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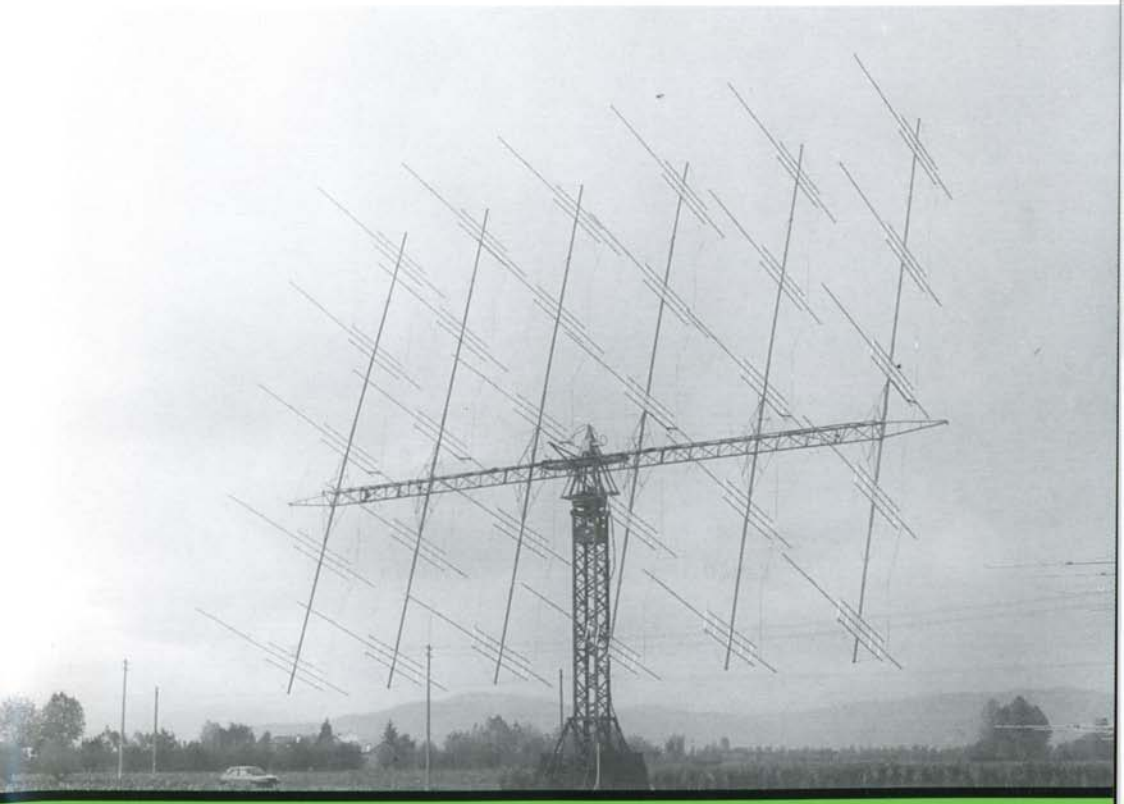
European EME Contest



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DUBUS
die zweisprachige Zeitschrift für den Schmalband-DX-Amateur auf UKW von 50MHZ bis 241GHz. Geschrieben von aktiven UKW-Amateuren für aktive UKW-Amateure.

DUBUS
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Technical Reports

Editor: Rainer Bertelsmeier, DJ9BV

No-Tune Transverter for 5.7GHz

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Abstract: Designed for ATV-applications this innovative broadband design for a 6cm transverter is of interest because of its unique features like dielectric resonator LO, microstripline filters and a switched FET-Mixer.

Kurzfassung: Eigentlich gedacht für ATV-Transverter ist dieser 5,7GHz Transverter wegen seiner Schaltungsdetails interessant. Er benutzt einen LO mit einem dielektrischen Resonator, Mikrostreifenleitungsfilter und einen FET-Mischer, der im Schalter-Betrieb arbeitet.

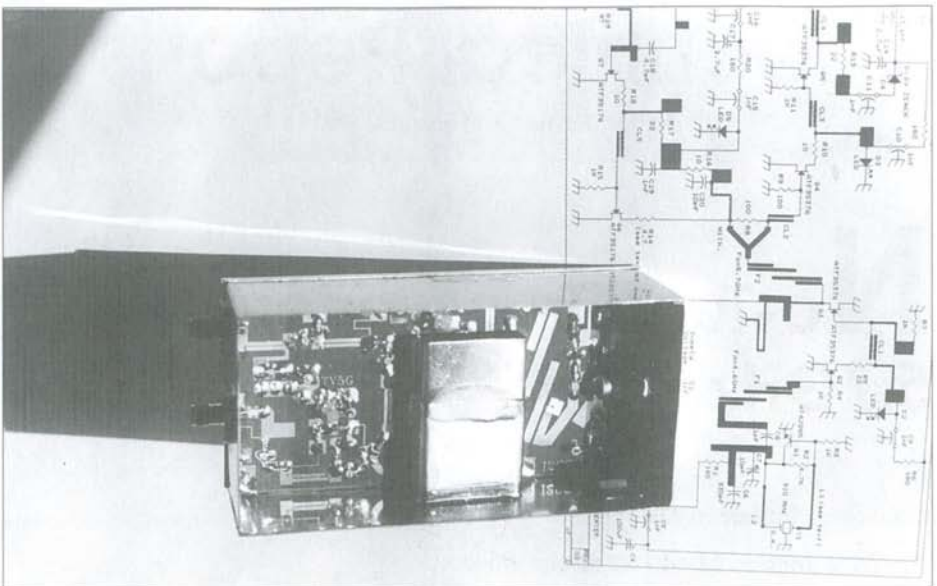
1. Introduction

Broadband communications of amateur interest, compared to narrow-band systems, are employed in a growing number of applications. These include high speed data links, digital-modulated television communications which require nearly I Mbit/sec of data (without the assist of various methods of compression the amount of data would raise to unacceptable levels) or the more conventional analog Amateur Television, which need a considerable amount of bandwidth. The goal of this project, beyond the fact that it's designed to operate @ 5.7 GHz, was to provide the highest degree of confidence to all those people that are still novices in the SHF world. No particular, (or expensive) piece of hardware is required to put together this transverter except for a soldering iron and a common tester.

Indeed, this design reflects in a low cost of realisation, opening the wonderful world of SHF to everyone who doesn't have time and money (maybe just not enough of them) to spend realising more complex devices. This is' also an opportunity to all those young people who would like to enter in the microwave arena but that didn't know how to make a rocky start.

Before taking a closer look to this transverter here are some figures: conversion gain 15-16 dB, noise figure 1.3-1.4 dB, output power 30-40 mW. Figure I shows one of the first samples.

Fig, 1: Transverter on 5.7GHz



1. Einführung

Breitband Techniken werden immer interessanter. dazu gehören ATV, DATV und Datenkommunikation. Dabei sind Datenraten von mehr als 1Mbit/s üblich. Um die Aktivität im SHF-Bereich zu steigern, wurde dieser einfach zu bauende 5,7GHz Transverter entwickelt.

Er hat eine Rauschzahl von 1,4dB, einen Übertragungsfaktor von 14...15dB und eine Ausgangsleistung von 30mW. Abb. 1 zeigt die ersten Baumuster.

2. Description

Innovation

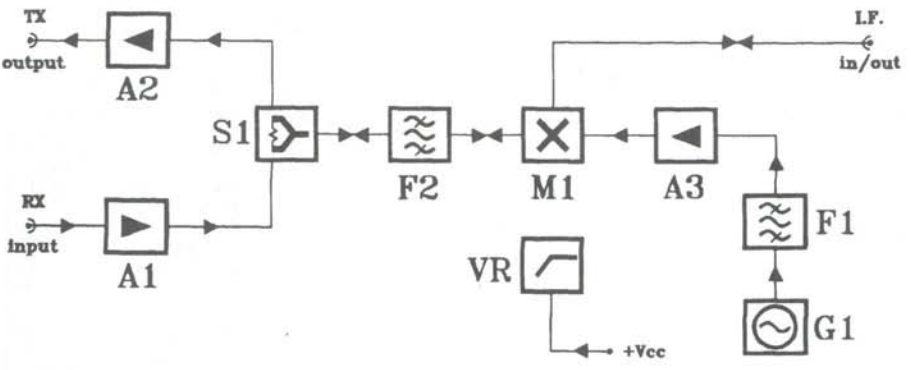
There are three major innovations in this transverter:

- This device is, first of its kind in the 6 cm band, "No Tune".
- In the local oscillator a dielectric resonator is employed : it's of the same type of those used in the high volume, low cost cellular phone applications.
- The passive, bi-directional mixer employs a non biased GaAs MESFET .

Fig 2 shows the block diagram of the transverter that can cover the whole 5.6-5.8 GHz segment with an IF bandwidth that span from 1.2 to 1.4 GHz . It's important to point out that:

- The local oscillator works around 900 MHz using a ceramic resonator designed to operate @ 914 MHz (nominal frequency).
- The filter marked 'F1' extracts the fifth harmonic (f = 4.6 GHz) from the oscillator and after being amplified by the buffer stage "Q2", the signal drives the mixer "M1".
- Mixer "M1" is realised by employing a single PBEMT (Pseudomorphic High Electron Mobility Transistor) which operates without the powering bias. The same mixer operates both in the receiving and in the transmitting mode.
- Filter "F2", needed to reject the image frequency, is centred @ 5.7 GHz, has a 300 MHz bandwidth, and it's realised us-

Bild/Figure 2: Block Diagram



A1 = RX R.F. amplifier
A2 = TX R.F. amplifier
A3 = Oscillator buffer
F1 = 5th harmonic band-pass filter (Fo = 4.6 GHz)
F2 = Image rejection filter (Fo = 5.7 GHz)
G1 = D.R.O.
M1 = Mixer
S1 = Power splitter
VR = Voltage regulator

ing a parallel coupled lines structure. Like "F1 " it doesn't need to be trimmed and it is printed along with the rest of the PCB on a high quality laminate (DuroidTm, type 5880 from Rogers corp. Microwave Materials Division).

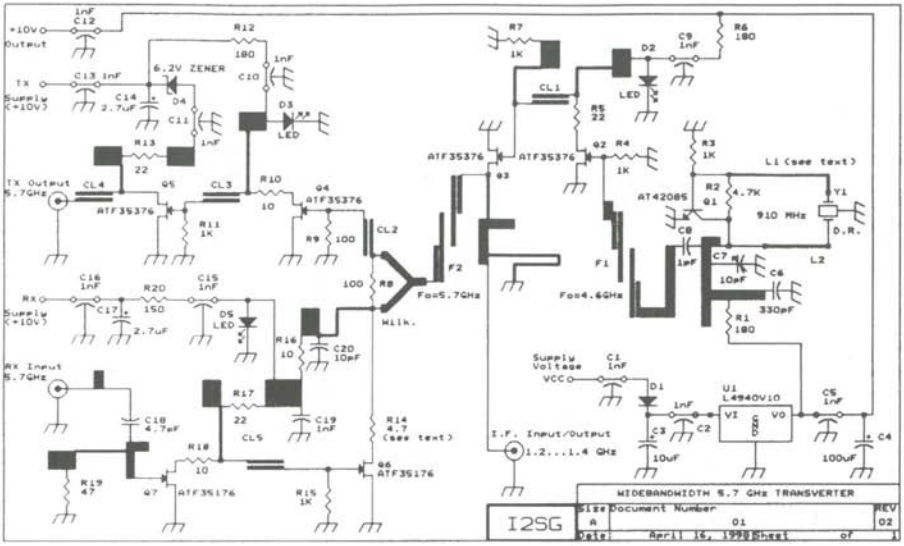
- Filter "F2" is also used both when transmitting and receiving; a Wilkinson hybrid power splitter following this filter, provides two separate paths of the received and transmitted signals.
- The RF amplifiers needed to boost the signals are respectively "Al " (Rx) and "A2 " (Tx). Switching between regulator Rx/Tx mode is done by commuting the power supply. The antenna T/R switch is external as well as optional power boosters and/or low noise preamplifiers.
- A single voltage regulator supplies bias to all stages
- An additional IF amplifier was not included in the project: the mixer is directly connected to the input/output port @ 1.3 GHz

The electric diagram of this transverter is shown in figure 3: it's all contained in a single printed circuit board measuring 108 x 54 millimetres. If everyone is interested in building this simple transverter I can supply (of course, feedback is very much appreciated!) both the printed circuit board and the ceramic resonator which are the only crucial components of this realisation.

All the other stuff needed to put this transverter together may be obtained easily trough vendors (but not all them sell the required parts in small quantities) or just paying a visit to HAM flea- markets. As I pointed out in the beginning, everything needed is a tester and a soldering iron.

In the next chapters you will find both the building tips and an quick explanation of the

Bild/Figure 3: Circuit Diagram



key points: simple descriptions and simulations were preferred to a strict and rigorous mathematical analysis in order to make everyone understand (not only the experienced OM) what they are about to.

Bi-directional mixer using a non biased MESFET

The Field Effect transistor employed in the mixer is used as a switch, without any biasing supply, that works at the same frequency of the local oscillator. This kind of mixer is similar to a 4-quadrant analog multiplier. This solution was first experimented by the author in 1965 at the Fairchild laboratories, where the planar technology was born.

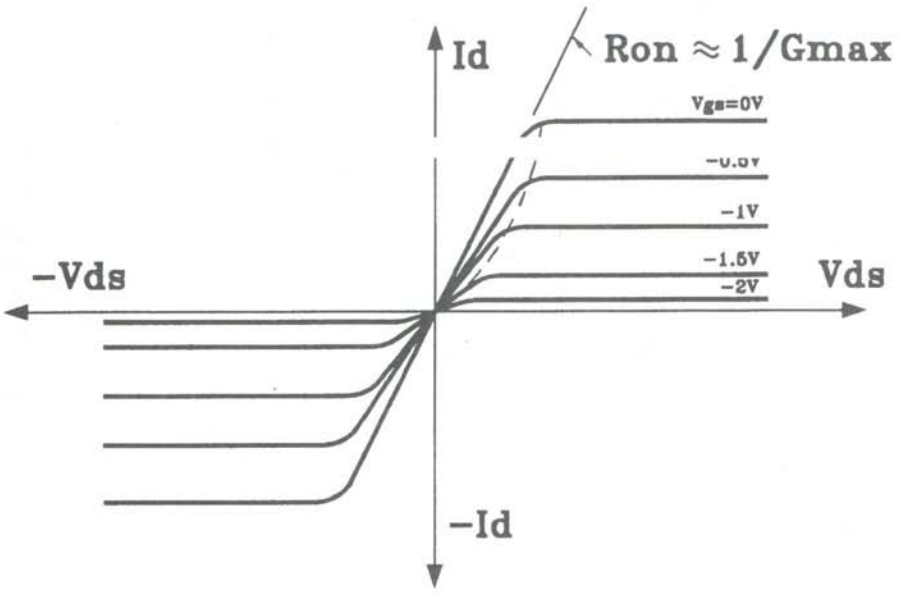
At that time the first MOSFET working at radio frequency range was also developed (its selling code was FT57) with a mutual conductance of 5 ... 7 mS. This device successfully operated up to some hundreds megaherz, replacing in some applications the vacuum tubes.

I remember I used ten FT57s to build a wideband (around 200 MHz) additive amplifier scoring a whooping (for those years) dV/dt = 2 KV/psec (see ref 2). I also realised a balanced mixer operating at 9MHz using just one of these MOSFETs.

By driving the gate with a signal of about 10V peak to peak, the device operated just like a switch and had a symmetric behaviour, no matter if the signals were driven from drain to source or vice versa. By neutralising the gate to drain capacitance, in the same way done for triodes, the carrier could be kept 60 dB lower than the output sidebands.

The characteristics of an ideal MOS are shown in figure 4: either in the first and in the third quadrant the device operates in the same way and all the Id / Vds curves cross the origin of the axes. By operating the MOSFET within the linear region (inside the dashed fine on fig 4), the device behaves much like a variable resistor whose value depends on the voltage applied to the gate. Thus, with an adequate driving signal to the

Bild/Figure 4: Typical Characteristics of a FET



gate, the transistor operates in the same way as a switch, as figure 5 shows.

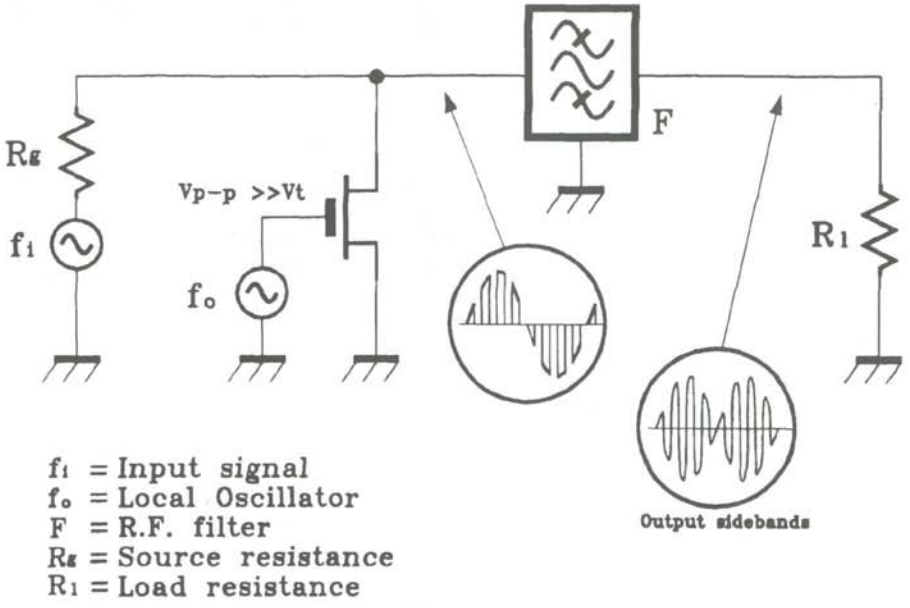
When the MOS is in the "ON" state, it acts like a linear, low value resistor, and this value is equal to the inverse of the channel conductance (Which reaches its maximum when the gate voltage is null and the drain current depends on the device intrinsic parameter IDss). When the transistor is switched off, only its output capacitance is relevant. In both states, the inductance associated with the internal wires connecting the semiconductor chip to the transistor case, has influence only at frequencies of thousands of MHz. If we suppose that the MOS operates as a switch with a symmetric duty cycle, as shown in figure 5, it may be demonstrated that the modulator conversion loss is equal to -6 dB. This mixer works in both directions, making also the demodulation process. In spite of being an asymmetric structure the driving signal is not present at the output except for a small part due to the feedback capacitance between gate and drain.

When operating at low frequencies the local oscillator signal suppression may be further enhanced with a simple neutralisation. The Fairchild FT57 device was a Metal Oxide Semiconductor device with the gate always insulated, and the working symmetry was perfect.

This is not true for GaAs MESFET devices, as those used in this project since the gate is a Schottky metal-semiconductor junction which behaves much like a rectifying diode. For this reason it was necessary to choose a device with both high transconductance (that presents low "ON" resistance) and low cut- off voltage, in order to limit the driving signal to the gate and to keep the conversion losses close to 6 dB.

To design a circuit matching all these expectations several tests were conducted employing a 'Jig' transistor mounting device (Transistor Fixture Hewlett Packard mod. I 1608A), together with a pair of biasing "T" (Hewlett Packard mod 11589A) (see fig. 6). To prevent undesirable and unpredictable oscillations to

Fig. 5: Modulator using a FET-Switch



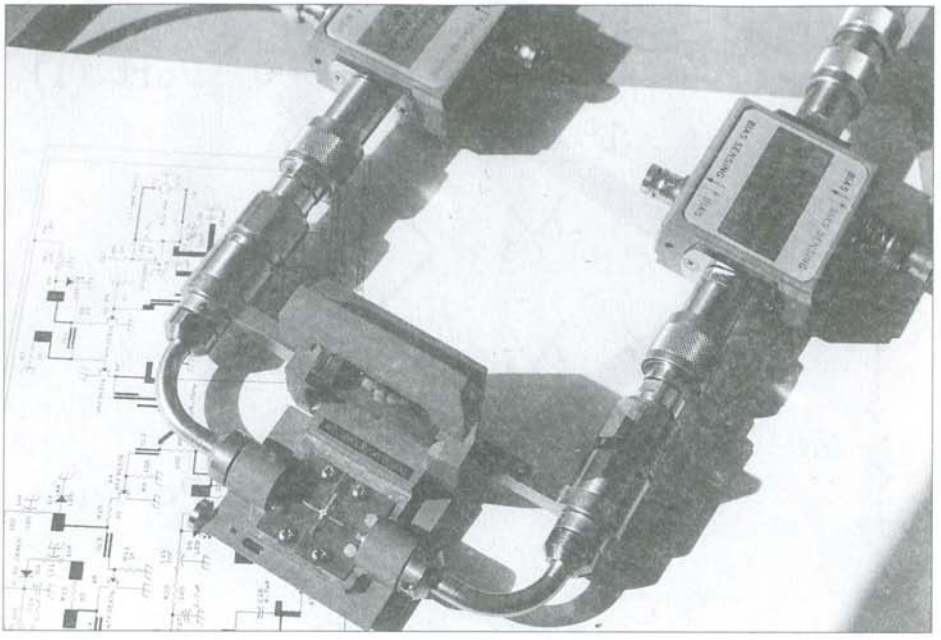
take place during the test, both the input and output ports are terminated on 50 Ohm loads. Among all the devices considered, the Avantek models AF35076,- 176,-376 or the more recent ATF36077 were chosen because they have a transconductance of 60...30mA and a threshold voltage of a few hundreds millivolt (thus a "ON" resistance of about 15 Ohm); another important quality is that they're easily available at modest prices. The same devices were already successfully employed in bi-directional mixers at a frequency of 10 GHz (see ref. 3)

Wilkinson divider

The mixer and the RF filter are employed both when transmitting and when receiving (with the signal travelling in the opposite directions). The RX channel is split from the TX channel by a symmetric Wilkinson power divider (-3 dB). The structure is visible in the middle of fig. 3. The function of the divider is to isolate the unused channel. Figures 7 and 8 shows the Wilkinson divider circuit and its simulation, when operating with a characteristic impedance of 50 Ohm. The key points are:

1. A signal sent through the input port (S) is split into two (thus it's -3dB for each output port); since both the resulting signals have the same phase, the voltage across "R" is null.
2. The two lines are one quarter of wavelength long. They're both connected to the input port (S) and between the outputs (1 - 2) there's a path of one half of wavelength. The signal applied at one of the two ports flows to the other across the resistor "R" and through the microstrip lines. Both the paths cause an attenuation of 6 dB, but while the resistor does not introduce any phase shift the signal in the lines has a 180° delay. So, the two voltages reaching the other port have an opposite phase and thus they cancel.

Fig. 6: Test jig for measuring MOSFETs and MESFETs



3. Therefore undesirable reflections through one of the output ports may reach the input (S) but not the adjacent port.
4. The Wilkinson divider works also as a signal adder.

If the working impedance is 50 ohm, the two lines have $Z_0 = 70\Omega$ and the resistor value is 100Ω. Figure 8 shows a computer aided simulation where "a" is the balancing resistance "b" are the two quarter-wavelength fines and "c" are the ideal connections between the two lines.

The predicted results are referred to the centre frequency:

1. The output at port 3 is -3 dB lower than the input (1) and its phase shift is -90'. The same applies to the other output port (4)
2. The isolation between the two output ports is 45 dB and remains better than -30 dB within a 1.2 GHz bandwidth.
3. The input port return loss is -40 dB, measured at the centre frequency

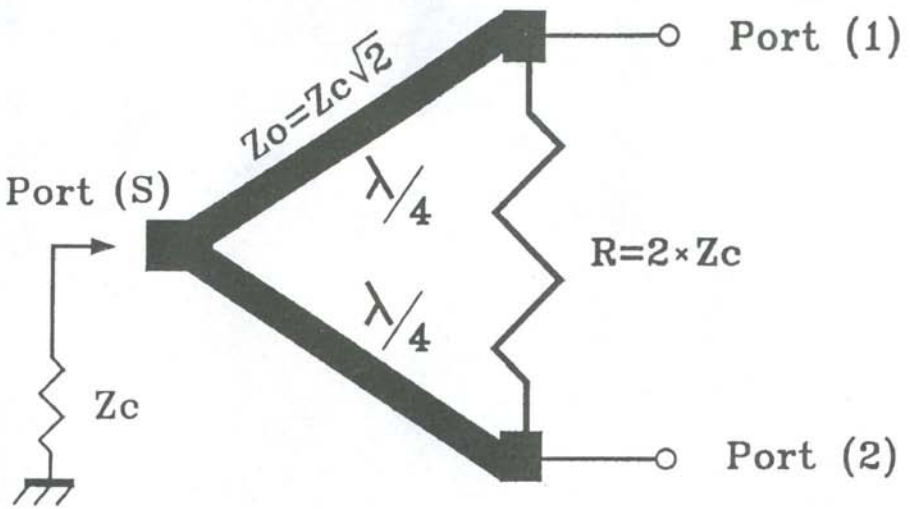
Coupled lines filter

Both F1 and F2 are bandpass filters realised with resonators which are one half wavelength long: they're placed side by side on the circuit board and staggered one quarter of wavelength away. The losses within the passband are related to three main factors:

1. Dissipation losses associated with the intrinsic resistance of the microstrip metal.
2. Losses inside the dielectric.
3. Losses associated with radiation.

The higher the characteristic impedance of the microstrip lines, the greater the radiation losses are. Using a material with a low ε_r for the board also increases these losses. Not all the electric field remains confined inside the substrate; some force lines of the field, especially those generated near the border of the strip, cross the air. This is the basic difference between a coaxial transmission line or a stripline from the microstrip.

Fig. 7: Wilkinson Divider



In the first two cases, the speed of energy propagation remains sole function of ε_r and independent of the physical dimension or the characteristic impedance of a line. When using microstrip it should be noted that:

- The degree of energy radiated varies with the materials employed. Low ε_r dielectrics may cause undesirable coupling between different structures of the circuit board. This is the reason because in this project the filter F2 is shielded with a grounded "U" shaped plate.
- As the frequency rises, even the thickness of the substrate has to be reduced. The impedance of the lines depends on the ratio between its width and the dielectric thickness. A high degree of precision is difficult to obtain when working with small dimensions.

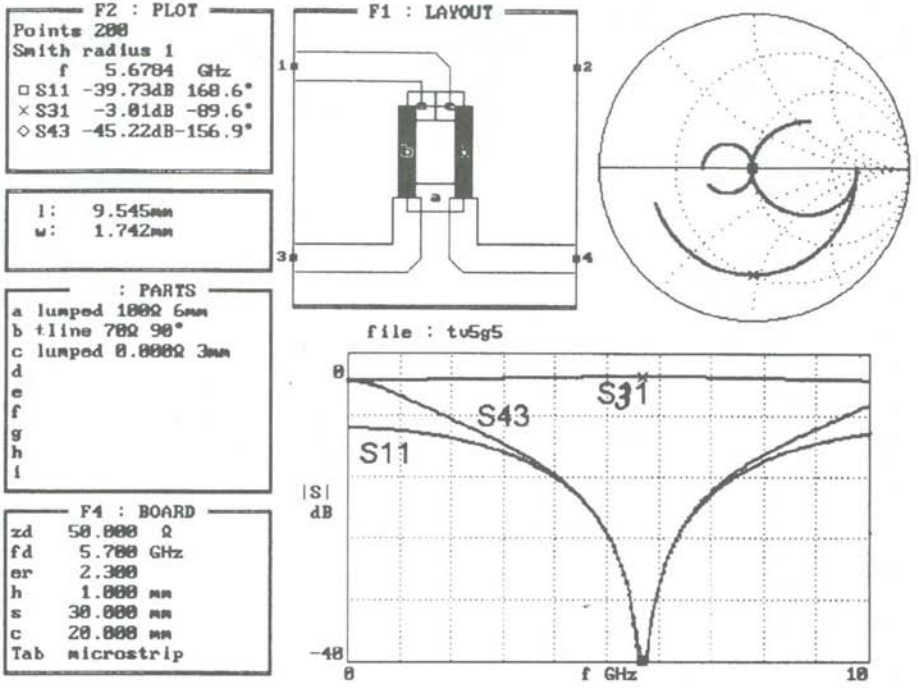
The gap between the microstrips in a parallel line filter increases while approaching the centre of the structure, and generally it also becomes wider as the desired bandwidth get smaller. Even when using excellent quality circuit boards it's not suggested to design filters with a relative bandwidth smaller than 5%.

Narrower filters require adjustments made with expensive equipment: but this goes beyond the goals of a no-tune project. In case of very wide pass-band filter, the spacing between the two lines coupled with the first and the last resonator, may be less than one tenth of millimeter: it's very difficult to obtain such an accuracy in an homemade amateur device. These are the other limits of this filter configuration. Figure 9 shows the analysis of F1 performed using the well known PUFF program: the filter has two resonators and 900 MHz away from its centre frequency (4550 MHz), it has about 40 dB of attenuation.

¼-coupler

Coupled lines, one quarter of a wavelength long, can be used in place of capacitors as well as to couple different stages. Their structure is visible on the printed circuit board and in the electric diagram where they are marked 'CL'. Figure 10 shows the behaviour of the electric filed generated by the microstrip lines

Fig. 8: Simulation of Wilkinson Divider



with their mode of operation: according to the direction of the current flow, the impedance assumes two different values called Z even" and Z odd" impedance.

Z Even (Z_{oe}):

We assume that both the currents have the same intensity and direction: thus the microstrips have the same potential and all the lines of the electric field across the substrate. The magnetic fields generated by the lines have the same direction; the induced potential is opposed to the applied voltage, and so the generated field is smaller: For this reason the value of Zoe is higher than Zo.

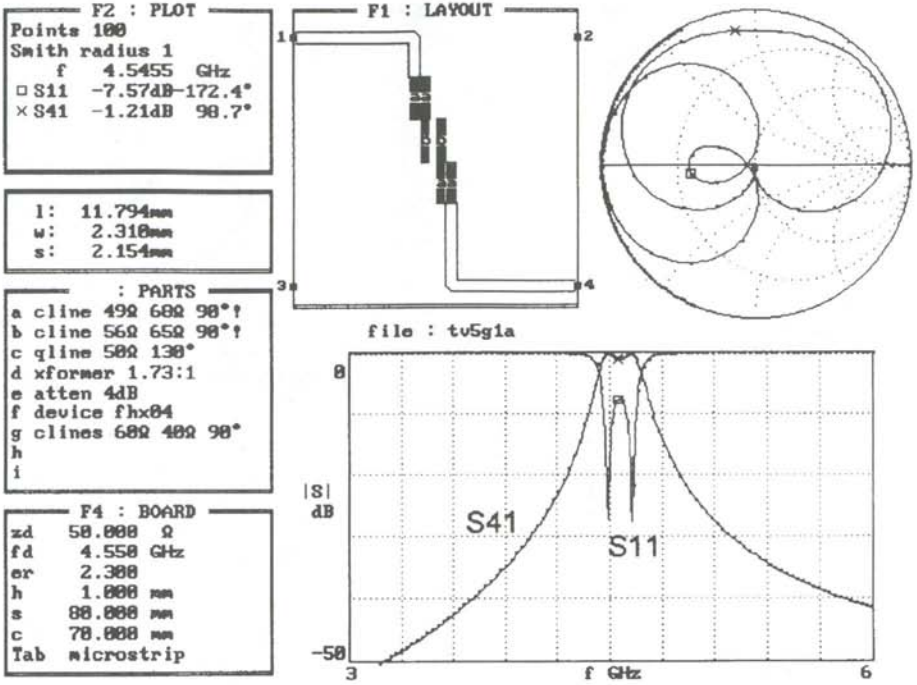
Z Odd (Z_{oo}):

In this case the currents flows in opposite directions, so there is a potential between the lines and the electric field gets stronger as the distance "S" of the lines decreases. Due to the effect of mutual inductance the value Zoo is smaller than Zo.

An intuitive view of coupled lines could be the following: A signal travelling through one of the lines reaches its end, and then is reflected with a phase shift of 180°: the same happens in the second fine, so whole system may be considered as a pair of V4 resonators tightly coupled. The practical limit of this system depends on the required spacing of the lines. Using soft boards and 50 ohm loads, the distance may drop to a few micron when using thin substrate, as required at the higher microwave bands. Four ways are to be considered to overcome this problem:

1. Use thicker metallization.
2. Design lines with a higher impedance.

Fig. 9: Simulation of Filter F1



3. Reduce the input / output terminating impedance.
4. Use thicker dielectric.

The first solution is usually not feasible in an homemade project (Industrial processes use electrochemical techniques) and the third may increase the overall complexity of the circuit. The remaining ways are the most adopted among HAMs, though small spacing between the lines and a low degree of tolerance are still a must.

Figure 11 shows the analysis of the coupler used in this transverter. The circuit was printed on a laminate, with a Duroid type 5890, 40 mils thick. The resonator lines width is 0.6 mm and the gap 150 microns. Since PUFF is not capable to incorporate the metal layer thickness, the spacing was enlarged to 180 microns in order to obtain the predicted results.

For those interested in the effects of the metal layer thickness in microstrip lines, see references 7 and 12. Printing a board with such small clearances is still possible without expensive equipment, although some experience and accuracy is needed. When choosing the appropriate Zoo, Zoe stick to the smallest feasible spacing. A larger gap means the reduction of the microstrip width, with undesiderable effects as greater radiation and dissipation losses.

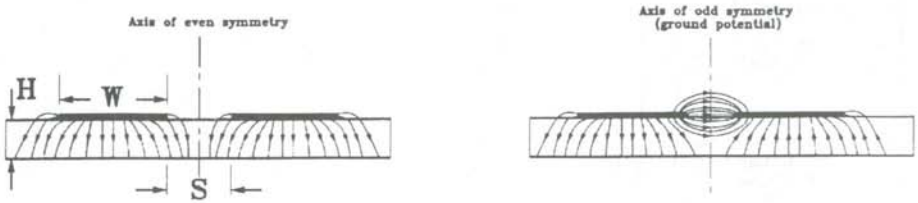
A coupling higher than needed enlarges the useful pass-band. The S11 function shown in figure 11 has two minimum peaks and its lower than -40 dB over a 600 MHz bandwidth.

Beschreibung

Drei Innovationen wurden in diesem Transverter realisiert:

- Er ist abstimmfrei

Fig. 10: Odd and Even Modes in Coupled Lines



EVEN-MODE electric field distribution

ODD-MODE electric field distribution

H = Ground spacing or substrate thickness
S = Microstrip spacing
W = Microstrip width

- Er hat als LO einen Oszillator mit einem dielektrischem Resonator
- Er hat einen passiven Mischer mit einem geschalteten MESFET.

Abb. 2 zeigt das Blockschaltbild. Der Transverter setzt auf eine ZF von 1,4...1,4GHz um und kann das ganze Band von 5,6...5,8GHz bestreichen.

Der LO basiert auf einem keramischen Resonator, der auf 914MHz schwingt. Das Filter F1 siebt die fünfte Harmonische auf der Frequenz 4,6GHz aus. Der Verstärker A3 hebt den Pegel für den Mischer M1 entsprechend an. Der Mischer M1 besteht aus einem PHEMT, der als Schalter betrieben wird. Dadurch ist er bidirektional und wird sowohl bei Empfang wie auch bei Senden benutzt. Mit dem Filter F2 wird die Spiegelfrequenz unterdrückt. Es hat eine Mittenfrequenz von 5,7GHz und eine Bandbreite von 300MHz. Ein nachfolgender Wilkinson Leistungsteiler sorgt für die Aufspaltung in Empfangs-. und Sendekanal. Der RX-Verstärker ist A1 und der TX-Verstärker ist A2. Alle Stufen werden von einem Spannungsregler versorgt. Es gibt keinen ZF-Verstärker.

Das Schaltbild ist in Abb. 3 zu sehen. Die Leiterplatte ist 108x54mm groß. Die Teile wird man bei jedem Händler oder auf dem Flohmarkt finden.

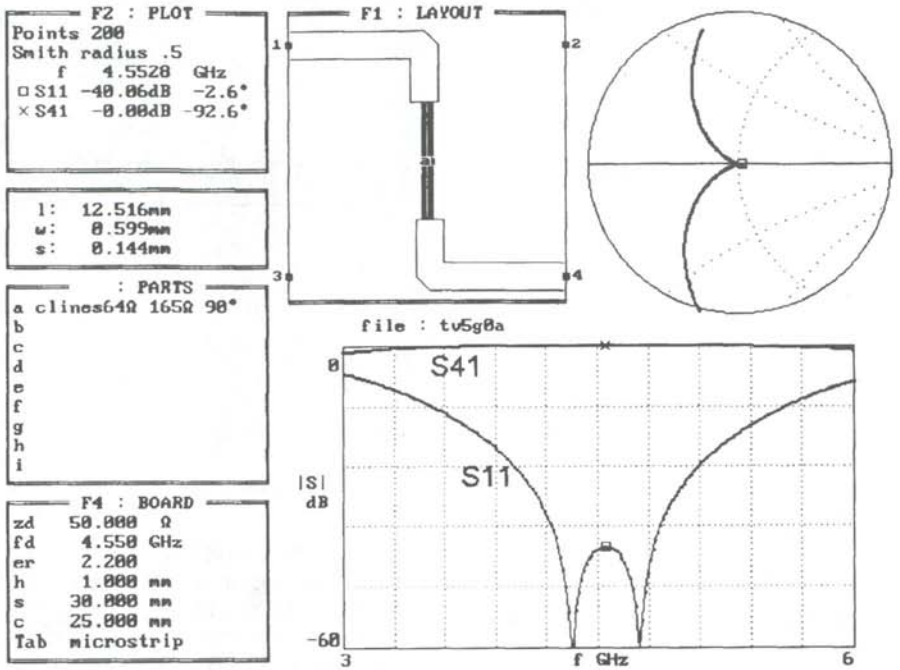
Bidirektionaler Mischer

Der FET in diesem Mischer wirkt wie ein Schalter. Er multipliziert, wie in Abb. 6 gezeigt, das HF-Signal mit dem LO-Signal. damit werden in bekannter Weise die Summen- und die Differenzfrequenz sowie alle deren Harmonische gebildet.

Die Gleichstromeigenschaften des FET gehen aus Abb. 4 hervor. Im ersten und dritten Quadranten der Kennlinie (I_D @ U_{DS}) sind die Kurven spiegelbildlich. Wenn man im linearen Bereich bleibt (Gestrichelte Linie), wirkt der FET wie ein von der Gatespannung gesteuerter Widerstand. Steuert man nun das Gate mit einer ausreichenden Spannung an, hat man den gewünschten Schalter (Abb. 5). Ist der FET eingeschaltet, wirkt er wie ein Widerstand, dessen Wert von der Steilheit abhängt. Ist der FET ausgeschaltet, wirkt nur die Kapazität des FET.

Mit MOSFET's als Schalter erreicht man perfekt symmetrisches Verhalten, da das Gate voll isoliert ist. Benutzt man GaAs MESFET's wirkt das Gate wie eine Schottky-Diode. Ist die notwendige Steuerspannung zu hoch, gibt es Gleichrichtungseffekte.

Fig. 11: Simulation of Coupled Lines



Um geeignete GaAs MESFET's auszusuchen, habe ich eine Testapparatur verwendet, (Abb. 6), welche die Schalteigenschaften diverser GaAs MESFET's bestimmte. Als besonders geeignet erwiesen sich die ATF 350xx-Serie von HP/Avantek und auch der modernere ATF36077. Sie haben eine Steilheit von 60...70mA/V und eine Pinch-Off Spannung von wenigen hundert Millivolt. Die Kanalwiderstände sind in der Größenordnung von 15Ohm. Wie Ref. 3 zeigt, wurden diese FET's schon bis 10GHz als Schalter eingesetzt.

Wilkinson Teiler

Der TX- und RX-Kanal werden durch einen 3dB Wilkinson-Teiler aufgetrennt. Seine Topologie ist in Abb. 7 zu erkennen.

Ein Signal am Eingangstor S wird auf zwei Signale mit 50% Leistung an den Ausgangstoren aufgeteilt. Da beide Signale gleich Phase haben, ist die Spannung über dem 100Ohm Widerstand gleich Null.

Da beide Leitungen des Teilers jeweils eine elektrische Länge von ¼ haben, wird das Tor 2 vom Tor 1 durch eine Leitung mit einer Länge von ½ verbunden. Die Spannung durch diesen Pfad ist also 180° phasenverkehrt und hebt sich mit der Spannung, die über den Widerstand induziert wird, gerade auf.

Jede Reflexion an einem der Ausgangstore wirkt folglich nur auf das Eingangstor, aber nicht auf das zweite, 'isolierte' Ausgangstor.

Da der Wilkinson-Teiler ein reziprokes Netzwerk ist, funktioniert er nicht nur als Teiler sondern auch als Summierer, der zwei Signale auf eine gemeinsames Signal kombiniert.

Fig. 12: PCB of Transverter

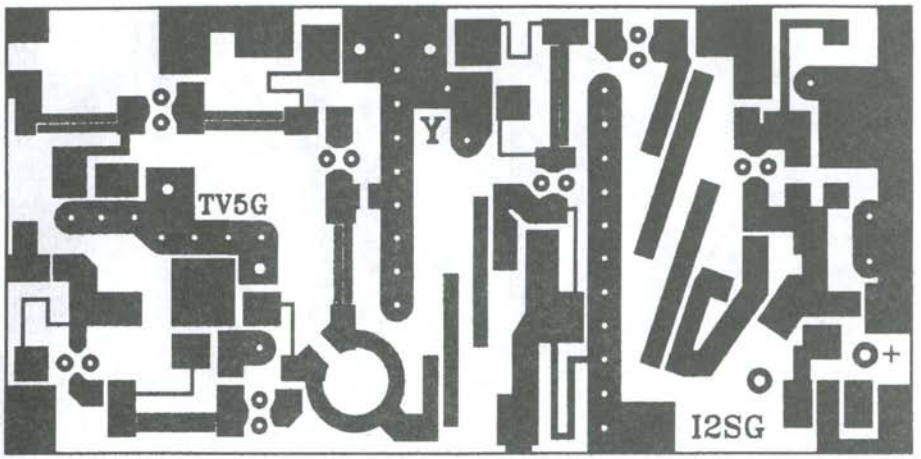


Abb. 8 zeigt die Simulation mit PUFF.

Filter mit gekoppelten Leitungen

F1 und F2 sind Filter, die aus gekoppelten ½-Leitungen bestehen. Die Verluste im Durchlaßbereich hängen von drei Faktoren ab:

1. Verluste im Metall der Streifenleitung
2. Dielektrische Verluste
3. Abstrahlung

Die abgestrahlte Energie hängt von der Dielektrizitätskonstante des verwendeten Material ab und der Impedanz der Leitungen ab. Je höher die Impedanz der Leitungen, desto größer ist die Abstrahlung. Je niedriger das ε_r des Substrats ist, desto höher ist die Abstrahlung. Das liegt an den Feldlinien, die sich umso weiter im Raum ausbreiten, je geringer das ε_r oder die Breite der Leitung ist. Das ist z.B. nicht bei koaxialen Leitungen der Fall.

Das Filter aus gekoppelten Leitungen eignet sich nur für Bandbreiten > 5%. Ist die Bandbreite geringer, muß man wieder abgleichen und die Abmessungen werden sehr kritisch (Genauigkeiten des Ätzprozesses auf < 50µm).

Abb. 9 zeigt die PUFF-Simulation des Filters F1. Das Filter hat zwei Resonatoren. Es erreicht eine Abschwächung von 40dB bei 900MHz Frequenzabstand.

