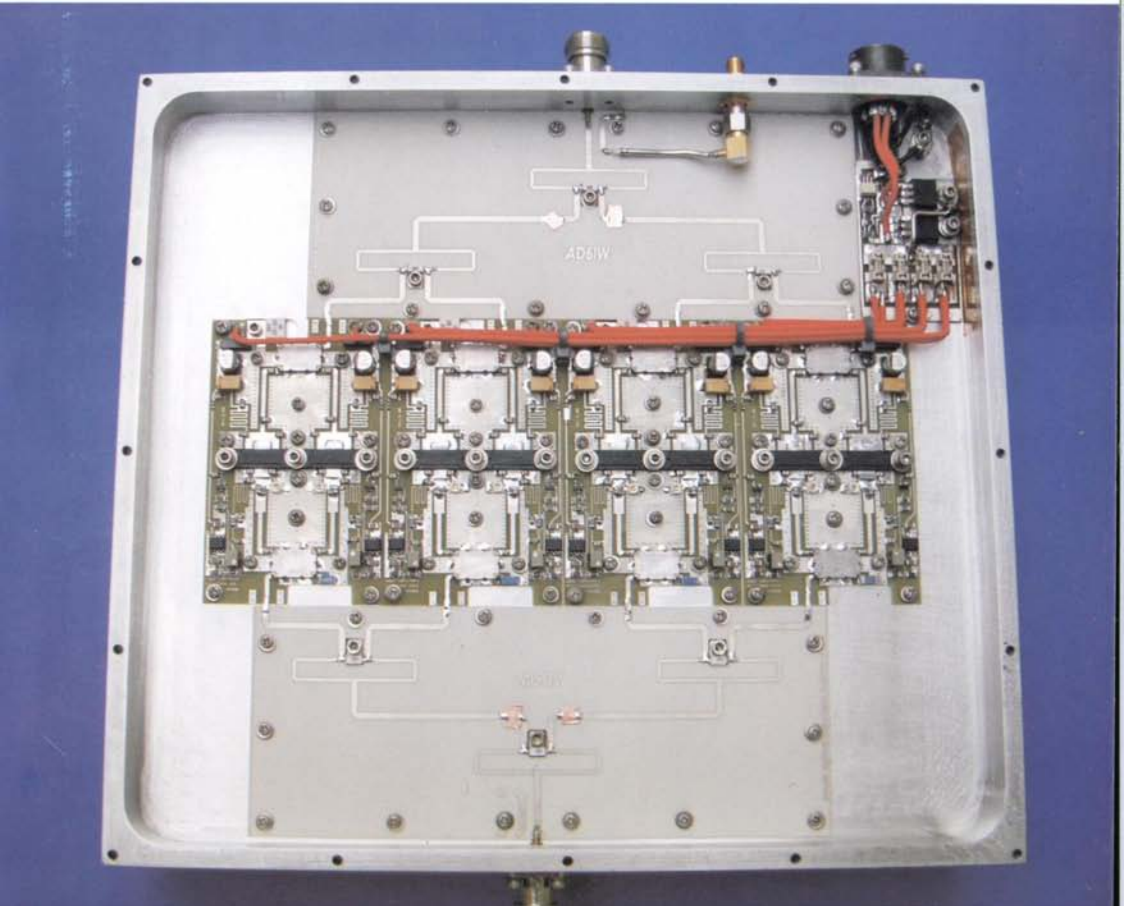
DUBUS

2/2008

Vol.37 2.Quarter

350W PA for 23cm by AD6IW



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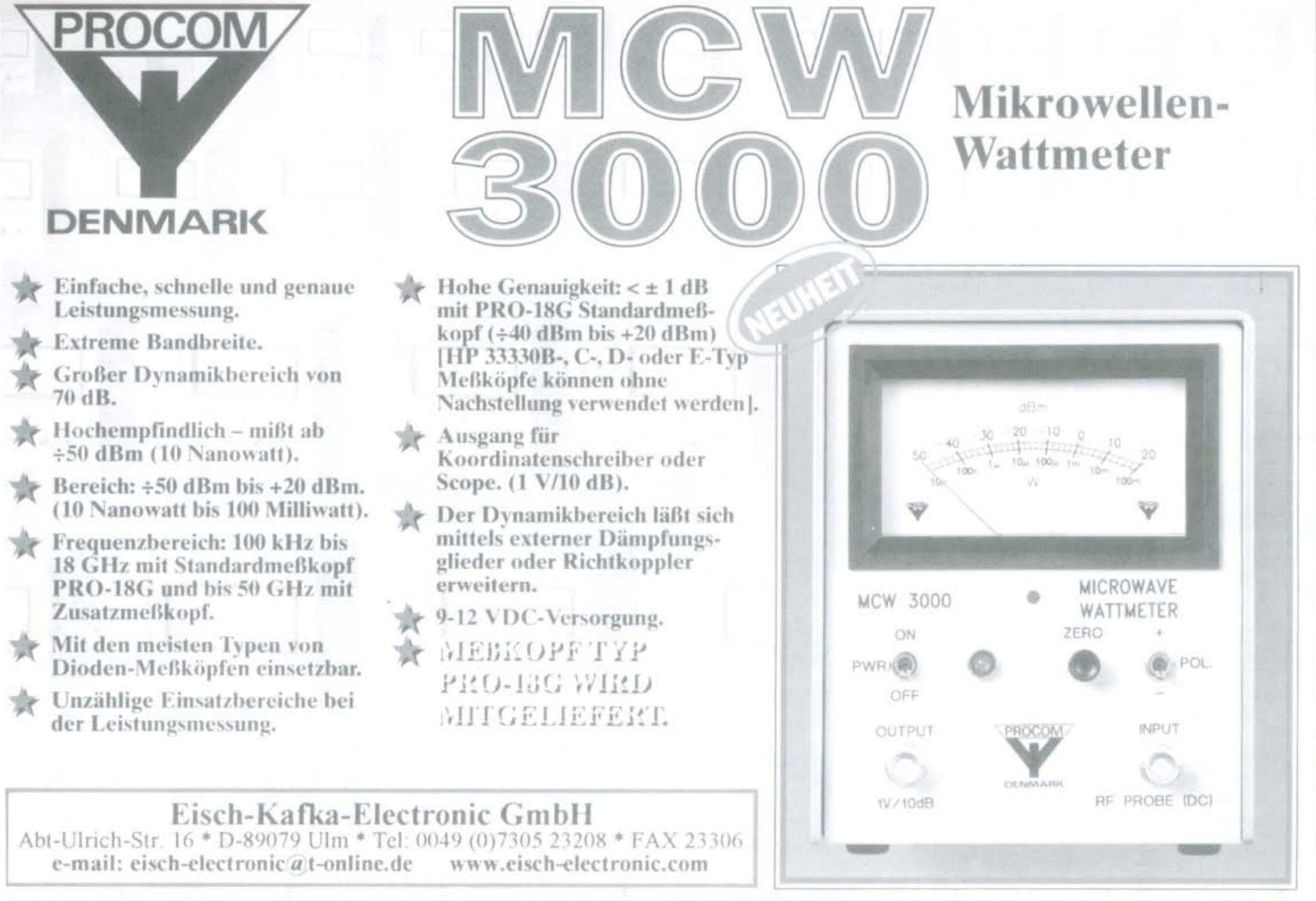
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Editorial Staff / Redaktion

Please send all new technical articles to CT1HZE (address below).

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Editorial

Dear DUBUS Reader!

Welcome to issue 2/2008. Sadly we have to report that several well known amateurs became silent keys recently. Amoung them is SM7BAE. See News & Comments section for more info.

Also on the VHF/UHF/SHF bands we see more and more that there is not enough new blood. This is no surprise with an average age of 54 of e.g. the 44.000 members of the German amateur radio club, the DARC. Allthough the number of licence holders in DL is quite constant at about 75.000 the DARC loses about 1000 members every year below the line and the average age rises by 1 year.

In my humble opinion it is time now to think about a European Amateur Radio Club that reresents all radio amateurs from the EC countries. Such a club could representate the radio amateurs in Brussels where most probably one day the amateur radio laws will be made for all EC. Such a club should be 100% democratic i.e. decisions should be made by votes of all members preferably on the web. I feel that people are missing this in the DARC, and by the way also in the IARU. Thus more and more members leave the club. We will see what the time will bring...

But now let`s enjoy the coming 3 months with the main Rain Scatter season on SHF and the Sporadic E season on 6m, 4m and 2m. More and more countries get access to 4m now and it is really an interesting band with much better Tropo properties than on 6m, much better chances for TEP than on 2m and still the chance for F2 propagation.

Please keep sending your technical articles and reports. Thank you!

Have a nice summer and DX season!
73 from Joe, DL8HCZ / CT1HZE
and the DUBUS team!

Editorial

Liebe DUBUS-Leser!

Willkommen zur Ausgabe 2/2008. Leider müssen wir diesmal einige Silent Keys melden, wie z.B. SM7BAE. Mehr dazu in den News & Comments.

Auch auf den VHF/UHF/SHF-Bändern sehen wir immer mehr, dass der Nachwuchs fehlt. Das ist nicht überraschend, wenn man sich das Durchschnittsalter von 54 Jahren von z.B. den 44.000 Mitgliedern des DARC anschaut. Obwohl die Zahl der Individuallizenzen mit etwa 75.000 relativ konstant bleibt, verliert der DARC jedes Jahr unter dem Strich 1000 Mitglieder und das Durchschnittsalter steigt um 1 Jahr.

Meiner Ansicht nach wäre es Zeit, über einen Europäischen Amaterfunkverein nachzudenken, der alle Funkamateure der EG-Länder vertritt. Solch ein Verein könnte dann die Amateure in Brüssel vertreten, von wo höchstwahrscheinlich eines Tages die Amateurfunkgesetzgebung kommen wird. Solch ein Verein sollte durch und durch demokratisch sein. Entscheidungen sollten per Abstimmung durch alle Mitglieder erfolgen, vorzugsweise über das Internet. Ich denke, dass viele das beim DARC, und übrigens auch bei der IARU, vermissen. Deshalb treten immer mehr Leute aus. Wir werden sehen, was die Zeit bringt...

Aber nun sollten wir die nächsten 3 Monate genießen mit der Hauptsaison für Regen-Scatter auf den SHF-Bändern und Es auf 6m, 4m und 2m. Immer mehr Länder bekommen Zugang zu 4m, was wirklich ein interessantes Band ist. Tropo geht dort viel besser als auf 6m und die Chancen für TEP sind viel höher als auf 2m und es gibt auch eine Chance für F2.

Bitte senden Sie uns weiterhin technische Artikel und Berichte zum Abdruck, vielen Dank!

Einen schönen Sommer, viel DX und 73
wünschen Joachim, DL8HCZ / CT1HZE
und das gesamte DUBUS-Team!

350 Watt Lateral MOSFET Amplifier for 23 cm

by Goran Popovic, AD6IW - goran@ad6iw.com

Abstract

A small, inexpensive, and very efficient power amplifier module was developed and constructed using commercial LD MOS transistors originally designed for cell base stations. See fig. 1. The amplifier modules were designed for combining, to achieve higher power levels. See fig. 2. The EME community has shown large interest in this project. That was a reason for this article.

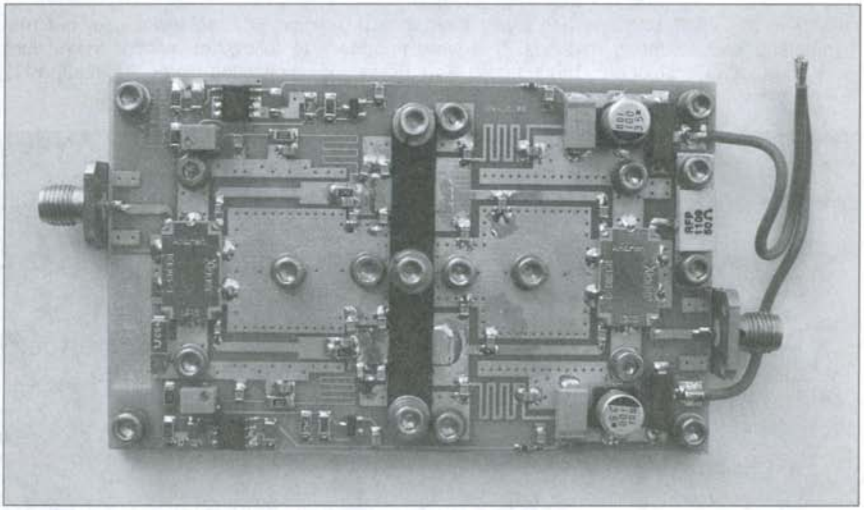

Fig. 1 Single PA module

Design considerations

The design goals were efficiency, cost and size. All three requirements are in correlation. Efficiency is in relation to the heat sink size. There are 150W power transistors available on the market, but the cost of a single transistor is equal to the price of eight of the 45W LD-MOS transistors used in this project.

There are other drawbacks related to the 150W transistor such as high thermal density and dissipation. Such a transistor would require expensive microwave substrate, and mounting on a copper heat spreader. With the high current flow of high power transistors more precautions must be taken. Any uncontrolled oscillation could destroy the transistor. The advantages of combining lower power transistors are spreading heat over a large area, better current distribution, and better linearity. The disadvantages of combing amplifiers is the loss in power dividers/combiners, connectors and cable losses. The size of the amplifier is important when combining, also how they are connected to the power dividers. Low loss Wilkinson power dividers and combiners (see fig. 10, 11, 12 and 13) were designed and integrated on RO4000C substrate. The sconnections between splitter-combiners and amplifiers are made without connectors or hard line, eliminating additional losses, and simplified design. The idea was to design the amplifier with new inexpensive LD MOS transistors, which are primarily used for the cell phone industry. Most 900 MHz transistors for cell base stations are internally matched and are poor performing, or they do not work at higher frequencies. I tried to modify a few of them, but the attempts were unsuccessful. The transistor used in this amplifier is a wideband transistor without internal matching but only characterized

up to 1GHz. I tested and experimentally characterized this transistor at 1296 MHz. with a network analyzer. The transistor had good efficiency, gain and power at 23 cm. It was a good starting point in this project. To keep cost low I designed the amplifier on FR-4 substrate. FR-4 is not a good substrate for 1296 MHz and it is not good for power amplifiers, as well. The dielectric loss is high, but thermally FR-4 is a decent substrate. Reducing the power level and mounting the PCB on the heat sink, keeping the high power traces short, and reducing the thickness of the PCB solved the problem. Building the amplifier on microwave substrate will give better performance, but the cost will be higher. The amplifier module was designed for 90W power level, with a pair of 45W transistors in balanced configuration.
The load pull method and a non-linear model was used to get the optimum gamma load match of the transistor. This is the load impedance where the transistor delivers the desired power level and efficiency. Input matching was a little tricky because input impedance decreases with higher frequencies. It was difficult to properly match the transistors. Some gain reducing was necessary due to an amplifier stability issue. This was done with a series resistor in gate, which improved matching as well. A few simulations and prototypes were made before the final version. The amplifier was tested on efficiency, RL, gain, power, and linearity. Measurements were close to the simulations. The amplifier is unconditionally stable.
The Freescale (Motorola) LDMOS MRF9045NBR1 transistor is built in an OMP (Over molded plastic) package, type TO-272-2. MRF9045NR1 is the same transistor in a different package, TO-270-2, which needs to be soldered to the heat sink with small flanges.
The transistor in the OMP package has lower thermal and junction to case resistance, but requires different mounting and soldering methods. It is very important to follow the vendor instructions for mechanical, thermal and soldering procedures. See Freescale application notes AN3263, AN1907, AN1955. As thermal interface use copper or t-gon 805 graphite thin sheets.

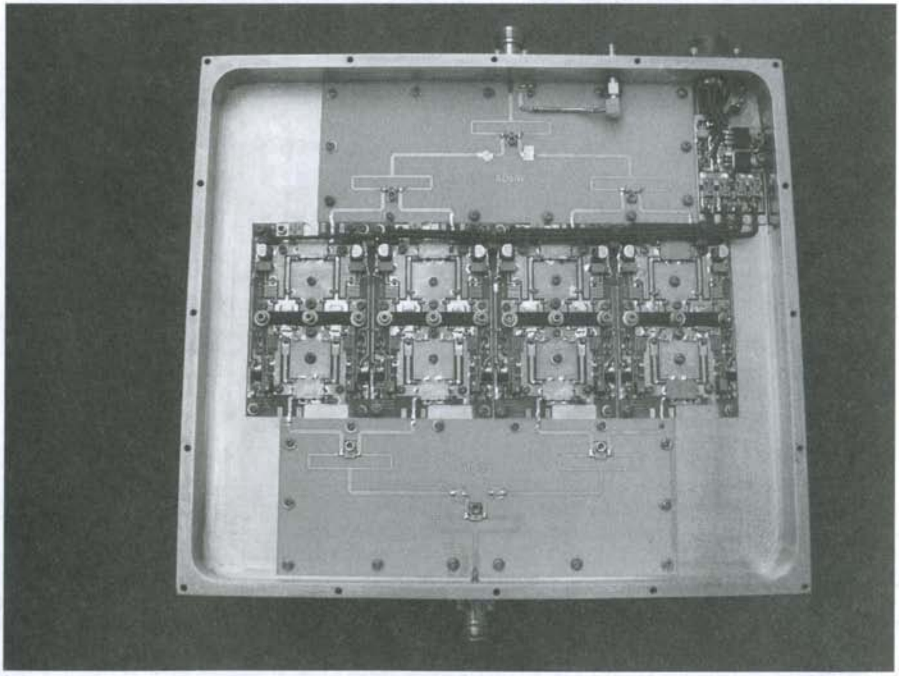

Fig. 2 Complete PA with 4 modules and switch board

Thermal analysis is very important for high power amplifier design. This is where the efficiency of the amplifier is paying off. All specs must be taken in consideration such as transistor case and junction thermal resistance, heat sink size, type and thermal resistance, ambient temperature, power dissipation, and altitude. At higher altitude where air density is lower the cooling is worse. Keep that in mind for hill top operations. Forced convection cooling was utilized in this design. The maximum transistor case temperature is 150 degrees C and transistor junction temperature is 200 degrees C. These temperatures should not be exceeded. The total dissipated power on the heat sink is a little lower than 400W at 43% of PAE, using natural convection cooling. At the full power output, the heat sink reached 100 degree C, so forcing cooling is needed. A 24V Papst fan type 4184NXG (94 CFM) reduced the temperature on the heat sink to 45 degree C. The transistor case produces a temperature of 81 degrees C at 45W output power. Reducing the operational temperature exponentially increases the reliability and life expectancy of the transistor. Reducing the junction temperature of the transistor 10 to 20 degrees C, results in a doubling of the MTTF (Mean time to failure). A design with Mitsubishi power modules was considered, but not utilized because of thermal issues, caused by the low efficiency of modules.

An extruded anodized black heat sink was used. See fig. 3. The size of heat sink is 240 x 270 mm. The thermal resistivity of the heat sink is 0.315 at 400W of heat dissipation, and 0.537 at 100W. The fin spacing, number of fins and height are important factors during selection of a heat sink. Black paint or anodized heat sink improves cooling as well. It is better to use a wider instead of longer heat sink. The wide side is perpendicular with air flow. By increasing width by a factor of two, heat dissipation capability increases by a factor of two. But increasing the length of the heat sink by a factor of two increases the heat dissipation capability only by factor of 1.4.

Fig. 3 PA with heatsinks

Amplifier module

The MRF9045 transistor is available in a few different packages. The MRF9045MBR1, used in this amplifier was recently replaced with the new 6th generation enhancement mode lateral MOSFET. The new transistor is MRFE6S9045NR1, with improved thermal and electrical performance. Thermal resistance is 1 deg C/W. Two transistors were tested MRF9045NR and MRF9045NBR1. They are in different packages but the only difference is the mounting method. Electrical performance was the same. The plastic package TO-272-2 is now obsolete for this transistor. TO-270-2 is the new standard package for this transistor. The new transistor has not been tried yet. Small modifications in design may be needed.

Amplifier design and performance

The size of the amplifier module is 9 x 5.5cm. The modules are connected directly to the splitter/combiner board without connectors to keep losses and cost low, and to eliminate hard line phase matching problems. Soldering short pieces of copper strips made the connections between the boards.

There are two MRF9045MBR1 transistors in balanced configuration, with separated bias circuits. See fig. 4, fig. 5 and fig. 6. The amplifier is working in class AB. The Idq current needs to be set at 350mA for each transistor. For fine tuning replace C6 and C7 with Voltronics trimmer capacitors. Changing the position of C22, C23 in small steps along the micro strip allows to tune to the maximum power output. Other tunings are not needed. There is a thermal protection built in the bias circuit. The 2N2222 transistor is adjusting

the gate voltage with temperature. Switching is done with two N type power MOSFETs and a LTC1255 as high side driver. See fig. 7 & 8. In general N type switching MOSFETs have lower Rds on resistance than P type transistors, lower voltage drop and lower power dissipation. Gate switching was tried but there was still some power at the output when the drive signal was presented. The amplifier would probably switch to class C. The amplifier may be used as a single module amplifier if there is no need for more power.
With four modules combined the output power is 350W, amplifier gain is 16dB and PAE 43%. With 3.4W drive power the amplifier produced more than 100W output with PAE 25%. Full power is reached with 30W of drive. Overdriving the amplifier is not recommended. Do not exceed 30W of drive for the 350W amplifier, or 4W of drive for a single module amplifier. The module has 16dB gain and driving it with 0.8W the amplifier produces 25W output, 3.5W in > 80W out. See gain and RL plot measured on a single amplifier module in fig. 9. The amplifier is used with a 28V / 30 A switching power supply, but it will work on 13.8V, but with lower gain and power output. In that case the biasing voltage needs to be retuned. The 350W amplifier size is 25 x 30 x 5 cm. At full power the DC current is in the range of about 28A.

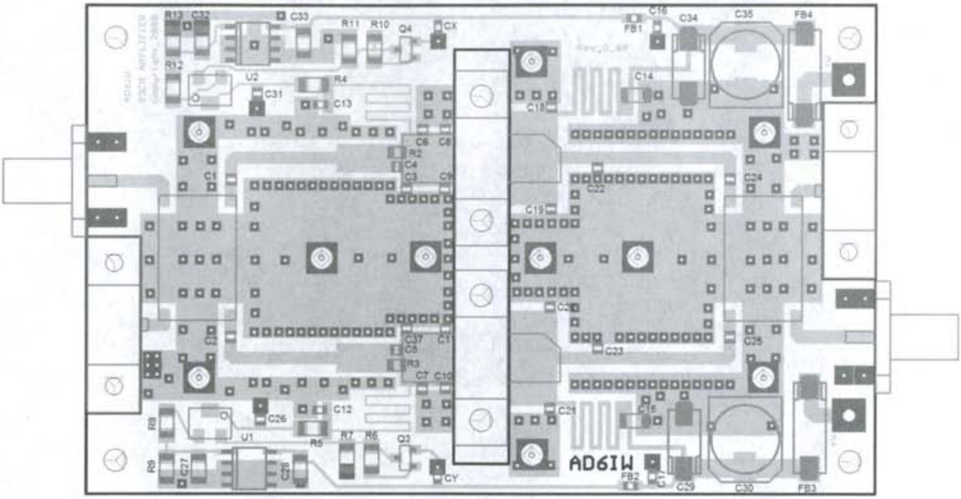

Fig. 4 RF PCB with parts

Results

Two complete amplifiers were built and tested in several EME activities. The amplifier was primarily made for our EME activities at the Jamesburg dish. The performance was good, and different modes were tested, CW/SSB, FM, AM and JT65. The amplifier was designed as "plug and play" in mind and no maintenance is needed. Hundreds of the EME contacts were made, with many hours of operation without a single failure. During long operations the temperature of the heat sink didn't reach more than 50-60 degree C, even during a hot day. As an experiment, a two way EME CW contact was made with this amplifier and a 1.2 meter dish.

Conclusion

A compact, high efficiency amplifier was designed and built with the next generation of power MOSFET transistors designed primary for the cell base station market. The amplifier produces enough power for small or medium size EME stations. Used with a light weight and small switching power supply, it is ideal for EME expeditions, portable and mobile operations, or for mounting on the back side of the dish. By combining more amplifiers higher power is possible.

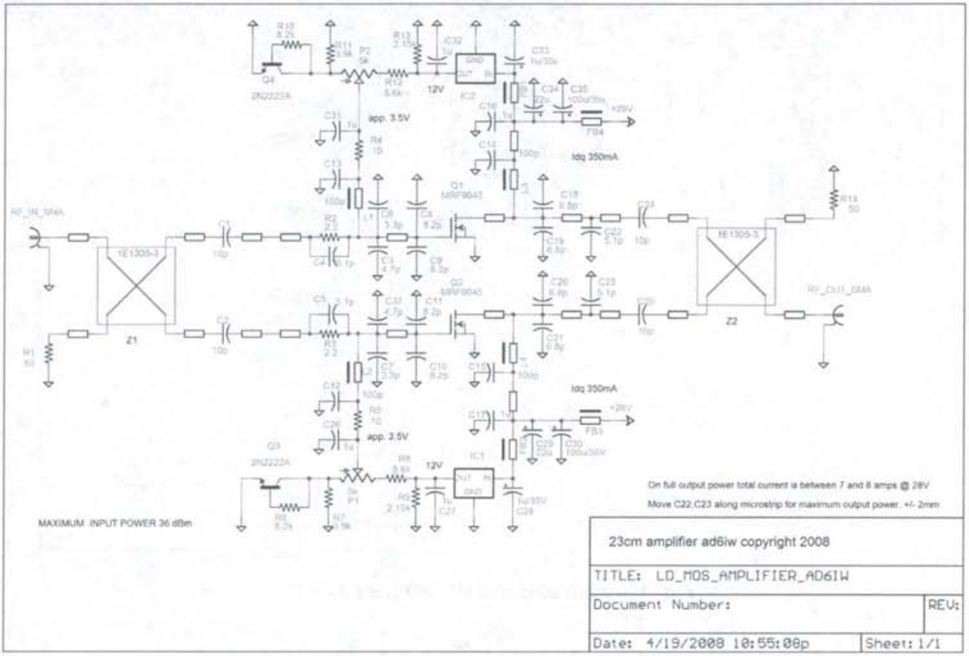

Fig. 5 Circuit diagram RF part

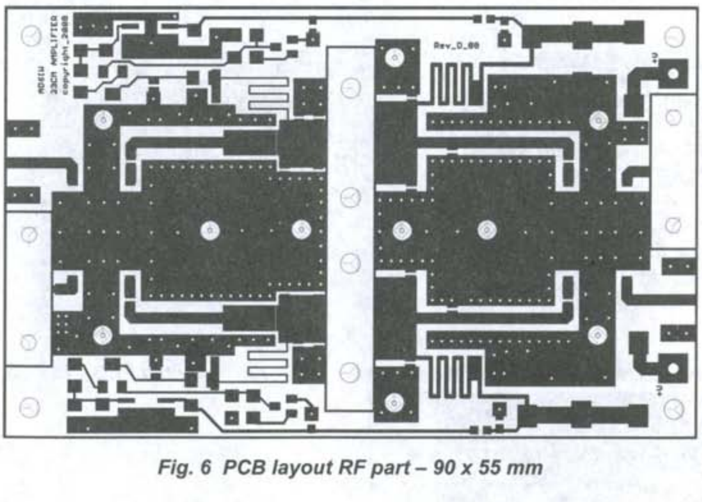

Fig. 6 PCB layout RF part – 90 x 55 mm

References

MRFE6S9045NR1 data sheet, Rev 0, 10/2007 Freescale, www.freescale.com
MRF9045NR1, MRF9045NBR1 date sheet, www.freescale.com
Freescale Application Notes: AN1907, AN3263, AN1955, AN1083 www.freescale.com
htttp://www.frigprim.com/online/natconv_heatsink.html

Kits are available at contact@rftech.us (Prices: PCB 50$ - amplifier 90W module kit $325 - splitter board, tested $155 - Mosfet switch kit $ 75, ready made $120, ready made and tested 90W modules $425)

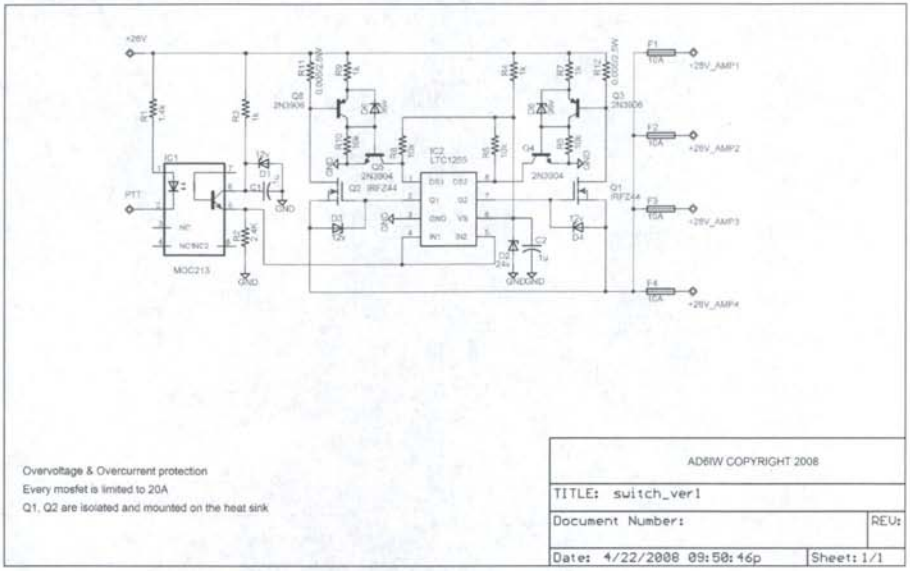

Fig. 7 Circuit diagram DC MOSFET switch

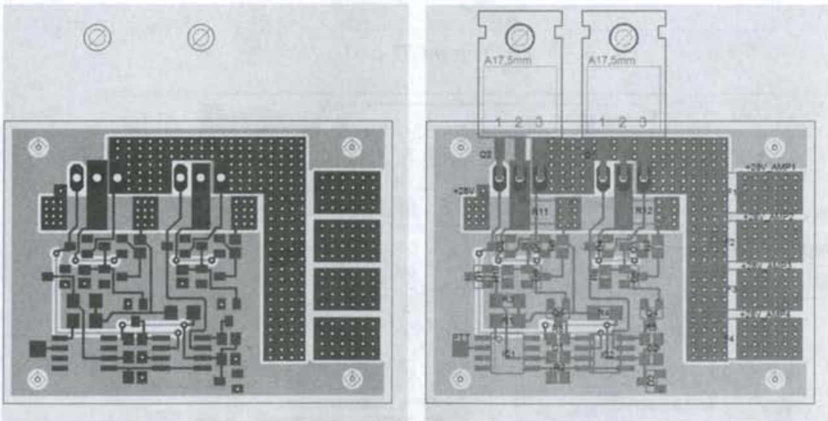

Fig. 8 Switch PCB - 49 x 36 mm

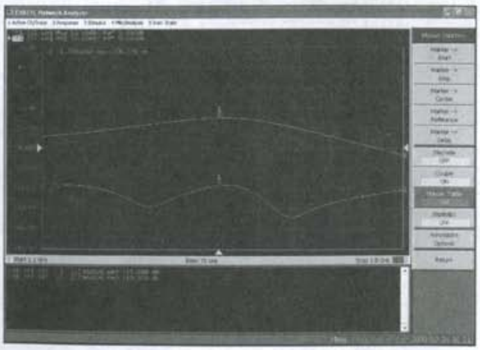

Fig. 9 Gain / RL – single PA module

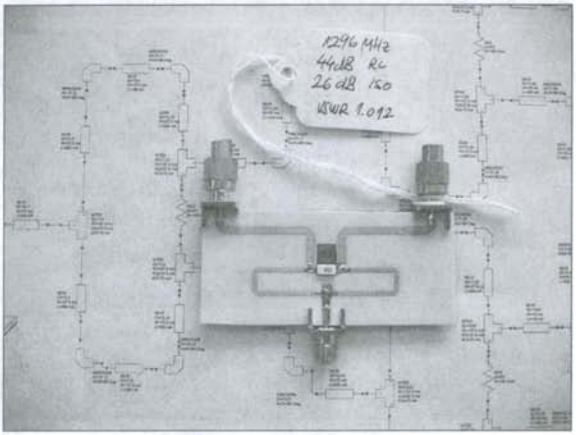

Fig. 10 Single Wilkinson divider

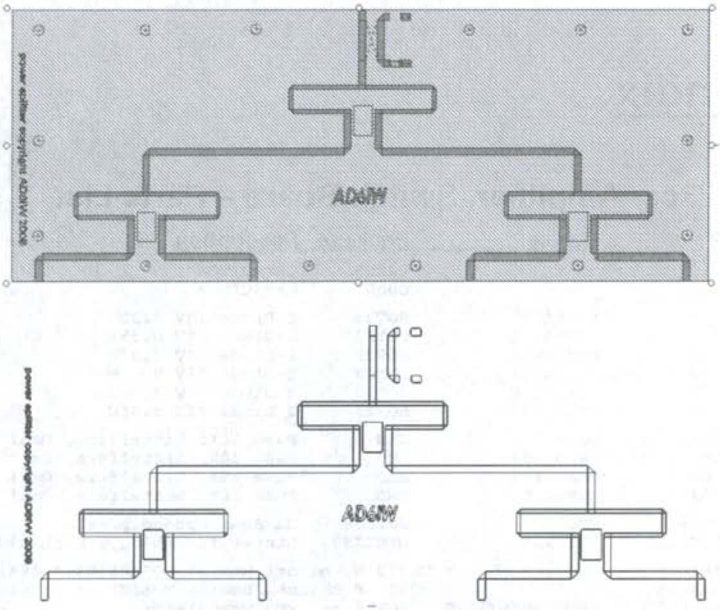

Fig. 11 Wilkinson divider – sketch with drillings (top) and layout 180 x 70 mm (bottom)

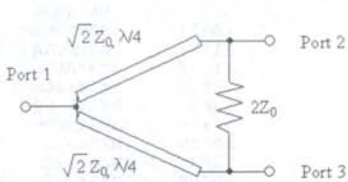

Fig. 12 Wilkinson divider – circuit diagram

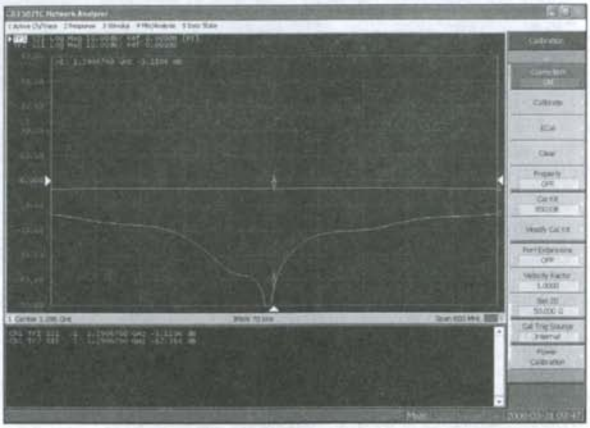

Fig. 13 Wilkinson divider - RL, isolation

Appendix

AD6IW 23cm Amplifier, Switch Board – Parts List

Part	Value	Device	Package	Description
C1	.1u		C0805	CAPACITOR
C2	.1u		C0805	CAPACITOR
D1	12v	BZX84C12	SOT23	Z-Diode 12V 0.35W
D2	24v	BZX84C24	SOT23	Z-Diode 24V 0.35W
D3	12v	BZX84C12	SOT23	Z-Diode 12V 0.35W
D4	12v	BZX84C12	SOT23	Z-Diode 12V 0.35W
D5	36v	BZX84C36	SOT23	Z-Diode 36V 0.35W
D6	36v	BZX84C36	SOT23	Z-Diode 36V 0.35W
F1	10A	Nano 154	SMD	Fuse 10A, Littelfuse, Omni blok
F2	10A	Nano 154	SMD	Fuse 10A, Littelfuse, Omni blok
F3	10A	Nano 154	SMD	Fuse 10A, Littelfuse, Omni blok
F4	10A	Nano 154	SMD	Fuse 10A, Littelfuse, Omni blok
IC1	MOC213	MOC213	SOIC08	On Semi optocoupler
IC2	LTC1255	LTC1255	LTC1255	Linear Technology, high side driver
Q1	IRFZ44		TO220	N-Channel Hexfet MOSFET 55V; 49A; 0,0175Ohm
Q2	IRFZ44		TO220	N-Channel Hexfet MOSFET 55V; 49A; 0,0175Ohm
Q3	2N3906	MMBT3906LT1SMD	SOT23	PNP Transistor
Q4	2N3904	MMBT3904LT1SMD	SOT23	NPN Transistor
Q5	2N3904	MMBT3904LT1SMD	SOT23	NPN Transistor
Q6	2N3906	MMBT3906LT1SMD	SOT23	PNP Transistor
R1	1.4k		R1206	RESISTOR
R2	2.4K		R0805	RESISTOR
R3	1k		R1206	RESISTOR
R4	1k		R1206	RESISTOR
R5	10k		R0805	RESISTOR
R6	10k		R0805	RESISTOR
R7	1k		R0805	RESISTOR
R8	10k		R0805	RESISTOR
R9	1k		R0805	RESISTOR
R10	10k		R0805	RESISTOR
R11	0.005/2.5W 1%		R2512	RESISTOR, ULR25R005FLFTR,IRC,Mouser ele.
R12	0.005/2.5W 1%		R2512	RESISTOR, ULR25R005FLFTR,IRC,Mouser ele.

AD6IW 23cm LD MOSFET Amplifier RF Board – Parts List

Part	Value	Device	Package	Description
C1	10p	600F	C0805	ATC
C2	10p	600F	C0805	ATC
C3	4.7p	600F	C0805	ATC
C4	5.1p	600F	C0805	ATC
C5	5.1p	600F	C0805	ATC
C6	3.3p	600F	C0805	ATC (or Voltronics JZ060 trim.cap)
C7	3.3p	600F	C0805	ATC (or Voltronics JZ060 trim.cap)
C8	8.2p	600F	C0805	ATC
C9	8.2p	600F	C0805	ATC
C10	8.2p	600F	C0805	ATC
C11	8.2p	600F	C0805	ATC
C12	100p	600F	C0805	ATC
C13	100p	600F	C0805	ATC
C14	100p	600F	C0805	ATC
C15	100p	600F	C0805	ATC
C16	.1u	50V	C1206	
C17	.1u	50V	C1206	
C18	6.8p	600F	C0805	ATC
C19	6.8p	600F	C0805	ATC
C20	6.8p	600F	C0805	ATC
C21	6.8p	600F	C0805	ATC
C22	5.1p	600F	C0805	ATC
C23	5.1p	600F	C0805	ATC
C24	10p	600F	C0805	ATC
C25	10p	600F	C0805	ATC
C26	.1u	50V	C1206	
C27	.1u	50V	C1206	
C28	1u	35V	C1206	
C29	22u/35V			POLARIZED CAPACITOR
C30	100u/50V			POLARIZED CAPACITOR
C31	.1u	50V	C1206	
C32	.1u	50V	C1206	
C33	1u	35V	C1206	
C34	22u/35V			POLARIZED CAPACITOR
C35	100u/50v			POLARIZED CAPACITOR
C37	4.7p	600F	0805	ATC
FB1	120/2A	BLM18PG121SN1D	0603	FERRITE BEAD
FB2	120/2A	BLM18PG121SN1D	0603	FERRITE BEAD
FB3	4221R			Delevan 5A FERRITE BEAD
FB4	4221R			Delevan 5A FERRITE BEAD
IC1		78L12	SOIC8	VOLTAGE REGULATOR
IC2		78L12	SOIC8	VOLTAGE REGULATOR
P1	5k	3214W	3214W	Multiturn
P2	5k	3214W	3214W	Multiturn
Q1	MRF9045MBR1	(see text)	TO-272-2	Freescale, N-Channel Enhancement MOSFET
Q2	MRF9045MBR1	(see text)	TO-272-2	Freescale, N-Channel Enhancement MOSFET
Q3	2N2222A	2N2222A	SOT-23	NPN Transistor
Q4	2N2222A	2N2222A	SOT-23	NPN Transistor
R1	50		R1206	TERMINATION RESISTOR 10W, KDI
R2	2.2		R0603	RESISTOR
R3	2.2		R0603	RESISTOR
R4	10		R1206	RESISTOR
R5	10		R1206	RESISTOR
R6	8.2k		R1206	RESISTOR
R7	3.9k		R1206	RESISTOR
R8	5.6k		R1206	RESISTOR
R9	2.15k		R1206	RESISTOR
R10	8.2k		R1206	RESISTOR
R11	3.9k		R1206	RESISTOR
R12	5.6k		R1206	RESISTOR
R13	2.15k		R1206	RESISTOR
R14	50	RFP-20-50TP	20W	Anaren
Z1		1E1305-3		Anaren
Z2		1E1305-3		Anaren
RF IN SMA		SMA		Option
RF OUT SMA		SMA		Option
100	20W(50W)	31-7006-100-5		Termination resistors in Wilkinson divider, Florida Labs

350-Watt-LD-MOSFET-Verstärker für 23cm

von Goran Popovic, AD6IW - goran@ad6iw.com

Einleitung

Eine kleines, günstiges und sehr effektives PA-Modul, das kommerzielle LD MOS Transistoren aus der Mobilfunktechnik verwendet, wurde entwickelt und aufgebaut. Siehe Abb. 1. Die PA-Module wurden so entwickelt, dass sie zusammengeschaltet werden können, um höhere Leistungen zu ermöglichen. Siehe Abb. 2. In der Gemeinschaft der EME-Funker gibt es großes Interesse an diesem Projekt. Das war ein Grund für diesen Artikel.

Überlegungen zum Design

Die Design-Ziele waren hohe Effektivtät, geringe Kosten und Abmessungen. Alle drei befinden sich in Korrelation. Die Effektivität steht in Beziehung zur Größe des Kühlkörpers. Es gibt 150-W-Transistoren auf dem Markt, aber die Kosten eines solchen einzelnen Transistors entsprechen denen von acht der 45W-LD-MOS-Transistoren, die in diesem Projekt verwendet werden.
Andere Nachteile des 150W-Transistors sind die hohe thermische Konzentration und deren Ableitung. Solch ein Transistor würde ein teures Mikrowellensubstrat benötigen sowie ein Montieren auf einer Kupferplatte zur Wärmeableitung. Durch den hohen Stromfluß in einem Hochleistungstransistor müssen mehr Vorsichtsmaßnahmen getroffen werden. Jegliches unkontrollierte Schwingen würde den Transistor zerstören. Der Vorteil des Kombinierens von Transistoren kleinerer Leistung ist die Verteilung der Wärme über eine große Fläche, bessere Stromverteilung und bessere Linearität.
Der Nachteil beim Kombinieren von Verstärkern sind die Verluste in den Leistungsteilern, Steckern und Kabeln. Die mechanischen Abmessungen des Verstärkers sind wichtig beim Kombinieren und auch auf welche Art er mit dem Splitter verbunden wird. Verlustarme Wilkinson-Leistungsteiler und Combiner (siehe Abb. 10, 11, 12, 13) wurden berechnet und auf RO4000C-Substrat realisiert. Die Verbindungen zwischen den Teilern/Combinern und den Verstärkern wurden ohne Stecker und Kabel ausgeführt, um zusätzliche Verluste zu vermeiden und das Design zu vereinfachen.
Es bestand die Idee, den Verstärker mit neuen nicht teuren LDMOS-Transistoren, die hauptsächlich in der Mobilfunk-Industrie eingesetzt werden, aufzubauen. Die meisten dieser Transistoren für 900 MHz für Mobilfunk-Basisstationen sind intern angepasst und arbeiten deshalb schlecht oder gar nicht auf höheren Frequenzen. Ich habe versucht einige von ihnen zu modifizieren, aber die Versuche waren erfolglos. Der hier verwendete Transistor ist ein Breitband-Typ ohne interne Anpassung, der allergings nur bis 1 GHz spezifiziert ist. Ich habe den Transistor bei 1296 MHz getestet und seine Eigenschaften experimentell am Netzwerk-Analysator bestimmt. Der Transistor zeigte gute Effektivität, Verstärkung und Leistung auf 23cm. Das war ein guter Ausgangspunkt für dieses Projekt. Um die Kosten niedrig zu halten, habe ich den Verstärker auf FR-4-Substrat entwickelt. FR-4 ist kein gutes Substrat für 1296 MHz und es ist auch nicht für Leistungsverstärker gut. Die dielektrischen Verluste sind hoch, aber die thermischen Eigenschaften sind brauchbar. Durch niedriges Leistungsniveau, das Montieren der PCB auf einem Kühlkörper, das Kurzhalten der Hochleistungsleiterbahnen und die Reduzierung der Dicke der Platine, wurde das Problem gelöst. Wenn man die PA auf Mikrowellen-Substrat aufbaut, wird es bessere Ergebnisse geben, aber es werden auch die Kosten steigen. Das PA-Modul wurde für 90 Watt Leistung ausgelegt mittels eines Paares von 45-W-Transistoren in balancierter Anordnung.
Die Load-Pull-Methode und ein nichtlineares Model wurden verwendet, um die optimale Gamma-Last-Anpassung des Transistors zu finden. Dies ist die Last-Impedanz, bei der der Transistor die benötigte Leistung und Effektivität liefert. Die Eingangsanpassung war ein wenig kompliziert, weil die Eingangsimpedanz mit höherer Frequenz absinkt. Es war schwierig, die Transistoren gut anzupassen. Es war nötig, die Verstärkung etwas herabzusetzen wegen eines Stabilitätsproblems.

