

EA5VHF/B is a new beacon in IM98WV on 144.470 MHz. 10 w, 9 ele, QTF N.

SK6VHF QRV from new QTH

The beacon SK6VHF is qrv from a new QTH in JO57TX on 144.488 MHz since the end of April. 4W, M2 Loop, 10 m a.g.l., 120 m a.s.l.

SK6UHI QRV

SK6UHI is qrv from JO57TX on 1296.805 MHz since the end of April with Alford slot and 10 W.

Stations, OPs

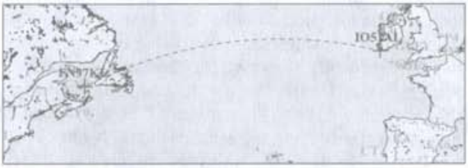
VK2BE SK

It is with deep sadness to report the passing of Lyell Louttit, VK2BE, in February following hospitalisation and surgery. It is believed he was 84. Many will have worked him off the Moon on 70cm and he also had the odd QSO on 23. He was a most active VHF and UHF operator in the Sydney area and always had a very big signal. Many will also remember him on HF from his activities from VS6. Vale, Lyell. Doug (VK3UM)

LA8AK SK

Jan Martin Noding, LA8AK, died on April 27th. He was 59 years old. He was very active on VHF/UHF/SHF from JO38 since the 70`s.

Expeditions



Sable Island – Ireland path: 3650 km

Transatlantic attempt 2005 from Sable Island

VY2SS and a large group of OPs from Canada and the U.S.I will be qrv from June 7th to July 7th from Sable Island (FN97) on 6m and 2m with QRO stations for EME and transatlantic attempts. There will be beacons running if there are no openings or EME operation. Allthough the distance from CY9 to Europe is with 3600km a bit larger than from Nova Scotia (VO1) with 3100km the last week of June and the first week of July will be the best period of the year for multihop Es propagation on 2m. For sure this is the case on 6m. The distance vom CY9SS (FN97) to Ireland EI (IO51) is around 3650km. This is a "typical" double hop Es distance. From CY9 to western France or Portugal the distances are above 4000km. CT1HZE will be trying to listen for CY9SS from IM57. The QRB is just 4350 km......

G0KZG/MM Summer 2005

Andy will be qrv again from the seas southwest of G/EI from June 17th to July 17th on 2m via FSK-MS and Tropo and 6m.

DL5MAE in 3A and ZB2

DL5MAE will be qrv on 2m CWMS (and EME?) in June/July from Monaco and Gibraltar. Usually he is on the VHF net on 14345 kHz for skeds when on site.

/MM Activity

DF5OL/MM (and DJ5SQ/MM on the first half) will be qrv from May 15th to July 10th on 2m for Tropo and Es on 144.300 MHz with 20W and a small antenna. Start is on May 16th in Hamburg, May 18th Southhamption, May 25th Malta and then Hong Kong Shanghai and all the way back. In the end of June the will back again east of Malta. The latest position is at:: http://www.sailwx.info/shiptrack/shipposition.phtml?call=DIIN May be they will also be on 70cm and 6m

SM6CMU in the North

SM6CMU plans to go to the Lofoten area again in July. He will be active on 2m FSK-MS and 6m as LA/SM6CMU. Anyway if the WX is good and he can catch a ferry he will go to JW (Bear Island, JQ94) instead. But this will be later on in the summer.

DL2NUD North Expedition 2005

LA/DL2NUD will beqrv from many rare squares in the far north on 2m via MS in FSK441A from June 4th to 26th. Squares include KP..7, KP..8, KP..9, JP..9, JP..8, JP..7 and KQ 20, 30 and 40! Rig: 17 ele M2, TS200 and Beko HLV 1200. Hermann is also willing to try EME. Skeds on 14345 kHz when on site

JO34 Activity in August

A group from the DARC club H36 will be qrv on August 21./22. with the call DF0WFB/p on 2m in SSB and 23cm in ATV from the island of Helgoland. Info: www.afu-ag.de

KP06

SM2CEW plans to be active again from KP06 via MS on 2m for one day this summer.

KP39 and 49

The OH8K group plans to activate these squares during Persides on 2m via MS and on 6m. – F1MPQ is also in this area in August and will try to be qrv together with OH8K.

EA8

EA8/DL6FAW will be qrv again this summer on 2m for Tropo and Es from La Palma, IL18AT. May be DL7AJA will visit him in July and be active on 2m as well.

PA2DW in JO47

PA2DW writes that there is a 50% chance that he will be qrv on 2m FSK MS as OZ/PA2DW from JO47 in July.

Perseids activity from JP51 from August 8-14, 2005

This years Perseids I plan to operate 144 MHz MS from a hilltop location in JP51BQ. Besides MS I also plan to participate in the NAC on 70 cm. I will hopefully be accompanied again by DL3YEL, in which case we may also operate 6 m. We will use the callsign LA0BY/p on 2 m and 70 cm.
The site is north of Ringebu at about 900 m asl where we will stay in a cottage with access to 230 V. This will make it possible to operate with decent power from the 2 x 4CX250B amplifier. The antenna will be 2 x 9-ele-yagis.
We will stay on the frequency 144,188 MHz for both sked and random operation in HSCW/SSB. In HSCW we will transmit

with 1500 lpm, using 2,5 min periods and the callsign will be abbreviated to LATBYP. In SSB we will use 1 min periods with breaks every 10-15 s. We will transmit the first (even) period.
For WSJT operation (only random outside the maximum) we will use 144,388 MHz. A special advise for WSJT: Make sure your QSO is complete. Those callers which are continuously transmitting without respect to ongoing QSO's will simply be ignored. Please watch your screen!
There is also the chance that we may set up a second station in **JP41** during the peak of the shower. We will probably have occasional access to the Internet from the main site. Further and updated information will be available on http://www.qsl.net/la0by/dxped.htm

IM66 - Expedition in June

From June 10th to 12th CS0RCL/p will be active from IM66BX, the Island of Clulatra on 6m, 2m, 70cm and 23cm. QSL via EA7AH.

TK Corsica Expedition

TK/F1PNR will be active from May 30th to June 28th from JN42 on 2m in SSB. Times: 0430-0900 and 1600-1700 UTC on 144.265 MHz. From June 12th to 25th also TK/F1YJ will be qrv from the same station.

News

WSJT User`s Guides in French, Italian, Polish, Japanese

are available on K1JT`s website at http://pulsar.princeton.edu/~joe/K1JT/Documentation.htm.

New DXCC country Curacao

On April 9th 2005 the people of Curacao (PJ, Netherland Antilles) voted with a majority of 68% for becoming an independent state. So Curacao will become a separate DXCC country like Aruba (P4) in 1986. It looks like that the remaining islands of the Netherland Antills (Bonaire and St. Maarten) may get independent states later on also.

Ham Paradise Somalia

At least for radio amateurs Somalia (6O) is a paradise: Any possible band is allocated to the amateur radio service, including 6m, 4m, 1.5m and all Microwave bands. Even there are bands like 70-90 kHz, 130-190 kHz, 495-526 kHz, 3500-4000 kHz, 5060-5450 kHz. On all bands there is a power limit of 3 KW PEP output. Anyone wanting to go there for 6m, 4m, 2m, 70cm, 23cm etc. EME?

167km 474 THz QSO in Australia

On Saturday 19 February 2005, Mike, VK7MJ and Chris Long set an Australian optical comms DX record between Mount Barrow and Mount Wellington in Tasmania, a distance of 104 miles, or 167km, and they did it without the use of laser sources! Chris Long writes: "We are principally interested in developing NON-laser systems for long range use as, going by the strict letter of the law, they require no licensing and therefore are usable by a much broader section of the community than are laser-based systems. Some aspects of our optical design are novel, such as the usage of a secondary plano-convex lens between light source and fresnel to optically vary the effective size of the source, in order to fill the fresnel's rather fuzzy prime focus area without increasing beam dispersal excessively. Aiming is via rifle sights, and the optical unit operates by bonding two co-lined fresnels to a single protective cover-glass sheet. Full duplex operation is provided. Here's our report of the actual record breaking event. Between 1100 and 1200 GMT on Saturday the 19th of February 2005, two way full duplex voice communication was established at 475 THz (630nm) over a distance of 167.7 km (104 miles), between stations on the summits of Mount Wellington (1260m asl) near Hobart in Southern Tasmania and South Barrow (1370m asl), near Launceston in Northern Tasmania. The tests were delayed by convective cap cloud and fog forming on the on the summit of mount Wellington at sunset. When the cloud cleared at 2140 local time, we had a beautiful crystal clear moonlit night over the centre of Tasmania, with light winds generating the occasional small drifting cloud puffs near Hobart. The light sources used were amplitude modulated, 630nm, 1 watt Luxeon LEDs, operating at 200mA quiescent current and collimated through 20cm by 25 cm fresnels. The receivers each used a BPW34 PIN photodiode into a low noise, FET-input transimpedance preamp. The beam intensities of 300-700W/steradian were clearly visible with the naked eye at 104 miles! Full details, photos of equipment, audio grabs of the contact and photos of past equipment are at: http://reast.asn.au/optical.php
Signals going north were reported as 4/7 with some scintillation and slow fading by Joe, VK7JG, Jason, VK7ZJA and Chris Long on Mt. Barrow. The signals received at Mt Wellington by Mike, VK7MJ and Justin, VK7TW were very noisy as a result of a 10dB increase in the receiver noise that turned out to be the result of an unstable audio amplifier, rather than RF blocking from the television transmitters, or moonlight interference as first thought. Reducing the receiver gain improved the readability to about 3/3 and a two-way duplex voice contact was completed. Slow morse signals from a mechanically chopped optical transmitter using a 55W QI lamp and a 200mm lens were received at 5/8 onMt Barrow. The Hobart signals remained readable at Mt Barrow through light mist clouds drifting past Mt Wellington from about 1150 GMT but the QSO was terminated at 12:00GMT by heavy cloud reforming above the Derwent Valley between Mt Wellington and Bridgewater. This is certainly a record for Australian optical communications and possibly a world record for non-laser amateur communications. Jason Reilly has posted a brief report and some pictures from Mt Barrow on his website at: http://members.optushome.com.au/~jason.reilly/

Dates and Contests

DDFM 6m Contest

To improve the activity on 6 meters and give a chance to work many french departments, the REF is organizing a 6 meters contest. Name of the Contest: DDFM Contest (French De-

partments Contest). Date/time: The contest will take place from 16.00 utc on Saturday 11th June to 16.00 utc on Sunday 12th June 2005 (24 hours duration). Mode: CW/SSB
Sections : 1- French stations. 2- Foreign stations.
Frequency: 50.200 and up (QSO's below 50.200 are not valid). Call: CQ F5XYZ/71 (Callsign/number of department).
Exchange: The contest exchange will consist of:
- Callsign. - RS(T). - Serial number e.g. 001, 002 etc.
- Locator (only 4 characters) e.g. 599001 JN26.
Scoring: One point is scored per contact.
Multiply by: the total number of french locators + french departments worked.
Score = contacts points x (locators + departments); e.g. 10 QSO x (10 locators + 10 departments) = 200 points.
Other Rules: The contest is open to all users of 50 MHz. All license conditions must be observed. During the contest it is prohibited to solicit contacts by using packet or cluster.
Entries: Logs can be in any text format as long as all multipliers and duplicate entries are clearly marked. A check list of each locator squares and departments worked must be included with your entry. The following declaration must be also included with your entry: "All rules governing amateur radio in my country have been respected, and I agree that the contest manager's decision is final". Entry must be postmarked no later than 10th July 2005 and send to the contest manager: F6IIT, Patrick Vermote, 175 chemin des Meuniers, F-86130 Dissay, France, or via e-mail to ddfm50@ref-union.org
If you want to get the list and the map of the french departments, send an e-mail to: fe8op@wanadoo.fr

ARRL EME Contest 2005

Dates: 6m to 23cms: 22./23. October, 13cm and up: 24./25. September 2005.