¼-Koppler

Zwei Viertelwellen-Leitungen, die durch einen Schlitz verkoppelt sind, wirken wie Bandpassfilter mit sehr niedrigem Einfügeverlust. In Abb. 10 wird die Funktionsweise gezeigt: In Abhängigkeit von der Stromrichtung gibt es eine 'Even'-Mode und eine 'Odd-Mode' Feldverteilung.

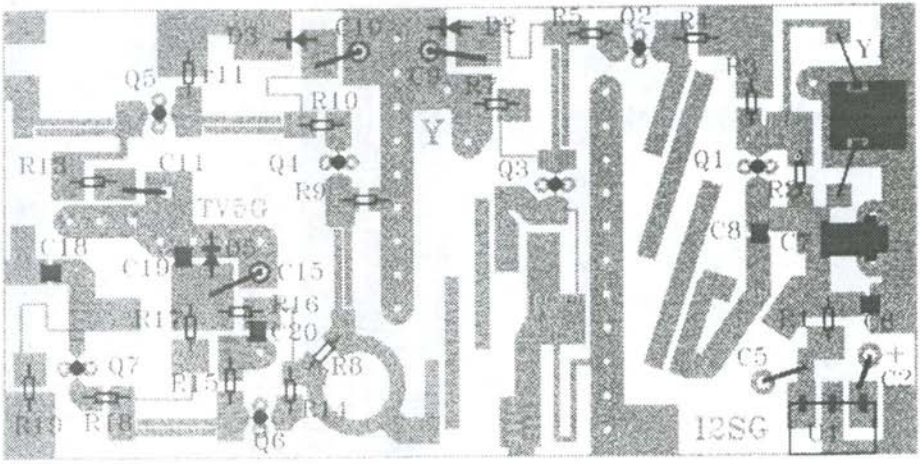
Z Even (Z_{oe}):

Beide Ströme haben gleiche Intensität und Richtung. Die Feldlinien gehen durch das Dielektrikum. Das magnetische Wechselfeld, das mit dem elektrischen Wechselfeld verknüpft ist, hat die gleiche Richtung und wirkt nach der Lenzschen Regel dem verursachenden Strom entgegen. Deswegen ist Zoe größer als Zo.

Z Odd (Z_{oo}):

Die Ströme fließen in entgegengesetzter Richtung. Es gibt eine starkes elektrisches Feld zwischen den Leitungen. Die Magnetfelder sind entgegengesetzt. Das bedeutet eine magnetische Kopplung. Darum ist Zoo kleiner als Zo

Fig. 13: Parts Layout (Top Side)



Die gekoppelten Leitungen in diesem Transverter sind 0,6mm breit bei einem Abstand von 150µm. das Substrat ist Rogers Duroid 5880 mit einer Dicke von 40mil=1,0mm. Abb. 11 zeigt die PUFF-Simulation. PUFF kann keine Dicke des Metalls (typ. 35µm) berücksichtige. Daher wurde zur Kompensation der Abstand mit 180µm angenommen. Die Abbildung zeigt den Bandpaßcharakter der Koppelleitungen.

3. Notes about the circuit

The oscillator stage employs a bipolar transistor (QI = Avantek AT42085), and a ceramic resonator made by Murata. This is a four poles filter with a centre frequency of 914 MHz, originally designed to be used in cellular communications, (typ. DFC2R914POOI-HHA). The device has a characteristic impedance of 50 Ohm.

It has been inserted between the collector and the base of the transistor through high impedance lines (L I, L2). A capacitor-line resonator (C7) is connected to the collector and its phase shift is complementary to that of the ceramic filter; by adjusting the value of C7 the frequency of the oscillator also changes (Ref 9).

In the first three prototypes the working frequency of the oscillator was set to 910 MHz. In order to enhance the output level of the fifth harmonic, an open stub operates along with F1, short circuiting the 3rd harmonic (2730 MHz this "idler" circuit increase the level of the fifth harmonic.

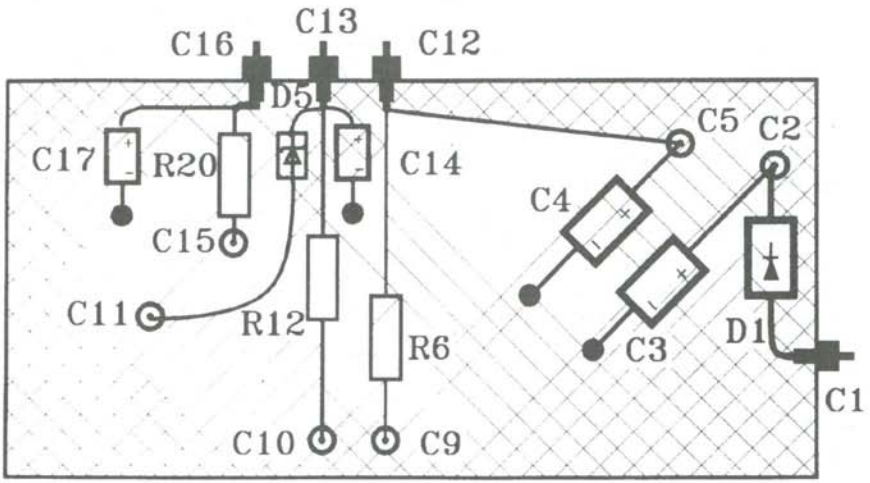
The fifth harmonic (4550 MHz) is selected by filter F1 and amplified by Q2. Like all the other stages, no biasing is applied to the gate. The drain supply for Q2, Q4, Q6 and Q7 is obtained through a resistor and a red LED (it drops about 1.9 V)

The first Rx stage includes an input matching network designed for the minimum noise figure: the measured NF in the first prototypes was in the range of 1.3 ... 1.5 dB. No adjustments are needed.

D1 protects the circuit against reverse biasing. Thanks to the low drop-out voltage regulator, the supply voltage may sink down to about 11.5 volt. Without D1 the minimum supply voltage may be even lower.

Neither the Rx nor the Tx stages need to be aligned. A good matching was engineered by selecting the interstage length of the microstrip lines. The stability was forced inserting resistors in the drains circuits with moderate

Fig. 14: Parts Layout (Bottom Side)



inductance at the sources ground returns of FETs.

The Tx output stage operates at 3.8 volt. This was obtained through a 6.2 V drop given by a zener diode (D4) connected to the +10 V regulated voltage.

3. Bemerkungen

Der Oszillator arbeitete mit einem Bipolaren Transistor ATF42085 und einem Keramikresonator von Murata. Das ist eine Filter mit einer Mittenfrequenz von 914MHz. Mit Hilfe von zwei Leitungen L1, L2 und dem Kondensator C7 wird das Filter zwischen Kollektor und Basis angeordnet. Mit Hilfe von C7 kann man die Phase drehen und damit die Arbeitsfrequenz auf 910MHz einstellen (Ref. 9). Für optimale Funktion als Verfünffacher gibt es einen 'Idler'-Stub, der die dritte Harmonische kurzschließt.

Die fünfte Harmonische wird von F1 ausgesiebt und durch Q2 verstärkt.

Die erste RX-Stufe ist rauschangepaßt und hat eine Rauschzahl von ca. 1,3dB. Die RX- und TX-Stufen müssen nicht abgestimmt werden. Stabilität wurde durch die Verwendung einer kleinen Sourceinduktivität und durch Drainwiderstände erreicht.

4. Assembly

After a quick overview of the circuit and its design, it's time to heat the iron up and start assembling the transverter. Most of the described operations are very simple. The printed circuit board is shown in figure 12: all the 1 mm holes have been grounded using 1.5 mm hollow rivets. The bigger holes host the feed trough by-pass capacitors with a diameter of 3 mm. Table 1 contains the list of all the components needed.

Figure 13 shows the components positioning from the microstrip side, while figure 14 shows the components mounted on the ground side. These are:

C1, C12, C13, C16:

by-pass capacitors mounted through the box

C2, C3, C5, C9-C11,C15:

by-pass capacitors mounted through the board

C3, C4, C14, C17:

tantalum capacitors

D1:

protection diode

D4:

zener diode

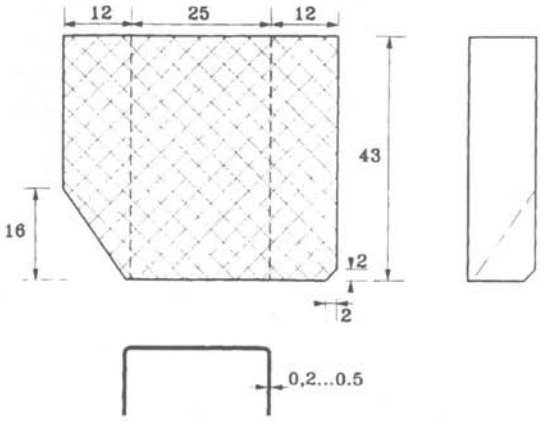
R6, R12, R20:

1/2 Watt resistors

A suitable enclosure for the transverter is a standard 110x55x40 mm tinned metal box. SMA connectors are recommended. When assembling the transverter it's suggested to follow these basic steps:

1. All the necessary holes in the case are drilled. The printed circuit board should be about 25mm away from the top cover of the case, so carefully drill the connectors holes at an adequate distance. A greater hole goes on the side of the case, in order to make possible adjustments of C7 inside the assembled box using a screwdriver.
2. The board must be adjusted to fit inside the case. The outer part of the microstrips that reach the connectors should be removed (about 0.3 mm) to prevent short-circuit with the metal box. Now the printed board is ready to be fixed to the case. On the microstrip side all the patterns touching the border must also be soldered to the box walls; the rivets must also be soldered from both sides, except those used by transistors which are soldered later, once the devices have been inserted..
3. The ceramic resonator with its connections on the upper side is fixed to the board. (Fig 13). It should be placed about I mm away from the case; don't solder the shorter side of the filter or let the soldering alloy enter its holes ! To connect the resonator to the circuit, use pieces of 0.4 mm tinned wire. Be sure that the connections are the shortest possible: it's better to trim the wires to the right size after having soldered one of their ends to the circuit. The resonator is made of ceramic; be careful when handling it: if chipped, it may not work at all !
4. All the other components but the transistors are connected to the circuit; U1 has an heat sink which should be also soldered to the box to help dissipating the heat produced. Before doing this, remove the nickel plating that usually covers T0220 heat sinks.
5. When soldering the transistors, it's better to temporary disconnect the iron from the AC line. The transistor connections that goes to the ground are soldered from the back (ground) side of the board after having inserted them through the rivets holes.
6. A "U" shaped shield is made with a 0.2 ... 0. 5 mm metal plate and later soldered to grounded lines on the board to cover F2 and M1 (see figure 1 and figure 15 and text later on).
7. A receiver operating at 1.3 GHz is connected to the IF input/output port and the +12 V power supply to C1 feed through capacitor. (C13 and C16 remain open). If the voltage regulator works and the circuit was built without mistakes, 10 V are

Fig. 15: Shield for Filter F2



Dimensioni in millimetri

measured on the terminals of C12. The gigatrim capacitor must be set to its minimum capacitance (usually the screw reach the outer border of the capacitor cylindrical case), then rotated for three turn clockwise. In this way the frequency of the oscillator is about 910 MHz. A more accurate tuning of the oscillator may be done with the aid of a frequency meter. D2 is lit and if you approach a finger to F I the light intensity changes: this means than Q2 operates in the class AB and the oscillator works correctly. The bias across the terminals of R7 must be greater than -0.3 V. If the receiver operates in the SSB mode, when touching F1 with a finger, the white noise lowers.

8. The plate shield must be carefully fitted against the transverter case and soldered over the two paired lines of rivets surrounding F2 and M1. It's recommended to glue on the cover of the transverter case a piece of absorbing foam. This will help reduce the reflection and undesirable coupling.
9. The powering bias is removed and then C12 is connected to C 16(A1 amplifier supply). The RX input must be closed with a 50 Ohm load or, if not available, with a

Fig. 16: Phase Noise of LO@4.55GHz

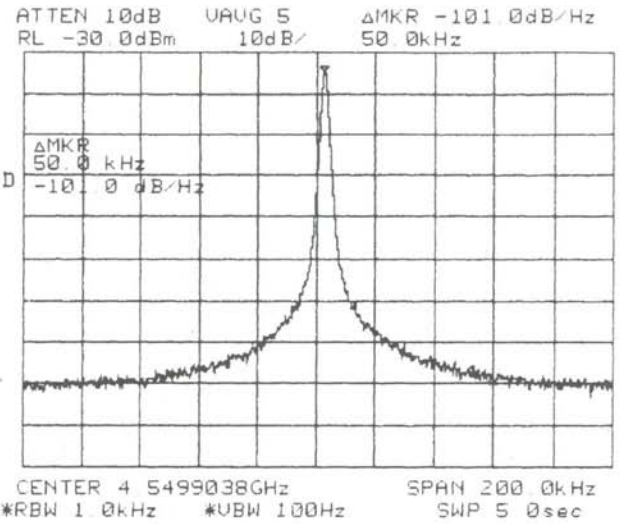


Fig. 17: Residual FM of LO@4.55GHz

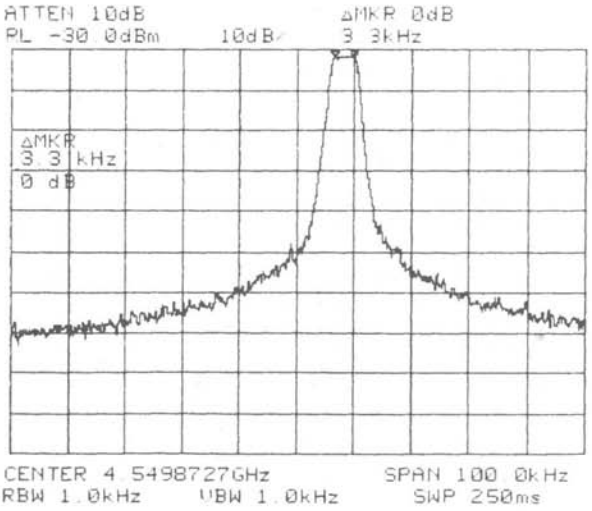
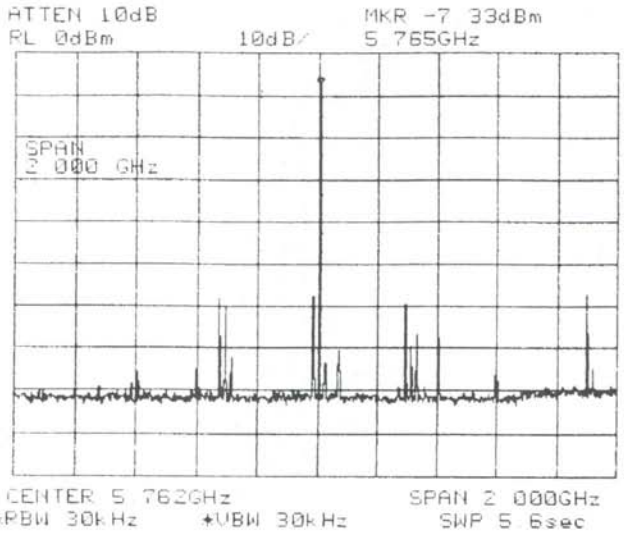


Fig. 18: Spurious Response of Output @ 1dB Compression



piece of coaxial cable long enough to provide some 10 dB of attenuation. When the supply voltage is applied again, D5 should also be lit: when this condition doesn't happen it means that the FET used in this stage have a very high IDss and an additional 270 Ohm 1/2 Watt resistor is needed in parallel with R20.

10. After having removed the bias, connect C12 to C13. The Rx stage is temporary shut down by unsoldering the wire connecting C 16 to C 13. If everything goes right, LED D3 must be fit, providing the necessary bias to Q5, Q6. It's time to test the voltage across R13, given that the current flowing through the resistor ranges From 40 to 70 mA. ...

And finally the transverter is finished ! Now it's ready to operate; it may be placed along with (pre)amplifiers and its T/R switch in a waterproof box, near the antennas or any other place may work just as well. A lot of solutions are possible as well as future upgrades. By now, 30mW of output power and a small (70cm) dish antenna provide enough satisfactions to start with.

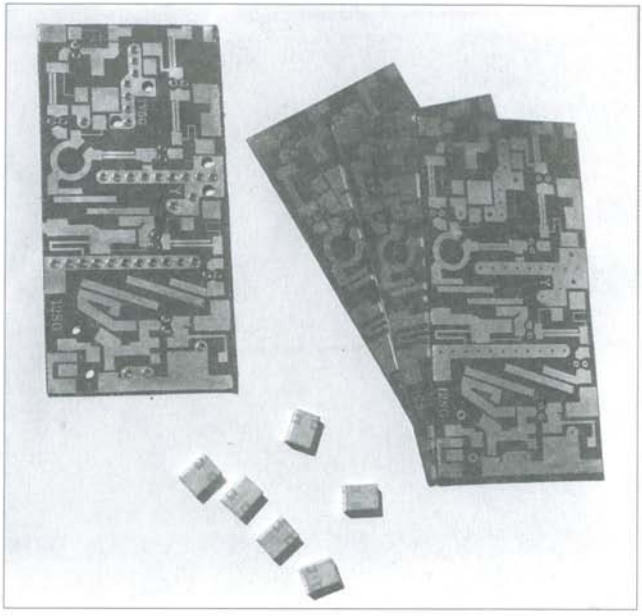
Konstruktion

Aus Tabelle 1 gehen alle Komponenten hervor, die für den Aufbau benötigt werden. Abb. 13 zeigt den Bestückungsplan von der Streifenleitungsseite und Abb. 14 den von der Masseseite. Der ganze Transverter findet in einer Weißblechdose mit den Maßen 110x55x40 Platz. Es wird folgende Reihenfolge der Aufbauschritte empfohlen:

1. All Löcher bohren. Die SMA-Buchsen so einbauen, daß für die Leiterplatte ein Abstand zum oberen Deckel von 25mm verbleibt. Als Durchkontaktierungen werden 1,5mm Hohlnieten verwendet.
2. Leiterplatte in das Gehäuse einpassen. Dann von der Masseseite verlöten
3. Laut Abb. 13 wird der Resonator auf die Platine aufgelegt und mit dünnen Drähten an die Pads angelötet. Es ist darauf zu achten, daß der Resonator nicht selbst angelötet wird oder mit der Wand Kontakt hat.
4. Alle anderen Bauteile mit Ausnahme der Transistoren einlöten. Der Regler wird mit seiner Kühlfahne an das Gehäuseblech angelötet.
5. Die Transistoren einlöten. Dazu kann man den Lötkolben vom Netz abtrennen[1]
6. Nach Abb. 15 wird ein U-Blech gebogen, um F1 und M1 abzuschirmen
7. RX auf 1,3GHz anschließen und +12V an C1 anschließen. Dann muß am Ausgang

1 *Besser ist es, einen ESD-Platz einzurichten. Er besteht aus einer leitenden Arbeitsmatte, die über 1M geerdet wird (Heizung!) und einen Anschluß für ein leitendes Armband hat.*

Fig. 19: PCB and Ceramic Resonators



des Reglers +10V messen. der Gigatrim Trimmer wird auf Minimum gedreht, und dann 3 Drehungen eingedreht. Dann ist die Frequenz des LO ungefähr 910MHz. besser ist es einen Zähler anzuschließen und mit dessen Hilfe die Frequenz exakt einzustellen. Berührt man F1 mit dem Finger, stellt man einen kleineren Strom durch Q2 fest. Ebenso ändert sich der Rauschpegel im RX.

8. Das in 6. gebogene Blech wird auf zwei Reihen von Nieten um F2 und M1 aufgelötet.
9. C12 mit C16 verbinden. RX mit 50Ohm abschließen. Wenn die Betriebsspannung wieder angelegt wird, leuchtet D5 rot. Andernfalls hat der FET einen zu hohen Idss. Dann wird ein weiterer 270Ohm Widerstand mit R20 parallel gelötet.
10. C12 mit C13 verbinden. C16 von C13 lösen. Spannung anlegen. LED D3 muß leuchten. Über R13 muß eine Spannung von 0,9...1,5V abfallen.

Das war's dann.

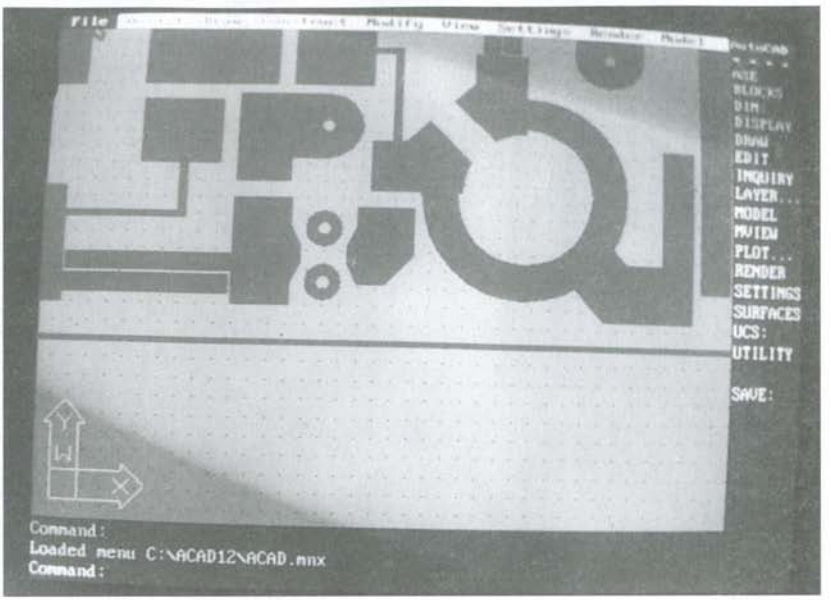
5. Transverter performance

Table 2 shows a short briefing of the electrical characteristics of the transverter: all the values were taken from the mean of the measured figures in the first three prototypes made.

Figure 16 shows the local oscillator spectrum: even if it's not as stable as a crystal controlled oscillator its phase noise is adequate to broadband applications for whose the device was intended. The measured value is -101 dBc/Hz in a 50 KHz offset. Figure 18 shows that the output signal spectrum is quite clean and all the not wanted products are kept over -50 dB lower. Since the gain of the transverter is not very high, in order to preserve a good noise figure, it's recommended to limit the receiver NF to 4 dB.

P.S.: Up to now, more than 30 units have been produced; most of them were used in analog ATV applications. One pair of this transverter

Fig. 20: Final stage of development-Plotting the film



were also tested for future use in a ATV repeater.

Table 2: Electrical Characteristics

Supply Voltage	11.5 Vmin/15V max
Supply Current (Rx mode)	140 mA
Supply current (Tx mode)	155 mA
Rx conversion gain	16 dB
Noise Figure	1,4 dB
Tx gain@ 1dB compression	14 dB
Tx output power @ 1dB compression	30 mW
Max. input power @ 1.3 GHz	10 mW
Pass band @ -3 dB	250 MHz
Image frequency rejection	50 dB
Local oscillator rejection (Tx)	40 dB
Spurious response	-50 dB

5. Meßdaten

In Tabelle 2 sind die Meßdaten eines typischen Exemplars zu sehen. Abb. 16 zeigt das Spektrum des LO. Das Seitenbandrauschen beträgt ca. -100dB/Hz in 50kHz Abstand. Für Breitbandzwecke ist das völlig ausreichend. Selbst für SSB-Betrieb ist es kein schlechter Wert. Abb. 18 zeigt das Ausgangsspektrum. Alle Nebenwellen sind besser als 50dB unterdrückt. Um die Gesamtrauschzahl nicht zu verschlechtern, sollte die Rauschzahl des Nachsetzers besser als 4dB sein.

6. Literatur/References:

[1] "Comparision of Schottky diode and floating, FET-biased mixers for wireless systems"

Table 1: List of Parts

Refeference	Component
C1, C2, C5, C9-CI3, C15, C16	I nF by-pass capacitor, 3mm dia.
C3	10µF , 25 V tantalum
C4	100µF, 15 V tantalum
C6	330 pF SMD low loss
C7	10 pF " Gigatrim"
C8	I pF SMD, low loss
C14, C17	2.7µF , 15 V tantalum
C18	4.7 pF SMD, low loss
C19	1 nF SMD
C20	10 pF SMD, low loss
R1	180 Ohm MELF
R2	4.71K Ohm MELF
R3, R4, R7, R11, R15	IK Ohm MELF
R5, R13, R17	22 Ohm MELF
R6 R12	180 Ohm 1/2 Watt
R8, R9	100 Ohm MELF
R10, R16, R18	10 Ohm MELF
R14	4.7 Ohm MELF
R19	47 Ohm MELF
R20	150 Ohm 1/2 Watt
D1 Y1	1N4000
D2, D3, D5	Red LED
D4	Zener 6.2 V 1/2 Watt
Q1	AT42085 (HP / Avantek)
Q2-Q5	ATF35376 (HP /Avantek)
Q6, Q7	ATF35176 (HP / Avantek
U1	L4940-V10 Low Dropout
Y1	DCE7R914FO01HHA (Murata)

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Water Cooling for Large Tubes

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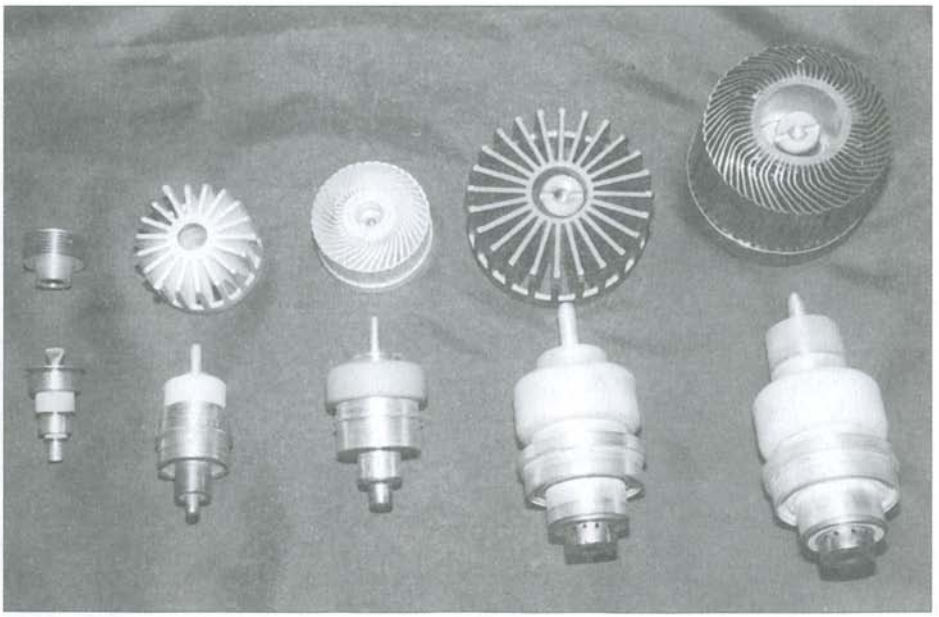
Abstract: Water Cooling has been used for years in amateur radio for cooling small planar triodes like the 2C39 to achieve higher power on 23cm. This article describes how real high power tubes like the GS35 can be used effectively and quiet with water cooling.

Kurzfassung: In Leistungsverstärkern für 23cm mit den kleinen Trioden 2C39 ist Wasserkühlung üblich, um die Röhren gezielt überlasten zu können. Das wird benutzt, um genügend Leistung auf 23cm EME zu gewinnen. Hier wird beschrieben, wie man Wasserkühlung für richtige Hochleistungstrioden wie

Fig. 1: Selection of Tubes suited for Water Cooling



die GS35 einsetzt, um einen leisen und temperaturstabilen Verstärker zu erhalten

1. Einführung

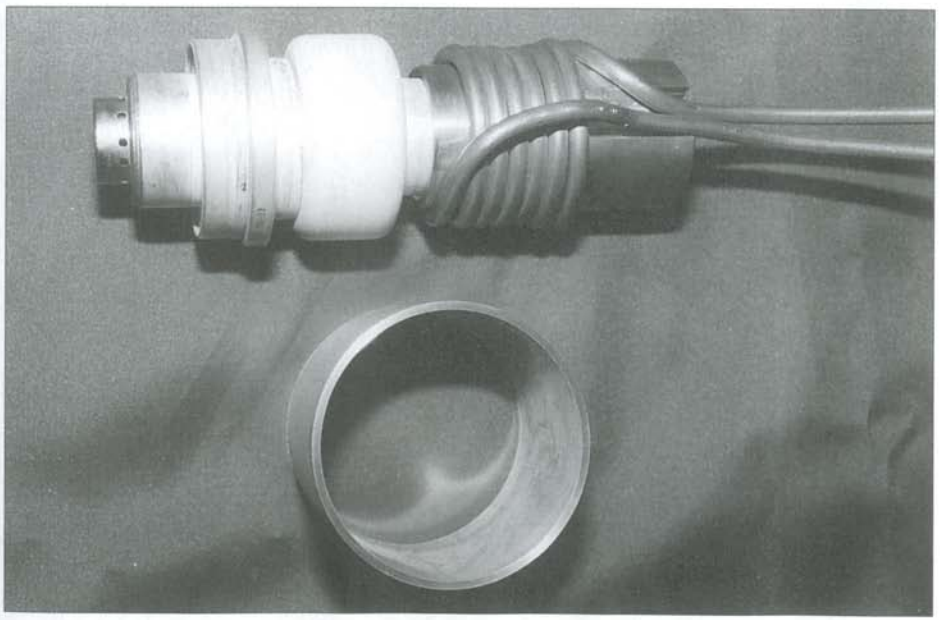
Der vorliegende Artikel beschreibt den Umbau von luftgekühlten Röhrenverstärkern auf Wasserkühlung. Dabei nutzt man die Besonderheit einiger Röhrentypen, den Anodenkühler abnehmen zu können (Foto 1). Eine konkrete Aufbauanleitung soll nicht erfolgen, vielmehr sollen dem interessierten Nachbauer die Kenntnisse vermittelt werden, das Kühlsystem für seinen individuellen Einsatzzweck zu bemessen.

2. Warum Wasserkühlung?

Im industriellen Bereich finden wassergekühlte Röhren dort Verwendung, wo der Einsatz in stark staubhaltiger Luft erfolgen muß, oder wo die Verwendung von geräuschintensiven Radiallüftern unerwünscht ist. Gerade letzterer Aspekt war es, der meinen "Chefmechaniker" Kurt, DL1RCG, und mich bewogen hat, diese Art der Kühlung einmal für Amateurfunkzwecke zu testen. Denn gerade in kleinen Funkbuden, wo der Schall sich nicht verläuft, wird das Empfangen schwächster EME-Signale auf die Dauer zermürbend. Es wird versucht, die Geräuschkulisse des Radiallüfters mit geschlossenen Kopfhörern und entsprechender Lautstärke zu übertönen. Das ist nach einiger Zeit ermüdend, führt sicherlich zu schlechtem Hörverhalten bzw. auf Dauer evtl. sogar zu Gehörschädigungen.

Wer hofft, mit auf Wasserkühlung umgebauten Röhren die Leistungsfähigkeit seiner PA zu steigern, dem sei hier gleich Einhalt geboten. Die Belastbarkeit der Anode wird bei richtiger Ausführung in der Tat verbessert. Die überschlägliche Wärmebelastung der Anodenoberfläche wird bei Wasserkühlung mit 100 W/cm2 angegeben, während bei Luftkühlung nur ca. 30-60 W/cm2 angesetzt werden. Meist wird die maximale Ausgangsleistung jedoch von anderen Parametern, wie z.B. dem Gitterstrom, begrenzt. Gerade im intermittierenden Betrieb wird die Anodenverlustleistung wohl eher selten leistungsentscheidend. Viel mehr gilt es, bei den umgebauten Röhren deren Gesamtkonzeption zu beach-

Fig. 2: View on modified GS35



ten. Viele müssen in ihrer Gesamtheit in die Kühlung mit einbezogen werden, d.h. jeder Kontaktring, jedes Keramikteil und jeder Übergang von verschiedenen Materialien müssen entsprechend den jeweiligen Vorgaben gekühlt werden. Nur bei wenigen Röhren wird auch im kommerziellen Einsatz nur die Anode gekühlt. In unserem Fall wird die Hauptwärmemenge an der Anode durch das Wasser abgeführt. Die übrigen Teile der Röhre hingegen dürfen nicht vergessen werden. Der Kühlaufwand ist jedoch gering, so daß kleine, leise Computerlüfter (axial), unterstützt durch eine Vergrößerung der Oberfläche an den Kontaktringen, hier vollends genügen (Fig. 5,6). Ganz ohne Lüfter kommt man also auch nach dem Umbau leider nicht aus. Das Ziel, eine deutliche Reduzierung des Lärmpegels zu erreichen, wird dennoch erreicht.

3. Welches Kühlverfahren?

In Anbetracht der im Amateurbereich abzuführenden Wärmemenge sowie vom Umweltaspekt her gesehen ist ein offener Kühlkreislauf, d.h. vereinfacht Anschluß der Röhre an einen Wasserhahn und anschließende Entsorgung des erwärmten Wassers über die Kanalisation, völlig undiskutabel. Und nur die wenigsten Funkfreunde werden zudem den Funkbetrieb vom Bad oder gar vom stillen Örtchen aus betreiben!

Was bleibt, ist der geschlossene Kühlkreislauf. Er spart Wasser und ermöglicht zudem den Einsatz destillierten Wassers, welches durch seine Reinheit ausreichend isolativ ist. Zudem sind in ihm keine mineralischen Bestandteile gelöst, welche sich in Form von Kalk bzw. Kesselstein im Kühler oder anderen Bestandteilen des noch zu beschreibenden Kreislaufes festsetzen und diese zerstören. Der Einsatz von echtem destillierten Wasser sei empfohlen. Es kostet nur unwesentlich mehr als nur demineralisiertes Wasser, über dessen Verhalten keine Erfahrungen vorliegen. Gerade der Einsatz von destilliertem Wasser schafft jedoch neue Probleme, die beim Aufbau des Kühlsystems unbedingt beachtet werden müssen. Es ist, bedingt durch seine Reinheit, äußerst ag-

Fig. 3: Finish of the anode cooler

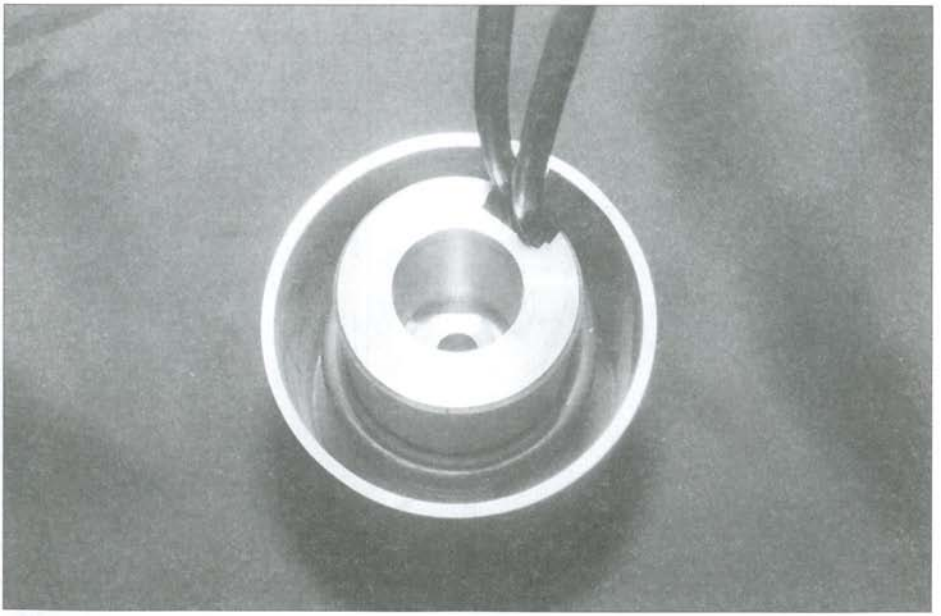
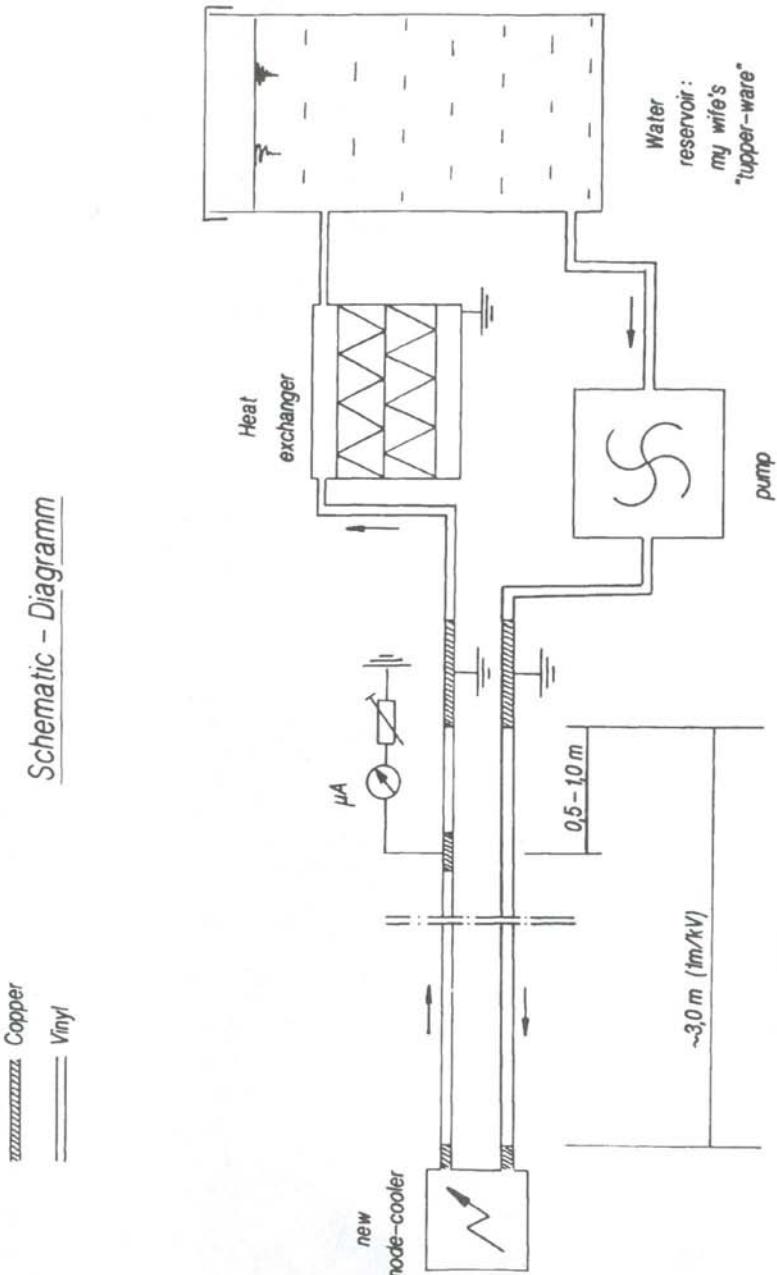


Abb./Fig. 4: Schematic Diagram



gressiv gegenüber bestimmten Metallen und Kunststoffen. Jegliches Herauslösen von Stoffen aus den verwendeten Materialien ist unerwünscht, da zum einen diese Materialien auf Dauer zerstört werden, zum anderen die gelösten Ionen das Wasser verunreinigen und als Ladungsträger die Isolation herabsetzen.

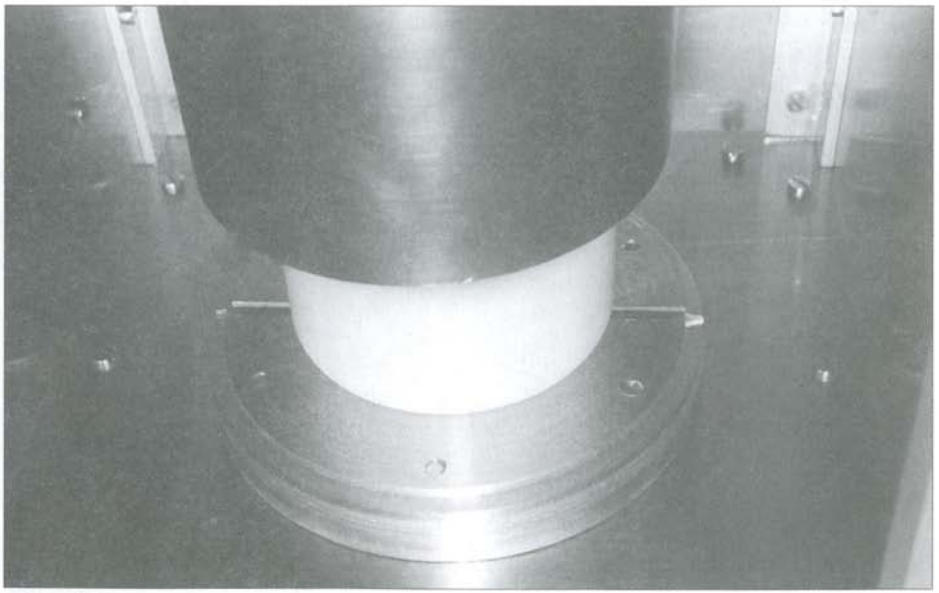
4. Der Kühlkreislauf

Der Kühlkreislauf ist in Abb. 4 aufskizziert. Er muß unter dem Aspekt aufgebaut werden, daß an der Anode die volle Spannung von mehreren KV anliegt. Zudem muß die bereits angesprochene Agressivität des destillierten Wassers Beachtung finden.

Der Anodenkühler

Dieses Bauteil muß sehr sorgfältig aufgebaut werden, damit die Funktion der Ableitung der Wärmemenge in das Wasser auf Dauer gegeben ist. Als Wärmeleiter kommen nur Metalle in Frage. Aufgrund des aggressiven Verhaltens des Wassers sollte für die wasserberührten Teile ausschließlich Kupfer verwendet werden. Messing ist völlig ungeeignet, da es zum Herauslösen der Zinkbestandteile kommt und das Metall sehr schnell zerstört wird. Es bietet sich die Verwendung von weichen, biegsamen Kupferröhrchen aus dem Installationsbereich an. Diese werden meterweise von der Rolle verkauft und sind ab 6mm Außendurchmesser erhältlich. Zunächst wird anstatt des Luftkühlers ein kleiner Zylinder aus Messing angefertigt, welcher auf die Aufnahme der Röhre paßt. Bei Röhren der GI7b-Reihe oder den GS31-Typen genügt eine plane Auflagefläche. Bei den 2C39-Röhren muß das entsprechende Gewinde des aufschraubbaren Kühlkopfes erstellt werden. Bei der hier getesteten GS35b bildet ein Konus den Übergang von der Anode zum Kühlkopf. Wer keinen versierten Metallbearbeiter wie DL1RCG zur Verfügung hat, kann auch den Luftkühlkopf zerlegen, indem die Lamellen entfernt werden. Der übrigbleibende Zy-

Fig. 5: View on Grid Clamp inside the Anode Cavity



linder bildet die Grundlage für den wassergekühlten Kopf. Das weiche Kupferrohr wird nun straff, Wicklung an Wicklung, um den Zylinder gelegt. Dabei genügen 5-7 Windungen völlig, um eine Röhre vom Typ GS35 mit 1,5 KW Verlustleistung zu kühlen (Fig. 2). Der Wärmeübergang vom Zylinder auf die Kühlschlangen ist jedoch infolge der tangentialen Kontaktfläche nicht ausreichend. Ein ausgedrehter Messingzylinder wird über den Wickelkörper mit dem Kupferrohr gestülpt. Der so entstehende Spalt wird nun mit Zinn vergossen (Fig. 3). Dazu hat sich bewährt, das ganze Gebilde auf ein Stück Blech zu stellen und auf eine leistungsfähige Elektroheizplatte gespannt zu erhitzen. Nach dem Ausgießen ergibt sich ein optimaler thermischer Übergang, der nur noch von der Paßgenauigkeit der Kontaktstelle des Röhrenkorpus und des Innenzylinders bestimmt wird. Durch diese Bauweise wird es möglich, bei mit Wasser in Berührung kommenden Teilen ausschließlich Kupfer zu verwenden und maschinell zu erstellende Teile aus leicht zu zerspanendem Messing zu fertigen. Als Zinn sollte kein Lötzinn von der Rolle verwendet werden, der Flußmittelanteil ist zu hoch. Zinn vom Karosseriespengler oder aus einer Lötanlage hingegen ist gut geeignet.