Das wurde mittels eines Serienwiderstands in der Gate-Leitung gemacht, was auch die Anpassung verbesserte. Einige Simulationen und Prototypen wurden angefertigt, bevor die endgültige Version gebaut wurde. Der Verstärker wurde auf Effektivität, RL, Verstärkung, Leistung und Linearität getestet. Die

Messungen waren nahe an den Werten der Simulation. Der Verstärker ist bedingungslos stabil.
Der Freescale-(Motorola)-LDMOS-Transistor MRF9045NBR1 ist in einem OMP- (over molded plastic) Package, Typ TO-272-2 gebaut. Der MRF9045NR1 ist derselbe Transistor in einem anderen Package, TO-270-2, das mit kleinen Flanschen auf den Kühlkörper gelötet werden muss.
Der Transistor im OMP-Package hat einen geringeren thermischen und Verbindung-zu-Gehäuse-Widerstand, aber benötigt eine andere Montage und Lötung. Es ist sehr wichtig, genau die Instruktionen des Herstellers für die mechanischen und thermischen Methoden und die Art des Lötens einzuhalten. Siehe die Applikationshinweise AN3263, AN1907 und AN1955 von Freescale. Als thermischen Übergang nimmt man dünne Blätter aus Kupfer oder t-gon 805 Graphit. Eine Analyse der thermischen Bedingungen ist sehr wichtig bei einem Design einer Hochleistungs-PA. Hier macht sich die Effektivität des Verstärkers bezahlt. Alle Spezifikationen müssen berücksichtigt werden, wie thermischer Widerstand des Transistorgehäuses und der Verbindung, Kühlkörpergröße und Ausführung und sein thermischer Widerstand, Umgebungstemperatur, Verlustleistung und Meereshöhe. In größeren Höhen, wenn die Luft dünner wird, ist die Kühlung schlechter. Das sollte man bei Portabel-Betrieb auf Bergen bedenken. In diesem Design wurde Kühlung mittels eines Lüfters realisiert. Die maximale Gehäusetemperatur des Transistors beträgt 150 Grad Celsius. Und die Temperatur an der Transistor-Verbindung 200 Grad. Diese Werte sollten nicht überschritten werden. Die totale Verlustleistung am Kühlkörper ist etwas weniger als 400 W bei 43% Wirkungsgrad und natürlicher Konvektionskühlung. Bei voller Ausgangsleistung erreichte der Kühlkörper 100 Grad, deshalb ist Kühlung mit einem Lüfter nötig. Ein leiser Papst-Lüfter (24V, Typ 4184NXG bei 94 CFM) reduzierte die Temperatur des Kühlkörpers auf 45 Grad. Das Transistorgehäuse erwärmt sich auf 81 Grad bei 45 Watt Output. Das Reduzieren der Arbeitstemperatur erhöht exponentiell die Zuverlässigkeit und Lebensdauer des Transistors. Ein Reduzieren der Temperatur an der Verbindung des Transistors um 10 bis 20 Grad C bewirkt eine Verdoppelung der MTTF (Mean time to failure, mittlere Zeitdauer bis zum Ausfall). Ein Design mit Mitsubishi-Leistungsmodulen wurde erwogen, aber aus thermischen Gründen, die durch die niedrige Effektivität der Module begründet sind, nicht umgesetzt.
Ein anodisierter schwarzer Kühlkörper wurde verwendet, siehe Abb. 3. Die Größe ist 240 x 270mm. Der thermische Widerstand beträgt 0.315 bei 400W Wärmeverlustleistung und 0.537 bei 100 Watt. Der Abstand der Kühlrippen, die Anzahl und Höhe sind ebenfalls wichtige Faktoren bei der Auswahl. Schwarze Farbe oder Anodisierung verbessert die Kühlung ebenfalls. Es ist besser einen breiteren als längeren Kühlkörper zu verwenden. Die breite Seite befindet sich lotrecht zum Luftstrom. Wenn man die Breite um den Faktor 2 erhöht, vergrößert sich die mögliche Wärmeverlustleistung um den Faktor 2. Aber wenn man die Länge des Kühlkörpers um den Faktor 2 erhöht, erhöht sich die Wärmeverlustleistung nur um den Faktor 1.4.

Das PA-Modul

Der MRF9045-Transistor ist in verschiedenen Gehäusen (Package) erhältlich. Der MRF9045MBR1, der in diesem Verstärker eingesetzt wird, wurde kürzlich ersetzt durch einen neuen Enhancement-Mode-Lateral-MOSFET der 6. Generation. Der neue Transistor ist der MRFE6S9045NR1, mit verbesserten thermischen und elektrischen Eigenschaften. Der thermische Widerstand ist 1 Grad C/W. Zwei Transistoren wurden getestet, der MRF9045NR und der MRF9045NBR1. Sie sind in verschiedenen Gehäusen, aber der einzige Unterschied ist die Befestigungsmethode. Die elektrischen Eigenschaften sind gleich. Das Plastikgehäuse TO-272-2 ist für diesen Transistor inzwischen überholt. TO-270-2 ist das neue Standard-Gehäuse für diesen Transistor. Der neue Transistor wurde noch nicht getestet. Eventuell sind dann kleine Anpassungen beim Design nötig.

Verstärker-Design und Eigenschaften

Die Größe des Verstärkermoduls ist 9 x 5.5 cm. Die PA-Module sind direkt mit den Platinen von Splitter bzw. Combiner verbunden, ohne Stecker, so dass Verluste und Kosten niedrig gehalten werden und um Phasenanpassungsprobleme mit Kabeln zu vermeiden. Verlötete kurze Kupferstreifen verbinden die einzelnen Platinen. Es sind jeweils zwei balancierte MRF9045MBR1-Transistoren mit getrennten Ruhestromeinstellungen vorhanden. Siehe Abb. 4, 5 und 6. Der Verstärker arbeitet in Klasse AB. Der Idq-Strom muss bei jedem Transistor auf 350mA eingestellt werden. Zum Feinabgleich werden die Kondensatoren C6 und C7 durch Trimmerkondensatoren von Voltronics ersetzt. Ändern der Position von C22 und C23 in kleinen Schritten entlang der Leiterbahn ermöglicht ein Abgleich auf maximale Ausgangsleistung. Eine weitere Abstimmung ist nicht nötig. Eine thermische Sicherung ist in der Ruhestromversorgung eingebaut. Der 2N2222-Transistor regelt die Gate-Spannung entsprechend der Temperatur. Das Schalten wird mit zwei N-Typ-Leistungs-MOSFETS und einem LTC1255 vorgenommen

(Abb. 7 und 8). Generell haben N-Typ-Leistungsschalt-MOSFETs geringeren Rds beim Widerstand als P-Typen, sowie geringeren Spannungsabfall und geringere Verlustleistung. Schalten des Gates wurde ausprobiert, aber es war immer noch etwas Leistung am Ausgang vorhanden, wenn das Steuersignal anlag. Der Verstärker würde wahrscheinlich dann im C-Betrieb arbeiten. Der Verstärker kann als einzelnes Modul betrieben werden, wenn nicht mehr Leistung benötigt wird.
Mit vier zusammengeschalteten Modulen beträgt die Ausgangsleistung 350 Watt, die Verstärkung beträgt 16dB und der Wirkungsgrad 43%. Mit 3.4W Treiberleistung liefert die PA mehr als 100 Watt Output bei 25% Wirkungsgrad. Volle Ausgangsleistung wird mit 30 Watt Steuerleistung erreicht. Ein Übersteuern der PA ist nicht empfehlenswert. Mehr als 30 Watt Input sollten für die 350 Watt Output nicht überschritten werden, bzw. 4 Watt für ein Verstärker mit einem einzelnen Modul. Das Modul hat 16 dB Verstärkung und ein Ansteuern mit 0.8 Watt liefert 25 Watt Output, 3.5 Watt liefern >80 Watt. In Abb. 9 ist eine Aufnahme der Messung von Verstärkung und RL eines einzelnen Moduls zu sehen. Der Verstärker wird mit einem 28V/30A Schaltnetzteil betrieben, er arbeitet aber auch mit 13,8V bei geringerer Verstärkung und Ausgangsleistung. In diesem Fall muss die Vorspannung neu eingestellt werden. Die Größe des 350-Watt-Verstärkers beträgt 25 x 30 x 5 cm. Bei voller Ausgangsleistung werden etwa 28A DC gezogen.

Ergebnisse

Zwei komplette Verstärker wurden gebaut und bei diversen EME-Aktivitäten getestet. Die PA wurde primär für den EME-Einsatz beim 30m-Jamesburg-Spiegel gebaut. Die Leistung war gut und es wurden verschiedene Modes, wie CW/SSB, FM, AM und JT65 getestet. Der Verstärker wurde so gebaut, dass er plug-and-play-mäßig funktionieren soll und keine Wartung erforderlich ist. Hunderte von EME-QSOs wurden damit abgewickelt, viele Stunden wurde ohne einen Ausfall gearbeitet. Während langen Betriebes hat die Temperatur des Kühlkörpers nicht mehr als 50 bis 60 Grad C erreicht, auch nicht an heissen Tagen. Es wurde als Experiment auch ein CW-EME-QSO mit einem 1.2m-Spiegel und dieser PA erfolgreich abgewickelt.

Schluß

Ein kompakter, sehr effektiver Verstärker wurde entwickelt und mit Leistungs-MOSFETs der neusten Generation aus der Mobilfunktechnik aufgebaut. Der Verstärker liefert genug Leistung für kleinere oder mittlere EME-Stationen. Mit einem leichten und kleinen Schaltnetzteil ist er ideal für EME-Expeditionen, Portabel- und Mobil-Betrieb oder auch um ihn direkt an der Rückseite eines Spiegels zu montieren. Durch Zusammenschaltung von mehreren Verstärkern ist noch höhere Ausgangsleistung realisierbar.

Referenzen

Siehe engl. Text oben.

Bausätze sind erhältlich (siehe engl. Text oben). Kontakt: contact@rftech.us

<u>Bildunterschriften</u>

Abb. 1 Einzelnes PA-Modul
Abb. 2 Komplette PA mit 4 Modulen und Schaltplatine
Abb. 3 PA mit Kühlkörper
Abb. 4 HF PCB mit Bauteilen
Abb. 5 Schaltbild HF-Teil
Abb. 6 Layout HF-Platine – 90 x 55 mm
Abb. 7 Schaltbild DC MOSFET Schalter
Abb. 8 PCB Layout Schalter – 49 x 36 mm
Abb. 9 Verstärkung / RL – einzelnes PA-Modul
Abb. 10 Einzelner Wilkinson-Teiler
Abb. 11 Wilkinson-Teiler – Layout, 180 x 70 mm
Abb. 12 Wilkinson-Teiler Prinzipschaltbild
Abb. 13 Wilkinson-Teiler - RL, Isolation

<u>Anhang:</u> Stückliste, siehe oben

Loop Feed With Enhanced Performance

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Introduction

Loop feeds are very often used as primary feeds in electrically small parabolic dish antennas. A loop feed configuration for 70 cm was published by Luis Cupido – CT1DMK [1]. A version for 23 cm was published by Guenter Koellner – DL4MEA [2]. These two versions also differ with respect to reflector size. The Cupido version utilizes a 1λ diameter reflector, while the Koellner version utilizes a smaller, approximately λ/2, diameter reflector. The objective of this article is to identify and discuss some of the inherent problems with electrically small, deep, parabolic dish reflector antennas configured with prime-focus feeds and to describe the design of a loop feed suitable for these antennas. The main advantage of a loop feed is improved dish antenna efficiency in a very simple mechanical configuration.

1. Efficiency of electrically small parabolic dish reflector antennas

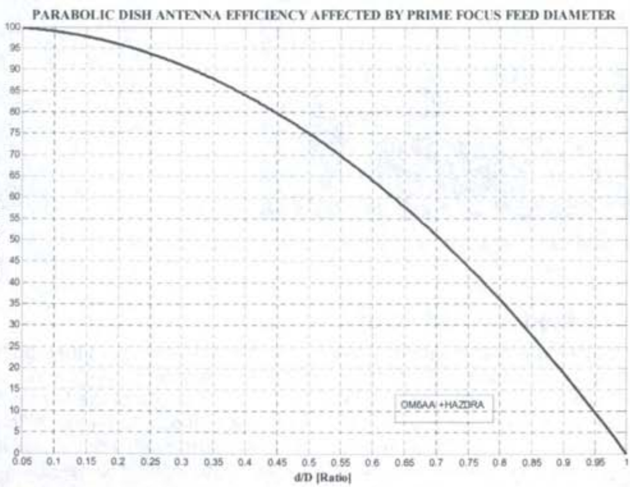
The efficiency of electrically small parabolic dish antennas is substantially degraded by various size-specific factors, among them, the large size of the feed in comparison to a relatively small reflector. For example, consider various diameter dish antennas having the same primary feed consisting of a simple waveguide with diameter 0.65λ. An antenna with a reflector diameter of 20λ has a feed-to-dish diameter ratio of .0325 while a smaller antenna with reflector diameter of 4λ has a larger, 0.1625 ratio. Furthermore, it is usually not possible to substantially reduce the feed's size. Some negative factors affecting the efficiency of small dish antennas are described by Paul Wade-W1GHZ [3].

The dominant factors affecting small dish antenna performance are:

a. Blockage of the dish reflector by its prime-focus configured feed

The gain of a parabolic dish antenna with prime-focus feed is given by:

$G = 10\log [\pi^2 (D^2 - d^2) / \lambda^2] * \eta$ (dBi) (dBi) (1)



where D is the reflector diameter, d is the feed diameter, λ is the wavelength and η is total efficiency. From (1) it is apparent that feed dimensions may significantly downgrade antenna efficiency due to reflector blockage. A graphical depiction of this is shown in Fig. 1 and indicates that the feed diameter, d, should be as small as possible.

Fig. 1 Effect of feed blockage on a uniformly illuminated antenna

b. Properties of the electromagnetic field emanating from the feed and its deviation from a spherical wave

According to Huygen`s Principle, the electromagnetic field at a given point is the superposition of spherical wavelets originating from a surface located between the given point and the source. This means that the feed aperture appears as multiple point-sources of spherical waves with specific magnitudes and phase. See Fig. 2. This phenomenon is partly responsible for efficiency degrading, divergent rays being reflected by the dish. For a given, fixed feed size, this efficiency degrading is continuously proportional to dish reflector size with a larger dish being less affected. Taking this into account, it requires that the feed be a good point-source of spherical waves. Application of Huygen`s Principle to an actual feed helps to clarify this. See Fig. 3, which depicts the propagation of an electric field within a corrugated horn antenna, commonly used as a primary feed. More information on Huygen`s Principle can be found in our reference [4].

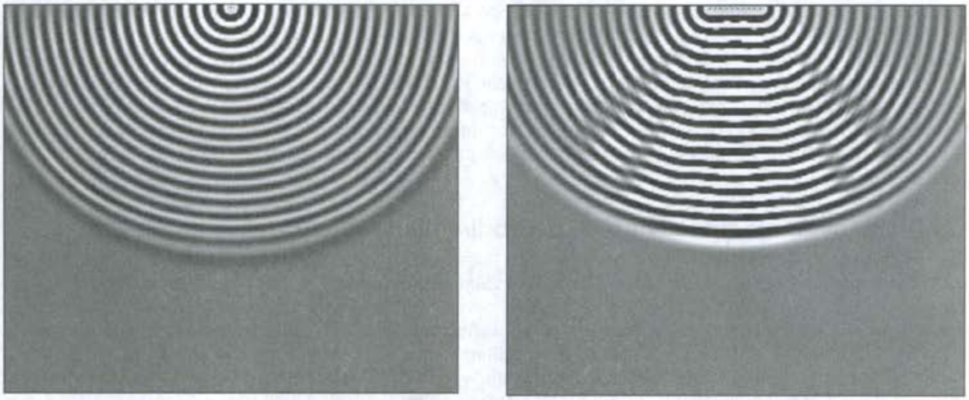


Fig. 2 Wave source visualization -- Point source (left), multipoint source (right)

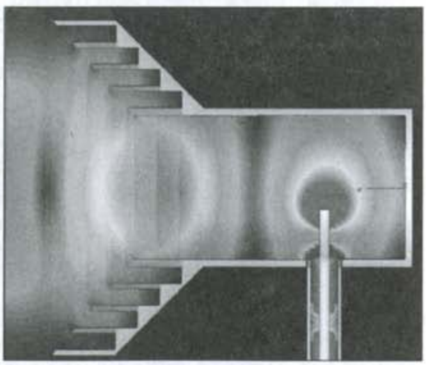


Fig. 3 Near electric field (time snapshot) of a corrugated horn antenna

c. Diffraction originating from the feed and struts

Diffractive effects originate when propagating electromagnetic waves interact with obstacles in their path, such as the feed and struts. See Fig. 4. Other sources of diffraction generated interference are the rim of the dish reflector and "overshadowed sites," which are locations defined by the projection of the feed and struts onto the dish surface. Diffraction introduces additional losses, mainly due to the disturbance of field homogeneity and field distribution above the reflector's surface. Most modern mathematical wave modeling software operates according to the Geometrical Theory of Diffraction published by Keller [5].

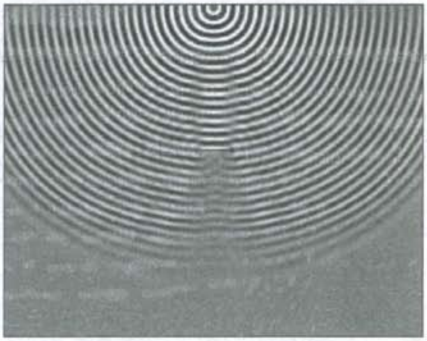


Fig. 4 Diffractive effect visualization

d. Main beam interference due to back lobe and secondary generated fields

The requirement for small physical feed dimensions, suggested in the previous sections, conflicts with requirements for low backward radiation from the prime-focus feed. Herein arises a problem in eliminating unwanted radiation using an electrically small structure, since smaller feeds typically exhibit a large back lobe radiation component. This unwanted radiation interferes with desirable radiation reflected from the dish and subsequently deforms the overall radiation pattern and downgrades the efficiency.

Examples of measured E- and H-plane radiation patterns of Fig. 5's plane circular waveguide with inner diameter 0.65λ and length 1λ are shown in Figs. 6. The waveguide is excited by a λ/4 probe. This simple structure is often used in conjunction with smaller and deeper dishes.

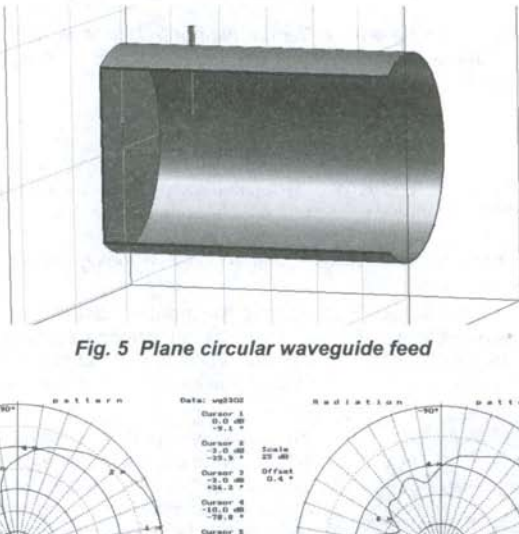


Fig. 5 Plane circular waveguide feed

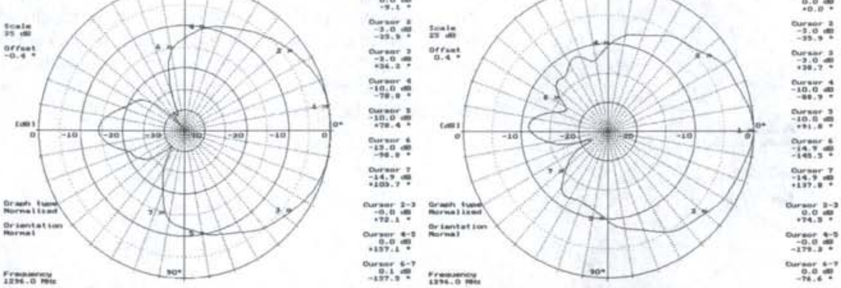


Fig. 6 Radiation pattern of plane circular waveguide feed, 0.65λ
-- Measured E-plane (left) and H-plane (right)

The radiation pattern in Fig. 6 shows that the back lobe is suppressed by only 12 dB. The backward radiation of this feed may be further suppressed by adding a choke at the open end of the waveguide, with the resulting narrowed radiation pattern and increased dish blockage as tradeoffs.

Consider the near field of a dish antenna fed by an ideal point source at its focus as shown in Fig. 7. Here, the electric field at the dish reflector's focus and immediate vicinity is non-homogeneous and has a relatively high intensity. This field generates parasitic surface currents on the feed body, which subsequently generate an unwanted field. The unwanted field has random polarization and interferes with the field reflected from the parabolic reflector resulting in reduced efficiency. There are several ways to eliminate the amount of induced radiation: reduce the feed's size, cover the feed with an electromagnetic absorbing material or provide a corrugated feed surface so that high frequency surface currents are not easily conducted.

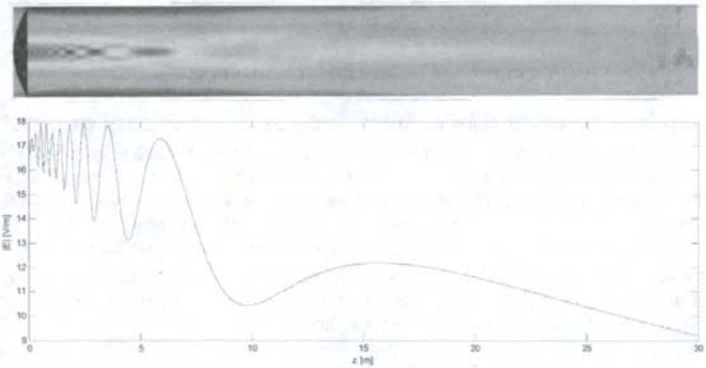


Fig. 7 Near E-field of an antenna with reflector diameter D = 3 m and f/D = 0.28. The dish is illuminated by a partly collimated point source (fo = 1296 MHz) at its focus. The "farfield" slope of the E-field starts ~15 m in front of the aperture.

e. Impedance match

In small dish configurations, the feed is usually located very close to the reflector. The short distance between feed and dish has an influence on the feed's impedance parameters and may contribute to the generation of a standing wave, especially with feeds employing waveguides. Installing the feed onto a dish may have a positive or negative affect on feed impedance match depending on the feed's specific design, dish reflector size and frequency.

Documentation of square cross section septum feed S–parameter dependence on the distance from a conductive plate has been published [6]. The study for an antenna assembly consisting of the feed displayed in Fig. 5 and the 5λ diameter dish reflector (f/D ratio 0.35) shown in Fig. 8 is plotted in Fig. 9. Waveguide excitation with the feed's base mode TE11 was used.

Simulation was performed using CST MW studio software [7]. To avoid potential problems with impedance matching and changes in the radiation pattern, a model of the entire antenna assembly, consisting of the dish and prime-focus feed, should be optimized.

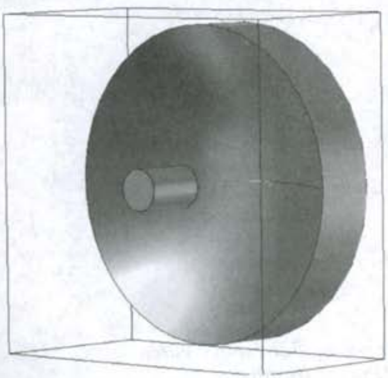


Fig. 8 5λ diameter antenna assembly

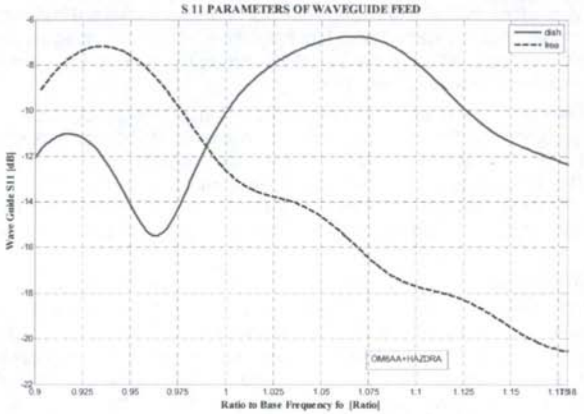


Fig. 9 Feed S_{11} parameter variations

2. Feed Design

A Loop Feed consists of one or more 1λ long radiators usually coiled into circular shapes, a reflector and signal feed lines. A dual band feed configuration is shown in Fig. 10.

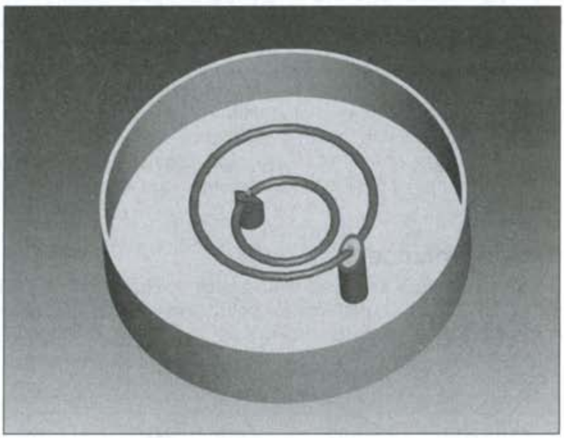


Fig. 10 – Dual-band Loop Feed

Using CST MW Studio software to investigate the loop radiation, we found that the distance between the loop radiator and its reflector not only affects the radiation pattern, but mainly the feed impedance. The loop reflector`s dimensions affect the symmetry of the radiation pattern and amount of back lobe suppression. The calculated results for various loop reflector parameters are shown in Tab. 1.

Reflector Size	Main Beam	Back Lobe	Angle for 10 dB	Angle for 10 dB	Angle for 3dB	Angle for 3dB
			E	H	E	H
D	dBi	dB	[°]	[°]	[°]	[°]
λ / 2	8,20	5,8	113,2	144	65,3	79,7
3/4 λ	8,9	13,7	112	140	64	75
1 λ	9,4	17,1	107,4	128,6	60	70
0,606 λ with Choke	8,2	17,4	133,2	143	74,4	78,8

Tab. 1 Radiation pattern characteristics

From these results it is evident that a larger loop reflector reduces backward radiation and improves the radiation pattern's symmetry with increased dish blockage as tradeoff. To mitigate this, we increased the elecrical size of the loop reflector by adding a collar ring around the reflector's perimeter. This improved the feed's performance without increasing dish blockage.

The subsequent optimization of the feed was performed using CST MW Studio's Time Domain Solver. The variables were loop diameter, the loop's distance from its reflector, loop reflector diameter and collar ring height. Items of interest were the shape of the main beam, back lobe suppression and S_{11} (impedance match). The optimization intent was to achieve the best performance for the most popular dishes, those with an f/D ratio close to 0.4. When one band was optimized, we added a second loop to achieve dual-band performance. The effect of the added loop on the radiation pattern of the base band was negligible.

To study the behaviour of a 6.5λ diameter dish reflector with feed, the entire antenna assembly was modeled. Further optimizations focused on the resulting radiation pattern and S_{11} parameter. Changes were made by using FEKO software [8] and applying the MLFMM method. Since this is a relatively large structure for computation, a simplified model without the coaxial feed lines was calculated. For the loop drive, we used a very simple symmetrical method employing a sloping coaxial line which initially caused some doubt about pattern deformation. Later however, we discovered that this simplification did not have a significant effect on the feed's performance.

3. Mechanical Design

The feed's base mechanical component is a structurally rugged cup-shaped reflector which was machined from Aluminum alloy EN AW 5083 (H111) cylindrical stock. A short, silver plated, machined brass coaxial stud with a flange at one end mounts on the reflector such that the stud extends into the cup of the reflector through a mounting hole in the reflector's flat surface. The flange end of the coaxial stud mates with the flange end of a ½" N-style female flange jack (mini 4-hole flange w/post terminal) and these are affixed to the outside flat surface of the reflector cup by four screws that pass through the flange jack, coaxial stud flange, and reflector. A circular, selfsupporting loop radiator is installed within the cup area of the reflector by soldering it to the coaxial stud with lead-free sodering alloy, SnAg5. For greater mechanical stability or for the 70 cm version, a TEFLON™ strut placed opposite to the coaxial stud can be added. The loop radiator is made of UT–141 semi-rigid coaxial cable which was formed using a bending jig. Mechanical detail drawings of the loop feed assembly are located in the Appendix.

4. Actual Measured Performance

The dual band loop feed's performance was tested in an anechoic chamber at ERA Pardubice Company, Czech Republic [9]. See Fig. 18. Radiation patterns for both bands and E- and H-planes were observed. Both the measured and calculated data are shown in Fig's 11 and 12 for comparison.

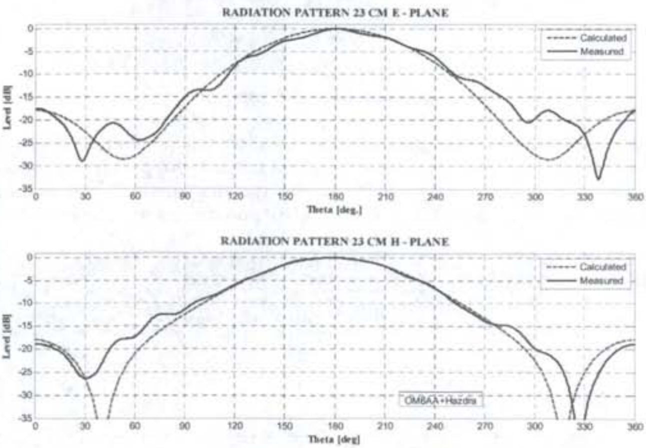


Fig. 11 Radiation Pattern - 23 cm

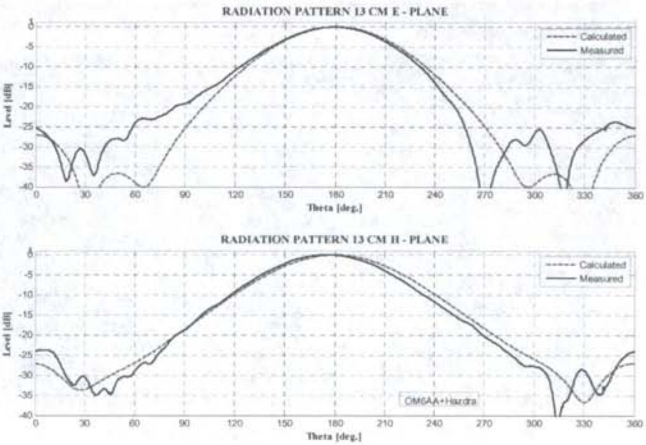


Fig. 12 Radiation Pattern - 13 cm

Good agreement between calculated and measured values was achieved. Observed differences present in the side lobes are attributed to model simplification since it was calculated without the coaxial feed stud. Despite this, axial symmetry for both bands and both planes remained very good. Calculated antenna efficiency for a 1.5 m diameter parabolic dish configuration is plotted in Fig.13.

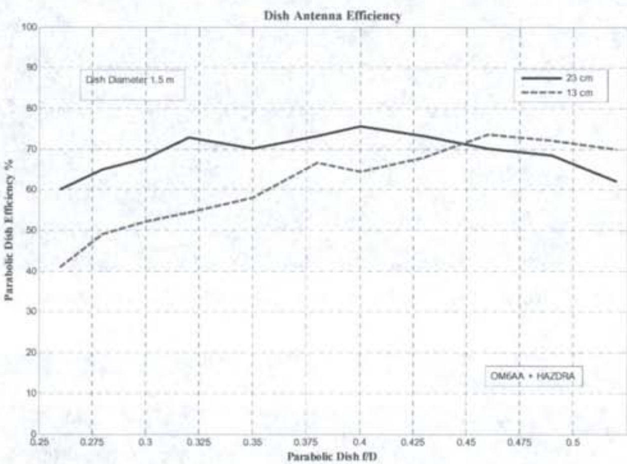


Fig. 13 Dish Antenna Efficiency

FEKO software was used to calculate the efficiency of both bands with the feed optimally positioned for the 23 cm band. Very good efficiency on the 23 cm band within a wide f/D dish ratio was achieved. Optimum performance on 13 cm was obtained with shallow dishes. The best dual band performance was obtained with dishes having an f/D ratio of 0.45.

Impedance match (S_{11}, S_{22}) for free space are shown in Fig's 14 and 15. Isolation (S_{21}) between loops for free space is 17.4 dB at 1296 MHz and 15.7 dB at 2320 MHz. An Agilent Technologies N1996A spectrum analyzer was used for these measurements.

Impedance and isolation have also been measured for an antenna assembly with a dual band-loop feed located at the focus of a 1.4 m dish antenna with an f/D ratio of 0.5. Improvement of impedance match on the 23 cm band for this configuration was measured. See Fig's 16 and 17. Only small changes in isolation between loops were observed, 19 dB at 1296 MHz and 15.8 dB at 2320 MHz.

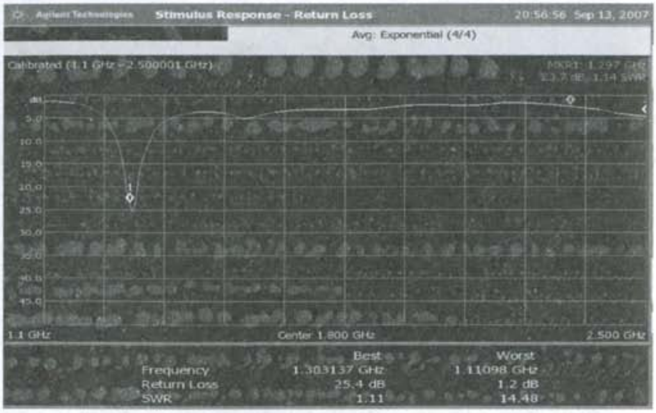


Fig. 14 Return loss for free space - 1297 MHz

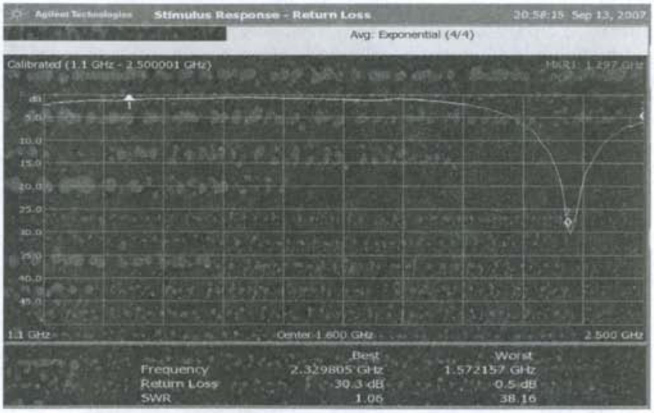


Fig. 15 Return loss for free space - 2318 MHz: 27.4dB (Marker 2)

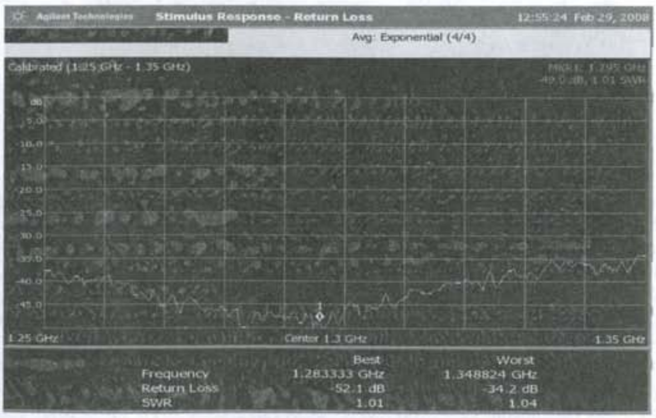


Fig. 16 Return loss in dish - 1295 MHz

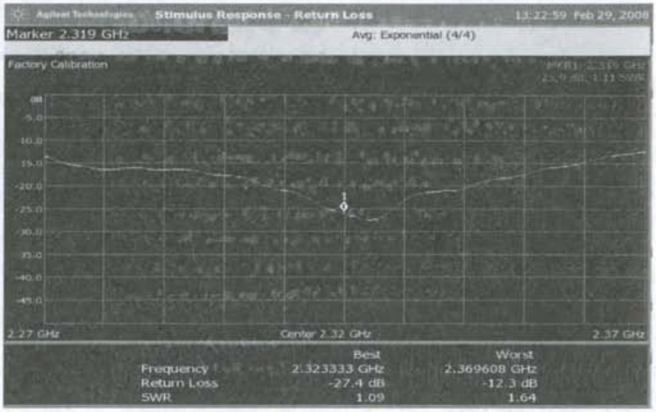


Fig. 17 Return loss in dish - 2319 MHz

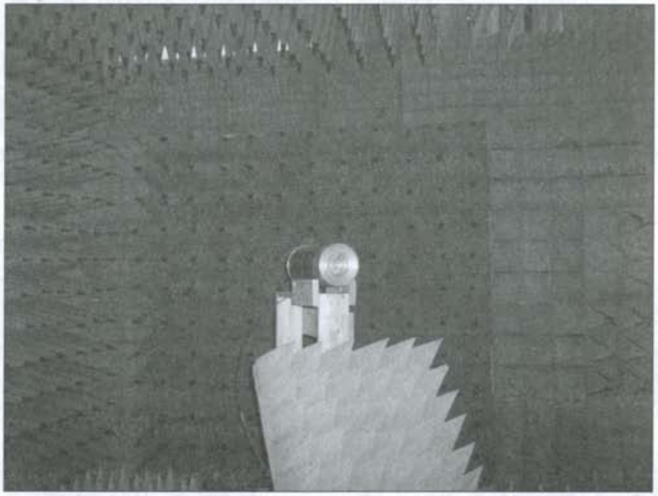


Fig. 18 Loop Feed in anechoic chamber at ERA Pardubice

5. Field tests

We gained valuable practical experience operating and testing the dual-band feed in the field during two radio contests. The first was participation in the IARU Region 1 UHF/SHF contest in 2007 by radio club OM50KHE. The antenna was configured with a 1.7 m diameter dish having an f/D ratio of 0.4 and the loop feed, mechanically adapted for actual antenna use, built into a rugged, cylindrical stainless steel enclosure. See Fig's 19 and 20. This antenna was used only on the 23 cm band. The result was to make 104 contacts including several QSO's over 800 km. Compared to the previously used feed (shown in Fig. 5), we documented a substantial improvement, breaking the club's record in this contest.

The second test was performed by members of radio club OK2KYC during the I. Subregional contest in 2008. The feed was placed at the focus of a 1.4 m diameter dish with an f/D ratio of 0.5. See Fig's 21 and 22. Very good results on both the 23 and 13 cm bands were also attained with the OK2KYC club's history records being overwritten in this contest.

Fig. 19 Jozef – OM6AM holding the feed housed in a stainless steel enclosure

Fig. 20 Fero – OM6AR mounting the feed onto the dish reflector

Fig. 21 OK2KYC`s antenna setup

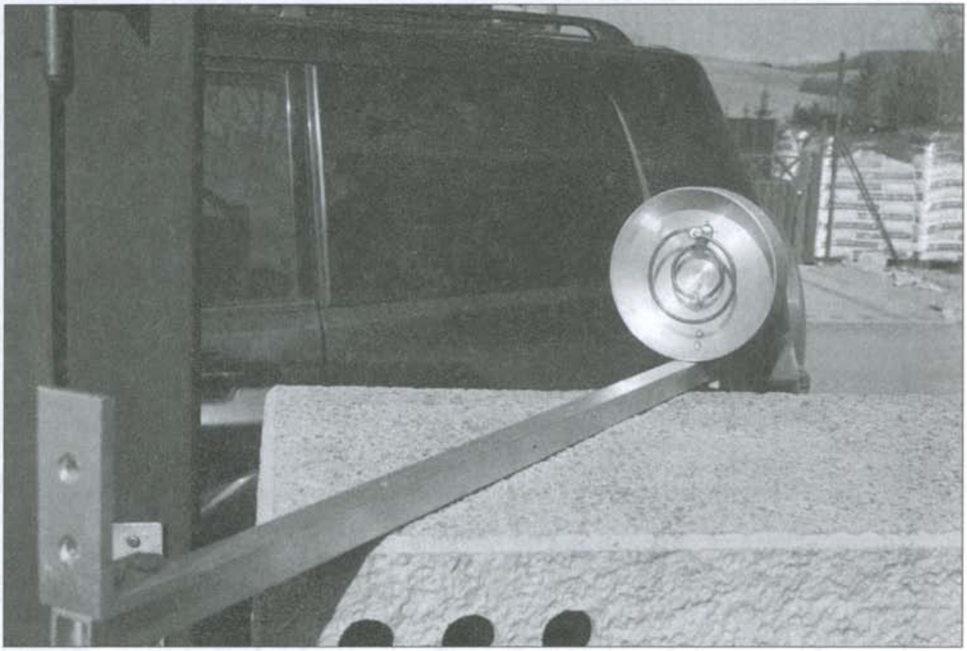


Fig. 22 Feed mount detail

Summary and conclusions

The loop feed represents a simple, highly efficient, easy-to-make feed variant for prime-focus-based dish antennas. A Loop Feed is easily adapted to various f/D dish ratios by changing the loop reflector's size and the feed dimensions may be scaled by frequency to adapt it to 70 cm or higher bands. Adding a second loop enables multi-band capability. The mechanical configuration is very rugged, compact and easily allows protection of the loop wires by using a dielectric cover over the feed's aperture. Our loop feed can handle very high power, limited only by its "N" style connectors. Since isolation between loops is relatively low, a high-power switching relay with good isolation must be used to protect the receiver in high-power, multiband applications.

Acknowledgements

The authors wish to acknowledge the help of Vitezslav Krcmar and Peter Kasparek – OK2ULQ for performing feed measurements, Vladimir Petrzilka – OK1VPZ, for fabricating mechanical parts and Robert Valenta for his technical and language assistance.

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Loop-Feed mit verbesserter Leistung

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Einleitung

Loop-Feeds werden sehr häufig als Primäre Feeds in elektrisch kleinen Parabolantennen verwendet. Eine Loop-Feed-Konfiguration für 70cm wurde von Luis Cupido, CT1DMK, in [1] veröffentlicht. Eine Version für 23cm wurde von Günter Köllner, DL4MEA, in [2] veröffentlicht. Diese zwei Versionen unterscheiden sich auch in Bezug auf die Reflektorgröße. Die Version vom Cupido verwendet einen Reflektor von 1λ-Durchmesser, während die Version von Köllner einen kleineren Reflektor von ungefähr λ/2-Durchmesser verwendet. Die Zielsetzung dieses Artikels ist, einige der bei kleinen, tiefen, mit einem primär-fokalen Feed ausgestatteten Parabolspiegeln auftretenden Probleme elektrisch zu beschreiben und zu diskutieren sowie das Design eines Loop-Feeds, das für diese Spiegel geeignet ist, zu beschreiben. Der Hauptvorteil eines Loop-Feeds ist die verbesserte Effektivität des Spigels bei einer sehr einfachen mechanischen Konfiguration.

1. Effektivität von elektisch kleinen Parabolspiegelantennen

Die Effektivität von elektrisch kleinen Parabolspiegelantennen wird entscheidend durch verschiedene größenabhängige Faktoren herabgesetzt, darunter die Größe des Feeds im Vergleich zum relativ kleinen Reflektor. Z.B. stelle man sich verschiedene Spiegelantennen vor, die dasselbe Primäre Feed, das aus einem einfachen Wellenleiter von 0.65λ Durchmesser besteht, besitzen. Eine Antenne mit einem Reflektordurchmesser von 20λ hat ein Feed-zu-Spiegel-Durchmesserverhältnis von .0325, während eine kleinere Antenne mit einem Reflektordurchmesser von 4λ ein größeres Verhältnis von 0.1625 aufweist. Außerdem ist es normalerweise nicht möglich, die Größe des Feeds entscheident zu verkleinern. Einige negative Faktoren, die die Effektivität von kleinen Antennenspiegeln beeiflussen, wurden von Paul Wade, W1GHZ, in [3] beschrieben.

Die dominierenden Faktoren, die die Leistungsfähigkeit eines kleinen Antennenspiegels beeiflussen, sind:

a. Blockade des Reflektors durch das primäre-fokale Feed

Der Gewinn einer Parabolspiegelantenne mit primär-fokalem Feed ist gegeben durch:

$$\mathbf{G = 10log\,[\pi^2\,(D^2 - d^2)\,/\,\lambda^2] * \eta\ (dBi)} \qquad \mathbf{(1)}$$

mit D = Reflektordurchmesser, d = Feeddurchmesser, λ = Wellenlänge und η = Gesamteffektivität. Aus Gleichung (1) ist ersichtlich, dass die Abmessungen des Feeds die Effektivität signifikant herabsetzten können durch die Blockierung des Reflektors. Eine graphische Darstellung dieses Sachverhalts zeigt Abb. 1 und sie zeigt, dass der Feeddurchmesser d so klein wie möglich sein sollte.

b. Eigenschaften des aus dem Feed entspringenden elektromagnetischen Feldes und seine Abweichung von einer kugelförmigen Welle

Entsprechend dem Huygen`schen Prinzip ist das elektromagnetische Feld an einem gegebenen Punkt die Überlagerung von kugellförmigen Elementarwellen, die aus einer Oberfläche entspringen, die sich zwischen dem gegebenen Punkt und der Quelle befindet. Das bedeutet, dass die Feed-Öffnung als multiple Punkt-Quelle kugelförmiger Wellen erscheint. Siehe Abb. 2. Dieses Phänomen ist teilweise Ursache für herabgesetzte Effektivität, wobei divergierende Strahlen vom Spiegel reflektiert werden. Für eine gegebene, feste Feedgröße, ist diese Minderung der Effektivität proportional zur Größe des Reflektors, wobei größere Spiegel weniger betroffen sind. Wenn man das berücksichtigt, ist es also nötig, dass das Feed ein gute punktförmige Quelle für sphärische Wellen ist. Die Anwendung des Huygen`schen Prinzips auf ein bestimmtes Feeds hilft also dieses zu klären. Siehe Abb. 3, wo die Ausbreitung eines elektrischen Feldes innerhalb einer geweiteten Horn-Antenne dargestellt ist, die viel als primäres Feed Verwendung findet. Mehr Informationen zum Huygen`schen Prinzip kann man in unserer Referenz [4] finden.

c. Beugung durch Feed und Streben

Beugungseffekte entstehen, wenn die wandernde elektromagnetische Welle mit Hindernissen im Pfad interagiert, wie dem Feed oder den Streben der Halterung. Siehe Abb. 4. Andere Quellen von Störungen durch Beugung sind der Rand des Reflektors und „überschattete Stellen", die definiert sind durch die Projektion des Feeds und der Streben auf die Spiegeloberfläche. Beugung erzeugt zusätzliche Verluste, hauptsächlich durch die Störung der Feldhomogenität und der Feldverteilung über der Reflektoroberfläche. Die meisten modernen Programme für die mathematische Modellierung von Wellen arbeiten entsprechend der geometrischen Theorie der Beugung, wie sie von Keller publiziert wurde [5].

d. Interferenzen in der Hauptstrahlrichtung durch rückwärtige Keulen und sekundär erzeugte Felder

Das Erforderniss von kleinen physikalischen Abmessungen, wie zuvor vorgeschlagen, steht im Konflikt mit dem Erfordernis einer geringen rückwärtigen Abstrahlung aus dem primär-fokalen Feed. Hiermit entsteht durch Verwendung einer elektrisch kleinen Struktur ein Problem beim Beseitigen der unerwünschten Strahlung, da kleine Feeds typischerweise eine große nach hinten gerichtete Strahlungskomponente aufweisen. Diese unerwünschte Strahlung interferiert mit der erwünschten Strahlung, die vom Spiegel reflektiert wird und folglich wird das gesamte Strahlungsdiagramm deformiert und die Effektivität herabgesetzt.
Beispiele der gemessenen E- und H-Ebenen des Strahlungsdiagramms des planaren zirkularen Wellenleiters aus Abb. 5 mit einem Innendurchmesser von 0.65λ und Länge von 1λ sind in Abb. 6 gezeigt. Der Wellenleiter wird mit einer λ/4-Sonde erregt. Diese simple Struktur wird oft in Verbindung mit kleinen und tiefen Spiegeln verwendet.
Das Strahlungsdiagramm in Abb. 6 zeigt, dass die Rückwärtskeule nur um 12dB abgesenkt ist. Die rückwärtige Strahlung dieses Feeds kann eventuell weiter durch Hinzufügen eines Chokes am offenen Ende des Wellenleiters abgesenkt werden, aber der Preis dafür ist ein schmaleres Strahlungsdiagramm und eine vergrößerte Blockierung des Spiegels.