144 MHz DX Activity Contest of VHF-DX-Group-DL-West 2004 - Results

Phone Class A

Place Call	Mod Call	Locator	Propagation	QSO-SQR	Total Points
1 PE1AHX	S	JO21	TR, ES, MS, AU	761201	152961
2 OZ1IEP	S	JO55	TR, AU	434120	52080
3 DK0OG	S	JN68	TR	347111	38517
4 DF0OL	S	JO40	TR	283112	31696
5 PE1HWO	S	JO21	TR, ES, MS, AU	206141	29046
6 DF7KF	S	JO30	TR, ES, AU	166131	21746
7 DJ2JS	M	JO31,40,50	TR, AU	205 98	20090
8 DM1CG	M	JO31,45	TR, ES, AU	140112	15680
9 YU1GT	S	KN04	TR, AU	89150	13350
10 DL8EBW	S	JO31	TR, ES, MS, AU	80 98	7840
11 IW0GPN	S	JN62	TR, ES, MS	73 85	6205
12 EA6VQ	S	JM19	TR, ES	72 48	3456
13 EA1ASC	S	IN70	TR, ES	52 54	2808
14 DO1ERS	M	JO31,30,45	TR	30 43	1290
15 DF2ZC	M	JO30,JM87,89	TR, ES	33 31	1023
16 DK5WO	S	JO30	TR, ES	20 38	760
17 DC2IP	M	JN49, JN49p	TR	15 43	645

CW Class B

1 DF7KF	S	JO30	TR, AU, MS, IO	177104	18408
2 LY2IC	S	KO14	TR, AU	138110	15180
3 DK0OG	S	JN68	TR	11881	9558
4 LA0BY	M	JO59, JO59p	TR, MS, AU	15661	9516
5 DF2ZC	M	JO30, JM89	TR, MS, AU	11581	9315
6 DL8EBW	M	JO31,30	TR, MS, AU	8073	5840
7 PE1HWO	S	JO21	TR, MS, ES	3338	1254
8 DH4NWG	S	JN59	TR, AU	2346	1058
9 YU1GT	S	KN04	TR	1221	252
10 DK5WO	S	JO30	TR	817	136
11 PE1AHX	S	JO21	TR, AU	89	72
12 DK2BJ	S	JO30	TR	319	57

MIXED Class C

1 PE1AHX	S	JO21	TR, MS, ES, AU	1007334	336338
2 DF7KF	S	JO30	TR, ES, MS, AU	410255	104550
3 DK3WG	S	JO72	TR,ES,MS,AU(E)	435231	100485
4 OZ1IEP	S	JO55	TR, MS, AU	495181	89595
5 DK0OG	S	JN58	TR, MS	499178	88822
6 LA0BY	M	JO59, JO59p	TR, MS, AU	470185	86950
7 DF2ZC	M	JO30,IN77,JM87,89	TR, ES, AU, MS	339187	63393
8 DL2OM	M	JO30,61	TR, ES, MS	389150	58350
9 DL8EBW	M	JO31,30	TR, ES, MS, AU	246210	51660
10 PE1HWO	S	JO21	TR, ES, MS, AU	262172	45064
11 DF0OL	S	JO40	TR	308115	35420
12 LY2IC	S	KO14	TR, ES, AU	173128	22144
13 DM1CG	M	JO31,45	TR, ES, MS,AU	148118	17464
14 G8HGN	S	JO01	TR, AU	8578	6630
15 YU1GT	S	KN04	TR, AU	9553	5035
16 EA6VQ	S	JM19	TR, ES, MS	8657	4902
17 EB7COL	S	IM77	TR, ES, MS	7560	4500
18 DK5WO	S	JO30	TR, ES	2851	1428
19 DH4NWG	S	JN59	TR, ES, AU	2752	1404
20 DG1VL	S	JO61	TR, MS	2830	840

TR= Tropo, ES=E-Sporadic, MS=Meteorscatter, AU= Aurora, AUE=Aurora-E, IO=Ionoscatter
S= Result from single Locator worked, M= Result from multi Locator worked. 73´s Uli DK2BJ

MUD 2005

Again I would like to invite everyone to Microwave Update 2005 hosted in the Los Angles, California area October 27th though the 31st. If you are interested in attending or presenting a paper, contact Chip Angle N6CA at N6CA@ham-radio.com I look forward to seeing you there.
Kent Britain, WA5VJB

Redaktionsschluss für DUBUS 3/2005 ist der 7. August 2005.
Deadline for reports etc. for DUBUS 3/2005 is August 7th 2005

When did YOU contribute to DUBUS the last time?

DUBUS EU-Microwave beacon list (May 2005), by DL8HCZ

QRG	Call	Locator	m asl	Antenna	QTF	Pwr	Keeper	Last Update	Remarks
1296.000	W2ETI	FN21TA		4x rh helix	moon	64dBmi	WA2IKL	03/05 EME-Beacon	QRT
1296.045	HB9BBD/p	JN47GA	1662	4xDipole	N	10tx	HB9BBD	04/05 HB9BBD	
1296.063	S55ZNG	JN65UU	643	V-J Slot	Omni	0.1	S59DKS	05/04 S51KQ	QRT
1296.080	S55ZSE	JN65WP	620	Slot	Omni	0.3tx	S53MV	04/05	
1296.090	S55ZMS	JN86CR	350	Slot	Omni	0.3	S53M	04/05 S51ZO	Experimental
1296.180	UU9JJ	KN64RO		Dipole	N/S	5 TX	UU9JJ	03/05 UU9JJ	
1296.380	S55ZRS	JN76MC	1219	Dipole	Omni	0.2	ZRS	12/04 S51KQ	
1296.739	F5XBH	JN38PJ	1070	Big wheel	Omni	4	F6BUF	04/05 F6HTJ	
1296.800	OE8XBK	JN66WQ	1909		Omni	2	OE8ABK	12/04 OEVSV	QRT
1296.800	DB0RHN	JO50AL	930	Dipol	Omni	1 TX	DK9MS	04/04 ex DB0GD	Proposal
1296.800	OE3XMB	JN77TX	1154			0.1	OE3FFC	12/04 OEVSV	QRT
1296.800	SK6MHI	JO57TQ	40	Alford slot	Omni	30		03/05 SM6CEN	
1296.803	DB0HEG	JN59GB	700	4 x Slot	Omni	0.5 TX	DL2QQ	12/04	
1296.805	DB0RIG	JN48WQ	780	4 x Yagi Box	Omni	50 e	DG9SQ	04/04 DJ3HW	QRV?
1296.805	SK6UHI	JO57TX	125	Alford slot	Omni	10 TX	SM6CEN	05/05 SM6CEN	
1296.810	DB0ZW	JN69AT	650	Slot	Omni	1 TX	DC9RK	03/05 DC9RK	
1296.810	GB3NWK	JO01BI	180	15/15 Slot Yagi	293°	50	G8BJG	04/05 G3PHO	QRT for ever
1296.810	PI7DIJ	JO33AI	20	9 el Yagi	200°	1	PA3DIJ	04/05 nw PA4FP	QRT
1296.810	SK7MHF	JO77IP	360	Alford slot	Omni	30	SM7MXO	03/05 SM6CEN	
1296.812	F1XBI	JN37NX	1278	4 el Yagi	135°	1	F1AHO	04/05 F6HTJ	Temp. QRT
1296.815	DB0VI	JN39NK	465	Slot	Omni	1	DL4VCG	07/04 DL4VCG	
1296.816	F1ZTF	IN95VO	125				F1MMR	04/05 F6HTJ	Proposal
1296.820	DB0OT	JO32QR	80	Big wheel	Omni	1 TX	DL1BFZ	09/04 DL1BFZ	
1296.820	LA1SHF	JO59JW		14 el Yagi	160°	10	LA4PE	04/05 LA0BY	QRT
1296.825	F5ZRS	JN25UD	1700		Omni	0.05	F5LGJ	04/05 F6HTJ	
1296.825	DB0ABG	JN59WI	522	Slot	Omni	0.5 TX	DJ3TF	04/04 DJ3HW	QRT
1296.825	DB0HF	JO53BO	65	Big wheel	Omni	0.3 TX	DK2NH	09/04 DJ3HW	
1296.825	OE3XAA	JN88BA	834		Omni	0.2	OE1BKW	12/04 OEVSV	Proposal
1296.830	GB3MHL	JO02PB	85	2 x 32 Slot wg	W/E	500	G3XDY	04/05 G3XDY	
1296.835	DB0AJ	JN57	620	12 el Yagi	0°	50	DK2RV	04/04 DJ3HW	QRT
1296.835	SK0UHG	JO89WI	55	Horizontal	Omni	10		04/05 SM6CEN	
1296.840	DB0KI	JO50WC	925	Slot	Omni	39	DC9NL	04/05 DC9NL	
1296.840	OH6SHF	KP13GM	55	Dipole	Omni	8		01/05 OH6DD	
1296.845	DB0LBV	JO61EH	234	4 x Slot	Omni	2 TX	DL1LWM	07/04 DJ3HW	
1296.845	SR3SHF	JO91CQ	180	2x Helix 6dB	Omni	2 TX	SP3JBI	01/05 SP3JBI	
1296.847	F5XBK	JN18IS	45	Alford Slot	Omni	10	F6ACA	04/05 F6HTJ	
1296.850	DL0UB	JO62KK	120	4 x Box	Omni	10 TX	DL7ACG	01/05 DL7ACG	
1296.850	GB3FRS	IO91PH	120	Disc	Omni	3	G8ATK	04/05 G4FSG	
1296.851	SK3UHG	JP92FW	175	Horizontal	Omni	10		03/05 SM6CEN	
1296.854	DB0JO	JO31SL	312	4 x 15 el Yagi	270°	350	DG8DCI	04/05 DJ3HW	
1296.855	OZ3UHF	JO56CE	150	5 el Yagi	180°	6	OZ1GMP	03/05 OZ2TG	QRT
1296.856	DB0LB	JN48OV	367	2 x Big wheel	Omni	0.3 TX	DL4SBK	12/04 DL3PK	
1296.860	GB3MCB	IO70OJ	300	15/15	45°	50	G3YJX	04/05 G3YJX	QRT (stolen)
1296.860	LA8SHF	JO59FB	30	13 dB Horn	180°	60	LA6LCA	04/05 LA0BY	
1296.862	F1XAK	JN23MM	114	Slot W	Omni	200	F1AAM	04/05 F6HTJ	
1296.865	DB0JK	JO30LX	260	4 x 8 el Yagi	Omni	40	DK2KA	04/05 DK2KA	
1296.865	HB9WW	JN37KB	1400	10 dB	Omni	18	HB9HLM	04/04 HB9HLM	Proposal for 7/04
1296.870	LA2SHF	JP53						04/05 LA0BY	Proposal
1296.870	DB0IBB	JO32VG	200	4 x Slot	Omni	170	DB7QW	01/05 DJ3HW	
1296.872	F1ZMT	JN07CX	85	Panel	180°	20	F1BJD	04/05 F6HTJ	
1296.875	HB9OK	JN45MW	1601	Alf. Slot	Omni	3.5	HB9DUR	08/04 HB9DUR	
1296.875	FX3UHX	IN78UK	121	Quad	90°	1	F6CGJ	04/05 F6HTJ	
1296.875	GB3USK	IO81QJ	235	Slotted wg	90°	250	GW8AWM	04/05 G4FSG	
1296.875	HG5BUB	JN97LM	485	Slot	Omni	0.8	HA5BDJ	03/05 HA1YA	Proposal
1296.880	DB0FRE	JN37WX	290		Omni	1.25 e	DL1GDM	04/04 DJ3HW	QRV?
1296.880	LA3SHF	JO38XB	5	2 x 15 el Yagi	180°	10	LA8AK	04/05 LA0BY	QRT