Kühlschläuche

Als Kühlschläuche sollen die isolierenden Schlauchleitungen des Kühlsystems bezeichnet werden. Sie müssen aus isolierendem Kunststoff sein. Schwarze, rußhaltige (UV-Stabilisierung!) Gummi- oder Kunststoffleitungen sind ungeeignet. Es darf kein leitender Füller enthalten sein. Gut eignen sich sogenannte Vinyl-Schläuche, welche in Baumärkten und Gartencentern für Zimmerspringbrunnen oder die Weinherstellung angeboten werden. Diese Schläuche aus klarem Kunststoff gibt es in verschiedenen Innendurchmessern und Wandstärken mit dazu passenden Verbindungen und Reduzierungen aus Nylon. Man sollte einen Durchmesser wählen, der gleich über die verwendeten Kupferröhrchen paßt. Pro Kilovolt Anodenspannung sind ca. 0,5-1,0m Kühl-

Fig. 6: Cathode Cooler

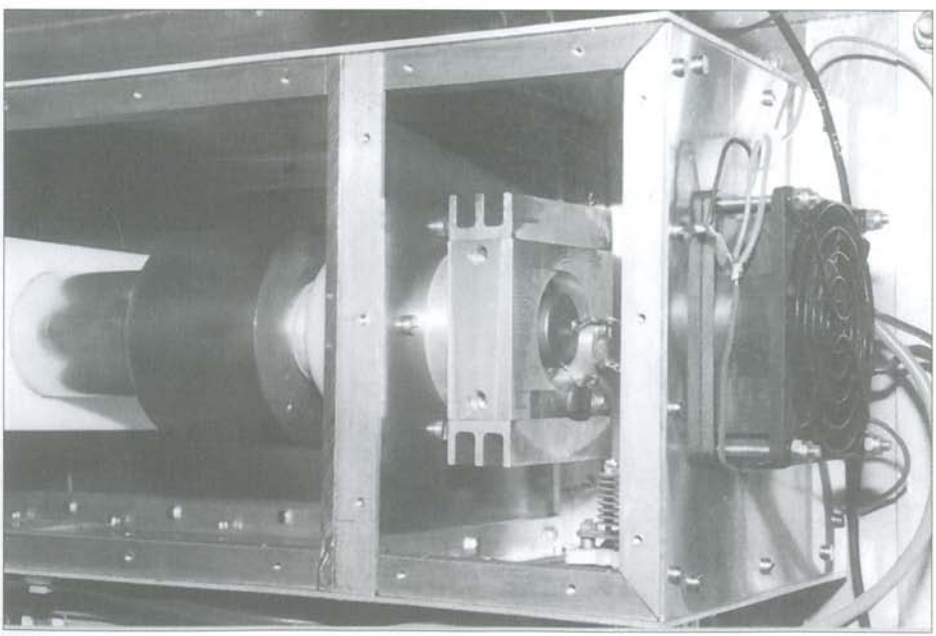
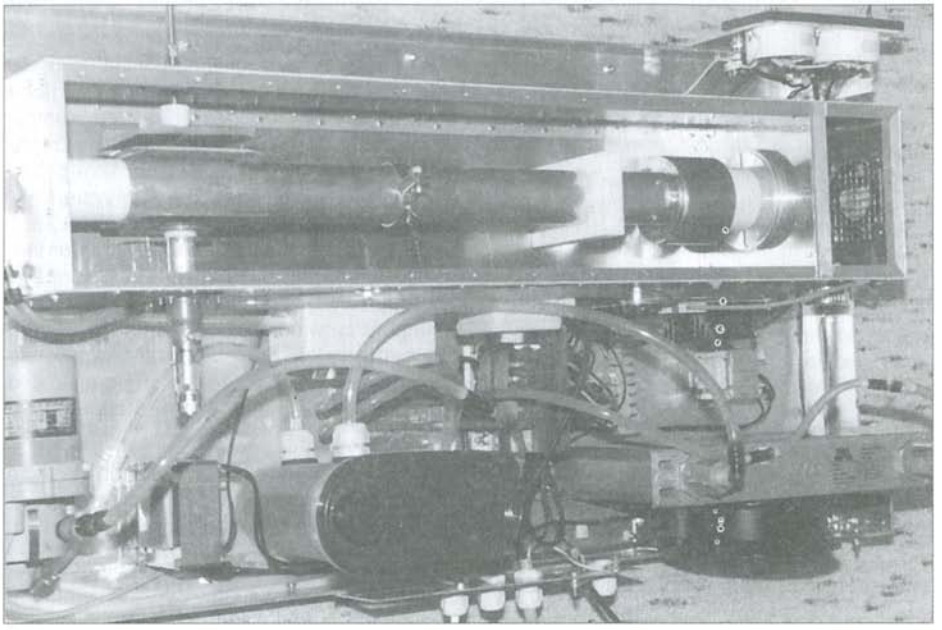


Fig. 7: Water-Cooled 2kW Amplifier for 144MHz



schlauch vorzusehen. Je mehr, desto besser die Isolation :
Es gilt auch hier:

R ~L/Q

- R= Widerstand der Schlauchleitung
- L= Länge der Schlauchleitung
- Q= Querschnitt der Schlauchleitung

Nach diesen beiden ausreichend isolativen Kühlschlauchabschnitten wird geerdet. Dazu werden zwei kurze Abschnitte Kupferröhrchen auf ein Stück MS-Blech gelötet. Vorher werden die Schlauchanschlüsse hochgebogen. Einer der beiden Isolierschläuche kann ca. 1/4 bis 1/3 vom kalten Ende aufgetrennt und ein Kupferröhrchen eingefügt werden. Es bildet sich ein hochohmiger Spannungsteiler aus den Isolierschläuchen. Ein uA-Instrument mit entsprechenden Vorwiderstand wird als "Verschmutzungsanzeiger" gegen Masse eingefügt. Steigt der Strom an, so ist dies ein Indiz für eine Verunreinigung des Kühlwassers.

Der Wärmetauscher

Ein weiter Nachteil des geschlossenen Systems ist die Erfordernis eines Wärmetauschers. Dieser gibt die von der Anode aufgenommene Wärmeenergie an die Umgebung ab. Dabei können sowohl Ölkühler als auch Kühlregister aus KFZ-Heizanlagen verwendet werden. Selbst kleine Ausführungen sind in der Lage, mehrere KW Heizleistung umzusetzen. Ein weitaus größeres Problem ist es, gebrauchte Wärmetauscher derart sauber zu bekommen, daß die Isolation nicht durch Fremdstoffe gefährdet wird. Ein leiser, sehr langsam laufender Flügelradlüfter unterstützt den Luftdurchsatz. Eine temperaturabhängige Drehzahlregelung ist empfehlenswert.

Die Pumpe

Als Pumpen eignen sich Kleinpumpen, wie sie für Aquarien oder Zimmerspringbrunnen in verschiedensten Ausführungen zu haben sind. Dabei sollte auch hier auf wasserberührte Messingteile geachtet werden. Leider sind selbst ansaugende Pumpen nur sehr selten zu bekommen. Ein entsprechender

Vordruck durch einen höher liegenden Wasserstand im Ausgleichsbehälter und tiefer liegender Pumpe löst dieses Problem.

Die Dimensionierung: Faustformel und Versuchsaufbau

Folgende Daten der umzurüstenden Röhre müssen bekannt sein:

- Anodenverlustleistung
- Anodenspannung
-

Die Anodenspannung bestimmt die Länge der isolierenden Schlauchleitungen. Pro KV Anodenspannung sollten ca. 1m Schlauchleitung zwischen Anode und Massepunkt vorgesehen werden.

Weiterhin wird eine Strömungsgeschwindigkeit des Wassers zwischen 1,0 und 1,3 m/sec empfohlen. Lokale Siedevorgänge im Kühler sind somit ausgeschlossen. Andererseits sollte die Strömungsgeschwindigkeit auch nicht schneller sein, da sonst Korrosionsvorgänge deutlich zunehmen. Die Strömungsgeschwindigkeit berechnet sich wie folgt:

$$V = \frac{Q}{A}$$

- V= Strömungsgeschwindigkeit in $^m/_s$
- Q= Wassermenge in $^{m^3}/_s$
- A= Querschnittsfläche des Kupferröhrchens in m^2

Pro kW Verlustleistung sollte eine Wassermenge Q von 1 l/min = $1.67 \cdot 10^{-5}$ $^{m^3}/_s$ angesetzt werden. Es genügt der Ansatz der durchschnittlichen Verlustleistung, welche bei CW/SSB deutlich niedriger liegt. In der vorliegenden PA mit der GS35 wurde statt 1,5 KW ein Wert von 0,9 KW angesetzt, was 900ml/min Wasserdurchsatz verlangt. Der Durchflußquerschnitt eines Röhrchens mit 4mm Innendurchmesser beträgt:

$A = D^2 \cdot \pi/4 = 1{,}26 \cdot 10^{-5}\ m^2$

Daraus folgt

$$V = \frac{0{,}9 \cdot 1{,}67 \cdot 10^{-5}}{1{,}26 \cdot 10^{-5}} = 1{,}2\ ^m/_s$$

Als größte Schwierigkeit gestaltet sich die Auswahl der richtigen Pumpe, da der hohe hydraulische Verlust des gesamten Kühlsystems schwer vorher bestimmbar ist. Eine Pumpe, die nominell mit 10 l/min angegeben ist, befördert in vorliegendem Kühlsystem gerade mal 900ml/min. Die Pumpen müssen also deutlich überdimensioniert werden. Stellt sich heraus, daß zuviel Wassermenge befördert wird, ist das kein Problem. Die Strömungsgeschwindigkeit darf nur nicht zu groß werden. Längere Schlauchleitungen erhöhen in diesem Fall die hydraulischen Verluste und die Isolation der Leitungen wird zudem besser.

Mittels dieses Testaufbaus läßt sich auch die Wirkung des Kühlsystems und die erforderliche Gesamtwassermenge vorab bestimmen:

Der Kühlkreislauf wird wie vorgesehen aufgebaut, jedoch wird kein Ausgleichsbehälter eingefügt. Stattdessen wird anstelle des Anodenkühlers ein Wasserkocher oder ein Behälter mit Tauchsieder eingesetzt. Der Wasserinhalt entspricht dem des Ausgleichsbehälters, die elektrische Leistung der Anodenverlustleistung der Röhre. (z.B. 1KW Wasserkocher).

Nach 20 min hatte sich das Wasser bei unserem Versuchsaufbau von 20 Grad auf ca. 42 Grad erhöht. Die Asymptote der Temperatur lag bei 45 Grad. Anwender, welche nie über längere Abschnitte Betrieb machen, können evtl. bei entsprechender Wassermenge ganz ohne Lüfter am Wärmetauscher auskommen. Bei Kontestbetrieb ist eine größere Wassermenge und ein großzügigerer Kühler vorteilhaft. Ich verwende ca. 3,0 l Gesamtwassermenge, nach 3h EME erreiche ich ca. 40 Grad. Diese Temperatur erhöht sich bei 50% RX, 50% TX nicht mehr weiter. Mehr als 50 Grad Wassertemperatur sollten unbedingt aus Korrosionsgründen vermieden werden.

5. Der Betrieb

Sind die angesprochenen Versuche erfolgreich abgeschlossen, erfolgt der eigentliche Aufbau. Der Ausgleichsbehälter sollte nicht ganz gefüllt werden, so daß Luftblasen aus dem Wasser entweichen können. Der Wasserspiegel im Ausgleichsbehälter ist der höchste Punkt im Wasserkreislauf! "Luftfallen" und Einschlüsse bei der Leitungsführung sind zu vermeiden. Durch Neigen und Klopfen bei laufender Pumpe werden alle Luftblasen entfernt. Nach ein paar Stunden Betrieb wird das Wasser bereits getauscht, da evtl. Produktionsrückstände in den verwendeten Werkstoffen das Wasser schnell verschmutzen. Zunehmende Leitfähigkeit während des Betriebs der Endstufe sind kein Grund zur Sorge. Zunehmende Erwärmung führt zu erhöhter Teilchenbeweglichkeit und somit zu verbesserter Leitfähigkeit. Nach der Abkühlung ist der Effekt wieder verschwunden. Das uA-Meter dient als Anzeige.

Eingangskammer und die Keramikisolation zwischen Anode und Gitter werden beim Prototypen mittels kleinen Axiallüftern separat gekühlt. In der PA findet ein Lamda/2 Kreis Verwendung. Das ursprüngl. Luftgekühlte Konzept stammt aus St. Petersburg und wurde dankenswerter weise von DL1EJA zur Verfügung gestellt. Die Kühlschläuche laufen innerhalb des Rohres und verlassen die Anodenkammer auf der der Anode abgewandten Seite, also an einem "heißen" Teil des Kreises (Lamda/2 !). Auf eine Länge von 10cm durchlaufen die Wasserleitungen ein starkes HF-Feld innerhalb eines Teflonzylinders (Foto 5) Die PA erreicht einen Wirkungsgrad von ca. 55%. Laut Informationen von Funkfreunden, die das Konzept luftgekühlt verwenden, sind deutlich mehr als 60% möglich. Möglicherweise ist die Wasserkühlung dafür verantwortlich. Ein Herausführen der Leitungen am Lamda/4 Punkt (kalt) könnte Verbesserungen bringen.

Weitere Probleme macht das Messen des Gitter- und Anodenstroms nach herkömmlicher Methode über eine hochgelegte B+-Leitung. Offensichtlich führt der zusätzliche Gleichstrompfad von der Anode nach Masse zu einer Beeinflussung der Zenerdiodenersatzschaltung in der Kathodenzuleitung, welche auf Ub- Potential liegt,und die Anodensicherung brennt bei PTT lautstark durch. Abhilfe schafft das Messen des Anodenstroms von der Ub- Leitung nach Masse. Von der Masse zur Kathode wird der Kathodenstrom gemessen. Der Gitterstrom wird über die Differenz bestimmt. Mit echtem Massebezug auf der Kathodenebene ist das Problem nicht mehr vorhanden.

Die PA läuft seit 5 Monaten problemlos, nach 2 Wasserwechseln ist die Leitfähigkeit annähernd stabil. Dennoch gilt es, das Langzeitverhalten der verwendeten Materialien im Auge zu behalten. Die Verbindung von Wasser und Hochspannung erfordert ein erhöhtes Maß an Vorsicht, somit dürfte ein derartiges Projekt wohl nur auf diesem Gebiet erfahrenen Selbstbauern zu empfehlen sein.

Ich würde mich über Erfolgsmeldungen oder Anregungen/Verbesserungen freuen.

Viel Spaß hinter der Werkbank!

6. Danksagung

Abschließend möchte ich nicht versäumen, den stillen Helfern aus meinem Ortsverband U01 an dieser Stelle einmal für die langjährige Unterstützung bei diversen Endstufenprojekten zu danken, allen voran DL1RCG, DG7RZ und DG6RB.

1. Introduction

Water cooling big tubes is an easy way to achieve quiet and reliable performance on EME. Useful are tubes where the anode radiator can be removed and exchanged to watertight jacket.

2. Why water Cooling?

In industrial applications water cooling is used for large tubes, in dusty environments and where low noise is premature. For EME especially the low noise level seems to be attractive.

Also water cooling allow for higher levels of plate dissipation. It has a rating of 100W/cm^2 in comparison 30...60 W/cm^2 for

forced air cooling. Nevertheless higher output power may not be feasible, because there are different limiting factors like safe values for grid and anode current. Also special attention should be taken to the cooling of grid rings and the cathode of the tube. At this points there are temperature sensitive joints of metal and ceramic. They have to be cooled by additional blowers anyway.

3. Design Alternatives.

In this design a closed loop cooling system was preferred to an open loop system. The closed loop system can be used with destilled water, which cares for the necessary isolation of the high anode voltage. The use of destilled water implies a careful selection of materials in the cooling system. Certain materials are prone to ion exchange. This ruins the pieces made from this material immediately and disturbs the purity of the cooling water.

4. The cooling System

Fig. 4 gives a sketch of the cooling loop. The main point is, how to do the isolation of the anode voltage.

The anode cooler

There is only one choice for the material of the anode cooler, i.e. copper. After removal of the air cooler, a cylinder made from brass is fitted to the core of the tube (Photo 2 shows a modified GS35). Then this cylinder is covered by 5...7 turns of copper tubing with mm ID. To enhance the heat flow from the anode to the copper tubing a second ring is fitted to the assembly (Photo 3) and the gap is filled with tin. This gives a very low heat resistance. A second advantage is that the cooling water is only in contact to copper but all mechanical parts can be easily machined from brass.

Pipes

The pipes must be made from insulating plastics. Black rubber or plastic pipes are not recommended. Instead so call Vinyl-Pies are a good choice. These can be obtained for home-production of wine or for in-house fountains. There are made from transparent plastic. Also fittings like joints and crosses are obtainable which are made from Nylon. You need about 0.5...1m of pipe per kV of anode voltage.

After two runs of adequate lengths of Vinyl-pipes the system has to be grounded. Two short pieces of copper pipe are soldered to a mounting plate. These plates are grounded and connected to the plastic pipes. One quarter from the 'cold' end a third copper pipe is inserted and connected to µA-meter. This serves an instrument to measure the purity of the cooling water. If the indication rises after some time you have to exchange the water.

The heat exchanger

For the heat exchanger you can use a car heat exchanger or an oil cooler, the smaller the better. An axial blower is fine to get a higher efficiency.

The pump

For the water pump you use anything what is used for small room fountains. Self propelling pumps are hard to obtain. A static pressure obtained by a higher tank and the pump at its bottom may help.

Some formulas help with the design of cooling system. Length of the pipes is about 1m/kV anode voltage. The velocity of the water should be about 1.2m/s. Local vaporisation is unlikely with this velocity.

The velocity is determined by

$$V = \frac{Q}{A}$$

- V= Velocity in $^{m}/_{s}$
- Q= Water flow in $^{m^3}/_{s}$
- A= Cross-section of pipe in m^2

Per kW of anode dissipation a water flow of 1l/min. is required. This amounts to $1.67 \cdot 10^{-5}$ $^{m^3}/_{s}$. For 900W of dissipation in a GS35 this results in the following numbers:

$$A = D^2 \cdot \pi/4 = 1{,}26 \cdot 10^{-5} \ m^2$$

It follows

$$V = \frac{0{,}9 \cdot 1{,}67 \cdot 10^{-5}}{1{,}26 \cdot 10^{-5}} = 1{,}2\ m/s$$

Be aware of the power of the pump. Because of the long runs of low cross-section of the pipes high back pressure is building up. It makes sense to overrate the pump heavily and follow a cut and try approach to determine the amount of water stored in the tank.

In my system I use 3l of water. After 3h of EME (50% duty cycle RX/TX) the temperature rises to 40°C. If the temperature is higher than 50°C there is a considerable danger of corrosion. This has to be avoided.

5. Operation

After the construction the filling of the system follows. Try to infuse as less air as you can. After all you have to run the pump for a while and try to get rid of the air blobs in the system.

After some hours the water has to be renewed, because all the remaining rubbish in the system has been collected by the first filling.

When the temperature rises also the indication of the Ammeter will rise. This is normal.

The current PA has a half-wavelength anode line on 144MHz (Photo 7). The electrical construction is a Russian one from St. Petersburg. Additional blowers cool the grid ring and the cathode. (Photos 5 and 6). Efficiency is about 55%.

Some problems can arise by conventional techniques to measure anode and grid current of the tube. The second DC-path from Anode to ground blows the conventional power zener bias in the cathode.

Now an Ammeter is inserted from cathode to ground for anode current. A second is inserted from B- to ground for cathode current. The grid current is determined by taking the difference of both.

6. Acknowledgement

I appreciate the work of my amateur friends DL1RCG, DG7RZ and DG6RB.

7. References/Literatur

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Microwave Products

Editor: Rainer Bertelsmeier, DJ9BV

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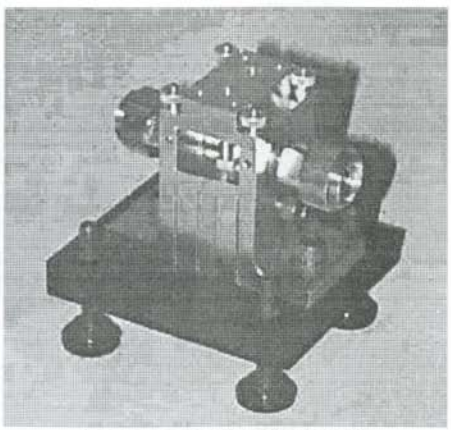
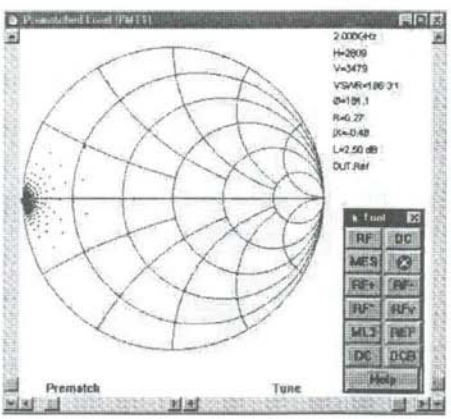


Testfassung MLTF (7mm)



Load Pull Tuner Kalibrierungspunkte am Transistor (Referenz) mit Prematch-Tuner (PMT-1818) - Kein Transformer notwendig!

Microwave Europe

Editor: John Sørensen, OZ1IPU

1296 MHz

DL1SUZ JO53UN wkd: 19.1.99 SM6EAN JO57WQ, 14.2.99 DJ3FI JO31DI, DL1YMK JO31QX, PA0ZM JO32GK, ON4PS/p JO20KQ LOC. 30 dxcc 12. Tks fer info Uwe.

DL7YS JO62NM wkd: 3.6.99 DF0CK JO50AN, 30.3.99 DL8OBU JO42XI, 31.3.99 DH5FS JO61UA, 2.4.99 DL1YMK JO31QX, DL8OBU JO42XI, 4.4.99 DG0VOG/p JO60OM, DJ2DA JO61PG, DG0ETE/p JO60OM, DL6NCI JO50VI, DH2UAK JO71FU, DG5BRE JO62VM. Rig: 85W to 37 elm LY. Tks fer info Peter John

DK0ALK JN38TD wkd: 050299 PE0MAR/P JO21BX, DH1NFL JO50TI, DK2XZ JO40XL. Tks fer info Mike.

G3XDY JO02OB wkd: 03-Oct-98 DL3IAS JN49, 16-Dec-98 F5JKK IN87, 07-Mar-99 DK0BN JN39, DL3YEE JO42, 29-Apr-99 DG2LAB JO54, DH0HAR JO53, OZ6OL JO65, 30-Apr-99 DL8OBU JO42, 02-May-99 OK1KIR/P JO60 857km, OK1OKL JO60, DL0GTH JO50, DL5OAQ/P JO42, DL3YCW/P JO41, DK8VR JN39. Tks fer info John.

2320MHz

EA6ADW/P JM19 wkd: 25.10.99 F6HTJ/P JN12LL,(1.st EA6/F). Rig: 1W,only 6dB-Horn from EME-Dish. Tks fer info Peter.

G3XDY JO02OB wkd: 03-Oct-98 PA0WMX JO21, 16-Dec-98 F5HRY JN18, 29-Apr-99 PA3FHY JO22, DH0HAR JO53 618km, 30-Apr-99 DJ6JJ JO31, 01-May-99 DK2MN JO32, PI4GN JO33, 02-May-99 DJ3FI JO31, DG1KJG JO30, PA6C JO33, DL3EAG JO31. Since October 1998 I have been back on 13cm after several years QRT.Rig is FT736R, G8LMW Transverter, 2C39BA PA (60W output), 44ele Loop Yagi @ 14m AGL, and MGF1402 masthead preamp. Tks fer info John.

3400MHz

PA0WWM JO22FE wkd; 300499 G4DDK JO02PA TR, G3LQR JO02QF TR, G4LIP/P JO01QD TR, G0FDZ/P JO01QX TR, DL1MK JO31QX TR, DK2MN JO32PC TR, DG1KJG JO30NT TR. Tks fer info Wim.

5760MHz

DG1VL/p JO61XE wkd: 02.05.99 DG2DWL/p JO60VR, OK1KIR/p JO60PM, DF0MTL JO60OM. Tks fer info Henry.

PA0WWM JO22FE wkd: 300499 G4DDK JO02PA TR, 010599 G3LQR JO02QF TR, G4LIP/P JO01QD TR, G0FDZ/P JO01QX TR, DL1YMK JO31QX TR, DK2MN JO32PC TR, 070599 F6DKW/P JN19AJ RS, 100599 DG1KJG JO30NT RS. Tks fer info Wim.

10368MHz

DK0ALK JN48AB wkd. 6.6.98 F5MKD JN38UP, DK0BN JN39VX, DL3NQ JN49IN, DJ1KP JO40JJ, HB9AMH/P JN37OE, DJ2DY/P JN39PN, DK0FLT JN59FW, DL3IAS JN49EJ, DL0GTH JO50JP, F5AYE/P JN25VV, 7.6.98 OE5VRL/5 JN78DK, DK9MN JN58TC, DF6IY JN48EU, OE2BM/2 JN67MV, hrd also: PA0EZ, G3LQR !! 3.10.98 HB9MIN/P JN37OE, DG1GLH/P JN48CO, DJ9DW JO40LE, DK0PX JN48JC, DK3IK/P JN39IH, DK4GD JN47GW, 4.10.98DL3NQ JN49IN, DJ5BV JO30MR, DC4UI/P JN49BF, DF5SL/P JN48KO, DJ3SX JN49IM, DB4CE JN57DR, DL1AS/P JN57DR, DF6TK JN47TR, OE5VRL/5 JN78DK, DK9MN JN58TC, 7.3.99 HB9MIO/P JN37WA, DK0PX JN48JC, DK4GD JN47GW, 1.5.99 F5MKD/P JN38UP, F1OET/P JN38UP, DL4EAU/P JO51FS, DH6FAE/P JO40PL, DJ9DW JO40LE, DL3NQ JN49IN, DF6NA JO40XS, DK9MN JN58TC, DK0OG JN68GI, DC8EC JN57UX, OK1VAM/P JN69GX, DK2GR JN59IE, DL3NDX/P JN59GB, DL9SH JN49DN, DJ6BU/P JO40RW, 2.5.99 HB9MIO/P JN37WA, DK0PX JN48JC, 3.7.99 HB9CZF/P JN37SH, DJ6BU/P JO40XL, OE5VRL/5 JN78DK, DC8EC JN57UX, DK2GR

JN59IE, DL0GTH JO50JP, OK1VAM/P JO60LJ, DL2ABO/P JO51GO, DK4VW JO40IT, DK9MN JN58TC, OK1KRQ/P JN69HN, DL0UL/P JN48UO, OE2M JN67NT, OE3WRA/3 JN77KR, DK4GD JN47GW, OE5MKM JN78CJ, DK0OG JN68GI, 4.7.99 OK1JKT/P JO60OK, F5MKD JN38UP, F1OET JN38UP, DM2AFN JO61WB, DL3NQ JN49IN, DJ1KP JO40JJ. Rig: 48cm dish, 0.08W. Tks fer info Mike.

DG9NCX JN59BT wkd: 28.5.99 DL3IAS JN49 RS, DK2AN/p JO51 RS, OK1JKT/p JO60 RS, DM2AFN JO61 RS, DL2ABO JO51 RS, DH4AE/p JO51 RS, DB6NT JO50TI RS, DK1KR JO53 RS, DL4OAN/p JO51 RS, DL2NUD JO63 RS, 30.5.99 PA3DYS JO21 RS, ON7WR JO20 RS, DL2NUD JO63 RS, 2.6.99 DK9MN JN58 RS, DF3CK JN57 RS. Rig: 1,2W 48cm dish. Tks fer info Hubert.

DG1VL/p JO61XE wkd: 02.05.99 DM2AFN JO61WB, DJ9LE JO40LE via rs 369km, DL6NCI JO50VI, DF6NA JN49XS via rs 324km, OK1OKL/p JO60LJ, DG2DWL/p JO60VR, DK0OG JN68GI via rs 331km, OK1KIM JO60RN, OK1KEI/p JN79CX, OK1KIR/p JO60PM, DG0VE JO71AG. Tks fer info Henry.

DF6NA JN49XS wkd: 27/03/99 DG1KJG JO30NT, 03/04/99 DG1KJG JO30NT, 05/04/99 DC9KK JO30NT, 05/04/99 DG1KJG JO30NT, 06/04/99 PA0WWM JO22FE, DH8AG JO31RL, DC9KK JO30NT, DG1KJG JO30NT, OK1JKT JO60OK, 22/04/99 DG1KJG JO30NT, 23/04/99 DK9MN JN58TC, DC8EC JN57UX, 25/04/99 DG1KJG JO30NT, 01/05/99 DG1KJG JO30NT, DG1KJG JO30NT, DL4EAU/P JO51FS, DK8VR JN39LH, DH1VY/P JN39JF, F5MKD JN38UP, F1OET JN38SM, DK9MN JN58TC, DK9MN JN58TC, DK0ALK JN38TD, DK0OG JN68GI, DC8EC JN57UX, OK1JKT/P JO60OK, OK1KEI/P JN79CX, DL4WO JO61XE, DG1VL/P JO61XE, DC9KK JO30NT, OK1OKL JO60LJ, 02/05/99 DL3EAG JO31DK, 04/05/99 DF3CK FH09E, DL3EAG JO31DK, 05/05/99 DL3EAG JO31DK, 07/05/99 PA3DYS JO21JP, PA0EZ JO22OF, PA5DD JO22IC, DL3EAG JO31DK, 08/05/99 DG1KJG JO30NT, DC6TV JO30MT, 10/05/99 OE5VRL/5 JN78DK, OK1JKT/P JO60OK, DM2AFN JO61WB, PA0WWM JO22FE, DG1KJG JO30NT, PA5DD JO22IC, PA0CIS JO22FD, PA3DYS JO21JP, DH8AG JO31RL, PA0EZ JO22OF, DK2AN/P JO51AT, DL2DR JO31TO, PE1PFW JO22ID, PA0BAT JO31FX, DB1BX JO32OS, DF7JS JO31JM, DC9YC JO31PI, DB5KN JO31NA, DC6TV JO30MT, PA3DYS JO21JP, DJ6JJ JO31LG, PA0EZ JO22OF, LX1DU JN29XM, 12/05/99 DK9MN JN58TC, 18/05/99 DC9KK JO30NT, DG1KJG JO30NT, 19/05/99 DM2AFN JO61WB, DC9KK JO30NT, 20/05/99 DM2AFN JO61WG, 28/05/99 OK1JKT/P JO60OK, PA0WWM JO22FE, DM2AFN JO61WB, DC9YC JO31PJ, DK1VC JO31RG, PA3CEG JO33FB, DL3EAG JO31DK, DL4DTU JO61TB, DL2ABO JO51CR, DG1KJG JO30NT, DH4AE/P JO51DQ, PA0EZ JO22OF, DK1KR JO53HW, PA3AWJ JO21GW, DL2NUD JO63MF, DL4IB/P JO64CJ, DF1OI JO42TF, OE5VRL/5 JN78DK, 29/05/99 DK9MN JN58TC, DL3EAG JO31DK, PA5DD JO22IC, 30/05/99 ON7WR JO20EP, F6DKW JN18CS, PE1PFW JO22ID, PA0CIS JO22FD, G3LQR JO02QF, DK5KB JO30LS, G3LQR JO02QF, PA3DYS JO21JP, F1HBF/P JN18GF, F1PYR/P JN19BC, F6DPH/P JN28QJ, ON7WR JO20EP, OK1JKT/P JO60OK, DL2NUD JO63MF, DG1KJG JO30NT, DJ6JJ JO31LG, DF7JS JO31JM, PA0CIS JO22FD, PA0EZ JO22OF, DL3EAG JO31DK, 02/06/99 DL4EAU/P JO51FS, PA5DD JO22IC, DG7MHR JN57DR, DC8EC JN57UX, OK1JKT JO60OK, DG1VL/P JO61XE, DM2AFN JO61WB, 03/06/99 PA3DYS JO21JP, 05/06/99 DL3EAG JO31DK, DK9MN JN58TC, DK0ALK JN48AB, OK1VAM/P JO60LJ, DG1KJG JO30NT, OK1JKT/P JO60OK, 06/06/99 DK4GD JN47GW, DF6TK/P JN47QT, DL2ABO JO51CR, 13/06/99 DG1KJG JO30NT, PA3DYS JO21JP. Rig: FT290R + DB6NT MKII + PA 5W + 90 cm dish + EGIS Rotor. Tks fer info Rainer.

EA6ADW/P JM19 wkd: (Extract of all 10G-QSOs,all QSOs RST 59+ except 9H1ES) 1998: TM2SHF/P JN42HF 530km (1.st EA6/TK), TK/F6BVA/P JN41HV 511km, F6BSJ/p JN12ML 282km, F6BVA/P JN23WE 428km, F5RVO/P JN24PE 505km, 1999: EA5JF/P JM08BR 213km, 9H1ES/P JM75FV 1090km(1.st EA6/9H1, EA-ODX), IS0/DF1EQ/P JN40OU 525km (1.st EA6/IS0), 9H1ES/P JM76EA 1076km (Gozo Isl.), IS0/DF1EQ/P JM49FH 462km, IS0/DF1EQ/P JM48EX 463kmGRID #29, F1ANY/P JN12LL 283km. Rig:1.2W/1m-offset,1dB. Tks fer infoPeter.

HB9CZF: As every year I was QRV in the July contest from JN37SH. HB9 enjoyed one of its hottest summerdays with appox. 30C at 1200m asl. All QSO listed below were made on July 3rd with QTF 47 degrees. At the end of the contest there was another rainscatter opening but no new stations QRV - DJ1KP, DK0ALK and myself were calling CQ for 30min. Interesting enough the scatter cloud had the same QTF as the day before; above Black Forest.

HB9CZF JN37SH wkd: 3.7.99 DJ1KP JO40JJ, DK0FLT JN59FW, DL4EAU/P JO51GO, DF6NA JN49XS, DK0ALK JN38TD, DL0GTH JO50JP, DH6FAE/P JO40PL, DL2ABO/P JO51GO, DK2GR JN59IE, OE2M JN67NT, DL3ALI/P JO50JP, OE5VRL/5 JN78DK, OK1VAM/P JO60LJ, OE5MKM JN78CJ, DL0UL/P JN48UO, DK9MN JN58TC, OK1KRQ/P JN69HN, OE3WRA/3 JN77KR, Heard: DJ6BU/p 59rs SSB JO40XL, 3.7.99 HB9CZF/P JN37SH, DJ6BU/P JO40XL, OE5VRL/5 JN78DK, DC8EC JN57UX, DK2GR JN59IE, DL0GTH JO50JP, OK1VAM/P JO60LJ, DL2ABO/P JO51GO, DK4VW JO40IT, DK9MN JN58TC, OK1KRQ/P JN69HN, DL0UL/P JN48UO, OE2M JN67NT, OE3WRA/3 JN77KR, DK4GD JN47GW, OE5MKM JN78CJ, DK0OG JN68GI, 4.7.99 OK1JKT/P JO60OK, F5MKD JN38UP, F1OET JN38UP, DM2AFN JO61WB, DL3NQ JN49IN, DJ1KP JO40JJ. My RIG: 1.2 Watt out, 48cm Parabol and IC202. Tks fer info Dominik.

OK1VAM/P JO60LJ Klinovec 1244 m a.s.l. wkd: 3/4.7.99 53 QSO/25 loc 40 QSOs via RS, 3x PA, HB 9CZF, SM7ACM, 3x OE, 34 DL, 11 = OK, ODX 640 km with PE0MAR, (OK1JKT, KIR, KIM, KKD =3D JO60; OK1AIY , UFL =3D JO70; OK1KHK =3D JO80; = OK1VEC, KRQ =3DJN69; OK1KEI JN79; OL2R =3D JN89. Rig: 2 m trx + transvertor home brew + 1 W Pa DB6NT, ant 1 m.Tks fer info Jan.

PA0WWM JO22FE wkd: 310399 GOWZV/P JO02 TR, 050499 DH8AG JO31RL RS, DL3NQ JN49IN RS, DG1KJG JO30NT RS, DC9KK JO30NT RS, 060499 DF6NA JN49XS RS, OK1JKT JO60OK RS, 130499 DL1YMK JO31QX RS, 300499 G4BYV JO02LQ TR, G3FYX IO81RM TR, G3JHM IO91LC TR, G4DDK JO02PA TR, G0WZV JO01KV TR, 010599 G3LQR JO02QF TR, G0EMG/P JO01QX TR, G0WZV/P JO01PU TR, G4LIP/P JO01QD TR, ON4CP JO20IV TR, DL3EAG JO31DK TR, G4DDK JO02PA TR, ON7WR JO20EP TR, DL1YMK JO31QX TR, DK2MN JO32PC TR, 020599 DG1KJG JO30NT TR, ON1BPS/P JO21CI TR, DC9YC JO31PI TR, 060599 DC9YC JO31PI RS, DJ5VW JO31RJ RS, 070599 F6DWG/P JN19AJ RS, F5HRY JN18EQ RS, F6DKW JN18CS RS, F1PYR/P JN19BE RS, DC6RW JN49HL RS, DJ1KP JO40JJ RS, PI4ZLD JO11WM RS, 100599 F6DWG/P JN19AJ RS, F6HPP JN19PG RS, DG1KJG JO30NT RS, DJ6JJ JO31LG RS, DH8AG JO31RL RS, DF6NA JN49XS RS, DH9NBB JN49WS RS, DH6FAE/P JO40PL RS, DL3IAS JN49EJ RS. tks fer info Wim

SM1HOW/p JO96EX wkd: 17.6.99 OH2AXH/p KP20LE new OH record 522 km. Rig: DB6NT 0,4W. Tks fer info Lars.

24192MHz

EA6ADW/P JM19 wkd: 10.5.98 EA5/F6GBQ/P IM98XR 226km, 30.5.99 EA5JF/P JM08BR 213km, (looking for holiday-24G-stns in EA3/5/6). Rig:1m-offset,90mW,1.7dB. Tks fer info Peter.

Your reports can be send to me on FAX ++45 98467877, E-mail dmteknik@post4.tele.dk as "ASCII-DOS text" or by post to my NEW ADDRESS: John Sorensen, Solystvej 13, DK- 9300 Saeby, Denmark, and please if possible on a disk in ASCII-DOS text, that will help me a lot, thank you. Vy 73 John OZ1IPU

Microwave: World Firsts and World Records

Band [GHz]	World First QSO			World Record		
	Date	Calls	QRB [km]	Date	Calls	QRB [km]
10	1946-05-06	W2JRM-W2JN	3.3	1994-12-30	VK6KZ/p-VK5NY/p	1912
24	1975-10.14	G3BNL/P-G3EEZ/p	150	1998-09-03	JM3KMO-JR3EDZ	402
47	1984-10-03	HB9AMH-HB9MIN	1	1998-05-15	F6BVA/p-F5CAU/p	193
76	1985-12-30	HB9MIN-HB9AGE	0.5	1995-12-07	HB9MIO/p-DK4GD/p	114
145	1992-12-12	DB6NT/p-DL1JIN/p	1	1997-04-07	DL6NCI/p-DB6NT/p	53
241	1993-05-23	DB6NT/p-DL1JIN/p	0.1	1995-06-07	DB6NT/p-DF9LN/p	2.1
411	1998-01-06	DB6NT/p-DL1IN/p	0.05	1998-01-06	DB6NT/p-DL1IN/p	0.05

If you have an update or a correction, please write to:
John Sørensen, OZ1IPU, Rosenvej 49, DK-9300 Sæby, Denmark.Tel.: (++45)9846-3311

Microwave USA

Editor: Kent Britain, WA5VJB

First I would like to invite everyone to the Microwave Update 1999 Conference hosted by W5LUA and myself. Microwave Update will be held at the Harvey House Hotel and Conference Center in Plano, Texas. Plano is on the northern edge of Dallas, Texas and the dates are October 21, 22, and 23. An international list of over 25 speakers has been arranged, our fleamarkets are well stocked, and our surplus tours are legendary.

For additional information you can contact W5LUA Al_Ward@HP.com or me at WA5VJB@FLASH.NET

The millimeter bands have been very active this spring. Shown in the photo taken at the Dayton Hamvention are N2GXH and N1XSY who did extensive rover operating for WA1ZMS. Though their efforts Brian now has 7 grids worked on 47 GHz. And this work was done in April and May, months hardly known for cool dry conditions normally expected for good millimeter wave propagation.

But this was not all, Brian WA1ZMS and Doug K2AD also got out their 75 GHz equipment and just earned the ARRL VUCC award for working 5 different grid squares on 75 GHz from a single location. Their last QSO for grid number 5 was 114 km, apparently tying the world record by HB9MIO and DK4GD. And again these QSO were made during the

Left N2GXH Center N1XSY Right WA1ZMS

'cool/dry' New England months of April and May.

All QSO's were made with narrow band CW using about 10 milliwatts of transmitter power. Antennas were 30 cm dishes with homebrew flat splash plate feeds. I hope to have more technical information and photos for next column.

Matts, SM6IKY's 600 watt 23 cm EME station.

I would also like to talk about some new 144 MHz equipment. One of the biggest difficulties for new amateur microwave activity is the lack of a good I.F. rig. Years ago when the IC-202 was not as popular I acquired five. A few years ago I did trade one off, but it took the trade of a network analyzer to pry the IC-202 out of my hands! Now MFJ is selling the MFJ-9402 144 MHz SSB Transceiver. There were 3 units at Dayton and I was able to get one. The MFJ-9402 covers 143.95-144.350, 7 watts, extremely stable, and almost exactly the same size as the IC-202. Dealer price is 400 dm, or $230 US. This is really going to help new microwave operators get going here is the US.