Nehmen wir das Nahfeld eines Spiegels, der mit einer idealen punktförmigen Quelle im Fokus gespeist wird an, wie in Abb. 7 gezeigt. Hier ist das elektrische Feld im Fokus des Reflektors und der unmittelbaren Nachbarschaft nicht homogen und hat eine relativ hohe Intensität. Dieses Feld erzeugt parasitäre Oberflächenströme im Körper des Feeds, die folglich ein unerwünschtes Feld erzeugen. Das unerwünschte Feld hat eine zufällige Polarisation und interferiert mit dem vom Parabolreflektor zurückgestrahlten Feld. Das reduziert die Effektivität. Es gibt verschiedene Wege, um die Menge an induzierter Strahlung zu eliminieren: Die Größe des Feeds reduzieren, das Feed mit einem Strahlung absorbierenden Material bedecken oder so eine Oberfläche für das geweitete Feed wählen, dass die hochfrequenten Oberflächenströme nicht gut geleitet werden.

e. Impedanzanpassung

Bei Konfigurationen mit kleinen Spiegeln befindet sich das Feed üblicherweise sehr nahe am Reflektor. Die kurze Distanz zwischen Feed und Spiegel hat einen Einfluß auf die Impedanzeigenschaften des Feeds und kann zur Erzeugung stehender Wellen beitragen, besonders bei Wellenleiter-Feeds. Das Installieren des Feeds im Spiegel kann einen positiven oder negativen Effekt auf die Impedanz des Feeds haben, abhängig vom spezifischen Design des Feeds, der Größe des Spiegelreflektor und der Frequenz.

Die Abhängigkeit der S-Parameter eines quadratischen Septum-Feeds von der Distanz von einer leitenden Platte wurde in [6] publiziert. Die Studie für eine Anordnung bestehend aus dem Feed in Abb. 5 und dem in Abb. 8 gezeigten Spiegelreflektor mit 5λ Durchmesser (f/D 0.35) ist in Abb. 9 wiedergegeben. Es wurde Wellenleitererregung mit dem Feed-Basismodus TE11 angewendet.

Die Simulation wurde mit der CST MW Studio Software duchgeführt [7]. Um potentielle Probleme mit der Impedanzanpassung und Änderungen im Strahlungsdiagramm zu vermeiden, sollte ein Modell der gesamten Anordnung, bestehend aus Spiegel und primär-fokalem Feed, optimiert werden.

2. Feed Design

Ein Loop Feed besteht aus einem oder mehreren 1λ langen Strahlern, die üblicherweise in zirkulare Form gebogen sind, einem Reflektor und der Einspeiseleitung. Ein Dualband-Feed ist in Abb. 10 gezeigt.

Zur Untersuchung des Strahlungsdiagramms des Loops wurde die CST MW Studio Software verwendet und herausgefunden, dass der Abstand zwischen dem Loop-Strahler und dem Reflektor nicht nur das Strahlungsdiagramm, sondern auch besonders die Impedanz des Feeds beeinflusst. Die gerechneten Ergebnisse für verschiedene Parameter des Loop-Reflektors sind in Tabelle 1 aufgezeigt.
Aus diesen Ergebnissen ist ersichtlich, dass ein großer Loop-Reflektor die rückwärtige Strahlung reduziert und die Symmetrie des Strahlungsdiagramms verbessert. Der Preis dafür ist vergrößerte Blockierung des Spiegels. Um das zu lindern, haben wir die elektrische Größe des Loop-Reflektors durch Hinzufügen eines Kragenringes (Choke) um den Umfang des Reflektors herum vergrößert. Das hat die Leistung des Feeds verbessert ohne die Blockierung zu erhöhen.

Die nachfolgende Optimierung des Feeds wurde mit der Software CST MW Studio Time Domain Solver durchgeführt. Die Variablen waren der Loop-Durchmesser, der Abstand zwischen Loop und Reflektor, Durchmesser des Loop-Reflektors und Höhe des Kragenringes. Interessiert haben die Form der Hauptstrahlungskeule, die Unterdrückung des rückwärtigen Zipfels und S_{11} (Impedanzanpassung).
Das Ziel der Optimierung war, die besten Leistungsdaten für die am häufigsten verwendeten Spiegel mit einem f/D nahe bei 0.4 zu erhalten. Als ein Band optimiert war, haben wir einen zweiten Loop hinzugefügt, um ein Arbeiten auf zwei Bändern zu erreichen. Der Effekt des hinzugefügten Loops auf das Strahlungsdiagramm des Basisbands war vernachlässigbar.
Um das Verhalten eines Spiegel-Reflektors von 6.5λ Durchmesser mit Feed studieren zu können, wurde die komplette Antennenanordnung modelliert. Weitere Optimierungen konzentrierten sich auf das resultierende Strahlungsdiagramm und den S_{11}-Parameter (Impedanz). Veränderungen wurden mit Hilfe der FEKO-Software [8] und Anwendung der MLFMM-Methode vorgenommen. Da dies für eine Simulation eine relativ große Struktur ist, wurde ein vereinfachtes Modell ohne die koaxialen Speisungen gerechnet.
Zur Erregung der Loops haben wir eine sehr einfache symmetrische Methode mit einer schräg abfallenden Koaxleitung verwendet, die zuerst einige Zweifel bezüglich der Deformation des Diagramms aufkommen ließ. Später jedoch haben wir herausgefunden, dass diese Vereinfachung keinen signifikanten Effekt auf die Leistung des Feeds hat.

3. Mechanisches Design

Die mechanische Basiskomponente des Feeds besteht aus einem mechanisch stabilen topfförmigen Reflektor, der aus einem zylindrischen Stück Aluminium-Legierung EN AW 5083 (H111) gefräst wird.
Ein kurzer gedrehter versilberter koaxialer Messingbolzen mit einem Flansch an einem Ende wird auf dem Reflektor so montiert, dass der Bolzen durch ein Montageloch in der flachen Oberfläche des Reflektors in den Topf des Reflektors ragt. Das Flansch-Ende des koaxialen Bolzens passt mit dem Flansch einer ½" N-Buchse (Mini-4-Loch-Flansch) zusammen und diese werden an der flachen äußeren Oberfläche des Reflektortopfes mit vier Schrauben befestigt, die also durch die Flanschbuchse, den Flansch des Koaxbolzens und Reflektor gehen. Ein runder selbsttragender Loop-Strahler wird durch Anlöten am Koaxbolzen über der Topffläche des Reflektors befestigt. Hierzu wird bleifreies Lot der Legierung SnAg5 verwendet. Für höhere mechanische Stabilität oder bei einer 70cm-Version kann eine TEFLON®-Strebe auf der gegenüberliegenden Seite des Bolzens hinzugefügt werden. Der Loop-Strahler wird aus UT-141 Semi-Rigid-Koaxkabel hergestellt, das mittels einer Biegevorrichtung geformt wird. Detaillierte Zeichnungen der mechanischen Teile der Loop-Feed-Konstruktion finden sich im Anhang.

4. Gemessene Eigenschaften

Die Leistung des Dualband-Loop-Feeds wurde in eine Meßraum der Firma ERA Pardubice in Tschechien [9] getestet. Siehe Abb. 18. Die Strahlungsdiagramme wurden für beide Bänder und E- und H-Ebene aufgenommen. Gemessene und berechnete Daten sind zum Vergleich in Abb. 11 und Abb. 12 gezeigt.
Es wurde gute Übereinstimmung zwischen den berechneten und gemessenen Werten erzielt. Die bei den Nebenzipfeln sichtbaren Unterschiede gehen auf die Vereinfachung des Modells zurück, da es ohne den koaxialen Bolzen berechnet wurde. Nichtsdestotrotz bleibt die axiale Symmetrie für beide Bänder und beide Ebenen sehr gut. Die berechnete Antenneneffektivität für eine Anordnung mit einem 1.5-m-Parabolspiegel ist in Abb. 13 aufgetragen.
Die FEKO-Software wurde verwendet, um die Effektivität für beide Bänder zu berechnen, wobei das Feed optimal für 23cm positioniert wurde. Es wurde eine sehr gute Effektivität auf dem 23cm-Band über einen weiten f/D-Bereich erreicht. Optimale Leistung auf 13cm wurde mit flachen Spiegeln erreicht. Die beste Dualband-Leistung wurde mit Spiegeln mit einem f/D von 0.45 erreicht.

Die Impedanzanpassung (S_{11}, S_{22}) für den Freiraum ist in Abb. 14 und Abb. 15 gezeigt. Die Isolation (S_{21}) zwischen den Loops beträgt im Freiraum 17.4 dB bei 1296 MHz und 15.7 dB bei 2320 MHz. Für diese

Messungen wurde ein Spektrumanalysator N1996A von Agilent Technologies verwendet.
Impedanz und Isolation wurden auch in einem 1.4-m-Spiegel mit f/D von 0.5 mit dem Dualband-Loop-Feed im Fokus gemessen. Auf dem 23cm-Band wurde eine Verbesserung der Impedanzanpassung in dieser Konfiguration gemessen. Siehe Abb. 16 und Abb. 17. Bei der Isolation zwischen den Loops wurden nur geringe Änderungen beobachtet, 19 dB auf 1296 MHz und 15.8 dB auf 2320 MHz.

5. Feldversuche

Wir haben wertvolle praktische Erfahrungen durch Verwenden und Testen des Dualband-Feeds in der Praxis bei zwei Contesten gesammelt. Der erste war der IARU Region 1 UHF/SHF Contest 2007 beim Radioclub OM50KHE. Die Antenne war hier ein 1.7-m-Spiegel mit f/D von 0.4 und einem Loopfeed, das mechanisch mit einem stabilen Edelstahlzylinder für die aktuelle Verwendung angepasst wurde. Siehe Abb. 19 und Abb. 20. Diese Antenne wurde nur auf dem 23cm-Band eingesetzt. Das Ergebnis waren 104 Kontakte inklusive diverse QSOs über 800km. Im Vergleich zum zuvor verwendeten Feed (gezeigt in Abb. 5), wurde eine deutliche Verbesserung dokumentiert, ein neuer Club-Rekord wurde in diesem Kontest aufgestellt.
Der zweite Test wurde durch Mitglieder des Radioclubs OK2KYC im I. Subregional-Contest 2008 durchgeführt. Das Feed wurde im Fokus eines 1.4-m-Spiegels mit f/D von 0.5 platziert. Siehe Abb. 21 und Abb. 22. Es wurden ebenfalls sehr gute Ergebnisse auf dem 23cm- und 13cm-Band erhalten, wobei die Rekorde in der Clubgeschichte von OK2KYC für diesen Kontest überboten wurden.

Zusammenfassung und Schluß

Das Loop-Feed repräsentiert eine einfache, hocheffektive, leicht herstellbare Feed-Variante für primärfokale Spiegel-Antennen. Ein Loop-Feed kann leicht für verschiedene f/D-Verhältnisse angepasst werden, indem man die Größe des Loop-Reflektors verändert. Die Abmessungen des Feeds können über die Frequenz umgerechnet werden, um es für 70cm oder höhere Bänder zu verwenden. Das Hinzufügen eines zweiten Loops ermöglicht Zweiband-Betrieb. Die mechanische Konstruktion ist sehr stabil, kompakt und ermöglicht durch Verschließen der Feed-Öffnung mit einer dielektischen Abdeckung den Schutz der Loops. Unser Loop-Feed kann sehr hohe Leistung vertragen, die nur durch die N-Verbinder limitiert ist. Da die Isolation zwischen den Loops relativ gering ist, sollte ein Relais mit guter Isolation für hohe Leistungen zwischengeschaltet werden, um den Empfänger bei QRO-Multiband-Betrieb zu schützen.

Danksagung

Die Autoren möchten sich für die Hilfe von Vitezslav Krcmar und Peter Kasparek, OK2ULQ, bei der Durchführung der Messungen an den Feeds bedanken, sowie bei Vladimir Petrzilka, OK1VPZ, für das Herstellen der mechanischen Teile und bei Robert Valenta für technische und sprachliche Hilfe.

Referenzen

Siehe engl. Text oben

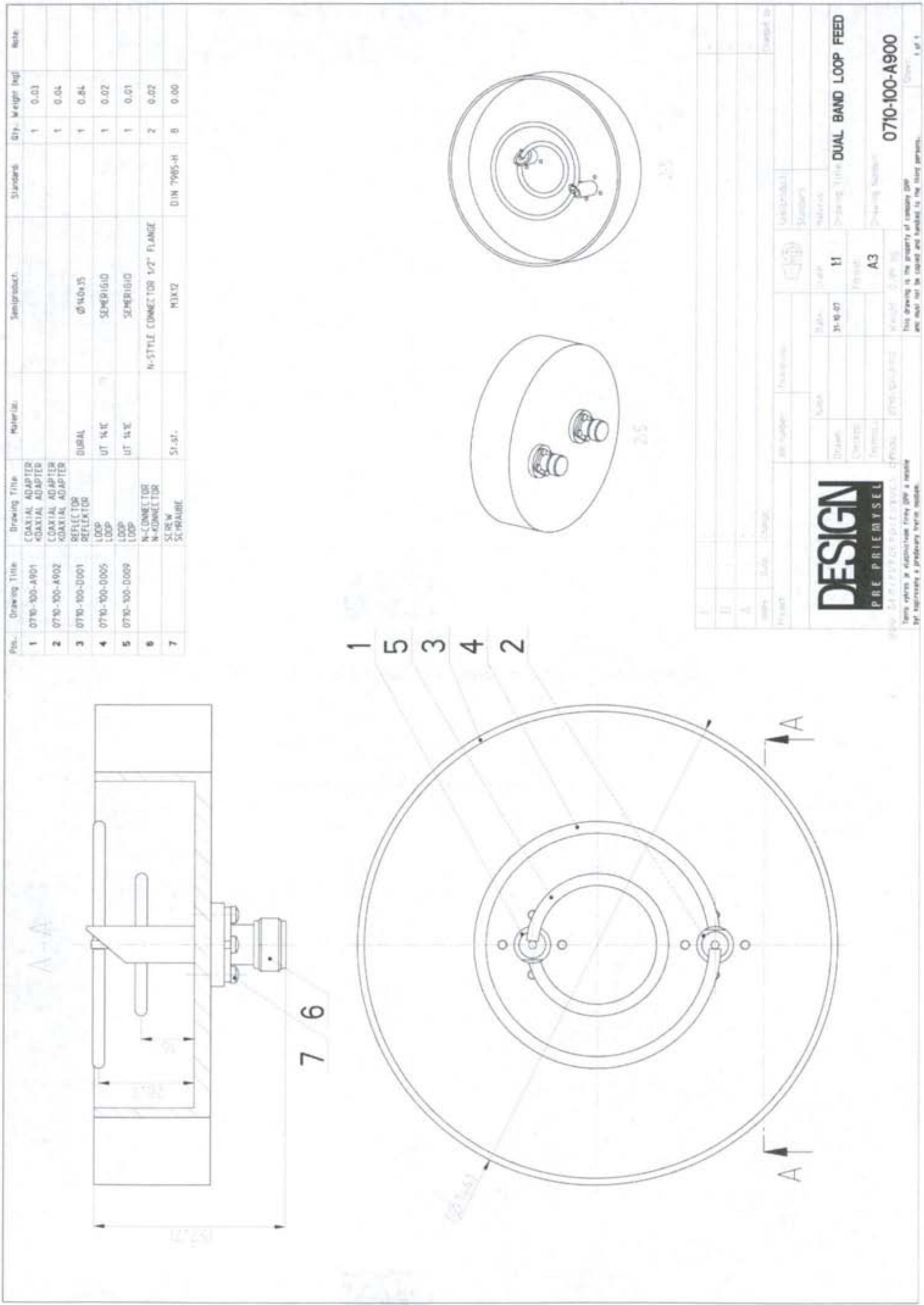
Bildunterschriften

***Abb. 1** Effekt der Feed-Blockierung auf eine gleichförmig ausgeleuchtete Antenne*
***Abb. 2** Visualisierung einer Wellenquelle -*
punkförmige Quelle (links), Quelle mit multiplen Punkten (rechts)
***Abb. 3** Elektrisches Nahfeld (Momentaufnahme) einer aufgeweiteten Horn-Antenne*
***Abb. 4** Visualisierung des Brechungseffektes*
***Abb. 5** Planes zirkulares Wellenleiter-Feed*
***Abb. 6** Strahlungsdiagramm des planen zirkularen 0.65λ Wellenleiterfeeds –*
gemessene E-Ebene (links) und H-Ebene (rechts)
***Abb. 7** Nahes E-Feld einer Antenne mit einem Reflektor-Durchmesser von D = 3m und f/D = 0.28. Der Spiegel wird durch eine partiell parallele Punktquelle (fo = 1296 MHz) in seinem Fokus ausgeleuchtet. Der „Fernfeld"-Abfall des E-Feldes beginnt etwa 15m vor der Öffnung.*
***Abb. 8** Anordnung der Antenne mit 5λ-Durchmesser*

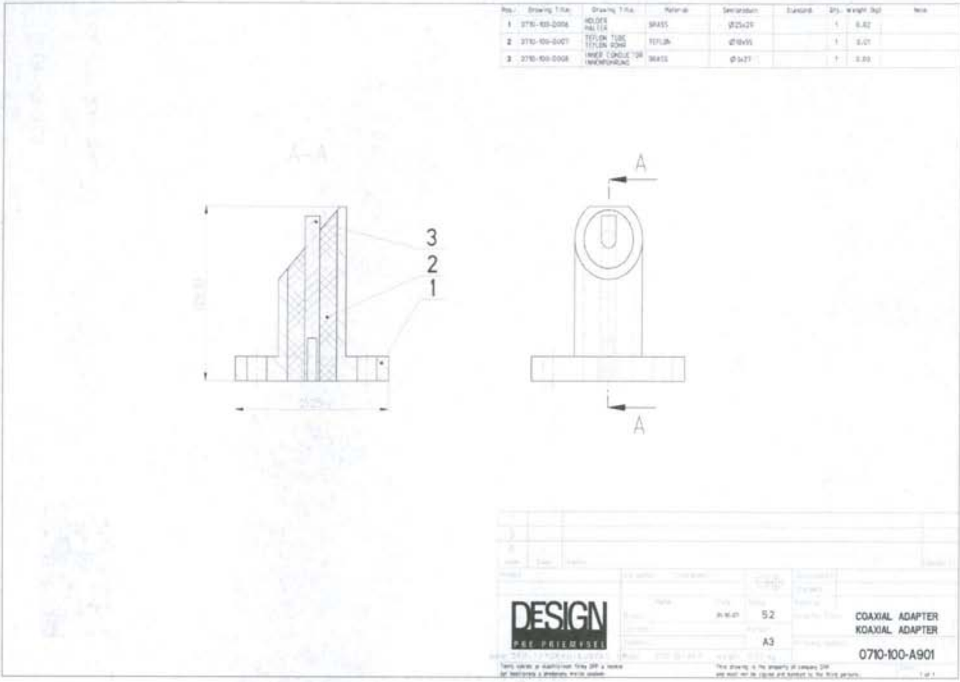
Fig. 23 Dual band loop feed – close view

Appendix / Anhang:

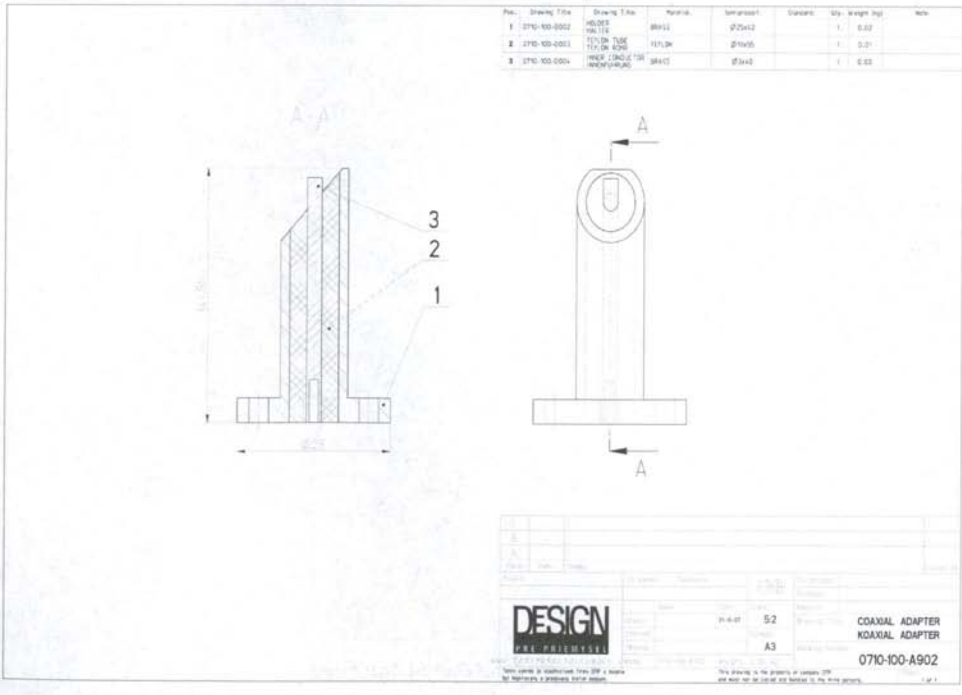
Construction details dual band loop feed
Konstruktionsdetetails für das Dualband-Feed

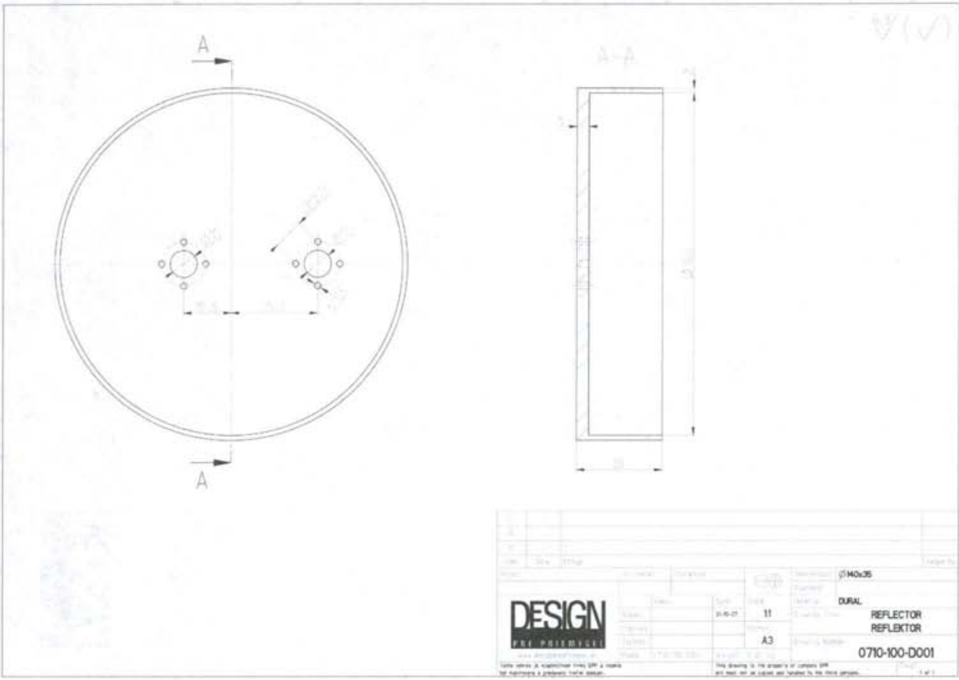


23cm & 13cm Dual Band Loop Feed

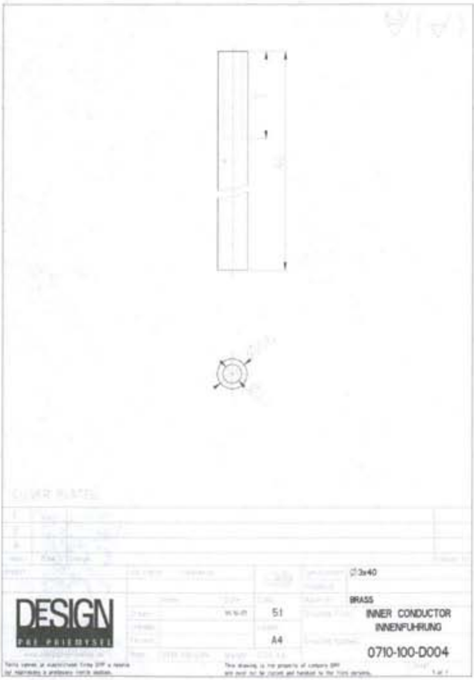


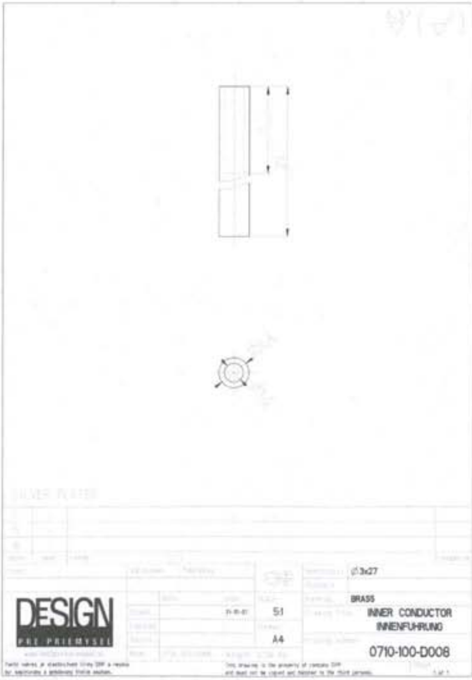
Coaxial Adapters for 13cm (top) and 23cm (bottom)

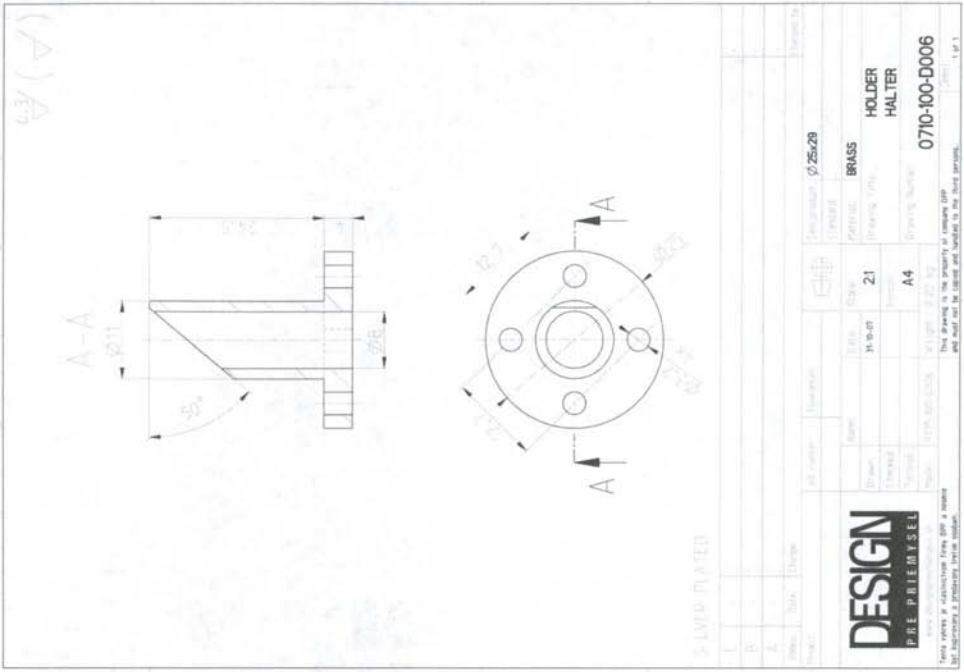




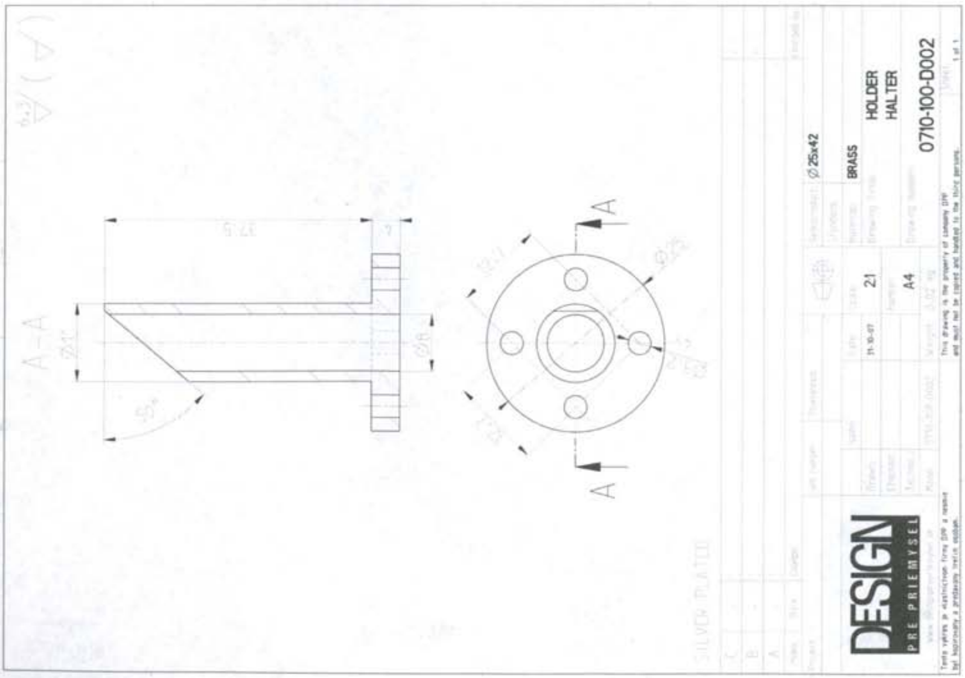
Reflector (top) and Inner Conductors (bottom) for 23cm (left) and 13cm (right)

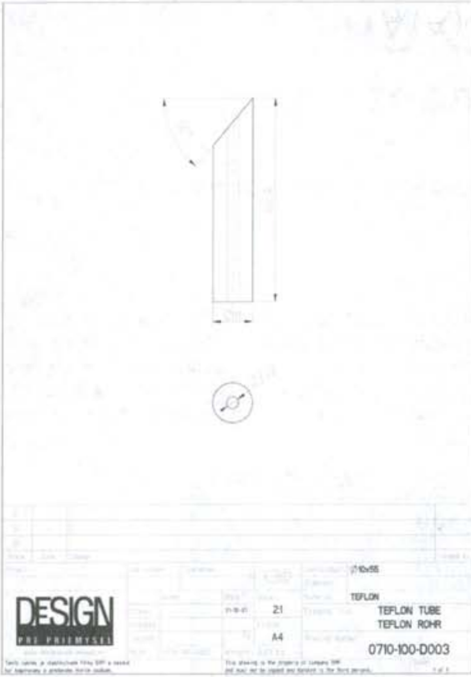


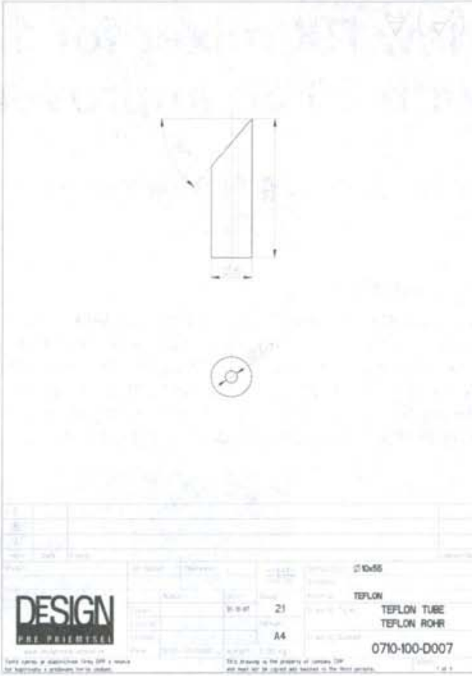




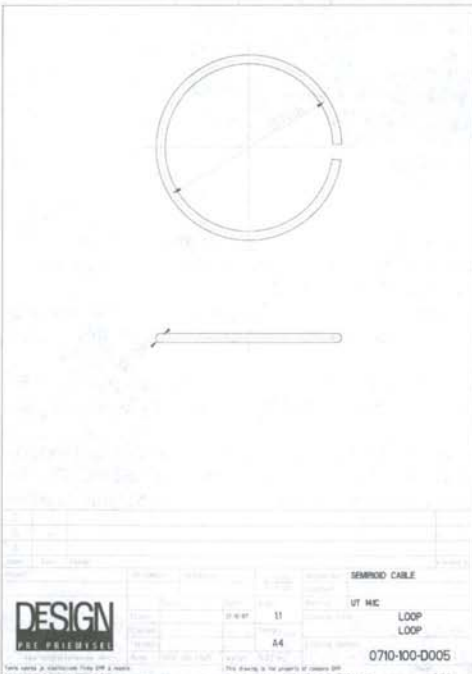
Brass Holder for 13cm (top) and 23cm (bottom)

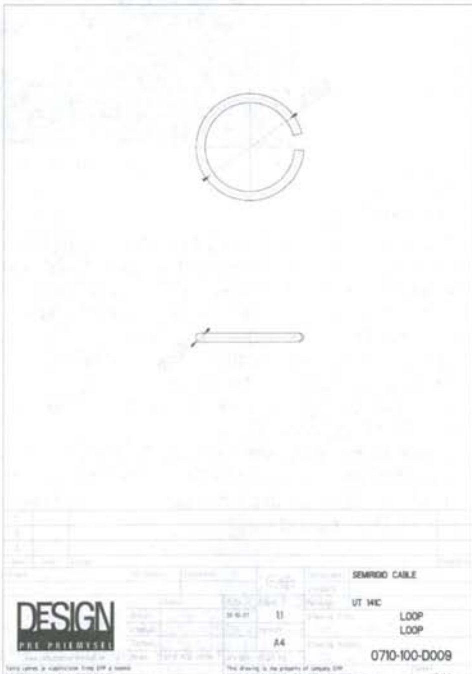






Teflon Tubes (top) and Loops (bottom) for 23cm (left) and 13cm (right)





New RX mixer for 122 GHz with 10 db improvement

by Jürgen Dahms, DCØDA, Vinklöther Mark 48, D- 44265 Dortmund

Introduction

The published harmonic mixer from DL2AM [1] with the M/A-COM diode MA4E1317 has been built by several OM. For further QSO attempts over larger distances using separate TX and RX there was demand for a more sensitive RX mixer. An improvement of the above mentioned concept is possible only by the use of a subharmonic mixer with a LO frequency of about 60 GHz. Success was first reached with this system in [2] although the 60 GHz signal was produced in a quite long winded way. There are new possibilities now by using a doubler module from 30 to 60 GHz.

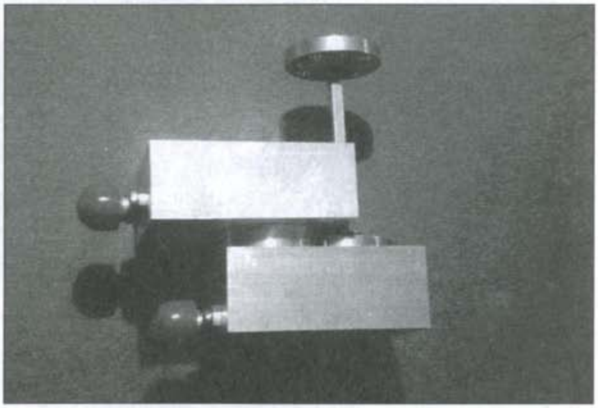


Fig. 1 shows the complete mixer

Construction

With the help of two standard housings from DB6NT (34 x 30 x 17mm) using a sandwich technique the mixer can be built quickly and simply. Only another stable 15 GHz oscillator and a separate IF preamplifier are necessary. A suitable oscillator circuit is available from DB6NT.

Both housings are screwed together with a homemade circular waveguide flange. In the upper housing are located the little doubler module and the following doubler board with the varactor diode, this is PCB Nr. 39 (30.5 – 61 GHz multipler) from DB6NT.

The power is coupled to the bottom housing via a circular WG drilling of 3,4 mm Ø which is optimal for 61 GHz. In this casing is the mixer board with the Russian mixer diode 3A147B-3, this is PCB Nr. 40 (120 GHz SHM-Mixer) from DB6NT.

The input signal is fed via a circular WG drilling of 1,8 mm Ø with the help of a short piece of rectangular WG R1400, WR 7 (110 - 170 GHz). The internal matching uses tuning elements from TECELEC. On the sides of the housings there are two hole SMA flanged jacks which are used for the 15 GHz signal and the IF preamplifier respectively.

Function of the mixer

With the little doubler module AMMP-6130 from AVAGO TECHNOLOGIES, over 100mW output are obtained on 30 GHz with just 4 mW input on 15 GHz. The module has the size 5.0 x 5.0 x 1.25 mm and 50Ω ports for input and output which are have internal coupling capacitors. The DC supply voltage is 5V

@ 200mA. For experiments the chip can be glued without any extra board between two SMA microstrip jacks. The connecting pins of the SMA jacks are glued to the appropriate ports of the chip. Several test assemblies have confirmed the amplification characteristics shown in the datasheet. This 100 mW on 30 GHz is then doubled with the M/A-COM varactor diode MA46H146 to 60 GHz. In the first try 15 mW were obtained without any problem. With an optimal working resistance of 3,2 kΩ for the varactor a bias current of 0.8mA was measured.

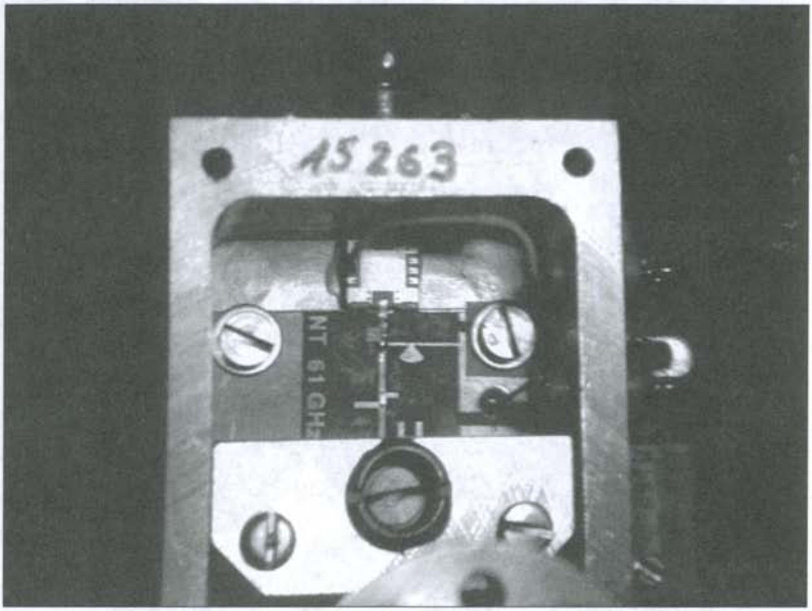


Fig. 2 shows the doubler module in the casing

In general there are two possibilities for the assembly. One mills a cross slot of 1.3mm depth and 5mm width directly into the face side of the casing OR one inserts the board onto a brass plate of 1.5mm thickness. This also enables the neccessary levelling with the module and was used in this case. The module is inserted with heat-conductive paste between its top side and the bottom of the casing. The four grounded areas of the connection side are connected with the head side of the casing and with the screwed brass plate respectively by using silver conductive glue. The heat dissipation is more than sufficient for longer operating periods.

The doubler board from 30 to 60 GHz is cut directly after the input coupling point. The connection from the output port of the module to the stripline is made for example with the cut lead from a GaAsFET. The junction can be tuned with a tiny soldered pad.

In fig. 3 we can see the RX input port with the rectangular WG WR7 flange. The thin white piece of wire is stuck with superglue and it delivers the supply voltage to the + port of the module.

For the following mixer a suitable mixer diode that was good for the 15mW LO power had to be chosen. Also the diode should have as little capacity as possible. Thus the only choice was the Russian mixer diode 3A147B-3 with its tiny capacity of 0,008 pF and an upper cutoff frequency of 4000 GHz. The diode is rated with 20mW CW dissipation RF power at + 20°C. The tiny glass casing of the diode has a size of just 200 µm. The best working resistance for optimal signal to noise ratio of the mixer was found to be at 680 Ω and 600 µA bias current. For the IF preamp a BFP 182 is used, working for best noise performance with optimal collector voltage and optimal collector current.

In comparison to the above mentioned mixer with the M/A COM diode MA4E1317 an improvemnt of 10 dB in the signal to noise ratio was obtained. This is a major step on 122 GHz!

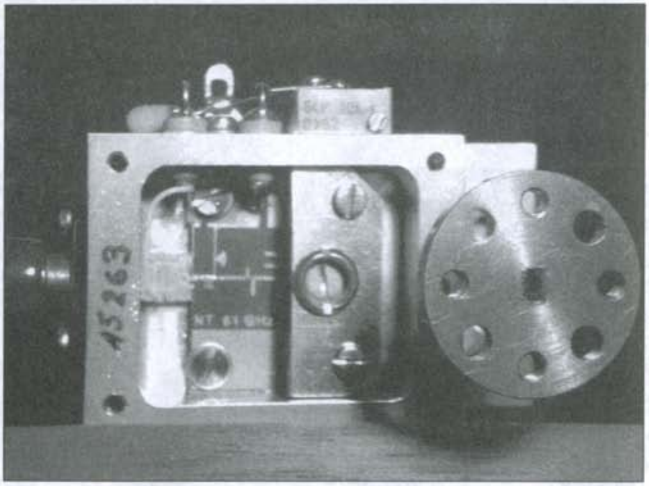


Fig. 3 shows the complete opened quadrupler (15 to 30 to 60 GHz)

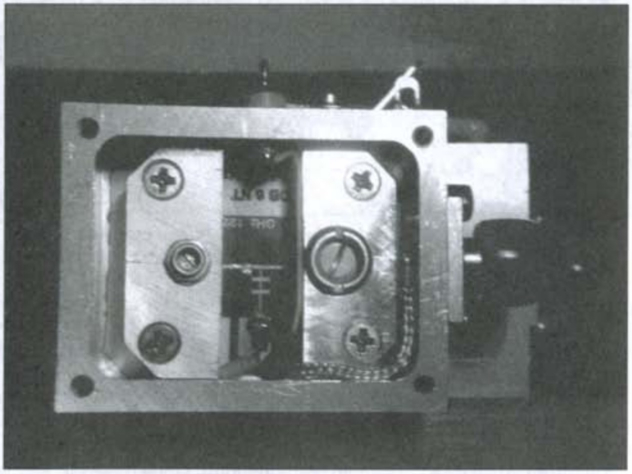


Fig. 4 shows the opened bottom side of the mixer housing

In fig. 4 one can see clearly the thin shielded IF cable to the mixer board. The mixer diode is located directly under the output tuning element and above the circular WG drilling. A tiny tuning flag was necessary behind the etched choke line.

Another step in receiver optimisation was finished successfully. However, the experiments on the 122 GHz band are not finished at all.

73, 55 de DCØDA

References

[1] Philipp Prinz, DL2AM: 122 Transverter with new Multiplier, DUBUS 2/2006, p. 8 and 4/2006, p. 57
[2] Jürgen Dahms, DCODA: 122 GHz Transverter with separate TX and RX part, DUBUS 1/2007, p. 48

Neuer Empfangsmischer für 122 GHz mit 10 dB Verbesserung

von Jürgen Dahms, DCØDA, Vinklöther Mark 48, 44265 Dortmund

Einleitung

Der in (1) veröffentlichte Oberwellenmischer mit der M/A-COM Diode MA4E1317 von DL2AM wurde inzwischen mehrfach nachgebaut. Für weitere Reichweitenversuche mit einem getrennten Sende-/Empfangssystem ist ein empfindlicher Empfangsmischer erforderlich. Eine Verbesserung gegenüber dem oben erwähnten Konzept lässt sich nur mit einem subharmonischen Mischer, dessen LO-Frequenz bei 60 GHz liegt, erreichen. Erste Erfolge wurden damit in (2) erzielt, wobei die 60 GHz noch sehr umständlich aufbereitet wurden. Mit einem Dopplermodul 30 nach 60 GHz ergeben sich neue Konstruktionswege.