1296.880	ON5SHF	JO10UN	130	Slotted	90°	10	ON5PX	04/05	ON7WP	
1296.885	DB0TUD	JO61UA	250	Slot 8dB	Omni	1	DL4DTU	04/05	DL4DTU	temp. QRT
1296.885	OY6BEC	IP62OA	700	13 ele yagi	150	150ri	OY9JD	07/04	OZ7IS	
1296.885	OE3XEA	JN78SB	725			1	OE3EFS	12/04	OEVSV	QRT
1296.886	F1XBC	JN06JG	140	Alford Slot	Omni	25	F1AFJ	04/05	F6HTJ	
1296.888	OM0MSA	JN88NE	570	Dipole	90/270°	0.045	OM3ID	01/05		
1296.890	GB3DUN	IO91RV	263	Alford slot	Omni	2	G3ZFP	04/05	G4FSG	
1296.890	I8EMG/B	JM89BJ	1400	3 ele	280	1	I8EMG	02/05	I8EMG	
1296.890	LA4SHF	JO28UO	5	Collinear	180°	40	LA9VFA	04/05	LA0BY	on .895
1296.897	HG6BUB	KN07AU	1015	Slot	Omni	1 TX	HA5ED	03/04	HA1YA	Proposal
1296.900	DB0AN	JO31SX	100	Big wheel	Omni	1 TX	DF1QE	04/04	DJ3HW	QRV?
1296.900	GB3IOW	IO90IO	250	Alford Slot	Omni	100	G8MBU	04/05	G4FSK	
1296.900/903	OK0EA	JO70UP	1355	2 x 15 el Yagi	S/W	3	OK1AIY	01/05		
1296.900	HG9BUA	KN08FB	930	Slot	Omni	1	HG5AZB	03/05	HA1YA	
1296.902	LX0SHF	JN39BP	420	2 x Big wheel	Omni	6	LX1JX	04/04	LX1DB	
1296.905	DB0AD	JO40AQ	693	dipole	Omni	1	DL7AJA	05/04	DL7AJA	
1296.905	SK4UHI	JO79LH	270	Horizontal	Omni	10	SM4RWI	03/05	SM6CEN	
1296.907	F5XAJ	JN12LL	1100	Slotted WG	Omni	10	F6HTJ	04/05	F6HTJ	
1296.910	DB0UX	JN48FX	275	4dBD	Omni	1 tx	DK2DB	04/05	DK2DB	
1296.910	GB3CLE	IO82RL	540	2 x 15/15 Yagi	0°	20	G3UQH	04/05	G3PHO	
1296.915	DB0UBI	JO42GE	165	Horn	45°	2.5 e	DD8QA	04/05	DD8QA	QRT since 4/04
1296.920	9A0BLB	JN83HG	778	Dipole	1			04/04	9A2MP	NOT QRV
1296.920	DB0VC	JO54IF	300	2 x Big wheel	Omni	10	DL8LAO	04/05	DL8LAO	
1296.920	GB3COA	IO75SU	52	2 x Quagi	0°/90°	10	GM1SXX	04/05	G4FSG	QRT
1296.920	PI7QHN	JO22KH	20	6 dB Gain	Omni	4 erp	PA0QHN sk	01/05	PA0EHG	will change QTH
1296.925	DB0AAT	JN67HT	800	Vertical	Omni	1 TX	DL8MCG	04/04	DJ3HW	ex DB0KME
1296.927	ES0SHF	KO18DN		2 x D-diamond	90°/270°	60/60	ES5PC	04/05		
1296.927	OH2SHF	KP20BB	67	10dB hor.	20+210°	35tx	OH2NXX	02/05	OH5LK	
1296.930	GB3MLE	IO93EO	600	Corner Refl.	160°	50	G8AGN	04/05	G4FSG	
1296.930/33	OK0EL	JO70SQ	900	Horn	270°	0.8	OK1AIY	01/05		
1296.930	OZ7IGY	JO55VO	95	4 x Big wheel	Omni	25	OZ7IS	03/05	OZ2TG	soon JO55WM
1296.935	DB0YI	JO42XB	455	4 x Quad	Omni	3	DL4AS	01/05	DL4AS	
1296.935	OH5SHF	KP30HV	145	Alford Slot	Omni	25		04/05	OH6DD	
1296.937	HG3BUB	JN96CC	535	Slot	Omni	0,5	HG5AZB	03/05	HA1YA	
1296.940	DB0RG	JO51AN	428	V Dipole	Omni	1	DL4OAN	04/04		Proposal
1296.940	SK7MHH	JO86GP	45	Alford slot	Omni	10		03/05	SM6CEN	QRT
1296.945	DB0OS	JO40CW	730	6 el array	270°	1	DG6YW	02/05		
1296.945	HB9F	JN46SW	1015	Corner refl.	0°	15	HB9MHS	03/05	HB9MHS	QRT for ever
1296.945	OH9SHF	KP36OI	236	10 dBd	200°	30	OH6DD	01/05	OH6DD	
1296.948	F5XBF	IN95WB	90	2 x Big wheel	Omni	50	F6CIS	04/05	F6HTJ	
1296.950	DB0HG	JO40HG	211	Big wheel	Omni	15 e	DL4FCS	05/04	DL1ZBR	Not QRV
1296.950	OZ5UHF	JO65GQ	35	Collinear	Omni	1	OZ3TZ	03/05	OZ2TG	QRV?
1296.955	OZ1UHF	JO57FJ	150	Big wheel	Omni	10	OZ9NT	01/05	OZ2TG	
1296.957	SK3GW/B	JP80JH	90	32 ele	210	10	SM3LBN	03/05	SM6CEN	ex SK3UFG
1296.960	DB0WTT	JO40LG	115	Big Wheel	Omni	1	DL1ZBR	05/04	DL1ZBR	
1296.960	DB0MFI	JN58KR	532		Omni	10 e	DG1MFI	04/05	DG1MFI	Proposal
1296.960	HG7BUB	JN97KR	700	Slot	Omni	1	HA5ED	03/05	HA1YA	
1296.965	DF0ANN	JN59PL	630	Eggbeater	Omni	0.5 tx	DL8ZX	04/05	DL8ZX	
1296.965	GB3ANG	IO86MN	319	Slot Yagi	170°	40	GM4ZUK	04/05	G4FSG	
1296.965	OK0EO	JN89QQ	602	2 Ele	SW	0.05/0.12	OK2VLX	01/05		Proposal
1296.970	GB3ESB	JO00GP	120	Alford slot	Omni	10	G4PRJ	04/05	G4FSG	QRT for ever
1296.970	SK7MHL	JO65OR	100	Alford slot	Omni	15	SM7ECM	03/05	SM6CEN	
1296.975	HG1BUB	JN87FI	725	Slot	Omni	1.5	HA1YA	03/05	HA1YA	
1296.975	DB0SGA	JN69KA	1024	4 x DQ	Omni	5 TX	DJ4YJ			QRT
1296.975	OH3RNE	KP11UM	210	Big Wheel	Omni	10	rep/beac	03/05	OH6DD	
1296.980	DB0JU	JO31CV	150	Helical	Omni	1.0TX	DL1EGF	04/04	DF5EO	Call nw DB0EE
1296.984	OZ2ALS	JO45WA	65	2 x slot	Omni	10	OZ9DT	03/05	OZ2TG	QRT
1296.985	DB0AS	JN67CR	1565	Dipolfeld	10°	0.5 TX	DL2AS	04/04	DJ3HW	
1296.990	GB3EDN	IO85HW	117	2 x Corner Refl	45°/315°	25	GM8BJF	04/05	G4FSG	