There are also two EME Conferencies planned in the Americas. Mark Gummer, N2IQU is sponsoring an EME Conference August 19th in Syracuse, NY. For additional information see kb2ah.com PY5ZBU is also sponsoring a moonbounce Conference in Rio de Janeiro August 18th and 19th, 2000. So we have a year to plan. For more information you can contact eme@inepar.com.br or the webb site http://www.eme2000.com.br

5m, 23 cm EME dish of SM6IKY/KD5FZX of Duncanville,

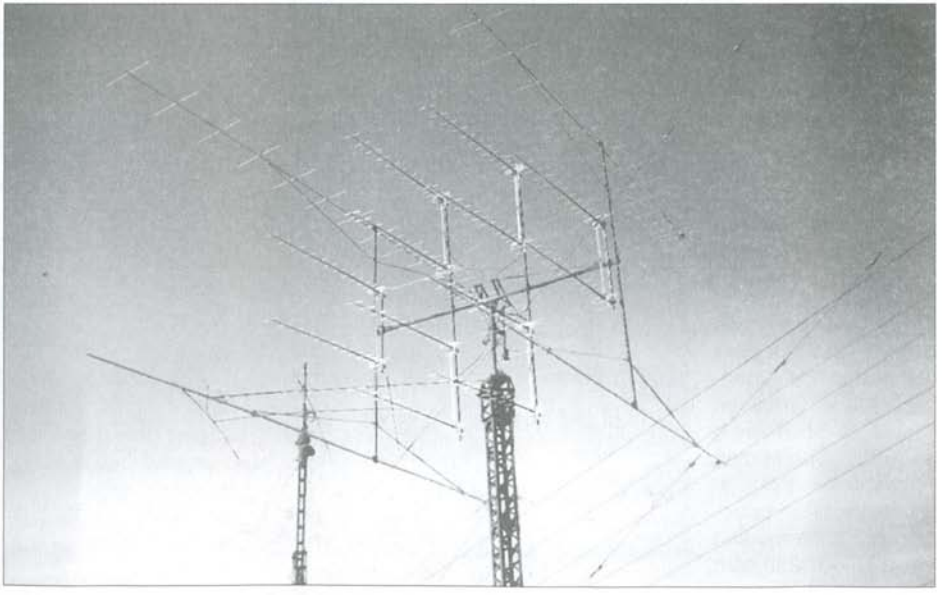
EME News

Editor: Bernd Wilde, DL7APV

intro: I want to let everyone know the proposed dates for the 1999 **ARRL EME** Competition will be: October 30 & 31 and November 27 & 28. Any comments let me know. 73 Joel W5ZN, see also comments at **net notes**! W5LUA proposes EME Microwave contest: Sep 4/5 & Oct 2/3 .. send comments back please.(13cm & above).

144 MHz

RW1AW Alex (KP50eb) is qrv since sept. 1998. He wkd in sept. OH7PI, OZ1HNE, KB8RQ, W5UN, RU1AA, F3VS, OH2BC, WA9KRT, W0HP, SM5FRH, I2FAK, IK3MAC, WA6PEV, LZ2US, OK1MS, W0HP, oct. VE3KDH, RZ1AWT, VE3BQN, VE1ZJ, K0FF, WA1JOF, K0GU, VE7BQH, SM4IVE, WB5LBT, K7CA, SM2CEW, HB9Q, SM5BSZ, RV3IG, UA3PTW, EA1ABZ, RU1A, K5GW, AA4FQ, DJ5MN, 7K3LGC, UT5ER, UA9FAD, DK3WG, F/G8MBI, nov. JH2COZ, PA0JMV, G4YTL, DL9MS, UR5LX, KA5AIH, EA3ADW, JH5FOQ, S52LM, I1ANP, G4ZHI, K6MYC, UA4API, W0PT, DL5MAE, K2GQAL, I3DLI, IK4WLV, W7HAH, OZ9AAR, IK1FJI, dec. K9MRI, UA4AAV, DK9ZY, K5GW, EA2LU, OH3AWW, G3ZIG, PA2CHR, IK2DDR, W1XE/0, AF9Y, WA6PEV, jan. 99 DJ7OF, EA3DXU, DL5DTA, PE1LCH, UT1PA, 9H1CD, F6BSJ, DL7FF, DL8GP, EA6VQ, UA3TCF, SM3MXR, UA4ALU, W0VD, SM7SJR, EI4DQ, W7FHI, feb. DL2RSX, OE5EYM, 9H1PA, LA9NEA, S57TW, march



RW1AW's 2m&70cm EME ant. 2m 4x17B2, 70cm 12x15el. bv

EME-TOPLIST

144MHz

Call	small	SQR	DX CC	US States	WAS	WAC	#
I2FAK	448	56	105	50	1993	1988	94
PA2CHR	254	43	63	48	--	1993	364
DJ7OF	150	28	30	22	--	1996	170
9A9B	66	16	21	11	--	--	84
PE1OGF	46	14	16	12	--	--	55
UA3PTW	40	12	14	9	--	--	41
EA1ABZ	37	15	17	0	--	--	39
YO2AMU	36	18	24	12	--	--	57
SP7DCS	33	15	15	8	--	--	33
YO2IS	33	14	16	10	--	--	34
S53J	28	11	12	3	--	--	31
F5HRY	21	?	8	7	--	--	21
JA9BOH	?	?	39	34	--	--	210
CT1DMK	?	?	41	?	--	--	118

432MHz

DL9KR	378	52	82	50	1987	1978	715
OK1KIR	229	43	62	43	--	1982	329
G3LTF	206	?	55	47	--	--	327
DL7APV	128	26	32	40	--	1984	151
F1ANH	125	25	31	25	--	--	159
YO2IS	115	23	33	23	--	--	141
OE9ERC	107	24	27	22	--	1993	126
G4ERG	77	21	24	19	--	--	93
OK1CA	71	24	25	22	--	1996	121
EA6ADW	64	19	23	19	--	--	65
CT1DMK	49	?	19	?	--	--	49
PA2CHR	38	14	17	10	--	--	45
F5HRY	31	0	14	8	--	--	31
OK1DFC	21	12	11	6	--	--	21
JA9BOH	?	?	48	42	--	--	296
G3SEK	?	?	54	42	--	--	275
ZS6AXT	?	?	32	?	--	--	152

1296MHz

OE9ERC	140	29	35	28	--	1993	201
OK1KIR	112	29	34	24	--	1989	139
G3LTF	108	?	31	20	--	--	134
F1ANH	106	25	31	20	--	1994	140
EA6ADW	97	23	29	23	--	1994	129
DJ9YW	96	26	32	17	--	1998	104
HB9BBD	92	23	31	20	--	1994	119
CT1DMK	67	?	24	?	--	--	69
OK1DFC	58	18	24	11	--	--	65
OK1CA	34	16	18	7	--	--	31
JA9BOH	?	?	1	?	--	--	2
HA5SHF	?	?	20	6	--	--	46
ZS6AXT	?	?	32	?		1993	144

2300MHz

OE9ERC	41	14	19	8	--	--	44
OK1KIR	31	13	17	8	--	--	32
F1ANH	17	8	11	5	--	--	18
G3LTF	13	?	12	2	--	--	14
EA6ADW	8	4	8	1	--	--	9
ZS6AXT	?	?	16	?	--	--	29

5760MHz

OE9ERC	14	7	12	2	--	--	16
OK1KIR	7	4	6	1	--	--	7
CT1DMK	5	?	4	?	--	--	4

10368MHz

OE9ERC	11	8	7	3	--	--	11
OK1KIR	11	7	10	2	--	--	11
CT1DMK	10	?	8	?	--	--	11

JR5JXV, DJ7UD, PY2DP, apr. T98CHR, T98LWT, IZ5EME #103 and than 300 qso and 24 dxcc. rig: FT736, IC746 MGF1302 0.35dB 2xGU74B hb.! 2400w out and 4x17B2 42m 7/8" feed line. tnx fer nice info Alex.

YO2AMU (KN06OC) reports now 107qso & 4 continents since sept. 98. last contacts were : DK3WG , DL5MAE , UA9FAD , Z30B , K8BHZ, ZS6ALE, JR5JXV (300W), EA3DXU, EA6VQ, ON7RB, LZ2US, RU1A, OE5EYM, HB9Q, CT1DMK, N2WK (#57). Doru is located in a middle of a quite big town. rig: TX TS130V+ HM transv. with tubes and PA - PP of 4CX250B, 1kW out. rx: HEMT preamp. HM transv. IF- SB303 old Heathkit. ANT: 4 x F9FT , 16 el. Full AZ&EL. tnx fer info Doru

432 MHZ

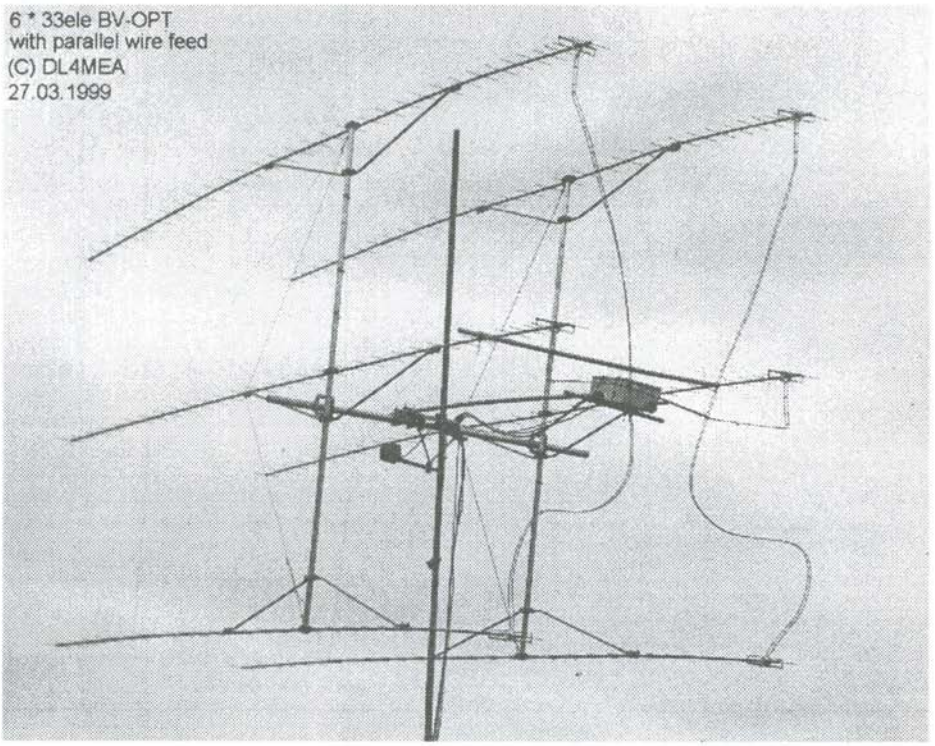
DK3FB Ruediger reports 04 May 1999, he was active during the last SW. He worked JA5NNS during his sked quite easily. The second one with WA4NJP was NIL. He

thought sometimes WA4NJP was there, but condx were not too good. Additionally, Ruediger worked N9AB (#) and K4QI on random. Heard were also RW1AW during his qso with N9AB.Just when he finished the qso with N9AB, he disappeared suddenly.

DL3EAG Stephan was also active during SW. The sked with JA5NNS was also successful, but as well as Ruediger, my sked with WA4NJP ended up with just listen to some sky-noise. I followed also the QSO between N9AB and RW1AW, but get no response from N9AB after calling him. Heard was also K4QI at moonset, but it was too late to finish a qso (abt. 2deg. elevation when I heard him).

DL4MEA (JN58jd) report from DUBUS/REF contest 1999. 27.03.1999 UR5LX, JA5OVU, HA1YA, DL9KR, DK3WG, JH4JLV, EA3DXU, OE3JPC, JA4BLC, F5AQC, G4ERG, OE5EYM, SM2CEW, PA3CSG, DL9NDD, VE1ALQ, S57RA, K5JL, N2IQU, DF3RU, W7CNK, K4QI, OE5JFL, DK3BU, K5WXN, IK5QLO, W7HAH, JA5OVU, JH4JLV, JA2TY, LX1DB, ON4KNG, OZ6OL for 31x21. Heard with good signals were: sv1btr several times, ut0rz? working DL9NDD wa9fwd, on5ofl, n0rz. Rig: FT847, driver 2*TP3069+ final GS35b, 25m Cellflex 1/2" + 8m RG217, 1.8dB measured loss, Ant. 6x33ele BV-OPT 11WL, 27.7dBi Gain see: http://www.qsl.net/dl4mea/vfg306/bild05.gif preamp DJ9BV style with ATF35076, NF unknown but good. During the first hours of the contest at saturday there must have been large faraday rotation, so I had no echos and only rare stations. It became better and better. About the same was on sunday. Activity was good on saturday and very low on sunday. I made 27 QSO on saturday and only 6 on sunday. What a difference! Finally, the parallel wire feed was worth it. Nevertheless, sometimes stations gave up too early until I was able to find the right filtering. I am not one of those having best skills in reading CW so those gave up too early. Sorry for that and maybe one reason was that my antenna was not always pointing right because of my this time manual tracking. Since it is very unusual to feed six yagis with parallel wire feed I setup a web page describing how to I did that at

RW1AW's station



http://www.sbs.de/~koellner/antennas/pwire fed.htm. Guenter

K2UYH reports : He had mixed results on our skeds this weekend in feb. On 70 cm on the 28th, we were on 10 minutes late for our IN3AGI sked and heard nil from him during the remaining 20 min. I hope he did not quite early on us. Has he been making his skeds? It is difficult for me to get home much before 0000 on Fridays - particularly with my spring schedule. I then worked UT3LL and N2HLT with out much problem, nil was heard from CT1WB - I understand from the Netnotes that he had TX problems, and nil from W7ALW, finally VK4AFL was QSO'd. On the 29th we worked on 23 cm RW3BP in an extra sked arranged via e-mail, moved DJ5MN to 1 March and QSO'd then, nil DH9FAG - I understand that he was QRV on random - any feedback as to why he did not show for his sked will be appreciated, nil IK2RTI, 0600 QSO K9BCT - nice signal, 0630 nil WA9OUU and nil JF3HUC. I also made a number of random QSOs and tried to give out as many points as time allowed in the DUBUS/REF Contest. Contest time was limited because of 70 cm skeds on the 27th and a visit from Paul, S57RA on Saturday. I took Paul over to KB2AH's QTH to see Tom multiple dishes and also gave him his first taste of 1296 EME on the 28th. 73, Al - K2UYH

RW1AW Alex (KP50eb) is qrv since april.1999. He wkd with qrp (125w!!) 28.03.99 DL9KR 569/549, DL9NDD 549/O, K5JL 559/439. 30.03. UR5LX O/O #4, 17.04. with qro (1500w) W7CNK O/O, 18.04. DF3RU, 24.04. F5FLN O/O, DK3WG O/O, EA3DXU O/O, UA9FAD, O/O, PA3CSG 539/449, VE6TA O/O, DL9KR 579/569, 25.04. DL9NDD 569/559, N9AB 559/549, HP3XUG O/O #14, DF3RUZ 559/439.rig: FT736, IC746 MGF1302+ CF300 0.4dB GS35B hb.! 1500w out and 12x15el. 9BV 42m 7/8" feed line. tnx fer nice info Alex.

W5VUY 30ft hb dish with 3/4 & 1/2" electr. cond. + chicken w

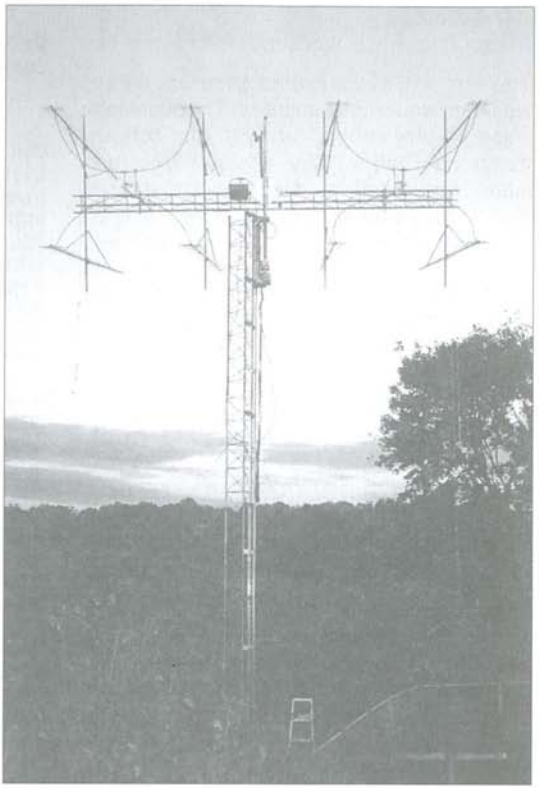
SV1BTR reports : feb sw was indeed a strange weekend in terms of polarity changing fast and severely degraded conditions in both polarities at times. It seemed that the band was dead....Worked on 25/2 DL8OBU, on 26/2 HP3XUG and last night WA4NJP all in V pol RX. Sent "O"s from 2nd period to KB4CNI being copied also in V pol. but it seemed his signal dissapeared. Same was true with WA4NJP who i lost for 20 minutes but then copied again towards the end of the qso.Heard well on 26/2 W1ZX & last night DF3RU.Nil heard from W0KJY, W7EME, OZ6OL, DL7APV, UA4API, N7LQ, GD4IOM , JA5NNS and copied but not complete IK5QLO. Cancelled skeds were G4RGK, DL4KG, W7KK. Jimmy SV1BTR, 4*32el. Cross BVO H/V pol. + 1.4KW

432 & up NETnews

FEB 27, 1999 Re W5LUA's note, both G3WDG and G4KGC are still QRV on **10GHz** eme. Window info is elevation limits >10 deg <36 deg, any azimuth. Location approx 52N, 0.5W. Interested in any skeds. 73 Charlie. Cesar **CT1WB** canceled all his 70cm skeds, his amplifier "exploded", and he thinks he need the next weekend for repairing it, therefore he can not be on any of the skeds. **W7CNK** found condx strange, cross polarizition.. worked OK1KIR, G4ERG, K1FO, W1ZX & then 1 way SSB.. 2 way SSB W7BBM.. K2UYH wrk .. was on for HP3XUG/SV1BTR, did not hear Louie heard OZ6OL. HEARD WA4NJP, WE2Y, SV1BTR signals were very strange souned like reverb on SSB contact. **W7QX**: never heard condx on 70cm such as last night.. appeared as 2 meter.. QRV after 0030z.. on 70cm.. worked 2 stations last night.. would like KB4CNI & WW2R skeds. ***Sun, 28 Feb*** **W7QX** never heard condx on 70cm such as last night appeared as 2 meter. **GM0ONN** trying to id 23cm sigs.. 1.2mtr dish 150w hopes to be QRV by endof year on 70cm. **VE1ALQ** worked 23 X 20 on 23cm in 3.75 hours of air time. Conditions appeared to be excellent on 23cm. I heard nothing on any of my 23cm Skeds, but did work IK3GHY random at 2303 57 minutes before sked time. Had a lot of fun, and sorry I missed a few stations. I hope you were NOT an Initial, hi. Darrell **ZS6AXT** Missed few stations from NA, W3XS, K3HZO, VE4MA, VE6TA. Please guys, look for me, my window is shorter than that of Eu stations. Otherwise 34 X22 (23cm).73, Ivo. **WS0F**, Donzil (DM34). will come up with a Paraclipse 3.8 Meter dish & pair of 7289 (2C39) tubes, he hope to be QRV on 23CM by summer. **DF5JJ/EA6ADW** is back to EA6 again. So please change mail-adress to

cerveny@ctv.es. He will be QRV 23cm last weekend of march.

***MAR 6*, WA2WIM** reports I have been working on setting up a trailer mounted 1296 EME station for about one year now. We have the trailer, dish mount, and dish almost finished. We are now working on the feedhorn and power supply for the amplifier. I am seeking help in two areas: 1. I need a source of material for the feedhorn. Does anyone know a source of sheet brass 0.020" or copper? How about using galvonized sheet metal like they use on furnace duck work? 2. I need to locate either a HV power supply or two identical microwave oven transformers or other transformer with suitable winding so I can build a suitable power supply. I would prefer ending up with about 1200VDC. If anyone could assist please email to: mailto: wa2wim@ismi.net 73 Neil. **K3HZO** reports : The T/R relay at the dish, energized for receive, was found to be intermittent after about two hours of operation. I became very, very hot. It's fixed now and the better quality relay is working fine. Last evening I worked CT1DMK for initial #57. First new initial of 1999. 73, Harry **WA4NJP**: Sunday had 5 skeds.. S52CW, WW2R good contacts 70cm 9H1ES good copy (no contact), DJ5MN good copy (no contact) and WA9FWD good copy but no reply 23cm. **KD5FZX** is a new call on 23cm (SM6IKY) had a contact on Monday night 500w 5mtr. **K2DH**: worked JS3HUC nad missed JH5LUZ had five initials 42x30 and also worked DJ5MN after contest ended.. high winds and heavy snow. new inits were DH9FAG, HA5SHF, VE6TA, IK3GHY, & DJ5MN now at #125. **WA5TKU** has new email watchiso@iglobal.net



KB4CNI 8x33el FO 432

Sun, 7 Mar* DH9FAG** grid JN49LX Karl., **DK3WG**: changed PO Box from 531 to 1531, now 351 inits on 70cm. ***Sat, 13 Mar directory: Discussion about **directory** and need to get together with Klaus to bring the directory issues to a common goal.. During discussions, it became apparent that a lot of folks are not aware of the EME directory and how to get a copy. In the days gone by, we used to have an "annual" update, print it and then mail it out either with the News Letter or in a separate mailing. But now, the updates are electronic and continuous thanks to Rick, NU7Z and Klaus,

DL4EBY.. Rick has been trying to maintain an accurate "active EME" list for the past 2 1/2 years.. He has found very little interest in folks wanting this list, but I attribute that to the fact that I have not made it well known here in the net notes.. SO, **If you desire a copy** of this list in electronic format, please **e-mail Rick** with your request **<Nu7z@aol.com>**, and be

Microwave EME weekend

The first ARRL sponsored Microwave EME weekend was a great success. The event took place on November 7 and 8th and concentrated on EME activity at 2300 MHz and higher. Entries indicated that about 30 stations from 15 countries participated in the event. 20 stations were active on 13 cm, 11 on 6 cm and 8 on 3 cm. Two stations were active on 9 cm but no two-way QSOs were recorded. Two days is not enough time to operate 4 microwave amateur bands on EME!

Stations that participated included CT1DMK, F1ANH, F2TU, G3LTF, HB9SV, I6PNN, IK2RTI, JA4BLC, JA8IAD, JA7BMB, NU7Z, OE9ERC, OE9PMJ, OE9XXI, OE9YTV, OH2AXH, OH2DG, OK1KIR, OZ4MM, S57UUU, SM3AKW, SM4DHN, VE4MA, VE7CLD, W4HHK, W5LUA, WA7CJO, WA8WZG, WD5AGO(SWL Report), and ZS6AXT

The first/second/third place single band single operator entries on each band are as follows: on 13 cm, OE9ERC/ZS6AXT/W5LUA, on 6 cm, OE9PMJ/OE9ERC/W5LUA and on 3 cm, WA7CJO/W5LUA/VE4MA. OK1KIR was on top as the only multi-operator entry. First/second/third place multi band entries went to W5LUA/OE9ERC/VE4MA.

Report submitted by W5ZN, WA8WZG, and W5LUA. Awards and certificates sponsored by KD4LT and WA8WZG. Thanks to W5ZN for compiling the results.

	GHZ				
Call	**2.3**	**3.4**	**5.7**	**10**	**Multi-Band**
CT1DMK	x	x	1,500	400	3,500
F1ANH	4,900				
F2TU	5,600				
G3LTF	1,600				
HB9SV	4,900				
I6PNN	x	x	900		
IK2RTI	100	x	900	x	900
JA4BLC	3,000				
JA8IAD	100				
JA7BMB	900	x	400	x	1,600
NU7Z	100				
OE9ERC	18,200	x	7,200	x	48,300
OE9PMJ	x	x	9,000		
OE9XXI	900				
OE9YTV	x	x	100	x	x
OH2AXH	400				
OH2DG	100				
OK1KIR	x	x	1,200	900	4,200
OZ4MM	13,200				
S57UUU	x	x	x	100	
SM3AKW	1,600				
SM4DHN	x	x	400	200	900
VE4MA	2,500	x	900	400	10,000
VE7CLD	x	x	x	200	
W4HHK	900				
W5LUA	18,000		Ech. 3,000	1,600	62,500
WA7CJO	x	x	x	4,900	
WA8WZG	3,600				
WD5AGO	(swl)				
ZS6AXT	18,000				
Stations	20	1	11	8	7 active

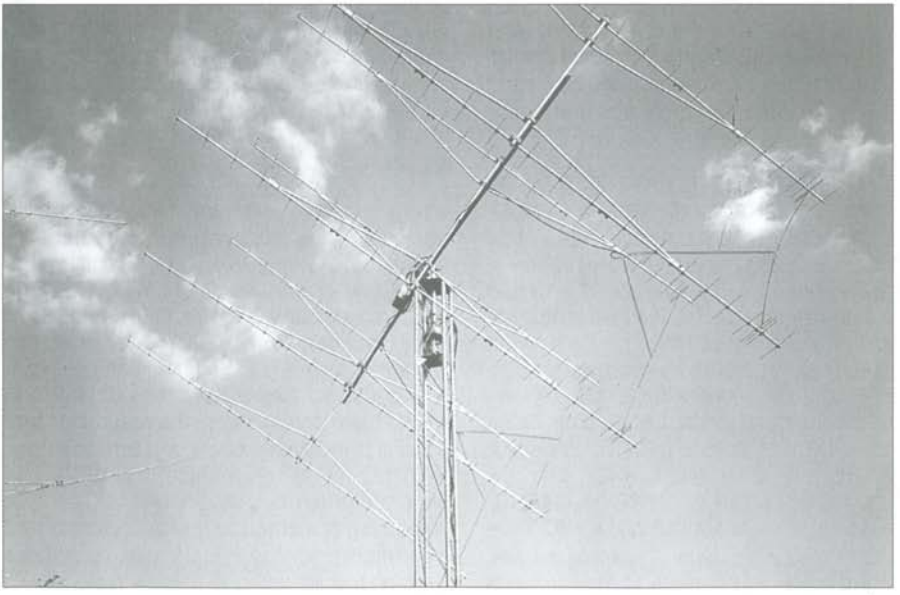
Thanks Al Ward W5LUA/9M2

specific as to the type of file you want (.xls, .doc, etc) and he will try to accomodate you. If you want a printed copy, send 8 1/2x11 envelope and enough postage to cover about 15 sheets of std bond paper. Rick may send some corrections back after these notes.. but at least the word is out. NU7Z, Rick N. Beatty, 23115 84th Ave. , W Edmonds, WA 98026

OE3JPC reports: 2 weeks ago I finished the installation of 2 aditional yagis for 70cm. With 4x DJ9BVopt/7.7wl-24el. things should be a lot easier though my pwr is still abt. 400W or 500W. What is remaining now is to solve some minor problems (adjustment, coating of the conections of the open wire feeders to prevent corrosion, etc.). Sun noise/cold sky (Leo) is about 13.7dB (flux 130) and cetainly can be improved by 0.3 or 0.4dB after all will be finished. Johannes "John". **YO2AMU:** email address.Doru : zaslad@arad.ro ***Sun, 14 Mar*** **Remember** to get you **sked requests** into **KLAUS** the weekend after every sked weekend. tklaus@berlin.snafu.de The **F6KSX** EME station is now (again) running well. We will be QRV on 3cm (10GHz) for the second part of the DUBUS contest. The operators will be F6DLA, F5HRY, F6EZV and

me (F1EHN). Station : Dish 3.3m, 50W, 0.8 dB NF, Vert Polar, F1EHN tracking system. see http://www.nitehawk.com/rasmit/f1ehn.html. Measurements on Sunday the 14th of March :CS/G = 5.5 dB Sun/CS = 15.5 dB Echoes was very good Best 73 and CU on the moon. J-Jacques F1EHN/ F6KSX EME Group (jjm_f1ehn@wanadoo.fr). **W4TJ** has a 13' solid dish, 14.5 sun noise 23cm, 10db on 2304.. trying to rcv on all bands 70cm to 10ghz

Sun, 14 Mar ....Sun, 21 Mar **JA8ERE:** Dish damage cancelled skeds !**CT1DMK** For those interested. A few bits were added to my web page about the GI7B 23cm amp. http://escriba.cfn.ist.utl.pt/cupido **NU7Z:** hydraulics still a problem. not QRV yet. **KL7HFQ**: listening on 70cm.. needs to take antennas down to repair dammaged yagis. ***Sat, 27 Mar*** **N7LQ** QRT on EME. I hereby announce the temporary end of EME operations from DM09dp in Nevada on 432. I am disassembling the 432 array in order to setup and test the 1296/2304 terrestrial arrays for the upcoming N7LQ June VHF QSO Party station. Also as Moon conditions will be poor at best for EME activity during the June Contest there will be no activity from DN01fa this year either. I hope to have the array back in operation by sometime in late July to early August. I will make an effort to get all the pending cards out soon!73 de Shawn N7LQ. **on4kng** hello dear Om's this is my new adress: peter.nagy@village.uunet.be--http://gallery.uunet.be/peter.nagy or http2//on4kng 73's de peter-on4kng. **KA0RYT:** do have a location in **ND. Send EMAIL** to Ron about ND DN98 or EN08 .. on 70cm.. any real desire ??? Planned weekend is Aug 07/08 .. but will not go if there is not much interest... North Dakota on 70cm and Maybe 23cm PLEASE PLEASE !!! send email interest to Ron!!!! **NU7Z:** any directory **updates** should be sent to Klaus. **AL7OB**: 16xNBS 222 and about 800w. Mike in Anchorage BP51dc 907-345-6999 melum@custom-cpu.com ***Sun, 4 Apr*** **KD4LT**: **QRT** on 70cm until repairs made to AMP.. probably 2 months.. but will be on 23cm. **VE6TA:** is now on 70cm with a good signal and will be back

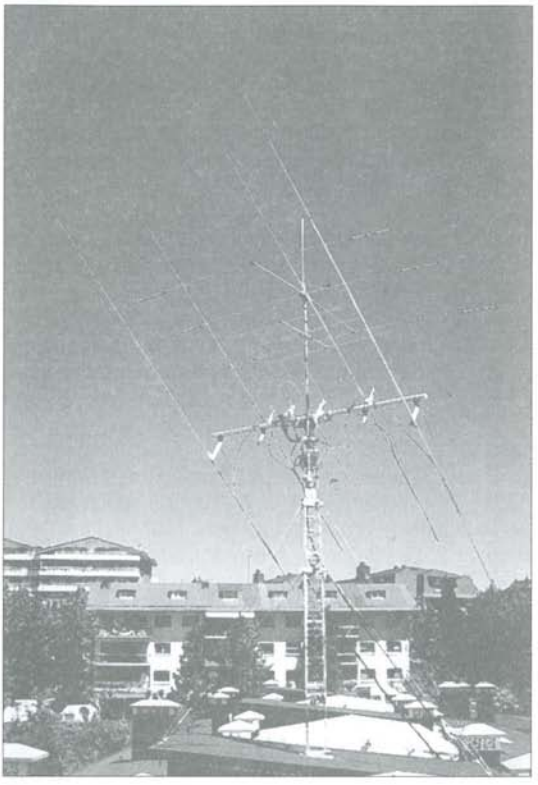


CT1WB 8x21el FT 432

on 23cm soon.. with more power. My new address is: Grant Furnald; Box 77, Site 14, R.R. 4; Edmonton, AB. T5E 5S7. **DL9NDD** reports condx were fair, actvity good. Worked only 62 Station + RW1AW in Sked, new Initial WW2R (on Random) in Sked hrd nothing. F5AQC, OE3JPC, VE6TA ? on4kng. DUBUS contest . March 27 and 28: The weather was fine this week-end compared to what we had most of time last year and it was a pleasure to make the following contacts with: JA5OU - DL9KR - SM2CW - F3RU - OE5YM - DL9NDD - K5JL - K4QI - WA9FWD - K5WXN - KA0RYT - G4ERG - 7M2PDT - DL4MEA - ON5OF - DK3WG - OZ6OL (#132) - W7CNK (#133) - UR5LX - N9AB (#134) - WW2R (#135). I had to repair the open tubing phasing lines . After that, I understood why I received some stations so weak, faraday rotation was also noticeable. Heard were: ON7SS/A (I suppose it was ON5RR), PA3CSG - HA1YA - SV1BTR - KB8RQ - VE1ALQ. Result is:21x15. **SV1BTR** QRT on 70cm eme for the next 3 years until change QTH because of high noise of the environemt that totally prevents of seeing cold sky. Worked 64 initials and 26 dxcc in these 15 months period. In March worked K5JL and new ones IK5QLO, YO2IS, EA6ADW. During the Dubus test while having S-7 QRN i worked only DL9KR and DF3RU on random and EA6ADW in sked. Going back on 2m eme after 3.5 years of absence. Jimmy SV1BTR.

Dirk **ON5OF** DUBUS CONTEST-1999 OE5EYM, SM2CEW, G4ERG, DL9NDD, K5JL, N2IQU, DF3RU, K4QI, WA9FWD, JH4JLV, JA5OVU, ON4KNG, N9AB Juergen, **DL8OBU** dismounted the 4x22el (6 WL) and put the new antenna on to the tower. now qrv again with 4 x 33 el (10 WL) on EME, what might be nearly 2dB more than before. On 23cm I have no antenna for EME-use anymore. During the last SW, I worked on 70cm: Mar27 : DK3BU (#95), DF3RU, JA5OVU, SM2CEW, EA6ADW (#96), K4QI, Mar28 : JH4JLV (#97), SM2CEW, OE5EYM, G4ERG. (all random, except EA6ADW). **K7XQ** I am now QRV 432 EME with a tiny setup (see signature below). I am ready to make my first contacts on 432 EME. If any " Big Guns " are interested, please let me know. I still have many improvements to go but would like to get my feet wet in the process. 73's from K7XQ Jeff in CM97QI, 4 X 2m12's 450 watts Full Elevation, 2 X 432-9WL's 400 watts Full Elevation. Internet: vhf2micro@aol.com K7XQ Webpage: http://members.aol.com/vhf2micro/k7xq.html ***Sat, 10 Apr*** **W7KK** not on in the April. I have taken down my 4 X FO-22 and am replacing with 4 X M2 432-9WL and some new LMR-400 phasing line. The WX has been very wet here and I don't think I'll be able to pour the new concrete needed for the new tower for a few weeks yet. My experiment using 2 of the 9WL's vertically didn't work too well in the March SW and I didn't work anyone. Hope to be back on in May with all four new antennas, horizontally. 73, Dave. ***Sun, 11 Apr*** **NU7Z**: not on 23cm, dish is back operational .. seeing 13.5 db sun noise on 13cm. not QRV at all untill May weekend.New hydraulic system is working very well. **W5LUA**: proposes that weekends be arranged so that the first night of sked weekends be 23cm and 2nd night be 70cm also skeds for the microwave bands be on the 2nd night as well.. and then alternate every other sked weekend from 13cm to 3cm on the 2nd day... this will allow those that are active on 3cm that need setup time (portable operation) to setup.. Frank reports that currently there is more random activity on 23cm on the 2nd day, but agrees that it would be better to try the above proposal. NU7Z also agrees

with the above proposal.. WA8WZG also agrees with the proposal.. N6BQ prefers the reverse for 23cm vs 70cm.. he usually works just a few on the first night then many on second night.. all are flexible, but should have more input from Europe.. Also Al says we can leave the 70cm & 23cm convention the way it is and just do microwave bands on 1st day.. NEED more comments !!! the reason for proposal is to increase activity on 13cm and 3cm. PA3CSG has no preference.. CT1DMK has no preference, but would like to see that something confirmed so that everyone knows whch night is which... !!!!Luis says many times he is on the wrong band at the wrong time. PLEASE !!! MORE FEEDBACK !!!!!! **CT1DMK**: Not availble on 70cm, no news from **CT1WB** so no skeds. ***Sat, 17 Apr***



EA2LY 2yagi 144 + 2yagi 432

K6IBY: 70cm ant are up.. hopes to be on next weekend EME will have 500w & 4xfo33 type yagis. **AL7OB**?: 4 yagis 700w.. ready on 70cm. ***Sun, 18 Apr*** in the April NL you wrote a wrong Telefon No.correct No. is 00 49 4532 26 13 77 de Frank **DD1XF** E-Mail <frank.schreyer@metronet.de> **N9AB**: will be doing some echo testing **PSK** on 432.031 during todays moon. AL7OB: Mike Melum has 16x12nbs yagis 600w, melum@customcpu.com heard some stations during contest and called several with no response. ***Sun, 25 Apr*** Copied my PSK31 echos today on 432.031. Difficult to echo test in this mode. Anyone else interested in testing PSK31. 73 Andy **N9AB** Andrew_Bachler@msn.com Greetings from Alaska! I recently finished my 16 X 12 element (NBS 2.2) array and have a K2RIW amp at 700 watts. I heard signals off the moon during the Eu contest but condx were not good here and I was not heard by anyone. I would like any help you can provide to make my first 432 EME contact. I have made some contacts on 144 EME since the first of the year, and converted my array over to 432. Let me know if/when you can arrange some QSOs. I need about 10 degrees to clear the mountains. Mike, **AL7OB**-Mike Melum, AL7OB, 7231 Northpark Dr., Anchorage, AK 99516, Phone: 907/345-6999, email: melum@customcpu.com, work: mike.melum@faa.gov. **N6BQ**: has the 5 meter dish up and the drives are working.. will be on in about 2 weeks.***Sun, 25 Apr*** Hello Joe,I had a catastrophic 432 Amplifier failure here and lost my solid state driving amplifier to the tube amp. I can only put out 50 watts. At this time I am off the air on 432 EME and will be until further notice. I will continue to listen (which is another serious problem. I could not copy any signal from K2UYH !!!) I hope to be back as soon as possible. I am still fully QRV on 2 meter EME. I will continue to monitor all 432 activity on this sked mailings/reflector. Jeff

K7XQ. **RW1AW:** had QSO with F6FLN, EA3DXU, DK3WG, UA9FAD, PA3CSG, VE6TA, K7XD, & N9AB this morning on random.. QSL via DK3WG with SASE. **G4RGK**: now has 4 hor and 4 vert. power down to 600w, is on moon NOW!

MAY 1, **WB0GGM**: new email address. wb0ggm@arrl.net. ***MAY 15,*** **UR5LX** My dish crash, I am cannot QRV. Life dish 10 year : 432 EME #367 , WAS 41, 60 DXCC. I hope QRV AGN soon.73! Sergey.UR5LX. ***MAY 16,*** **W7HAH** I got a phone call yesterday from w7tvf that an **expedition** is going to **Burma** next Jan and he may be part of it and if he goes he plans on setting up an EME station, probably on 432. He is a weak signal operator and has worked some 432 eme. I will forward any new information as it becomes available.

9H1PA My station is now ;4 x 10el XPOL (3wl) and 700 watts 73's and hope to hear you on the Moon Regards Philip

ARRL'99

The age old question is on us again: What dates for the ARRL EME contest?

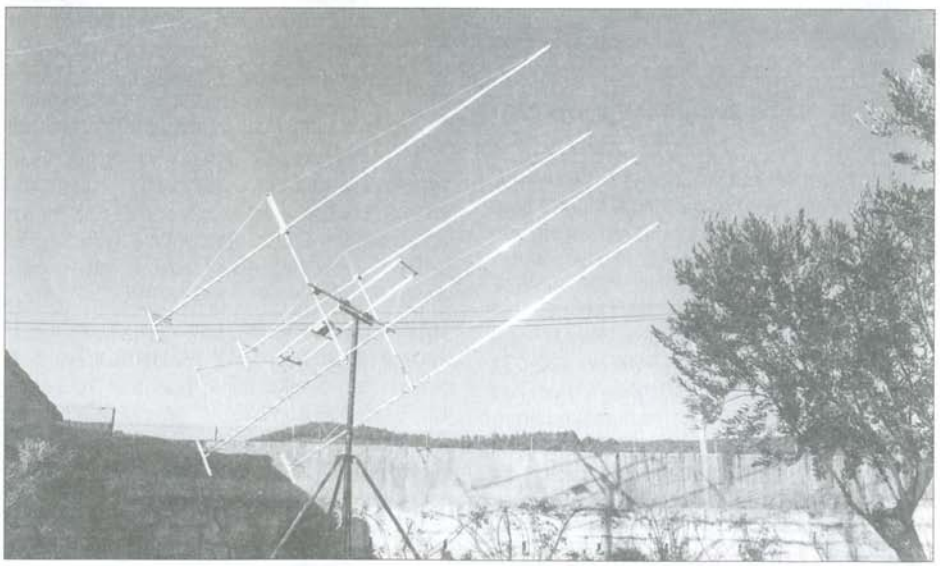
As with last year, we have the same problems. The 2 meter stations in the northern part of Europe and to some degree in the NE USA and Canada (and I would assume 70 CM stations) do not like the contest in late November or early December due to high winds and particularly ice.

However, last year at the STRONG request of the Europeans we moved the EME contest away from an earlier weekend in November to get away from a major terrestrial contest in Europe. The weather was particularly bad on the December weekend and many northern Europeans complained how come the ARRL picked such a silly time?" I took several 2 meter stations to task for their comments on E Mail in December when they were complaining and making comments re the ARRL that were absolutely not true!

This year Ian, G3SEK states it is a UHF terrestrial contest being held on Oct 2/3 meaning if we stay away from this weekend, then the only choice is October 30/31 and November 27/28.

Ian's comments: October 2/3 clashes with the IARU Region 1 UHF/Microwave contest (1400 UTC Sat to 1400 Sun, 432 and up). For some people there might be a conflict of interest because they can't operate the tropo contest and the EME contest at the same time. Even so, that still might not rule the weekend out for the EME contest, because:

1. There are unlikely to be QRM problems at the bottom end of the bands, because the activity is centred on xxxx.200MHz.
2. On Saturday the moon sets at about the time the tropo contest begins, and rises again at about 0000UTC on Sunday. Therefore the actual overlap of moon time with the tropo contest is only about 14 hours, not the whole 24.



F1CH 432 ant.