Bild 1 zeigt den neuen kompletten Mischer.

Konstruktion

Mit zwei DB6NT-Standardgehäusen (34 x 30 x 17 mm) in Sandwichbauweise lässt sich der komplette Mischer schnell und einfach aufbauen. Es sind nur noch ein stabiler 15 GHz-Oszillatorbaustein und ein separater ZF-Vorverstärker notwendig. Einen passenden Oszillatorbaustein findet man im Angebot von DB6NT www.kuhne-electronic.de.

Beide Gehäuse werden über einem selbst gefertigten Rund-HL-Flansch miteinander verschraubt. In der oberen Gehäuseschale ist das kleine Dopplermodul und die nachfolgende Dopplerplatine mit der Varactordiode untergebracht, Leiterplatte Nr. 39 PCB 30,5 – 61 GHz Multiplier aus dem Leiterplattenangebot von DB6NT.

Über eine für 61 GHz optimale Rund-HL-Bohrung von 3,4 mm Ø wird in das darunter liegende Schalengehäuse die Leistung eingekoppelt. Hierin befindet sich die Mischerplatine mit der russischen Mischerdiode 3A147B-3, Leiterplatte Nr. 40 PCB 120 GHz SHM-Mixer von DB6NT. Über eine Rund-HL-Bohrung von 1,8 mm Ø mit einem kurzen Stück Rechteck-HL R 1400, WR 7 (110 - 170 GHz) wird das Eingangssignal eingespeist. Die interne Anpassung erfolgt mit Tunerelementen der Fa. TECELEC.
Über die seitlich an den Gehäusen angeschraubten SMA-Zweiloch-Flanschbuchsen werden die 15 GHz eingespeist bzw. der separate ZF-Vorverstärker angeschlossen.

Funktion des Mischers

Mit dem kleinen Dopplermodul AMMP-6130 von AVAGO TECHNOLOGIES lassen sich bei nur 4 mW Input auf 15 GHz über 100 mW Output auf 30 GHz erreichen. Das Modul hat die Abmessungen 5.0 x 5.0 x 1.25 mm und einen 50Ω Eingangsport, ebenso einen 50Ω Ausgangsport, die intern jeweils mit Koppel-C verbunden sind. Die Versorgungsspannung liegt bei 5 V und der Strombedarf bei etwa 200 mA. Es lässt sich somit zum Erproben ohne Zusatzplatine sehr einfach zwischen zwei SMA-Microstripline-Buchsen einkleben, wobei die Anschlusspins der SMA-Buchsen mit dem jeweiligen Port verklebt werden. Mehrere Versuchsaufbauten haben die vom Hersteller angegebenen Verstärkungskurven bestätigt. Die so gewonnenen 100 mW auf 30 GHz werden mit der M/A-COM Varactordiode MA46H146 auf 60 GHz verdoppelt. Im ersten Aufbau sind problemlos 15 mW erreicht worden. Bei einem optimalen Außenwiderstand für den Varactor von 3,2 kΩ wurde ein Querstrom von 0,8 mA gemessen.

Bild 2 zeigt den Einbau des Dopplermoduls in das Gehäuse.

Grundsätzlich gibt es für den Einbau zwei Möglichkeiten. Entweder fräst man eine Quernute direkt an der Gehäusestirnseite von 1,3 mm Tiefe und 5 mm Breite oder man legt die nachfolgende Platine über eine

1,5 mm starke Messingplatte entsprechend höher. Damit lässt sich der Niveauausgleich zum Modul ebenfalls erreichen, von dieser Möglichkeit wurde im vorliegenden Fall Gebrauch gemacht. Das Modul wird kopfseitig mit Wärmeleitpaste in den Gehäuseboden eingelegt und die vier Masseflächen der Anschlussseite einmal mit der Stirnwand des Gehäuses und einmal mit der eingeschraubten Messingplatte mittels Silberleitkleber verbunden. Die Wärmeableitung des Moduls ist auch bei längerem Betrieb mehr als ausreichend.
Die Dopplerplatine von 30 nach 60 GHz wird bis kurz hinter dem Einkoppelpunkt abgeschnitten und die Verbindung vom Ausgangsport des Moduls zur Leiterbahn mit z.B. einem abgeschnittenen Gatebeinchen eines GaAsFET hergestellt. Die Stoßstelle kann mit einem kleinen aufgelöteten Plättchen kompensiert werden.

Bild 3 zeigt den kompletten offenen Vervierfacher (15 n. 30 n. 60 GHz).

Mit im Bild 3 ist der Empfangseingang mit Rechteck-HL-Flansch WR 7 zu sehen. Über das dünne mit Sekundenkleber verklebte weiße Drahtstück wird die Versorgungsspannung dem Plusport des Moduls zugeführt.

Für den nachfolgenden Mischer musste eine passende Mischdiode ausgewählt werden, die für die gewonnene LO-Leistung von 15 mW geeignet ist. Außerdem sollte sie möglichst geringe Kapazitätswerte aufweisen. Somit kam nur die russische Mischerdiode 3A147B-3 mit einer minimalen Kapazität von 0,008 pf und einer oberen Cutoff Frequenz von 4000 GHz in Frage. Als Dissipated CW RF Power werden bei + 20°C 20 mW angegeben. Das kleine Glasgehäuse der Mischdiode ist nur 200 µm groß.
Der beste Außenwiderstand bei optimalem Signal-Rauschabstand des Mischers wurde mit 680 Ω gefunden. Hierbei fließen 600 µA Querstrom. Als ZF-Vorverstärker dient ein BFP 182, der mit optimaler Kollektorspannung sowie optimalem Kollektorstrom für bestes Rauschverhalten arbeitet.
Es wurden gegenüber einem eingangs erwähnten Mischer mit der M/A COM Diode MA4E1317 10 dB Verbesserung im Signal-Rauschverhältnis erreicht, dies bedeutet einen sehr großen Schritt auf 122 GHz!

Bild 4 zeigt den Blick auf das untere geöffnete Mischergehäuse

Deutlich ist in Bild 4 das dünne abgeschirmte ZF-Zuleitungskabel zur Mischerplatine zu erkennen. Die Mischerdiode liegt direkt unter dem ausgangsseitigen Tunerelement über der Rund-HL-Bohrung. Ein kleines Optimierungsfähnchen hinter der geätzten Drosselleitung war erforderlich.

Ein weiter Schritt bei der Empfängeroptimierung konnte erfolgreich abgeschlossen werden.
Damit sind die Experimente im 122 GHz Band aber bei weitem noch nicht beendet.

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Referenzen
Siehe engl. Text oben.

More about SMT and Microwave Housings

by Philipp Prinz, DL2AM

Introduction

About 3 years ago I bought my first multiplier. I quickly realised that these affordable devices are very useful for our needs on the microwave bands and looking back they have helped to increase activity on the very high bands in several countries. I was so fascinated by these parts that I have again and again tried new ways to make hombrewing and usage easier for other microwave enthusiasts and maybe even get them qrv.

Here I describe new housings (see figure 1 and sketch in figure 2) which are the result of many recent experiments even up to 241 GHz. The housings differ only in the diameter of the WG hole. These WG holes should be as smooth as possible - if possible they should be ground. Hubert Krause [2] will produce and supply these housings under the name "UNI". Also new is the WR28 milling on the bottom side of the short circuit slider, that is used for the WG input. The depth of it should be about 2.5mm. The Tekelec 6926/7 tuning element sits above it, see fig. 3.

If the UNI casing is used for a transverter the IF housing can be flanged onto its bottom side or screwed next to it. One can also use it just for a beacon or CW TX.

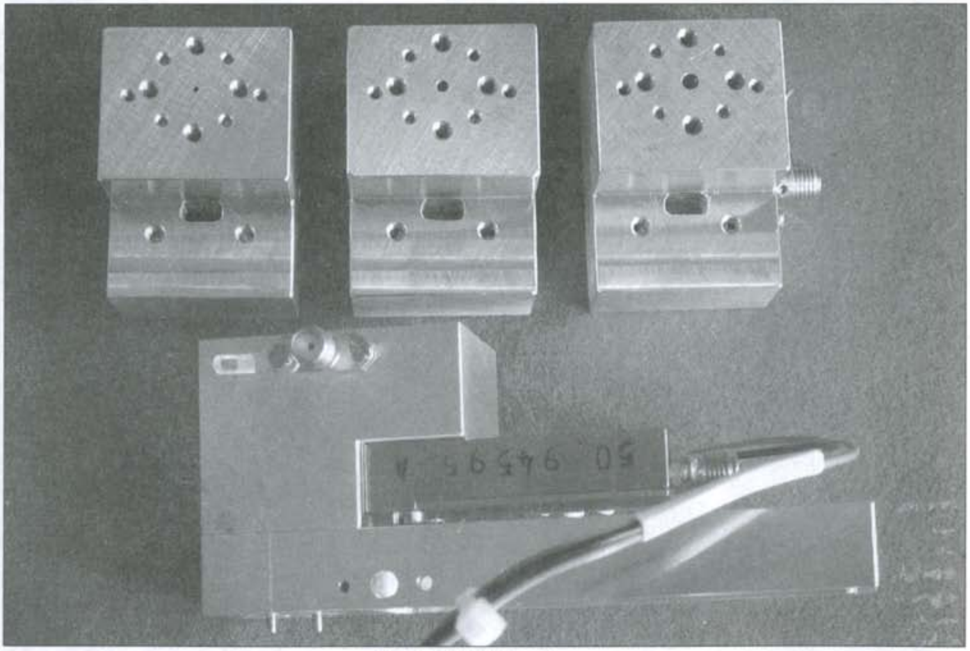


Fig. 1 "UNI" housings

New PCBs

Michael DB6NT [1] supplies suitable PCBs for all 3 housings with waveguide inputs. For 76 GHz it is WG45, for 122 GHz WG47 and for 241 GHz WG32, see figure 4.

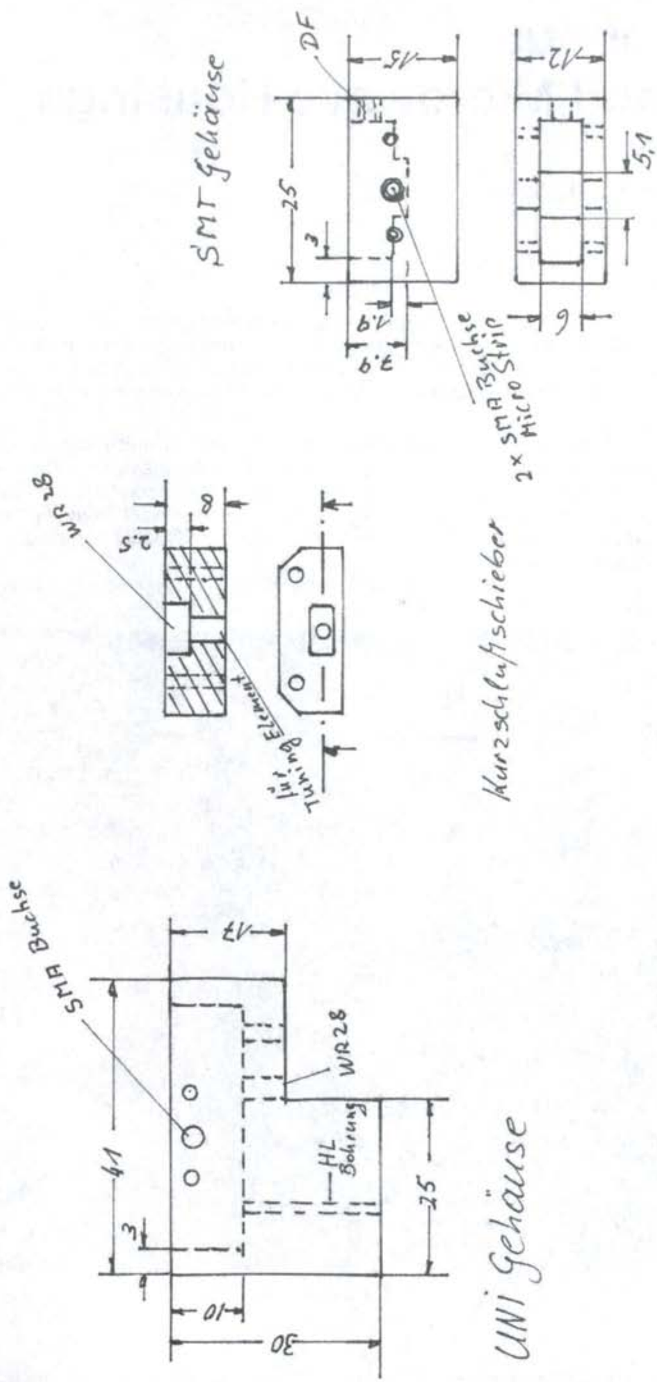


Fig. 2 Sketch - from top to bottom: SMT housing, short circuit slider and UNI housing

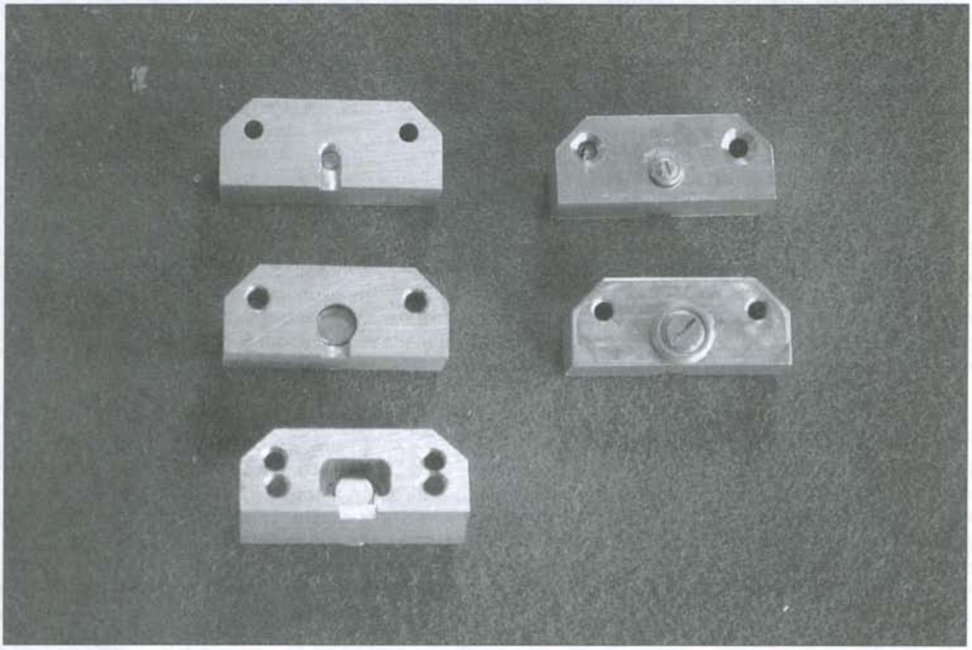


Fig. 3 Milling for the short circuit slider

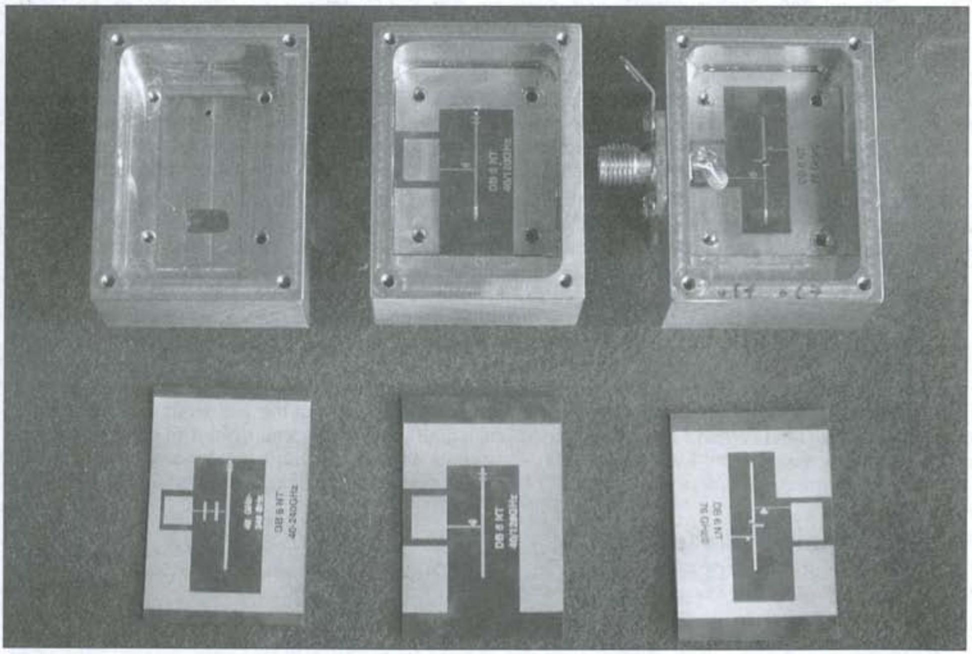


Fig. 4 PCBs from DB6NT

DB6NT also offers PCBs for the RX converters with wavguide inputs as follows: 122 GHz (30 – 60 GHz) WG39; (60 - 120 GHz) WG40; 241 GHz (40 – 80 GHz) WG42. If another PCB without WG input is used, after glueing the PCB the aperture for the WG can be cut afterwards with a scalpel, see fig. 5. A strand of silver plated wire of about 0.25mm is laid over the entire WG and soldered to the 50 Ohm line. With a side cutters one shortens this coupling pin to the required length. This is about 40 to 60% of the WG height depending on the frequency. Tuning methods and techniques have already been described in my previous articles [5], [6] but I want to mention that for tuning work without spectrum analyser it makes sense to choose at first such an LO QRG for a transverter that a carrier appears on the upper sideband. This carrier is tuned for maximum output and diode working voltage by inserting tuning flags and adjusting the tuning elements alternately. Now the correct LO is fed and 144 MHz IF applied. The IF power should in most cases be about 20 mW. For the RX mixer a carrier power of 4 to 6 µW is sufficient with the mixer diode MA4E1317. I have got these results from several test assemblies. See fig. 6. With the varactor diode MA46H146, 10 to 13 mW RF can be obtained on 76 GHz. The alignment using the tuning elements is much more effective with this diode and a flag is only necessary for maximum output. The maximum diode voltage of about 3.2 V that is generated at a working resistance of about 5 kOhm is not equal to the maximum output power, but it is not far from it. See fig. 7.

Farewell OCXO?

I have tested two new PLL stabilised crystal oscillators from DB6NT. They work at 141 MHz for a final QRG of 122 GHz. See fig. 8. First measurements were a pleasant surprise as the jitter was not bigger than with my previously used OCXOs. The frequency was super stable, especially after switching on again. When looking at the noise spectrum on 122 GHz and switching between OCXO and PLL I can hardly see a difference. For a 10 MHz reference I use a Rubidium clock and also a GPS receiver that was built by DJ6JJ. So my next QSO attempts will probably not bring sore fingers again from searching for the signal.

New amplifiers with SMT packages

Avago (HP) offers several cheap amplifers with SMT packages. Most interesting to me were the AMMP 6233, 5620 and 6408. These 3 packaged chips are 5 x 5 x 2 mm in size. First I tested the 5620. According to the data sheet it is specified for 6 to 20 GHz and provides 17.5 dB gain. See fig. 9 and 10. I milled 3 identical housings of 12.5 x 25 x 15 mm, see fig. 2. In the 5mm slot a little bit of silver conductive glue is applied, then the chip is applied with the pins upwards and the ground areas are glued to the aluminium casing. Then the micro SMA strip flange jacks are slid over the input and output pads. These striplines should be as short as possible. A piece of 0.1mm silver wire is soldered to the feed through capacitor, the capacitor is screwed into the casing, and the free end of the wire is glued to the pad of the chip. A 100 nF capacitor of 0402 size is glued from DC input to ground and then the housing is heated.

Now the amp can be tested. The amplifier worked perfectly from 5 to 20.5 GHz but not higher, unfortunately. Then I tested the 6233 amplifier, that has a gain of 23 db from 18 to 32 GHz. I found some self oscillation but this disappeared after inserting some absorbing foam. This amplifier is usable for 24 GHz as it has a low noise figure of about 2.5 dB and delivers about 8 dBm according to the data sheet. This was also confirmed by my measurements. Finally the 6408 amplifer was tested. According to the data sheet it should work from 6 to 18 GHz and deliver 20 dB gain and 1 W output. My ulterior motive was to may be use it also on 24 GHz as the parameters looked promising. The input is only partly matched. One has to stick with silver conductive glue bridges from pin 1 to pin 7 and from pin 2 to pin 6, with 100nF bypass capacitors to ground. The grounded sides have to be supplied with a lot of silver conductive glue for good thermal transfer. The first test showed already that 19 GHz was the end even after inserting a tuning flag at the input. When I reached about 400mW at 10.3 GHz the amp died. The cooling was not sufficient and for the next try I will apply more silver conductive glue. I have got my amplifers from Mr. Schneider in Germany, phone, ++49 6441924427. Have fun with your next experiments! 73 Philipp

References and sources

[1] Kuhne Electronic, www.DB6NT.de

[2] Hubert Krause, www.Micro-mechanik.de

[3] Philipp Prinz, www.DL2AM.de

[4] Jürgen Dahms, DC0DA: 122 GHz Transverter with separate TX and RX part, DUBUS 1/2007, p. 48

[5] Philipp Prinz, DL2AM: New Housings for 47, 76 and 122 GHz Transverters, DUBUS 3/2007, p. 23

[6] Philipp Prinz, DL2AM: 122 Transverter with new Multiplier, DUBUS 2/2006, p. 8 and 4/2006, p. 57

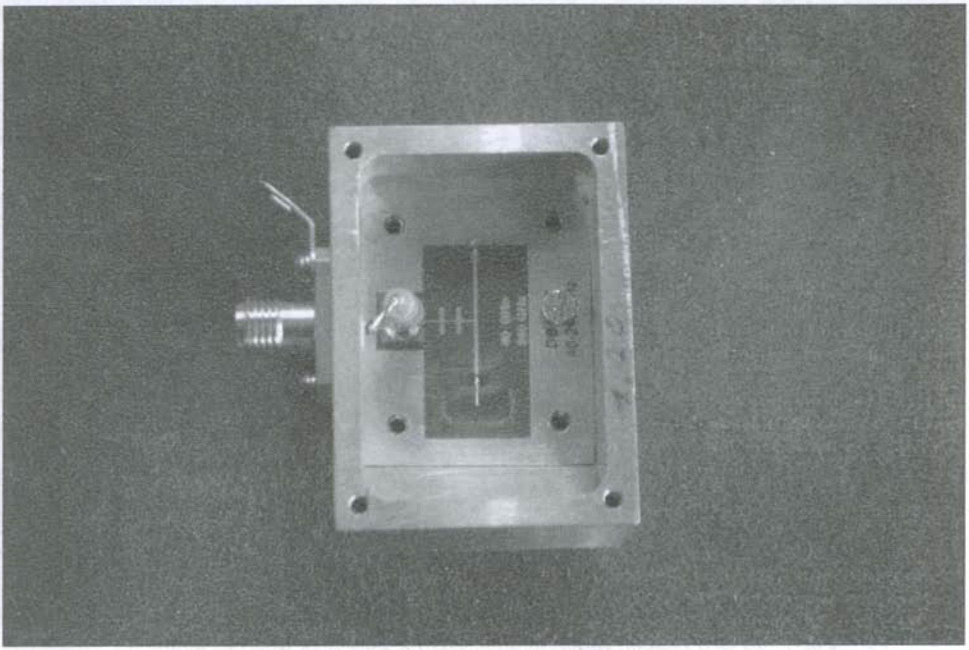


Fig. 5 UNI casing with WG input

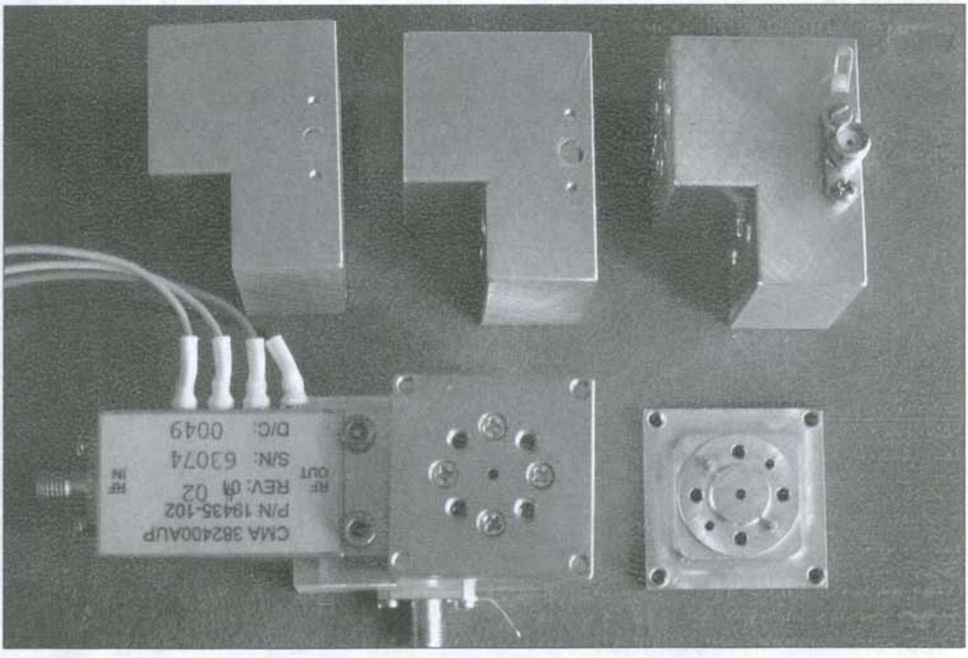


Fig. 6 RF fed through the back of the board

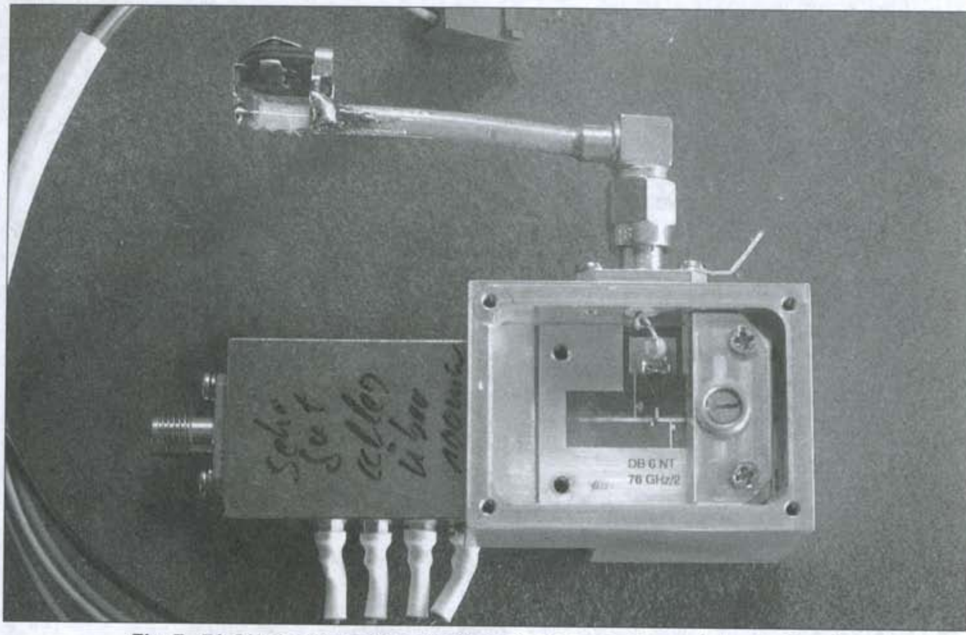


Fig. 7 76 GHz beacon with potentiometer for operating point adjustment

Fig. 8 PLL XO from DB6NT

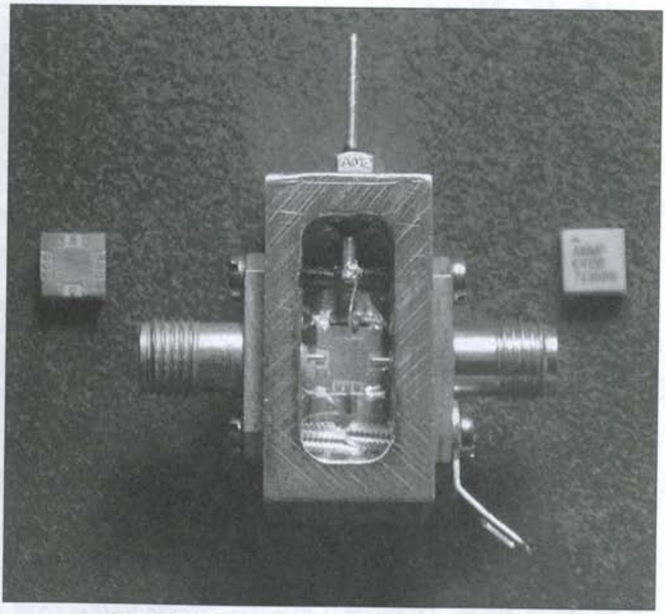


Fig. 9 SMT packages from Avago – close view

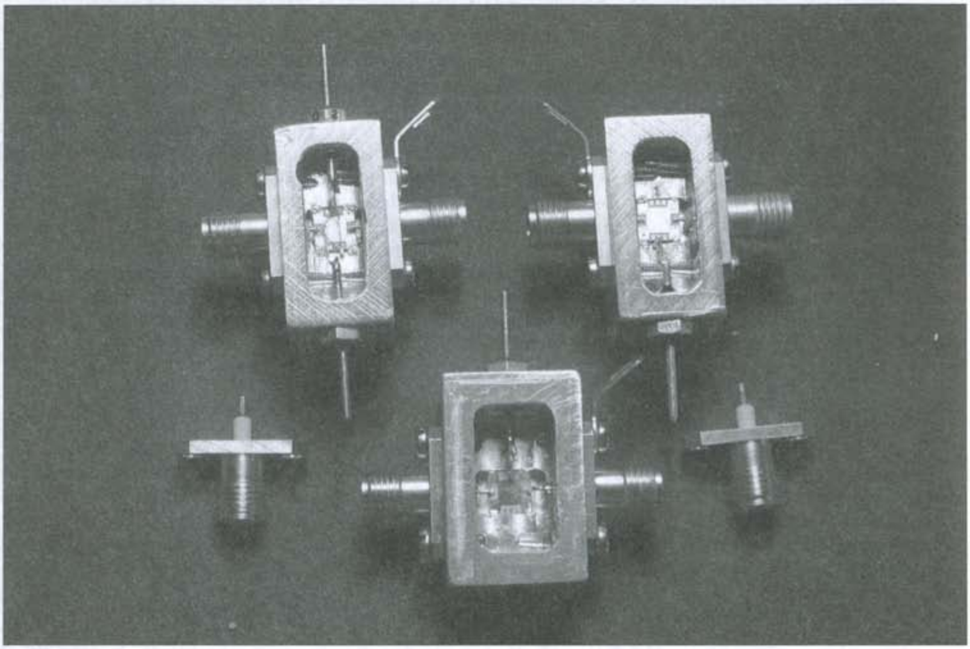


Fig. 10 SMT packages from Avago in different assemblies

Mehr über SMT- und Mikrowellen-Gehäuse

von Philipp Prinz, DL2AM

Einleitung

Vor ca. 3 Jahren habe ich die ersten Multiplier (Vervielfacher) auf dem Afu-Markt erworben. Gleich habe ich erkannt, dass sich diese preisgünstigen Komponenten für unsere Mikrowellen sehr gut eignen und aus heutiger Sicht haben diese wohl in einigen Ländern die Mikrowelle vorangebracht. Mich hat es selbst so fasziniert, dass ich immer wieder neue Wege versuche, um für viele Mikrowellen-Begeisterte, den Selbstaufbau und die Anwendung leichter zu machen, damit sie dann vielleicht auch qrv werden.

Die hier vorgestellten neuen Gehäuse, siehe Abb. 1 und Schema in Abb. 2, sind das Resultat aus vielen Versuchen auch bei 241 GHz. Diese Gehäuse unterscheiden sich nur noch durch die Größe der Bohrung für den Hohlleiter (HL). Diese HL-Bohrungen sollten so glatt wie möglich ausgeführt sein, am besten gerieben. Hubert Krause [2] wird diese Gehäuse unter dem Namen „UNI" fertigen. Neu ist dabei auch beim Kurzschluß-Schieber die WR28-Ausfräsung an der Unterseite, der für den Eingang des HL verwendet wird. Die Tiefe sollte ca. 2,5 mm sein und darüber sitzt das Tuning-Element Tekelec 6926/7, siehe Abb. 3.
Wird das neue UNI-Gehäuse als Transverter benutzt, kann an dieses Gehäuse das ZF-Gehäuse unten angeflanscht oder daneben angeschraubt werden. Man kann es auch nur als Bake bzw. CW-Sender benutzen.

Neue PCBs

Michael DB6NT [1] hat freundlicherweise für diese drei Gehäuse auch passend die PCB mit Hohlleiter-Einspeisung angefertigt. Für 76 GHz ist es die Nr. 45, für 122 GHz Nr. 47 und für 241 GHz Nr. 43, siehe Abb. 4. Erwähnen möchte ich noch, dass er auch schon für den Empfangs-Konverter für 122 GHz, 30 – 60 GHz, Nr. 39 und 60 auf 120 GHz, Nr. 40, sowie für 241 GHz, 40 auf 80 GHz, Nr. 41 und 80 auf 241 GHz, Nr. 42, die PCBs anbietet. Wenn eine andere PCB z.B. ohne HL-Einkopplung benutzt wird, kann mit dem Skalpell der HL nach dem Einkleben der PCB ausgeschnitten werden, siehe Abb. 5. Man legt einen versilberten Litzen-Draht von ca. 0,25 mm über den gesamten HL, lötet diesen an der 50-Ohm-Leitung an. Mit dem Seitenschneider schneidet man den Koppel-Stift auf die entsprechende Länge ab, dies ist ca. 40 – 60 % der HL-Höhe je nach Frequenz. Abgleicharbeiten und Techniken sind von mir schon genügend beschrieben worden, aber eines möchte ich noch erwähnen: Für Abgleicharbeiten ohne Spektrum-Analyzer ist es sinnvoll, bei einem Transverter zuerst den LO so zu wählen, dass ein Träger auf dem oberen Seitenband entsteht. Diesen Träger auf maximalen Output bzw. maximale Dioden- oder Arbeitsspannung durch Anbringen von Fähnchen bzw. Abgleich der Tuning-Elemente wechselseitig trimmen. Danach den korrekten LO einspeisen und die 144 MHz ZF zumischen. Die ZF-Leistung liegt in den meisten Fällen bei ca. 20 mWatt. Für den Empfangs-Mischer reicht eine Trägerleistung von 4–6 µWatt mit der Mischer-Diode MA4E1317. Meine Feststellungen basieren auf immer mehreren Aufbauten, siehe Abb. 6. Mit der Varactor-Diode MA46H146 kann bei 76 GHz 10 bis 13 mWatt HF erzeugt werden. Der Abgleich mit den Tuning-Elementen ist bei dieser Diode wesentlich wirkungsvoller und ein Fähnchen nur für max. Ausgangsleistung nötig. Die maximale Dioden-Spannung von ca. 3,2 Volt, die bei einem Arbeitswiderstand von ca. 5 kOhm entsteht, ist nicht exakt gleich der maximalen Ausgangsleistung, aber sie liegt nicht weit davon entfernt. Siehe Abb. 7.

OCXO ade?

Von Michael, DB6NT, habe ich zwei neue PLL stabilisierte Kristall-Oszillatoren von 141 MHz für eine Ausgangs-Frequenz von 122 GHz getestet, siehe Abb. 7. Bei meinen ersten Messungen ist mir angenehm aufgefallen, dass der Jitter nicht größer ist, als bei meinen vorher verwendeten OCXOs. Die Frequenz ist super stabil, vor allen Dingen beim wieder Einschalten. Wenn ich das Rauschspektrum (Rauschglocke) auf 122 GHz anschaue, und zwischen OCXO und PLL umschalte, ist kaum ein Unterschied festzustellen. Als 10-MHz-Referenz nehme ich mein Rubidium und auch einen GPS-Empfänger von Heino Schübbe, DJ6JJ, den er mir angefertigt hat. Bei den nächsten Feldversuchen werde ich wohl keine wunden Finger mehr bekommen durch ewiges Suchen nach dem Signal.

Neue Verstärker im SMT-Gehäuse

Von Avago (HP) gibt es verschiedene preisgünstige Amplifier im SMT-Gehäuse. Für mich waren die AMMP 6233, 5620 und 6408 vorerst von größerer Bedeutung. Diese drei gehäusten Chips haben eine Größe von 5 x 5 x 2 mm. Als ersten testete ich den 5620. Dieser hat laut Datenblatt eine Breitbandigkeit von 6 – 20 GHz und 17,5 dB Gain, siehe Abb. 8 und 9. Ich fräste drei gleiche Alu-Gehäuse mit den Maßen 12,5x25x15 mm Höhe, siehe Abb. 2. In die 5 mm breite Nut bringe ich ein wenig Zweikomponenten-Silberleitkleber an, lege den Chip mit den Anschlüssen nach oben ein und verklebe auch die Masse-Flächen mit dem Alu-Gehäuse. Danach schiebe ich die SMA-Mikro-Strip-Flanschbuchsen über In und Out der Pads. Diese Striplines sollten so kurz wie möglich sein. Am Durchführungskondensator (DF) löte ich ein Stück 0,1 mm Silberdraht an, schraube den DF ein und klebe das freie Ende an das Pad vom Chip. Einen Kondensator der Größe 0402 von ca. 100 nF klebe ich von DC-In gegen Masse und erhitze dann das Gehäuse. Das war's schon und der Test kann beginnen. Der Verstärker geht hervorragend von 5 – 20,5 GHz, aber leider nicht höher. Als nächstes habe ich den Verstärker 6233 getestet, der von 18 – 32 GHz bei 23 dB Gain funktionieren sollte. Ich bin gleich verfahren wie vorhergehend. Beim Test habe ich festgestellt, dass eine Eigenschwingung vorhanden war, diese aber mit Leitgummi abzustellen war. Dieser Verstärker ist für 24 GHz anwendbar, da er auch ein geringes Rauschen von 2,5 dB aufweist und ca. 8 dBm abgibt, lt. Datenblatt. Dies hat sich durch meine Messungen auch bestätigt. Nun kam für mich der interessanteste 6408-Verstärker an die Reihe. Er soll breitbandig von 6 – 18 GHz lt. Datenblatt laufen, bei 20 dB Gain und 1 Watt liefern. Der Hintergedanke war natürlich, ihn vielleicht für 24 GHz benutzen zu können, was die angegebenen Parameter vermuten ließen, wobei er am Eingang nur teilweise angepasst ist. Bei diesem sind 2 Bügel von Pin 1 zu Pin 7 und Pin 2 zu Pin 6 und zwei 100 nF Cs mit Siberleitkleber anzukleben. Außerdem ist an den Masse-Seiten viel Silberleitkleber zur Wärmeübertragung anzubringen. Beim ersten Test habe ich gleich festgestellt, dass leider bei 19 GHz das Ende war, auch nach dem Anbringen eines Fähnchens am Eingang. Als ich bei 10,3 GHz ca. 400 mWatt auskoppelte, hat er den Geist aufgegeben. Die Kühlung durch die Silberleitpaste war doch zu gering. Ich werde noch einen neuen Versuch machen und noch mehr Silberleitpaste zur Kühlung auftragen. Bezogen habe ich die Amplifier von Herrn Schneider, er ist unter der Tel.-Nr.: 06441924427 erreichbar.

Nun viel Spaß beim Experimentieren. Es grüßt Philipp, DL2AM.

Bildunterschriften:

Abb. 1 UNI-Gehäuse
Abb. 2 Abmessungen der SMT- und UNI-Gehäuse
Abb. 3 Ausfräsung für Kurzschlussschieber
Abb. 4 PCBs von DB6NT
Abb. 5 UNI-Gehäuse mit HL-Eingang
Abb. 6 HF-Durchführungen durch Rückwand
Abb. 7 76 GHz – Bake mit Poti für Arbeitsspannungseinstellung
Abb. 8 PLL von DB6NT
Abb. 9 + 10 SMT-Gehäuse von Avago

Referenzen und Quellen: siehe engl. Text oben

Simple Low Cost RX Mixer for 24 GHz

- an experiment without PCB / WG and not for winning a contest!

by Wolfgang Demmer, DD8BD, Lagerstr. 37, 49828 Neuenhaus

Introduction

Not too many amateurs have the facilities to make a teflon board for a 24 GHz mixer head. And the average amateur neither has the skills in precision mechanics nor the suitable tools nor the expensive waveguide stock for building such a head for 24 GHz.

I was looking for a VERY simple solution with existing parts from the fleamarket, cheap semiconductors from Ebay (BFP405 and BAT15-099) and a few SMD devices, like SMD ceramic capacitors or homemade capacitors (1.5 x 2 mm) from teflon board offcuts. May be there are even simpler methods to build such capacitors. A piece of UT-141 Semi Rigid cable holds the parts.

A DMC-PLL-DRO oscillator from the junk was intended to be used as LO. For amplifing the IF an suitable external existing IF-amplifier with coaxial connectors was used.

Experiments and results

After a long phase of experimenting due especially to the small size of the Dual Schottky Diode BAT15-099, finally I succeded. My UT-141/BAT15-099 mixer head was placed in a small milled aluminium housing and I received my "home" beacon on 24 GHz! As antennas I used tiny homemade constructions like a dipole and a Vivaldi antenna over small distances of 50cm and then also 10m.

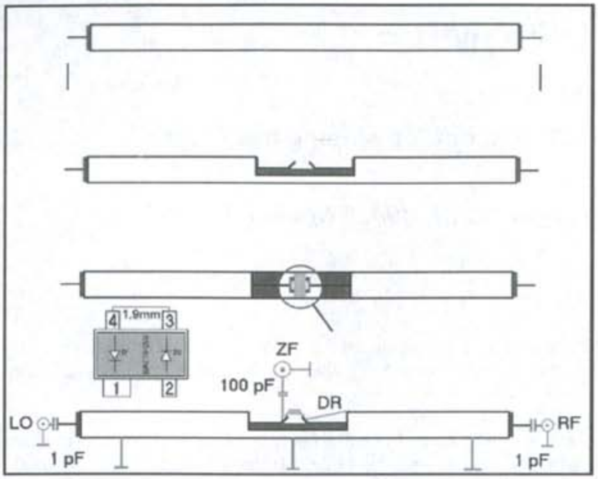
A major problem was the huge change in signal level when the cover of the casing was closed. This was caused an insufficient grounding of the piece of coaxial cable to the casing. When the casing was half closed with the cover the RX signal became significantly stronger. After grounding the coaxial cable close to the LO input with copper foil that was clamped under the cover this effect at least partly disappeared. In the middle the shield of the coaxial cable was grounded by a soldering pin and a 3mm screw at the side of the middle chamber. Another grounding of the cable beween the diode and RF input may be not necessary but could be tried.

As a trial without any theoretical background I soldered a choke (0.1mm CuL, 1cm long, no turns!) on the RF side between diode and ground. Then there was no change any more in the signal level when the cover was closed. However, when I moved the choke more to or away from the wall the signal level changed. With the choke more away from the wall the RX signal level decreased significantly and closing the cover completely made the receiver much worse. How long should the choke be in this case ideally? A question for that I still need advice and literature.

It was very difficult to solder the 4 pins of the dual diode BAT15-099. Here I should find a better solution may be with the help of pieces of a teflon board or something else. When I built a little multiplier using the same technique later on, I found that the inner conductor of the UT-141 cable can be moved very easily. Thus it can be pulled back into the cable and supplied with a suiting angle and both inner conductor parts will be in a parallel position. This facilitates a lot the soldering of a double diode with 4 pins. See figure 2.

The 1pF SMD ceramic capacitors (or alternatively pieces of teflon PCB) were soldered to the slotted ends of the inner pin of the SMA jacks. The SMA jacks were dismantled before doing this. The inner conductors of the semi rigid cable were suitably shortened and the line relocated into the casing and soldered. For all soldering I used 0.5mm solder.

The assembled mixer is shown in fig. 3 and fig. 4.



UT-141 Semi Rigid Cable, 6cm length

Cut aperture in the middle, as small as possible, with inner conductor cut

View on the aperture from the top with BAT15-099 inserted

left: BAT15-099 pins and dimension

Sketch of the assembly with capacitors and choke (DR) and the three points for grounding with soldered Cu foil

Fig. 1 Assembly on a UT-141 coaxial cable

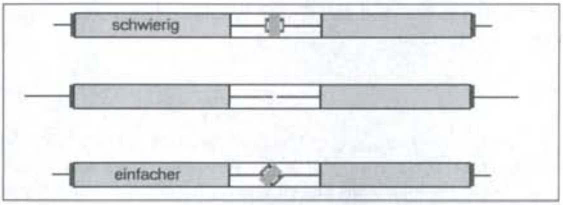


Fig. 2 Another way of soldering the diode - top difficult, bottom easier. A bit of the inner conductor is pressed from the outer ends of the cable into the middle aperture.

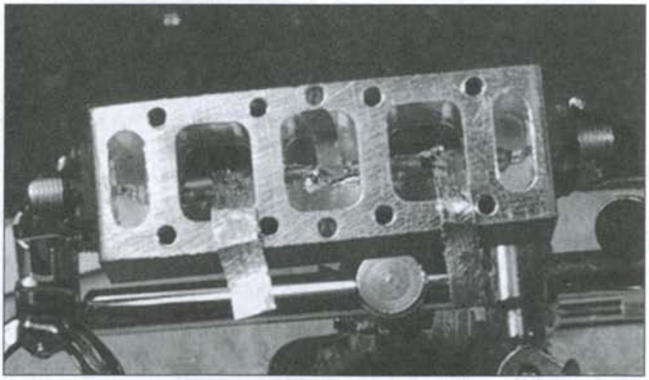


Fig. 3 Open housing of the 24 GHz mixer head with the 6cm Semi Rigid cable inserted

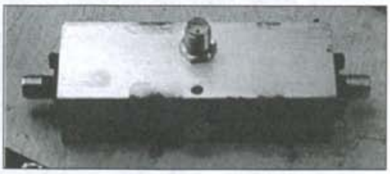


Fig. 4 Housing of the 24 GHz mixer head – bottom side, looking at the IF jack

Figure 1 shows my instructions for building this mixer head for 24 GHz for beginners and experimenters (like me). One could also use this head as an external mixer for use with a spectrum analyser.
As an IF amplifer I used a broken, repaired and modified with a ERA-1 MMIC, Picosendond Pulse Lab Amplifier. Any other external IF amplifier should work without any problem as long it is suitable for the IF used.
As one can buy the BAT15-099 diodes very cheaply on Ebay and one can get pieces of UT-141 cable often even connected with SMA jacks from the junkbox the total cost for this head was 10 Euro maximum, including the old casing with the 2 SMA jacks from a flea market.
Of course the perfomance of this simple head will be low due to the non optimised matching, but it works and the low cost to build it is unrivalled.