1297.010	DB0JW	JO30DU	238	4 x 12 el Yagi	45°	70	DL9KAS	02/05 DJ3HW	
1296.xxx	9A0SSH	JN85JO	485					06/04	Proposal
2301.000	ON0EHF	JO21IB	This is a repeater and no beacon!				ON7WP	04/04 ON7WP	Test operation
2304.040	S55ZNG	JN65UU	643	V-J Slot	Omni	0.1	S50M	04/04 S51KQ	QRT
2304.050	S55ZSE	JN65WP	620	Slot	Omni	0.5tx	S53MV	05/04 S53MV	
2304.160	I3D	JN55		Slot	Omni	32	IW3FZQ	12/00 I5WBE	QRT
2320.020	F1ZQT	IN95VO	125	Slot	Omni	2	F1MMR	04/05 F6HTJ	
2320.050	HB9BBD/p	JN47GA	1662	4xDipole	N	8 tx	HB9BBD	04/04 HB9BBD	
2320.050	S55ZSE	JN65WP	620	Slot	Omni	0.5tx	S53MV	05/04 S53MV	
2320.090	S55ZMS	JN86CR	350	Slot	Omni	0.5	S53M	04/05 S51KQ	
2320.800	SK6MHI	JO57XQ	135	Slotted WG	Omni	150	SM6EAN	04/05 SM6CEN	
2320.810	DB0ZW	JN69AT	650	6 x Slot	Omni	1	DC9RK	03/05 DC9RK	Proposal
2320.810	SK7MHF	JO77IP	360	2 x Big wheel	Omni	0.1	SM7MXO	03/05 SM6CEN	on .817
2320.812	SK0UHH	JO99BM	90	4 x Horn	Omni	25		03/05 SM6CEN	on .806
2320.815	DB0VI	JN39NK	465	Slot	Omni	1	DL4VCG	04/04 DL4VCG	
2320.820	DB0OT	JO32QR	80	Big wheel	Omni	1 TX	DL1BFZ	09/04 DL1BFZ	
2320.825	DB0HF	JO53BO	65	Big wheel	Omni	0.3 TX	DK2NH	10/04 DJ3HW	
2320.825	OE1XTB	JN88EE	170	4 x dipole	Omni	1	OE1MOS	09/99 OE1MCU	QRT
2320.830	GB3MHS	JO02PB	85	Slotted WG	Omni	25	G3XDY	04/05 G3XDY	
2320.832	OH6SHF	KP13GM						01/04 OH6DD	Proposal
2320.833	DB0FGB	JO50WB	1090	Slot 8dBD	Omni	3.5 tx	DB8UY	04/05 DB8UY	
2320.838	F5XAC	JN12LL	1100	Slotted WG	Omni	20	F6HTJ	04/05 F6HTJ	on .840
2320.840	DB0KI	JO50WC	925	Slot	Omni	14	DC9NL	04/04 DC9NL	
2320.842	OH3SHF	KP11VK	225	6 dBi	Omni	200		01/05 OH6DD	
2320.845	DB0LBV	JO61EH	234	DQ	135°/225°	1.5 TX	DL1LWM	04/04 DJ3HW	
2320.845	SR3SHF	JO91CQ	180	2 x Helix 6dB	Omni	1 TX	SP3JBI	01/05 SP3JBI	
2320.850	DB0GW	JO31JK	80	2 x Helix	Omni	1 tx	DL4JK	04/05 DL4JK	
2320.850	DL0UB	JO62KK	115	Slot	Omni	1 tx	DL7ACG	01/05 DL7ACG	
2320.850	GB3NWK	JO01BI	180	Alford Slot	Omni	5	G8BJG	04/05 G3PHO	QRT since `02
2320.855	DB0SHF	JN48WP	822	3 x Dipole	280°	1	DL1SBE	01/05 DL1SBE	
2320.857	PI7GHG	JO21CV	30	10 el Yagi	270°	30	PE1GHG	03/05 VERON	QRT nw
2320.860	LA8SHF	JO59FB	30	13 dB Horn	180°	50	LA6LCA	04/05 LA0BY	ex LA1UHG
2320.860	DB0LB	JN48OV	367		Omni		DL4SBK	04/04 DL3PK	Proposal
2320.860	DB0IBB	JO32VG	200	10 x Slot	Omni	4	DB7QW	01/05	
2320.862	F1XAH	JN23MM	114	Slotted WG	Omni	15	F1AAM	04/05 F6HTJ	Temp. QRT
2320.865	PI7TGA	JO21VT	75		135°/270°	50	PA0TGA	03/05 VERON	on .880?
2320.875	IQ7GC	JN80PU	390	2 x 10 ele	305/135	20e	I7OZV	05/05 I8EMG	ex I7G
2320.872	F1ZRI	IN98WE	260	14 ele loop	190	80	F1BJD	04/05 F6HTJ	
2320.875	HG5BUC	JN97LM	485	Slot	Omni	1	HA5BDJ	03/05 HA1YA	Proposal
2320.880	DB0GO	JO41ED	738	10 x Slot	Omni	50	DB1DI	04/04 DJ3HW	
2320.880	DB0YI	JO42XB	455	4 x Quad	Omni	3	DL4AS	01/05 DL4AS	on .878
2320.880	LA3UHH	JO48JK	5	2 x 6 dB Horn	90°/180°	1	LA8AK	04/05 LA0BY	
2320.885	DB0TUD	JO61UA	250	Slot 8dB	Omni	1	DL4DTU	04/05 DL4DTU	temp. QRT
2320.885	PI7RMD	JO31AE	100	2 x Quad	180°	10	PE1KXH	03/05 VERON	
2320.886	F5ZMF	JN06JG	230	Slot	Omni	40	F5BJL	04/05 F6HTJ	
2320.888	OM0MTA	JN88NE	570	Dipole	90/270°	0.012	OM3ID	01/05	
2320.890	I8EMG/B	JM89BJ	1400	3 ele Yagi	280	1	I8EMG	02/05 I8EMG	
2320.890	GB3ANT	JO02PP	75	Alford slot	Omni	5	G8VLL	04/05 G4FSG	(on. 892)
2320.890	HG9BUB	KN08FB	930	Slot	Omni	0.5	HA5SHF	03/05 HA1YA	Proposal
2320.900	HG3BUC	JN96CC	535	Slot	Omni	1 TX	HG5AZB	03/05 HA1YA	on .895
2320.900	DB0UX	JN48FX	275	4dBD	Omni	1 tx	DK2DB	04/05 DK2DB	
2320.900	DB0JW	JO30DU	238	6 el Array	45°	25	DL9KAS	01/05	
2320.900	SK3UHH	JP92FW	175	Dish	180		SM3UZS	03/05 SM6EAN	
2320.905	GB3SCS	IO80UU	274	Alford slot	Omni	60	G0API	04/05 G4FSG	(on .900)
2320.910	OK0EE	JN99BK	568				OK2XDX	01/05	Proposal
2320.912	DB0RG	JO51AN	428	6 x Dipole ?	Omni	5	DL4OAN	04/05	Proposal
2320.915	DB0UBI	JO42GE	165	Collinear	45°	0.5	DD8QA	04/05 DD8QA	QRT since 4/04
2320.920	DB0VC	JO54IF	300	Big wheel	Omni	3	DL8LAO	04/05 DL8LAO	

2320.925	GB3PYS	IO82HL	436	Alford Slot	270°	10	GW4NQJ	04/05 G4FSG	(on. 935)
2320.930	OK0EL	JO70SQ	900	Horn 5dB	270°	0.8	OK1AIY	01/05	
2320.930	OZ7IGY	JO55VO	91	Alford slot	Omni	20	OZ7IS	04/05 OZ2TG	Temp. QRT
2320.930	PI7PLA	JO33IC	50		Omni	0.15 TX	PA0PLA	03/05 VERON	
2320.937	DB0JO	JO31SL	312	Horn	270°	0.2 TX	DG8DCI	10/04	
2320.940	GB3WYE	IO81KO	369	Dipole panel	90°	100	GW8AWM	04/05 G4FSG	QRT for ever
2320.940	SK7MHH	JO86GP	45	30 cm dish	0°	50		03/05 SM6CEN	
2320.945	DB0OS	JO40CW	730	8 el array	270°	2	DG6YW	01/05	
2320.950	DB0KP	JN47TS	435	Slot	Omni	0.1 TX	DL1GBQ	04/04 DJ3HW	QRV?
2320.950	OZ9UHF	JO65HP	30	Slot	Omni	5	OZ2TG	12/04	
2320.955	GB3LES	IO92IQ	220	Slot	160°	30	G3TQF	04/05 G4FSG	
2320.955	OZ1UHF	JO57FJ	150	Slot	Omni	8	OZ9NT	12/04	on .950
2320.960	HG7BUC	JN97KR	700	Slot	Omni	0.3 TX	HA5ED	03/05 HA1YA	Proposal
2320.960	DB0MFI	JN58KR	532		Omni	10	DG1MFI	04/05 DG1MFI	Proposal
2320.960	DB0AJA	JN59AS	360		NW	10	DL6NDG	04/05 DF6NA	
2320.963	HG6BUC	KN07AU	1015	Slot	Omni	1 TX	HA5ED	03/05 HA1YA	Proposal
2320.965	DF0ANN	JN59PL	630	4 x D Q	Omni	2.5 ei	DL8ZX	04/05 DL8ZX	Temp. QRT
2320.967	DB0AS	JN67CR	1560	28 el Yagi	337°	0.5 TX	DL2AS	10/04	(DJ3HW: 985)
2320.970	SK7MHL	JO65OR	100	WG slot	Omni	25	SM7ECM	03/05 SM6CEN	
2320.975	DB0JL	JO31MC	175	Slot	Omni	0.5	DF1EQ	04/04 DF1EQ	QRV?
2320.975	HG1BUC	JN87FI	725	Slot	Omni	0.8 TX	HA1YA	03/05 HA1YA	
2320.975	ON4KUL	JO20KV	120	2x10 Slot	Omni	1 TX	ON4IY	04/05 ON4IY	Proposal
2320.980	DB0JU	JO31CV	150	Helical	Omni	1 TX	DL1EGF	04/04 DF5EO	Call nw DB0EE
2320.987	F1ZSO	JN05MP	517				F1DXP	04/05 F6HTJ	Proposal
2320.998	PI7EHG	JO22JH	95		Omni	10	PA0EHG	04/05 VERON	on .990
3400.007	DL0UB	JO62KK	110	4 x Horn	Omni	5 TX	DL7ACG	12/04 DL7ACG	ex 3456.850
3400.012	DB0RG	JO51AN	428		Omni	5	DL4OAN	04/05	Proposal
3400.015	PI7SHF	JO22JH	93	10 dB Slot	Omni	90	PA0EHG	04/05 VERON	
3400.025	DB0HF	JO53BO	65		202°		DK2NH	04/04 DJ3HW	
3400.040	DB0KI	JO50WC	925	Slot	Omni	12	DC9NL	04/04 DC9NL	
3400.050	DB0JL	JO31MC	175	D-Helical	Omni	0.15	DF1EQ	04/04 DF1EQ	QRV?
3400.050	S55ZSE	JN65WP	620	Slot	Omni	0.5tx	S53MV	05/04 S53MV	
3400.060	DB0MFI	JN58KR	532		Omni	10	DG1MFI	04/05 DG1MFI	Proposal
3400.068	GM4LBV/B	IO86RQ	350	Slot panel	120	25eirp	GM4LBV	04/04 GM4ISM	
3400.090	S55ZMS	JN86CR	350	Slot	Omni	0.5	S53M	04/05 S51KQ	
3400.085	DB0AS	JN67CR	1565	Double 8	10°	0.5TX	DL2AS	04/04 DJ3HW	ex .020
3400.170	PI7CKK	JO33GE	55	10 dB Slot	Omni	5/30 e	PE1CKK	03/05 VERON	on .160
3400.810	DB0ANU	JN59HH	564	60cm dish	310	10	DL6NCO	09/04 DL6NCO	
3400.400	OK0EL	JO70SQ	900	Horn 5dB	270°	0.1	OK1AIY	01/05	
3400.800	LA1UHG	JO59FB	30	13 dB Horn	180°		LA6LCA	02/04 OZ1CTZ	call -> LA8SHF
3400.830	GB3MHS	JO02PB	85	Slotted WG	E/W	75	G3XDY	04/05 G3XDY	
3400.850	DB0GW	JO31JK	80	Double Helical	Omni	1 tx	DL4JK	04/05 DL4JK	
3400.888	OM0MZA	JN88NE	570	Horn	45	0.11	OM3ID	01/05	Proposal
3400.900	GB3OHM	IO92AJ	171	16 Slot wg	Omni	8	G6KOA	04/05 G4FSG	
3400.905	GB3SCF	IO80UU	274	Alford slot	Omni	60	G0API	04/05 G4FSG	(on .900)
3400.910	GB3ZME	IO82SQ	198	Slotted WG	Omni	15 tx	G3UKV	04/05 G4FSG	
3400.930	OZ7IGY	JO55VO	100	Slot	Omni	100	OZ7IS	04/05 OZ2TG	Proposal
3400.945	DB0AJA	JN59AS	360	3 x Sector	Omni	20	DL6NDG	04/05 DF6NA	
3400.955	OZ1UHF	JO57FJ	150					03/05 OZ2TG	
3456.005	DB0EZ	JO31BS	110	tube	115	0.1	DB9JC	04/04 DJ3HW	
3456.800	DB0KHT	JO40FE	247	Horn	Omni	10	DJ1RV	04/04 DJ3HW	
3456.855	DB0SHF	JN48WP	822	Horn	280°	0.5 TX	DL1SBE	04/04 DL1SBE	Temp. QRT
3456.885	DB0TUD	JO61UA	260	Slot	Omni	1	DL4DTU	04/05 DL4DTU	temp. QRT
3456.965	DF0ANN	JN59PL				2.5 ei	DL8ZX	04/05 DL8ZX	Proposal
5760.010	S55ZSE	JN65WP	620	Slot	Omni	0.5tx	S53MV	11/04	on .020
5760.029	PI7EHG	JO22JH	95	Horizontal	Omni	75	PA0EHG	04/05 VERON	
5760.030	OK0EL	JO70SQ	900	Horn 5dB	270°	0.08	OK1AIY	01/05 on .023	