We need to get this issue resolved at the earliest possible time. Can you prompt your group for some feedback and resolution. Maybe Ian's MOON-NET message will drive out all the feedback that is required. Thank's Ian for your well stated MOON-NET message. 73, Lionel, VE7BQH. ve7bqh@wimsey.com

NETNOTES by K1RQG can be found most of the time http://www.nitehawk.com/rasmit/netnotes.html

1296 MHz

DJ9YW wkd in'98 : 6.01.98: DJ5MN#, OE9XXI, 10.01.98: S59DCD CW &SSB, GW3XYW, HB9SV SSB, GW3XYW SSB, G4CCH#, LX1DB SSB, IK6EiW, ZS6AXT, KB2AH, KD4LT 11.01.98 WD5AGO, OE5ERC SSB, 12.01.98: W4OP 31.01.98: W2UHi, 1.02.98: W2UHi CW&SSB, KB2AH 7.02.98 DL0SHF, JH5LUZ, JA5CZD, N2iQU SSB OH2AXH SSB, OZ4MM SSB, W2UHi, PY5ZBU # 8.02.98 W0KJY# QSL? ZS6AXT HB9SV, W3XS #, 28.02.98 K5JL SSB, K2DH SSB, W2UHi 28.03.98: DL6YDH # 29.03.98 K5JL, W2UHi, 4.04.98 JA7BMB, F1ANH, 5.04.98 OZ4MM, SM3AKW, ZS6AXT, JH5LUZ, I2FGT (same I2COR?) 25.04.98 OE9ERC-SSB, W2UHi, 1.05.98: TM8EME SSB #, 2.05.98 HB9BBD CW&SSB, N6BQ, ON5RR, K3HZO #, 23.05.98 OZ6OL #, N6BQ, 24.05.98 W2UHi, N6BQ, 27.05.98 NL7F #, 30.05.98 JA6CZD 31.05.98 HB9BBD CW&SSB, ZS6AXT, 20.06.98 W2UHi, K2UYH, OZ6OL, N6BQ, K5JL, 21.06.98 F2TU, KB2AH 27.06.98 JR9NWC #, OH2DG #, W2UHi, K2DH, W6HD#, 28.06.98 HB9BBD, 18.07.98 HB9BBD SSB, N6BQ, W7CS #, 25.07.98 DD1XF, DF4PV #, WA9FWD #, 26.07.98 DF4PV, DL6YDH, OZ6OL, 16.08.98 F2TU, N6BQ, W2UHi,KD4LT, 5.09.98:HA5SHF #, 13.09.98 N6BQ, VE1ALQ, 4.10.98 9H1ES #, DF4PV, 10.10.98 JA8ERE #, 31.10.98 HA5SHF, DF4PV, W2UHi, 1.11.98 KD4LT, OZ6OL, N2iQU, K5JL, VE1ZJ #, WA4NJP #, 29.11.98 W2UHi, KB2AH, 5.12.98 W6HD, HB9BBD, OH2AXH, JH5LUZ, OK1DFC, OE9XXi, OE9ERC, JA6CZD, 6.12.98 K5JL, VE1ZJ, HA5SHF, F6CGJ, OH2DG, SM3AKW, F5PAU, DF4PV, OE9XXI, F1ANH, OE9ERC, F2TU, OE5EYM #, ZS6AXT, 26.12.98 WA9OUU #103, K5JL, 27.12.98 VE6TA. tnx fer info Heinrich

IN3AGI 8x30el. 432

HA5SHF results DUBUS/REF Contest. We were QRV only 1st day.Nice weather and good activity. I heard many stations,unfortunately only 13 complete QSO-s.We worked new preamplifier with FHX 35(better results, fewer noise). 27.02.HB9SV 569/539, OH2DG "O"/"O", HB9BBD 579/559, F6CGJ

559/"O", PA3CSG 569/549, OH2AXH 559/429, OE5EYM 569/449, ZS6AXT 449/"O", K2DH 559/549 #47, K3HZO "nil", OZ4MM 569/549, W2UHI 559/449, 28.02.OE9XXI 579/559, ON5RR "O"/"O" #48 DXCC:21--- 20.03. F1ANH 559/439, W2UHI 559/"O", K3HZO "M"/"O" #49,WAS:8, EA6ADW 559/"O", 27.03. GW3XYW "O"/"O" #50,DXCC:21, W2UHI 559/439, 28.03. N6BQ 559/"O" #51,WAS:9, W6HD 559/339 #52. We tested on 13cm our RX with OE9ERC(many thanks for the effort Erich).First result fine!This time we have few power on tx side (with TH 6885 under construction).Maybe we QRV from summer on 13cm. --17.04.W2UHI 549/449, K5JL 579/539, 24.04.HB9SV 569/449, 22.05.HB9SV 569/429, N2IQU 559/439, W2UHI 549/449, WA8WZG sked/nil, W7SZ sked/nil, KD5FZX 559/439 sked(as HA5BGL), 23.05.EA6ADW "O"/"O", HB9SV 569/549, WA8WZG sked/nil, K9BCT sked/nil, VE6TA sked/nil 73,Csaba HA5BGL

HB9BBD here is my log on 1296 mc eme contest. loc: JN47EE, Canton AG. TX: TH327, 2.4Kw out, loss to feed: 1.5dB, Dish 10m dia. f/D 0.5, Mesh 8mm, Gain: 40dB, RX: Cavity preamp 0.25dB NF, Category: guess QRO?!, Single Op, 27.2.:
HA5SHF 559001 559, ON5RR 559002 559, ZS6AXT 579003 599, OH2DG 569004 569, OZ6OL 579005 579,PA3CSG 589006 589, F6CGJ 589007 589, DH9FAG 569008 569, HB9SV 589009 589, OE9ERC 57 010 57, F2TU 579011 569, OE5EYM 589012 579, F5PAU 589013 579, OH2AXH 579014 569, SM3AKW 579015 579, CT1DMK 569016 569, IK3GHY 579017 589, OK1KIR 579018 569, OE9XXI 589019 579, VE1ZJ 569020 579, VE1ALQ 599021 599, K3HZO 549022 539, K2DH 579023 589, OK1DFC 569024 579, WD5AGO 579025 579, VE6TA 559026 559, OZ4MM 579027 589, K4QI 589028 589, K5JL 589029 589, W2UHI 579030 589, WA9FWD 539031 569, 28.2 OE5JFL 589032 589, N6BQ 589033 569, W6HD 579034 579, W3XS 549035 589, WA8WZG 539036 599, JH5LUZ 579037 599, JF3HUC 589038 599, VK5MC 569039 579, F1ANH 579040 569, LX1DB 599041 599, DF3RU 559042 569, DL0SHF 58 043 57, SM2CEW 579044 589, DF4PV 569045 579, N2IQU 599046 599. MULTIPLIERS 28, SCORING: 46 random qso (x) 100 (x) 28 multipliers = 128'800 points

Pictures may be obtained in my homepage: http://www.hb9bbd.ch Conditions were excellent on 23cm. I could not be qrv at moonset on saturday morning. My window towards NA unfortunately ends about 2 hours early. Therefore, stn at the westcoast (W7SZ e.g.) have to be on early to qso with me. I was chasing a very weak signal for about 30 min - to finally find out that this was a spurious output of N2IQU, 32db down.! 73 HB9BBD, Dominique

OK1DFC wkd in ARRL: 10.10.98 F5PAU 559 549, LA8LF 559 559, HB9BBD 589 579, ZS6AXT 539 539, HB9BHU 539 579, G3LTF 559 549, OK1KIR 539 549, OE9ERC 559 549, EA6ADW 569 549, DF4PV 529 439, OE5EYM 559 559, OZ4MM 559 449, OZ6OL O 539, F6CGJ 579 559, N2IQU 559 549, OH2AXH 559 559, KD4LT 559 559, SM6CKU 559 539, OE9XXI 579 559, SM3AKW 559 559, WD5AGO 559 O, EA3UM 559 549, W2UHI 559 549, KB2AH 569 559, OE9XXI 55 53, K5JL 559 559, DC6UW 559 539, JH5LUZ 539 559, SM4DHN 559 439, F1AHN 559 449, OH2DG 449 549, JA6CZD 559 449, 11.10.98 00:08 S59DCD 559 449, ON5RR 559 529, DH9FAG 559 559, F5AQC 559 549, VE1ALQ 559 529, HB9SV 579 559, OE5JFL 579 559, K4QI 559 439, KB2AH 559 549 DUPE, PA3CSG 559 549, F5PL 559 539, W7CS 539 549, HB9BBD 55 53 DUPE, JA7BMB 559 559, DF3RU 439 439, 05.12.98 01:12 G3LQR 449 449, F2TU 559 549, CT1DMK 339 549, Sum: 470

05.12.98 02:45 K3HZO O O, 05.12.98 03:05 W5LUA 449 549, 05.12.98 03:12 OE9ERC 559 559 DUPE, 05.12.98 04:29 OZ6OL 339 529 DUPE, 05.12.98 20:11 DF9QX 449 449, DJ9YW 549 549, HB9BBD 579 559, SM2CEW 449 549, GW3XYW 549 549, 06.12.98 02:25 W2UHI 559 559, K2DH 559 559, HA5SHF O O, K2UYH O 559, VE1ZJ 549 549, N6BQ 559 439, DC6UW 559 559, K9KFR O O, VK5MC 559 439.

all ssb : 30. Jan 99 HB9BBD 55 51, OE9XXI 55 44, LX1DB 55 44 S59DCD 44 54,

OE9ERC 55 54, 31. Jan 99 K5JL 55 44, W2UHI 55 52, K2UYH 55 52, KB2AH 55 53, EME DUBUS/REF: 27-Feb-99 K4QI 559 549, VE1ZJ O O, HB9SV 599 559, N2IQU 559 549, W6HD 559 549, F6CGJ 559 559, W2UHI 549 539, F2TU 549 549, N6BQ 539 529, OE9ERC 559 559, K5JL 559 549, KD4LT 559 549, OH2DG O O, OH2AXH 559 559, ZS6AXT 559 569, ON5RR 449 529, OE9XXI 559 559, DH9FAG O O, SM3AKW 549 549, OK1KIR 549 549, HB9BBD 579 569, VE1ALQ 559 559, OE5EYM 569 559, OZ4MM 569 559, F5PAU 559 559, CT1DMK O O, 28-Feb-99 IK3GHY O O, VE6TA O O, W7GBI 559 559, OZ6OL O O, K2UYH 559 549, K2DH 559 559, JH5LUZ 559 559, F1AHN 559 559, SM2CEW 559 559, JF3HUC O 559, HB9BHU O 539, DF4PV 549 439, LX1DB 579 559. TOTAL 3900 73 Zdenek OK1DFC

ZS6AXT Just received Dubus 1/99 and had a look at *EME Toplis*t. In my humble opinion the structure of it is not correct and fair. First worry of everybody is how many different stations he worked, then how many continents, last how many countries. The rest like small squares etc is of very little importance . Well - think about this please.. Thus eg. on 144 JA9BOH should be in third place, on 432 JA9BOH in third place, on 23cm ZS6AXT in second place, on 13 cm ZS6AXT in third place etc. For those who do not have WAC, there should be number of continents worked instead of the date of WAC . Such sorting out of the stations would make the table in line with real activities and achievments. Hope to be soon on 6cm , so far had few mishaps in skeds, equipment is working, just to optimize the horn position, which is quite a job in my conditions ! Thanks, 73, Ivo

Expedition T98CHR

Since our first small expedition last year to Geneva 4U1ITU we were hungry for more. The place we had to go must be good for Tropo,MS and EME. The first one we were thinking of was 3A , but some inquiries told us that it wouldn't be easy to operate from there. By this time T9 was showing up in our mind.

During the Hamfest in Friedrichhafen in 1998 we asked the hamradio organization of Bosnia and Herzegovina about the possibilities there were. They told us about the situation in their country and that there wouldn't be any problem. Around Christmas 1998 we decided to get serious and started the whole operation. By this time T9 was added to our CEPT license , but both of us applied for a special T9 callsign. Next we tried to get in touch with T9 hams who could help us , but unfortunately nil here. The fact that we wanted to operate from JN84 (a most wanted square) made it not much easier.

In February we decided to check the location first and we drove down to Bosnia and Herzegovina. After 1 day of searching with the GPS receiver we found a good VHF location (JN84ax), but no hotel of any accommodation around. Finally we found someone who spoke German and promised us he could arrange a room in any house we wanted. After exchanging phonenumbers we did set up a small station (ic706 + 150W PA + 10el) in the snow (1-2M) and made some radio contacts with 9A,DL and I. Due to the clouds and heavy snowfall we couldn't see how the takeoff was but it felt good to us.

Back in Holland there was a lot of work to do. Antennas has to be build , a portable crankup tower too, and some public relation work. The antennasytem must not be too big so we did choose for the 10el 3wl opt DJ9BV design. The same antenna Chris used in EA6 last year with good results. Lionel VE7BQH and Rainer DJ9BV helped us here. The result was a very light H/V switchable portable EME antenna system.

In the meantime Lionel was handling all the EME skeds and Jurgen the MS skeds. Our daily freetime became limited. When there was Moonset we had to prepare for Meteorscatter and when we finished MS there was Moonrise. The time 1600z - 1800z was sacred , we needed time for rest and to eat.The final skedlist for EME counted 70 stations for MS counted 67 stations, and some troposkeds were made. All the radiostuff was ready by the beginning of April , and now we were thinking about how to get food,

because we hadn't time for shopping in Bosnia.

At this point Monique (Chris YL) helped us a lot. She arranged a microwave and prepared food we could heat up easily.We were not sure about the powersource over there so we had to buy a powergenerator(3000W) . By the end we were really thinking of going with 2 cars. Fortunately we got all the stuff in 1 Chrysler Voyager.

This is a list what we had with us:4x 10el xyagi, stacking frame, kr400 rotator, kr500 elevation rotator,H2000 phasing line, 1/2" feedline,6m cranckup tower,2x ts850, 2x ic706, ft 847,2x dspfilter , 3x powersupply, 1 preamp with all the relays for tx/rx and h/v,3x spare preamps,memorykeyer, bencherpaddle,2x DTR,2x laptop for MS,Moontracking and FFTDSP ,microwave, food, tools, sparepart, heater, packetradiostation, 70cm preamp,70cm antenna,70cm amplifier,several meters of coax cable, 2x 2m PA,2x transverter, licences, logging stuff, cameras, GSM phone with Inet access, 20m dipole,etc.....

The main plan of us was to work with 2 stations. After the LT2s transverter rx side we made a splitter so we could feed 2 ts850's with the 28mhz signal.When one was working and listening on the sked frequency the other one could listen on the random frequencies. This was a great advantage for us. On the main transceiver we connected a ic706 on the IF output(8.83Mhz) the ic 706 was connected to the laptop with the FFTDSP program of AF9Y. The advantage of this: the FFTDSP program is getting a NOT filtered signal ,and on the TS850 and the timewave 59+ you can set the filter as small/wide you want without any affection on you FFT analyze. You can see on the FFT screen IF there is someone replying on your call and WHERE.

We left Holland mondaymorning with a loaded car heading for our destination Donja Koprivna in Bosnia and Herzegovina. The first night we stayed in a hotel in Graz ,Austria. The second day we arrived at our destination just after noon. Our contact in Bosnia didn't arrange the room we wanted, he had a room at his brothers place (lowest part of the village)for us. At this QTH there were no possi-

Departure

Shack of T98CHR

bilities for a VHF expedition, so we were thinking of moving out of town to find a good alternative.

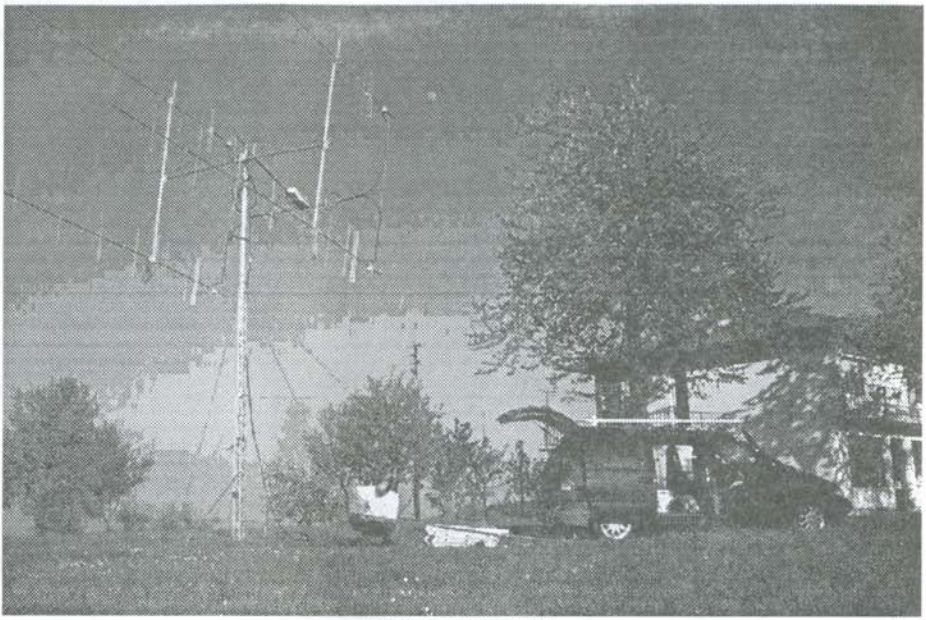
Finally we decided to build up the station on the hilltop in the village and to use the car as a shack. 15:00 local we started to build up the the tower and antennasystem and before it was dark a lot of work was done.

Next day 21/4/99 we finished everything and at 12:00 local the station was running. As promised we called Peter PA0PVW for a troposked. But no qso at that time only a lot of firework by MS bursts. At 13:14 we had the first station in our log , S51DX via tropo. The whole station was running very well and we did some echotest. With 100W we had a good copy of our signal from the moon. We only had some doubt about the vertical part of the system. the first random qso's we made were SM5BSZ and OZ1HNE on the 21st.

Everything was on schedule. We closed down the station that afternoon and went back to the room for some food and sleep. The skedlist was starting at 0200 22/4/99 with a MS sked with LY2MW and from that point the MS sked and EME sked would slide into each other. So in the middle of the nite we went up the hill again with the CAR/SHACK and connected all the cables to the station again. This wasn't the the easiest way but we couldn't leave the car with all the equipment alone. Only when there was a small time gap between the MS and EME sked ,one of us slept in the car for 2-3 hours. When there was a longer time (later in the week) we disconnected the station and slept both in the guesthouse.

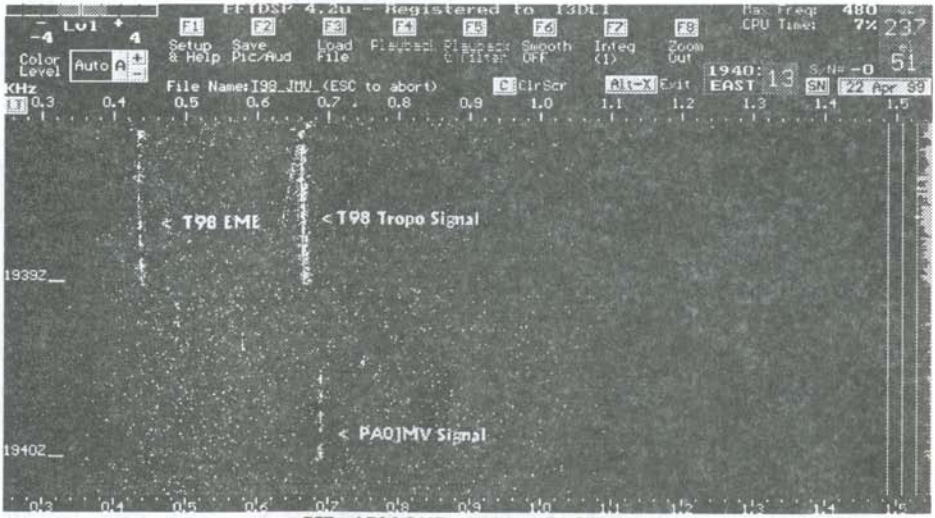
After a couple of days we figured out that we had terrible qrm from 2000-0100 Z due to the jamming activity of the AWAC airplanes in the Balkan War. Sorry for those stations who has skeds during these times. Fortunate most station who had a sked did call us on random when they heard us. THIS IS VERY IMPORTANT DURING A EXPEDITION!!! DON'T WAIT UNTIL YOUR SKEDTIME SHOWS UP!!! TRY TO WORK THE STATION ASAP ON RANDOM FREQUENCY!! AND SPREAD OUT ON THE RANDOM FREQUENCIES!!!

During the first week the EME skedlist changed a lot. Thanks to Lionel VE7BQH for



Station of T98CHR

sending updates by Email to us. Our Inet connection with the mobile phone worked perfect. The Dutch provider told us that it wasn't possible to transfer data on the GSM network in Bosnia, and that there was no roaming service for data. But as real radioamateurs we just tried it and all worked OK for us. We were glad we had a spare PA for 2m with us (thanks John ,PE1OGF) in the morning of the 26th during a random MS QSO



FFT of T98CHR working PA0JMV

with DL3YEL the Discovery PA failed. Both capacitors in the anode line were gone. This was all because we couldn't load the PA proper. The Discovery PA is going very fast into tripping because RF feedback to the input circuit (missing screenring with fingerstock to ground) . If we have a good socket for the 3CX800 it is possible to get some output during our next expedition!! Who can help Chris with a complete socket for his PA? please mail to PA2CHR c.ploeger@wxs.nl he would be very pleased with it.

After changing the PA's everything was working fine again. Via Lionel we got a request of DL9KR for a EME test on 432Mhz with moonrise. Unfortunate we lost the sked because we didn't get the skedinfo exchanged on time. During this experiment we lost a powersupply (tx-ing on 144 and 432 at the same time was too much for it) When you are tired you not as keen on it anymore...

After putting up the 70cm station we made some qso's on OSCAR 10 .For the OSCAR we only had a 10el H yagi and 80W.

The activity on the OSCAR 10 was very surprising, many station called us and we had some nice pile-ups. T9 is rare on the OSCAR too. The overall results on 144Mhz were in 12 days 646 qso's (EME LIST, MSLIST rest tropo and oscar10) Chris and I really enjoyed our trip to Bosnia and Herzegovina and we learned a lot about how to prepare a expedition. we are already thinking about the next one. If you have some suggestions please sent your list to: expedition@vandeglind.demon.nl Best 73's PA2CHR (T98CHR) Chris , PE1LWT (T98LWT) Jurgen more pictures at picture gallery of T9 expedition

Last

- **deadline** every first of Feb./May/August/Nov.
-
- my email bernd_wilde@eac-com.de
- EME conference 2000. We now have dates for the event which are August 18, 2000 arrival of the participants and August 19 / 20, 2000 for the conference.Please respond directly to Don, PY5ZBU, as soon as you can.his Email is: **iridium@inepar.com.br** - PY5ZBU
-
- What about the **TOP LIST**, see report from ZS6AXT. Should we change to initials, or stay counting small grids? A list based on initals is published in NL regulary. The start of this toplist was made to keep the tropo list clean from EME contacts. This tropo list based on small grids. LET ME Know what you think!!!

73 Bernd DL7APV

EME Contest 99

Editor: Joachim Kraft, DL8HCZ

Results European EME Contest 1999

Results 144MHz

1	**SM5FRH**	**790400**	**152(+ 0)**	**52**	**QRO**	**SIN**
2	IK3MAC	612500	125(+ 0)	49	QRO	MUL
3	F3VS	600000	120(+ 0)	50	QRO	MUL
4	SM5BSZ	453600	108(+ 0)	42	QRO	SIN
5	RU1A	434300	101(+ 0)	43	QRO	SIN
6	OZ1HNE	245000	70(+ 0)	35	QRO	SIN
7	LZ2US	193130	62(+ 3)	31	QRP	SIN
8	IK1FJI	174000	60(+ 0)	29	QRO	SIN
9	OE5EYM	162000	54(+ 0)	30	QRO	SIN
10	I3DLI	155000	62(+ 0)	25	QRO	SIN
11	G3ZIG	88200	42(+ 0)	21	QRO	SIN
12	F6BSJ	73500	35(+ 0)	21	QRP	SIN
13	W0VD	64260	30(+ 6)	21	QRO	SIN
14	S52LM	61600	28(+ 0)	22	QRP	MUL
15	EA3DXU	53200	28(+ 0)	19	QRO	SIN
16	JH2COZ	43200	24(+ 0)	18	QRO	SIN
17	UA3PTW	38400	24(+ 0)	16	QRP	SIN
18	DK5YA	36800	23(+ 0)	16	QRP	SIN
19	DK9ZY	36000	24(+ 0)	15	QRP	SIN
20	IV3GBO	32200	23(+ 0)	14	QRO	SIN
21	CT1DMK	31500	21(+ 0)	15	QRO	SIN
22	JH5FOQ	30800	22(+ 0)	14	QRP	SIN
23	UA4AAV	29540	21(+ 1)	14	QRO	SIN
24	EA2AGZ	28000	20(+ 0)	14	QRP	SIN
25	S51ZO	27300	21(+ 0)	13	QRP	SIN
26	JL1ZCG	26400	22(+ 0)	12	QRP	MUL
27	DK2LR	26000	20(+ 0)	13	QRP	SIN
28	N2WK	25200	18(+ 0)	14	QRP	SIN
29	W3SZ	24700	19(+ 0)	13	QRP	SIN
30	I1ANP	23400	18(+ 0)	13	QRP	SIN
31	HB9AHD	17600	16(+ 0)	11	QRP	MUL
32	F6HVK	17000	17(+ 0)	10	QRP	SIN
33	I2RV	16500	15(+ 0)	11	QRP	SIN
34	YO2AMU	15400	14(+ 0)	11	QRP	SIN

35	9A9B	15000	15(+ 0)	10	QRP	SIN
36	DL2IAN	14100	14(+ 1)	10	QRP	SIN
37	SP7DCS	14000	14(+ 0)	10	QRP	SIN
38	JH0WJF	13000	13(+ 0)	10	QRP	SIN
39	YO2IS	11000	11(+ 0)	10	QRP	SIN
40	UA4AQL	9090	10(+ 1)	9	QRP	SIN
41	F9HS	8400	12(+ 0)	7	QRP	SIN
42	SL4BP	8000	10(+ 0)	8	QRP	SIN
42	JH0ISW	8000	10(+ 0)	8	QRP	SIN
43	9A3PA	6370	9(+ 1)	7	QRP	SIN
44	IZ1BZN	6300	9(+ 0)	7	QRP	SIN
45	PE1OGF	4320	7(+ 2)	6	QRP	SIN
46	F8DO	3500	7(+ 0)	5	QRP	SIN
47	IK7EZN	3000	6(+ 0)	5	QRP	SIN
48	EA1YV	2500	5(+ 0)	5	QRP	SIN
49	LY2SA	1600	4(+ 0)	4	QRP	SIN
49	JH0VJW	1600	4(+ 0)	4	QRP	SIN
50	DF1HF	900	3(+ 0)	3	QRP	SIN
51	W5UWB/2	400	2(+ 0)	2	QRP	SIN
51	NP4C	400	2(+ 0)	2	QRP	SIN
51	JF4TGO/8	400	2(+ 0)	2	QRP	SIN
51	IZ5BXF	400	2(+ 0)	2	QRP	SIN
52	N0KQY	100	1(+ 0)	1	QRP	SIN
	W5UN	CHECKLOG	137(+ 0)	49	QRO	SIN

Results 432 MHz

1	**K5JL**	**251600**	**68(+ 0)**	**37**	**QRO**	**SIN**
2	UR5LX	198000	55(+ 0)	36	QRO	SIN
3	DL9NDD	180090	62(+ 1)	29	QRP	SIN
4	OE5EYM	171600	52(+ 0)	33	QRO	SIN
5	K4QI	132300	49(+ 0)	27	QRO	SIN
6	JA5OVU	108000	45(+ 0)	24	QRO	SIN
7	DL4MEA	65100	31(+ 0)	21	QRO	SIN
8	G4ERG	60800	32(+ 0)	19	QRP	SIN
9	ON4KNG	33600	21(+ 0)	16	QRP	SIN
10	F1ANH	33000	22(+ 0)	15	QRO	SIN
11	F5AQC	28000	20(+ 0)	14	QRO	SIN
12	OZ6OL	23800	17(+ 0)	14	QRP	SIN
13	OE3JPC	23400	18(+ 0)	13	QRP	SIN
14	EA3DXU	22800	19(+ 0)	12	QRP	SIN
15	JH4JLV	20000	20(+ 0)	10	QRO	SIN
16	KB4CNI	18240	15(+ 2)	12	QRO	SIN
17	S57RA	15000	15(+ 0)	10	QRP	SIN
18	ON5OF	14300	13(+ 0)	11	QRP	SIN
19	VE6TA	11790	13(+ 1)	9	QRP	SIN
20	IK5QLO	10800	12(+ 0)	9	QRP	SIN
21	JA4BLC	8400	12(+ 0)	7	QRO	SIN
22	S51ZO	8000	10(+ 0)	8	QRP	SIN
23	OK1DFC	7700	11(+ 0)	7	QRO	SIN
24	W3XS	5400	9(+ 0)	6	QRP	SIN

25	S52CW	4200	7(+ 0)	6	QRP	SIN
26	YO2IS	2500	5(+ 0)	5	QRP	SIN
27	JA2TY	1000	5(+ 0)	2	QRP	SIN
28	UT3LL	900	3(+ 0)	3	QRP	SIN
29	JJ1NNJ	400	2(+ 0)	2	QRP	SIN

Results 1296MHz

1	**K5JL**	**133300**	**43(+ 0)**	**31**	**QRO**	**SIN**
2	F6CGJ	129600	48(+ 0)	27	QRO	SIN
3	K2DH	126000	42(+ 0)	30	QRO	SIN
4	OZ4MM	110200	38(+ 0)	29	QRP	SIN
5	W2UHI	99900	37(+ 0)	27	QRP	SIN
5	K4QI	99900	37(+ 0)	27	QRO	SIN
6	ZS6AXT	98400	41(+ 0)	24	QRP	SIN
7	OK1DFC	97500	39(+ 0)	25	QRO	SIN
8	N6BQ	94770	35(+ 1)	27	QRO	SIN
9	F2TU	88800	37(+ 0)	24	QRO	SIN
10	SM3AKW	87400	38(+ 0)	23	QRP	SIN
11	F5PAU	86100	41(+ 0)	21	QRO	SIN
12	OE5EYM	81400	37(+ 0)	22	QRO	SIN
13	ON5RR	68420	31(+ 1)	22	QRP	MUL
14	OZ6OL	55100	29(+ 0)	19	QRP	SIN
15	CT1DMK	48200	24(+ 1)	20	QRO	SIN
16	IK3GHY	46500	31(+ 0)	15	QRP	SIN
17	DH9FAG	40800	24(+ 0)	17	QRP	SIN
18	JH5LUZ	40000	25(+ 0)	16	QRO	SIN
19	F1ANH	28600	22(+ 0)	13	QRO	SIN
20	VE6TA	18000	15(+ 0)	12	QRP	SIN
21	W3XS	15400	14(+ 0)	11	QRP	SIN
22	JF3HUC	12800	16(+ 0)	8	QRP	SIN
23	HA5SHF	8960	11(+ 2)	8	QRP	MUL
24	VK5MC	3000	6(+ 0)	5	QRP	SIN

Results 2320MHz

1	**ZS6AXT**	**16800**	**14(+ 0)**	**12**	**QRP**	**SIN**
2	OZ4MM	11000	11(+ 0)	10	QRP	SIN
3	F1ANH	4900	7(+ 0)	7	QRP	SIN
4	JA4BLC	3000	6(+ 0)	5	QRP	SIN
5	IK2RTI	1200	4(+ 0)	3	QRP	SIN

Results 5760MHz

1	**CT1DMK**	**400**	**2(+ 0)**	**2**	**QRP**	**SIN**

Results 10GHz

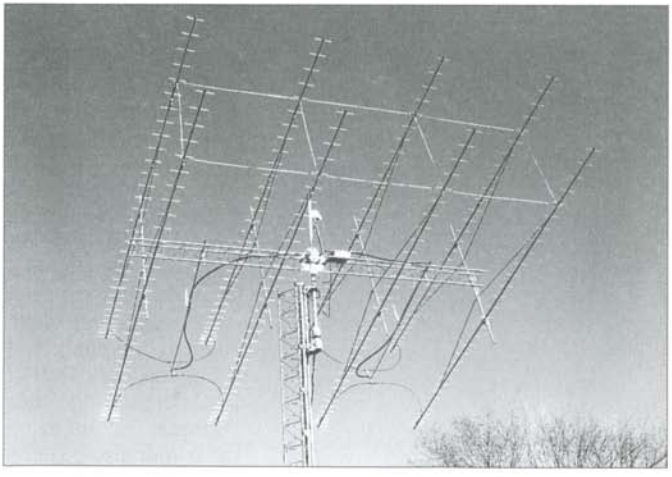
1	**F6KSX**	**4900**	**7(+ 0)**	**7**	**QRP**	**MUL**
2	S57UUU	400	2(+ 0)	2	QRP	MUL
2	CT1DMK	400	2(+ 0)	2	QRP	SIN

Results Multiband

1	**OE5EYM**	**1215500**	**143(+ 0)**	**85**	**QRO**	**SIN**
2	K5JL	754800	111(+ 0)	68	QRO	SIN
3	K4QI	498800	86(+ 0)	56	QRO	SIN
4	ZS6AXT	198000	55(+ 0)	36	QRP	SIN
5	CT1DMK	191490	49(+ 1)	39	QRO	SIN
6	OZ4MM	191100	49(+ 1)	39	QRP	SIN
7	F1ANH	178500	51(+ 0)	35	QRO	SIN
8	OK1DFC	160000	50(+ 0)	32	QRO	SIN
9	OZ6OL	151800	46(+ 0)	33	QRP	SIN
10	EA3DXU	145700	47(+ 0)	31	QRO	SIN
11	S51ZO	65100	31(+ 1)	21	QRP	SIN
12	VE6TA	58800	28(+ 1)	21	QRP	SIN
13	WS3XS	39100	23(+ 1)	17	QRP	SIN
14	YO2IS	24000	16(+ 1)	15	QRP	SIN
15	JA4BLC	20400	17(+ 1)	12	QRP	SIN

Congrats to the winners SM5FRH on 144MHz, K5JL on 432MHz and on 1296MHz, ZS6AXT on 2320MHz, CT1DMK on 5760MHz and F6KSX on 10GHz and OE5EYM on Multiband.

Thanks to all who did participate.



KB4NCI, FM08, 8xFO33

Soap Box

IV3GBO, 2m: I've worked only from time to time. Sometime I had good conditions and I have listened to 21 more stations over the ones I've collected: Maybe I will increase my power in the near future. Thanks to all, 73s, Giampietro IV3GBO.

JL1ZCG, 2m, Ops JA4KLX Hirohumi Kondo and JR4ENY Susumu Awaya: Bad Faraday lock to EU on Saturday Midnight. So Condx too poor for our V-Pol.

I1ANP, 2m: All ok, at start of the contest. At moonrise of saturday 27, blower of my linear qrt. Spent my time, saturday afternoon and after for repairing the blower, but it was not possible. Sunday morning I had to work, returned home on sunday afternoon. A friend presented me temporary blower, arranged outside linear

IK2RTI, 4.3m dish for 13cm

and to be active on last two hours of the contest. Tks to Murphy for all on february mount, before azimuth rotor, now blower, fortunately mount is finish. The WX was beauty, no wind, sun. Call severall time, but not aswer VE7BQH, LZ2US. Sorry, see next time. Mario I1ANP.

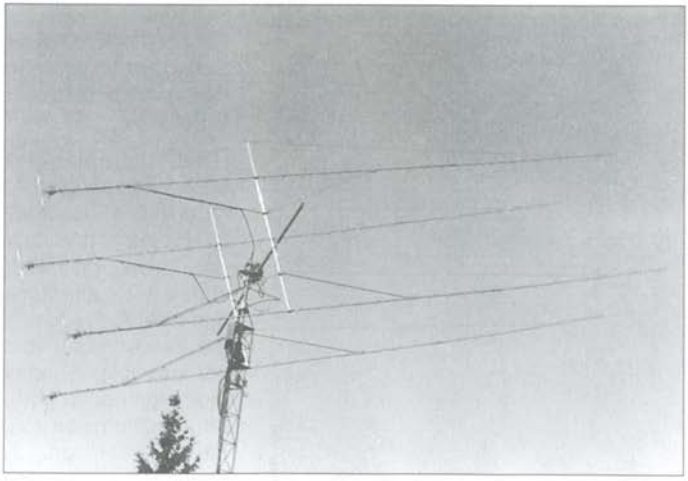
W5UWB, 2m: Very poor conditions today, believe we had an AU event that might have messed things up for me.

PE1OGF, 2m: I was QRV just for some hours, found conditions ver poor and palarity was jumping arround. Had some skeds of wich most failed. only worked 2 new stations.

JF4TGO/8, 2m: I'm very happy to QSO with W5UN & SM5FRH by random. Both of them are my 1st & 2nd QSO on EME! I was very surprised that only I called SM5FRH just once and he was called me back soon !

YO2IS: Not too many stations on 70cm, changeable conditions, poor on saturday better on sunday. Many CWNR's...Was glad to make my 4th DUBUS contest. Best 73's and cu via Moon.

ZS6AXT: Very nice Contest, this year with a better participation on 13 cm, but still not what it could be. In my opinion own country should count also as a multiplier, as it is done in the Italian EME Contests. Otherwise stations from countries with only one station on the band are at disadvantage against others with say two stations. They lose one multiplier and thus may lose against station with less contacts who has another countryman operating ! Not quite fair then. Thanks for organizing this Contest. I hope to be next year also on 6cm, it did not work out this year for me. Ivo Chladek



DL9NDD, 4x9BV on 70cm

I3DLI, 2m: I hav'nt worked in my standard fashion because of my weakness. I had two surgical treatments to my low back vertebrae just overriding ARRL & DUBUS test, hi. Now I'm far ameliorate. Thanks for this important test management. Paolo, I3DLI

N0KQY, 2m: Not a very high score for a contest, but I was amazed to get the one contact with W5UN with the 4218 watts ERP. Heard many of the big stations thru out the contest period, but only one reply back. Gary Krenzel

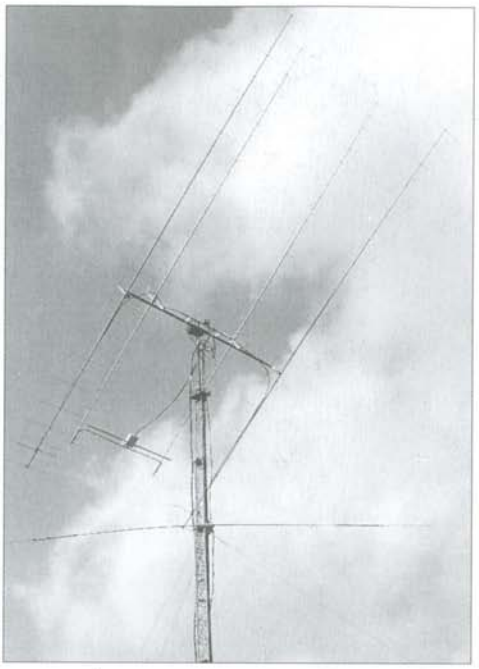
F9HS, 2m: I found condx bad, QRN on first day and deep QSB on second day, although signals were vy strong at times. 6 hours of trafic only. CWNR: HB9Q W5LBT VE7BQH VE1ZJ OE5EYM (loud), Heard: DL5MAE G3ZIG F6BSJ UA4ALU LZ2US. One antenna score is 38 stn in 6 months time. 73's de Claude F9HS

IK5QLO, 2m: Only few hours of operating time: found pretty good conditions and a lot of stations around. I enjoyed it very much. See you next year! Andrea IK5QLO

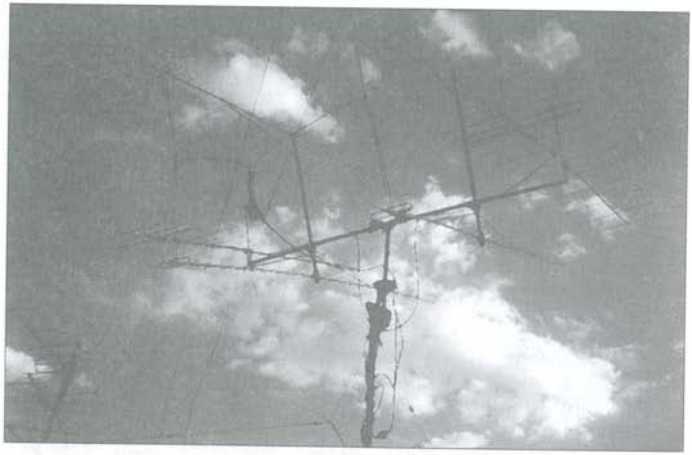
VK5MC, 23cm: Time did not permit me to operate for a longer period. I heard and called quite a few other stations who didnot here my 100watts. I was pleased to participate in the contest and give a few stations a contact with VK. 73s Chris Skeer, VK5MC

HA5SHF: 23cm: We were QRV only first day. Nice weather and good activity... We tested new preamplifier (better results, less noise). 73,Csaba, HA5BGL

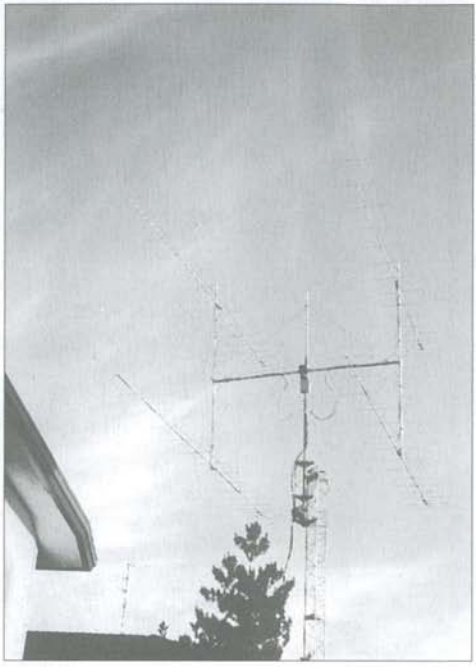
DL2IAN, 2m: This was the first time taking part in a EME Contest and it was really interesting. Conditions have been not so good on Saturday, much changing of the polar-



EA3DXU, 2x17M2 on 2m



UT3LL, Antenna for 2m and 70cm



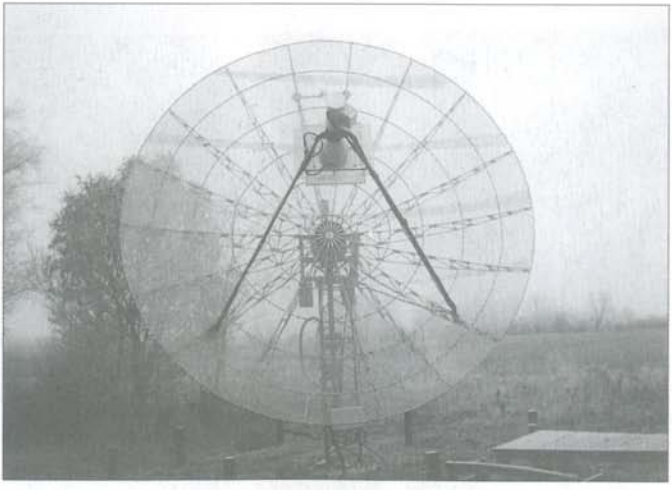
I2RV on 2m

ity, but I was able to complete 14 QSOs on Random with my small Rig. Wkd 6 initials and have now 32. That is a lot for me. TNX also to the guys of DUBUS magazine for this nice contest.

HB9AHD 2m: Dies war mein erster EME-Kontest! Tolles Erlebnis und große Freude, als wir erstmals unser eigenes Signal schwach hörten. Im Kontest waren die Signale dann einiges stärker und wir konnten die ersten schönen EME-QSOs fahren. Deutliche Signale aus Japan und Kanada gehört, aber leider nicht gearbeitet. Trotz des enormen Aufwandes zum Aufstellen der Station sind wir an einem nächsten EME-Kontest wieder dabei.

K2DH, 23cm: This was a fun contest! Lots of activity! I worked several new initials and had lots of FB QSOs. My activity was limited on Friday night, so I could have probably worked a few more stations if Id been on all available hours

DK2LR, 2m: Mein schönstes QSO war mit VE2BQH: Es dauerte sehr lange bis mein QRPP-Signal an der Reihe war. Als dann bei Monduntergang die meisten Stationen in EU CL hatten, waren wir lange in Kontakt, da mein Horizont in diese Richtung weniger als 1 Grad beträgt.



OZ6OL, 5m dish for 70cm and 23cm

DF1HF, 2m: Hatte ziemlich viel QSB und die Signale waren sehr leise. Normalerweis kann ich im Contest ca. 30-40 verschiedene Stationen hren. Sogar W5UN verschwand teilweise für mehrere Minuten im QSB. Mehr QSOs waren bei den schlechten Bedingungen nicht drin, dafür hatte ich eine große Anzahl von "QRZs". Vielen Dank für den Kontest und das Auswerten.

JH4JLV, 70cm: I enjoyed this contest very much. Initial QSOs is 10 up to #82.