Another idea would be to use the collector base section of a modern transistor with high transiton frequency as a diode, e.g. BFP620. I am waiting for the BFU725F (transit frequency 68 GHz). If this type appears on the mass market in mixers, multipliers and LNAs, it should be a cheap opportunity.

My housing was taken from an old filter from PA0KBT, probably similar housings are available at flea markets. One could also try to solder the UT-141 just to a copper-clad board and to mount the SMA jacks on the board. However, a milled housing probably will be better.

As I do not really like to tap small threads I was very happy to find 2 SMA flange jacks already on the housing. For the IF I have used a SMA single hole jack.

I have not yet tested if the mixer works also on other lower microwave bands. Probably the LO input capacitor and the RF input coupling capacitor will have to be increased below 10 GHz.

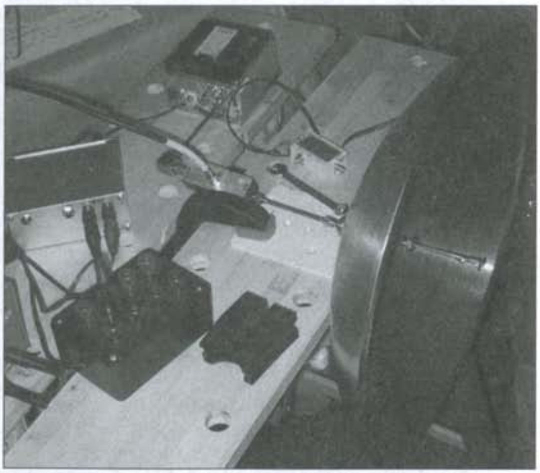


Fig. 5 24 GHz assembly with mixer head, LO and fruit bowl dish

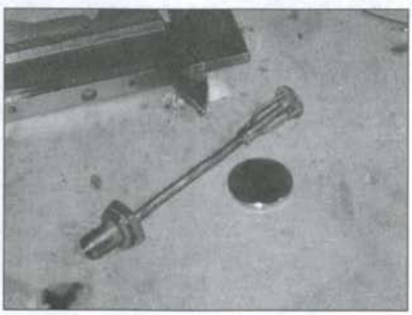


Fig. 6 24 GHz Dipole feed

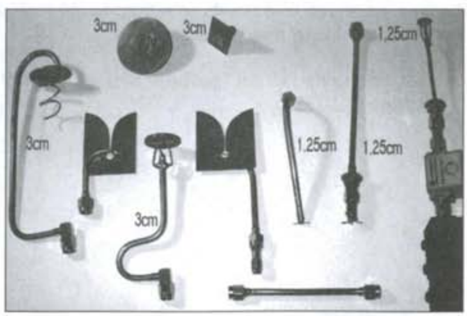


Fig. 7 Homemade antennas for 24 and 10 GHz

As LO I used as mentioned above a DMC-PLL-DRO oscillator from the junkbox. Some of these LOs can be tuned very well for a 1296 MHz IF but also other IFs are possible depending on the oscillator (and crystal, that canbe obtained e.g. from Eisch Electronic or Andyquarz).

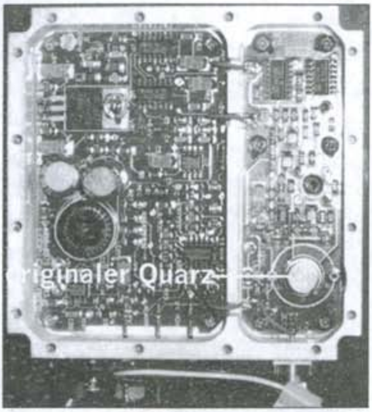


Fig. 8 DMC PLL Oscillator with crystal

If these DMC-LOs are detuned with their DRO screw, they still produce a measurable oscillator signal, but the frequency will be changing over a range of Hz to kHz. This is because the PLL is not locked. Thus a received signal of the 24 GHz test beacon is only noticable as a noise level increase. If the PLL is locked, after warming up the oscillator is stable and the beacon can be detected and its keying is readable!
The original crystals of these DMC oscillators have 3 little pins. See figure 8. A HCU-25 crytal with 2 pins fits exactly into two of the little holes (the left and and middle hole from the direction of the SMA crystal control connection) of the socket. The chosen crystal frequency must suit to the mlltiplication factor of the oscillator (e.g. x 228). Otherwise the PLL will not lock.
Sometimes adjusting the DRO with the tuning screw is critical and patience is needed. Probably the voltages at the test point should be checked. In my working oscillator I measured 7.23 V at the point "VT" and 0 V at the point "ALM" when the PLL was locked.

Possible improvements

Adding a two stage IF amplifier and a 24 GHz LNA makes the RX signal of the simple UT-141-BAT15-099 mixer head much stronger.

Antennas

With a bit of dexterity one can construct dipole antennas for 24 GHz by using a piece of UT 141 semi rigid cable with an SMA jack on one end and soldering to the other end a piece of wire of about 5mm length to the inner conductor and another one of about 3 mm to the shield. The wire should be of 0.5mm or less diameter. See fig. 6 and fig. 7. Using an illuminated magnifying glass and a 'helping hand' will help a lot here as well as for all the other work with the mixer head.

TX multiplier

I have also tried to build a TX multipier with one of the diode sections of the BAT15-099. The same idea with the UT 141 line was used. With 5 mW input on 1036,... MHz I could detect a clear signal on 10 GHz. The order of the parts was: Input SMA – 1 pF C, choke 1cm 0.2mm CuL from ground to cathode of the diode – diode with cathode to the input – NO C at the output, thus an open output with SMA. The coaxial line was grounded at 3 points with copper foil that was clamped under the cover of the housing (the same one as for the mixer head was used).

I am very interested to get feedback and ideas for improvements! Have fun with your experiments.
73 Wolfgang, DD8BD

Einfacher und günstiger RX-Mischer für 24 GHz

Ein Experiment ohne Platine und ohne Hohlleiter – nicht für Contest-Siege!

von Wolfgang Demmer, DD8BD - dd8bd_@freenet.de

Einleitung

Nur wenige OM werden die Möglichkeit haben, für einen 24GHz-Mischkopf eine Teflonplatine herzustellen und der Durchschnittsamateur hat weder professionelle Fähigkeiten im Bereich der Feinmechanik wie auch nicht die passenden Werkzeuge, noch das nötige kostbare Hohlleitermaterial dafür, um einen Empfangs-Mischkopf für 24GHz herzustellen.

Es bestand die Absicht, eine ganz simple Lösung mit vorhandenem Flohmarktmaterial, günstig bei Ebay erworbenen Halbleitern (BFP405 und BAT15-099) und wenigen SMD-Bauteilen, hier entweder SMD-Keramik-Kondensatoren oder aus Teflon-Platinen-Resten hergestellte 1,5 x 2 mm kleine Kondensatoren herzustellen – sicher gibt es noch einfachere Lösungen - Kapazitäten zu erzeugen. Als Bauteilträger sollte ein Stück UT-141 Semi Rigid Koax dienen.

Als LO sollte zunächst ein DMC-PLL-DRO-Oscillator verwendet werden, für die Verstärkung des ZF-Signals ein frequenzmäßig passender vorhandener externer ZF-Verstärker mit Koax-Anschlüssen.

Experimente und Ergebnisse

Nach stundenlangen Tüfteleien wegen der geringen Größe insbesondere der Doppeldiode BAT15-099 klappte es dann schließlich, mein UT-141/BAT15-099-Mischkopf eingebaut in ein kleines gefrästes Alu-Gehäuse vom Flohmarkt empfing deutlich das Signal meiner Hausbake auf 24GHz!
Als Antennen wurde kleine Eigenbauten wie ein Dipol und eine Vivaldi-Antenne verwendet. Testdistanz zunächst erst mal 50cm, dann schließlich bis ca. 10m bei freier Sicht.

Das Hauptproblem, was sich nach stundenlanger Problemsuche wegen heftiger Signalpegeländerungen im Empfänger beim Aufsetzen des Deckels zeigte, war die nicht ausreichende Massekontaktierung des Koax-Stücks am Gehäuse. Bei nur halb aufgeschobenem Deckel wurde das Empfangssignal wesentlich stärker, aber nach entsprechender Erdung des Semi Ridgid–Stückes nahe dem LO-Eingang per Cu-Folie, deren Ende unter dem aufgeschraubten Deckel eingeklemmt wurde, war das Problem teilweise behoben.

In der Mitte war der Außenmantel der Leitung bereits geerdet (3mm-Schraube mit Lötfähnchen an seitlicher Wand der mittleren Kammer). Eine weitere Erdung der Leitung zwischen Diode und RF-Eingang schien nicht nötig zu sein, sollte aber getestet werden.

Nach Einlöten der aus 0,1mm lackiertem Cu-Draht bestehenden Drossel (reiner Versuch ohne technisches Hintergrundwissen bezüglich der genauen Maße) von ca. 1cm Länge (ohne Windungen) auf der RF-Seite zwischen Diode und Masse reagierte diese Kammer nicht mehr untypisch bei Aufsetzen des Deckels, wohl aber änderte sich der Empfangspegel, wenn die Drossel in Richtung Gehäusewand oder entgegengesetzt gebogen wurde. War sie von der Wand entfernt, sank der Empfangspegel deutlich und ein völliges Aufsetzen des Gehäusedeckels verschlechterte den Empfang deutlich. Wie lang sollte die Drossel in Luft wirklich sein?

Hinsichtlich der Funktion von Drosseln in einem GHz-Empfangsmischer in nicht eine Versorgungsspannung führenden Leitungen und deren Berechnung in Luft könnte ich noch einen guten Artikel oder Ratschläge gebrauchen, um mich schlau zu machen.

Sehr schwierig gestaltete sich das Anlöten aller vier Beinchen der Doppeldiode BAT15-099, hier muss noch eine bessere Lösung gefunden werden, z.B. die Verwendung von Reststücken, Schnipseln einer

Teflonplatine oder etwas anderes. Bei Bau eines kleinen Vervielfachers nach dem gleichen Prinzip stellte ich später fest, dass sich der Innenleiter des UT-141 leicht verschieben lässt, so dass man ihn in die geöffnete Mitte des Koax hineinziehen und passend anwinkeln kann, sodass sich beide Innenleiterteile parallel gegenüber stehen, was das Einlöten einer Doppeldiode mit vier Beinchen wesentlich erleichtert (siehe Abbildung 2 dazu).

Die SMD-Keramik-1pF-Kondensatoren (alternativ Teflon-PCB-Stückchen) wurden an die Kerben am Ende der Innenleiter der SMA-Buchsen gelötet, wozu die SMA-Buchsen zunächst ausgebaut wurden. Die beiden Innenleiter des Semi Rigid Koax wurden dann passend gekürzt, die Leitung wieder in das Gehäuse eingeschoben und dann angelötet. Dazu wurde wie auch für die anderen Lötungen 0,5mm-Lötdraht verwendet.

Abbildung 1 zeigt meine Bauanleitung dieses Mischkopfes für weniger betuchte Funkamateure, Schüler und Studenten, Beginner oder neugierige Experimentatoren (wie mich, hi) auf 24GHz oder Nutzer eines Spektrumanalyzers, denn dieser UT-141-/BAT15-099-Mixer kann auch als externer Mischer für einen Analyzer verwendet werden (die ZF ist natürlich abhängig vom verwendeten Oszillator (LO / Frequenzaufbereitung)! Abb. 3 und Abb 4. zeigen den fertig aufgebauten Mischkopf.

Als ZF-Verstärker verwende ich einen abgestorbenen aber mit einem ERA-1 MMIC reparierten und etwas modifizierten Picosendond Pulse Lab Amplifier. Jeder andere externe ZF-Verstärker müsste auch funktionieren, sofern er zu der verwendeten ZF passt.

Da die BAT15-099 Dioden sehr günstig in Ebay angeboten werden und man aus dem HF-Schrott-Angebot Stückchen oder fertige mit SMA-Anschlüssen versehene UT-141-Koaxleitungen beziehen kann, kostet dieser Mischkopf allerhöchstens 10 Euro, wobei auch schon der Flohmarktpreis für das kleine ausgeweidete Gehäuse mit zwei SMA-Flanschbuchsen inbegriffen ist!

Zwar wird die Performance dieses simplen Mischkopfes wegen nicht optimierter Anpassungen ziemlich schlecht ausfallen, doch er funktioniert und sein Herstellungspreis ist konkurrenzlos niedrig!

Eine weitere Idee ist, als Diode die Collector-Basis-Strecke von neueren Transistoren mit hoher Transitfrequenz zu verwenden (z.B. BFP620). Auf den BFU725F (Transitfrequenz = 68 GHz) warte ich noch. Wenn diese Transistoren als Massenprodukte angeboten werden, sollten sie eine kostengünstige Möglichkeit zum Aufbau von Mischern, Vervielfachern, LNAs usw. bieten.

Das Gehäuse, ursprünglich eine Art Filter, stammt von PA0KBT, Kees Broeken. Eventuell sind ähnliche kleine Gehäuse auf Flohmärkten günstig aufzutreiben. Alternativ kann man das UT-141 auch auf eine kupferkaschierte Platine aus der Bastelkiste auflöten und die SMA-Buchsen in die Platine einbauen (Durchkontaktieren nicht vergessen). Wahrscheinlich ist aber ein Gehäuse mit festen Wänden wie eben ein gefrästes Alu- oder Messing-Gehäuse von Vorteil .

Da ich mit dem Schneiden von Gewinden unterhalb von drei Millimetern auf Kriegsfuß stehe und auch wenig bis gar kein passendes Werkzeug dafür habe, war ich natürlich froh, dass schon zwei SMA-Anschlüsse (Vier-Loch-Flansch-Buchse) vorhanden waren. Für den ZF-Anschluss habe ich eine SMA-Einschraub-Buchse verwendet.

Noch nicht getestet habe ich, ob der Mischer auch auf anderen, tieferen Mikrowellenbändern funktioniert, vermutlich müssen unterhalb von 10GHz der LO-Eingangskondensator wie auch der RF-Einkoppelkondensator ein wenig vergrößert werden.

Als LO diente, wie oben erwähnt, ein DMC-PLL-DRO-Oszillator aus dem Elektronik-Schrott (eine Quelle der Freude für den bastelnden Funkamateur, hi). Einige dieser LOs lassen sich gut für die ZF von 1296MHz abgleichen, aber auch andere Zwischenfrequenzen sind je nach Oszillator (und Quarz, den man z.B. bei Eisch-Kafka oder Andyquarz schleifen lassen kann) möglich.

Wenn diese DMC-LOs mit der DRO-Schraube falsch abgestimmt sind, erzeugen sie zwar einen Oszillatorpegel, der sich auch messen lässt, allerdings wandert die Frequenz heftig im Hz/KHz–Bereich rauf und runter, sodass ein empfangenes Test-Bakensignal nur als Rausch-Amplitude wahrnehmbar ist. Das ist eben der Fall, wenn die PLL nicht einrastet. Ist die PLL aber eingerastet, steht der Oszillator nach entsprechender Aufwärmung so stabil, dass sich eine Bake ohne Problem damit erkennen lässt und auch die Kennung lesbar ist!

Die originalen Quarze dieser DMC-Oszillatoren haben drei Beinchen, ein HCU-25-Quarz mit seinen zwei Beinchen passt exakt in zwei der Löchlein (linkes Löchlein und mittiges Löchlein von dem SMA-Quarzkontrollanschluss aus gesehen) des Quarzsockels! Siehe Abb. 8. Die gewählte Quarzfrequenz muss zum Vervielfachungsfaktor des Oszillators passen (z.B. x 228). Andernfalls kann die PLL nicht einrasten. Trotz passenden Quarzes habe ich aber mit einem neuen Quarz genau dieses Problem der nicht einrastenden PLL bei einem anderen Oszillator. Wahrscheinlich muss ich mit mehr Geduld und Vorsicht die DRO-Schraube einstellen und die Spannungen an den Messpunkten VT und ALM beachten. Bei meinem für das Experiment verwendeten, funktionierenden Oszillators liegen an dem Messpunkt „VT" 7,23 Volt und an dem Messpunkt „ALM" 0 Volt bei eingerasteter PLL an.

Mögliche Verbesserungen

Und: Mit einem zweistufigen ZF-Verstärker und einem 24GHz-LNA wird das Empfangssignal des simplen UT-141-BAT15-099-Mischkopfes wesentlich lauter.

Antennen

Man kann mit etwas Fingerspitzengefühl leicht Dipolantennen für 24GHz bauen, indem man ein Stück UT-141-Semi Rigid mit SMA-Anschluss nimmt und an den Innenleiter am Ende des Koax ein ca. 5mm langes und an den Außenmantel ein ca. 3mm langes Stückchen 0,5mm (oder weniger) Draht anlötet. Siehe Abb. 6 und Abb. 7. Eine „Dritte Hand" und eine Labor-Tisch-Lupenlampe sind dabei von Vorteil, so wie auch bei den anderen beschriebenen Basteleien.

TX-Vervielfacher

Auch wurde mit einer der beiden Diodenstrecken der BAT15-099 versucht, einen Vervielfacher nach dem gleichen Aufbaumuster mit einer UT-141-Leitung aufzubauen. Mit 5mW Ansteuerleistung bei 1036,... MHz war ein deutliches Signal auf 10GHz festzustellen (Reihenfolge der Bauteile: Eingang SMA; C=1pF; Drossel 1cm 0,2mm CU-Lackdraht von Masse auf K der Diode; Diode mit Kathode in Richtung Eingang; am Ausgang kein C, also offener Ausgang mit SMA). Das Koax wurde an drei Stellen mit Folie geerdet, die wie bei dem Mischkopf, der das gleiche Alu-Gehäuse hat, unter den Gehäusedeckel geklemmt wurde.

Sollte jemand Verbesserungsideen haben, würde ich mich über Hinweise sehr freuen!
Viel Freude beim Experimentieren !

73 Wolfgang, DD8BD, OV I33

Bildunterschriften

Abb. 1 Anordnung im UT-141 Koaxkabel
Von oben nach unten: - UT-141 Semi Rigid Kabel, 6cm lang
- Öffnung in der Mitte schneiden, so klein wie möglich, Innenleiter durchtrennen
- Blick auf die Öffnung von oben mit eingebauter BAT15-099, links BAT15-099-Anschlüsse und Maße
- Zeichnung der Schaltung mit Kondensatoren und Drossel (DR) und den drei Punkten für die Erdung mittels angelöteter Kupferfolie.

Abb. 2 Alternative Lösung zum Einlöten der Diode. Unten: An den Enden wird etwas mehr Innenleiter freigelegt und dann nach innen gedrückt, so daß die Biegungen entstehen können.

Abb. 3 Offenes Gehäuse des 24-GHz-Mischers mit eingebautem 6cm Semi-Rigid-Kabel

Abb. 4 Gehäuserückseite mit Blick auf die ZF-Einspeisungsbuchse

Abb. 5 Test-Anordnung der 24-GHz-Anlage mit Mischer, LO und Obstschalenspiegel

Abb. 6 Dipol-Feed für 24 GHz

Abb. 7 Verschiedene Eigenbau-Antennen für 24 und 10 GHz

Abb. 8 DMC-PLL-Oszillator mit Quarz (unten rechts)

More about Oblongs (III) – improved 2m models

by Slobodan Bukvic, YU7XL, yu7xl@nadlanu.com

In previous Dubus issues, I have described super oblong antennas for 1296 MHz and 432 MHz. Now I want to describe some models of the oblong antenna for 144 MHz.

From the point of view of the antenna, the situation is quite different compared with higher frequencies. The sky and the ground noise are much higher on 144 MHz. For the calculations, the temperature of the sky is taken to be 1000K, and of the ground 200K. Therefore the performance of the oblong antennas can not be so spectacularly better in comparison with the yagi. Anyway, they are better. But, the main advantage of oblong still remains –the much larger bandwidth.

I have made several hundreds of oblong models for 144 MHz, using aluminum rods with diameters of 3, 4 and 5 millimeters. I did not want to consider a larger diameter, because the element weight becomes impractical and also for economic reasons. Smaller diameters are impractical, too as the elements are not strong enough mechanically. Smaller diameters gives a little bit better performance, though the difference is almost negligible. You can choose between 3 or 4 or 5 millimeter rods, and the only good consideration is mechanical strength. In previous parts of this article I stated that the best results are obtained if the boom length is in the range of 10 to 20 wavelengths. Such a long antenna for 144 MHz is not possible. However, I have made simulations for several long boom models, just to prove this statement. Furthermore a larger element height is better for the 144 MHz oblongs. This gives higher gain and better bandwidth, though their temperature is a bit higher. Accordingly, the G/T ratio is better, but a too large height is not suitable, because modeling can become a nightmare and you will always get quite unexplected results – just like when trying to shape a rubber balloon by squeezing it. Suppressing one lobe, another unwanted lobe is coming up etc.

Anyway, the oblong is an interesting antenna for 144 MHz as well, worth building and using. One can say it is hard to build, more expensive, etc. I do not agree. Both yagis and oblongs have advantages and disadvantages, but one simple piece of advice has to be followed: put the oblong element isolated above the boom, not around the boom.

One more thing to explain: I always design antennas for a little bit above the intended centre frequency. When the antenna is erected on the tower (or put in the stack), the central frequency will shift down due to the influence of the surroundings. Now let us look at some oblong models for 144 MHz.

Performance Data (No loss condition)

TYPE	ELE	L (mm)	G (dBi)	F/B (dB)	F/Sh (dBi)	F/Sv (dBi)	Hor (°)	Ver (°)	Temp (K)	G/T (dB)	ΔF * (MHz)
Q210XLS	10	6348	15.38	23.56	22.84	19.48	33.6	35.9	220.1	-8.05	2900

* ΔF given for SWR=1.5

Antenna	Boomlength (mm)	Material	Gain (dBi)	TA (K)	G/T (dB)	Bandwidth (MHz)
Q210XLS	6348	No loss	15.38	220.1	-8.05	143.250-146.120
		Aluminum	15.29	221.7	-8.17	
EF0211-5	6325	No loss	15.24	226.7	-8.31	142.500-144.750
		Aluminum	15.14	228.5	-8.45	

Dimensions

	Ref	De	D1	D2	D3	D4	D5	D6	D7	D8	- All dimensions given in milimeters
Pos	0	310	653	1267	1976	2788	3649	4539	5389	6348	
Length	806	752	728	696	672	652	638	618	594	578	

- All elements made of Al rods Ø 5 mm - The height of all rectangles is 300 mm

Table 1: 10 element oblong Q210XLS – Performance data, comparison with YU7EF Yagi and dimensions

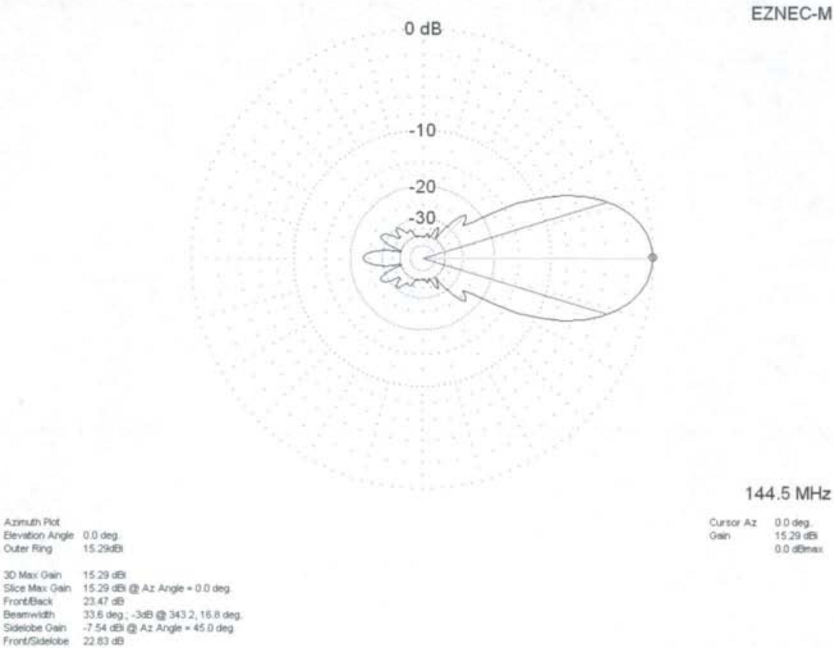
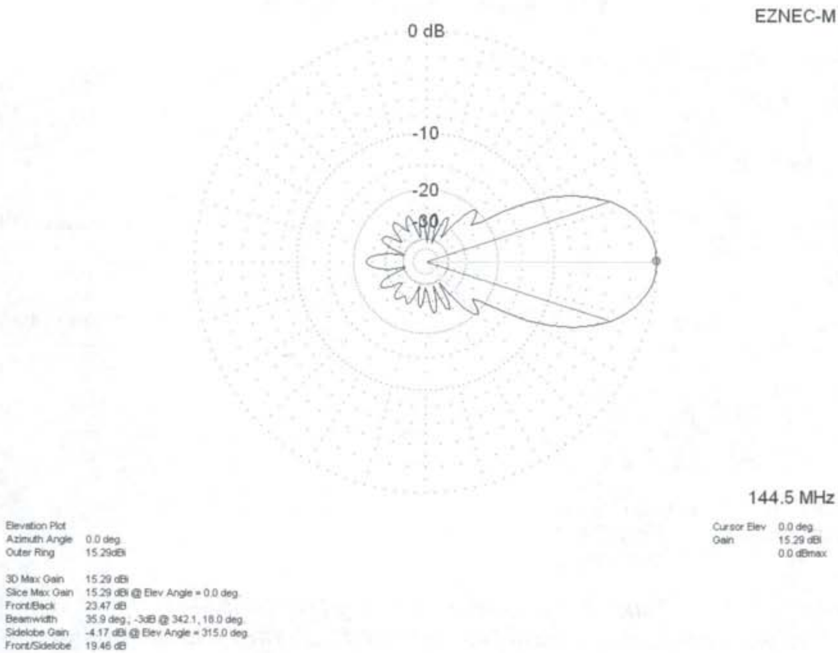


Fig. 1: 10 element oblong for 2m – horizontal plane (top) and vertical plane (bottom)
(EZNEC simulation - losses included)



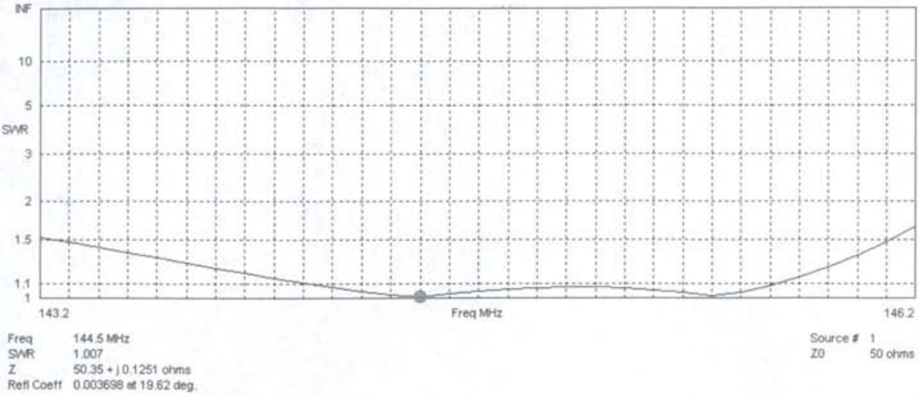


Fig. 2: SWR sweep for the 10 ele 2m oblong antenna (EZNEC simulation, losses included)

12 element oblong Q212XLK

Performance Data (No loss condition)

TYPE	ELE	L (mm)	G (dBi)	F/B (dB)	F/Sh (dBi)	F/Sv (dBi)	Hor (°)	Ver (°)	Temp (K)	G/T (dB)	ΔF * (MHz)
Q212XLK	12	7225	15.98	22.85	21.42	19.75	31.4	32.9	220.0	-7.44	2630

*** ΔF given for SWR=1.5**

Antenna	Boomlength (mm)	Material	Gain (dBi)	TA (K)	G/T (dB)	Bandwidth (MHz)
Q212XLK	7225	No loss	15.98	220.0	-7.44	142.850-145.480
		Aluminum	15.87	222.0	-7.59	
EF0212-5	7260	No loss	15.91	224.0	-7.59	143.300-144.820
		Aluminum	15.81	226.0	-7.73	

Dimensions

	Ref	De	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Pos	**0**	**400**	**568**	**932**	**1385**	**2011**	**2808**	**3666**	**4532**	**5453**	**6355**	**7225**
Length	**792**	**750**	**723**	**686**	**676**	**658**	**642**	**630**	**618**	**602**	**588**	**586**

- All elements made of Al rods Ø 5 mm
- The height of all rectangles is 320 mm
- All dimensions given in milimeters

Table 2: 12 element oblong Q212XLK –
Performance data, comparison with YU7EF Yagi and dimensions

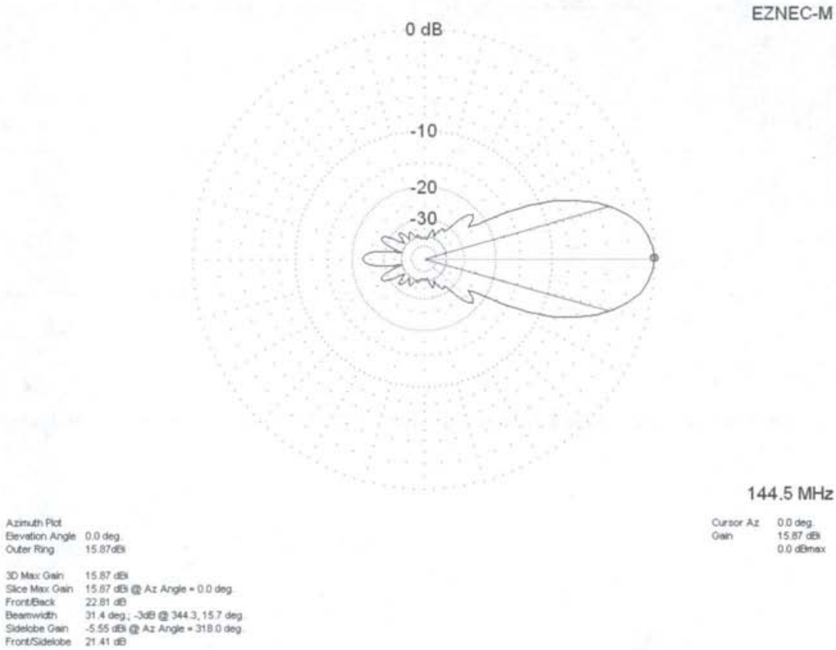
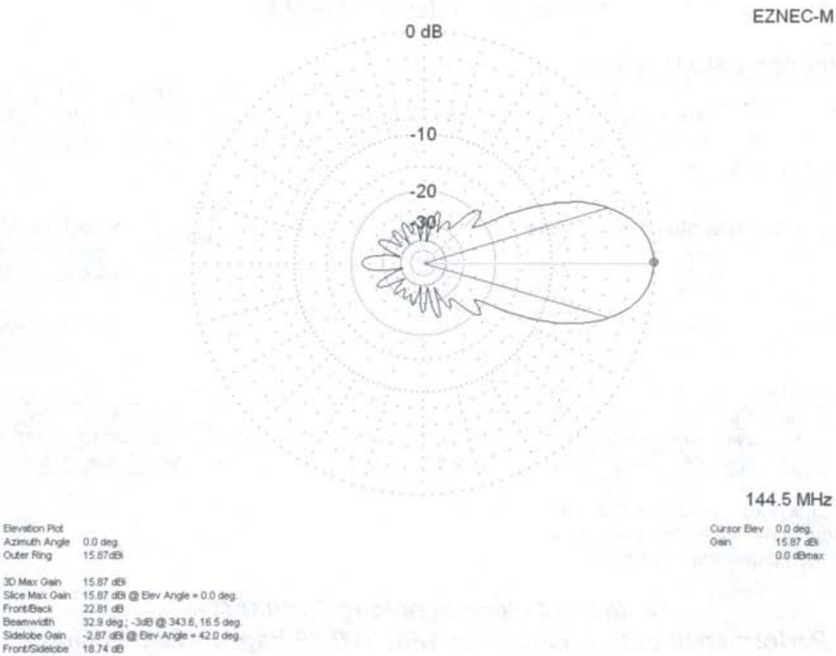


Fig. 3: 12 element oblong for 2m – horizontal plane (top) and vertical plane (bottom) (EZNEC simulation - losses included)



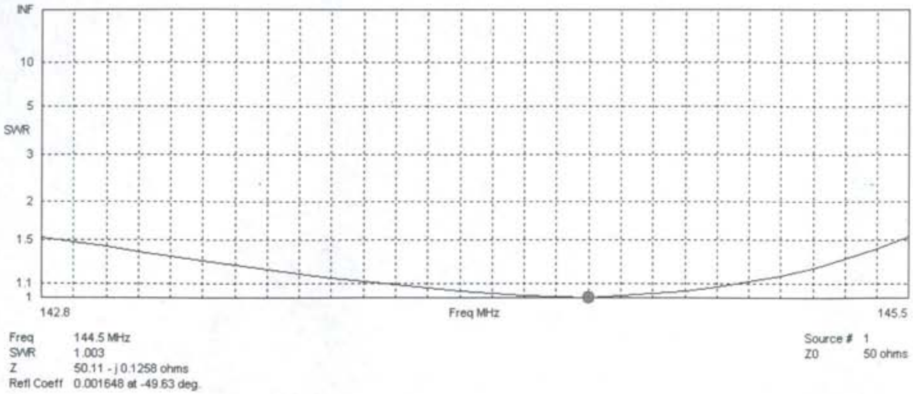


Fig. 4: SWR sweep for the 12 ele 2m oblong antenna (EZNEC simulation, losses included)

14 element oblong Q214XLM

Performance Data (No loss condition)

TYPE	ELE	L (mm)	G (dBi)	F/B (dB)	F/Sh (dBi)	F/Sv (dBi)	Hor (°)	Ver (°)	Temp (K)	G/T (dB)	ΔF * (MHz)
Q214XLM	14	9045	17.39	26.66	18.84	17.33	26.4	27.3	220.2	-6.04	1.200

*** ΔF given for SWR=1.5**

Antenna	Boomlength (mm)	Material	Gain (dBi)	TA (K)	G/T (dB)	Bandwidth (MHz)
Q214XLM	9980	No loss	17.39	220.2	-6.04	143.800-145.000
		Aluminum	17.23	223.1	-6.25	
EF0215-5	10060	No loss	17.26	223.0	-6.22	143.750-144.460
		Aluminum	17.06	226.7	-6,49	

Dimensions

	Ref	De	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
Pos	**0**	**344**	**544**	**1125**	**1875**	**2705**	**3572**	**4499**	**5409**	**6325**	**7315**	**8212**	**9178**	**9980**
Length	**714**	**668**	**652**	**625**	**608**	**591**	**581**	**572**	**562**	**548**	**542**	**536**	**530**	**522**

- All elements made of Al rods Ø 5 mm
- The height of all rectangles is 400 mm
- All dimensions given in milimeters

Table 3: 14 element oblong Q210XLM –
Performance data, comparison with YU7EF Yagi and dimensions

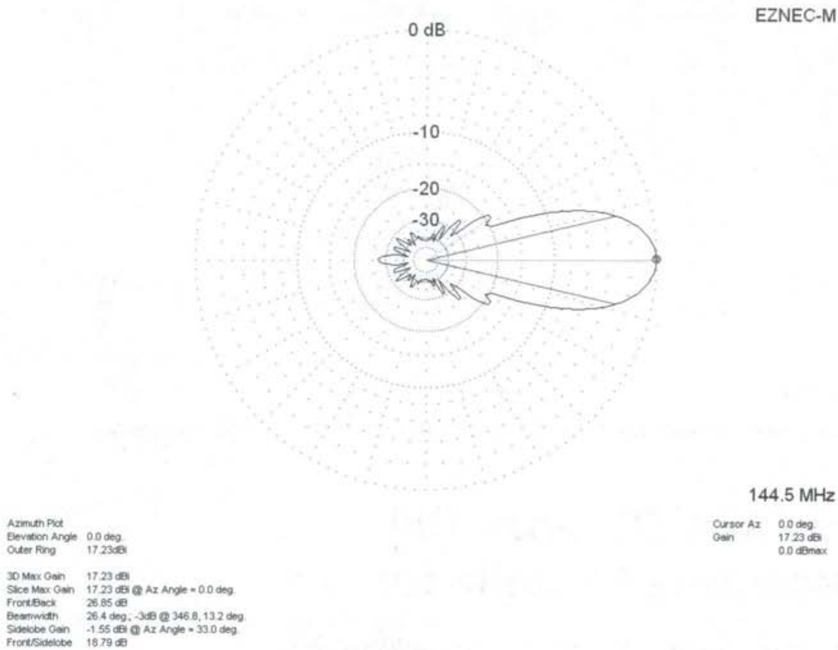
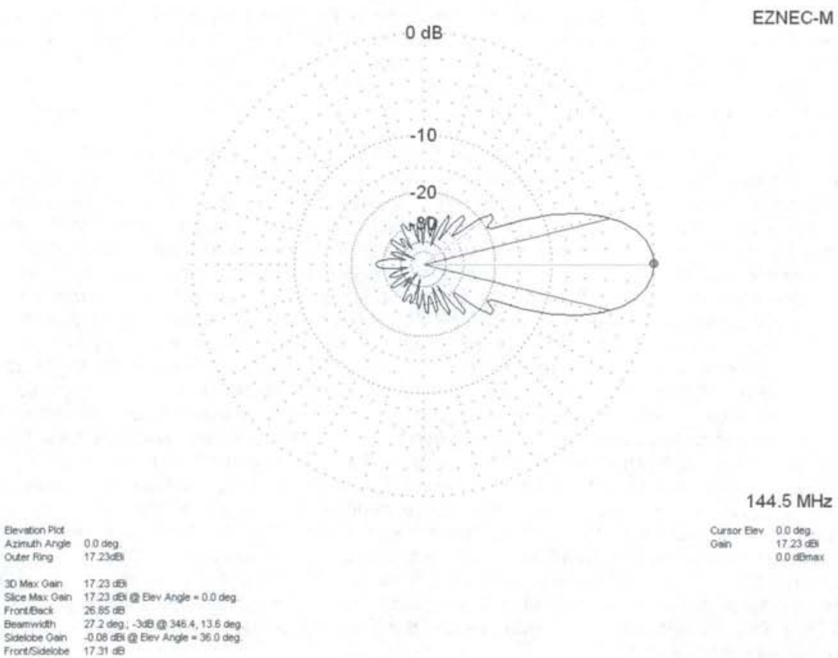


Fig. 5: 14 element Oblong for 2m – horizontal plane (top) and vertical plane (bottom) (EZNEC simulation – losses included)



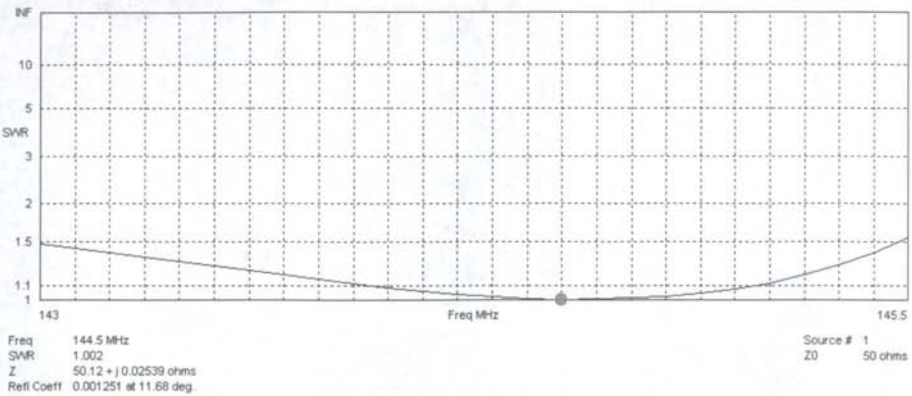


Fig. 6: SWR sweep for the 14 ele 2m oblong antenna (EZNEC simulation, losses included)

Mehr über Oblongs (III) – verbesserte Modelle für 2m

von Slobodan Bukvic, YU7XL, yu7xl@nadlanu.com

In den letzten beiden DUBUS-Ausgaben habe ich Oblong-Antennen für 1296 MHz und 432 MHz beschrieben. Nun möchte ich einige Modelle für 144 MHz zeigen.

Je nach betrachteter Situation, haben wir hier ziemliche Unterschiede im Vergleich zu den höheren Frequenzen. Himmels- und Erdrauschen sind viel höher auf 144 MHz. Für die Berechnungen wurde eine Himmelstemperatur von 1000 K und von 200 K für den Grund angenommen. Deshalb können die Leistungsdaten von oblongen Antennen auf 2m nicht so spektakulär besser sein im Vergleich zu einer Yagi. Aber sie sind besser. Der Hauptvorteil von oblongen Antennen bleibt aber: das ist die viel größere Bandbreite.

Ich habe einige hundert von oblongen Versionen für 144 MHz mit Alu-Elementen von 3, 4 und 5mm Durchmesser gerechnet. Größere Durchmesser wollte ich nicht betrachten, weil das Gewicht der Elemente dann unpraktisch und unwirtschaftlich wird. Geringere Durchmesser sind ebenfalls unpraktisch, die Elemente sind dann mechnisch nicht stabil genug. Dünnere Elemente geben leicht bessere Ergebnisse, der Unterschied ist aber nahezu vernachlässigbar. Man kann also zwischen 3, 4 und 5mm Elementen wählen und der einzig wichtige Faktor, der zu bedenken ist, ist die mechanische Stabilität. In den vorhergehenden Teilen des Artikels habe ich geschrieben, dass die besten Ergebnisse erhalten werden, wenn die Boomlänge im Bereich von 10 bis 20 Wellenlängen liegt. Solch eine lange Antenne ist auf 2m nicht möglich. Aber ich habe Simulationen für diverse solcher langen Modelle gemacht, um diese Aussage zu bestätigen. Bei Oblongs für 2m ist eine größere Element-Höhe besser. Dies gibt höheren Gewinn und bessere Bandbreite, obwohl ihre Temperatur ein wenig höher ist. Folglich ist das G/T-Verhältnis besser. Eine zu größe Höhe ist aber nicht gut, da dann das Modellieren zum Albtraum werden kann und man immer ziemlich unerwartete Ergebnisse bekommt, so als ob man versuchen würde, einen Gummiballing durch Pressen zu formen. Ein Zipfel wird unterdrückt, ein neuer kommt etc.

Jedenfalls ist die Oblong auch für 2m eine interessante Antenne und wert gebaut und verwendet zu werden. Man kann bahaupten, dass sie schwierig zu bauen und teuerer ist etc, aber ich widerspreche.

Beide, Yagis und Oblongs haben Vor- und Nachteile. Ein einfacher Rat sollte befolgt werden: Man sollte das oblonge Element isoliert über dem Boom anordnen, nicht um den Boom herum.

Noch ein Hinweis: Ich designe Antennen immer für eine ein bißchen höher liegende Mittenfrequen. Wenn die Antenne erstmal auf dem Mast (und ggf. gestockt) errichtet wird, sinkt die Mittenfrequenz leicht aufgrund von Umgebungseinflüssen. Nun folgen drei Oblong-Modelle für 144 MHz. Daten und Dimensionen siehe engl. Text oben.

New figure of merit for Yagi antenna comparison?

In a paper that was recently published by YU1AW on the web [1] a new figure of merit for yagi antenna comparisons was proposed. YU1AW concludes in this peper that the currently used antenna G/T for comparison of Yagi antennas given in the charts from VE7BQH [2] is not suitable due to high values of antenna noise temperature even in space communications on VHF bands.

How does YU1AW define the figure of merit?

He writes: "The new figure of merit (M) is based not only on receiving demands of antenna gain and noise temperature ratio G/T, but also on other important parameters of antenna which takes play on transmitting. Among the most important are SWR bandwidth, antenna efficiency, gain bandwidth, antenna Q factor, radiation resistance, etc. This new concept can be justified by the physical properties of antenna and its use both as a receiving and as a transmitting antenna.
For evaluating of figure of merit M for a transmitting antenna, we can take its gain and relative working SWR bandwidth product, G*B, which is the measure of antenna total efficiency, antenna losses and response of antenna to different environmental effects. For a receiving antenna we can take for M the gain and equivalent noise temperature ratio G/T, which is the measure of antenna signal sensitivity and cleanliness of its radiation pattern. Then we get:

M = G*B * G/T = G2 B / T

or expressed in dB

M = 20 log (G) + 10 log (B) – 10 log(T) [dB]

Relative working SWR bandwidth B can be calculated from antenna SWR diagram according formula B = (Fh - Fl) / Fo, where Fh and Fl are higher and lower frequencies at which the antenna SWR=1.5, and Fo is resonant frequency of antenna. The SWR value for relative working bandwidth calculation can be arbitrarily chosen, although SWR=2.62 is equivalent to -3dB bandwidth for single dipole antenna. Multi-element arrays like Yagi antennas can have very different SWR curve with few SWR minimums. So it is better to choose some low value for SWR to reduce its number and get more uniform data. Comparing multi element antennas like Yagis according their SWR curve may be problematic due to interpretation of SWR values relative to other physical properties of such antenna. But because we compare very similar antennas with usually very similar number of elements and similar boom lengths, relative working SWR bandwidths can be used as a relative criterion of antenna Q factor. This criterion is not always straightforward and adequate to the real Q factor value of yagi antenna but it can be used as guideline. At least the working SWR bandwidth is very valuable property of every transmitting antenna by itself." (...)
"The larger the M number, the better the antenna, similar to previous G/T comparison."