5760.040	IW5BSF/B	JN53GW	1000	Horn	255	0,01	IW5BSF	03/05 I5WBE	
5760.040	HB9MPU	JN47HD	1000	3x12dB Horn	N	0.2tx	HB9CAU	04/04 HB9CAU	
5760.040	OK0EA	JO70UP	1355	12 el Slot	180/270°	0.5	OK1AIY	01/05	
5760.050	DB0EZ	JO31BS	110	Slot	Omni	1	DB9JC	04/04 DJ3HW	
5760.060	OK0EX	JN79OW	500	Slot	115/315	0.06	OK1FEN	01/05	
5760.060	F1XAO	IN88HL	326	Slotted WG	Omni	10	F1LHC	04/05 F6HTJ	
5760.068?	GM4LBV/B	IO86RQ	350				GM4LBV	04/04 GM4ISM	Proposal
5760.070	DB0JL	JO31MC	175	Slot	Omni	0.5	DF1EQ	04/04 DF1EQ	
5760.120	S55ZMS	JN86CR	350	Slot	Omni	0.5	S53M	04/05 S51ZO	
5760.590	HB9OK	JN45MW	1601	Slot	Omni	3.5	HB9DUR	04/04 HB9DUR	may be .950?
5760.800	OH3SHF	KP11VK	225	15dBi	Omni	250		01/05 OH6DD	on .806
5760.800	DB0KHT	JO40FE	247	Horn	Omni	0.5 TX	DJ1RV	04/04 DJ3HW	
5760.800	SK6MHI	JO57XQ	135	Slot WG	Omni	65	SM6EAN	03/05 SM6EAN	
5760.805	DB0RIG	JN48WQ	780		Omni	15	DG9SQ	04/04 DJ3HW	QRV?
5760.810	DB0ANU	JN59HH	570	Slot	Omni	10	DJ9AT	09/04 DL6NCO	
5760.815	F5XBE	JN18JS	160	Slot	Omni	4	F5HRY	04/05 F6HTJ	
5760.830	GB3MHC	JO02PB	85	Slotted WG	Omni	2.5	G3XDY	04/05 G3XDY	Proposal
5760.830	DB0FGB	JO50WB	1090	Slot 8 dBD	Omni	4.5 tx	DB8UY	04/05 DB8UY	
5760.840	DB0KI	JO50WC	925	Slot	Omni	0.6	DC9NL	01/05 DC9NL	
5760.845	F1XBB	JN07WV	170	Slot	Omni	150	F1JGP	04/05 F6HTJ	
5760.850	DL0UB	JO62KK	115	Slot	Omni	0.25TX	DL7ACG	01/05 DL7ACG	
5760.850	DB0GW	JO31JK	80	Slotted WG	Omni	1	DL4JK	04/05 DL4JK	Proposal
5760.850	I3EME	JN55WV	1400	Slot 10 dB	170°	1	I3EME	03/05 I5WBE	ex I3E
5760.855	DB0SHF	JN48WP	822	Patch Array	280°	0.05	DL1SBE	01/05 DL1SBE	on .830
5760.855	F5ZPR	IN94QT	60	WG slot	Omni	10	F6CBC	04/05 F6HTJ	
5760.860	DB0ARB	JN69OC	1456	Slot	Omni	3	DJ4YJ	04/04 DJ3HW	
5760.860	LA8SHF(1UHG)	JO59FB	30	13 dB Horn	180°	25	LA6LCA	04/05 LA0BY	on .877
5760.860	OE8XGQ	JN66WQ	1909	Slotted WG	Omni	3	OE8MI	04/05 OE5VRL	on .863
5760.875	HG5BSA	JN97LM	485	Slot	Omni	0.2	HA5BDJ	03/05 HA1YA	
5760.875	GB3RBY	IO92JJ	165	Slotted WG	Omni	1	G4LRT	04/05 G4FSG	QRT
5760.880	OM0MXA	JN88NE	570	Dipole	45/225°	0.11	OM3ID	01/05	Proposal
5760.885	DB0TUD	JO61UA	260	Slot	Omni		DL4DTU	04/05 DL4DTU	temp. QRT
5760.890	HG3BSA	JN96CC	535	Slot	Omni	0.5	HG5AZB	03/05 HA1YA	
5760.895	OE1XVB	JN88FE	350	Slotted WG	Omni	0.1tx	OE1WRS	04/05 OE5VRL	
5760.900	DB0CU	JN48BI	970	Slot	Omni	5	DJ7FJ	04/04 DJ3HW	
5760.900	HG6BSB	KN07AU	1015	Slot	Omni	0.3 TX	HA5ED	03/05 HA1YA	Proposal
5760.900	GB3OHM	IO92AJ	171	Slot wg	Omni		G6KOA	04/05 G4FSG	QRT
5760.905+/-	GB3SCC	IO80UU	274	Slotted WG	Omni	6	G0API	04/05 G4FSG	(on .880)
5760.905	SK0UX/B	JO99BM	90	Hybrid Quad	220	2		03/05 SM6CEN	QRT
5760.910	GB3ZME	IO82SQ	215	Slotted WG	Omni	100	G3UKV	04/05 G4FSG	
5760.910+/-	HB9G	JN36BK	1577	Slot	Omni	6.8		04/05 F5HRY	
5760.912	DB0RG	JO51AN	428		Omni	10	DL4OAN	04/05	Proposal
5760.924	GB3KEU	IO93FB	330	Slotted WG	Omni	5		04/05 G3PHO	Proposal for 2005
5760.930	OZ7IGY	JO55VO	91	Slotted WG	90/270°	15	OZ7IS	12/04	on .947
5760.945	DB0AJA	JN59AS	360	Slotted WG	Omni	10	DL6NDG	04/05 DF6NA	
5760.950	OZ9UHF	JO65HP	30	Slotted WG	Omni	50	OZ2TG	02/05	on .945
5760.950	F6CXO	JN03RM?	273	WG slot	Omni	2	F6CXO	04/05 F6HTJ	
5760.950	HG9BSA	KN08FB	930	Slot	Omni	0.1 TX	HG6AZB	03/05 HA1YA	Proposal
5760.955	OZ1UHF	JO57FJ	150	Slotted WG	Omni	8	OZ9NT	04/05 OZ2TG	on .941
5760.960	DB0MFI	JN58KR	532		Omni	10	DG1MFI	04/05 DG1MFI	Proposal
5760.960	HG7BSA	JN97KR	700	Slot	Omni	0.2	HA5ED	03/05 HA1YA	Planned
5760.965	OE2XRO	JN67LA	3105	Slotted WG	Omni	35	OE1MCU	05/05 OE5VRL	
5760.965	DF0ANN	JN59PL				2.5 ei	DL8ZX	04/05 DL8ZX	Proposal
5760.970	SK7MHL	JO65OR	100	WG slot	Omni	10	SM7ECM	04/05 SM6CEN	
5760.970	ON0CM	JO20IV					ON4AOD	01/04 ON4AVJ	Proposal?
5760.970+/-	G4LOJ/B	JO02QN					G4LOJ	08/03 F5HRY	
5760.975	ON4KUL	JO20KV	120	2x10 Slot	Omni	5 TX	ON4IY	04/05 ON4IY	Proposal
5760.975	HG1BSA	JN87FI	725	Slot	Omni	0.4 TX	HA1YA	03/05 HA1YA	
5760.985	DB0AS	JN67CR	1565	Double 8	10°	0.5 TX	DL2AS	04/04 DJ3HW	on 5760.100