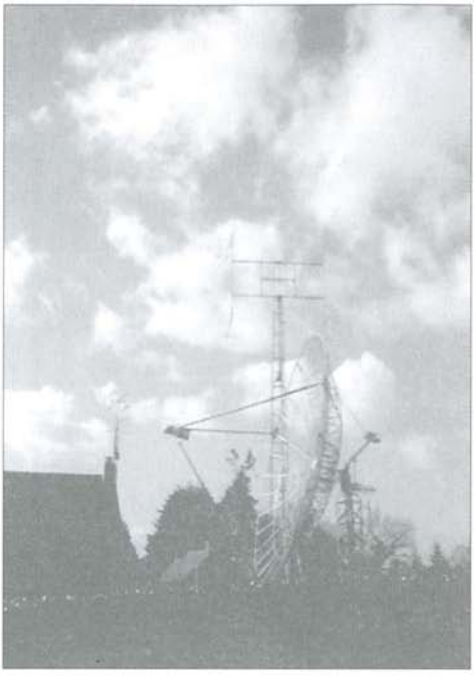
KB4CNI, 70cm: The first 24 hours went very smoothly. I had a connector problem on the second day that caused the flexible length between the hardline and power divider to short and take the system down for the last part of the contest.

F6CGJ, 23cm: Condx generally bad, no EA, G were heard. A very good surprise: A random QSO with DJ5MN running with a single yagi. This contact looked like my very first EME QSOs several years ago.

OZ4MM: Couldnt use much time for the contest this year, but anyway great to be with. I found fair condx on both 2304 and 1296.

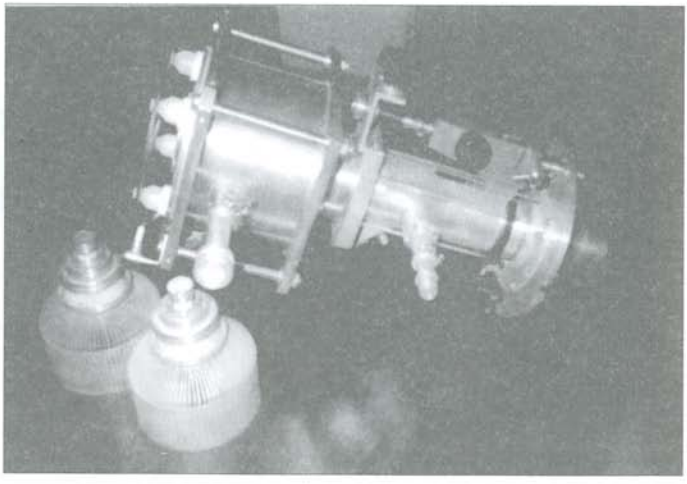
OE5EYM, 2, 70 + 23: Three bands and good condx were hard to work. But my equipment worked without trouble. So I enjoyed the contest very much. TNX to all stations who gave me a point.

G3ZIG, 2m: Thank you once again for organizing another enjoyable moonbounce contest. Conditions a little down to start with. Ws unable to operate the last session on Sunday because of high winds.



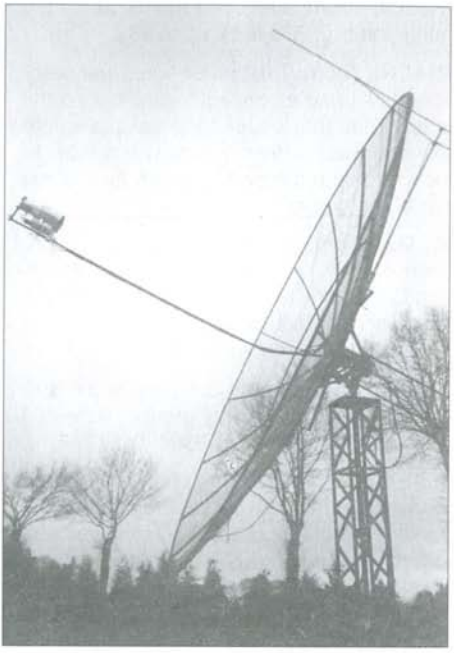
F5PAU, 6.7m dish

SM5FRH, 2m: DUBUS contest 1999 is over. Lots of snow fell down during the first day. Impossible to work anything from 1941-2235 due to high SWR. Looked at Swedish song contest on TV instead. Sorry to say that ZZ Top Album ANTENNA did not participate!! Not so many new stations on, perhaps to early in the year with weather problems. Smallest Station worked this contest JF4TGO/8 with 2 yagis and 120W. It is always nice with JA stations running QRP. Easy to work,



F5PAU, PA for 23m , 1kW out

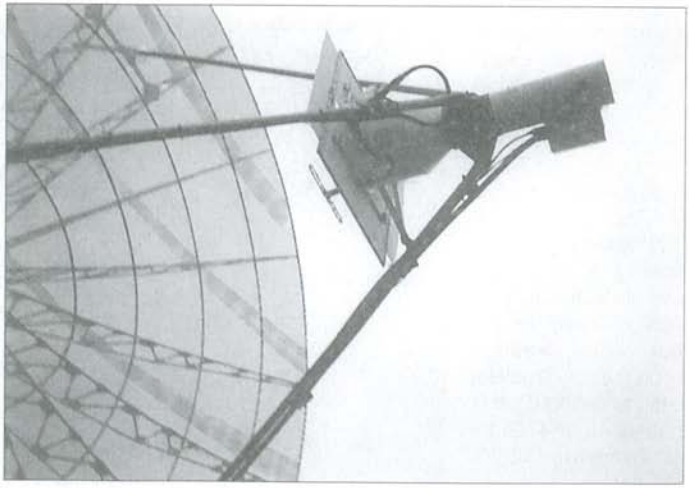
JH0WJF PA for 2m/70cm



F1ANH dish

they all have very good ears. 73s to all and have a nice time with coming expeditions and Es openeings.

SP7DCS, 2m: Because of Murphys visit my system has been reduced from 4 to 3 yagis before the contest. Despite of decreased gain I enjoyed the contest. Condx were good. Farady made that many signals came in vertical. See you next year with a new system.



OZ6OL feed for 70/23cm

Tropo News

Editor: Joachim Kraft, DL8HCZ - Joachim@Kraft.net

2m > 700 km

DK0ALK, JN38TD, wkd: 4./5.7.1998 DK5KK JO63EX 729km,DF0TEC/P JO73CF 731, DL0YE/P JO54AG 702, DL5UH/P JO74AA 792, OZ1ALS JO44XX 777, DL0EO JO54AK 720, SQ6W JO80FQ 699, EA3EZG JN12IG 759, OZ9EDR/P JO64GX 832. 5./6.9.98 DL0WMD/P JO74AA 792km, DL9MS JO54WC 726, DL0EO JO54AK 720, SM7WT JO65QQ 926, DL0YE/P JO54BG 703, DK0SL/P JO44PI 700, G8LIO90JO 695. 6./.3.1999 DJ9MT JO54EG 708km, DF0TEC/P JO73CF 731, DL8VU JO54EG 708, SQ6W JO80 699, DK5LO JO54DF 702, DL5LM JO44SR 744, DL9LAV JO54EF 703, DL0KF JO44SK 713. 3.4.1999 DL8DU JO44SK 713km. 1./2.5.1999 DF0TEC/P JO73CF 731km, DL9MS JO54WC 726, DL0NBG JO63OL 711, DB7LN JO44VL 721, SM7LXY/7 JO65TM 918, DK5LO JO54DF 702, OZ1SDB/P JO44XX 777, DK4LI JO44WQ 744, DB4LL JO44SM 722, DL8VU JO54EG 708, DG7YEX JO44NI 699, DL3TW JO44SK 713, DL2BZE JO72AW 700, EA3FTT/P JN12IK 742.

DL0HMB, JO34WE, 55m asl. wkd 2m-Contest: 1.5.99 1400-2330 DL5MAE JN58VF 716km, DL5GAC/P JN47SS 722, SP2OFW JO92AC 716, DK0OGJN68GI 724, OK1KCI/P JO80EN 720. 2.5.99 0349-1246 OL5W JO80DG 719km, 0357 OK1KZD/P JN79PP 716, OM3RRC/P KN09CE 1013, DL2RMC JN68GI 724, OE5NNN/3 JN77GX 831, DL3MHB/P JN57JN 764, DG5TR/P JN57MT 742, DC1MTH/P JN57JN 764, DC1MKR/P JN57JN 764. OPs: DG3XA, DD3XN, DL1XAQ, DJ2XS. Rig: TS850s, LT2s, 3CX800A7, 9ele. Tnx for info Matt

DL1EJA, JO31DS, wkd: 27.4.99 0946 DL8CMM/MM JO85AU. 30.4.99 0834 F1IXQ JN15MQ. 4.5.99 1724 LA7M JO48KK. 9.5.99 1916 SP2FAX JO83VA. 15.5.99 1617-1909 GD0EMG IO74QD, 2A0BQI/P IO85RU, 2S4ZUK/P IO86RW, G8NJA/P IO80DQ. 16.5.99 0901-1108 I4XCC JN63GV, OK2DL JN89AO, OK1OFL JN89AR, OK1KLX JO80BJ, IV3GBO JN66OA, 9A2AE JN86HF. 24.5.99 1458 F6CRP IN96KE, F6ANW JN06FQ. 28.5.99 1444 I4XCC JN63GV. 31.5.99 0918 I4XCC JN63GV, 1658 IK4DCX JN64GA, 2040 GI6ATZ IO74AJ. 1.6.99 1718 LA7M JO48KK, 2037 SP2OFW JO93AC. 5.6.99 2049 TM2OOO JN15VP, 2144 F6KDI/P IN97NH. 12.6.99 1452 I4XCC JN63GV, 1525 SP2OFW JO93AC. 13.6.99 1008 I2FAK JN45OB. 14.6.99 1435 I4XCC JN63GV. RIG: since 15.05.99: 4x15ele Hygain (ca. 20dBd 23m up, IC720A+LT2S, PA with GS35B (750W), PreAmp with MGF1302 NF=0,3dB. Tnx for info Oliver

DL8HCZ, JO53, wkd: 27.4.99 DL8CMM/MM JO85AT new sq. 30.4.99 DL8CMM/MM JO05 new sq.

LA0BY/p, JO59IX wkd: 5.1.99 SM1TDE/1 JO96BW, SP1CNV JO84CF, DL5ME JO52SD, DF0WD JO42FD, OH1XT KP01UK. 2.2.1999 SP1CNV JO84CF, DF0WD JO42FD, OH1XT KP01UK. 2.3.99 DH8BQA/p JO73CF, OH0AZ JP90XI, OH6JUM KP02OJ, SP1CNV JO84CF, DL5ME JO52SD, DL1UU JO62SP, SM5TC/4 JP61OC. 6.4.99 OH0A JP90XI, OH2W KO29FX, DH8BQA/p JO74AA, DL4IB JO64CC, OH1XT KP01UK, ES1AJ KO29HK, DJ3LE JO44SH. tnx for info Stefan

DK0ALK, JN38TD, 70W, 2x16el., wkd 70cm: 4./5.7.1998 OL2R JN89AO 637km, PI4GN JO33KK 591, DK0WAL JO61OA 514, DJ1JD JO52CK 512. 6./7.3.1999 PI4GN JO33KK 591km, PA6C JO33FB 553, DJ9KH/P JO42OX 549, DL8QS JO43KH 582, DK9OY JO52CK 512. 1./2.5.1999 DL1SUN JO53PN 655km, DJ4LH JO44NM 717, DL8QS JO43KH 582, PI4GN JO33KK 591, DK9OY JO52CK 512, G4LIP/p JO01QD 560.

DK0ALK, JN48AB, 70W, 2x16el, wkd 70cm: 3.10.1998 PA6NL JO21BX 518km, PI4GN JO33KK 604, G/OK2KKW/P JO02SL 674, DL8QS JO43KH 587, DJ1JD JO52CK 511. tnx for info Mike

6m News

Editor: Joachim Kraft, DL8HCZ - Joachim@Kraft.net

DL1EJA, JO31, wkd 6m: 16.6.99 1650 OD5SX KM74WK, new DXCC!! 5H3US, 4X1IF and Z23JOR had good sigs but didn't find way in the log. 24.5.99 1519 CT3FT IM13TA. 30.5.99 1754-1808 EH8BPX IL18SK, LU2EG GF05XD new DXCC ODX. 31.5.99 1856 EH8BI IL28GB. 7.6.99 1751-53 4Z4DX KM72KD,OD5SB KM74VJ. 10.6.99 1830 PY5CC GG54RE new DXCC, 1858 EA8/EH5CPU IL28GD. 18.6.99 1659 9J2BO KH44CP new DXCC. Rig: 6ele Yagi 12m up; IC706MKII Tnx for info Oliver

DL2FDL, JO40LN, wkd 6m: 17.5.99 1946-2018 SP8RHP KO10, SP8BTJ KO10, SO8FHG KO10, UR7TM KN39. Tnx for info Michael.

DL8HCZ, JO53, wkd: 9.5.99 EH4AV IM88. 19.5. 7Q7RM KH74, hrd 7Q7SIX KH75. 17.5. UU7JM/p KN65, UR5LX KO70, UX1CN KN59, ER1OO KN46, YO8BPY KN37, UU2JJ KN75, UU1JD KN65, US5CCO/A KN58, UR5GL KN66, UY5QZ KN77, YO6QT KN25, UR7TO KN39, UR5ZEL KN56, UT2HN KN79. 24.5. 2037 EA8/EH5CPU IL28. 5.6. SM3UZS JP92, YO4CIS KN43, OH5A KP53NE, UR5ZEL/p KN57, EO6F KN45. 6.6. ER1LW/p KN47, ER1A/p KN47, EH4EED/p IM68, SV3/DJ6AM KM07. 7.6. EH1AGZ/p IN71, SV2DFA/2 KN00. 11.6. UU7JM KN64. 19.6. LZ2PP KN33, 4L5O LN21, US5QGL KN86, SV5BYR Km46. 20.6. Z31JA KN11, UR5YDW KN28, YO5CRQ KN17, SP5ULD/8 KN09, SP6TRQ/9 KO00, SP8AWQ KN19, RA6AX KN94, SP9HWN KO00. 23.6. ES4EQ KO39, OH6JW/8 KP44, LY1DQ KO25, EW8CD KO52, SM/DL5DSM/p JO88, LA2OG JP42, hrd 1900 JW7SIX!! 25.6. 1840-2005 W1ALS FN55, KB1DSG FN65, KA1A, W1WHL FN31, KU2A, N1BUG FN55, W1JZR FN42, W1LP FN41, K2OVS FN30, K2WE, W1CWU FN42, W3JO FM29, KO2OK, K3HZO, W1XP FN42, W4MYA FM07.

DJ6TK, JO53FG, wkd 6m with 1Watt and 2Ele: 19.5.99 7Q7RM KH74. 19./20.6.99, 4L5O LN21JR, SV2DCD KN00NF, ES5RY KO38, YL3AG KO26AW, Z31JA KN11CR, SV2DFA/2 KN00RF, T97V JN84VD, YT1VV N94US, OE6FGG JN77RC, 9A99P JN82DJ,S58DX JN65W, 5B4AGC KM64CU,ER1LW KN46KW,SV5BYR KM46. Tnx for info, Wilf

I4YNO, JN54KP wkd 6m: 30.5.99 1725 EH8BPX IL18 1836 LU2FFD FF97. 11.6.99 1910 9J2BO KH44. 19.6.99 0911 5B4AGC KM64. 20.6.99 0828 4L5O LN21, 1800 5A1A JM62. Tnx for info Alex.

ZK2GEO, 6m report: Hallo zusammen, jetzt, nachdem die DXpedition schon etwas hinter uns liegt, fiel uns ein, dass wir ja auch ein(!) 6m-QSO hatten. Unser Call war bekanntermassen ZK2GEO, und das ganze lief am 31.3.99 um 22.06 UTC auf 50.110 MHz. Die Gegenstation war TI5KD, aus einer Entfernung von etwa 9950 km! RST war geg 55/ erh 52. Wir benutzten 100 W an einer G5RV-Antenne, die eigentlich nur von 160-10m brauchbar sein sollte, dann aber doch recht gut auch auf 6m lief. Leider glckten keine weiteren QSOs, obwohl einige Male Baken aus KH6 beobachtet wurden, und wir auch hin und wieder CQ riefen. Vielleicht klappts ja beim nchsten Mal besser.... Unser Locator auf Niue war AH51BA, der von TI5KD ist uns leider nicht bekannt, aber wir haben die Entfernung zur Hauptstadt San Jose berechnet.Herzliche Grsse und vy 73/55 von der 'ZK2GEO-Gang' Uwe, DL2YAK und Hape, DL1EMH

ATTENTION!

Weinheim VHF-Meeting 1999: This year in Mannheim-Maimarkthalle Sept.18th/19th. DUBUS at stand H09. All books TECHNIK 1, 2, 3, 4, and 5 available there!

Aurora News

Editor: Norbert Göttsche, DL8LAQ

LA0BY (JO59FW) wkd on 144 MHz (DX or rare loc):

1999-01-05 (LA0BY/P in JO59IX)

2142 OH2KKP	KP20MH	55A	57A	30
2159 OH6QR	KP22BN	52A	55A	30

1999-01-13

1726 SP2MKO	JO93CB	53A	55A	45
1741 DF8LC	JO53CT	59A	59A	40
1744 DL1UU	JO62SP	59A	59A	40
1745 DJ6TK	JO53FG	59A	59A	40
1748 SQ2EEQ	JO94HI	52A	56A	45
1753 DB4LL	JO44SM	59A	59A	40
2204 LY2MW	KO24PQ	55A	55A	45
2213 DL7YS	JO62NM	55A	56A	40
2227 YL3AG	KO26AW	59A	59A	45
2231 MM0BQI	IO85KX	57A	55A	10
2237 GM8LFB	IO88JH	54A	54A	350
2248 SP4MPB	KO03GS	57A	57A	50
2254 DL1SUZ	JO53UN	56A	57A	40
2258 SM7TZK	JO77ML	54A	55A	40

1999-01-22

1628 LA5FHA	JP50EV	57A	54A	340

1999-02-18

1452 DJ9MG	JO52TC	59A	59A	40
1453 DL5CC	JO64AD	59A	59A	40
1455 DD0VF	JO61VC	59A	59A	45
1457 DL5ME	JO52SD	59A	59A	45
1458 DL5YM	JO62VN	59A	59A	45
1502 SP2BNJ	JO94HK	52A	59A	50
1516 LY2BH	KO25DR	52A	53A	40
1518 DL2HRE	JO51TQ	53A	57A	40
1530 LA2PHA	JO38IB	59A	59A	20

1999-03-01

1609 SM5TC/4	JP61QB	54A	56A	20
1728 SP2MKO	JO93CB	55A	59A	40
1733 DK5KK	JO63EX	59A	58A	50

1999-03-02 (LA0BY/P in JO59IX)

2059 OH6KSR	KP22VG	52A	53A	30
2101 OH5NM	KP41IE	55A	55A	30
2103 SK2AT	KP03BU	59A	59A	20
2106 OH1XT/2	KP20LG	59A	59A	30
2107 OH3MF	KP20FR	56A	57A	30
2109 LA4XGA	JP33VC	57A	55A	10
2109 OH3BHL	KP10CL	53A	55A	30
2111 SM3LWP	JP81NH	55A	55A	30
2113 OH2KKP	KP20MH	55A	55A	30
2117 OH5LK	KP30ON	56A	55A	30

Thanks for your report, Stefan.

Es News

Editor: Norbert Göttsche, DL8LAQ

Send your reports to dl8laq@hamburg.roses.de or to my packet radio address DL8LAQ@DB0HB.#HH.DEU.EU.

73, Norbert

DF1IAZ (JN49LD)wkd on 144 MHz:

1999-05-24

1234	EA7IT	IM87	59 59
1245	EA9IB	IM85NG	59 59
1250	EA5CA	IM99TL	59 59
1331	EB4BAP	IM69PU	59+2059
1337	CT1ESJ	IN60KI	59 59
1337	CT1DQM	IN60	59 59
1339	EA2CAR	IN82PU	59 59
1347	EA2CJV		59 59
1354	EA2AWD/MM	IN84LP	59 59
1358	CT1EEB	IN50	59 59
1408	CT1DNF	IN50QP	59 59
1434	EA1BLA	IN53UM	59 59
1445	EA1DAV	IN53	59 59

Thanks for your report, Ralf.

DF1SO (JN48PO) wkd on 144 MHz:

1999-05-24

1341	CT1DNF	IN50QP	56 59
1345	CT1DJM	IN60IM	56 59

Heard: EB4BAP (IM69), CT1ESJ (IN60), EB1EHH (IN73), EA1BLA (IN53). Equipment: 100W, 12 ele DJ9BV (12,8 dBD). Thanks for your report, Dieter.

DG2DBT (JO31XE) wkd on 144 MHz:

1999-05-24

1320	EA7GTF	IM87CS	59 59

Heard many EA7. No chance to work more DX due to big pile-up. Equipment: IC275H, 90W, 4 ele Yagi. Thanks for your report, Tobias.

DG3GAG (JN48) wkd on 144 MHz:

1999-06-20

1028	SV3CYM	KM08VG	55 59
1042	SV7DMK	KN21LH	59 59
1047	LZ5QD	KN12IG	59 59
1053	LZ1AG	KN22ID	59 59
1059	LZ1QKP	KN12QP	59 59
1108	Z31DX	KN11	59 59
1111	SV8DTD	KM39EA	59 59
1117	LZ5UV	KN12GR	59 59
1118	LZ1UH	KN11SU	59 59
1123	LZ1WL	KN13	59 59
1131	LZ1ZC	KN12	59 59
1133	TA1AT/M	KN41	59 59
1141	LZ1QI	KN12PR	59 59
1142	LZ1QB	KN12RO	59 59
1159	Z36IBI	KN02SA	59 59 fm
1201	YU1TH	KN03	59 59 fm
1201	LZ5KL/M	KN22	59 59 fm
1206	SV7\DH1GV	KM17	59 59 fm
1209	SV7DMD/M	KM17	59 59 fm
1214	LZ3PZ	KN12PQ	59 59 fm
1215	LZ5AZ	KN21	59 59 fm
1327	YO4NF	KN44HE	59 59
1333	YO4IMP	KN44AI	59 59 fm
1335	YO9AZD	KN35AA	59 59

1999-06-22

1548	LZ2KZ	KN33FC	59 59
1605	YO3JW	KN34CK	59 59
1607	YO3FWR	KN24BL	59 59
1620	YO9GDJ	KN25WA	59 59

Thanks for your report, Erwin.

DG8NFB (JN59MK) wkd on 144 MHz:

1999-05-14

1323	CT1ESJ	IN60KI	59 59
1353	CT1DQM	IN60	59 59
1431	EB1EHO	IN73DM	59 59

1999-06-20

1049	SV5TS	KM46CF	59 59 *

Remarks: * 145,375 FM. Heard: Z36EHN in FM-mode; SV8DTD (KM38EA). Equipment:50W, Datong HF-Clipper and BigWheel. Thanks for your report, Klaus.

DG9BEM (JO43CD) wkd on 144 MHz:

1999-05-24

1235	EA6XQ	JM19
1302	EA5EZJ	IM98
1304	EB5BCF	IM99
1310	EA5FKX	IM98
1338	EA6FB	JM08
1342	EA5AGR	IM88
1346	EA5CA	IM99
1347	EA7IT	IM87 (odx 1925km).

Worked at 1415 UTC on 145.5 FM with IM88 with 53/55. 30W and lambda 1/4 antenna on my car at 150km/h. Lost the call in qsb... Thanks for your report, Thomas.

DH1DCN (JO41BD) wkd on 144 MHz:

1999-05-24

1253 EA5EZJ IM98VX, 1305 EA5CA IM99TL, 1314 EA7AJ IM87CS, 1320 EA7GTF IM87CS, 1323 EA9IB IM85NC, 1431 EB4BAP IM69TU, 1447 EB2FLH IN82QU.

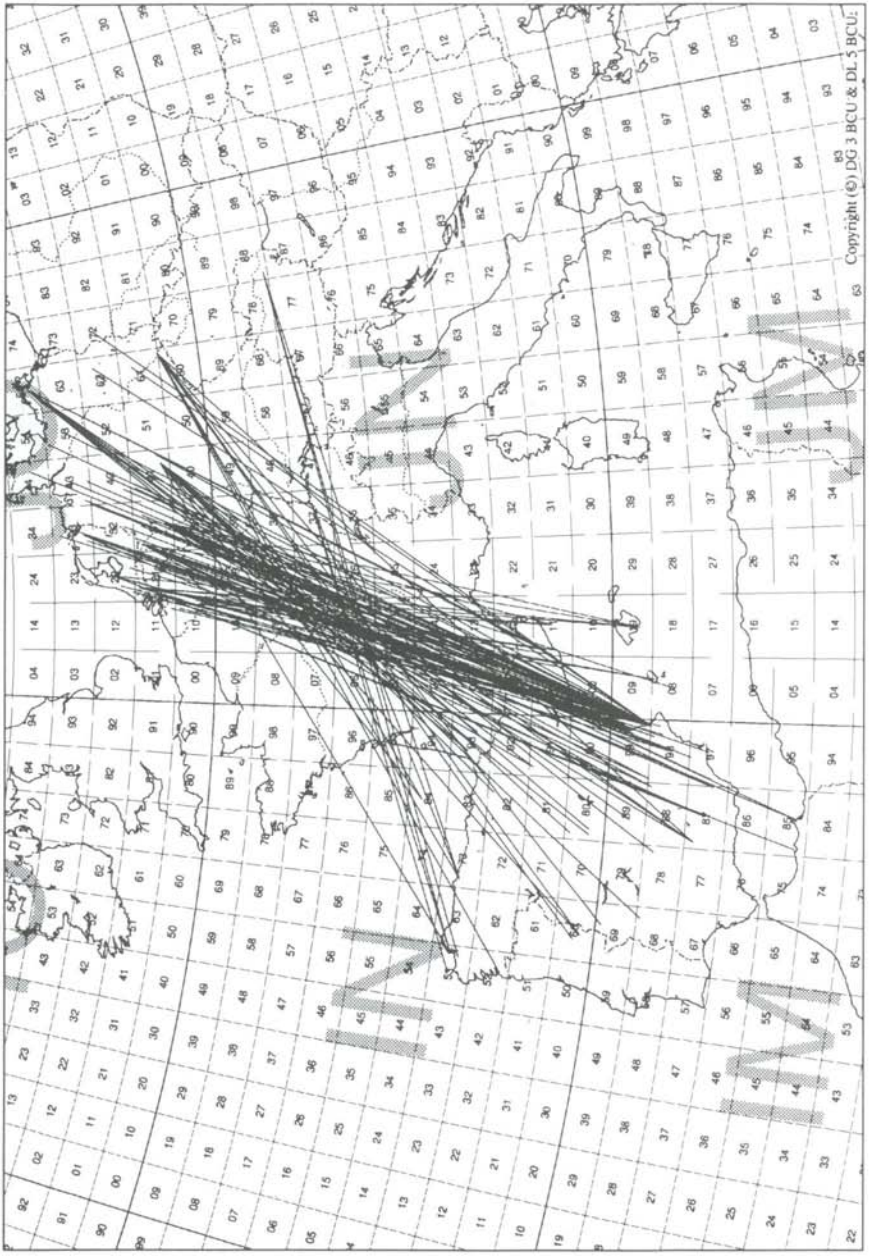
Equipment: IC706 MKII, 100W, preamp, 11 ele F9FT, 480m asl. Thanks for your report, Marc.

DH5MK (JO41IV, ex DC3QB) wkd on 144 MHz:

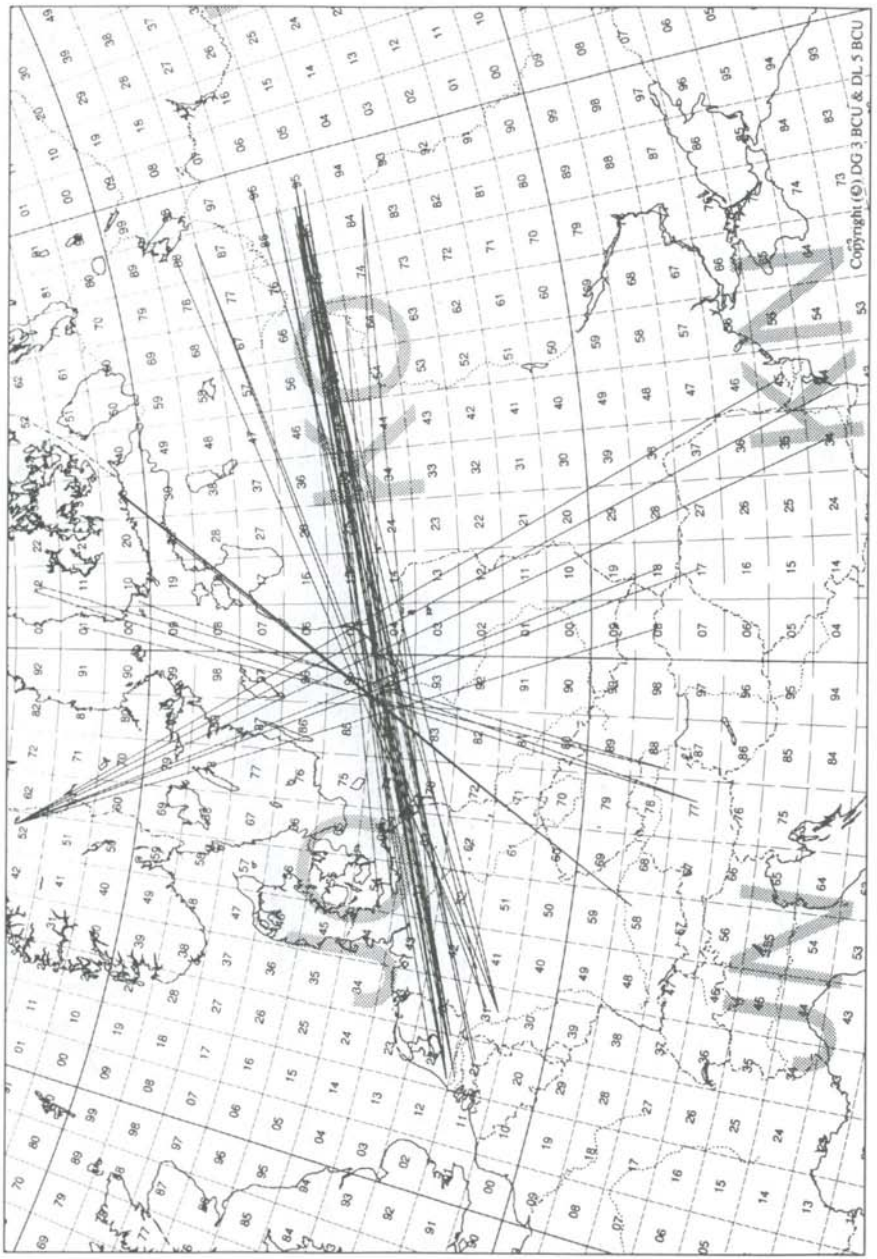
1999-05-24

1236	EA7IT	IM78	59	59	
1256	EA5EZJ	IM98VX	59	55	
1300	EA5CA	IM99TL	59	59	
1313	EA7AJ	IM87CQ	55	59	
1315	EA7GTF	IM87CS	59+	59+	*1

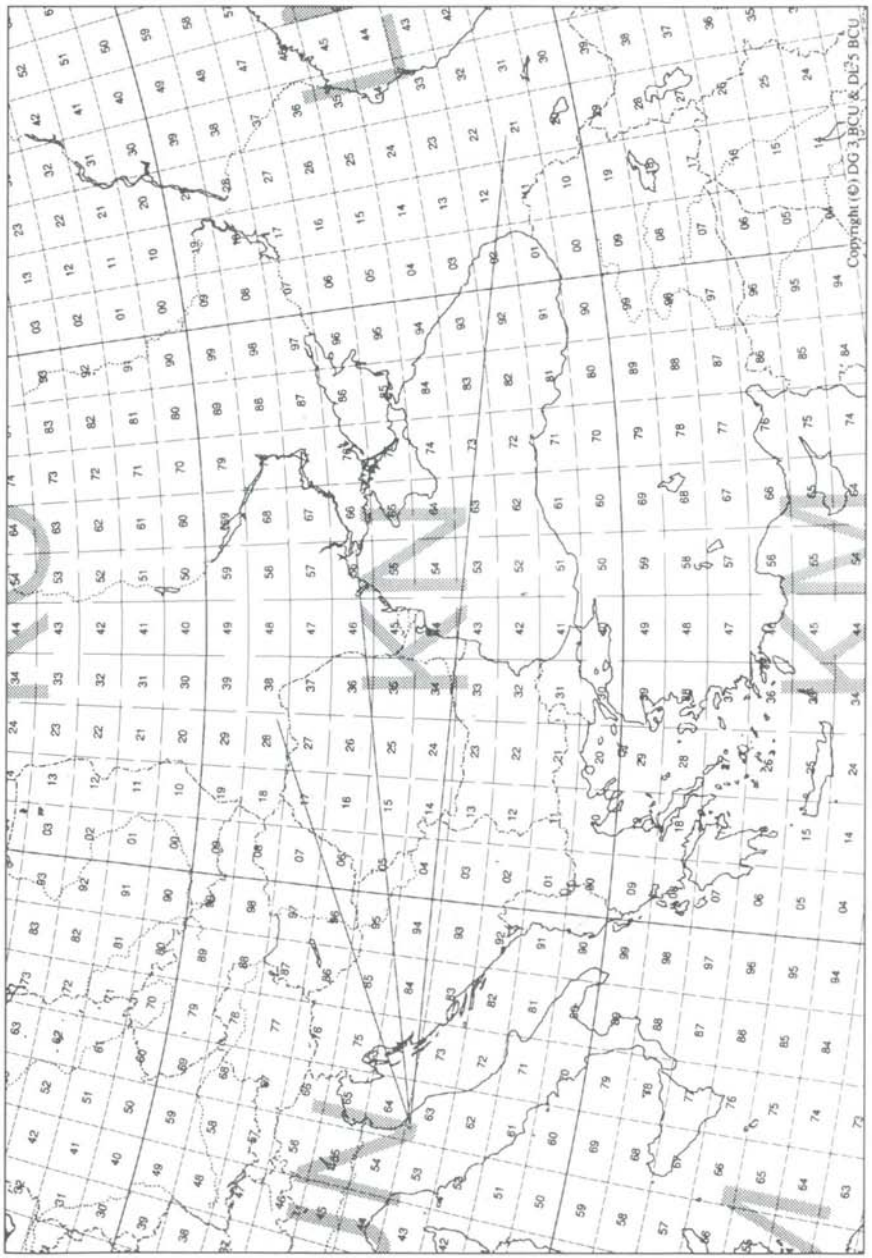
ES on May 24th, 1999



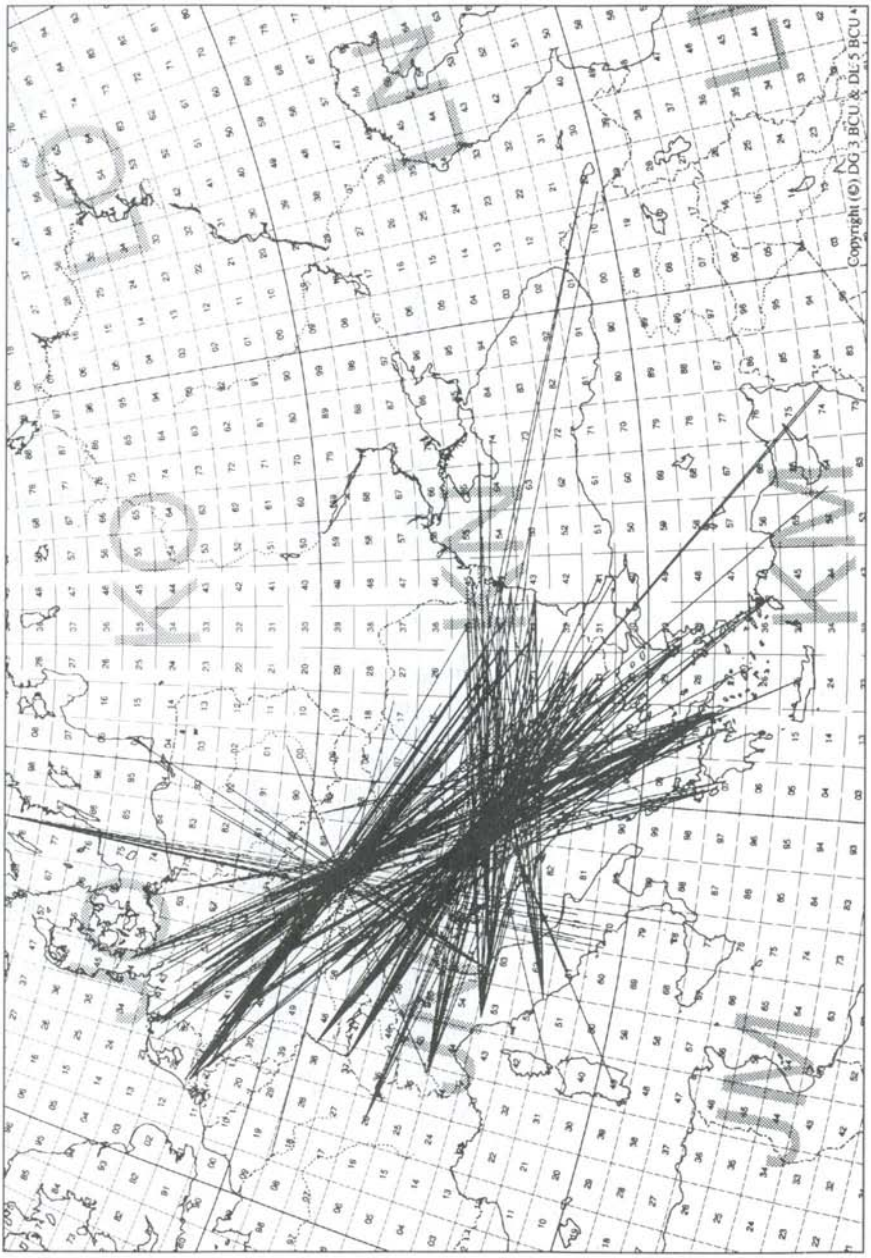
ES on June 19th, 1999



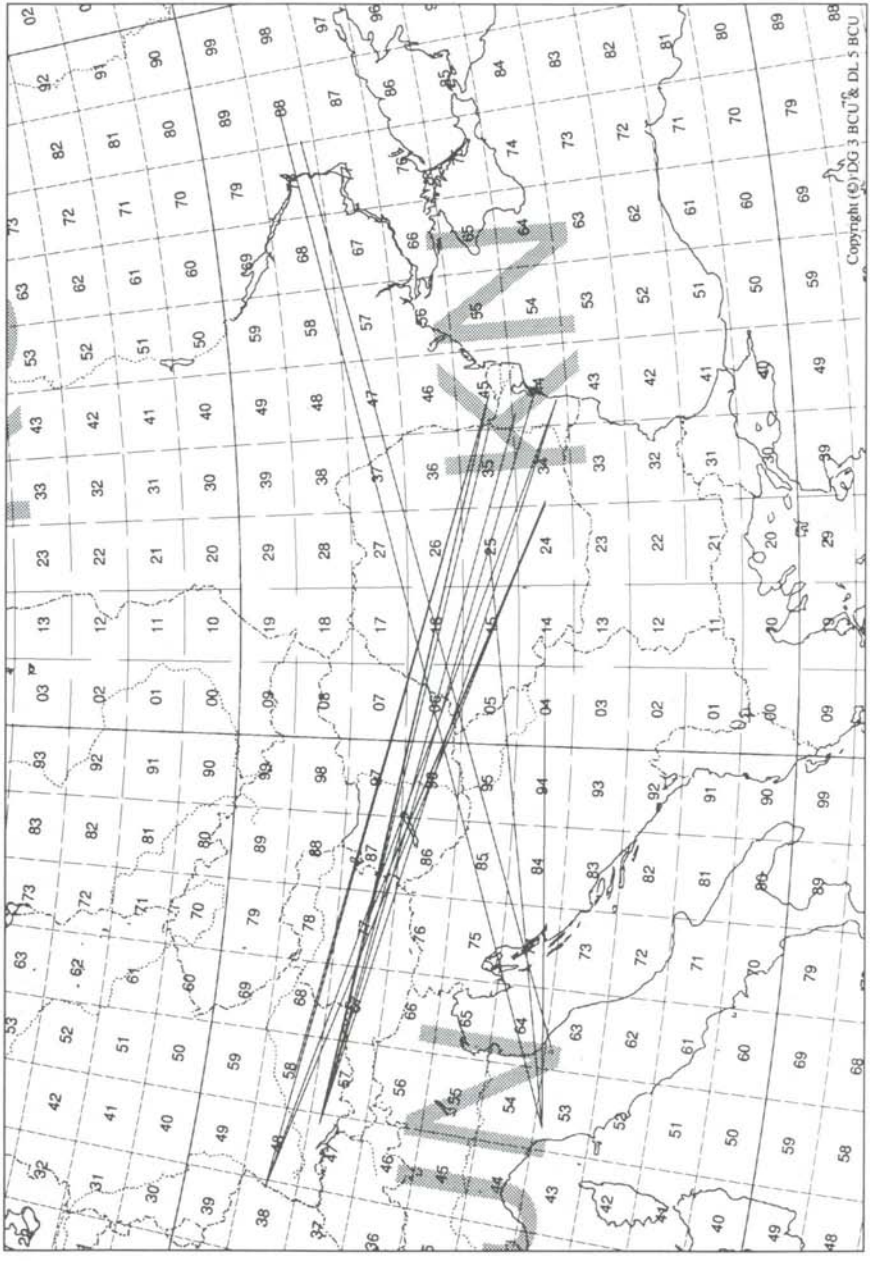
ES on June 20th, 1999/Graph A



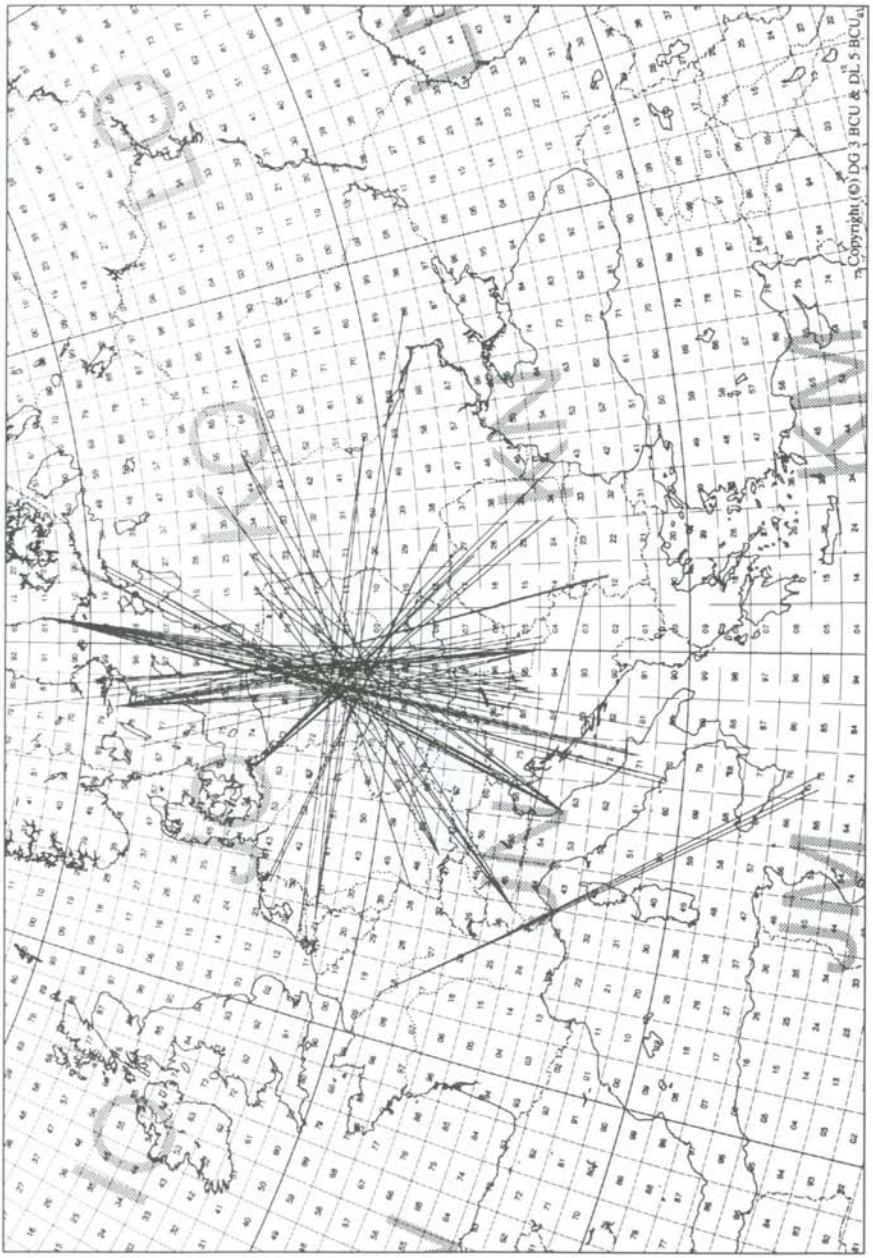
ES on June 20th, 1999/Graph B



ES on June 20th, 1999/Graph C



ES on June 20th, 1999/Graph D



1319 EB5BCF	IM99TK	59	59
1321 EA9IB	IM85	59	59 odx
1344 EA6FB	JM08PW	59	59
1403 EA5EGV	IM97KM	59	59
1413 EA4BPJ	IN80EJ	53	59
1423 EA1BFZ	IN81TW	59	59
1442 F5DUX	IN93IN	59	59
1443 F6FHP	IN94TR	59	59
1999-06-19			
1723 UA3MBJ	KO88MM	53	59
1999-06-20			
1143 SV1AMH	KM18UA	59	59 fm
1147 SV4CGB	KM19GO	59	59 fm
1148 LZ1BT	KN12VV	59	55 fm
1151 LZ2CM	KN13OJ	55	55 fm
1151 LZ2RM	KN13OJ	55	57 fm
1155 YU7AR	KN05BW	59	59
1156 YU7EW	KN05HP	59	59
1157 YO2BBT	KN05TG	59	59
1206 SV1ENG	KM18VB	59	59

Remarks: *1 Hrd over abt. 90min. with 59+20! Heard: SV5TS, SV9ANG and lots of SV's; due to small equiment and amazing pile-ups no others could be worked... Equipment: FT726R, 100W, MGF1302, 6 ele indoor! 73, Michael.