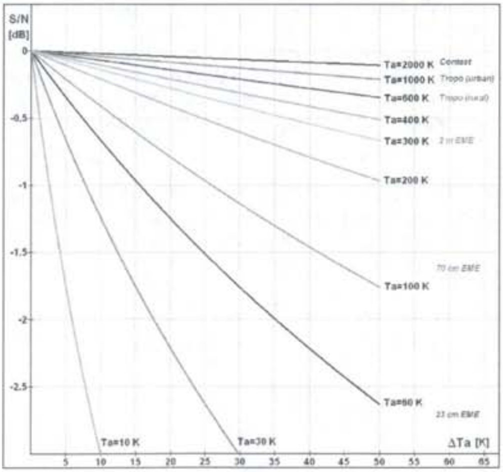


Fig. Relative S/N versus antenna noise difference Ta - taken from [1]

References

[1] VHF Antenna Noise Temperature, Dragoslav Dobricic, YU1AW, http://yu1aw.ba-karlsruhe.de/vhfnoisetemp.pdf
[2] VE7BQH G/T chart, http://www.vhfdx.net/VE7BQH.html

G8MBI/F5VHX, Graham, comments on YU1AW`s paper:

I think the main body of YU1AW's work is very good, the explanations of Noise Temperatures and G/T calculations are correct withing my limits of understanding. Most of this has been published before but in bits and pieces, it is very nice to see it pulled together with the graphs and other data.

With respect to the proposal for a new figure of merit for comparing Antennas I have some reservations. Firstly I think it is incorrect to state rather simplistically that the prior method developed by VE7BQH is using inappropriate numbers for Tgnd and Tsky. Even presented within AW's paper we see graphs and comments that indicate that the BQH numbers are not unreasonable for an Urban QTH with an optimum Tsky. While AW's paper contains a proposal for a new 'average' Tsky, I do not see any number given for a new Tgnd ?

This is anyway , in my opinion, largely academic as I spent many months myself running the actual BQH models across a range of Tsky and Tgnd and it is clear that few, if any, designs included in the table will move position, ie a good performer is a good performer. I would prefer to see a lot more work done and some attempt at running many more models to give a side by side comparison of the BQH table before we adopt a new 'standard', I am happy to do so if it is proven that it has merit.

Turning to the inclusion of SWR bandwidth in a figure of merit. I would make the following points.

It is extremely difficult to model Driven Elements (the DE) and the area around the DE in modellers [for this reason the BQH method does not do it, in the computer models all DE structures were replaced by a simple straight dipole at resonance]. Wire modellers do not handle close spaced wires well, segmentation of wires that have tight bends & corners is a tricky business. I would have insufficient confidence in complex models attempting this and the result might be wrongly condeming an otherwise perfectly good antenna.

In addition the chosen match method and feed method also has an effective bandwidth and even if my above points were overcome these would not and could not be included without a mix of computer modelling (difficult) and real world realisation (even more difficult).

Assuming my reservations about modelling in the DE area were calmed I would anyway still be generally against including SWR bandwidth in a single figure of merit for two further reasons:

Firstly, to 'hide' an important aspect of an antennas design from those attempting to pick a good antenna to use is not productive in terms of their education about antennas. Better to let people study for themselves and learn which parameters might be important to them.

Secondly, SWR bandwidth requirements are QTH and application specific. If I live in the North of Europe and suffer long snowy or wet winters, a narrow bandwidth antenna could be an issue. But if I live in the South of Europe this could be a non issue for me.

So by moving and mixing this parameter into one number (even though it may also be stated seperately but perhaps wrongly modelled) there will be a trend for people to learn less and a danger that some perfectly good antennas for some circumstances will effectively be 'downgraded' to the casual glance. This is in my opinion both unwise and un-fair.

None of my comments are intended to say that YU1AW's work is anything other than useful and thought provoking, but in my opinion the modelling community should address some of the above points before adopting a new standard. There is nothing to stop AW as an individual doing the work of constructing an alternative table and presenting it, so I am a little unclear what he is asking for?

Graham

Working radio at remote location

by Ulf Larsson, SM0LCB/SM7LCB - ulfl@home.se

It's a fine feeling to get home from work, settle down in that comfortable chair and then check out the bands. I put out a CQ call with the keyer and get a reply from a station in England. Sure it's fine but a little strange since I have no antenna or radio in my shack here in Solna (close to Stockholm) where I live. My antenna and radio are in our summer cottage down on the island of Öland off the south east coast of Sweden. Working a station in England isn't especially unique – but it is when you work it on 10 GHz. How is this done then? Let me try to explain in this article! I will let others explain how long range QSO's can be made on microwave.

Fig. 1 Ulf, SM0LCB at home in Solna active as SM7LCB on Öland

I first started to plan remote operation at the beginning of the 1990's but at that time couldn't find suitable cheap technical methods to implement remote control within a reasonable frame. Towards the end of the century when the Internet became more widespread and with it broad-band, I bought an Icom IC-706 transceiver. The best thing about this station is that it has a removable front control panel which is absolutely necessary for remote operation since the control panel remains at home and the radio is at the remote location. In year 2000 I had the radio remotely controlled between two computers at home in the shack. Then began a few years development to find out how the rest of a functioning remote system would work out. In my case a remote system would cover the following items

- Remote control of the IC-706 transceiver,
- Remote control of the antenna rotor,
- Remote control of the transverter, firstly for 1.3 GHz and higher bands,
- Sound transfer to and from the transceiver,
- The Transfer of CW – manipulator keyer or hand key signals to and from the transceiver.

All these items excepting the last one were soon operational and worked locally in my shack. I worked many **N**ordic **A**ctivity **C**ontests on 1.3 GHz with this setup. I tested the remote control of the rotor system during my many visits to the island. In the spring of 2004 broadband was introduced on the island and it was time to seriously launch remote control between Solna and Öland. The summer of 2004 became intensive, installing the antennas, building the radio hut by the antennas, hanging up the coax between the antenna hut and the cottage and finally installing the computers broadband and the software. When I left the island in August 2004 everything was fixed and working.

Fig. 2 Antenna installation on a nearby barn

Fig. 3 Antennas for 1.3, 10 and 24 GHz

I was full of excitement when I got home to Solna and connected to the Internet, powered up the radio on the island and began to work radio through the remote system. Everything worked just as planned and I was a very happy radio amateur when I first heard the noise from the radio on the island in the loudspeakers at home. The real test came during the **NAC** contest on 1,3 GHz in August and I am still active in this contest. I have also managed to work many fine rain scatters and tropo-openings which are good fun, amongst others I have worked F1ANH (SSB 1558 km) on 1,3 GHz as well as GM4LBV (CW 1169 km) on 10 GHz. More about this is on my home-page where log sheets, maps with squares worked and recordings of the many QSO's worked on microwaves can be found. The answer to the question, "Why work radio on microwaves?" can also be found there.
How have I managed all this you might wonder? Well, you buy a radio and hack a bit of code any radio ham worth his salt should be able to do it don't you think? Lets not joke about it, there has been an awful lot of hacking code and that has taken a long time. Most of the methods used to work out the remote commands are described on my home page, but here's a short list of methods.

- Remote control of the IC-706.
My own software developed for Linux/Windows.

- Remote rotor control.
My own software in a PIC-processor (in the rotor box) driven via ICOM bus from my own LOGGER program and Internet software for Windows/Linux.

- Remote control of the transverter mainly for 1.3GHz and higher bands.
My own software in a PIC processor (in the transverter) driven via ICOM bus via LOGGER program and my own Internet software for Windows/Linux.

- Sound transfer to and from the transceiver.
I use freeware here, and today I use Team Speak and IHU.

- Keyer and hand-key signal transfer to and from the transceiver.
My own software in a PIC processor at the keyer/hand key as well as my own Windows/Linux to connect them to the transceiver make this possible.

Is remote control of radio's here to stay? The answer is Yes! At present I live in a QTH, Solna, which does not enable me to work microwave, so remote operation is a necessity for me to be able to work theses bands. Of course remote operation can be done in other ways but for me it was important to solve the problem by using my own equipment and software in the true radio amateur spirit. Already there are complete solutions on the markets and it won't be long before they are available from the radio amateur stockists, then it will be easy for the ordinary "mains socket amateur" to use this method.

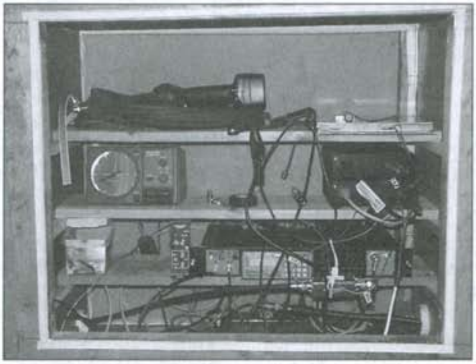


Fig. 4 Antenna hut at the antenna with rotor control, power supply and transverter for 1.3GHz

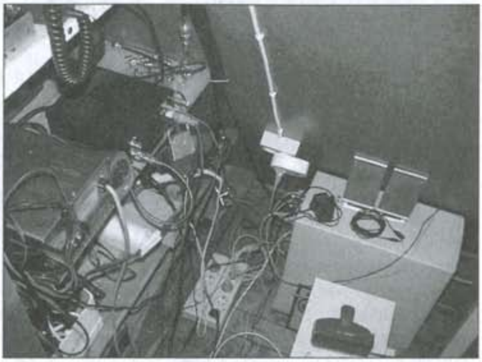


Fig. 5 Installation in the cottage about 60 meter from the antennas with the radio, power supply, computer and Internet connection

However I am pleased with my own solution which allows me to operate my radio wherever I may be with the front panel on the desk and to call CQ with the manipulator-keyer or hand key to my transceiver on the island of Öland. For instance when I was present at the VHF-meeting in Norway I listened and worked my radio on the island of Öland in Sweden. It felt real good.

73s de Ulf - SM0LCB/SM7LCB
Translated from Swedish by Derek - SM5RN.

Homepage **http://sm0lcb.shacknet.nu** Mirror site http://sm7lcb.shacknet.nu

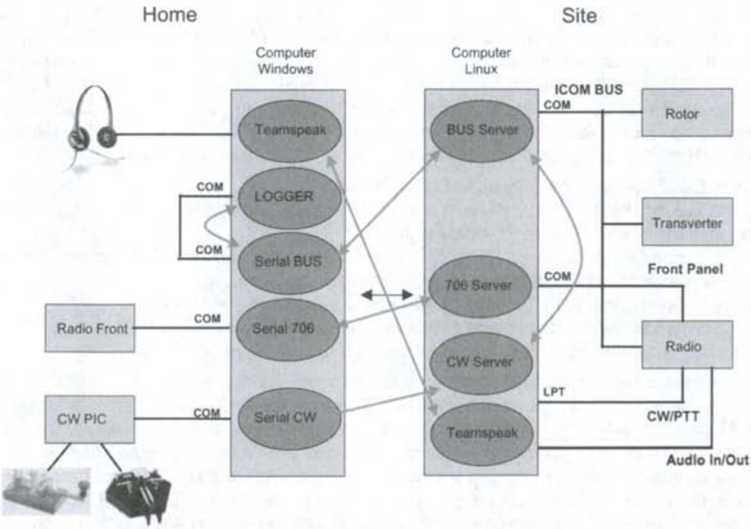


Fig. 6 The remote controlled station from SM0LCB

Ferngesteuerte Mikrowellenstation

von Ulf Larsson, SM0LCB/SM7LCB - ulfl@home.se

Es ist ein nettes Gefühl, von der Arbeit nach Hause zu kommen, sich in einen bequemen Sessel zu setzen und dann über die Bänder zu drehen. Ich rufe mit meiner Taste CQ und bekomme Antwort von einer Station in England. Das ist schön, aber etwas merkwürdig, denn ich habe keine Antenne und kein Funkgerät in meinem Shack hier in Solna (nahe Stockholm), wo ich lebe. Meine Antenne und Funkgerät befinden sich in unserem Ferienhaus auf der Insel Öland an der Südost-Küste Schwedens. Eine Station aus England ist nichts besonders Einzigartiges, aber schon, wenn man sie auf 10 GHz arbeitet. Wie geht das nun? Das will ich in diesem Artikel erklären!

Erstmals habe ich Anfang der 90er Jahre geplant, eine ferngesteuerte Station aufzubauen. Zu der Zeit aber konnte ich keine passenden günstigen technischen Möglichkeiten in einem dafür angemessenen Rahmen finden. Am Ende des Jahrhunderts, als das Internet sich verbreitete und schneller wurde, habe ich einen Icom IC-706 Transceiver gekauft. Das beste daran ist, dass man das Bedienteil abnehmen kann, was absolut nötig ist, wenn man ferngesteuert arbeiten will, da es zu Hause verbleibt, während das HF-Teil am entfernten Standort steht. Im Jahr 2000 hatte ich diesen Transceiver dann zuhause im Shack zwischen zwei Computern ferngesteuert betrieben. Dann folgten einige Jahre Entwicklungsarbeit, um herauszufinden, wie man den Rest eines funktionierenden ferngesteuerten Systems realisieren kann. In meinem Fall sollte das System folgende Punkte abdecken:

- **Fernsteuerung des Transceivers IC-706,**
- **Fernsteuerung des Rotors,**
- **Fernsteuerung des Transverters, an erster Stelle 23cm und höhere Bänder,**
- **NF-Übertragung zu und vom Transceiver,**
- **CW-Übertragung vom Keyer zum und vom Transceiver.**

Alle diese Punkte, außer dem letzten, waren schnell verwirklicht und arbeiteten lokal in meinem Shack. Ich habe so in vielen **N**ordic **A**ctivity **C**ontesten auf 23cm gearbeitet. Ich habe die Fernsteuerung des Rotors bei meinen vielen Besuchen auf der Insel getestet und es wurde dann Zeit, das Fernsteuerungs-System zwischen Solna und Öland wirklich ernsthaft in Betrieb zu nehmen. Der Sommer 2004 wurde intensiv genutzt, die Antennen zu installieren, Koaxkabel zu verlegen und schließlich die Computer, Internet und die Software zu installieren. Als ich die Insel im August 2004 verließ, war alles aufgebaut und am Arbeiten.

Ich war total aufgeregt, als ich zu Hause in Solna ankam, loggte mich ins Web ein, fuhr die Station auf der Insel hoch und begann über das ferngesteuerte System Funkbetrieb zu machen. Alles funktionierte wie geplant und ich war ein sehr glücklicher Funkamateur, als ich das erste Rauschen aus dem Funkgerät auf der Insel bei mir zu Hause im Lautsprecher hörte. Der wirkliche Test kam dann im NAC-Contest auf 23cm im August (ich bin übrigens immer noch in diesem Contest aktiv). Ich habe inzwischen viele tolle Regenscatter- und Tropo-Öffnungen arbeiten können, u.a. habe ich F1ANH (SSB 1558 km) auf 23cm und GM4LBV (CW 1169 km) auf 10 GHz gearbeitet. Mehr darüber ist auf meiner Homepage zu finden. Da gibt's auch Antwort auf die Frage "Warum Amateurfunk auf Mikrowelle?" Wie ich das alles hinbekommen habe, mag sich der Leser fragen? Nun, man kauft ein Funkgerät und programmiert ein bisschen herum... Jeder, der sich Funkamateur nennt, sollte das können, oder? Nein, Spass beiseite, das Programmieren war fürchterlich viel Arbeit und hat viel Zeit benötigt. Die meisten Methoden, wie man fernsteuern kann, sind auf meiner Homepage genau beschrieben (in Englischer Sprache), hier eine kurze Übersicht:

- Fernsteuerung des IC-706: Meine eigene Software für Linux/Windows.
- Fernsteuerung des Rotors: Meine eigene Software in einem PIC-Prozessor (im Rotorteil), Treiber via ICOM Bus über mein eigenes Log-Programm und Internet-Software für Windows/Linux.
- Fernsteuerung des Transverters (für 23cm und höher): Meine eigene Software in einem PIC-Prozessor (im Transverter), Treiber via ICOM Bus über mein eigenes Log-Programm und Internet-Software für Windows/Linux.
- NF-Übertragung zu und vom Transceiver: Hier nutze ich Freeware, zur Zeit Team Speak und IHU.
- Übertragung der Signale von Keyer und Handtaste zu und vom Transceiver: Meine eigene Software in einem PIC-Prozessor (bei der Taste befindlich) und meine eigene Software unter Windows/Linux, um die Verbindung zum Funkgerät zu machen.

Soll die Fernsteuerung bei mir erhalten bleiben? Ja, denn ich lebe an einem Standort, wo ich keine Mikrowellenstation betreiben kann, so dass eine ferngesteuerte Station die einzige Möglichkeit ist, qrv zu sein. Natürlich kann man so ein System auch anders realisieren, aber für mich war es wichtig, das Problem mit eigenem Equipment und eigener Software, ganz nach dem wahren Amateurgeist zu verwirklichen. Es gibt bereits komplette Lösungen zu kaufen und sicher bald auch im regulären Amateurfunkhandel. Ich aber bin froh mit meiner eigenen Lösung, die mir erlaubt von dort mit meinem Transceiver auf Öland zu funken, wo auch immer ich mit dem Bedienteil auf dem Tisch und Keyer daneben bin. Z.B. als ich auf dem VHF-Treffen in Norwegen war, habe ich über meine Station auf Öland gehört und gearbeitet. Das war ein tolles Gefühl. 73 von Ulf, SM0LCB

Homepage **http://sm0lcb.shacknet.nu** Mirror site http://sm7lcb.shacknet.nu

The Live MUF Software from G7RAU

by Jim McMasters, KM5PO

One subject that is talked about a lot is E skip (es). This mode of propagation is responsible for many of the contacts made on 10 and 6 meters and most of us know it as a phenomena that seems to increase in the summer time and someone said it has something to do with sunspots. If you've ever been at a contest or field day station during the summer, then you know that things get crazy when "E skip" is alive. Here I would like to describe *Live MUF*, a piece of software that is the latest in a series of efforts over the years to help track, analyze, and predict E skip phenomena. I will not get into the cause of this propagation which is the source of much discussion but rather I would like to tell you how this software works and give you instructions on how to get it working for you.

Many of us got our first set of tools for E skip out of Emil Pocock's (W3EP) QST article with it's MUF chart that enabled one to figure out the Maximum Usable Frequency by knowing the signal frequency and path endpoints on an existing E skip contact. So what we used to do (and still do) was listen on 6 meters for successful contacts and also ask operators what they were hearing and by tracking the path lengths and whereabouts we could see where the MUF was rising and even figure out the skip point which must be exactly in the middle of a path assuming a single reflection. It was not long until we saw DOS based computer programs that would perform the calculations necessary so long as you could feed it the required data. This meant keying the grid locators of both ends of the contact as well as the frequency of the QSO. Many were the hours that we took the calculations and mapped contacts with pencil on a grid map in order to track the E clouds and be ready with antenna headings to catch E skip on 144 MHz!

As technology improved and the public Internet became more available, there was a union of sorts between those who were interested in E skip prediction and the resources available in the vast DX cluster network. Dave Edwards, G7RAU decided he was tired of drawing those lines on a map and decided to create a computer program that would calculate Es MUF in realtime based on spots received from the dxcluster and map the data. His effort, started in 1999, has now resulted in the most useful, versatile software using state-of-the-art technology to help us with es predictions. I have been using this software for two years but I have found that the program can be a challenge to get up and running for some of my friends therefore I would like to show readers how to do it. Before continuing let's talk about requirements.

There is a web version of the program which can be used to see the accumulated spots data and a map with the contacts diagrammed. This version of the program requires an internet connection of course, and it is a quick way to see the status of things from say your cell phone (I do this with my Treo 650, see figure on the left side) and it's the perfect solution if you do not care to download the main client program with all it's whistles and bells. You only need to create a one time personal login to get access to the web version. The web version comes in two flavors. One that will allow you to select what you want to see and how the map is centered and then another version (link is farther down the main page) that will pull up either a North American map or a Europe map. But if you want the full enchilada, then you will need the main client program. For this program, you will need the internet connection but this time you need one that is always on such as broadband or DSL. I've found it best to install the client on machines running Microsoft XP but it is possible to get it to work with all versions of Windows from Windows 98 up.

Here are the steps for installing and setting up Live MUF version 7 on an XP machine:

Fig. Live MUF V7 web version displayed on a cell phone with internet connection

1. Browse to http://g7rau.demon.co.uk/default.aspx?menu=30 and click on the LIVE MUF V7 page.
2. Look for the words (in blue font) ".Net Framework Downloads" in the first couple of paragraphs on the page. If you know for sure that you already have the Microsoft.Net Framework version 2 already installed on the machine you do not need to click on these words. If you are in doubt then click on these words.
3. A page from Microsoft will come up. If .Net Framework is not installed on the machine you will see a message in red letters that says "You do not have the .NET framework installed on this computer... etc etc"


.NET Framework Version 2.0 Redistributable Package

Download the most recent update to the Microsoft .NET Framework and get everything you need to run applications developed using the .NET Framework.

- Download x86 version
- Download x64 version
- Download IA64 version

4. Simply scroll down to find the following list of downloads (see figure on the left) and click the top link (Download x86 version).
5. When you click the top link, it will take you to a download page where near the beginning you will find the actual button labeled "Download". Click this button.
6. The download (about 22.4 MB) will take a short time if you have a broadband connection.
7. Click through the Microsoft .Net Framework 2.0 Setup wizard, accepting the End User License

Agreement and so forth.

8. Once the .Net Framework install is complete you are ready to download the Live MUF client. You are 1/3rd the way done, hang in there.

9. Return to the LIVE MUF V7 page or if you have closed your browser go to http://g7rau.demon.co.uk/default.aspx?menu=30 and click on the LIVE MUF V7 page. Find the link with Live_MUFV7.exe in it and click on this link.

10. After the program is downloaded, run the install. The files are extracted to the "My Documents" folder.

11. Now go to the directory where your files were extracted and you will find the icon Live_MUF.exe as shown on the left side. This icon is your start-up icon and double clicking it will start up the program Live MUF. Congratulations, you're now 2/3rds the way finished. Hang in there.

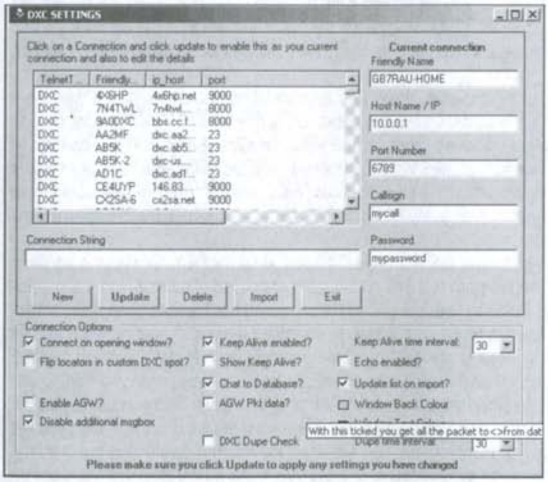
12. Double click the Live_MUF.exe icon and let's get started.

13. When the program begins for the first time, a "User Details" window is presented. See figure on the left side. Key in your callsign and your locator square in the appropriate boxes, then click the "Update" button. You may now close this window.

14. On the left side of the screen you will see a "navigation pane" where you may expand and collapse "nodes" by clicking on the "+" (plus) and "-" (minus or hyphen) next to a folder. Let's expand the "Available Windows" node by clicking on the plus sign.

15. Now expand the DXC node and then click on the Settings folder. This is where we will setup our gateway to the DXspider network so that Live MUF can go get spots that are being entered by ham operators in real time!

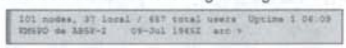
16. In the "DXC S e t t i n g s" window, along the right side find a box named "Callsign" and key your callsign in here, then click the "I m p o r t" button. See figure below.



17. The main table in the "DXC Settings" window will now be populated (from clicking the "Import" button). I personally use the AB5K or AB5K-2 connections. You would pick only one at this time and you do this by clicking on the entry, so do this now by clicking on AB5K under the Friendly_name column. Now find and click on a checkbox labeled "Keep alive enabled?". Now click the "Update" button.

18. You may now collapse the DXC node by clicking on the minus sign next to it. When you do this, the DX CLUSTER window will pop up. On the menu bar near the top of the program you can now click on "Connect".

19. If the connection is successful, you will see some verbage in your DX CLUSTER window ending with a statement similar to the following little figure:



Note: if the AB5K server does not seem available, then back track to the DXC Settings window and select the AB5K-2 entry and click update.

20. You will see the cursor flashing in a box. This is where you can send commands to the server. We will send a command to make the server filter out spots to show us only the ones we are interested in. Type in set/filter dxbandmode/pass vhf,uhf,mw and then press enter. The server will respond with an affirmative message.

21. Now in the left hand navigation pane expand the Mapping node, then the MUF Mapping node. Click on Settings under the MUF Mapping area.

22. In the "Centre Locator" box key your Grid Locator and in the "Recent spot limit" dropdown select 15. Now click the Save and Exit buttons. This panel will be one that you can come back to and customize over and over to make your maps look better.

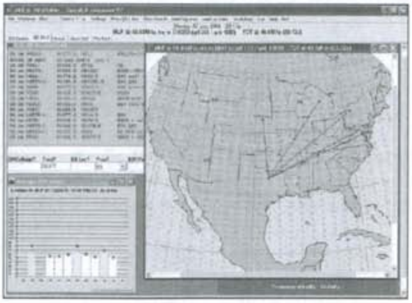
23. Now simply click on the "MUF Mapping" folder itself. This will open the MUF map window and it will probably display Europe. Right click the map and select "Draw Map".

24. Congratulations, you now have the program running and as spots come in through the connection we set to the DXspider, these spots will be mapped!

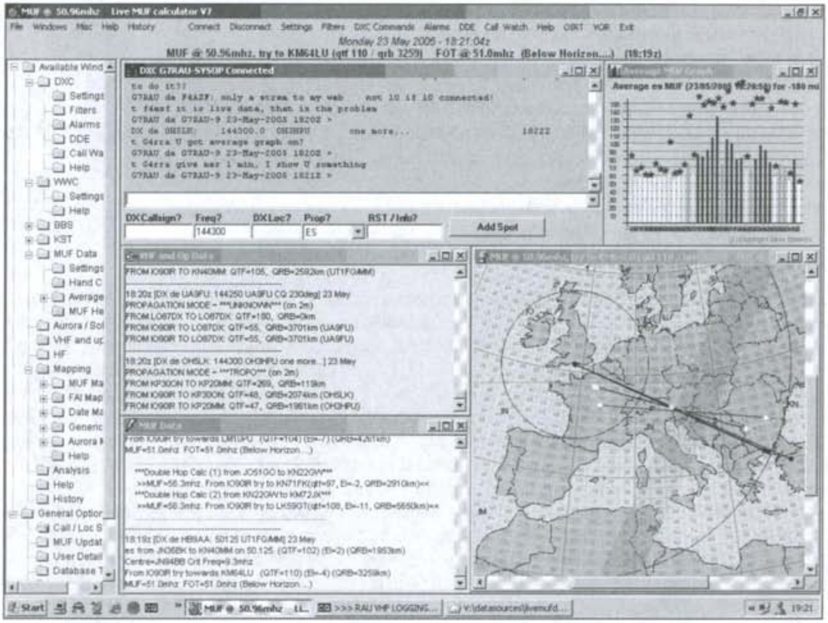
25. To make our display really sweet, we need at least one more window. Expand the "MUF Data" node and then the "Average MUF" node. Click now on the Settings folder within the "Average MUF" node.

26. On the "Average MUF graph settings" window, change the "Time Scale" to 30 and the "Time Spacing" to 2. This will cause our Average MUF graph to update every 2 minutes and hold 15 updates at a time. Now click the Update button and then close the window.

27. Now click on the "Average MUF" folder itself and the Average MUF Graph will open.

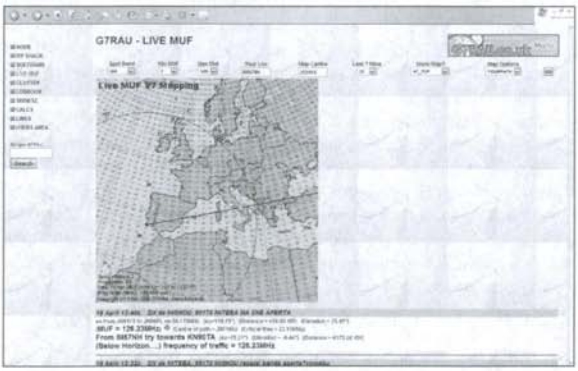


28. Arrange your windows so they are easy to see and operate. I do this as in the figure on the left side by closing the left hand navigation pane (hover your mouse over the nav pane right hand edge until you get a double pointer then double click), and then moving / resizing the three windows accordingly.
Another example from G7RAU is shown in the next figure below.

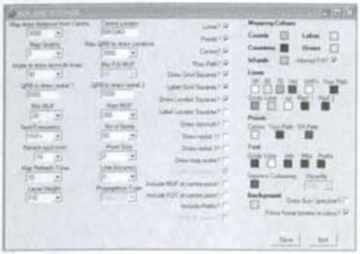


I would like to point out a few things about the software that will help you get more out of it.

Using the web version. See the image below. At a minimum, you should key in your grid locator to the "Your Loc" and "Map Centre" fields and also select the "At-Top" value in the "Show Map?" drop-down. The Figure shows the result after clicking the GO button. Also, the ultra-simple version is found much lower on the webpage and simply offers a no-frills EU and North America maps with spots mapped.



Keep alive. In the main client program you will need to configure a "keep alive" value in order to keep your telnet session active with the DXC server you are attached to. If this connection goes dead, you will no longer be receiving updates. This can be frustrating when you have been away from the computer for a while and return to find that your logging and mapping has stopped. This setting is found on the DXC Settings panel (see "Keep Alive" checkbox lower center in the image on the previous page). Be sure to click the Update button on this panel after you check/tick the Keep Alive checkbox. To bring up this panel, expand "Available Windows" and then "DXC". You will then see "Settings", "Filters", "Alarms" and so forth. Click on "Settings".



Tweak the MUF Map Settings. This panel (Expand "Mapping", "MUF Mapping", click on "Settings") configures everything to do with the main map. Besides setting colors for the various path lines and center/end-points, you can select or deselect grid locator labels, azimuthal lines from "your center", DX radii lines and so forth. One example of a setting is "Map Quality". Map Quality values run from 1 to 5 with 1 representing the best. See figure on the left side.

LIVEMUF 7 now has many other features. Here are some listed:

- Up to 5 DXC windows
- KST, WWC and BBS windows.
- An ES, AU, Hotspot and date map. On clicking on a spot end you can get the MUF / DX info.
- All maps can be saved as and all have multi-map feature so you can watch post event the build up in a 'TV show' style.
- Choice of 99 generic maps so you can set up different maps for different scenarios.
- HF, VHF, MUF and AU data windows.
- Analysis tool for post event analysis and exporting of data.
- User customisable propagation filter to include / exclude spots based on info.
- Dx Spider / custom file importer to get data into Live MUF.

In the interest of our readers, Dave Edwards, G7RAU was generous enough to spend some time providing some background on himself and his program: *My real interest in 'sporadic e' was sparked back in 1993 when I 1st experienced vhf (only licensed less than a year then). I had been a HF swl so I had a basic understanding of es/au from many years of keen listening on all ham bands. In the beginning I used a laminated paper map and used a yellow chinagraph to plot what was happening. I think part of the fun is being there right at the beginning and knowing you got it right. I remember getting an muf calc from the web in the 1990s sometime (muf.exe by Mark G4PCS) that run in dos and decided to create something in windows so it was easier to calculate es muf. In 1997 I started hammering calculations into excel and after time started getting the kind of answers I wanted so next was building an app with the calculations. The 1st release of mufcalc to the world was ~2000 I think and soon a lot of people were downloading and commenting on the app. My 1st live attempt used the OH webpage to suck 50 spots at a time and calc them (2001) and then EA6VQ persuaded me to create a telnet client for live calcs and that was when Live MUF telnet was started ~ 2002. The 1st releases were pretty basic and full of bugs and calc areas and that's where Keith G4FUF joined and we tweaked and corrected the maths for a more accurate model. MLive MUF went from V1 to V4 and then onto V6 written in VB until ~2004? and then I started using .net to rewrite the app. Things were put on ice after the alpha version as I suffered a minor stroke and lost my eyesight for a while but gladly things improved and I started work again on V7. The mapping model is an ongoing thing in V7, It took me a year to work out the maths and code for this. I know the mapping is poor quality but the base map data points are free (released by the CIA in 1980s hi) and the maths were mostly worked out by myself which was satisfying once I had the thing working. Development has marched on with V7 and I must point out that many of the features you find over the development of live MUF have been requested by the hams who use the app, thanks to them all for their valuable input from V1 to current. The app has many features now and can be a bit daunting to a new user but I feel with a bit of playing and things become clear. The next stage on is live AU (Aurora) mapping. G4FUF and G3NAQ have done most of the maths needed for this and all I need to do is find some spare time to get my head around it and build it into the app. What I am missing is a full list of USA/Canada callsigns and (6 length, not 1st 4 charactors) locators. I emailed qrz and hamcall to see if they were willing but no joy. If I had a list of calls and locs I could add them to the call/loc db and this would greatly increase the accuracy of the web tool and the client tool. My biggest concern is the steady decline in activity and in general a slow up of people willing to try things like ionoscatter etc. There are many reasons and I think software doesn't help some people as they become reliant on the info and do not check things for themselves. There are still a lot of times when the only answer is to call and check the bands especially with current activity levels. My background: Currently Data team leader with Oracle and SQL server admin and sql reports for apps for the Isle of Wight College. I also manage a small team for college timetables and electronic registers. Before that I worked as software designer, systems analyst, Aircraft laminator / fitter, a boat builder and many years ago I sold Ice Creams and Doughnuts to tourists I worked in Europe for a number of years and this is my excuse for taking so long to get my HAM ticket. I think part of the fun is being there right at the beginning and knowing you got it right."*

This article consists of material from KM5PO (tnx!) with additional information from G7RAU (tnx!) and was edited by CT1HZE.

(Red.: Da Programm und Dokumentation nur in Englisch verfügbar sind, gibt es hier auch keine DL-Übersetzung des Artikels.)

Microwave Parts

Ceramic Surface Mount

Frequency Mixer WIDE BAND

SIM-24MH+

Level 13 (LO Power +13 dBm) 7300 to 20000 MHz

CASE STYLE: HV1195
PRICE: $11.95 ea. QTY (10-49)

+ RoHS compliant in accordance with EU Directive (2002/95/EC)

The +Suffix has been added in order to identify RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications.

Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	50mW

For extended temperature range, consult factory.

Pin Connections

LO	8
RF	4
IF	2
GROUND	1,3,5,6,7

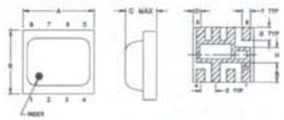
Features

- wide bandwidth, 7300 to 20000 MHz
- low conversion loss, 5.7 dB typ.
- high L-R isolation, 36 dB typ.
- excellent IF BW, DC to 7500 MHz
- LTCC double balanced mixer
- tiny size, low profile, 0.08"
- useable as up and down converter
- aqueous washable
- protected under U.S Patent 7,027,795

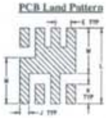
Applications

- fixed satellite
- mobile
- radio location

Outline Drawing



PCB Land Pattern



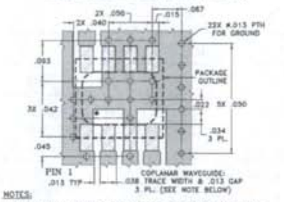
Suggested Layout.
Tolerance to be within ±.002

Outline Dimensions (inch / mm)

A	B	C	D	E	F	G
0.200	0.180	0.087	0.025	0.050	0.028	0.043
5.08	4.57	2.21	0.64	1.27	0.71	1.09

H	J	K	L	M	N	wt
.0050	.030	0.060	0.238	0.144	0.065	grams
0.13	0.76	1.52	6.05	3.66	1.65	0.08

Demo Board MCL P/N: TB-458+
Suggested PCB Layout (PL-284)



NOTES:
1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020" ± .0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Electrical Specifications

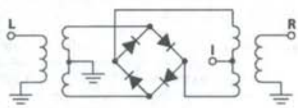
FREQUENCY (MHz) LO/RF f_L-f_U	IF	CONVERSION LOSS* (dB) Typ.	σ	Max.	LO-RF ISOLATION (dB) Typ.	Min.	LO-IF ISOLATION (dB) Typ.	Min.	IP3 at center band (dBm) Typ.
7300-20000	**DC-7500**								
7300-10000		7.0	0.2	8.5	43	31	19	13	20
10000-14500		5.7	0.1	7.5	36	29	18	13	16
14500-18000		7.6	0.3	9.3	26	19	15	10	18
18000-20000		8.5	0.3	10.9	28	22	25	16	25

1 dB COMPR. +9 dBm typ.
* Conversion loss at 30 MHz IF. σ is a measure of repeatability from unit to unit.

Typical Performance Data

Frequency (MHz) RF	LO	Conversion Loss (dB) LO +13dBm	Isolation L-R (dB) LO +13dBm	Isolation L-I (dB) LO +13dBm	VSWR RF Port (:1) LO +13dBm	VSWR LO Port (:1) LO +13dBm
7300.00	7330.10	6.65	43.77	18.89	3.94	6.09
7500.00	7530.10	6.32	39.57	19.63	3.47	8.37
8000.00	8030.10	6.12	35.84	20.35	2.76	4.99
9000.00	9030.10	7.38	48.14	19.20	4.81	2.76
9500.00	9530.10	7.00	48.23	17.30	3.84	2.56
10000.00	10030.10	6.73	45.78	16.83	3.38	2.62
10500.00	10530.10	6.29	42.22	17.92	3.17	3.22
11000.00	11030.10	5.93	40.36	19.17	2.35	2.25
12000.00	12030.10	5.84	35.97	18.67	1.99	3.49
12500.00	12530.10	5.55	34.02	18.08	1.92	2.31
13000.00	13030.10	5.70	33.28	18.18	1.48	2.28
14000.00	14030.10	5.74	34.81	19.35	1.87	2.77
14500.00	14530.10	6.21	36.04	21.54	2.52	3.07
15000.00	15030.10	6.80	35.11	28.80	2.96	4.28
15500.00	15530.10	6.92	31.74	22.63	2.49	3.20
16000.00	16030.10	7.08	27.52	16.03	2.47	2.97
17000.00	17030.10	7.94	26.56	15.86	4.43	1.25
18000.00	18030.10	8.16	29.19	24.93	2.49	1.99
19000.00	19030.10	7.75	31.50	28.10	3.12	2.04
20000.00	20030.10	9.60	26.59	22.49	2.54	1.27

Electrical Schematic



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REV. A
M116611
SIM-24MH+
ED-13229/1
DJ/CP/AM
080317
Page 1 of 2

Price is 13,00 € for Qty 5 – 9.

PE4140

Ultra-High Linearity UltraCMOS™ Broadband Quad MOSFET Array

Product Description

The PE4140 is an ultra-high linearity passive broadband Quad MOSFET array with high dynamic range performance capable of operation beyond 6.0 GHz. This quad array operates with differential signals at all ports (RF, LO, IF), allowing mixers to be built that use LO powers from -7 dBm to +20 dBm. Typical applications range from frequency up/down-conversion to phase detection for Cellular/PCS Base Stations, Wireless Broadband Communications and STB/Cable modems.

The PE4140 is manufactured on Peregrine's UltraCMOS™ process, a patented variation of silicon-on-insulator (SOI) technology on a sapphire substrate, offering the performance of GaAs with the economy and integration of conventional CMOS.

Features

- Ultimate Quad MOSFET array
- Ultra-high linearity, broadband performance beyond 6.0 GHz
- Ideal for mixer applications
- Up/down conversion
- Low conversion loss
- High LO Isolation
- Packaged in small 6-lead 3x3 mm DFN

Figure 1. Functional Diagram

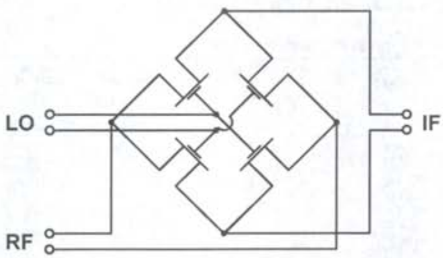


Figure 2. Package Type

6-lead DFN

Table 1. AC and DC Electrical Specifications @ +25 °C

Symbol	Characteristics	Test Conditions	Min	Typ	Max	Units
F_{TYP}	Operating Frequency Range[1]		DC		6.0	GHz
V_{DS}	Drain-Source Voltage	V_{GS} = +3V, I_{DS} = 40 mA	260	320	380	mV
V_{DS} Match	Drain-Source Voltage Match			12	40	mV
V_T	Threshold Voltage	V_{DS} = 0.1V; per ASTM F617-00		-100		mV
R_{DS}	Drain-Source 'ON' Resistance	V_{GS} = +3V, I_{DS} = 40 mA	6.5	7.75	9.5	Ω

Note 1: Typical untested operating frequency range of Quad MOSFET transistors.

Surface Mount

Frequency Mixer

HJK-3H+
HJK-3H

Level 16 (LO Power +16 dBm) 140 to 180 MHz

CASE STYLE: TTT881
PRICE: $16.95 ea. QTY (1-9)

+ RoHS compliant in accordance with EU Directive (2002/95/EC)

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications.

Maximum Ratings

Operating Temperature	-20°C to 85°C
Storage Temperature	-55°C to 100°C
LO & RF Power	19 dBm

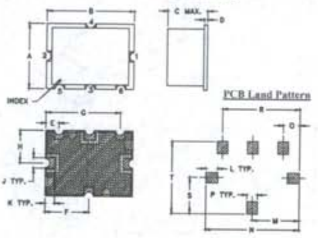
Pin Connections

LO	2
RF	1
IF	3
GROUND	4,5,6

Features
- high IP3, 37 dBm typ.
- compression, 3 dB higher than LO power
- protected by US Patent 6,807,407

Applications
- base stations
- communication systems
- cellular
- PCS

Outline Drawing



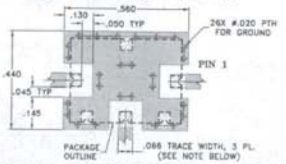
Suggested Layout, Tolerance to be within ±.002

Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H	J
.38	.50	.23	.020	.075	.250	.425	.187	.050
9.65	12.70	5.84	0.51	1.91	6.35	10.80	4.75	1.27

K	L	M	N	P	Q	R	S	T	wt.
.050	.070	.270	.540	.060	.095	.445	.208	.415	grams
1.27	1.78	6.86	13.72	1.52	2.41	11.30	5.28	10.54	0.8

Demo Board MCL P/N: TB-12
Suggested PCB Layout (PL-079)



NOTE: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. GROUND PAD SHALL BE FREE OF SOLDER MASK IF REQUIRED FOR SOLDERING.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER), SEE NOTE 2.

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Electrical Specifications

FREQUENCY (MHz)			CONVERSION LOSS (dB)			RF in at 1dB Compr (dBm)	IP3 (dBm)	LO-RF ISOLATION (dB)		LO-IF ISOLATION (dB)	
RF	LO	IF	Typ.	σ	Max	Typ.	Typ.	Typ.	Min.	Typ.	Min
140-180	160	0.5-20	8.0	0.1	9.2	+19	37	44	35	44	30

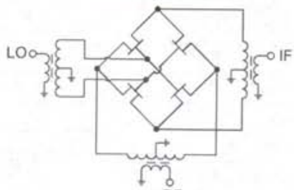
Typical Performance Data

RF Freq. (RF1 for IP3) (MHz) LO=160 MHz	IF Freq. (MHz)	CONV. LOSS (dB)	RF-2 for IP3 (MHz)	IP3 (dBm)
139.9	20.1	8.14	140.9	34.1
144.9	15.1	8.16	145.9	34.1
149.9	10.1	8.17	150.9	34.3
154.9	5.1	8.17	155.9	34.2
156.9	3.1	8.17	157.9	34.5
157.9	2.1	8.19	158.0	34.4
158.9	1.1	8.21	159.0	34.7
159.5	0.5	8.24	159.6	34.2
160.5	0.5	8.26	160.6	34.6
161.1	1.1	8.22	161.2	34.6
162.1	2.1	8.19	162.2	34.3
163.1	3.1	8.19	164.1	34.0
165.1	5.1	8.18	166.1	34.2
170.1	10.1	8.19	171.1	34.2
175.1	15.1	8.23	176.1	34.1
180.1	20.1	8.25	181.1	34.4

LO/RF Freq. (MHz)	ISOLATION L-R (dB)	ISOLATION L-I (dB)	VSWR (:1) RF PORT (LO=160 MHz)	VSWR (:1) LO PORT
140	50.78	52.78	1.27	15.53
145	50.70	48.36	1.27	9.33
150	51.06	44.92	1.28	6.13
155	52.09	42.08	1.27	4.16
160	54.10	39.91	1.28	3.20
165	55.81	38.41	1.27	3.09
170	54.88	37.59	1.27	3.62
175	52.76	37.23	1.26	4.57
180	51.28	37.20	1.28	5.74

IF Freq. FOR VSWR (MHz)	VSWR (:1) IF PORT
0.3	1.10
0.4	1.09
0.5	1.10
0.8	1.13
1.1	1.14
3.1	1.16
5.1	1.15
8.1	1.15
10.1	1.15
15.1	1.16
20.1	1.16

electrical schematic



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REV. D
M98898
HJK-3H
EDR-5182/1
RVN/TD/CP
060601

Freescale Semiconductor
Technical Data

Document Number: MRF6VP11KH
Rev. 1, 4/2008

√RoHS

RF Power Field Effect Transistor

N-Channel Enhancement-Mode Lateral MOSFET

Designed primarily for pulsed wideband applications with frequencies up to 150 MHz. Device is unmatched and is suitable for use in industrial, medical and scientific applications.