10100.000	GB3IOW	IO90IO	250	Slotted WG	Omni	1	G8MBU	04/05	G3PHO	Wideband
10120.000	GB3ALD	IN89VR	90	Sector Horn	30°	1		04/05	G4FSG	Wideband
10368.005	F5XBD	JN18JS	160	Slot	Omni	9	F5HRY	04/05	F6HTJ	
10368.015	DB0EZ	JO31BS	110	Slot	115	1	DB9JC	04/04	DJ3HW	
10368.031	F6BVA	JN33BD		Dish	SE	1KWe	F6BVA	04/05	F6HTJ	
10368.037	PI7SHY	JO21RK	80	16 dBi Horn	300°	1/10 e	PA0SHY	04/05	VERON	temp. QRT
10368.050	HB9MPU	JN47HD	1000	3x12dB Horn	N	0.5tx	HB9CAU	04/04	HB9CAU	
10368.050	I5X	JN44XH		Alford	Omni	0.05	I5JRV	03/05	I5WBE	
10368.050	LX1DU/B	JN29XM	280	1.3m Dish	63°	20k e	LX1DU	04/04		Intermittant beacon
10368.050	OK0EL	JO70SQ	900	12 el slot WG	135/270°	0.15	OK1AIY	01/05	on .042	
10368.050	OZ9UHF	JO65HP	30	Slotted WG	Omni	3	OZ2TG	03/05	OZ2TG	QRT
10368.055	S55ZKP	JN65XM	1028	Slot	Omni	0.4	S51JN	05/04	S51KQ	
10368.060	F1XAI	JN07WV	170	Slotted WG	Omni	10	F1JGP	04/05	F6HTJ	Temp. QRT
10368.061	DK4GD/B	JN47FW					DK4GD	10/03	DF6TK	
10368.073	GM4ISM/B	IO85BU	370	Slotted WG	Omni	0.5eirp	GM4ISM	04/04	GM4ISM	
10368.070+/-	I4X	JN54IG	1350	Dipoles	Omni	0.1	I4BER	04/04	I4BER	
10368.070	IW5BSF/B	JN53GW	1000	Horn	255	0,01	IW5BSF	03/05	I5WBE	.010 ?
10368.075	PI7GOE	JO11XL		Slotted WG	Omni	0.1	PE1CIG	07/03	PE2KP	QRT
10368.075	OK0EA	JO70UP	1355	12 el Slot	180/270°	0.5	OK1AIY	01/05		9/03 on .091
10368.080+/-	PI7TGA	JO21VT	75	16 dB	270°	4 erp	PA0TGA	04/05	VERON	on .090
10368.082	S55ZRS	JN76MC	1215	Slot	Omni	0.27	ZRS	12/04	S51KQ	on .073
10368.108	F1XAP	IN88HL	326	Slotted WG	Omni	10	F1LHC	04/05	F6HTJ	
10368.120	DB0JL	JO31MC	175	Slot	Omni	0.2	DF1EQ	04/04	DF1EQ	Temp. QRT
10368.140	IT9JLW/B	JM67LX		Slot	160			03/05	I5WBE	QRV?
10368.150	I3EME/B	JN55WV	1400	Slot 10 dB	170°	1.5	I3EME	03/05	I5WBE	ex I3F
10368.160+/-	HB9OK	JN45MW	1601	Slot	Omni	3.5	HB9DUR	08/04	HB9DUR	nominal QRG .200
10368.178	DB0AS	JN67CR	1565	Horn	10°	0.5TX	DL2AS	12/03		
10368.180	I8EMG/B	JM89BJ	1400	Horn 20dB	280	20 erp	I8EMG	03/05		will QSY to .900
10368.195	PI7EHG	JO22JH	95	13 dBi Slot	Omni	75	PA0EHG	04/05	VERON	
10368.240	GB3SWH	IO91TP	187	Slotted WG	45/225°	1	G4KUJ	04/05	G4FSG	
10368.291	DB0ZDF	JN49CX	290				DF4WJ?	03/04		
10368.295	DL0WY	JN67AQ	1838	10 dB Slot	W,N,E	0.1 TX	DJ8VY	04/05		(DJ3HW: .853)
10368.300	F5ZPS	IN94QT	83	Horns	0°/135°	20/800	F6CBC	04/06	F6HTJ	
10368.365	OK0EX	JN79OW	500	Slot	115/315	0.04	OK1FEN	01/05		9/03 on .395
10368.682+/-	LX1DB/B	JN39CO						03/04		
10368.755	F1XAE	JN24PE	1910	Horn	270°	5	F1AAM	04/05	F6HTJ	Temp. QRT
10368.800	OH3SHF	KP11VK	225	17 dBi	Omni	40		08/04	OH6DD	
10368.800	SK6MHI	JO57XQ	135	Slotted WG	Omni	5	SM6EAN	03/05	SM6CEN	
10368.802	DB0UL	JN48XK	630	Slotted WG	Omni	4	DL5EBT	04/04	DJ3HW	
10368.805	DB0SI	JO53QP	90	Slot	Omni	1	DL1SUZ	05/05	DL1SUZ	(ex DB0XL)
10368.810	SK6YH/B	JO57XQ	135	60cm dish	60	10kwe	SM6EAN	04/05	SM6EAN	
10368.810	DB0GHZ	JO34WE	55	Slot WG	Omni	45	DK1ZD	02/04		
10368.810	DB0ANU	JN59HH	570	Slot 12 dB	Omni	10	DJ9AT	09/04	DL6NCO	
10368.810	SR7JSG	KO01BW		Slot WG	Omni	1	SP7JSG	04/04	SP3JBI	QRT
10368.810	GB3XHS	IO83VO	175	Slotted WG	Omni	40	G6GXK	01/05	G6GXK	ex G6GXK/B
10368.813	OK0EW	JO60OK	875	2 x 8 slot	90°/270°	1.5	OK1JKT	01/05		
10368.815	DB0VI	JN39NK	465	Slot	Omni	1	DL4VCG	04/04	DL4VCG	
10368.815	DB0MAX	JN58SP	420				DK1MAX	04/04	DJ3HW	NOT QRV!
10368.820	OE8XXQ	JN66UO	2166	10dB	Omni	1	OE8MI	04/05	OE5VRL	
10368.820	DB0KHT	JO40FE	247	Horn	Omni	3	DJ1RV	04/04	DJ3HW	
10368.822	SK3SHH	JP92FW	175	dish 33dB	180	10k	SM3UZS	04/05	SM6CEN	
10368.825	DB0HRO	JO64AD	75	Slot 10 dbD	Omni	0.2TX	DL5CC	04/04	DL5CC	
10368.825	F1XAU	JN27IH	516	Slot WG	Omni	13	F1MPE	04/05	F6HTJ	
10368.830	GB3MHX	JO02PB	80	12 Slot WG	Omni	5	G3XDY	04/05	G3XDY	
10368.833	DB0FGB	JO50WB	1090	Slot 8 dBD	Omni	1.3 tx	DB8UY	04/05	DB8UY	on .828
10368.835	SK0SHH	JO89XJ	60	60cm dish	237	10kw erp		04/05	SM6CEN	on .840
10368.840	DB0JO	JO31SL	312	6 x Slot	Omni	1	DG8DCI	01/05		on .855
10368.840	SK0SHI	JO89XK	70	Horizontal	Omni	1		04/05	SM6CEN	on. 846
10368.842	F6DWG	JO09WI		Slot	Omni	130	F6DWG	04/05	F6HTJ	

10368.845+/-	SR3XHR	JO81SX		WG	Omni	1		04/04 SP3JBI	Test operation
10368.845	DB0SZB	JO60JM	767	Slot	Omni	15	DG0YC	04/04 DJ3HW	QRT
10368.850	DB0GG	JN48NR	400	Slot	Omni	2	DL5AAP	04/04 DJ3HW	on .857
10368.850	DL0UB	JO62KK	115	Slot	Omni	0.15TX	DL7ACG	01/05 DL7ACG	
10368.850	DB0GW	JO31JK	80	Slotted WG	Omni	0.1	DL4JK	04/05 DL4JK	
10368.850	GB3SEE	IO91VG	250	Slotted WG	Omni	1	G0OLX	04/05 G0OLX	QRV soon
10368.853	SK1SHH	JO97CJ	52	Dish 33 dB	360°	10k		04/05 SM6CEN	
10368.855	DB0SHF	JN48WP	822	Horn	280°	0.01	DL1SBE	04/04 DL1SBE	
10368.855	SR0CWK	JO90NS	282	Slotted WG	Omni	4	SP9NLY	01/05 SP3JBI	
10368.858	OE8XGQ	JN66WQ	1909	Slotted WG	Omni	1	OE8MI	04/05 OE5VRL	
10368.859	F1DLT	JN27UR		Horn	NE	15	F1DLT	04/05 F6HTJ	
10368.855	F1BDB	JN33KQ	1200	Slot	Omni	1	F1BDB	04/05 F6HTJ	
10368.860	DB0ARB	JN69OC	1456	Slot	Omni	3	DJ4YJ	04/05	on .857
10368.860	F5XAD	JN12BL	2400	Slotted WG	NNE	2	F6HTJ	04/05 F6HTJ	
10368.860	LA8SHF	JO59FB	30	13 dB Horn	180°	10	LA6LCA	04/05 LA0BY	=ex LA1UHG on .845
10368.865	DB0JK	JO30LX	260	Slot	Omni	200	DK2KA	04/05 DK2KA	
10368.870	DB0IBB	JO32VG	200	Slot	Omni	2	DB7QW	04/04 DJ3HW	
10368.870	GB3KBQ	IO80LW	167	Slotted WG	Omni	1	G4UVZ	04/05 G4FSG	(on .865)
10368.875	HG5BSB	JN97LM	485	Slot	Omni	0.5	HA5BDJ	03/05 HA1YA	Proposal
10368.875	OE5XBM	JN78DJ	985	Slot WG 10dB	Omni	1 TX	OE5VRL	04/05 OE5VRL	
10368.875	DB0HW	JO51GT	1020	Slot	WNE	0.04	DL3AAS	03/04	(DJ3HW: .880)
10368.880	GB3CEM	IO82WO	165	Slotted WG	Omni	30	G4PBP	04/05 G4FSG	(on .870)
10368.880	HG6BSB	KN07AU	1015	Slot	Omni	1TX	HA5ED	03/05 HA1YA	Proposal
10368.884	HB9G	JN36BK	1600	Slotted WG	Omni	2	HB9PBD	12/03	
10368.885	OE1XVB	JN88FE	350	Slotted WG	Omni	0.2TX	OE1WRS	04/05 OE5VRL	Temp. QRT
10368.885	DB0TUD	JO61UA	285	Slot	Omni	5	DL4DTU	04/05 DL4DTU	
10368.885	OM0MYA	JN88NE	570	Slot	45/225	0.11	OM3ID	01/05	Proposal
10368.890	LA9SHF	JO59FS	160	10dB Horn	180	1.3Tx	LA8GKA	04/05 LA0BY	
10368.890	DB0KLX	JN39VK	350	Slot	Omni	1 TX	DC2UG	04/04 DJ3HW	
10368.890	ON4RUG	JO11UB	95	Slot 11 dB	Omni	0.7 tx	ON6UG	04/05 ON4IY	
10368.890	HG9BSB	KN08FB	930	Slot	Omni	0.1 TX	HG5AZB	03/05 HA1YA	Proposal
10368.895	LX0DB	JN39CO	408		Omni	400 e	LX1DB	04/04 LX1DB	
10368.898	DB0ECA	JN57UV		Slot	Omni	10	DC8EC	09/04 DC8EC	
10368.900	DB0ELS	JO43FF	26	11dB Slot	Omni	0.5 tx	DL9BL	01/05 DL9BL	on .893
10368.900	F5XAY	JN24BW	1671	Slot WG	Omni	2	F6DPH	04/05 F6HTJ	
10368.900	OH1SHF	KP10NJ	15	Dipole	180	0.3		01/05 OH6DD	
10368.900	DB0UX	JN48FX	275	Slot 12dBD	Omni	0.2tx	DK2DB	04/05 DK2DB	
10368.900	DB0CU	JN48BI	970	Slot	Omni	5	DJ7FJ	04/04 DJ3HW	
10368.900	GB3AZA	IO94TF	75	Single 18" dish		50	G8AZA	04/05 G4FSG	QRT since `02
10368.900	GB3SCX	IO80UU	274	Slotted WG	Omni	1	G0API	04/05 G4FSG	on .905
10368.900	OZ5SHF	JO45VX	210	Slotted WG	Omni	4	OZ2OE	03/05 OZ2TG	on .907
10368.902	LX0CD	JN39BO	420	16 ele	Omni	20 e	LX1JX	04/04 LX1DB	
10368.903	SR6NCI	JO80JG	1150	Slotted WG	Omni	1	SP6GWB	04/04 SP3JBI	QRT
10368.910	DB0HEX	JO51HT	1242	Slot	N/S	10 e	DG0CBP	04/04 DG0CBP	Temp. QRT
10368.910	GB3RPE	IO81AO	60	Slotted WG	Omni	4	GW4ADL	04/05 G3PHO	
10368.910	SK7MHF	JO77IP	505	Slotted WG	Omni	2	SM7MXO	04/04 SM6CEN	QRT for ever
10368.910	HG3BSB	JN96CC	535	Slot	Omni	1 TX	HG5AZB	03/05 HA1YA	
10368.912	DB0RG	JO51AN	428		Omni	1	DL4OAN	04/05	Proposal
10368.915	OZ4SHF	JO65BV	22	Slotted WG	Omni	10	OZ1UM	03/05 OZ2TG	on .907
10368.920	DB0VC	JO54IF	300	Slot	Omni	10	DL8LAO	04/04 DL8LAO	
10368.927	OE3XMB	JN77TX	1154	Slotted WG	Omni	1.5	OE3FFC	04/05 OE5VRL	Temp. QRT
10368.928	F1URI	JN35FU	1660	dish	jn35kt	2.2kwe	F1URI	04/05 F6HTJ	Mt. Blanc Scatter
10368.930+/-	I6X	JN63RO	250	8dB Horn	350	10	I6CXB	04/04 I6CXB	
10368.930	DB0HO	JN47QT	843	Slot	Omni	10	DF6TK	04/04 DJ3HW	
10368.930	GB3MLE	IO93EO	600	Sectoral horns	0/180°	1	G8AGN	04/05 G4FSG	(on .912)
10368.930	OZ7IGY	JO55VO	92	WG Slot	Omni	5	OZ7IS	08/04 on .953	
10368.932	OE2XBO	JN67MW	740	Slotted WG	Omni	0.1 tx	OE2HFO	04/05 OE5VRL	Temp. QRT
10368.940	DB0DON	JN58JR	532	Slot	Omni	1 tx	DL5MEL	04/04 DL5MEL	
10368.940	GB3CCX	IO81XW	342	Slotted WG	Omni	3	G6AWT	04/05 G4FSG	(on .925?)