DJ3LE (JO44TN) wkd on 144 MHz:

1999-05-24			
1300 EA5EGV	IM97KX	59	59
1302 EA5EZJ	IM98VX	59	59
1307 EA5CA	IM99TL	59	59
1310 EA9IB	IM85NG	59	59 *
1316 EA7IT	IM87XI	59	59
1326 EA5FKX	IM98IM	59	59
1340 EB4EZU	IM89VI	59	59
1345 EA5TM	IM99SK	59	59
1347 EA5AGR	IM88WV	59	59
1350 EB5BCF	IM99TK	59	59
1354 EA7GTF	IM87CS	59	59
1407 EA7AJ	IM87CS	59	59
1420 EA5ZF	IM99WU	59	59
1437 EA2AGZ	IN91DV	59	59

Remarks: * 2350km! ODX and new continent! Equipment: 2 * 9 ele Yagi 55m asl, 4CX250R (450W). Thanks for your report, Hans-Jürgen.

DJ4TC (JO63PN) wkd on 144 MHz:

1999-05-24			
1403 EB4EZU	IM89VI	59	59
1418 F5DUX	IN93IN	59	59
1428 EB4BAP	IM69PU	59	59
1433 CT1ESJ	IN60KI	59	59
1441 EB2FLH	IN82QH	59	59

Equipment: 300W, 2*11 ele DJ9BV. Very strong signals, but no chance to make a qso. Thanks for your report, Peter.

DJ6TK (JO53) wkd on 144 MHz:

1999-05-24			
1303 EA5CA	IM99TL		
1331 EA7GTF	IM87CS		
1348 EA6FB	JM08		
1431 EA2AGZ	IN91DV		

Equipment: 50W and 10 ele Yagi. Thanks for your report, Wilf.

DL1GI (JN47) wkd on 144 MHz:

1999-06-19			
1155 YO4NF	KN44HE	59	59
1999-06-20			
1100 SV7DMK	KN21LH	59	59
1050 LZ5QD	KN12	59	59
1128 LZ1DP	KN22TK	59	59
1110 LZ1UH	KN11SU	59	59
1115 YO4RON	KN45AR	hrd	57
1110 SV8DTD	KM39ER	hrd	59
1120 LZ1WL	KN12	59	59
1125 LZ1QI	KN12PR	59	59
1135 LZ1ZC	KN12	59	59
1136 TA1AT/M	KN??	hrd	52
1143 YU1INO		59	59
1145 LZ1AG	KN22ID	59	59
1228 LZ1KG	KN31CS	59	59
1216 LZ5GB	KN12QP	59	59
1334 YO4NF	KN44HE	59	59 odx 1614km
1339 YO9AZD	KN35AA	59	59

Equipment: FT-736R, 11 ele Flexa, 4CX250 (200W). SV7DMK war fast eine Stunde mit sehr starkem Signal auf 144.304 MHz und "verdrängte" sogar starke lokale Stationen. SV8DTD arbeitete wohl Kontest, "vergab viele Nummer" und leider anderen OM s somit die Gelegenheit ihn zu arbeiten... Die LZs waren auch fast eine Stunde mehr oder weniger stabil. Die beiden YO-Stationen tauchten nur für wenige Minuten kurz auf, danach waren lediglich noch kurzzeitig TA-Rundfunksender bis 107Mhz hörbar, das OIRT-Band war noch weit länger offen (in Richtung SP/YO/UB5). Viele LZs konnte ich deshalb arbeiten, weil diese sich n i c h t auf der 144.300 tummelten; die TA-Station antwortete auf einen "CQ-Ruf" meinerseits weitab der 144.300, was dafür spricht, daß auch "DX-Stationen" jenseits der Anruffrequenz hören... 73, Ralf. Vielen Dank für den Bericht, Ralf.

DL2FDL (JO40LN) wkd on 144 MHz:

1999-05-24			
1353 EA1BFZ	IN81SS	59	59
1355 EA4EHI	IM68TV	59	59
1409 EB4FQP	IM68TV	59	59
1414 EB2FLH	IN82QU	59	59
1420 EA4EWD	IN84LP	59	59
1421 CT1ESJ	IN60KI	59	59
1432 F5DUX	IN93IN	59	59
1435 CT1DNF	IN50QP	59	59

Thanks for your report, Michael.

DL8EBW (JO31NF) wkd on 144 MHz:

1999-05-24			
1235 EA6XQ	JM19LH	59	hrd
1238 EA7GTF	IM87CS	57	59 c
1240 EA5CHT	IM97CK	55	54 nc
1243 EA3CRI	JN11	55	hrd
1245 EA5EZJ	IM98VX	59	hrd
1259 EA5FKX	IM98	52	hrd
1308 EB5BCF	IM99TK	57	59 c

1310	EA9IB	IM85NG	59 59 c
1312	EA5AGR	IM88WV	59+ hrd
1316	EA5EZU	IM89VI	59+ hrd
1320	EA6FB	JM08	55 hrd
1332	EA5CA	IM99TL	55 hrd
1337	EA7IT	IM87XI	55 59 c
1338	EA7AJ	IM87CS	55 55 c
1345	EA5CD	IM98BX	55 hrd
1354	EB4EZU	IM98	59 hrd
1415	EA3...	JN11	55 hrd
1450	F6FZS	IN93	55 hrd

I have had more than 120 min opening on 144MHz - shortest QRB hrd was an F station in IN93! Had guests in our home so was not qrv for all the time.

1999-06-19

1715	UA3MBJ	KO88SA	59 59 c
1728	RK3AF	KO85	52 hrd
1730	UA3DHC	KO96	339c hrd

1999-06-20

Very big opening which was much better south east from my QTH (start with KM39, which I hrd after 35min after the first DL/OK in JO60/JN59) and ended at 1210 with SV2CXI in FM.

1147	YO9AZD	KN35AA	59 59 c
1156	LZ2ZC	KN23OE	59 59 c fm
1201	SV4CGB	KM19	59 59 c fm

Heard between 1035 and 1212: SV8DTD KM38, LZ1DX KN11, SV0EC KN10, SV1DH KM18, SV1BTR KM17, SV1LK KM17, SV4BHA/m KM19, SV2CHL KM19, YO3JW KN34, SV8FEA KM28, YO3APJ KN34, YO7IV KN24, YO4FRJ/p KN34, LZ2JMH KN23, SV2CXI KN10, SV2DVE KN11?, SV1ENG KM18 and SV2BWS KN??

1637	UT5ER	KN78	559	559 c

Heard between 1607 and 1640: UR5EUP KN78, UT5EC KN78 (beacon 144,339.2!), UR0EY KO88, US5UES KO50, UT5ER KN78 worked G (SSB) and US5WU KO20.

1999-06-22

1518	YO7IV	KN24	59 hrd
1523	YO3JW	KN34CK	59 55 c

Worked from my car on the Autobahn back home (80W, 5/8 vert. ant.). Equipment: FT726R mod. CF300, 11 ele DL6WU, MGF1302, 300W (4CX250R). Thanks for your report, Guido.

DL9NCW (JO50XH) wkd on 144 MHz:

1999-05-24

1400	EB4BAP	IM69PU	hrd
1408	CT1EEB	IN50	
1410	CT1DQM	IN60	
1411	CT1ESJ		hrd
1413	CT1DNF	IN50	hrd
1432	EA1CNO	IN52	
1433	EA1CBY	IN52	
1435	EA1DAV	IN53	
1446	EB1EHO	IN73	
1450	F1UO	JN25	hrd

999-05-31

1355	SV1OH	KM18VA	hrd
1401	SV3AGQ	KM17LX	wkd with 2W

1999-06-20

1030	SV8DTD	KM39EA	hrd
1100	SV0EC	KN10CJ	hrd
1101	SV9ANK	KM25NI	
1104	SV1DKR	KM17UW	
1105	Z31DX	KN11	hrd
1112	SV4CGA		hrd
1112	SV1LK		hrd
1113	Z32VB	KN01PA	
1114	SV3AGR		hrd
1115	SV1AMH		hrd
1120	SV1BTR	KM17UW	
1128	SV2DFA/2	KN00RF	
1131	SV1RK	KM17VU	
1135	SV3AGQ	KM17LX	hrd
1137	SV1BRL	KM17UW	
1138	SV1CNS	KM18UA	
1141	SV4CFZ	KM19FO	

1999-06-23

0945	SM4VQP		hrd

Equipment: IC202, 2/50W, 17 ele Yagi 12m agl, QTH 450m asl. Thanks for your report, Wolf.

I4YNO (JN54KP) wkd on 144 MHz:

1999-05-30

1839 EH4EHI IM68TV, 1843 EB4FQP IM68TV.

1999-06-20

From 1022 to 1154: LZ1AG KN22ID, LZ1DP KN22TK, LZ2ZY KN13, LZ2CW KN23GK, LZ2QA KN43EK, LZ2ZK KN23TB, LZ2HV KN23TB, LZ2HQ KN23UB, LZ2FR KN13IU, LZ4KAC KN13TS, YO4FRJ/p KN34AW, YO4NF KN44HE, YO3APJ KN34AL, YO3ACX KN34BL, YO3JW KN34CK, YO7VS KN14VH, YO4FYQ KN44HE, LZ2OU KN33GF, YO7IV KN24KV, LZ2SK KN43EK, YO3FWR KN34BL, LY2WR KO24OQ, YO4WZ/p KN44EW, YO9DAX/p KN44EW. Heard the last LZ + YO at 1220. At 1411 heard UR0EY KN88AF. Thanks for your report, Alex.

I5WBE (JN53JR) wkd on 144 MHz:

1999-05-24

1349	TM5S	IN78NA	
1413	F6HRP	IN88KN	
1426	F1GHB	IN88GR	

1999-05-30

1726	CT1FOH	IN50RA	
1730	EA7AVY	IM	hrd
1735	EB7MAC	IM	
1833	EB7HAF	IM76SR	
1834	EB7FLW	IM76SR	
1839	CT1FAK	IN50QO	
1841	CT1ESJ	IN60KI	

Very strange opening, period vy fast, not many activity. In the period from 1730 to 1834 very low signals with modulation like FAI, later strong signals and good modulation.

1999-05-31

1335	LZ2FO	KN13KX
1338	YO3APJ	KN34AL
1340	LZ2VK	KN43EK
1343	LZ2SK	KN43EK
1344	YO7VS	KN14VH
1345	YO4NF	KN44HF
1346	LZ2QA	KN43EK
1346	YO7GGS	KN14

1347 YO7IV	KN24KV
1348 YO4GJH	KN35XG
1349 YO9CAD	KN35PF
1352 YO9IE	KN34AW
1352 YO7AQF	KN24KU
1352 YO7IV	KN24KV
1354 YO7VK	KN24
1354 YO4ATW	KN35
1355 YO7AQF	KN24KU

Thanks for your report, Enrico.

OE3MWS (JN88DC) wkd on 144 MHz:

1999-05-24

1351 EA1BLE	IN53UM	59 59
1355 EA1DAV	IN53TH	59 59
1359 EA1EWL	IN73DM	59 55

Equipment: TR751E, 1200W, 2*17 ele Yagi (5wl) 25m agl and 230m asl, MGF1302, DSP. Thanks for your report, Fred.

OE6IWG (JN77PK) wkd on 144 MHz:

1999-05-24

I was not at home. Sporadic-E to EA and CT, but more than two hours good spanish music on my car-radio.

1999-05-29

1027 RZ6BU	KN84PX	57 59

1999-06-19

1711 OH1AYQ	KP12JP	59 59

Hello Timo, it was very nice to work you again after long time (2m 1984! and 6m 1990!).

1715 OH1XF	KP10CG	59 59

1999-06-20

First opening to SV8, SV9 and 5B4 on 0956z but NO chance to work any! Too much qrm, qrm, qrm - a horror... Amateur radio is a hobby?

1108 SV1BTR	KM17VX	59 59
1116 SV8DTD	KM39EA	59 59
1117 SV0EC	KN10CJ	59 hrd

Heard him 1 hour, but no chance...

1122 SV3AGQ	KM17LX	59 59 YL Sitsa
1126 SV1BRL	KM17UW	5559 YL
1127 SV1CNS	KM18UA	59 59
1128 SV1JG	KM18WF	59 59
1129 SV1AHM	KM18UA	59 fm, not wkd
1131 SV1RK	KM17VU	59 59
1134 SV2DFA/p	KN00RF	59 59
1328 YO3APJ	KN34AL	59 59
1330 YO3ACX	KN34BL	59 59
1435 UX0FF	KN45KJ	59 59

No SV7, ER or Z3 heard. At all this openings: 6 new loc's and SV as new dxcc (now 52).

1999-06-22

Nothing! My Locator JN77 was again (some most of the time) a ufb sporadic reflector for others, hi. HI?...aehemmm... Equipment: My ooold (1980!) Kenwood TS770 modified (good noise, hi), CF300 preamp, 400W, 4 * 10 ele 2.2wl homemade. I need about 8-10 degrees elevation for direction south east due to the mountains in front of my nose. My qth is situated at 520m asl, the mountain has 1630m asl at a distance of only 8km :-(So I was waiting for SV nearly 20! years as a new dxcc! See you soon on the VHF bands. 73, Walter. Thanks for your report, Walter.

OK2PIN writes:

This is a report of a nice ES opening. The QSOs below have been worked under radio-club's call sign OK2KJT in a Czech Activity Contest (which turned in DX chasing at the end of contest). Than I continued under my own call sign OK2PIN worked SV for the first time. Used RIG was R2CW TCVR, 300 W PA, 6xDJ9BV (elevation ability out of order at the time - bad luck) + F9FT. The QTH is located at 700 m asl.

OK2KJT (JN99AJ) wkd on 144 MHz:

1999-06-20

1006 SV1EN	KM18VA	59 59
1007 SV1COK	KM17VX	59 59
1010 SV1DKR	KM17UW	5959
1053 SV3AQR	KM07OL	59 59

Good Operator, knowing DX operating!

1056 SV3CYM	KM08VG	59 59

OK2PIN (JN99AJ) wkd on 144 MHz:

1999-06-20

1103 SV3AQR	KM07OL	59 59
1104 SV3CYM	KM08VG	59 54
1200 IZ8BAB	JM89IG	59 59

All signals typically 59+++ with a high pile-up from OK, OE, SP, DL and HA. Also heard some other SV but being in a DXing fever not recorded call signs and locators, hopefully next time... 73, Zbynek, OK2PIN. Thanks for your report, Zbynek.

ON1AEN (JO10UV) wkd on 144 MHz:

1999-05-24

1304 EA6XQ	JM19LH	59 59
1309 EA5FKX	IM98	57 55
1314 EA5CA	IM99TL	59 59
1323 EA5EZJ	IM98VI	59 59
1334 EA6FB	JM08PW	59 59
1340 EA3DXU	JN11CM	59 59
1341 EA3CRI	JN11	59 59
1345 EA3GJO	JN11	59 59
1349 EB3DYS	JN11	57 59
1354 EA3ADW	JN11	59 59
1358 EA3TA	JN11AM	59 51 *

Remarks: * fading away. Equipment: FT225RD, GI7B, 3*10 ele DJ9BV at 75m asl, MGF1302 (9BV). Thanks for your report, Hans.

ON1ALJ (JO10VV) wkd on 144 MHz:

1999-05-24

1316 EA5FKX	IM98	59 59
1324 EA5EZJ	IM98	59 59
1339 EA3DXU	JN11	59 59
1341 EA6FB	JM08PW	59 55
1343 EA3CRI	JN11	59 59
1346 EA3TA	JN11AM	59 55
1348 EB3DYS	JN11	59 59
1349 EA3ADW	JN11	59 59

1353 EA3GJO	JN11BI	59 59	*
1359 EA3GJO	JN11BI	59 59	*

Remarks: * lot of QSB, complete? Equipment: TS790E, 40W, 2*10 ele DJ9BV. Thanks for your report, Joe.

ON4KHG writes:

In JO10WK also, we had an Es opening, but of shorter duration compared to PA and DL stations. It was very frustrating to hear stations only 100 km North or East from me working DX while I was hearing absolutely nothing... Finally, later, I could nevertheless work the following stations:

1999-05-24

1338 EA3CRI	JN11CL	59 59	
1341 EA6FB	JM08PW	59 59	
1344 EA3DXU	JN11	59 59	
1346 EB3DYS	JN11	59 59	

Also heard EA5FKX (IM98) and EA3FBA (JN01) but nothing else. The skip was quite short, which is very unusual, meaning a MUF well above 200 MHz. That is the reason why the opening was shorter for me. It seemed that my QTH was about to be the most southern one able to reach the scatter point in a North-South path. I did't hear any Northern F station working Es. The scatter point was about over JN16, as F5HRY (JN18) reported a QSO to JN15 on 6 m. In that area, F8OP reported thunderstorms. For more than ten years of activity, I very often noticed Es scattering clouds over areas were there was thunderstorms...

ON4KHG (JO10WK) wkd on 144 MHz:

1999-06-19

1740 RV3AH	KO85TO	55 53	
1720 RX3PX	KO84SD	55 hrd	

1999-06-20

1141 YO5PLA	KN16SP	59 59	
1142 YO6DBA/P	KN36DA	59 59	
1143 YO6KNY/P	KN36DA	59 59	
1144 YO5CFI	KN16WJ	59 59	
1145 YO4RDN	KN45AK	59 59	
1146 YO4RXX	KN45AK	59 59	
1146 YO4REC	KN45AK	59 59	
1151 YO5QAQ	KN16UG	59 59	
1153 YO4ATW	KN35XG	59 59	
1159 YO9DAX/P	KN44EW	59 59	
1159 YO4WZ/P	KN44EW	59 59	
1200 YO5BWD	KN27GD	59 59	
1213 LZ1UH	KN11SU	59 55	
1625 UT5ER	KN78	59 hrd	*
1631 US5WU	KO20DI	59 59	*
1636 US0UES	KO50PI	56 hrd	*

Remarks: * PA QRT, worked with only 25 W... Equipment: TS440S, Transverter, 120 W, 2x9 el. F9FT. Good DX and let's hope the Es season will be better than the previous ones. Thanks for your report, Gaetan.

PE1HWO (JO21GV) wkd on 144 MHz:

1999-05-24

1256 EA6XQ	JM19LH	59 59	
1312 EA5CA	IM99TL	59 59	
1316 EB5BCF	IM99TK	59 59	
1317 EA6FB	JM08PW	59 59	
1331 EA5FKX	IM98	59 59	
1342 EA3ADW	JN11CQ	59 59	
1343 EA3DXU	JN11CM	59 59	
1344 EA3TA	JN11AM	59 55	
1347 EA3CRI	JN11CL	59 59	
1350 EB3FBA	JN01TG	59 59	
1352 EB3EHJ	JN11	59 59	
1354 EB3DYS	JN11	59 59	

Heard: EA3CP, EB5EE, EA5ZF (IM99WU), EA2HG, EA3DVJ, EA5EGV, EB3FAT(JN01OP), EA7CW, EA5EZJ (JM18) and CT1??? (very short).

1999-06-19

1723 RK3AF	KO85QR	59 59	
1724 RA3DQT	KO95HI	59 59	
1725 UA3DHC	KO96CB	599	599
1731 RK3AF	KO85QR	59 59	

Heard: RX3PX KO84SD, RA3?D? 144.052 ssb in russian only, he didn't speak english and did not respond to cw. No stations in fm.

1999-06-20

1143 YO3APJ	KN34AL	59 59	
1147 HA8AH	KN06MN	59 59	
1150 YO3JW	KN34CK	59 59	
1152 YO2II/P	KN06PE	59 59	
1152 YO2LIO	KN06UG	59 59	
1153 YO2LMM	KN06PD	59 59	
1159 YO5QAQ	KN16UG	59 59	
1159 YO9AZD	KN35AA	59 59	
1205 YO7AQF	KN24KU	59 59	
1205 YO7DEW	KN25ID	59 59	
1211 Z31DX	KN11GD	59 59	

Heard: YO2LEA KN06WK, YO4FRJ/P KN34AW, YO7IV KN24KV, SV0EC KN10CJ (taking his time). No stations in FM.

1999-06-22

1504 YO7VS	KN14VH	59 59	
1510 YO2LHD	KN05WQ	59 59	
1519 YO7IV	KN24KV	59 59	
1524 YO3JW	KN34CK	59 59	

Thanks for your report, André (email: pe1hwo@amsat.org).

S53BU writes:

We had short opening on Monday, 1999-05-24 towards NW Spain and SW France. The opening began at around 12.45 UTC and ended around 13.20 UTC. I worked these stations from JN76GB:

1245 EB1EHO	IN73DM	59+20dB
1255 F6FHP	IN94TR	57
1305 EA1BLA	IN53UM	59+10dB

I used a TM-255E with PA 200W and 11 el. F9FT. Only these three stations were heard here and also worked by S53EA (JN75ET), S53VV (JN65UM), S57JA (JN76GB, he didn't work F6FHP). Thanks for your report, Blaz.

Meteor Scatter

Editor: Norbert Göttsche, DL8LAQ

Dear Readers, don't forget to send in all your reports, experiences and comments about the MS avtivity!

It happens sometimes that I can't recognize what column of your report includes the number of bursts or pings or the tx/rx report. Please don't forget to give me a short hint. In this column the order is bursts, pings and seconds. And here is again the meaning of the short cuts: c = complete, bs = backscatter, m = many, nc = not complete, nil = not in log (no reflections!), r = random, s = ssb, sc = sidescatter and t = tailend.

Send your reports to dl8laq@hamburg.roses.de or to my packet radio address DL8LAQ@DB0HB.#HH.DEU.EU.

73, Norbert

DL1EJA (JO31DS) wkd on 144 MHz:

1999-06-06
0730 OH5A KP53NE 26 26 c
1999-06-08
0700 OH0LIZ KO09KW 26 26 c
1999-06-12
0649 RU1AA KP40XD 38 38 c
1140 IK0OKY JN61GT 26 26 c
1999-06-19
0655 HV4NAC JN61 27 27 c
1999-06-20
0600 SM5TSP JP99CE 27 27 c

Equipment: 4*15 ele Yagi 23m agl, IC720A + LT2S, MGF1302, GS35B. Thanks for your report, Oliver.

DL8EBW (JO31NF) wkd on 144 MHz:

1999-04-09
0400 0445 LA4XGA JP33VC 26 26 6 12 0.7c *1
1999-04-16
0400 0455 LA4XGA JP33VC 26 26 5 16 5.0c *1
1999-04-23
0300 0321 T98LWT JN84AX 26 27 4 13 0.5c
0335 0411 G0KZG/mm IN47 26 27 7 7 1.0c
1930 1955 G0KZG/mm IN37 26 26 6 3 2.0c r
1999-04-28
0330 0430 G0KZG/mm IN18 26 1 5 0.3nc
1999-05-09
0445 0520 G0KZG/mm IO30EH 26 26 7 16 1.0c
1999-05-14
0345 044 0G0KZG/mm IO31 26 26 8 6 4.0c
1999-05-21
0400 0433 LA4XGA JP33VC 26 26 12 15 1.5c *1
1999-05-28
0400 0422 LA4XGA JP33VC 26 36 6 8 2.0c *1
1999-06-04
0400 0421 LA4XGA JP33VC 27 26 12 19 0.8c *1
1999-06-06
0458 0628 OH5A KP53NE 26 26 6 11 0.8c r *2
1999-06-11
0400 0408 LA4XGA JP33VC 27 39 8 8 1.0c *1
1999-06-18
0355 0406 LA4XGA JP33VC 27 29 8 12 1.0c *1
1999-06-20
0554 0620 HV4NAC JN61FT 27 27 8 m 1.0c r
1999-06-25
0355 0416 LA4XGA JP33VC 28 27 7 m 1.0c *1

Remarks: *1 Regular sked to Geir (1320km), to test MS-condx; *2 Thanks Janne for long qrv for me - at least hrd your "SSS" and it took only 3 periodes to complete! Was listening parallel to CH R1 Rfls - tremendous! NIL: 1999-06-09 TA1ZK KM39 1933km , 1999-06-11 TA1ZK KM39 1933km. Equipment: FT726R modified (CF300), 4CX250R abt 300Wtts, 11 ele Flexa, MGF1302, DTR-MS tape recorder (made by DF7KF), ETM9C, RX/TX max 3500lpm, OH5IY Compact-MS-Soft Version 5.0. Every sked for MS, also with stations worked before is very welcome! Thanks for your report, Guido.

Activityreport 144MHz MS IN72/IN82

by EA1/DH3YAK & EA1/DL8EBW

Our first QTH was top of a mountain in abt. 1200m. asl called Valcabado. Absolut free take of over 270 angle and in direction DL the abyss going down abt 400m. At these place we have seen 14 eagles! Thanks for the visit from EA1EPM and friend and family and from EA1ABZ who promissed to go there again... From here (IN72ws) we completed in total 59 MS-QSOs:

1999-05-02 (144.119 MHz)
1530 1608 DL9MS JO54 26 26 20 11 0.5c r
1628 1725 DD0VF JO61 27 27 12 14 2 c r
1732 1808 DJ7OF JO51 27 26 5 m 1 c r
1822 1853 PA2DWH JO22 27 27 12 19 1.5c r
1917 1955 DF8IK JO30 27 27 11 18 1.5c r
1957 2008 DL5MAE JN58 27 27 5 m 2 c r
2012 2022 DK0OG JN68 27 26 6 m 2 c r
2028 2038 S57TW JN75 27 27 m m 2 c r
2045 2145 DL4NAA JN49 28 27 5 3 2 nc r *1
2157 2215 IW1AZJ JN35 27 27 7 7 1 c r
2222 2248 DL5MCG JN58 27 27 6 2 1 c r

1999-05-03 (144.119 MHz)
0350 0432 DL1EJA JO31 27 37 m m 1 c r
0435 0453 DL2ARD JO60 26 26 6 8 2 c r
0457 0513 DK5DQ JO31 27 27 11 7 8 c r
0515 0527 DL3YEL JO41 27 27 7 6 1 c r
0530 0553 DF1BN JO31 27 27 13 m 1 c r
0553 0602 DF7KF JO30 27 27 m m 1 c r
0610 0635 DJ5MS JN68 27 27 9 m 8 c r
0640 0653 S57EA JN76 38 27 8 m 10 c r
0702 0718 I3LGP JN55 27 27 m m 1 c r
0725 0754 DJ2QV JO31 26 27 6 m 0.7c r
0758 0808 DJ3LE JO44 27 27 m m 22!c r *2
0812 0820 DK3BU JO33 28 37 m m 8 c r *2

0822 0832 DJ1OJ JN58 27 38 m m 16 c r *2
0842 0858 DL1DUR JO70 27 27 13 m 1 c r *2
0902 0922 PA9KT JO33 27 27 m m 3 c r
0923 0928 ON4AMX JO20 27 27 6 m 3 c r
0930 0948 PA5DD JO22 27 27 10 3 2 c r
0952 1010 G0FIG IO90 27 27 m m 1 c r
1012 1028 G4PIQ JO01 27 27 8 1 2 c r
1037 1058 I1JTQ JN35 38 27 8 16 7 c r *8
1102 1128 DG3GAG JN48 27 26 7 8 1 c r
1200 1212 G0CUZ IO82 26 26 5 6 1 c *3

1999-05-03 (144.135 MHz)
1700 1800 DH0GHU JN38 26 26 7 3 1 nc
1800 1823 DH1DCN JO41 26 27 6 1 c
2000 2100 OE3MWS JN88 2 nc
2100 2135 DL1UU JO62 36 27 5 3 8 c
2135 2200 DL8CMM JO52 nil *4
2200 2230 DK5KK JO63 nil *4
2230 2300 DL9USA JO71 nil

1999-05-04 (144.135 MHz)
0300 0330 DK8EL JO31 nil
0330 0400 DL5ME JO52 27 26 6 2 1 c
0400 0408 IZ5EME JN52 28 26 m m 2 c
0410 0445 DL4MEA JN58 26 27 7 2 1 c

1999-05-04 (144.119 MHz)
0457 0508 PE1LCH JO23 27 49 6 9 1.5c r
0517 0555 S54AA JN76 27 27 5 22 1.5c r *8
0602 0610 I5WBE JN53 38 37 m m 6 c r
0612 0632 F8DO JN26 28 29 4 m 1 c r
0645 0712 DK9ZY JO40 27 26 13 m 1 c r
0722 0742 DL8CMM JO52 27 27 11 12 1 c r
0747 0820 I1DMP JN35 28 27 8 7 2 c r
0912 0942 DL1SUZ JO53 28 26 14 13 2 c r *5
1002 1017 HB9Q JN47 28 28 12 m 2 c r *6
1042 1112 G0KAS IO91 26 27 11 6 1 c r

1999-05-04 (144.135 MHz)
1500 1545 DF1ZE JN49 26 36 9 3 2 c
1545 1600 HA3UU JN96 nil
1600 1610 PB1TT JO22 27 27 5 2 1 c
1610 1655 DH2OAA JO42 26 27 4 3 1 c
1700 1745 ON7UC JO11 26 38 m m 1 c
1745 1800 DL9GS JO31 2 nc

1999-05-05 (144.135 MHz)
0300 0341 OE6IWG JN77 27 27 7 2 2 c
0345 0400 OE3MWS JN88 nil
0400 0440 G4ZHI IO91 27 26 9 3 32!c
0440 0510 SP2OFW JO93 nil

1999-05-05 (144.119 MHz)
0512 0528 IV3HWT JN65 28 26 17 m 4 c r
0530 0605 PE1OGF JO21 39 4 m 18 nc r
0605 0637 PE1OGF JO21 26 37 7 12 2 c r
0645 0712 IK1LGV JN44 38 27 4 7 10 c r *7
0727 0802 DL6BF JO32 37 27 m m 25!c r
0807 0844 I8TWK JN70 28 37 m m 2 c r *5
0852 0904 F8OP JN26 29 27 4 m 2 c r

1999-05-05 (144.135 MHz)
1000 1035 EA6VQ JM29 26 27 9 m 1 c *8

We were a bit unlucky with the place in IN82 - the national park was not any longer opened for tourists, so we getting in front of a closed door after 3 hours of drive. We took agn 4 hours driving through IN82 to find a suitable QTH, but at all we got the only acceptable QTH abt 100m. far away from these national park again. The only problem, it was 200m lower than the decided place and open from 40-70 only - so we not changed antenna one time - always fixed to 50 and therefor the result (39 QSOs) is a bit lower from IN82lw:

1999-05-06 (144.119 MHz)
0555 0650 DL9MS JO54 26 26 m m 1 nc r
0655 0712 DF7KF JO30 39 27 8 m 15 c r
0715 0753 DK9ZY JO40 39 27 m m 10 c r
0755 0805 DJ1OJ JN58 29 37 5 m 2 c r
0807 0829 F8OP JN26 38 27 m m 6 c r
0832 0838 DJ7OF JO51 37 27 7 3 8 c r
0842 0909 F8DO JN26 29 29 m m 2 c r
0917 0927 I1JTQ JN35 39 27 8 m 5 c r
0928 0938 PE1OGF JO21 28 27 7 m 2 c r
0940 1008 I1DMP JN35 29 37 12 7 45!c r
1012 1058 DL6BF JO32 27 10 7 1 nc r *9
1105 1122 DJ4UF JO30 27 27 10 10 1 c r
1127 1140 I5WBE JN53 28 27 8 m 3 c r
1157 1217 PA3BIY JO22 39 27 7 m 6 c r
1222 1242 G0FIG IO90 26 26 12 2 1.5c r

1999-05-06 (144.135 MHz)
1500 1525 DH9OY JO51 26 26 5 1 1 c
1525 1550 DJ9YE JO43 26 28 5 3 1 c
1600 1614 DL2ARD JO60 27 27 5 6 1 c
1614 1700 DJ2QV JO31 26 27 7 5 1 c
1700 1713 DL1EJA JO31 27 26 7 1 c
1714 1800 DL4DTU JO61 27 27 2 1 nc *10
1700 1800 DD3DX JO31 nil sri
1800 1907 DH1DCN JO41 26 26 5 1 1 c?
1900 1925 DH1TW JN59 nil
1925 1943 DK0OG JN68 27 27 16 m 3 c
1943 2010 DH0GHU JN38 26 2 0.5nc

1999-05-07 (144.135 MHz)
0130 0200 PA2DWH JO22 26 3 2 0.5nc
0200 0250 DK5DQ JO31 26 26 10 4 2 c
0250 0300 PA5DD JO22 nil
0300 0345 G4ZHI IO91 26 26 5 6 1 nc *11
0345 0405 DL5ME JO52 26 26 10 3 c
0405 0414 IZ5EME JN52 26 26 9 m 1 c
0415 0448 S53VV JN65 26 27 5 3 1 c *12
0448 0502 IK1PAG JN35 27 37 5 1 1 c

1999-05-07 (144.385 MHz)
0502 0520 I8MPO JN70 26 27 7 4 30!c s *13
0520 0521 I8MPO JN70 27 27 1 20!c s *13

1999-05-07 (144.135 MHz)
0537 0548 IK0BZY JN61 27 26 3 m 8 c

1999-05-07 (144.119 MHz)
0600 0619 I3LGP JN55 38 37 m m 9 c r
0622 0628 DL4MEA JN58 28 37 m m 2 c r
0630 0704 DH0GHU JN38 27 27 10 13 13 c r
0705 0740 IV3NDC JN55 28 27 m m 2 nc r
0740 0748 DF1CF JN57 29 27 4 m 2 c r
0752 0818 PA9KT JO33 29 27 m m 2 c r
0825 0838 DF8IK JO30 27 27 5 4 1 c r
0850 0906 HB9Q JN47 28 27 11 m 6 c r *6
0916 0932 IV3NDC JN65 28 37 11 8 2 c r

144.119 MHz with EA/DL8EBW - Call of the random-station

144.135 MHz with EA/DH3YAK - Call of the sked-station
144.385 MHz SSB skeds (used our both calls)

Remarks: *1 Sri, we did not catch any RRR - keying sounds poor; *2 Our best rndm-periode in that shower. 4 stn in 1 hour! *3 Excellent Colin - 12min with 40Watts and 5el - congrats QSO was done direct qsy from VHF-Net...(just a test, hi); *4 Both were not qrv due to damaged rig from their own trip; *5 Pse remember IARU procedure - I cant give R R R without getting MY complete call! (therefor I need to send MMM!); *6 Nice to see somebody spreads really +2 kHz!! fb easy qsos; *7 Got your slow speed rrr in 10" burst...; *8 Side- / backscatter QSO; *9 We hrd your RRR after 20min without I txed a R-Rprt - was not able to rescuee these QSO anymore in 50 minutes! *10 Why you stopped after 20min - you was tailend, so continous up to full hour! We lost DD3DX (2 tailend) bcse you stopped! *11 Sorry, nothing hrd after 25min from you - any defects? *12 Sorry, we missed some periodes due faulty generator! *13 As regular in our expedition we run an SSB Sked to Lucio - also this time one big reflection (total around 50") occured and so we was able to make two QSO (EADH3YAK & EADL8EBW,) hi.
Equipment: FT225(Mutek), Discovery 3CX800A7 abt 600Wtts, 12el M2 on abt. 6m. over the caravan, SSB RX-Ampl. , DTR-MS tape recorder (made by DF7KF), OH5IY Compact-MS-Soft Version 4.2 on Laptop.
Direct incomming QSLs (with SASE) will be answered direct - QSLs via buro will be answered via buro of course! QSL-Adress: DH3YAK, W.Recker, Max-Kolbe-Str. 22, 59348 Luedinghausen or DL8EBW, G. Juenkersfeld, Gustav-Freytag-Str.1, 42327 Wuppertal.
Again many thanks going to EA2LU, EA1EPM & friend, EA2AZW and EA1ABZ for all their help and hospitality. Without these, we were not able to give these both squares to so many peoples... We hope you have had same fun as we have had at our trip - we be sure there will be a next activity one day again! Kind regards, 73, Winfried and Guy, VHF-DX-Group DL-West. Thanks for your report, Winfried and Guy.

F1FIH (JN23GS) wkd on 144MHz:

1998-11-17

0441	SM4VQP	JO79	38 38	csr
0446	OK1CDJ	JO70	59 59	csr
0449	DL5WG	JO52	59 59	csr
0451	SP4MPB	KO03	59 59	csr
0453	9A1CAL	JN86	37 37	csr
0454	DK5KK	JO63	59 59	csr
0456	OK1UAK	JO70	39 39	csr
0457	DL2ARD	JO60	39 39	csr
0459	S57TW	JN75	59 59	csr
0459	DL5WG	JO52	37 37	csr
0500	DL5ME	JO52	57 56	csr
0501	SP6GVU	JO81	37 37	csr
0503	CT1FAK	IN50	39 39	csr
0505	DK5KK	JO63	59 59	csr
0509	HB9SUL	JN46	59 59	csr
0511	CT1CAD	IM67	59 59	csr
0520	HG8CE	KN06	59 59	csr
0534	G8XVJ	IO83	39 39	csr
0539	SP2FAX	JO83	59 59	csr
0539	LY2FE	KO05	59 59	csr
0542	PA3DYS	JO21	39 39	csr
0543	DH7FB	JO62	59 59	csr
0544	S51AT	JN75	59 59	csr
0545	DL1EJA	JO31	59 59	csr
0547	OZ1CTZ		59 59	csr
0548	OK1FFD	JO60	59 59	csr
0550	DL2HWA		59 59	csr
0553	PA3BIY	JO22	59 59	csr
0553	DJ3VI	JO51	59 59	csr
0553	YT1VV	JN94	59 59	csr
0554	LY3ED	KO14	59 59	csr
0554	OM5RW		59 59	csr
0555	SP5CCC	KO02	59 59	csr
0556	DL1HTT	JO61	59 59	csr
0557	LY2MW	KO24	59 59	csr
0601	PE1BVM	JO21	59 59	csr
0602	PA3CEE	JO33	59 59	csr
0606	OK1VSO	JN79	59 59	csr
0606	OK2ZZ	JN89	59 59	csr
0608	DL1SUN	JO53	59 59	csr
0609	DF9PX	JN49	59 59	csr
0630	YT4D	JN94	59 59	csr
0632	SP2SGZ	JO82	59 57	csr
0641	DK1KO	JO53	59 59	csr
0642	LA2PHA	JO38	57 57	csr
0708	SM4VQP	JO79	59 59	csr
0708	SP9EWO	JN99	59 59	csr
0709	DG7MHJ	JN57	57 59	csr
0711	LA5KO	JO59	37 37	csr
0714	DG7MHR	JN57	59 59	csr
0720	DJ2QV	JO31	59 59	csr
0721	OZ5AGJ	JO56	59 59	csr
0722	LY2SA	KO14	59 59	csr
0723	DL9MS	JO54	59 59	csr
0725	YU7KB	JN94	57 59	csr
0733	DJ4SO	JO44	59 59	csr
0733	LA0BY/P	JO59	59 59	csr
0733	PA0ZM	JO32	59 59	csr
0734	DL5CC	JO64	59 59	csr
0735	DL1SUZ	JO53	59 59	csr
0736	PE1PJG	JO33	59 59	csr
0736	SM6EAN	JO57	59 57	csr
0737	DL2ARD	JO60	59 59	csr
0738	DD0VF	JO61	59 59	csr
0738	OZ1BPN	JO56	59 59	csr
0741	DL5ZA	JO5?	59 59	csr
0741	DL3ALI	JO50	57 57	csr
0742	SP2SGZ	JO82	59 59	csr
0743	SP5CCC	KO02	57 57	csr
0743	DL1SUN	JO53	59 59	csr
0750	OZ6OL	JO65	59 59	csr
0750	DL5XV	JO53	59 59	csr
0751	DJ5BV	JO30	59 59	csr
0801	EA7BGR	IN80	57 57	csr
0831	SP7JSG	KO01	37 37	csr
0843	OZ1LPR	JO44	59 59	csr
0851	YU7KB	JN94	59 59	csr
0856	OK2DL	JN89	59 59	csr
0909	LA3FV	JO59	27 59	csr
0909	S57TW	JN75	57 57	csr
0915	DJ0EM	JN37	57 59	csr
0920	SK7HW		37 37	csr
0931	LA0BY/P	JO59	59 59	csr
1001	LA0BY/P	JO59	59 59	csr

1998-11-18

0941	YU7EW	KN05	37 37	csr

73, Michel. Thanks for your report, Michel.