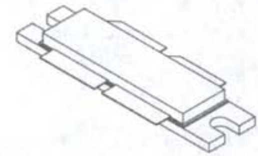
- Typical Pulsed Performance at 130 MHz: V_{DD} = 50 Volts, I_{DQ} = 150 mA, P_{out} = 1000 Watts Peak (200 W Avg.), Pulse Width = 100 μsec, Duty Cycle = 20%
  - Power Gain — 26 dB
  - Drain Efficiency — 71%
- Capable of Handling 10:1 VSWR, @ 50 Vdc, 130 MHz, 1000 Watts Peak Power

Features

- Qualified Up to a Maximum of 50 V_{DD} Operation
- Integrated ESD Protection
- Excellent Thermal Stability
- Designed for Push-Pull Operation
- Greater Negative Gate-Source Voltage Range for Improved Class C Operation
- RoHS Compliant
- In Tape and Reel. R6 Suffix = 150 Units per 56 mm, 13 inch Reel.

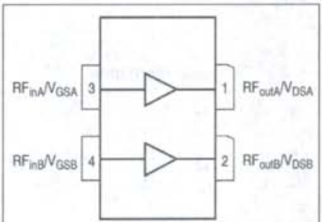
MRF6VP11KHR6

10-150 MHz, 1000 W, 50 V
LATERAL N-CHANNEL
BROADBAND
RF POWER MOSFET



CASE 375D-05, STYLE 1
NI-1230

PART IS PUSH-PULL



(Top View)

Figure 1. Pin Connections

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	-0.5, +110	Vdc
Gate-Source Voltage	V_{GS}	-6.0, +10	Vdc
Storage Temperature Range	T_{stg}	- 65 to +150	°C
Case Operating Temperature	T_C	150	°C
Operating Junction Temperature	T_J	200	°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value (1,2)	Unit
Thermal Resistance, Junction to Case Case Temperature 80°C, 1000 W Pulsed, 100 μsec Pulse Width, 20% Duty Cycle	$R_{\theta JC}$	0.03	°C/W

1. MTTF calculator available at http://www.freescale.com/rf. Select Software & Tools/Development Tools/Calculators to access MTTF calculators by product.
2. Refer to AN1955, *Thermal Measurement Methodology of RF Power Amplifiers.* Go to http://www.freescale.com/rf. Select Documentation/Application Notes - AN1955.

freescale semiconductor

DOUBLE-BALANCED MIXER
SURFACE MOUNT MODEL: SGM-3-13

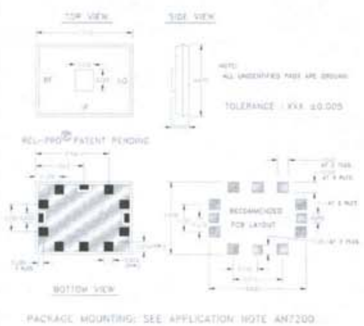
WIDE BANDWIDTH — 1350 - 7000 MHz

FEATURES:
- High Reliability
- Low Construction Cost
- Small Size, Surface Mount
- Lead Free REL-PRO® Technology

SPECIFICATIONS (Rev C 05/24/07)

Frequency (MHz)	RF/LO: 1350 - 7000; IF: DC - 2000
Conversion Loss (dB)	Typ. 7.0; Max. 9.5
Isolation (dB)	LO/RF: Typ. 25, Min. 10; LO/IF: Typ. 20, Min. 8; RF/IF: Typ. 20, Min. 10
LO Power	+13 dBm (Nom.)
1 dB Comp. Pt.	+7 dBm (Typ.)
Input IP^3	+20 dBm (Typ.)
RF Input Power	150 mW (Max.)
Impedance	50 Ohms (Nom.)
Operating Temperature Range	-40 to +85 °C

Package # 310



DOUBLE-BALANCED MIXER
SURFACE MOUNT MODEL: SGM-2-17

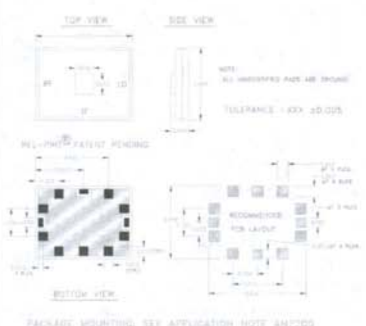
WIDE BANDWIDTH — 250 - 3250 MHz

FEATURES:
- High Reliability
- Low Construction Cost
- Small Size, Surface Mount
- RoHS Compliant
- Lead Free REL-PRO® Technology

SPECIFICATIONS (Rev. B 05/24/07)

Frequency (MHz)	RF/LO: 250 - 3250; IF: DC - 700
Conversion Loss (dB)	Typ. 6.5; Max. 8.5
Isolation (dB)	LO/RF: Typ. 30, Min. 15; LO/IF: Typ. 10, Min. 5; RF/IF: Typ. 30, Min. 15
LO Power	+17 dBm (Nom.)
1 dB Comp. Pt.	+10 dBm (Typ.)
Input IP^3	+18 dBm (Typ.)
RF Input Power	100 mW (Max.)
Impedance	50 Ohms (Nom.)
Operating Temperature Range	-40 to +85 °C

Package # 310



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ATV News

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ATV–Relais 9A0TVR in Kroatien (Istrien) interessant für Italien-Urlauber

Das ATV-Relais 9A0TVR auf dem 1396m hohen Ucka (Nähe Opatja) auf dem östlichen Teil der Halbinsel Istrien in Kroatien ist an der nördlichen italienischen Adriaküste mit ausgezeichneten Feldstärken zu sehen. Der Erbauer und Betreuer des Relais ist Darko, OE7DBH (oe7dbh@tirol.com).
Besonders interessant ist das Relais daher für Italien-Urlauber an den zahlreichen Stränden der italienischen Ostküste. So konnte das Testbild des Relais mit einem 33cm-Spiegel auf 10 GHz über 100 km in der Nähe von Bibione (Venezien) mit B5 absolut problemlos empfangen werden; weitere Empfangsberichte zeigen, daß dies auch noch mit einer 20db-Hornantenne möglich ist. 9A0TVR arbeitet im Nonstop-Betrieb und sendet auf 10410 MHz horizontal.
Aufgrund von Radarstörungen ist das Ansprechen auf 23cm (1255 MHz, 1262 MHz, 1272 MHz) nur mit großer Leistung möglich; auf 13cm dagegen problemlos. Die Eingabefrequenzen hier sind 2387 MHz und 2407 MHz. Den Einzugsbereich des Relais zeigt die abgebildete Karte.

Engl.: 9A0TVR is a Croatian ATV repeater on 10410 GHz (H) that is interesting for experiments during a holiday in the area of NE Italy. See map above.

OE7XSI: ATV-Relais auf 2809m Höhe

OE7XSI steht auf der Valluga (47° 09´ 30" N, 10° 12´ 45" O), dem höchsten Gipfel im Arlberggebiet (westliche Lechtaler Alpen) an der Grenze von Tirol und Vorarlberg. Gearbeitet werden kann über das Relais aus Teilen Österreichs, dem südwestdeutschen Raum und der nördlichen Schweiz.
Aufgrund von kommerziellen Umbauten (Wetterradar) auf der Valluga mußten Darko, OE7DBH und sein Team auch das ATV-Relais neu installieren; in dieser Höhe keine leichte Aufgabe. Inzwischen ist OE7XSI wieder voll betriebsbereit und kann auf insgesamt 13 (!) verschiedenen Frequenzen auf 13cm, 3420, 3440MHz und 3cm angesprochen werden. Neu sind die Empfangsfrequenzen auf 10260, 10360 und 10400 MHz. OE7XSI sendet rund um die Uhr auf 10450 MHz mit vertikaler Antennenpolarisation. Die DTMF-Steuerung erfolgt auf 144.535 MHz.

OE7XSI Antennas

Engl.: OE7XSI is an ATV repeater in NW Austria that can be worked from SW-DL, N-HB9 and OE. TX is on 10450 GHz, RX is on 13(!) QRGs on 13cm and on 3420, 3440, 10260, 10360 and 10400 GHz.

Neue ATV-Weltrekorde auf 10 GHz und anderen Mikrowellenfrequenzen geplant

Jedes Jahr an einem Wochenende im Monat Juni findet der sog. Grande Bleue (Mittelmeer-Tag) statt. Die OM's der Anrainerstaaten des westlichen Mittelmeeres versuchen dabei auf hohen Frequenzen in ATV und SSB in Kontakt zu kommen und erzielen dabei über das Mittelmeer oft erstaunliche Reichweiten.
HB9RXV, Paul ist dabei einer der aktivsten Teilnehmer. Im Jahre 2004 konnte er den bestehenden Weltrekord in ATV auf 10 GHz mit einer Verbindung zwischen Kalabrien/Süditalien (I8/HE5IBC) und Südspanien (EA7/F1URI-F4CXQ) auf 1564 km verbessern.
Für das Jahr 2008 hat Paul mit seinem Team eine weitere Steigerung der Entfernung geplant. Dies soll mit einer Distanz über 2300km zwischen Standorten in Marsa (Ägypten) und Almeria (Spanien) geschehen. Leider brachte eine erste Anfrage über das Schweizer Konsulat an die ägyptische Fernmeldebehörde keine Genehmigung für 10 GHz. Paul, HB9RXV wird nun versuchen, eine Genehmigung für eine andere Frequenz zu erhalten und dabei die ägyptischen Behörden auf die Bedeutung eines derartigen wissenschaftlichen Projektes, das heißt, die Ausbreitung von hohen Frequenzen über große Wasseroberflächen, hinweisen.
Sollte auch diese Anfrage scheitern, werden Paul und sein Team beim diesjährigen Grande Bleue auf Sardinien qrv sein und ein weiteres Projekt im Jahre 2009 ins Auge fassen – eine Transatlantikverbindung in ATV zwischen Sali (Senegal) und Recife (Brasilien). „Sicher eine Weltpremiere" meint dazu Paul, HB9RXV. Weitere Infos unter www.swissatv.ch

New ATV world record attempts on 10 GHz and other microwaves frequencies

Each year on a weekend in June takes place the so-called Grande Bleue (Mediterranean day). The OM of the neighboring countries of the Western Mediterranean Sea trie

to come thereby on high frequencies at ATV and SSB in contact and often obtain amazing ranges over the Mediterranean Sea. HB9RXV, Paul is one of the most active participants. In 2004 he improved the existing ATV world record on 10 GHz with a contact between Calabria/South Italy (I8/HE5IBC) and South Spain (EA7/F1URI-F4CXQ) on 1564 km. For the year 2008 Paul and his team plan a further increase of the distance. This with a distance over 2300 km between locations in Marsa (Egypt) and Almeria (Spain). Unfortunately a first inquiry over the Swiss consulate to the Egyptian communications authority did not bring a permission for 10 GHz. Paul, HB9RXV will now try to get a permission for another frequency and refer the Egyptian authorities the importance of a such scientific project, i.e., the propagation of high frequencies over large water surfaces.
Even if this inquiry should fail, Paul and his team will be qrv in the Grande Bleue this year from Sardinia island and a further project in 2009 will be a transatlantic contact in ATV between Sali (Senegal) and Recife (Brazil). "Surely a world premiere" comments Paul, HB9RXV.
Further information at: www.swissatv.ch

Paul, HB9RXV and his ATV expedition bus

HB9RXV`s portable ATV microwave shack

VHF News
Australia & New Zealand

VK7MO, Rex, reports:

This has not been a good season for troposcatter so there are no interesting terrestrial contacts to report in the February to April period where I would normally expect this.

Joe VK7JG is active on 6 meters EME with JT65A and has a high power permit that allows him to run 1 kw to a 7 element yagi. He recently worked OY3 in the Faroe Islands.

Leigh VK2KRR had his first 1296 MHz contact with G4CCH using JT65C.

Rex VK7MO (2.3 metre dish) has been testing out QRP EME on 2302 MHz with Charlie VK3NX (3.7 metre dish) and Sergej RW3BP (2.7 meter dish) and been achieving copy on JT65A down to 3 watts by using GPS locking at both ends and automatic Doppler correction of his IC-910-H using a program produced by Glenn VK2CCW.

Rex VK7MO and Ken VK7XDY have been experimenting with Luxeon LEDs to bounce Red Light from clouds and atmospheric particles. This is still early days but we have achieved 66 km on JT65A and 55 km on voice. We think the secret to this success is that by using broad beamwidths of around 10 degrees we do not run into the problems of loss of gain on narrow beamwidths when lasers are used for scattering - this seems to be analogous to the aperture coupling losses that apply to VHF and microwave troposcatter propagation when high gain and narrow beamwidth antennas are used.

Some tests I have been doing with VK3HZ using GPS locked systems at 10 GHz to use JT65A on troposcatter. So far we have only achieved 202 km on troposcatter and 220 km on a direct path - but that is a new digital record for 10 GHz for VK. Still a long way short of the voice records in VK with ducting - but GPS locking does open up some possibilities for ducting contacts from my QTH to ZL1/2 if I can get someone operational there with GPS locking and JT65A.

73 Rex, VK7MO

VHF South America

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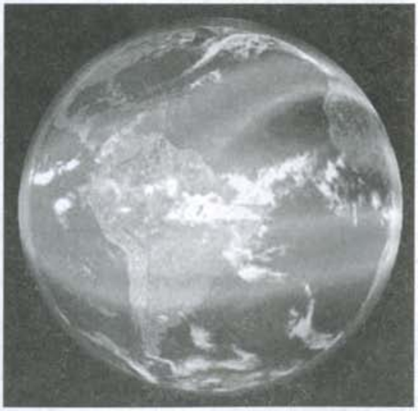
Ionosphere in 4 Dimensions

NASA and Space Environment Corporation produced some interesting kml files for Google Earth. They show geophysical measurements of the ionosphere in three-dimensional projections. The "4D" is related to the time, updated via GE and Internet every 10 minutes.



These files are associated to CAPS (Communication Alert Planning System) and ES4D (Earth Space 4D) services. The informations are about the Radio Availability, Total Electron Content, MUF, foF2, TEC evolution for the latest 24 hr and MUF evolution during the latest 24 hr, all worldwide. The website for kml files is: http://tinyurl.com/5579rr

More informations of NASA and videos are also found in:
http://tinyurl.com/63bjct
http://tinyurl.com/5tgf2d
http://tinyurl.com/5qt9zp
http://tinyurl.com/668pt6

On the press release, NASA explains the importance of the resource for the ham radio operators too. According solar physicist Lika Guhathakurta of NASA headquarters in Washington, DC, USA: "This is an exciting development [...] The ionosphere is important to pilots, ham radio operators, earth scientists and even soldiers. Using this new 4D tool, they can monitor and study the ionosphere as if they're actually inside it".

On my GE, the transparency of the layers was not effective but I believe that partial view was caused by some very basic operation or proprieties on my version.

By SEC website, these maps are also provided in the usual way with global and regional takes: http://tinyurl.com/5vhfmm

N1MM Tutorial

José Márcio PY4OG made several videos in Portuguese with the basic operations for N1MM Log software. That effort helps a lot of the contesters of AVHFC for correctly made their computerized logs. The links provided by Rio DX Group for this content are:

Tutorial 1: Config program:
http://riodxgroup.dxwatch.com/node/132
Tutorial 2: Config files:
http://riodxgroup.dxwatch.com/node/133
Tutorial 3: Config windows:
http://riodxgroup.dxwatch.com/node/134
Tutorial 4: History Call:
http://riodxgroup.dxwatch.com/node/136
Tutorial 5: Cabrillo files:
http://riodxgroup.dxwatch.com/node/140

There's also the master data and history call about VHF stations in Brazil at:
http://riodxgroup.dxwatch.com/node/139

Araucaria VHF Contest (AVHFC) May 3rd and 4th 2008

ZW2J (GH52) Team. (L to R) Martins PY2HN, Ronan PP2RON, Pereira PU2WDV and Enos PY2ENO.

In the beginning of May, about 200 PY stations, according Peter Sprengel PY5CC/PP5XX, enjoyed the Araucaria VHF Contest (AVHFC). The contest was head by Araucaria DX Group, one of the most important DX clubs in HF contest, now tuned on VHF too. The AVHFC has very similar rules of

CQWW VHF and promoted DX activity in 50 MHz and 144 MHz trough more than 30 grid squares, some bit rare like GH52, activated by Japy DX Group as ZW2J. For next year is expected that more VHF/UHF competitive bands could be add. For updated information visit:
http://www.araucariadx.com/avhfc2008/

Here one very good video describing the PY4OG contest station during AVHFC located at Serra de Carrancas, GG78:
http://tinyurl.com/4eb739

Here a list of the stations and DX groups which were qrv on 3 to 4 May, 2008 in the contest: (Locator, Call, Bands)

FJ92 PV8DX FJ92 5ØMHz 100W SSB e CW
PV8AZ FJ92pu 5ØMHz

GF49 PY3KN GF49kw 5ØMHz, PU3LYB GF49kw 5ØMHz

GG4Ø PY3YM GG4Økh 5Ø + 144 MHz.

GG42 PP5JAK GG42rr, PP5KR GG42rr

GG43 PY5EBU GG43ls 144MHz

GG46 PY5EW GG46ip

GG48 PU2MJU GG48cc

GG49 PT9PA GG49df 5Ø + 144MHz 100W

GG51 PP5BZ GG51, PP5IZ GG51, PP5DA GG51, PP5VK GG51pt, PU5IMF GG51hh, PU5ATX GG51pr

GG52 PP5ZD GG52, PP5BI GG52 144MHz 100W CW, PP5TR GG52kh

GG53 PP5YY GG53lc, PP5XX GG53qw 5Ø e 144 MHz SSB +CW

GG54 PY5HW GG54rc 5Ø + 144MHz , PU5RPI GG54jo 5Ø +144MHz, PY5FO GG54im, PY5DC GG54, PY5ARP GG54os 1860m, PY5IP GG54jr

GG55 PY2JCM GG55nm

GG58 PU2TAC GG58dh 5Ø + 144MHz, PS2T GG58xn 5Ø + 144MHz, PY2WS GG58ve

GG59 PU2MUN GG59ed 144MHz

GG65 PY2REK GG65ot, PU2TIB, PY2GF.

GG66 (Sao Paulo) PY2BF GG66sk 144MHz, PY2WG GG66ku, PU2KLM GG66lj, PY2ZK GG66qm 144MHz, PY2RBB GG66sm 144MHz, PY2SM GG66ph, PY2RDA GG66pl 5Ø + 144 MHz, PY2NQ GG66rh, PY2RDZ GG66pr, PY2RJ GG66rp 5Ø +144MHz 100W, PY2NFE GG66kl 5Ø + 144MHz, PY2WQF GG66kl 5Ø + 144MHz, PY2XAT 5Ø +144 MHz, ZV2T GG66, PY2DA GG66og, PY2BJO GG66, PY2HL GG66sk 5Ø + 144MHz, PY2DU GG66nl.

GG67 PU2MNU GG67ht 144MHz, PU2TUA GG67ji 5Ø + 144MHz, PY2NET GG67kf 144MHz , PU2KEY GG67kb 144MHz, PU2UDX GG67ka 5Ø + 144MHz , PY2RDS GG67mb, PU2VIR GG67uc 5Ø + 144MHz: PU2VIR, PY2VM, PY2WC + PY2EL, PY2PVT GG67md, PY2DUN GG67lb..

GG68 ZV2ALT GG68hx 5Ø e 144MHz: PY2TZT, PY2FCL, PY2HT, ZZ2SZV e PY2EX - PY2VV GG68dq 50MHz, PY2IAX GG68cx.

GG76 PU2WOT GG76aq 144MHz, PY2RAC GG76ou: PY2RAC, PU2PAH, PY2VOA e PY2RST. - PY2EU GG76dv.

GG77 PU2MVA GG77je 5Ø + 144MHz, PU1MIL GG77vl 144MHz

GG78 PY4OG GG78: PY4OG, PY4OY, PY4ZN. - PY4PTO GG78ms.

GG87 (Rio de Janeiro) PY1UR GG87kc 5ØMHz, PY1PDF GG87le 144MHz, ZW1TT GG87jl RIO DX GROUP 5Ø + 144 MHz PY1ZV, PY1LO, PY1NB. PY1RY, PU1TNT + PU1VHF.

GG88 PY4AQA GG88ds 5Ø + 144 MHz

GG89 PU4HUD GG89no

GH4Ø PT9EW GH4Øjh

GH51 PY4DK GH51vi 144MHz

GH52 ZW2J GH52pf: Parque Estadual da Serra de Caldas Novas-GO PY2HN, PU2WDV, PY2ENO, PP2RON, PT2AN + PT2WWV.

GH96 PY6LS GH96wd 5Ø + 144MHz 100w

GI64 PR8ZX GI64gl 5Ø + 144MHz

HIØ6 PT7ZZ HIØ6sg, PT7ZAP HIØ6rg 50 +144MHz, PT7KT HIØ6.

HI13 PS7KP 144 MHz

HI21 PY7DCW HI21 5Ø + 144MHz: PY7DCW, PY7DI, PY7RP + PY7RR. - PY7XC HI21es.

HI36 PYØFF HI36td 5Ø + 144 MHz

(CT1HZE: One can see that the highest number of VHF stations comes from the Sao Paulo area (GG66). Amazing that there is nobody from Brasilia (GH64). It was quite impressive to see all the spots of the PY VHF stations on the DX cluster during the contest weekend. Hope this stimulates the interest in weak signal DX (EME, MS, Tropo, TEP) in South America.)

Microwave Japan

Seiji Fukushima, Ph.D, JH6RTO

EME dxpedition to The Philippines 'Kazu Ogasawara', JA1RJU

Six members, JA1BRK, JA1TGC, 7N4TJR, JF1IST, JF2XGF, and JA1RJU, gathered in The Philippines in February to carry out 2m EME dxpedition. We built our EME station, DX0EME, in Calaca, Batangas State, the Philippines near Manila, where the grid locator is PK03jw. Although we brought a FT-847, an 800W amplifier, and a 2x10el Yagi, a power combiner in the amplifier was found to lack one of the resisters. Then, we measured the output power of all four power units and used the single highest-power (300W) unit and only one.

Due to the seriously bad weather condition of storm, our operation was limited to only 3 days of between the 16th and 18th of February. Nevertheless, we made 2m EME QSOs with 49 stations in 17 countries successfully. In addition, we worked HB9Q on 70cm EME using a FT-847 (50W) and a 21el Yagi without any amplifiers. We thank PARA, DU1FBY, DU1EV, DX1HB, JH0MHE, and JK7TKE for their assistance.

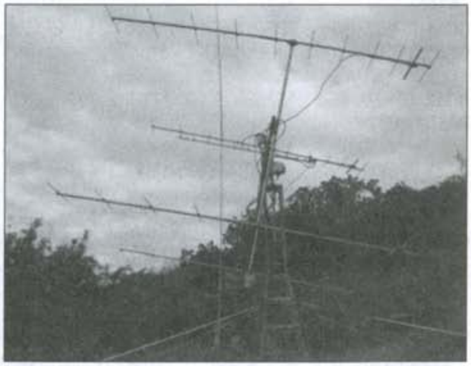
DX0EME shack

Kazu operating DX0EME

QSL card. Look at our jackets. We look like the polar dxpeditioners!

JD1BMP: EME dxpedition to Ogasawara Islands reported by Editor

Editor has not received any reports and, then, just introduces its web site on Ogasawara dxpedition by Isao, JM1WBB: http://gongon.com/JM1WBB/ogasawara2008/ogasawara2008.html. He built an authorised 2m, 500W station with a 4x11el Yagi on Ogasawara Islands to establish 119 EME QSOs. For more information, visit his web site.



JD1BMP 2m EME antenna 4 x 11 ele

Microwave Europe

Editor: Simon Lewis, DL4PLM
GM4PLM@hotmail.com

Welcome to another Microwave Column

Well it looks like the summer weather is with us and as I write this Germany is enjoying some warm sunshine and a stable high pressure system. Lets hope this summer stays a little more settled and opens up some good propagation. Rally season is also here and don't forget the excellent Ham Radio event held in June as always in the pretty town of Friedrichshafen. So on with the news.... Simon DL4PLM

New UK 24 GHz Record

Exciting news from the 24 GHz band with a new Uk record set on 17 Feb 2008 between the stations of G4EAT and PA0BAT. John G4EAT reports "the weekend weather was forecast to be cold with temperatures of -5C overnight, so I was expecting to see a big reduction in water vapour losses at 24GHz. These losses are usually very high in the summer and an extra 0.25dB/km loss is typical so the winter months are normally best for 24G DX. Also seen in the weather forecast was an unusually high anti-cyclone 1045mb over the UK which was expected to decline and therefore also likely to provide some tropo enhancement.

It is always good to test 3cms first to see if there is any tropo enhancement on the higher microwave bands.

I raised Gerard PA0BAT (JO31fx) via the ON4KST microwave chat site. At first Gerard could not hear me on 3cms but after raising his tower another 12m he was 59+10. We QSY'd up to 24G and he copied my reports on CW almost straight away. After a small adjustment to his 80cms dish he then gave me 57 on SSB. QRB was 408km, a new UK record for the 24,048MHz band. The previous OK record was for a QSO between Charlie Suckling G3WDG and PA0EZ at 391km in 1997.

Arie, PA0EZ (JO22of) then requested a test but had no 3cms operational. We tried directly on 24G and had a solid CW QSO over a 319km path.

24GHz stations:

G4EAT - 2.5W, NF circa 2dB, 60cms offset antenna

PA0BAT - 2.5W, 80cms antenna

Congratulations to both John and Gerard for a fine QSO and excellent achievement on 24 GHz.

Dave Cox G0RRJ SK

It is with very great sadness that we have to report that Dave Cox G0RRJ passed away 17 March 2008. A well known microwaver, Dave had been very bravely fighting serious illness for over a year and maintained his enthusiasm for radio right up to the last couple of weeks of his life. He was a very well known callsign both on and off air, he as also well known on the KST cluster pages and at the UK microwave meetings and his popularity was reflected in the great number of tributes and messages of condolence in the days after the sad news was announced. He leaves his XYL and two sons, and our thoughts are with them on hearing this news.

France on 3,4 GHz soon?

French REF annual report mentions 3.4 GHz allocation. The French National Society REF recently released their annual report which gives optimistic signs for Digital, HF, 70 MHz and 3.4 GHz Amateur operations in that country.

In particular there are tentative signs of moves towards a small allocation at3.4 GHz which would be particularly beneficial. The report says:

Dossier 3,4 GHz: L'administration est d'accord pour lancer une nouvelle étude qui porte sur une largeur réduite à 200 ou 300 KHz en début de bande et nous demande un dossier complémentaire à nos demandes précédentes.

The full report can be read at
http://ag.ref-union.org/2008/rapport_moral_2008.pdf
RÉSEAU DES ÉMETTEURS FRANÇAIS (REF)
http://www.ref-union.org/

G3PHO with GB3KEU

GB3KEU Beacon

Peter Day G3PHO reports: "The 5.7GHz beacon GB3KEU is now finally on air! On the 6th of April 2008, at 1115 UTC, I "pulled the big switch" to end some 4 years of waiting and frustration! This is my first attempt at a beacon but it may not be my last." The 5.7GHz Sheffield beacon GB3KEU was finally switched, on after a long period of uncertainty of where it was to be located. The idea of a beacon in memory of the late Tim Leighfield, G3KEU,came soon after his death in May 2002 but, for various

reasons, it's taken me almost 6 years to turn an idea into something that can now be heard!
The technical details are:
Callsign: GB3KEU
Location: IO93GH38, Meadowhead Sheffield, UK
Height above sea level: 190m
Frequency: 5760.925MHz
Keying mode and message: FSK ~ 400Hz shift. GB3KEU IO93EH38 (twice) and 25 seconds of key down carrier.
Antenna: Slotted Waveguide 10dB gain and omni directional
Power out (ERP): 25 watts

Ireland on 10GHz

EI4GHB, Tony from IO52QQ reports that he and 2 other EI`s will be qrv on 10 GHz soon.

OZ1UHF OTA

The OZ1UHF-beacons in JO57FJ has been shutdown and will be removed from the antenna mast which has to be replaced. Negotiations with the mast owner about the cost for hosting them on the new mast are still ongoing. Hopefully the beacons will go on the air again this autumn.
Vy 73 de OZ1FF - Kjeld

Events

59th HAM RADIO Friedrichshafen

Venue: Exhibition center in Friedrichshafen
Date: 27th - 29th June 2008
http://www.hamradio-friedrichshafen.de/

53th VHF Convention Bensheim (former Weinheim)

Venue: Karl Kübel Schule in Bensheim
Date: Sat, 2008-09-13
http://www.ukw-tagung.com/

Free Literature

Graham F5VHX / G8MBI writes ...
I am indebted to Dick K6HIJ for posting this link on the U.S. Microwave Reflector.....
http://descanso.jpl.nasa.gov/Monograph/mono.cfm
The last item (book) on this page covers LNAs and all associated subjects. No matter what you really know about Noise and LNAs, or think you know, this document will be invaluable to you, it should be mandatory reading for anyone into EME. It contains every formula and every measurement/analysis you are ever going to need, all in one PDF. Some of it is heavy going, some of it could not be easily/practically applied in 'amateur' systems but ALL of it is compulsive reading. Even if you just go 'oooh' and 'ahhhh' at some of the pictures and concepts.

Hyper Online

The French microwave newsletter, "HYPER", from editions 1 to 132 (i.e. to December 2007), is now freely available online. You'll find also some special editions (G8ACE amps, F1OPA 6cm transverter, 1W qualcom surplus adaptation, EME, etc).
Our thanks go to F6ABX, F4CWN, F1CHF and F6HYE for the hard work.
You can find the Hyper archive at:
http://dpmc.unige.ch/hyper/

Microwave RF articles

Gian I7SWX has spotted articles on a 144 MHz oscillator and PIN Attenuators on the Microwave & RF website. The April 2008 issue of Microwave & RF April 2008 has two interesting articles both of which are available on the web.
(1) Large-Signal Approach Yields Low-Noise VHF/UHF Oscillators
In contrast to traditional small-signal approaches, the use of large-signal, time-domain design techniques helps deliver low-noise grounded-base oscillators for VHF/UHF applications.
Part 1 of this three-part article series explores the use of large-signal design techniques for a grounded-base 144-MHz oscillator.
http://www.mwrf.com/Articles/ArticleID/18646/18646.html
(2) Cut Loss In Low-Voltage, Wideband PIN Attenuators
Some simple techniques, such as the addition of a ferrite bead, can be used to reduce the minimum attenuation of a PIN diode attenuation for broadband, high-frequency applications.
http://www.mwrf.com/Articles/ArticleID/18648/18648.html
Microwaves & RF http://www.mwrf.com/
(Southgate ARC News)

Microwave USA

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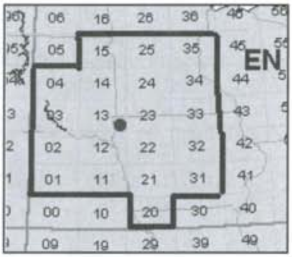
Conferences

I would like to invite everyone to the **Central States VHF Society conference** this July 24-27 in Witichia, Kansas. We will have an excellent group of technical speakers along with Noise Figure, Network Analysis, and Antenna Range Workshops. I hear that Sam Jewell, G4DDK will be the banquet speaker.
For current information visit **www.csvhfs.org**

The **Microwave Update 2008 conference** will be held on Friday, October 17 through Saturday, October 18 in Bloomington, Minnesota. This conference always has an excellent collection of technical papers and speakers. Along with good fellowship. Again current information can be found at **www.microwaveupdate.org**

KM0T with 20 grids on 24 GHz

Congratulations go to Mike, KM0T for working his 20th grid square on 24 GHz on May 5th 2008 with a QSO with N0DQS in EN20HX. More interesting is that Mike worked all these grids from his home QTH in Iowa in EN13VC. For those of you in Europe, the mountains of Iowa are like the mountains of Holland. The land is very flat for hundreds and hundreds of km. His longest QSO's took advantage of the spring storms by using Rain Scatter. Just a few years ago grid totals like this were hard to collect on 23 cm, much less 1.2 cm. Look for Mike's total to continue to increase his count during the summer thunderstorms.



KM0T: 20 grids on 24 GHz in 5 years - next target will be EN05

KM0T with his 1.2 cm home station

KM0T's home stations

The portable rigs from N0DQS in EN20

KM0T on 50 MHz to 24 GHz from Iowa

A lot of additional information and pictures about Mikes DX activity on 24 GHz is on his website: www.km0t.com

2-m-EME News

Heinz Borde, DM2BHG
e-mail: Heinz.Borde@t-online.de

DUBUS CW Contest 12/13 April

CT1HZE (Joe) wkd in the contest: SV1BTR, RU1AA who had a mega signal over many hours, F3VS, DK3EE, OZ1HNE, LZ2US, F1FLA, I3EVK, SP7DCS, F0CXO # initial, OZ4MM # initial, K9MRI. Hrd were IT9CJC, SV3AAF, RX1AS, YO2AMU and OK1KKD.

OZ1HNE (Jorgen) The DUBUS CW EME 144 MHz section is well over, and once again thanks to DUBUS for arranging this excelent contest with easy and good rules. I was QRV around 10 hours during the weekend and it was all great fun to work "old" and new friends. I worked 27 QSO's random QSO's and I was calling CQ most of the time, but missed "normal" stations like LZ2US, next time Marko (-; Highlight of the contest was working DL5MAE and DK3WG after very long time since our last QSO. Thanks to Wolfgang and Jurgen for the FB QSO's and see you both very soon again. Condition was not very good on Saturday with changing and strange polarity ??? I was only on for a short time Sunday, but all seem much more stabil. Here is a list of stations I worked during the contest: IK2DDR, OK1MS, F3VS, YO9FRJ, CT1HZE # F0CXO, SP7DCS, SV1BTR, I2RV, I3EVK, YO2AMU, DL5MAE, DK3WG, K5QE #,F1FLA, SM2CEW, RU1AA, RA6DA #, OK1VVP, PA3CWN, OZ4MM, HA2RG, PA3CEE, JH0WJF, RA3EC #, K9MRI, RX1AS

9A9B (Branimir) - Pretty good condition and practically all the time heard my own echo. Station worked: SV1BTR, RU1AA, LZ2US, IK2DDR, YO2AMU, K5GW, S57DCS

SP7DCS (Chris) Thanks all for qsos in 2m CW Dubus Contest. On Saturday conditions were extremly bad (Faraday) as well WX were bad. Some real well equiped stations could not hear me and I had many hours without echo with my H pol yagis.On Sunday it was much better and I had echo on my normal level (20dB on Winrad waterfall) but very low participation did not allow to make many qsos. Due to problems qith PA my power was lower during the contest what did not help at all. I was not qrv full time and made 35qsos. Many thanks for Victoria SV2KBS for FB contact.
12.04.2008: RU1AA JM1GSH F1FLA OK1KKD IK2DDR DK3EE SV1BTR IT9CJC PA3CWN OK1MS OZ1HNE LZ2US SM2CEW YO9FRJ OZ4MM F3VS DL5MAE RA6DA OK1VVP
13.04.2008: RA3EC YO2AMU HA2RG# I3EVK JH0WJF F0CXO CT1HZE YU1IO YU7XL SV2KBS#307 RX1AS K9MRI K5GW 9A9B K9DX K1JT

SV1BTR (Jimmy): Hello "RF is King" Lunar Fans!
The excellent European EME Contest (DUBUS & REF) 2m cw section is over, last weekend. I had a very enjoyable time & tons of fun, meeting old and new friends via the moon on random.
Worked 65 QSOs, 60 stations on 2m random. My log is at the office, so don't have the callsigns handy (sri but i never memorize callsigns by heart!). No loggers/clusters were used.
Highlight was random QSO with SV2KBS Victoria who is a good operator and with a solid commitment for cw eme. I would like to thank also Alex RU1AA who, as a big gun, was present throughout the Contest with a big signal (+6db vs the past). It was nice to exchange qso numbers with him, 3.5 hrs before the contest during our moon talk. Conditions were really bad on Saturday. All signals were about 4-5db down in both polarities, with long & deep qsb. My echoes were weak. Sunday things were better, and propagation Sunday night was giving big echoes.
I look forward to the 23cm section of this Great RADIO Contest, 10/11 May.
73 Jimmy SV1BTR, 2m: 16*1.1wl xpol 21.5dbd

SV2KBS (Victoria): Wkd in the contest: RU1AA; SV1BTR, LZ2US and SP7DCS.

DUBUS CW activity event May3/4

OZ1HNE (Jorgen) I was QRV on 144 MHz most of the time in May DUBUS CW activity event. I found good condition in the first window and good activity. In the second window condition was changing a lot, and from time to time no own echoes in H or V polarity ??? Activity was lower in the second window and I got 3 more stations in the log. JM1G?? was calling me for long time, but I never got the complete callsign. JM1 was always good copy but EVERY time the last letters was lost i QSB !!!! Thanks very much for your patience. I was very glad to hear PA0JMV again calling me this morning, and we had a FB QSO. I was again very glad to hear the high activity on the band, and many thanks to all for the QSO and great fun.
I worked the folowing stations on CW random:
1. Pass: OK1MS JH0WJF IK2DDR PA3CWN SV2KBS YO2AMU SV3AAF PA0JMV F0CXO
2. Pass: LA8YB K9MRI CT1HZE
I look forward to next CW activity, and if any stations would like to try a sked, please send me a mail. Best 73, OZ1HNE Jorgen.
8 x 8 elm. crossyagi's and 8877.

PA3CWN (Oene): I was qrv in both legs for almost the full time and found condx to be good at 1st leg but much qsb on the strong signals. The second leg was not that good at my side. Less activity and much qrm from the neighbourhood gave only 1 qso more. I have been calling CQ several times for periods of almost an hour and Peter returned at my CQ (again :-)), so calling CQ helped this day ! The signal from Jorgen was the most constant in both legs and guess Jorgen switched pol on a regular base. I had lots of troubles with the signal of Alex which was very close to a birdie, but was able to copy all the info and very glad to work Alex from KO40. I worked these fine 6 stations with UFB operating practice on May 3:
LA8YB, OZ1HNE, OK1MS, SM2CEW, RU1AA, IK2DDR. Total points: 60X6=360 points
Heard was Doru YO2AMU . I called, but the signal was gone and not heard it thereafter. I also saw traces of IT9CJC when IK2DDR and SM2CEW were both calling Marcello. I hope to meet you all and more in next event and GL to all! Vy 73 Oene

IK2DDR (Francesco): here my final result of may 3 2008 of Dubus 2 m cw eme activity event. I was active on both windows and despite the less participation, respect this morning, i found very good conditions,in the afternoon, with strong own echoes on most of the time.

04.10	LA8YB	RO/O	10	LA8
04.28	OZ1HNE	RO/O	10	OZ1
04.48	OK1MS	O/RO	10	OK1
05.26	YO2AMU	RO/O	10	YO2
05.49	SM2CEW	O/RO	10	SM2
06.02	IT9CJC	O/RO	10	IT9
11.32	CT1HZE	O/RO	10	CT1
12.00	PA3CWN	O/RO	10	PA3
12.20	K9MRI	O/RO	10	K9

HEARD NO WORKED: 7K3LGC (i called him many times), FINAL SCORE: 90X9=810 POINTS
Let me send a particular "THANKS" to K9MRI, that after our 1st 2m eme contact on early '90, is always present, during our DUBUS ACTIVITY EVENTS, with a very strong signal. Thank you. See you all again on 2m cw eme. Francesco,IK2DDR

AROUND 2-m-EME

PE1BTX (Gerard) On sunday had difficult copy of DX0EME but when my moon came higher signals improved. Unfortunatly my actuator for elevation stopped (brooke down) at 15 degrees and I rapidly lost moon and the signal of DX0EME
Monday evening 4 hours of repair to get ready for the upcoming JD1 expedition. At 2130Z all was working again, pointing at the moon and great echos. 2008-02-18 wrkd PA3CWN new CW initial #9 EME initial # 231. Oene is my shortest EME QSO, distance between us only 42 km but with the DSP seperation of the EME and Tropo signals was no problem. We keyed letter by letter, waiting for each echo, conditions were FB, signals up to 529 from both of us. 2008-02-20 wrkd JD1BMP new DXCC #98 EME initial # 232. 2008-02-20 wrkd F1FLA new CW initial #10 (no new EME, already wrkd b4 in JT65). Jean was very strong up to 539, fb EU-EU conditions.

DK3WG reports the results of the R/U-stn and his own from **March 2008:**
RX1AS - JT65B worked H44HP
RV3IG - JT65B new DK5LA, OH6UW, K5QE and HL4GHT.
UA4AQL - JT65B wkd YU1JB, DL9GS, UA4LCF, DG1VL, W7IUV,I1ANP, K5QE, W6OUU, WA4NJP, W1IPL and GI4SNA.
UA4NX - JT65B added HA0HO.
RA6DA - JT65B with H44HP
-RV9UV - JT65B new EB5EEO, IT9CJC, G4ZFJ, DL9GS, LU7DZ, VE5UF, K5QE,W1IPL, EI4DQ and DL8YHR.
UA9FAD - JT65B added K5QE and YU1JB.
DK3WG - JT65B wkd ZS2GK (field#80), YU1JB, H44HP (DXCC#139, field#81), HL4GHT (DXCC#140).

and from **April 2008:**
RU1AA - CW with SV2KBS
- JT65B from KP40 with DL9GS and KI4TZ.
- JT65B from KO48 with T61AA (new DXCC), HL4GHT (DXCC), ZL3NW, R9J, VE6CPP (his first), YU2DX, ET4AA (DXCC) and BX1AD (DXCC #128).
RX1AS - JT65B new I6BQE, OH4EA and ??
RV3IG - JT65B with PF7M , VK2KRR F6BEG, IT9CJC, EB5GP, UA4NX, WA2ODO, KN4SM, DL0VV ZS2GK and YT3I.
RW3WR - JT65B: K6MYC, SV8CS, ZL1WN, HA0HO, PA3FPQ, PE3RDP, EA6VQ, N1BUG, I6BQI and DF7RG.
UA3MBJ - JT65B wkd VK2KRR
UA4AQL - JT65B added ZS2GK
UA4NX - JT65B wkd RV3IG, DK1CO, G4CBW and OK2UZL #177.
RA6DA - CW with OZ1HNE, DL5MAE, YO9FRJ, LZ2US, SV1BTR, SP7DCS, IK1DDR, RU1AA, RA3EC and OK1VVT.
- JT65B: ET3AA, N6VMO, ZS2GT, F6BEG, T61AA, VE7DXG, DG1VL, PF7M, YL2OK, RA3GES, RX1AS and SP2OFW.
RV9UV - JT65B: ZL1WN, WJ6T, I3MEK, I6BQI, OE6IWG and EI4DQ. - CW with SV1BTR.
UA9FAD - JT65B: N0YK, R9J, EB5GP and HL4GHT.
RA9YDL - JT65B with ZL1WN, RX9CHW, ON7EX, RX1AS, RV9UV, G4ZFJ, F6GRB, JR3REX, N0YK, PE1RDP, GW3XYW, DH7FB/p, SP3VSC, PA4PS, RA3GES, AA7A, RA0FCA, CN8LI, R9J, SV8CS, PA3ECU, OH4LA, DK1MAX, PF7M, OM3BC,

OH2LHE, DK5WL, RA4HCN and UA9HK.

DK3WG - JT65B wkd AA4SC, HA5CRX, VK2KRR, R9J, N2GHR, ZL3CU, ET3AA (DXCC # 141) #1154.

DK3WG is waiting for the R9J-QSL cards before he start the service.

EXPEDITIONS

DX0EME (PK03JW)

Kazu JA1RJU was active from Batangas (PK03JW) in the main land Philippines in mid February and he has worked a fair number of stations with his some 300 watts out to two 10 elements yagis though there was some local FM interfering.

Ogasawara on 2m EME(QL17cc)

From 19 to 25 February 2008 JD1BLY and JD1BMP were successfully QRV on 2m EME from Ogasawara (JD1) in QL17CC, using some 500 watts out to a 4 x 11 elements yagi array: As EME activity from JD1 Ogasawara is reported only once when the 7J1YAM team in 1998, running about 200 watts to two 12 elements yagis, managed a few QSOs on 2m CW. Last spring Makoto JI5RPT and Isao JM1WBB decided to go for a Ogasawara 2008 project which includes high power 2m EME operation. After intense negotiations with the Japanese PTT a high power licence was granted with 500 watts out on 2m. There were even two inspectors to dispatched to Ogasawara to check the equipment and output power. On 13 February 2008 Makoto arrived Ogasawara and installed all antennas: for 160m, 80/40m and 4 x 11 elements yagis for 2m, JD1BMP started calling CQ on 144,075 MHz JT65B 1st sequence from 0900Z on 20 February. With a -20dB signal VK2KU was the first one completed at 0940Z. And after two ZL QSOs the great pileup started. It sounded almost like some kind of modern music: In the hf-quiet area with a very low noisefloor even -24dB signals could be heard in the head phones. After 50 EME QSOs that day Isao went to bed with great satisfaction. Within those six days of operations from Ogasawara **119** 2m EME QSOs were completed, a very good result.

H44HP Solomon Islands

Bernhard DL2GAN and Hermann DL2NUD safely arrived on the Salomon Islands on 7 March 2008. Sadly the equipment did not. With lots of improvisation they managed to become QRV with some spare RIG, only without RX preamp and the proper antenna cable: On 15 March H44HP completed a number of QSOs with the 18 elements M2 and good power.

Also the next day H44HP was QRV and successfully worked EME. Had Hermann only had his preamp and the faster laptop, also decoding at his site would have been easier. So there were long periods of CQ only. Then, on 17 March, with the antenna at a very high elevation, the "spare" coax melted. As result also part of the PA was suffered damage. Three of the four power moduls were blown up and so H44HP had only 350 watts out left over. At least they made 35 hams happy.

NEWs AND INFORMATION

EA6VQ (Gabriel) - Yesterday I was QRV on 144 MHz EME for about 10 hours and experimenting the whole time with a configuration that allows me to run simultaneously two instances of WSJT and Linrad in a single computer (I don't want to have more PC making QRM in the shack...hi)

One of the instances of WSJT was getting its audio input from the mic line of the PC and it was also used for transmitting, with my conventional station (TS-790).