10368.945	DB0OS	JO40CW	730	12 x Slot	270	2	DG6YW	01/05	on .943
10368.945	DB0AJA	JN59AS	340	2xSlot WG	Omni	1	DL6NDG	04/05 DF6NA	
10368.950	F6CXO	JN14EB	650	Slot WG	Omni	10	F6CXO	04/05 F6HTJ	(ex F1EIT)
10368.952	DB0FHR	JN67BU	461	Slot	Omni	1	DL5MEA	04/04 DJ3HW	
10368.955	OZ1UHF	JO57FJ	150	Slotted WG	Omni	0.8	OZ9NT	03/05 OZ2TG	
10368.960	GB3CMS	JO01HR	107	Sl. WG 10dB	Omni	30mW	G4GUJ	04/05 G4FSG	
10368.960	SK4BX/B	JO79LH	275	Sl. WG	Omni	8		04/05 SM6CEN	Temp. QRT
10368.960	HG7BSB	JN97KR	700	Slot	Omni	0.1	HA5ED	03/05 HA1YA	Proposal
10368.963	DB0NBB	JP63PN	110		Omni	3	DJ2BC	04/04 DJ3HW	10/03 on .940
10368.965	DF0ANN	JN59PL	630	12 x Slot	Omni	2.5 ei	DL8ZX	04/05 DL8ZX	Temp. QRT
10368.965	OE2XRO	JN67LA	3105	Slotted WG	Omni	1 tx	OE1MCU	05/05 OE5VRL	
10368.970	SK7MHL	JO65OR	100	WG slot	Omni	10	SM7ECM	03/05 SM6CEN	
10368.970	HG7BSA	JN97KR	700	Slot	Omni	0.1TX	HA5SHF	03/04 HA1YA	Proposal
10368.975	ON4KUL	JO20KV	120	2x12 Slot	Omni	1	ON4IY	04/05 ON4IY	
10368.975	HG1BSB	JN87FI	725	Slot 10 dBD	Omni	0.25TX	HA1YA	03/05 HA1YA	
10368.985	HB9AK	JN47LI	1133	10 dB Slot	Omni	0.23	HB9CZF	04/04 HB9CZF	QRT
10368.994	F5XBG	JN26KT		Slotted WG	Omni	5	F6FAT	04/05 F6HTJ	
10368.999	DB0KI	JO50WC	925	Slot	Omni	5	DC9NL	01/05 DC9NL	
10369.000	F1XAN	JN09TD	300	Slotted WG	Omni	1.5	F1PBZ	04/05 F6HTJ	QRT
24025.000	GB3IOW	IO90IO	250	Sectoral horn		8	G8MBU	04/05 G4FSG	Wideband
24048.975	ON4KUL	JO20KV	120	10dBi	Omni	1 TX	ON4IY	04/05 ON4IY	Proposal
24048.055*	DB0JO	JO31SL	312	6 x Slot	Omni	0.6	DG8DCI	10/04	ex 24192.055
24048.100	HB9OK	JN45MW	1601				HB9DUR		Proposal
24048.170*	F6DWG	JN09WI	240	Parabol	29	1KWe	F6DWG	04/05 F6HTJ	
24048.180*	F6DKW	JN18CS	230	Slot WG	Omni	15	F6DKW	04/05 F6HTJ	
24048.202*	PI7EHG	JO22JH	95	24cm dish	267°	238	PA0EHG	04/05 PA0EHG	ex 24192.160
24048.202*	PI7EHG	JO22JH	95	13 dBD	Omni	16	PA0EHG	04/05 PA0EHG	ex 24192.160
24192.550*	F1ZPE	JN07WV	170	Horn/WG	53/Omni	15/3	F1JGP	04/05 F6HTJ	
24048.805	DB0SI	JO53QP	90	Slot	Omni		DL1SUZ	05/05 DL1SUZ	Proposal
24048.815	DB0VI	JN39NK	465	Slot	Omni	0.3	DL4VCG	04/04 DL4VCG	Proposal
24048.820*	DB0JL	JO31MC	175	Slot	Omni	0.12	DF1EQ	04/04 DF1EQ	ex 24192.120
24048.830	GB3MHK	JO02PB	85	SlottedWG	Omni	25	G3XDY	05/05 G3XDY	Planned
24048.833*	DB0FGB	JO50WB	1090	Slot 8dBD	Omni	0.7 tx	DB8UY	04/04 DB8UY	ex 24048.833
24048.840	DB0KI	JO50WC	925	Slot	0°	0.5	DC9NL	03/05 DC9NL	Proposal
24048.850	DB0GW	JO31JK	80	Slotted WG	Omni	0.05	DL4JK	04/05 DL4JK	
24048.853	DL0WY	JN67AQ	1838	Sect. horn	W,N,E	0.01	DJ8VY	04/05	
24048.860	F1ZSE	JN24PE	1910	Slot WG	Omni	1	F1AAM	04/05 F6HTJ	Proposal
24048.860	DB0ARB	JN69OC	1456	Parabol	SW	0.03	DJ4YJ	04/04 DJ3HW	
24048.865	DB0JK	JO30LX	260	2 x H-Horn	Omni	1	DK2KA	04/04 DK2KA	qrv on 24192.865
24048.875	DB0HW	JO51GT	1016	Slot	Omni	1	DL3AAS	04/04 DJ3HW	
24048.875*	OE5XBM	JN78DJ	985	Sl. WG 13dBi	Omni	0.1tx	OE5VRL	04/05 OE5VRL	
24048.885	DB0TUD	JO61UA	250	Slot 10dB	Omni	0.01tx	DL4DTU	04/05 DL4DTU	
24048.895	DB0ECA	JN57UU	705	Slot	0°	1	DC8EC	05/04 DC8EC	Proposal + new QTH
24048.900	DB0CU	JN48BI	970	Horn	180°	5	DJ7FJ	04/04 DJ3HW	
24048.905*	DB0NCO	JN59NB	746	Slot	Omni	0.8	DL6NCO	09/04 DL6NCO	
24048.905*	GB3SCK	IO80UU	274	Slotted WG	Omni	3	G0API	04/05 G4FSG	
24048.910	GB3ZME	IO82SQ	215	Slotted WG	Omni	10	G3UKV	04/05 G4FSG	ex 24192.910
24048.912	DB0RG	JO51AN	428		Omni	1	DL4OAN	04/05	Proposal
24048.920	DB0AJ	JN57	620	Slot	Omni	0.1	DK2RV	04/04 DJ3HW	QRT
24048.920	HG3BSC	JN96CC	535	Slot	Omni	0.18	HG5AZB	03/05 HA1YA	
24048.925	GB3BNL	IO93FB	330	22dB Horn	N/S	0.4tx		12/03	Proposal
24048.930	DB0KHT	JO40FE	247	Horn	Omni	0.02 TX	DJ1RV	04/04 DJ3HW	ex 24192.050
24048.930	OZ7IGY	JO55VO					OZ7IS	04/05	Proposal
24048.945	DB0AJA	JN59AS	360	2x8 Slot WG	Omni	0.5	DL6NDG	04/05 DF6NA	ex 24192.945
24048.950	HB9G	JN36BK						04/03 HB9AHL	Planned?
24048.960	DB0MFI	JN58KR	532		Omni	10	DG1MFI	04/05 DG1MFI	Temp. QRT
24048.960	HG7BSC	JN97KR	700	Slot	Omni	0.1	HA5ED	03/05 HA1YA	Proposal
24048.965	OE2XRO	JN67LA	3105	Slotted WG	Omni	5	OE1MCU	05/05 OE5VRL	