LA0BY in JO59FW wkd on 144 MHz:

1998-12-13								
0847	0920	F6FHP	IN94	27	7	3	1	ncr
1447	1512	YU7MS	KN05EF	27	28 4	2	1	cr
1998-12-14								
0232	0242	RU1A	KO48VR	27	27 5	3	3	cr
0257	0326	9A5Y	JN85OO	28	29 m	m	10	cr
0330	0340	S53VV	JN65	28	28 m	m		cr
0345	0355	DL5YET	JO41EV	37	27 7	3	6	cr
0420	0432	S51AT	JN75GW	37	28 3	3	5	cr
0510	0532	PA3FOC	JO22	37	27 6	13	25	cr
0615	0710	DN2MS		26	26 7	13	2	cr
2205	2235	PA6T	JO32EH	27	28 16	7	3	cr
2240	2308	I3LGP			27			ncr
1999-01-03								
2305	2350	IK4DCX	JN64	27	27			ncrs
2348		9A1CAL	JN86EL	27	27			ncrs
1999-01-04								
0000	0030	LZ1ZX	KN32IO				nil	2223 km
0040		I2FAK	JN45OB	38	38 1		20	crs
0045	0050	IK4DCX	JN64	38	27 6		20	crs
0058	0101	I4XCC	JN63GV	38	27 3		20	crs
0122	0137	DG9NCX	JN59BT	38	39 2		10	ncrs
0143	0158	9A4VM		38	38 6		10	crs
0202	0212	S51DI		28	26 6		8	crs
0218	0222	YU1WP	JN94	27	27 3		10	crs
0220	0226	SP9EWO	JN99HW	38	37 2		10	crs
0244	0258	S51AT		28	27 3		8	ncrs
0306	0308	9A1CAL	JN86EL	28	37 3		10	crs
199904-24								
0258	0330	T98CHR	JN84AX	27	27 8	4	2	c

Thanks for your report, Stefan.

MS expedition to KN08

OM7AQ (KN08AM) wkd on 144 MHz:

1998-08-11						
1200	F1NSR	JN33			nil	s *1
1700	DG5OAF	JO51	27	37	c	s
2316	IW0DBO		37	37	c	r s *2
1998-08-12						
1050	IW2BNA	JN45	27	36	nc	r *2
1125	F6FHP		27	36	c	r
1248	F6CRP	IN96	37	38	c	r *3
1800	HB9FAP	JN46			nil	s *4
2018	RA3QTT		28		nc	r *5
2153	I6BQI		38		nc	r *5
2241	GM4AFF		38		nc	r s *6
1998-08-13						
0404	DJ5BV		38		nc	r s *6
0415	PE1BVM		37		nc	r s *6
0450	ON6NL		37	37	c	r s
0455	LA5KO		36		nc	r s *6
0505	MS0AGC/p		36		hrd	r s *6

Remarks: *1 Sorry, I could not be qrv; *2 Very qrm; *3 Ufb qso! Many thanks! *4 No reflections; *5 Local qrn (thunderstorm); *6 Very strong qrm from local stations. Equipment: PA RE025XA (450W), preamp CF300, 16 ele F9FT. For MS we used software MS-DSP by 9A4GL and Compact MS-SOFT v5.0 by OH5IY. Participants of these expedition: OM7JG, OM7PY and OM7AQ. I am qrv on MS from home (JN98UI). Skeds via eMail om7aq@gw.ha3kgc.ampr.org or ax.25 OM7AQ@OM0PBB.SVK.EU. Thanks for your report, Zoli, OM7AQ.

PA0ZM writes:

I'm not a crack on MS . I managed to score a nice amount of QSO's. For me it was really marvelous to hear so many reflections, so strong and a so long duration. During the period from 0730 UTC to 1030 UTC the reflections some times lasted for about 10 minutes caused by a multiple of meteortrails, which could be derived from the variation in signal strenghts, during a reflection period. It was sometimes such a pile-up that it was difficult to come through or to get a confirmation from the other side. But nevertheless it was a one time experience, only overshadowed by the fact we did not have a clear sky and that the maximum occured during daylight.

PA0ZM (JN32GK) wkd on 144 MHz:.

1998-11-16						
2305	S51TE	JN76BI	49	37	c	s r
2321	OH6KTL	KP02OJ	38	26	c?	s r
2330	SP2FAX	JO83	39	27	c	s r
2345	9A1CCY	JN85OO	59	36	nc	s r
2355	LY2MW	KO24PQ	59	37	c	s r
1998-11-17						
0003	CT1FOH	IN58AR	37	37	c	s r
0005	OH5LK	KP30	36	26	c	s r
0015	SP4MPB	KO03GS	37	37	c	s r
0035	YT1VV		37	37	c	s r
0044	YU1EW	KN05	37	59	c	s r
0058	HA6NQ	JN98UW	39	59	c	s r
0108	OE3SA		37	37	c	s r
0112	9A1CCY	JN85OO	37	59	c	s r
0115	UT8AL	KO61WF	37	59	c	s r
0120	IW3DAN	JN53GU	39	39	c	s r
0125	S51AT	JN75GW	39	39	c	s r
0128	9A1RKV	JN74OC	39	39	c	s r
0132	I8MPO	JN70FP	39	37	c	s r
0133	9A3PA	JN85EL	38	39	c	s r
0136	OH1XT	KP01UK	39	39	c	s r
0145	EA9AI	IM75IV	37	39	c	s r
0200	YU7MS	KN05	39	37	c	s r
0205	9A4EW	JN95JG	39	39	c	s r
0211	S51TE	JN76BI	37	27	c	s r
0235	ES2RJ	KO29JM	27	27	nc	s r
0240	RV3EG		37	59	c	s r
0244	HA6NQ	JN98UW	59	59	c	s r
0308	EA3TI	JN11DC	59	59	c	s r
0310	EA4BAZ	IN80	59	59	c	s r
0314	EA/DF9OX	IM88XM	59	59	c	s r
0320	ES2RJ	KO29JM	39	39	c	s r
0330	OH6KSR	KP22VG	59	59	c	s r
0330	LA5KO	JO59	39	39	c	s r
0353	RW1AW	KP50EB	59	59	nc	s r
0402	UR5LX	KO70WK	55	55	c	s r
0720	LZ2FO	KN13KX	37	37	c	s r
0735	F1FIH	JN23GS	59	57	c	s r
0737	HB9SUL	JN46LA	59	59	c	s r
0828	I8TWK	JN70GR	59	59	c	s r
0831	S53VV	JN65UM	59	37	c	s r
0834	SV0EC	KN10AQ	59	59	c	s r
0847	EI4DQ	IO51WU	59	59	c	s r
0855	YU4NC		59	59	c	s r
0857	HB9FAP	JN46EW	59	59	c	s r
0935	SM3COL	JP82XP	59	59	c	s r
0936	RW1AW	KP50EB	59	59	c	s r
1016	EA2LU	IN92ET	59+	59+	c	s r *1
1022	YU7KB	JN94XX	59	59	c	s r

1026	YU1WP	JN94	59 59	c s r
1035	IZ5EME	JN52NS	59 59	c s r
1036	IW1AZJ	JN35UB	59 59	c s r
1040	F1NSR	JN33JH	37 39	c s r
1057	I8TWK	JN70GR	59 59	c s r
1059	IW3DEC		37 37	c s r
1121	HA2SX		37 59	c s r
1215	ON4IM		59 59	Tropo!
1217	F1YJ		57 56	Tropo!
1998-11-18				
0050	HA3UU	JN96	39 39	c s r

Remarks: *1 Very strong and long reflections. Equipment: 85W (!), 10 ele Yagi 30m asl. Thanks for your report, Geert.

PE1HWO (JO21GV) wkd on 144MHz:

1999-01-04				
0254	9A2PT	JN75	37 37	c r s
1999-05-22				
0900 0935	EA6VQ	JM19MP	37 26 m m	c
1999-05-30				
0700 0905	TK5JJ	JN41JW	26 26	c
1999-06-03				
2215 2255	LY2BIL	KO24OQ	37 26 m m	c
1999-06-09				
0530 0615	S55AW	JN75DS	28 26	c
1999-06-12				
0400 0440	IK1LGV	JN44JK	27 27 6 10 10	c
1999-06-12				
0610 0630	RU1AA	KP40XD	27 28 m m	c r
1999-06-13				
0500 0536	9A2RD	JN65TF	27 27 1	c s
1999-06-14				
0455 0510	LY2FE	KO05OQ	27 27	c r
1999-06-15				
0600 0630	OE6IWG	JN77PK	26 26 14 13 1	c
1999-06-17				
0400 0430	HA8CE	KN06EN	27 27 12 19 2	c

Equipment: FT-101ZD + TRV, MGF1302, 4CX250B, 17 ele Yagi, MSDSP 070b. Thanks for your report, André - PE1HWO @ PI8VNW.

SURPRISE 1998 LEONID DISPLAY WAS A LARGE BLAST FROM THE PAST

In the early hours of 17th November last year (1998), meteor watchers awaiting the Leonid shower were taken by surprise when a spectacular display of bright meteors occurred 16 hours before the predicted time for the maximum of the shower. The explanation has now been uncovered as a result of research by Dr David Asher and Professor Mark Bailey, of Armagh Observatory, and Professor Vacheslav Emel'yanenko, of South Ural University, Chelyabinsk, Russia. They have shown that the bright meteors were seen when Earth passed through a dense arc-shaped cloud of particles shed from Comet Tempel-Tuttle in the year 1333. By matching theory and observation, Dr Asher and colleagues have proved for the first time that meteoroid streams associated with Halley-like comets have complex braid-like structures within them. This work points the way to more precise predictions of the timing and intensity of meteor showers in the future. These results are reported in the 21st April 1999 issue of the Monthly Notices of the Royal Astronomical Society.

The Leonid meteor shower occurs between 15 and 21 November each year, with peak activity on the night of the 17/18 November. These meteors are produced when small dust particles ejected from Comet Tempel-Tuttle enter the Earth's atmosphere at high speed and burn up. Comet Tempel-Tuttle moves around the Sun in an elliptical orbit taking approximately 33 years for a complete revolution. Its orbit is similar to that of Halley's Comet, and so Comet Tempel-Tuttle is classified as a Halley-type short-period comet. Owing to the large angle between the Earth's orbit and the comet's (162 degrees), the dust grains collide almost head-on with the Earth, and hit the atmosphere at about 71 kilometres per second. At this speed, a one-centimetre particle carries the same amount of energy as a speeding truck on a motorway.

Every 33 years or so, when Comet Tempel-Tuttle passes near to the Earth, the intensity of the Leonid display is greatly enhanced because the stream of dust grains is more densely packed close to the comet. Meteor 'storms' have been seen many times during the past thousand years, notable events being those of 1799, 1833, 1866 and 1966. The earliest record of Leonid meteors dates back to the year 899.

November 1998 saw astronomers preparing for a possible meteor storm during the night of 17/18 November. Although a moderately strong peak was observed as predicted, the meteor shower as a whole was dominated by the appearance of hundreds of exceptionally bright meteors, known as fireballs, more than 16 hours ahead of the predicted peak.

The intensity and duration of this exceptional event indicated that the Earth must have passed through an extremely dense, narrow stream of large dust grains and particles,

having sizes ranging up to several centimetres. The timing suggested that these particles occupied an orbit somewhat different from the main stream of small grains, and that they left the comet's nucleus many hundreds of years ago. But in that case, it is necessary to explain why the stream has held together so tightly for so long.

To solve the problem, Dr. David Asher and his co-workers calculated the motion of large dust grains ejected from the comet at each of the last 42 occasions when it made its closest approach to the Sun. (Comets release very little dust, if any, when they are far from the Sun's heat.) They checked each case to see whether any of the particles could explain the fireballs seen in 1998, and identified September 1333 as the time when most of the observed particles were released. These particles did not spread out in space because of a dynamical process known as a resonance. (A similar process gives rise to the fine structure seen in Saturn's rings.)

Many comets and asteroids swing around the Sun in orbits that are simple multiples of the orbital period of Jupiter, the most massive planet in the solar system and the biggest disturbing influence on cometary orbits. Comet Tempel-Tuttle is no exception to this rule, having entered one of these 'resonant' orbits as long ago as the seventh century AD. For every fourteen revolutions of Jupiter, Comet Tempel-Tuttle makes five, and the same relation holds true for the largest dust particles gently released by the comet.

The large grains therefore have average orbital periods very close to that of the comet, and are kept in step by the influence of Jupiter. Instead of spreading around the whole orbit, they occupy a rather short arc, leading to the formation of a dense strand of large particles, distinct from the 'normal' storm strands of small particles, ahead of and behind the comet. The structure of the meteoroid stream close to the comet can be visualized as rather like a telephone wire, made up of many separate, narrow strands. These form a complex, braided structure of material within the broader, ribbon-like meteoroid stream.

The calculations by David Asher and co-workers showed that in November 1998 most of the resonant arcs missed the Earth by a wide margin, but the arc of particles released in 1333 cut right through the Earth's orbit, and the calculated time for when this happened matched the observed fireball maximum to the hour.

This remarkable result is the first observational demonstration of one of the most important dynamical features of meteoroid streams associated with Halley-type short-period comets. The work highlights the presence of fine structure *within* meteoroid streams, and suggests important new avenues for research. For example, by observing the variations in meteor rates close to the peak of a shower it may be possible to infer the precise distribution in space of the meteor-producing strands. Variations in meteor rates may be correlated with changes in the meteor brightness distribution to infer the history of mass loss by a comet over many revolutions around the Sun.

The researchers are not expecting a repeat performance of bright fireballs in November this year (1999). All the resonant strands in the meteoroid stream will be well past Earth in space. However, a strong 'normal' display is likely, peaking at about 2 a.m. on November 18th, due to meteoroids ejected from Comet Tempel-Tuttle in the years 1866, 1899 and 1932, which have not yet had time to disperse around the comet's orbit.

(from Royal Astronomical Society Press Notice, Ref. PN 99/09)

News & Comments

Editor: Klaus Tiedemann, DL4EBY

44th Weinheim VHF Convention

Just a few days after the deadline of last DUBUS issue, the dates and location of the VHF Convention in Weinheim 1999 was **changed!** The weekend now is again the third (not second) weekend in September: **1999 Sept. 18/19**. The new location is a few kilometers from Weinheim in the "**Mannheimer Maimarkthalle**".

Here are some details:

"This convention hall has a lot of advantages for all hams. The complete exhibition (including fleamarket) takes place in the halls free of rain. The new congress center near by provides all that is needed for a successful convention, combined with short walks, even the parking place is close.

The move was necessary as Weinheim didn't agree the convention to go back to the 'good old Multschule', and the tents were far away from the optimum. Even though it is not in Weinheim, it still will be the "Weinheim VHF Convention"!

See also: http://home.t-online.de/home/zweiburgenapotheke/afuukw.htm

UKW-Tagung Weinheim

Kurz nach dem Redaktionsschluss des letzten Heftes wurden Zeit und Ort der UKW-Tagung **geändert!** Neuer (alter) Termin und neuer Veranstaltungsort:

Die 44. UKW-Tagung findet am **18./19. September 1999** statt, also doch am 3. Wochenende im September. Ausserdem wurde der Veranstaltungsort ein paar Kilometer verlegt. Die UKW-Tagung findet in der "**Mannheimer Maimarkthalle**" statt.

Die Messehalle des "Maimarktes" bietet uns Funkamateuren eine Menge Vorteile. Die gesamte Ausstellung (inklusive Flohmarkt) kommt in der Halle trocken unter. Das neue Kongresszentrum direkt nebenan, bietet alles, was für eine fruchtbare Tagung nötig ist. Und das bei kurzen Wegen, selbst der Parkplatz liegt direkt gegenüber. Den Ortswechsel haben wir vollzogen, weil uns, nachdem unsere "gute alte Multschule" renoviert und umgebaut ist, in Weinheim kein Platz mehr für die UKW-Tagung zur Verfügung gestellt wurde. Das improvisierte Messegelände mit Zelt und langen Wegen wollen wir unseren Besuchern nicht mehr zumuten.

Wenn noch Amateure etwas Neues aus dem VHF/UHF/SHF-Bereich vorstellen wollen, wenden Sie sich bitte direkt an Achim Vollhardt, DH2VA. Die Vortraege können in deutsch oder in englisch gehalten werden. Zusagen für Referate sollten bis 30.06.1999 eingegangen sein. Wenn ein Beitrag im UKW-Tagungs-Skript aufgenommen werden soll, muß dieser bis zum 25.7.1999 vorliegen.

Ein Hinweis zum Flohmarkt: Dieses Jahr sind keine Zelte noetig. Alle duerfen mit unters Dach.

Aussicht: Nach vierjährigem Provisorium, wird die UKW-Tagung wieder räumlich zusammenrücken und so zu einem echten Treffpunkt für alle FunkamateurInnen werden. Trotz kurzer Wege wird das Platzangebot für alle deutlich erweitert. Auch wenn die UKW-Tagung nicht mehr auf Weinheimer Gemarkung stattfindet, bleibt es doch unsere Veranstaltung.

Siehe auch: http://home.t-online.de/home/zweiburgenapotheke/afuukw.htm

NEW!

ACHTUNG – ATTENTION!
Korrektur für DUBUS BUCH TECHNIK 5!
Correction for DUBUS book TECHNIK 5!

1. Bug on Page 52/Table 1 Mechanical Data for BV6-1wl: Lengths for all elements are wrong

Table 1: Mechanical Data for BV6-1wl (6 El.)

Element	Position [mm]	Boom-Diam. [mm]	Element-Length [mm]
R	0	30	**2966**
DE	922	30	**2850**
D1	1232	30	**2734**
D2	2411	30	**2734**
D3	4329	30	**2702**
D4	5850	30	**2670**

Beacon List

Editor: Joachim Kraft, DL8HCZ

CALL	QRG	WW	POWER	ANTENNA	QTF	ASL	MODE
9A1CAL	50,000	JN86EL	1W	VERTICAL	OMNI	330	
GB3BUX	50,000	IO93BF	15W ERP	TURNSTILE	OMNI	460	A1A
HC2FG	50,000	EI97	5W	JPOL	OMNI		
LU8YYO	50,000	FF50	1,5W	VERTICAL			
VE1SMU	50,001	FN84	25W	11 ELE	90		
7Q7SIX	50,003	KH75	5W				
BV2FG	50,003	PL05RA	3W	5/8 V			
4N0SIX	50,004	KN04FU	1W	DIPOLE	N/S	400	
HV3SJ	50,004	JN61FV		QRT			
I0JX	50,004	JN61HV	4W	3 ELE	NW		
ZS2SIX	50,005			PROPOSAL			
EH7AH/B	50,006	IM67		5 ELE	280		
DX1HB	50,008	PK04	20W	HORIZONTAL	QRT NOW		
OK0EK	50,011	JN79					
SV9SIX	50,011	KM25NH	30WERP				
OX3SIX	50,012	HP16	100W				
LZ1JH	50,013	KN22TK	1W	GP	OMNI		
9M6SMC	50,014	OJ85AX	3W	GP	OMNI	100	
CU3URA	50,014	HM68QM					A1A
S55ZRS	50,014	JN76HD	8W	GP	OMNI	1219	A1A
LU9EHF	50,015	FF95	15W				
KD4AOZ	50,016	EM83					
V51VHF	50,018	JG87MH	670W	5/8 V	OMNI		
CX1CCC	50,019	GF15					
GB3SIX	50,020	IO73TJ	100W ERP	3EL. YAGI	270	58	F1A
OZ7IGY	50,021	JO55VO	20W ERP	TURNSTILE	OMNI	92	A1A
4N6SIX	50,022	JN62		PROPOSAL!			
FR5SIX	50,022	LG78	2WERP	HALO	QRT NW	2896	F1A
XE1KK/B	50,022	EK09IK	20W		OMNI		
LX0SIX	50,023	JN39AV	5W	HOR. DIPOLE			
SR5SIX	50,023	KO02PC	5W	DIPOLE	W/E		A1A
9H1SIX	50,025	JM75FV	25W	5 ELE.			F1A
OH1SIX	50,025	KP11QU	50W ERP	8 X DIPOL	OMNI	157	A1A
ZP5AA	50,025	GG14	VERTICAL				
JE7YNQ	50,027			=EX JA7ZMA			
SR6SIX	50,028	JO81HH	10W	1/4GP	OMNI	140	F1A
XE2UXL	50,028	DM10XL	50W	SQ-LOOP	OMNI	200	
SR8SIX	50,029	KN19CN	10W	DIPOLE	QRV NOW		
CT0WW	50,030	IN61GE	40W	CROSSDIPOLE	OMNI	800	F1A
CS1ACP	50,031	IN61					
VE6QRM	50,031	DO21	25WERP	4 ELE YAGI	20		
ZD8VHF	50,032	II22TB	25W	5 ELE.	45		
ZB2VHF	50,035	IM76	35W	90% QRT			
ES0SIX	50,037	KO18PO	15W	DIPOL	E/W	35	DOT
FP5XAB	50,038	GN16	15W	DIPOLE HOR.		40	
FY7THF	50,039	GJ35	100W	GP	OMNI		F1A
SV1SIX	50,040	KM17UX	30W ERP	V-DIPOLE	OMNI		
VO1ZA	50,040	GN37					F1A
ZL3SIX	50,040	RE66	70W	2 X DIPOLE	NW/NE		
YB0ZZ	50,042	OI33		GP		20	
GB3MCB	50,043	IO70OJ					
R3VHF	50,043	LO16XG		PROPOSAL			
YO2S	50,043	KN05PS	2W	DIPOLE			

CALL	QRG	WW	POWER	ANTENNA	QTF	ASL	MODE
ZL3MHF	**50,043**	RE66	20W	VERTICAL			
VE6ARC	**50,044**	DO05	30W		OMNI		A1A
ZS6TWB	**50,044**	KG46RD	15W	3 ELE	330		
OX3VHF	**50,045**	GP60QQ	20W	GP	OMNI	70	A1A
4N1SIX	**50,046**	KN04OO	10W	GP	OMNI	196	
JW7SIX	**50,047**	JQ68TB	10W	3ELE	180		
TR0A	**50,048**	JJ40	10W	GP	OMNI		
VE8BY	**50,048**	FP53	30W	V	OMNI		FSK
5W1WS	**50,050**	AH46	60W	5ELE			
GB3NHQ	**50,050**	IO91VQ	15W ERP	TURNSTILE	OMNI	35	F1A
VA3BCN	**50,050**	FN03					
ZS6DN/B	**50,050**	KG44	100W	5 ELE			
LA7SIX	**50,051**	JP89MB	20W	4ELE	180		
Z21SIX	**50,052**	KH52NK	3W	DIPOLE			
PI7SIX	**50,053**	JO22NC					
VE3BEE	**50,053**	DN09	10W	5ELE			
VK3SIX	**50,053**	QF02WH	10W	9ELE			
OZ6VHF	**50,054**	JO57EI	50WERP	TURNSTILE	OMNI	70	A1A
J3EOC	**50,056**	FK92	1.6W				
VK7RNW	**50,057**	QE38	20W	X-DIPOL			
VK8VF	**50,057**		20W	VERTICAL			
4X1IF	**50,058**	KM72	3W	HALO			
PY2AA	**50,059**	GG66	5W	GP	OMNI	850	
VE3UBL	**50,059**	FN09	8W	HORIZ	OMNI		
GB3RMK	**50,060**	IO77UO	40W	FOLDED DIPOLE	0/180	270	F1A
GB3NGI	**50,062**	IO65PA	18W ERP	DIPOLE			F1A
OZ2VHF	**50,062**	JO45FL	1W	DIPOL	N/S		
GB3LER	**50,064**	IP90JD	100W ERP				
GB3IOJ	**50,065**	IN89WE	25W ERP	TURNSTILE	OMNI	115	F1A
VK6RPH	**50,066**	OF88AA	10WERP	DIPOLE	OMNI	317	
OH9SIX	**50,067**	KP36OI	35W ERP	2 X X-DIPOL	OMNI	192	A1A
K2ZD/B	**50,068**	FN20	20W	5/8 VERTICAL	OMNI		
K6FV	**50,069**	CM87					
EA3VHF	**50,070**	JN11MV	10W	GP	OMNI		A1A
SK3SIX	**50,070**	JP71XF	10W	X-DIPOLE	OMNI	500	
ES6SIX	**50,073**	KO37MT	10W	GP	OMNI	85	A1A
EA8SIX	**50,075**	IL28GC	10W				
JY6ZZ	**50,075**	KM71	8W	5/8 V			
VR2SIX	**50,075**	OL72	30W ERP	GP	OMNI		
YO3KWJ	**50,075**	KN34BJ	5W	GP	OMNI		
KD4HLG/B	**50,076**	EM73	10W	AR7			
PY2AMI	**50,076**	GG67	10W	GP	OMNI		
KE4SIX	**50,078**	EM83	5W	RINGO RANGER	OMNI		
OD5SIX	**50,078**	KM74	10W	GP			
PT7BCN	**50,078**	HI06					
VK4BRG	**50,078**	QG48	1W	TURNSTILE			
JX3SIX	**50,079**	IQ50OV	10W	5 ELE	160		QRV?
JX7DFA	**50,079**	IQ50OV		QRV 1.4.98 TO	1.8.98		
SK6SIX	**50,080**	JO57QJ		QRT??			
ZS1SES	**50,080**	JF96JC	10W	HALO	OMNI		
LZ1SIX	**50,082**	KN12	1W	TEMP. QRT	OMNI	1600	
VE9MS/B	**50,087**	FN65RR	10W	QUADLOOP	OMNI		
YU1SIX	**50,087**	KN03KN	10W	GP	OMNI		F1A
LW5EJU	**50,090**	GF05NM	12W	DIPOL			
CN6VHF	**50,093**	IM64NA	6W	PROPOSAL	OMNI		
TU2VHF	**50,094**	IJ7					
CT0SMB	**50,100**	IM59SK	250MW	DIPOL	OMNI	1600	F1A
UL7JC/P	**50,150**	NN19NX					
IS0A	**50,163**	JM49NG	1W	DIPOLE			
VK0AQ	**50,200**	OC53MM	50W	3 ELE	NE		FSK
ZR1DCEZS8	**50,200**	KE82	10W	DIPOLE	N/S		
F6IKY	**50,230**	JN35AT	0,75W	5ELE	0	700	
OM0MRA	**50,240**	JN88NE		PROPOSAL		570	
GB3IFX	**50,275**	IO94FM	35W	2 X 6 ELE	180		

CALL	QRG	WW	POWER	ANTENNA	QTF	ASL	MODE
VK3RMV	**50,293**	QF12AH	15W	V			
VK6RSX	**50,304**	OG77	50W	U-DIPOL	OMNI		
VK6RBU	**50,306**	OF76	100W ERP		260	300	
VK6RTW	**50,308**	OF85	10W	DIPOL			
FX4SIX	**50,315**	JN06CQ	25W	2*DIPOLE	OMNI	153	A1A
ZS5SIX	**50,321**	KG50	10W	HALO			
FC1FNH	**50,418**	IN96LD	10W	QRT NOW			
5B4CY	**50,500**	KM64HT	35W	5 ELE. YAGI	WNW	2000	A1A
SV9-RADAR	**50,521**	KM25	1KW	4 X 11 ELE			
ZS1STB	**50,904**	KF04	25W	GP			
ZS6SIX	**50,950**	KG33	10W	3 ELE			
VK4RIK	**52,445**	QH23TE					
GB3BUX	**70,000**	IO93BF	20W ERP	2*TURNSTILE	OMNI	460	A1A/3E
ZS5MTL	**70,005**	KG50IG	50W	OMNI	QRV?		
GB3REB	**70,010**	JO01GK	28W ERP	2ELE	66	65	F1A
GB3ANG	**70,020**	IO86MN	100W ERP	3EL. YAGI	160	370	F1A
GB3MCB	**70,025**	IO70OJ	40W ERP	2 EL.YAGI	45	320	F1A
S56A	**70,030**	JN76	1W				
5B4CY	**70,112**	KM64LU	10W	4 ELE. YAGI	WNW	117	F1A
ZB2VHF	**70,120**	IM76HE	50W	4ELE QUAD	0		F1A
EI4RF	**70,130**	IO63SN	25W ERP	2*5EL. YAGI	NE/SE	120	A1A
U6L	**144,040**	LN07BQ					
U6Y	**144,085**	LN04BO	1.5W	DIPOLE	0/180		
V51VHF	**144,115**	JG87MH	70W	11 ELE.	0	2300	A1A
UZ9UT	**144,122**	NO35BI	15W	9EL. YAGI	270	260	A1A
OE3XAA	**144,126**	JN88BA		QRT			
5B4CY	**144,139**	KM64HT	40W	6+6EL. YAGI	NW	2000	A1A
UZ3MWQ	**144,157**	KO87SV	5W	TURNSTILE	OMNI	130	A1A
R9XI	**144,160**	MP06CA	5W	16 ELE.	350		A1A
UL8PWA	**144,162**	MN69					A1A
KH6HME	**144,170**	BK29GO	1200W ERP	2X7Y	TO CA	2501	
UZ3PWJ	**144,180**	KO93BD		TURNSTILE	OMNI		A1A
UA9C	**144,189**	LO96WW	3W	2*DIPOLE	OMNI	??	A1A
UB4JXN	**144,190**	KN65TT					A1A
UZ6AWA	**144,193**	KN95LB	5W				A1A
UA4NX/A	**144,199**	LO49JJ	10W	9 ELE YAGI	360	230	A1A
RL7BZ	**144,201**	MO31FW		9 ELE.	90		A1A
UT4JWD	**144,201**	KN64RO	3W		OMNI		A1A
UA9UKO	**144,225**	NO33					
UA0W	**144,244**	NO53OU		9 ELE.	270		A1A
UB4CWY	**144,245**	KN59TM	3W		OMNI		A1A
UR4CWY	**144,250**	KN59TM	5W	GP	OMNI	200	
UZ3TYA	**144,250**	LO16QT	5W	9 ELE.	SE		A1A
UZ9AWA	**144,250**	MO05QD	5W	DISCONE			A1A
UA9KK	**144,268**	MP65LN		6 ELE.	0		A1A
UL7BBT	**144,275**	MO51QE		12 ELE.			A1A
ER5C	**144,276**	KN45DU	1W	DIPOLE			
UA6XBO	**144,282**	LN13TM	5W	7 ELE	330		A1A
W1RJA	**144,282**	FN42CJ	60W	5 ELE	60		
W6KGS	**144,288**	DM13AS				60	
UZ9AWD	**144,293**	LO93MI	5W	4*ZICKZACK			A1A
UZ9YWQ	**144,300**	NO23WJ		5 ELE.	0/270		A1A
VE1KG	**144,300**	FN84	250W	4 X 10 ELE	EUROPE		
UZ3UZA	**144,313**	LO06LX		DIPOLE			A1A
UT5EC	**144,341**	KN78MM	10W	4X YAGI	OMNI	180	A1A
UZ1OWV	**144,360**	KP94VN	0.1W	DIPOLE	130/310		A1A
UB4YWW	**144,370**	KN28XG	4W	QUAD		285	A1A
UR4YWW	**144,370**	KN28WG	3,5	TURNSTILE	OMNI	280	
UT5G	**144,370**	KN66LS	5W	DIPOLE	180/360	80	A1A
UT5U	**144,376**	KO50CG	5W	DIPOLE	OMNI	169	A1A
LY2GEZ	**144,380**	KO37MJ	5W	GP	OMNI	150	
RB4IZS	**144,392**	KN88SR	3W		135/315		A1A
UB5RXI	**144,398**	KO51HU	5W	DIPOLE	0/180		A1A
TRANSATLC	**144,400**		RESERV.	TRANSATLANTIC	BEACON		

CALL	QRG	WW	POWER	ANTENNA	QTF	ASL	MODE
UT3BW	144,400	KN29UA	8W	CROSSDIPOLE	OMNI	365	
GUARD QRG	144,401						
EA8VHF	144,402	IL28GC	10 ERP	PROPOSAL	OMNI		
OY6VHF	144,402	IP62NA	40W	2*4 ELE.	NE/SE	300	A1A
EI2WRB	144,403	IO62IG	200W ERP	5 EL. YAGI	95+180	248	A1A
UA3IFI	144,403	KO76WU	2W	GROUND PLANE	OMNI		A1A
EA1VHF	144,404	IN53UG	25W	5EL. YAGI	NE		A1A
F5XAR	144,405	IN87KW	400W	9 ELE YAGI	270	165	A1A
GUARD FRQ	144,406						
UK	144,407			TRANSATLANTIC	BEACON		
F5XSF	144,409	IN88GS	50W ERP	9ELE	90	145	F1A
DB0SI	144,410	JO53QP	0,5W	BIG WHEEL	OMNI	90	A1A
YO2X	144,410	KN05PS	0.3/3W	TURNSTILE	OMNI		
I1G	144,411	JN44VC	4W ERP	4 ELE YAGI	SE	745	QRV
SK4MPI	144,412	JP70NJ	200W	4*6EL. YAGI	NW+NE	520	A1A
3A2B	144,413	JN33RR		QRT			
DB0JW	144,414	JO30DU	25W ERP	5EL. YAGI	NNE	225	F1A
I1M	144,415	JN33UT	20W	BIG WHEEL	OMNI	300	
PI7CIS	144,416	JO22DC	50W	DIPOLE	W/E	40	F1A
OH9VHF	144,417	KP36OI	100W ERP	10DBD	200	310	A1A
ON4VHF	144,418	JO20FP	2.5W	BIG WHEEL	OMNI		F1A
I2M	144,419	JN55AD	10W ERP	BIG WHEEL	OMNI	46	QRT
DB0RTL	144,420	JN48OM		PROPOSAL			
OZ7IGY	144,421	JO55VO	30W ERP	BIG WHEEL	OMNI	94	A1A
DB0TAU	144,422	JO40HG					
PI7FHY	144,423	JO33WW	10W ERP	HALO	OMNI		QRV?
IN3A	144,424	JN56NB	0,1W	GP	OMNI	225	
F5XAM	144,425	JO10EQ	14W	BIG WHEEL	OMNI	99	F1A
EA6VHF	144,426	JM08PV	20W	3ELE	N		
OK0EJ	144,427	JN99IF	0.3	4 ELE	W		
PI7PRO	144,427	JO22NC	10 WERP	HALO	OMNI		QRV??
DB0JT	144,428	JN67JT	30W ERP	2*4+4 DIPOLE	W/NNW	785	F1A/B
IV3A	144,429	JN65RW	5W	2 X TURNSTILE	OMNI		
GB3VHF	144,430	JO01DH	40W ERP	2*3EL. YAGI	315	190	F1A
9A0BVH	144,431	JN85JO	1W ERP	V DIPOLE	OMNI		
9H1A	144,432	JM75FV	1.5W	TURNSTILE	OMNI	210	A1A
DB0LBV	144,434	JO61EH	0,4W	2 X DIPOLE	OMNI	234	F1
HB9H	144,435	JN46KE	03/3WERP	2 X DIPOLE	OMNI	1600	A1A
SK2VHG	144,435	KP07MV		NOT QRV!			
UL8GWW	144,435	MN83	5W	DIPOLE			A1A
I3ZJ/I3A?	144,436	JN55OL	50	PROPOSAL	S		
PI7NYV	144,436	JO32EH	2W	HALO	OMNI	80	
LA1VHF	144,437	JO49GT	12W	TURNSTILE	OMNI	1882	QRT
LX0VHF	144,438	JN39CP	10W	BIG WHEEL	OMNI		A1A
SK3VHF	144,439	JP73HF		TEMPORARY	QRT		
DL0UH	144,440	JO41RD	1W ERP	V-DIPOLE	OMNI	385	A1A
LA4VHF	144,441	JP20LG	380WERP	2 X 8 ELE	N	35	
I4A	144,442	JN54LG	20W ERP	2*TURNSTILE	OMNI	950	PLANNED
OH2VHF	144,443	KP10VJ	25W	9 ELE	0	76	
DB0KI	144,444	JO50WC	3WERP	4X2 ELE	OMNI	1025	
I5A	144,444	JN53GW		PROPOSAL		1000	
GB3LER	144,445	IP90JD	500W ERP	2 X 6 ELE	NE/SE	107	F1A
OK0EB	144,446	JN78DU	0.1W	BIG WHEEL	OMNI	1083	F1A
SK1VHF	144,447	JO97CJ	20W ERP	2 X CLOVER	OMNI	65	A1A
HB9HB	144,448	JN37OE	10W	2ELE	345	1300	F1A
I0A	144,449	JN62IG	10W	2*BIG WHEEL	OMNI	300	A1A
DL0UB	144,450	JO62KK	10W	MALTESE CROSS	OMNI	120	A1A
F5XAV	144,450	JN23GX	5W	HALO	OMNI	100	F1A
LA7VHF	144,451	JP99	150WERP	10ELE	190		
OK0EC	144,452	JO60CF	80MW	3EL. YAGI	E	790	F1A
GB3ANG	144,453	IO86MN	20W ERP	4EL. YAGI	160	370	F1A
IS0A	144,454	JN40QW	1W	TURNSTILE	OMNI	350	
OH5ADB	144,454	KP30NN	0.1	DIPOLE	QRT!		
DB0GD	144,456	JO50AL	1W	KREUZDIPOL	OMNI	926	A1A

CALL	QRG	WW	POWER	ANTENNA	QTF	ASL	MODE
EA2VHF	**144,457**	IN91DJ	18 WERP	PROPOSAL	OMNI		
SK2VHF	**144,457**	JP94TF	100W ERP	2*10 ELE.	0/200	300	A1A
F1XAT	**144,458**	JN15AO	25W	BIG WHEEL	OMNI	913	F1A
I0G	**144,458**	JN63IB	10W	4XDIPOLE	OMNI	1200	QRT
LA5VHF	**144,459**	JP77KI	100W ERP	2*6 EL. QUAD	15/180	260	A1A
HG1BVA	**144,460**	JN86CW	5W	QUAD	80	370	A1A
SK7VHF	**144,461**	JO65KJ	10W ERP	2*BIG WHEEL	OMNI	25	A1A
I6A	**144,462**	JN72FH	24WERP	2 X 5 ELE YAGI	340/180	150	
LA2VHF	**144,463**	JP53EG	500W ERP	10EL. YAGI	15	710	A1A
I7A	**144,464**	JN81EC	8W	BIG WHEEL	OMNI	685	A1A
DF0ANN	**144,465**	JN59PL	0,3W	V-DIPOLE	OMNI	360	
OZ4UHF	**144,466**	JO75KC					
HB9RR	**144,467**	JN47FI	0.0225W	?PROPOSAL?		904	
I8A	**144,467**	JM78WD	8W ERP	2*TURNSTILE	OMNI	1778	A1A
OK0ED	**144,467**	JN99BO	0.1W	2*DIPOLE	OMNI	560	F1A
F1XAW	**144,468**	JN26IX	10 W	BIG WHEEL	OMNI	561	F1A
LA6VHF	**144,468**	KP59AL	300W ERP	6 EL. YAGI	210	70	A1A
UZ9XZZ	**144,468**	MP06CA	5W	2*9 ELE.	15/195		A1A
GB3MCB	**144,469**	IO70OJ	40W ERP	3 EL. YAGI	45	320	F1A
IT9A	**144,469**	JM67LX	10W ERP	2*BIG WHEEL	OMNI	825	A1A
OH2VAN	**144,470**	KP20		PROPOSAL!	OMNI		
OZ?	**144,471**	JO		PROPOSAL!			
IT9G	**144,472**	JM68QE	35W ERP	5EL. YAGI	0	150	PROPOS.
SK2VHH	**144,473**	JP94	50KW ER	HORIZ.	360	300	
EA3VHF	**144,474**	JN11LS	1W	HALO	OMNI	155	QRT
OK0EL	**144,474**	JO70SQ	0.005	DIPOLE	W/E	1036	F1A
DL0SG	**144,475**	JN69KA	5W	4 X 4 ELE		1024	
LY2WN	**144,475**	KO25DB	5W	TURNSTILE	OMNI	95	
F5XAL	**144,476**	JN12LL	2/40W	5 ELE	N	1100	F1A
DB0ABG	**144,477**	JN59WI	4W	BIG WHEEL	OMNI	522	A1A
9A0BVV	**144,478**	JN95JG		QRV 7.6.98			
LA3VHF	**144,478**	JO38RA	15W	16 ELE	180	30	
OM0MVA	**144,478**	JN88NE	O.11WERP		W/E	570	
S55ZRS	**144,478**	JN76MC	1W	DIPOLE		1219	
F6KJD	**144,479**	JN26QE	50W ERP	BIG WHEEL	OMNI	250	F1A
IT9S	**144,479**	JM77NO	3W	2*BIG WHEEL 6DB	OMNI	250	PROPOS.
SR5VHF	**144,479**	KO02ON	0,75	TURNSTILE	OMNI		
EI3DP/P	**144,480**	IO41XP	25W	8 ELE QUAGI	281	488	QRV 96
GB3NGI	**144,482**	IO65VB	25W	2 X YAGI	45+135	508	
SR5VHW	**144,483**	KO02PC	3.5	CROSSDIPOLE	OMNI		
DL0PR	**144,486**	JO44JH	150W	6 ELE. YAGI	0/180	100	A1A
DB0FAI	**144,490**	JN58IC	1000W ERP	16ELE	305	590	A1A
OZ3VHF	**144,500**	JO55HL	0.5W	CLOVER	OMNI	35	A1A
VK6RBU	**144,560**	OF76	10W ERP		80	300	
VK6RSX	**144,576**	OG77					
YU1VHF	**144,850**	KN04OO	5W	2 X QUAD	N/NNW	196	
DB0INN	**144,853**	JN68GI				504	
CU7VHF	**144,901**	HM58					
OK0EA	**144,927**	JO70UP	4MW	2*DIPOLE	OMNI	1355	F1A
SK0VHF	**144,936**	JO99BM	30W ERP	4 ELE.	225	80	A1A
TF8VHF	**144,940**	HP84PA	40W	VERTIKAL			
YU7VHF	**144,940**	JN95				538	
CT0SAT	**144,950**	IM59SK					
YO2X	**144,955**	KN05OS	2W	TURNSTILE	OMNI	80	A1A
LZ1KDZ/B	**144,958**	KN32FR	10W	DIPOLE		1000	
OK0ET	**144,978**	KN08SU	0.5W	HB9CV	W	981	F1A

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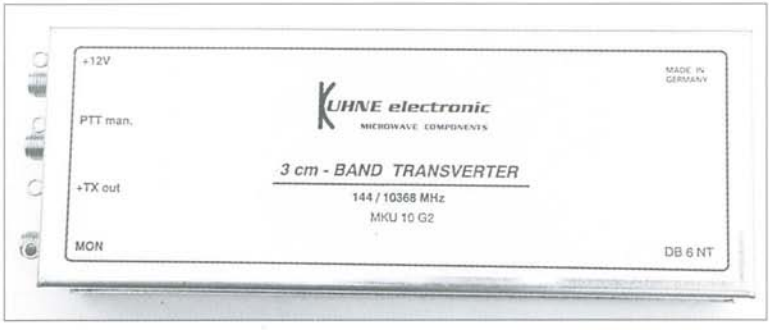

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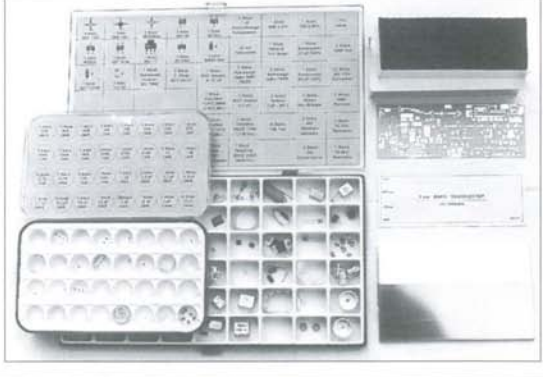

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