24048.965	DF0ANN	JN59PL	630		Omni	2.5 ei	DL8ZX	04/05 DL8ZX	Proposal
24048.970*	SK7MHL	JO65OR	100	WG slot	Omni	1	SM7ECM	04/05 SM6CEN	
24048.985	DB0AS	JN67CR	1565	Horn	10°	0.5 TX	DL2AS	04/04 DJ3HW	ex 24192.405
24100.000	GB3ALD	IN89VR	90	Sectoral horn	30°	8	Wideband	04/05 G4FSG	Temp. QRT
24192.000	ON4RUG	JO11UB	95	Slotted	Omni	0.1	ON6UG	04/04 ON6UG	Proposal
24192.050	I3EME/B	JN55WV	1400	Slot 8 dB	170°	0.25	I3EME	03/05 I5WBE	ex I3G
24192.070	OK0EX	JN79OW	500	Slot	115/315°	0.02	OK1FEN	01/05	
24192.114	OK0EL	JO70SQ	900	12 el slot WG	90/135°	1	OK1AIY	01/05	
24192.120	HB9MPU	JN47HD	1000	2x6dB Horn	N+W	0.3tx	HB9CAU	04/04 HB9CAU	
24192.180	I6G	JN63RO	30	0.4m Dish	335°	0.155	I6CXB	04/04 I6CXB	
24192.180	I8EMG/B	JM89BJ	1400	Horn 23dB	280	20 erp	I8EMG	03/05	will QSY to 24049.900
24192.180	OK0ET						OK1VAO	01/05	Proposal
24192.225	OK1JKT	JO60OK	875	Slot	205	0.1	OK1JKT	01/05	
24192.252	F1XAQ	IN88HL	326	Slotted WG	Omni	0.4	F1LHC	05/04 F6HTJ	Temp. QRT
24192.800	SK6MHI	JO57XQ	135	2 x Sect Horn	S+N	1	SM6EAN	02/04SM6CEN	QRT
24192.830	F5XAF	JN18DU		Parabol	90°	1	F5ORF	04/05 F6HTJ	QRT
24192.860	LA8SHF	JO59FB	30	13dB Horn	180°	?	LA6LCA	04/05 LA0BY	
24192.862	F1..	JN24PE	1910			0.08	F1UNA	04/04 F6HTJ	Proposal
24192.875	GB3RBY	IO92JJ	165	Slotted WG	Omni	0.1	G4LRT	04/05 G4FSG	QRT
24192.875	HG5BSC	JN97LM	485	Slot	Omni	0.18	HA5BDJ	03/05 HA1YA	Planned
24192.880	OZ9UHF	JO65HP	30	Slotted WG	Omni	0.1		03/05 OZ2TG	
24192.890	GB3DUN	IO91RV	260	Slotted WG	Omni	1	G3ZFP	04/05 G4FSG	(will QSY)
24192.895	LX0DBC	JN39CO	408		Omni	100 e	LX1DB	04/04 LX1DB	
24192.900	OH1SHF	KP10NJ						01/04 OH6DD	Proposal
24192.900	SK0UX/B	JO99BM	90	60cm dish	230	500		04/04 SM6CEN	Temp. QRT
24192.915	OZ4SHF	JO65BV	22	Slotted WG	Omni	10	OZ1UM	03/05 OZ2TG	
24192.930	HG6BSC	KN07AU	1015	Slot	Omni	0.15	HA5ED	03/05 HA1YA	Proposal
24192.940	GB3AMU	IO81JN	266	Sect. Horn	135°	1	GW3PPF	04/05 G4FSG	(will QSY)
24192.955	OZ1UHF	JO57FJ	150	Slotted WG	Omni	0.5	OZ9NT	03/05 OZ2TG	QRT
24192.975	ON4LVN	JO20IV	120	Slotted WG	Omni	0.5	ON4AOD	04/04 ON7WP	
47088.050	SK0UX/B	JO99BM	90		SW	80		05/04 SM6CEN	Proposal
47088.240	I3H	JN66EB	1570	Horn 25 dB	180°	1.2	I3OIB	03/05 I5WBE	
47088.833	DB0FGB	JO50WB	1090	15 dB Horn	0°	0.02tx	DB8UY	04/04 DB8UY	100° Horn
47088.853	DL0WY	JN67AQ	1830	Horn	0°/90°/270°	0.015	DJ8VY	04/04 DJ3HW	
47088.865	DB0JK	JO30LX	260	2 x H-Horn	Omni	0.1 TX	DK2KA	04/04 DK2KA	
47088.875	OE5XBM	JN78DK	855	Sl. WG 20dbi	260	0.02	OE5VRL	04/05 OE5VRL	
47088.875	HG5BEA	JN97LM	485	Slot	Omni	.015	HA5BDJ	03/05 HA1YA	Proposal
47088.888	PI7EHG	JO22JH	95	Horn	200	0.4 e	PA0EHG	04/05 PA0EHG	
47088.895	DB0ECA	JN57UU	705	Horn	0°		DC8EC	05/04 DC8EC	temp. QRT
47088.895	LX0CDE	JN39CO	408		Omni	1 e	LX1DB	04/04 LX1DB	
47088.900	HG3BEA	JN96CC	535	Slot	Omni	.015	HG5AZB	03/05 HA1YA	Proposal
47088.900	HG6BEA	KN07AU	1015	Slot	Omni	.015	HA5ED	03/05 HA1YA	Proposal
47088.905	G8BKE/p	IO80UU	274	20dB Horn	80°	0.01tx	G4JNT	02/04 G4JNT	=GB3SCK qth
47088.912	DB0RG	JO51AN	428		Omni	0.3 e	DL4OAN	04/05	Proposal
47088.985	DB0AS	JN67CR	1565	Horn	10°	0.5 TX	DL2AS	04/04 DJ3HW	
76032.833	DB0FGB	JO50WB	1090	16 dB Horn	0°	0.015tx	DB8UY	04/04 DB8UY	70° Horn
76032.895	LX0CDF	JN39CO	408		Omni	0.1 e	LX1DB	04/04 LX1DB	
76032.960	DB0MFI	JN58KR	532	Slot	Omni	10 e	DG1MFI	04/05 DG1MFI	temp. QRT
76032.875	HG5BEB	JN97LM	485	Slot	Omni	0.01	HA5BDJ	03/05 HA1YA	Proposal
76032.895	DB0ECA	JN57UU	705	Horn	0°		DC8EC	05/04 DC8EC	temp. QRT
76032.900	HG3BEA	JN96CC	535	Slot	Omni	0.01	HG5AZB	03/05 HA1YA	Proposal
76032.900	HG6BEB	KN07AU	1015	Slot	Omni	0.01	HA5ED	03/05 HA1YA	Proposal
76032.985	DB0AS	JN67CR	1565		10		DL2AS	04/04 DJ3HW	
145152.985	DB0AS	JN67CR	1565		10		DL2AS	04/04 DJ3HW	qrv??

Pwr: no entry or "e" = ERP, ei = EIRP, tx = TX-Output Pwr.

SUPER LOW NOISE PREAMPLIFIER

The MKU 131 AH-HEMT and MKU 231 AH-HEMT are Low Noise Amplifiers for 1,3 GHz and 2,3 GHz band equipped with the latest HEMT from Mitsubishi. By virtue of this special device and its unique circuit design it provides unequalled performance needed for serious 1,3 GHz and 2,3 GHz weak signal operation like EME, Satellite and Tropo DX. ***These preamps contain no coaxial relays.***

Specifications	MKU 131 AH-HEMT	MKU 231 AH-HEMT
• Frequency range	1296 +/- MHz	2304-2322 MHz
• Gain	min. 17 dB	typ. 16 dB
• Noise figure	max. 0,4 dB @ 18 °C	typ. 0,4 dB @ 18 °C
• Operation voltage	+9...15 V DC	+9....15 V DC
• Current consumption	15 mA	15 mA
• Input connector	N-male	N-male
• Output connector	N-female	N-female

195,00 €

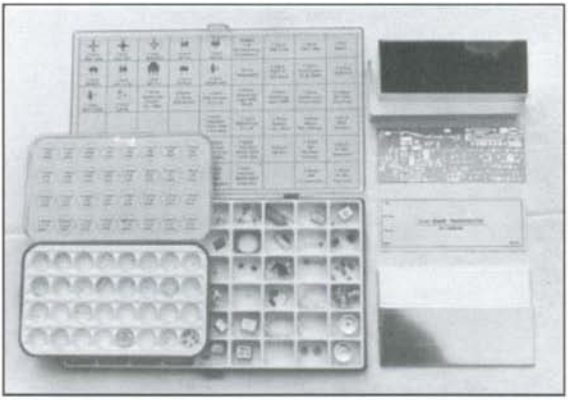
- **Low noise figure and high gain**
- **Milled aluminium case**
- **Dimensions: 50 x 30 x 18 mm**
- **Unconditionally stable, no parasitic oscillations in case of poor antenna match**

Other connectors on request!

DB6NT TRANSVERTER-KITS FOR 1,3 GHz ... 10 GHz

- ✓ **Compact construction**
- ✓ **Built-in transmit / receive IF switch**
- ✓ **Operating voltage +12....14 V DC**
- ✓ **Tinplate case**
- ✓ **SMA-female connectors**
- ✓ **All transverters are also available as ready made modules!**

For more technical details, please visit our website: www.db6nt.de



Type	Kit 1,3 GHz 13G2	Kit 2,3 GHz 23G2	Kit 3,4 GHz 34G2	Kit 5,7 GHz 57G2	Kit 10 GHz 10G2
Input frequency	144...146 MHz	144...146 MHz	144...146 MHz	144...146 MHz	144...146 MHz
Output frequency	1296...1298 MHz	2320...2322 MHz	3400...3402 MHz	5760...5762 MHz	10368..10370 MHz
Output power	>1,5 Watt	>1 Watt HF	>200 mW	>200 mW	>200 mW
RX gain	>20 dB	>20 dB	>20 dB	>20 dB	>20 dB
Noise figure	max. 0,8 dB NF	max. 0,8 dB NF	max. 0,9 dB NF	typ. 1 dB NF	typ. 1,2 dB NF
Dimensions mm	32 x 60 x 100	30 x 80 x 150	35 x 60 x 150	30 x 80 x 150	30 x 55 x 150
Price (incl. VAT)	255,00 EUR	281,00 EUR	306,00 EUR	306,00 EUR	332,00 EUR

All prices incl. VAT!

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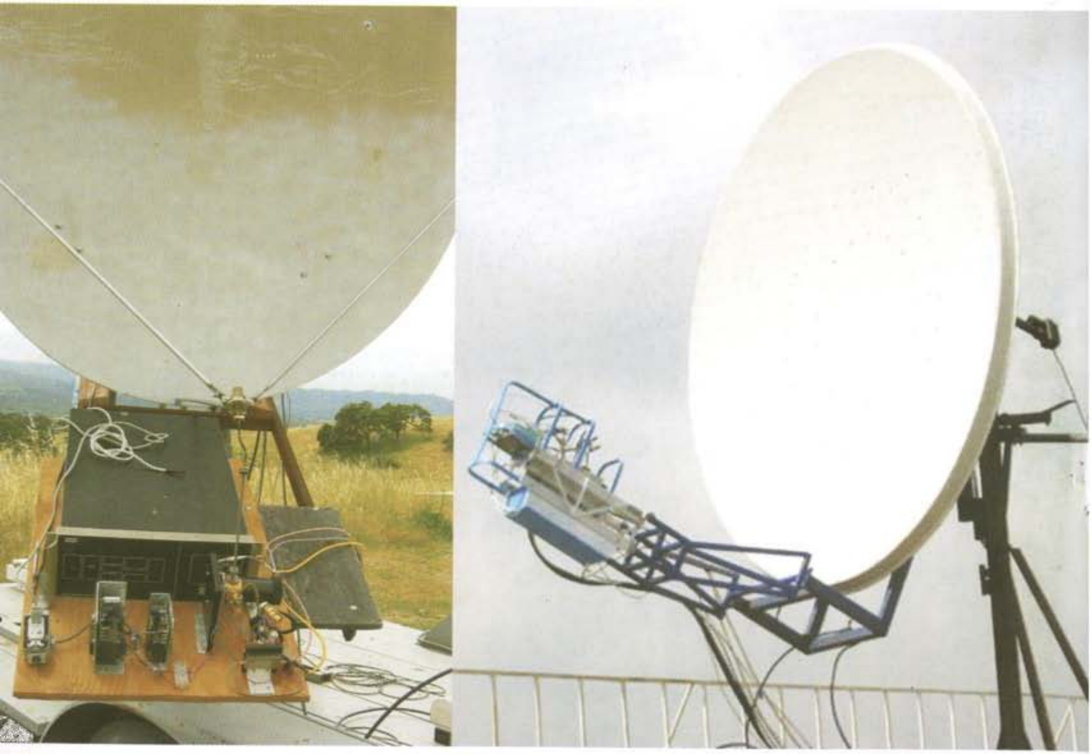
In this issue:

1st ever EME QSO on 47 GHz on January 23 rd 2005 between AD6FP and RW3BP



AD6FP 47 GHz EME Stations RW3BP

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