The other instance was getting the audio though VAC (Virtual audio cable SW) from Linrad and the SDR-IQ, and it was only used for looking for other stations in the aprox. 160 kHz band I was monitoring. To my surprise everything was running perfectly. The CPU load of the PC (a laptop with a Core2Duo, 2.4 GHz, processor) is normally below 30%, except when both WSJT's are running the decode simultaneously, but even then the decodes were pretty fast. I'm also very satisfied with the RX performance of the SDR-IQ + Linrad, that is aproximately the same than with my traditional setup (sometimes even better).

It was great to be CQing on a frequency, but being able to monitor the whole EME band during the RX periods. You never get bored when nobody answer your CQ...hi It's not like MAP65, but so far it's a noticeable improvement.

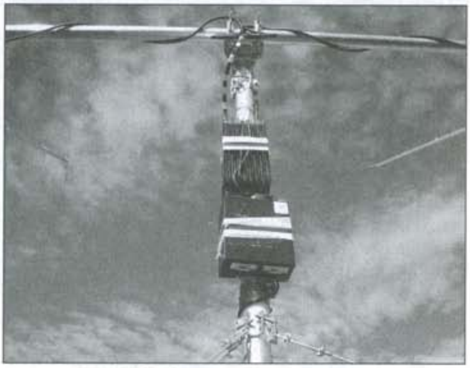
For those wondering how can I have so many windows open in a 14" laptop, the answer is that I have a secondary 22" monitor connected and that I use both at the same time. If you want to have a better idea you can have a look to the RF+AF diagram of my station at

http://www.vhfdx.net/safont_sch.html

Many thanks to Leif for his support, correcting the mistakes of my initial tests, and also to VK2KU's for his helpful pages.

JAMESBURG (AA6EG, Pat) Don't sign off Jamesburg yet, in the long term, for further EME. There are able candidates for buying it in, or soon to be in discussions with the owner to buy, or lease-to buy options. The Xprize competition has given new use/importance/vitality to dishes like Jamesburg for use in high bandwidth Earth-Moon Communications. If any of you know of a dormant large (>18 meters dia) dish, in reasonable (not necessarily perfect) shape, that might be available for re use, any where in the world, please contact me. Some of the candidates, are of a nature/state of mind, to be able to allow varied uses of the dish in the future when it is not in use for "paying" projects. That is really encouraging news. One Xprize competitor is also looking for a location to build a very large Paul Allen Array-like Array. of 450 18 ft dishes, spaced on 50 ft centers (roughly) I make that out to be at least 25 acres needed. They wanted to use Jamesburg's 160 acre land, but I know the local neighbors who are generally countrified gentlemen/Winemakers/CEOs would put up serious resistance to blanketing Jamesburg's beautiful hillsides in more dishes. So, if anyone knows of some radio quiet, clear land that is suitable for such an array, with Fiber optic Connectivity, I am looking. Ideally California, (maybe Mojave Desert or similar, possibly Nevada) Now, a technical question: Jamesburg's two axes are driven by large 20 hp AC motors. (approx 18" dia, by 24" in) The motors are speed controlled with variable frequency AC drives. In the EME application, I have observed the AC Motor Shafts directly, they move at very slow RPM, with RPMs further reduced extremely so, by large reduction gearboxes, eventually driving the ring and pinion gears on each axis. The dish motion, even the 100 footer, as all EME'ers know, is barely even perceptible for EME. My question is, if you include the 20 hp motors that run lightl, in ~10 percent opposition torque to eliminate gear backlash, there are 4 large motors driving the dish, at extremely slow speed. On an EME weekend, this is going for hours at a time. We have not directly measured the drive power consumption, yet, but does anyone know in a general way, if the motor electrical power consumed by the Variable frequency drive motors, is still substantial, even though lightly loaded? At EME velocities my opinion is that the actual power/torque used to derive the dish is very low...but I may be wrong. A reminder to Northern California folks: Check out Radiofest 2000, a two day event in Monterey, Feb 23,24. Great speakers, events, BBQ; Astronauts, Hams, UC Berkeley Nanotube Radio inventors/ experts, all to be there. This year, it is a small tight venue, so will be crowded. see: http://www.radiofest.org for details.

VE2ZAZ (Bert), Version 5 of the WorkedGrids software is now available for download on my website. It contains several enhancements, such as printing, copying to clipboard and centering on a specific grid square. WorkedGrids is a ham log grid square mapping software. It is a freeware and it runs under Windows. The program displays a map showing the amateur radio grid squares contacted and logged in using a third-party logging program. WorkedGrids uses colors to display information on a per-band basis. Up to four bands can be displayed concurrently on the map. For its input, the program reads the plain-text (ASCII) log files generated by most logging programs as well as ADIF-format files. This project was initiated because I could not find a logging program that provided the level of detail and mapping quality that I wanted. The software is directed towards the VHF and above operators who collect grid squares for contesting or award purpose. It is designed to supplement a logging program and it replaces the pen and paper technique. Please visit http://ve2zaz.net for more details.



ET3AA: PA and PSU in the tower!

ET3AA / ZL1RS, (Bob) After many months and fruitless visits to "telecom" and "security" to obtain an amateur radio licence in Ethiopia, it was with great pleasure that I received the kind permission of the Ethiopian Amateur Radio Society (EARS!) to use their club station callsign ET3AA to operate on EME. In just a few days following this news I built up a small EME station in my residence garden and finally started operation this weekend. Despite the small system (2 x 11 element YU7EF11B yagis and a Mirage B3016 150W PA), it appears to be working fairly well ... in fact, well beyond my expectations! So far, 57 contacts in 16 hours of operating on Saturday and Sunday! There are some photos and information at:
www.df2zc.de/et3aa
QSL info. You can make your QSL request directly to EARS at the following address: ETHIOPIAN AMATEUR RADIO SOCIETY, P.O.BOX: 60258, ADDIS ABABA, ETHIOPIA.
The club has ZERO funds for return postage, so an SAE and GS (or something to cover postage, but I think IRC's are useless here ...) will be essential if you want a reply. If this is beyond your means, or philosophy, or for some reason it doesn't work out, please feel free to QSL direct via ZL1RS (address in QRZ.com) and I will make sure you do get a return card in July or August when I return to ZL and have the time.

ET3AA 2m EME from Ethiopia

W5UN (Dave). A milestone was reached here today when W5UN completed a QSO with Bob Sutton, ZL1RS, who operated from club station ET3AA on 2 meter EME for DXCC country number 200. Bob has given me many new countries during his journey throughout the world over the years. Thanks Bob, and also to the many others, who have helped me reach this milestone.

KB8RQ (Gary) I what to thank Bob, ET3AA that was operating from the club station. For letting me be the first to work him Saturday from a new country and also being by DXCC 200 country on two meters. I also want to thank all others that helped me to this goal.

T61AA VK1UN (Ross) is qrv on EME from Afghanistan on 2m and 6m EME. Ross is now QRV from a new QTH in the Helmand Province MM21OE. He is currently running a 9ele Tonna and GS35 at 1kw level. He has no elevation, so he is running moonrise and moonset only. His moonset has proven to be best. As he is there to do a job he is only QRV when time and job allows him. He prefers to use 144.125 always first. Read more about his plans
http://www.mmmonvhf.de/latest.php?id=1220

W2DRZ (Tom) Just a update on the new CONTROLLER progress.
Russ (K2TXB) is just finishing the new 2.0 code for the W2DRZ controller. This NEW code has a auto correcting use for QUADRATURE with INDEX channel INCREMENTAL encoder, fixes error position problem.The code is finished and many other improvements so will be delivering the new code in our controller along with a new PICC to plug into the prior existing controllers.There is no change except the new plug in PICC and a additional new mini decoder board for the INDEX channel. K1RQG (Joe) has been doing the BETA testing of the new program and has been a great help using the new PICC with the changes and improvements he has provided we are now ready to ship the new units. This will run the following items:
MOONSKED GM4JJJ
F1EHN tracking F1EHN
TRACK_SM W4SM also does POLAR MOUNT tracking
VK3UM/VK5DJ VK3UM also does POLAR MOUNT tracking
NOVA W9IP
There are other interface tracking programs also used in the new code. Atod decoding using POTs for encoders ABSOLUTE US DIGITAL encoders QUADRATURE INCREMENTAL encoders, with or with out INDEX/Z channel PARALLEL 16 bit encoders. Can save the operating conditions to a computer file for upload using many different settings is new.

XIV Italian EME Contest CW/SSB 8-9 September 2007 – Results 2m

Call.	n.QSO	Ita.	Points	Antenna
Cat. A)				
1) YO3FFF	8	2	122	1 x 5WL
2) VA3TO	1	1	31	2 x K1FO-12 5WL
3) ES5PC	1	1	31	1 x 5 WL
Cat B)				
1) SV3AAF	21	5	315	4 x 2.04WL
2) PA3CWN	18	2	222	4 x 9 el. DK7ZB
3) EA3DXU	5	2	92	2 x 5wl (SK)
Cat.C)				
1) LZ2US	39	7	537	4 x 17 LBX
2) YO2AMU	30	6	426	4 x 15 BVO
3) G4DHF	28	5	385	8 x 2.2WL
4) SM7GVF	19	3	253	4 x 14 el. DK7ZB
5) OK1KKD	15	3	213	4 x 2M5WL
6) 9A9B	6	2	102	4 x F9FT
7) RA3EC	2	1	41	4 x 13 el..
8) JM1GSH	1	1	31	4 x 2 .49WL Verti
Cat.D/E)				
1) G3ZIG	38	5	485	8 x 3. 99 WL .
2) OK1MS	34	6	466	8 x 15LY 3. 65WL
3) SP7DCS	25	3	313	16 x 8el..
4) YU1CF	20	4	284	16 x
5) JH0WJF	13	4	214	8 x 17 el 2M5WL
RU1AA	20	4	Check log per request	
Cross Yagi				
1) SV1BTR	55	8	718	16x6el.H+16x6el.V
2) K1JT	30	5	405	4 x Xpol yagi

ONCE THERE WAS A CHAT ABOUT

(Chats of common interest in INTERNET)

-Moon echoes (OH2LHE, Hannu)
Running currently WSJT version 5.9.7. How do I listen to my own echoes with this? I know that

some previous versions have this feature.
W7GJ (Lance): You will of course briefly hear and see your echoes as usual when you stop a XMIT sequence and switch back to receive. However, if you wish to use the FB EME ECHO MODE to test for your own echoes, you need to use WSJT version 4.9.8:
http://physics.princeton.edu/pulsar/K1JT/WSJT498.EXE
Because this version has the EME ECHO MODE as well as the very handy EME CALCULATOR, I suggest you download this old version and install it in a file named WSJT4 for safekeeping and future reference.

– Triode Grid Current (Wilt W1IPL) Hello all, I have a pair of 3cx800s back in service after a long time. I cannot seem to find the point of minimum grid current and max output. Can anyone suggest a tuning procedure? And the relationship of anode loading to proper tuning?
W7GJ (Lance): I have never operated the 3CX800A7 tubes, but I know with my 8877 amplifiers, I have always tuned up the tube as W6PO instructed me years ago. That was to peak the output while adjusting the input tuning as well as the plate tuning and loading. Then, as you get closer to maximum power ratings, you can tweak the plate loading control slightly to reduce the grid current with very little change in output power. Then re-peak the tuning controls for maximum output at that loading setting. This technique has worked very well for me in finding the optimum safe performance settings for the tube.
WA4EWV (Al): I have been told that I should put an SWR bridge from the output of the transmitter to the input of the 8877. This makes input tuning a little easier.

-Help with a gassy tube (K1SG, Steve)
My amplifier is currently down, and I am QRT off the moon for the moment. The problem appears to be a gassy 3-1000Z, which arcs over periodically. Can you "cure" a gassy tube? Thanks in advance.
W7ALW (Barrie): A truely gassy tube would arc internally continuously. With the very limited description of the symtoms, I'd be more inclinded to think you are being visited by parasitics, or a sporodic "open" in the tune or load circuit. Also, ceramic plate-blocking caps, when subject to heat and high current, can fail. I'm not familiar enough with the 3-1000Z to know how it is gettered. If it has a heat-activated getter, running the filament only for an hour or two may help.
WA4EW V(Al): I was going to suggest the same thing. Run the filaments for 30 or so minutes to see if there is a "little bit left" of the "getter".
This was also a suggestion to me by Rich at AntennaWorks.

TREASURY INTERNET

Replacement Transformers
http://www.magcap.com/

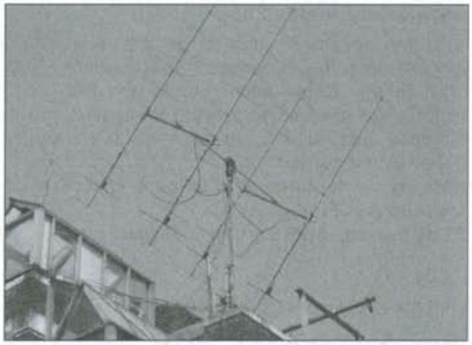
Worked Grids square mapping software
http://ve2zaz.net

Time Sync Program
http://oneguycoding.com/automachron/

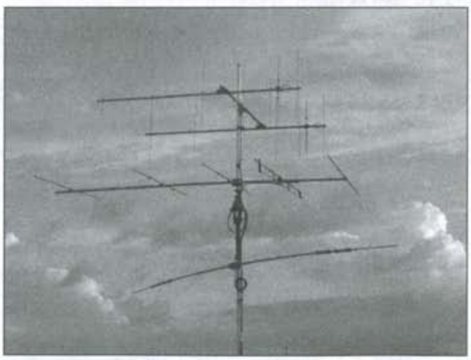
Pictures of ET3AA are on a temporary subsite of www.df2zc.de, please see
www.df2zc.de/et3aa

See the antenna of the DX station you are contacting.... Will be available via Google Earth or via the new version of EME System (available in the coming weeks). Please, send me your photo of EME antenna to build a geo-localized photos database... more: http://www.f1ehn.org/

NEWCOMERS



DS1MFS, PM37, is a newcomer on 2m EME from South Korea with 4 x 13 ele + 100w



PT7ZAP, Daniel, HI06, starts EME on 2m with 2 x 7 ele vertical and 300w but plans to upgrade to 4 x 12 ele.

13th EME Conference
Florence, August 8th to 10th 2008

(ARI-CRT) we have recently been able to finalize the registration form for the 13th EME Conference, in Florence, Italy, Aug. 8/9/10/2008. The website

www.ari-crt.it/eme.2008

has the necessary details on the registration process and the accompanying programs, (just click on the 'Registration" button and the "Visit" button). We are looking forward to meeting you in Florence next August. We'll be glad to answer by e-mail to any question.

Here some lectures and papers that will be presented in Florence.

73 de Enrico, I5WBE, eme2008@ari-crt.it

- Antennas

OM6AA - Prime-Focus Feed for 10 GHz.

N2UO - Computer Optimized Dual Mode Circularly Polarized Feedhorn.

F1EHN - Photo database of EME antennas with their exact location.

N9JIM - Presentation about the Jamesburg Earth Station.

- EME on 24-47 GHz and beyond

G4HUP - Direct Frequency Synthesis for 47GHz Transceivers.

W5LUA - 24 and 47 GHz EME activity by W5LUA and VE4MA.

W5LUA - Mutual Doppler.

- Lab equipment

K6JEY - Measuring sun noise with an HP 400FL AC voltmeter.

- EME Dxpeditions past and future

W5LUA - 1296 WAS Expeditions by W5LUA and WA5WCP.

EA3XU - ED3DXU - EME 144 MHz. Expedition 9,10 February 2008 DUBUS & REF Contest JT65.

CX/DL1YMK 2008 Expedition, by DL1YMK.

- Radio-astronomy research using EME equipment

K6JEY - Update on the OVRO (Owens Valley Radio Observatory) project.

I4AOR - Radioastronomy and Amateur Radio services: common challenges toward top levels in technical knowledge, system sensitivities and social compatibility.

- EME and software radio

WA6KBL - New Developments in Winrad and software defined receivers.

IV3NWV - Some notes on the performance of wideband sampling receivers for E.M.E. operations.

- Digital modes

DJ5HG - The Cat and the Squirrel:Fundamentals of Communication, overview on basic principles of digital communication.

K1JT - Radio Amusements of an Aging Physicist.

IK2DDR - CONTESTS, AWARDS and DXCC separation, between CW and DIGITAL on VHF-UHF-SHF.

DUBUS 2m CW EME Activity Weekends 2008

JUNE 7 0830-1130 & 1700-2000 UTC
JULY 5 0700-1000 & 1530-1830 UTC
AUGUST 22 2130-0030 &
AUGUST 23 0600-0900 UTC
DECEMBER 13 0030-0330 & 1730-2030 UTC

QRG: 144.040 – 144.060 MHz Info: http://www.sm2cew.com/dubus-aw.html

Victoria`s 2m EME Report

by Victoria Panagiotou, SV2KBS – sv2kbs@gmail.com

Considering that there are millions of hams out there, including several hundreds of them being involved with CW EME and me just struggling to become one of them, I am very lucky to be a guest contributor at DUBUS pages !

Right after I got my license 2,5 years ago and while being in our local ham clubstation, I randomly picked an old issue of our national ham magazine "SV news". I still remember so clearly an article written by Jimmy SV1BTR about EME Contesting and Practice; to me, it was by far the most attractive, catchy and interesting article I could find in that magazine since it involved a personally beloved celestial object of mine, the Moon ! Being a keen stargazer and an amateur astronomer since I was 14 years old, using the Moon as a passive reflector for CW signals bouncing sounded absolutely exciting and thrilling !

I just could not help reading that article again and again, and the more I did not understand of it, the more I loved it !

Ever since, I always had EME in the back of my mind, however I did not dare to make any steps; I could never imagine, even in my wildest dreams that I could establish any EME QSO's.

In the meantime, I got involved solely with HF bands, phone most of the times and some CW.

And more and more articles were coming from Jimmy, the end of which was always the same "I am at your disposal for any information you need - please feel free to contact me"

So, after having worked the most of what I could on HF with my vertical antenna during the bottom of the solar cycle, I was looking for shifting the gear higher to meet the ultimate DX challenge !

Thus, I decided to take the big step and I got in touch with Jimmy, and without realizing how, everything happened very quickly !

From the very first moment, he gladly forwarded me the essential resources I had to study - answering thoroughly every single inquiry I had, although I tested his patience to the end with my "plug 'n' play" philosophy that I developed in HF bands ! He designed my station from scratch, and thanks to my dad Nick and my good neighbor-friend-ham SV7JAJ in less than 3 months the EME Antenna system was erected !!

What impressed me from the very first moment, was the warm welcome I received from a group of people that did not even know me before, as well as many confidence-boosting messages that added little wings on my feet !

Now, after having participated -completely at my own pace- in the European EME Contest as well as the DUBUS Activity Event, I am experiencing the absolute Moonfest ! Every time I dig a CW signal out of the noise my stomach is filled with butterflies and if I am lucky enough to complete a QSO I am dancing round to every corner of my room !
So far, I have had the great pleasure to establish 10 QSOs and I have enjoyed every single one - it's beyond my expectations !

Before finishing, I would like to emphasize on this: I deeply regret the fact that I decided to get started with EME just recently and I did not dare to do it before, just because of a misconception of mine: that EME is an unreachable form of communication and that requires extremely expensive equipment and a large property.

I regret that I did not get involved with EME before. Now, I can feel that it's a feasible achievement as well as viable to the average ham, not because it's easy, but because of the great support of the extremely helpful and alive CW EME community, who are generous people, always there ready to share their knowledge and experience and give you the best they can.

Ham Radio stands for me as a sort of travelling worldwide without passport. For me, it's not just a hobby, but an extensive collection of self-standing hobbies making it a unique source of inspiration, knowledge, acquantances and EME is taking it one step further, by giving you the chance to acquire a spectacular vision of the world from another, challenging prespective. How could I describe the EME experience in a few words ? Like this: Fly to the moon and straight onto heaven !!

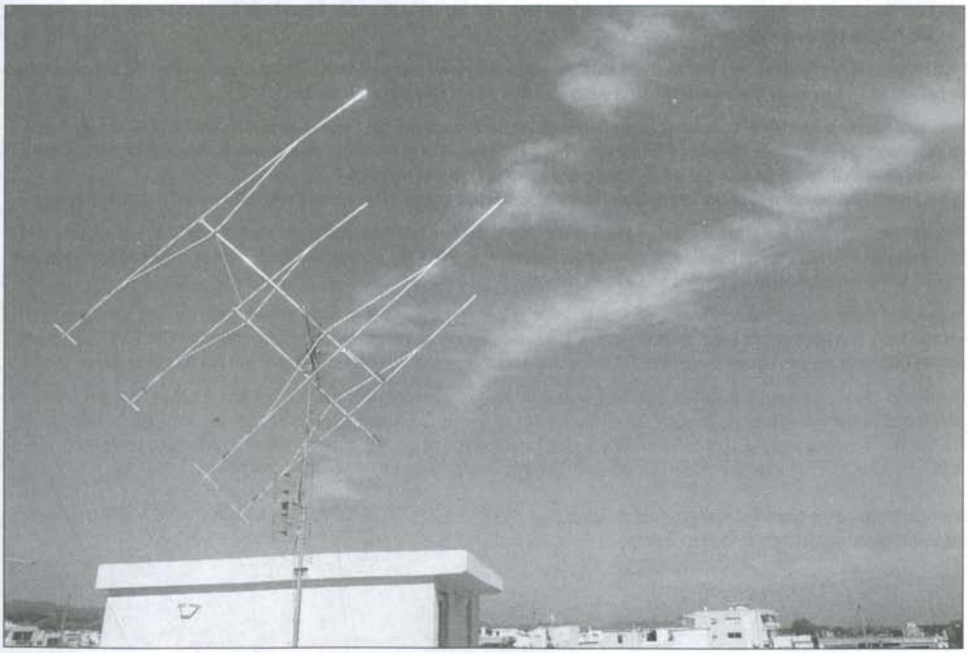
Heartfelt thanks to the guys that made my dream come true: SV1BTR, LZ2US, ON4DPX, SV7JAJ, SV9CVY, CT1HZE, my dad as well as my grandmother for the sponsorship !

Happy Moon echoes and experimenting

de Victoria SV2KBS

4x17el 3,3wl - GU74B by LZ2US - MGF 1302 CW skeds welcome!

SV2KBS, EME shack in KN20WU



SV2KBS, 2m EME antennas

70cm + up EME News

DL1YMK 2008 Moonbounce DXpedition to Uruguay (GF15), Report

First full day of the CXpedition is over, time has come to do a summary. On 30th of .April we managed to put the meshes into the dish, because the high winds from the Pampa in Argentina had calmed down. Because we needed daylight we began just after sunrise. When we were ready - 3 hours later, hi – the moon window to Europe was already closed, so we couldn´t test, but we heard our own echoes. We spent some time to optimise the position of the feed in the dish and announced in the EU-moonreflector that we are qrv and need desperately some US boys to test. We were really happy to hear W5LUA as first contact from DL1YMK/CX. Than strong signals from K5JL/W5ORH and K5SO showed us, that the station works fine. Thanks a lot to K1RQG who activated the first stations via short wave!

CX/DL1YMK location in Uruguay at CX5BW`s HF antenna farm

Later, after a hard struggle because of an eucalytus tree (and CX5BW's huge HF towers, hi) we worked VK3UM. We had to learn that the window to the East is poor because of this special tree,hi. They should have imported German beer to CX rather than VK-eucalyptus!!!! Therefore we haven't heard anything from the JA-boys, but hopefully the moon position improves next days. The rest of the day we spent with trials to improve our own situation, that means how to get warmer? (2 sweaters are ok, but 2 trousers??). We were frozen all over with temperatures of 11 degrees C - in the sleeping room, hi. In Uruguay, it never becomes really cold (this definitely is a fairy tale…), so the houses cannot really be heated, only by an open fire place. So we learned how to maintain the fire without dieing from suffocation – and this was Monikas duty today: she continuously fed the fire to get somewhat warmer during the operation. For nighttime we got electrical heated plates from CX5BW, thanks a lot!

We arose at 2.30 local time, it was really hard, I can tell you! The moon was just over the horizon as we tried to hear our "beacon" HB9BBD. We heard Dominique immeadiatly with a smashing 579 and got 569- not too bad that… We improved the dish position with our further beacons OK1DFC and LX1DB - a huge thanks to all, who helped us blinds once again 'hearing' the moon. The next minutes I tried to separate single signals in the pile up over the moon – a smashing experience on our CXpedition! The next hours we first worked EU- than the US-stations random or skedwise. A very special experience was the second call of Willi, LX1DB in SSB with a 57 signal, while we got 55. It was a nice talk over the moon, really clear and armchair copy.

We worked today (in this row): **HB9BBD, OK1DFC, F2TU, LX1DB, HB9Q, G4CCH, OZ4MM, DL4MEA, OK1CA, LA9NEA, SM4DHN, SM2CEW, G3LTF, PA3CSG, DF3RU, IK3COJ, DJ9YW, SV1BTR, SM3AKW, ES6RQ, OK1KIR, LX1DB (SSB), ES5PC, W7BBM, K9SLQ, WW2R, K2UYH, WA6PY, N2UO,** some of them twice (random and skedtime, hi). In total we worked until now 33 initials in 15 countries (US as one country), many of them countries first, during 39 qso´s.

Among our skeds we only missed SP7DCS, sorry, nothing heard. We owe a very special "thank you" to K1RQG who once again arranged the skeds!!

The Uruguayan ham's are extremly friendly and helpful, we got a warm welcome from Pedro, CX5BW (we are living in his holiday home, where he has his huge antenna farm and his shack) and Richard, CX2AQ (without his very special help we would have never gotten the high power license!!). And we already met the president of the Radio Club Uruguayo, CX1AA, Alfredo at their club station- Monika & Michael

CX/DL1YMK EME shack

Hi gang, due to numerous birdies on 432 MHz we had to move 2 kHz down to 432.043 MHz. Birdies are produced by nearby TV repeater, so no way to stay on 432.045 or we would have made NO qso today as a consequence. So we will RX on 432.043, adjusting TX for Doppler, from now on. This is especially true for May 4th. Despite heavy polarization problems (could hear US only vertical i.e.), we made 14 QSO's, mostly random. Of course very sorry for those skeds, which failed. If there is interest still to work us, we are available on May 4th from 1030ut - 1100ut, because we made it rnd today with G3LTF and I1NDP - this is also true for ATP.
Hopefully we produced a smile on the face at **DL9KR, OK1DFC, HB9Q, DF3RU, OZ4MM, SM2CEW, UA3PTW, PA3CSG, I1NDP, DL7APV, G3LTF, K1RQG, K1FO and K2UYH.**
Please note once again: no matter where you are and what sked slots you have: please you start the first sequence. Reason is simple: we just have to adjust a wobbling bunch of alu (MUD) on the moon in 1st sequence, hi!
The 70cm QSO's are much more demanding than anything else out here in the middle of nowhere, with dozens of flies around your head, producing even more QRM, oh boy, oh boy. At least, I was grilled from the rear 2day (sitting in front of open fireplace - to get the temperatures higher than 10°C inside the house), but fingers remained clumsy... Hang on boys, so do we, we've got no choice... 73/88 de M & M

The guest house and dish

Hello Lunatics, today we managed for the second time after Iceland a 3-band EME-DXpedition. Our 13 cm activity now makes it possible, to get the WAC on 13 cm EME, because it is the first time that South America – as far as we know – has appeared on the moon on 13 cm. This was feasable only because of the tremendous efforts of CX2AQ and his good relationship to the URSEC (local license means 2390 MHz and 10W, which doesn't bring EME really forward..).
Congrats to Willi, **LX1DB, for the first WAC on 13cm!** Like in TF, he gave us a beacon to focus on the moon with the wobbling something of a dish (but doesn't weigh much).
After Willi we worked, mostly before sked slots, during heavy rain in the following line: **F2TU, OZ4MM, HB9SV, G3LTF, OK1KIR, DL4MEA, OK1CA, PA3CSG, ES5PC, IW2FZR, HB9Q (sri for letting you wait, were looking for you on 2320, shame on us), WW2R, W5LUA, G3LTF** (dupe, thanks for giving an audible moon, Peter).
We didn't copy SM2CEW (Peter was repairing station), LA8LF and VE6TA. Just after digging out WA6PY we had to close down because of high winds again. Monika tried to keep the dish on the moon for a while, but no way, vy sri! It's too early to risk the dish, as done in TF. Paul, hopefully will catch you on 9th.
After yesterday's update we managed to work Doug, **VK3UM**, with the setting moon on 70cm on the western pass (like TF) – probably our hardest piece of work so far...Unfortunately nil again from Japan, most likely because of that VK-import to our West.
Tomorrow we will show up again on 70 cm, hope to work those of you we missed so far. On May 9th we will be back on 13cm, please let us know, if there are further sked requests. Don't let us down on Monday May 5th, when we will be back on 23cm. Still many well-known calls missing.
73 / 88 de M & M

Hi lunatics, yesterday we completed with a second day the CX-activity on 70 cm. In total we worked 22 initials in 15 countries and made 27 qso´s. 70 cm was a hard struggle comparing to 23 and 13 cm due to a strange polarisation shift in these southern latitudes, hi. We worked on **May 4th: DL9KR, F2TU, RW3PX, DK3WG, G4RGK, SD3F, G3LTF, OZ4MM, K0RZ, LX1DB, K1RQG,** some of them for a second time after May 2nd. Only from DL9KR and K1RQG we got good 559 reports, we heard Jan even with a fantastic 579 signal! Mainly we changed o/ro. Sorry for those we missed, we sometimes heard the call or the reports, but didn´t get it completed, it was sometimes borderline. So please: If I send an "?Y", only send your call, not mine. I do know my call!!
Comparing to our TF activity we had improved our output because we bought a new BEKO PA with 1 kW out. We got it only a few days before the lift off of the boxes to CX. The PA worked very stable, doesn´t heaten anywhat, so a compliment to Bernhard Korte for his new development! We also improved the number of initials on 70 cm comparing to the DXpeditions to Iceland and Madeira.
We still have a request for 70 cm activity from here, so we thought whether we will be back once more on 70 cm on Monday, May 12th before the JT-skeds on 23 cm (19.45 UTC) and after them

(there is already a JT sked on 70 cm). So please send us, if there is still interest in doing so! The moon is available for us from 17.30 UTC until 04.00 next day. The JT is especially for those who failed in the skeds in CW to give them a 2nd chance to work us, but also for other weak stations. The time slots of PA3FXB and SM5LE became free, because they worked us in CW on May 5th!Congrats to both, they did an excellent job with small stations! So skeds are still available.
Vy 73 M&M

Monika`s & Michael`s Magic Moon Machine

Yesterday (May 5[th]) we had the smashing experience of 3 random **SSB QSO´s on 23 cm: LX1DB (57/55), K1RQG (57/56) and K5SO (56/53).** All 3 had fantastic signals over the moon, it was nearly unbelievable to make SSB qso`s from a portable DXpedition station. So we talked a while off the rock, hi, including Monika's greetings to our friend Joe K1RQG!!!. Thank you very much for this experience! We worked furthermore in CW: **SV3AAF (congrats to your 3rd qso ever!), G4DZU, G4RGK, PA3FXB, SM5LE, ON7UN, K1RQG, K5SO, SP6JLW, W2DRZ, NY2Z, and K2UYH.** We missed DL2HWA and DL1HYZ, although we could hear our own echoes underneath their 549-signal, but obviously they had nil cpy from us. Boys, try again in contest, if you have a copy on us.In this context: pse adjust your CW-speed to the libration conditions! For the first time we heard JA8ERE with O report, but could not complete. Now 3 days off for sightseeing…at least a little bit… (to be continued)

Thank you Monika and Michael for another GREAT EME expedition with satisfaction guarantee ☺ (CT1HZE)

T7/HB9EHJ on 23cm EME

Bodo, DL3OCH, was qrv from May 1 to 4 from JN63FW (San Marino) on 23cm EME. This was the first time that T7 was qrv in this mode/Band.
Bodo reports: Hello EME friends... Not everything worked how it should today. We arrived at 8am on May 1[st] here in San Marino and had beautiful weather. It was sunny with blue sky. I have started to set up equipment at 9:15z and was QRV at 09:45z. I worked OK1TEH tropo in CW. The signal was strong but with very heave QSB. It became cloudy and I moved the antenna to the moon as soon as the QSO with OK1TEH was done. I called cq and saw DJ9YW, HB9Q, OK1DFC and ES6RQ calling. I started to call DJ9YW but he disappeared after two periods. Big black rain clouds moved over and I didn't see any signals any more. I then saw HB9Q calling and called but he then disappeared. The next hour was mostly like that, just an up and down between copying a signal with -24dB or no trace at all. With these difficult conditions I was finally able to work OK1DFC (-23dB), HB9Q (-24dB) and DJ9YW (-25dB). The clouds became bigger and it started to rain. I decided to take everything down to protect the equipment for damages. I wont be QRV today because its raining and the moon will go down soon. I therefore will be on the moon tomorrow again. Please look at the 1296.090 for me in JT65C (I do TX first). I will be on between 10:00z and 12:00z. The weather is supposed to be really nice tomorrow. ES6RQ, you were up to -24dB today, please call tomorrow again. Ok, I will look for all.
On May 2[nd] Bodo continues: Hello EME friends... Today was really good for EME. The weather was perfect. Blue sky, temperature 20°C and no wind. Moon was visibly which made it easier to point the antenna to the moon. I now worked the following stations from San Marino:
May 1st.
OK1TEH, tropo, CW, very QSB
OK1DFC, -23dB
HB9Q, -24dB
DJ9YW, -25dB (needed a few tries)
May 2nd.
OK1KIR, -26dB
PA3CSG, -22dB
DJ9YW, -23dB (best signal from him ever)
K2UYH, -20dB (speaker)
W5LUA, -24dB

DJ9YW told me that there was also RD3DA and SV1OE calling. Sorry I missed ES6RQ as well. On May 4[th] I was QRV for another hour and was able to give G4CCH and ES6RQ a new DXCC on 23cm. That way I made a total of 11 QSOs and

worked 10 stations (9 via EME and 1 tropo). I could have worked some more stations but they are either not QRV on JT65 or to weak.
It would have been nice to work them as well. With all that said, I see a real potential in doing some more QSOs on 23cm even with just a single yagi. Two or three years ago I usually only worked three stations or so. Now, there are coming more and more stations out to try to QSO me. There are some big ones out there that could work me in CW. I wonder why they do not try or ask me for a sked. Is it because I am a JT user as well (who has more than 100.000 CW QSOs in the log as well). I activated so many rare DXCCs and many of them for the very first time on 23cm. I will activate many more but cannot promise to have more than just a yagi. Vy 73 de Bodo, DL3OCH

T7HB9EHJ (=DL3OCH) on 23cm EME

HI3TEJ 70cm EME

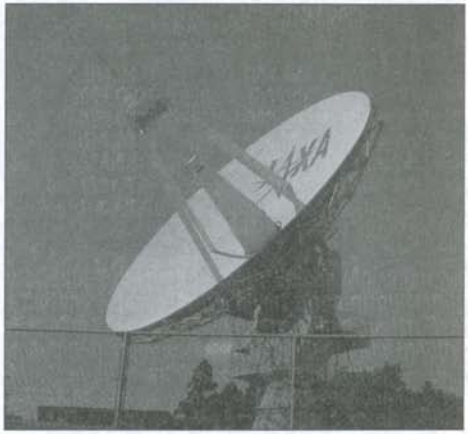
HI3TEJ, Ted looks for info and equipment for a decent 70cm EME station. hi3tej@hotmail.com

Liechtenstein on 23cm EME

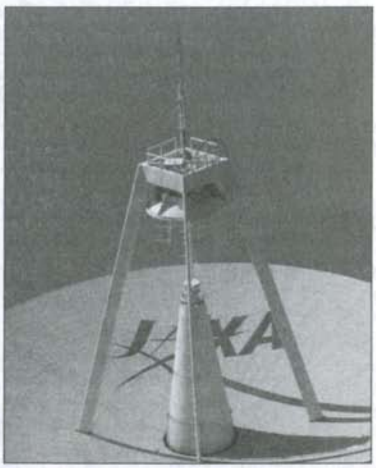
HB0/DF1SR was qrv in the 23cm DUBUS EME contest on May 10/11. Prior the contest also a 13cm operation was planned but was not successfull due to RX problems.

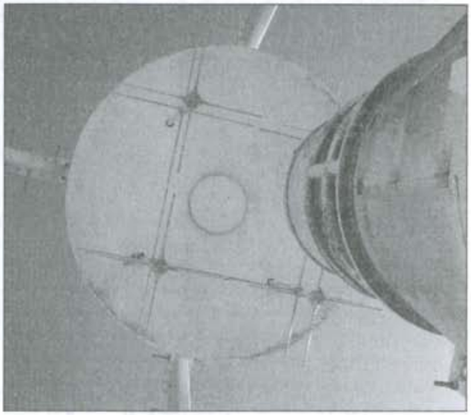
New Big Dish EME Project from Japan – 8J1AXA

Katsuura Dish Experimental Station (KDES) will use the call sign 8J1AXA for he operation from the JAXA Space Communications Center, using 18m Gregorian dish antenna. Station license would hopefully be issued in a few months first for a simple small station of JA beginners' size, and then grow up to be a big one.
It is requrested here in Japan to apply for the station license change on every occation when you change main rigs, output power and antennas, which would use to delay the licensing procedure. So we can not tell you now when we could operate EME with full output power on a certain band.
The original JAXA 18m dish was designed in 1976 for 137MHz and 2.1GHz. We are designing modified feeds for amateur bands, from 144MHz up to 5.7GHz possibly. Fortunate enough, it would be very possible to operate with the original antena configuration 2.3/2.4GHz. For EME use, we have to re-model the auto-tracking system from the present manual servomoters. JAXA already removed the program tracking system from this antenna, and the high power TWTA, as well.
Mike JH1KRC reported



The 18m JAXA dish





The original Xdipole feed for 137 MHz

JA EME Meeting in June

All Japan EME Meeting will be held at Tokyo Grand Hotel, near Tokyo Tower, 14-15 Juen, 2008. Every amateurs, and non-amateurs as well, are welcome. Meeting, exhibition, and lecture starts from 3pm, 14 June. Diner banket begins from 7pm. for 2 hours. All night meet starts from 9pm. You can sell or buy something as you like. Morning lecture starts from 9am, after the breakfast, until 12am. Hotel room (2-person) including every thing costs 18k-yen each. Lectures and meeting only, for two days, 5k-yen. One day lecture and meeting, 3k-yen. If you have a chance to come to Tokyo this time, join us. Reservation is requested before 31 of May. For further information, contact: Mike Watanabe, JH1KRC jh1krc@syd.odn.ne.jp

1st F to ES on 10 GHz

On May 4th F2TU worked ES5PC on 10 GHz EME for a first ever F-ES.

Malyj Vysotsky – R1M on 70cm EME

The R1MVA-Expedition (Op. OZ2M, OH5LID etc. in the beginning of June may try also 70cm EME with a decent station. Loc.is KP40.

Belarus on 23cm EME

A team from UA3 was qrv as EV5M in the DUBUS 23cm CW EME contest on May 10/11 from KO54. A report will follow in next issue.

24 GHz EME (tnx to K2UYH NL!)

DF1OI: Johannes reports on his March 24 GHz EME activity - - Thanks to all stations which participated in the 24 GHz activity day. I completed QSOs with OK1KIR, VE4MA and W5LUA. I also exchanged test signals with DK7LJ and LX1DB, and was received by DL7YC and PA0EHG. Although the WX was not too good (lots of rain clouds, but no rain) all signals where (O) quality with spreading around 150 Hz.

OK1KIR: The weekend before the EWW Contest we had a party on 24 GHz EME! OK1KIR was finally able to get on board. We completed our rig after 4 years of work, and contacted all stations available during the weekend. QSO'd on 9 March at 1103 DF1OI (O/O) on 24048.100, 1134 DK7LJ (O/O) on 24048.100, 1401 LX1DB (449/449) on 24048.200, 1601 W5LUA (549/449) on 24048.100 and 1706 VE4MA (O/O) on 24048.150. We were really happy for each one contact, especially the first OK-LX and OK-VE QSOs. Rotating the feed (LP) showed low influence (as perceived, not measured) except ~ +/- 10-15 degs from a deep minimum (at perpendicular pol). Signals showed frequency spreading from about 100 Hz up to 200 or 300 at maximum on the Spectran waterfall. Very clean (narrow) signals were received during our QSO with DK7LJ and later on from LX1DB (quite clean) and especially from W5LUA. An RX CW bandwidth of about 1 kHz was optimum for the reception of most of signals during the day. Sun noise was 14.8 dB at 0900 (lightly cloudy) and 14.4 dB in the afternoon at an el of 43 degs with more clouds. The respective moon noise was approx. 1.95 dB in both cases. Noise ratios were measured to close sky without searching for a maximum in the coldest sky. The antenna beamwidth was slightly over 0.2 deg. It was hard to measure on noise sources of 0.5 deg size. Moon tracking using F1EHN's software with incremental steps of 0.02 deg was used to point the beam to the moon's center (tested every 10 ~ 15 minutes with small but necessary corrections). The change in moon noise, when rotating the polarization, was < +/- 0.02 dB. We used a 4.5 m solid dish with a linear pol feedhorn, TWTA and transverter all located at the focal point and rotatable over +/- 90 degs. Our LNA was by DB6NT with a 1.5 dB NF (not measured). Our RF power was about 20 W (not measured precisely as each section of WG or transition swallows 0.5 dB or more. Two WG switches in series after TWT (continuously powered up) with proper sequencing were used to safely operate the LNA.

VE4MA: Barry reports on the 24 GHz activity in March -- Thanks everyone the great activity! It seems that the WX was bad for most in Europe. Signals seemed to vary up and down considerably during a transmission sequence on all EU stations. My moon noise was stable. I was able to put my new preamp in this morning and the measured NF was 0.35 dB better almost the same as the increase in moon noise up to 2.1 dB again. I used to have 2.1 on 24,192 and still need to put in a better down converter (which I have). I did not improve the TX power this month, but maybe next. I had some problems here. My tracking program failed about 5 times and I had to restart and check pointing. I need to improve this system. It is good after a while but not reliable enough. I worked W5LUA (449/449), DF1OI (O/O) - nice signal, saw someone getting ready to tailend, partial DK7LJ (M/-) incomplete - signal was weak and variable, OK1KIR (O/O) for initial #8 - nice signal at times but variable and CW speed too fast, LX1DB (559/559) - great signal but it took a while to find. It's getting very exciting with all the regular activity on 24 GHz. Soon we can possibly have PA0EHG and IQ4DF joining us.

9 CM ACTIVITY WEEKEND 7/8 JUNE

In June 2007 there was a very successful Activity Weekend (AW) on 3.4 GHz organized by G3LTF. Peter is doing the same again this year. The dates are 7/8 June. The concept of an AW is to concentrate the activity of the relatively few stations currently equipped onto a single weekend, to encourage newcomers, both transmitting and listening, to test out new feeds, preamps etc, compare measurements and above all to have fun. There should be a couple of strong signals (W5LUA and LX1DB) on the band to help newcomers. Most activity last year and since has been on and around 3400.100, but there is likely to be some at 3456.100 as well. DF6NA has kindly established a web page with a list of stations active and building at
www.moonbounce.info/3400.htm that will be updated, so keep him informed. Thanks to VE4MA and Rainer there is now a paper entitled "3.4 GHz Moon Bounce Made Easy" written by VE4MA at the above link – just click at the bottom of the page. This should be helpful to those thinking of starting on this band. Among the stations currently active on 9 cm are G4NNS, G3LQR, OK1CA, OK1KIR, W5LUA, VE4MA, VK3NX, LX1DB, WW2R, N9JIM, DL4MEA and VE6TA.

DL4MEA: Guenter is QRV on 23, 13 and 9 cm and was active in the April leg of the DUBUS Contest on both 13 and 23 cm – On 13 cm on Friday before the contest I tested a G4DDK 2stage preamp on the NF meter. It showed a 0.5 dB NF. This is an improvement of 0.1 dB against the one that I had used before and so I installed it. I did not have time to optimize it, which will be done later. On lower frequencies, it showed a 0.4dB NF. Sam has made a really nice set of preamps with reproducible noise figures. Curiously my sun noise did not change, but my impression was that it gave a recognizable benefit on RX. None of the stations I worked was a problem to read. The crossband behavior was really good as demonstrate by my initial with NA4N. Unfortunately operation on 2424 MHz was not possible because my 2424-2324 MHz mixer did not work as expected. This mixer originates from a GSM transmitter local loop. First, the 100 MHz LO did not start, and it then somehow did not convert - my apology to the JAs. I worked on Saturday G3LTF, ES5PC, VK4AFL, OZ4MM, F5WJF, F2TU, OK1KIR, IW2FZR, OK1CA, HB9SV, G3LQR, HB9Q, SD3F, PA0BAT, VE6TA, NA4N and K2UYH. CWNR were VK3NX due to frequency confusion. I was not aware that both are listening around 100. I called on 050 for a long time. I used a DB6NT Rev 2 transverter with G8ACE oven, MRF21120 driver, 2 x MRF21120 final with about 150 W at the feed, round septum polarizer feed with Chapperal ring in 4.5 m, 0.32 f/d dish, and G4DDK 2 stage preamp with 0.5 dB NF (not optimized). On Sunday, I switched to 9 cm and received echoes quite early. I heard VK3NX on CQ, answered, and then the door bell rang. Unfortunately due to this, I missed the sked time too, but I was able to catch him later when PA0BAT did not show up (he did not find the moon), and so I made the first VK-DL contact on 9 cm. Originally I had planned to move back to 13 cm after this contact, but I stayed on 9 cm and worked OK1CA, G3LTF, OK1KIR and W5LUA between family activities. I closed the station at 2100 and may have missed some other stations. I can be QRV on 9 cm in about 10 min, since the whole transverter is set up on a single rail. My 9 cm station is "low budget"! I think I did not spend more than €250 for it. It uses G4DDK multiplier, DB6NT Rev. 1 transverter with G8ACE oven, Toshiba 50 W PA, round septum polarizer feed with Chaperal ring (taken from a C-Band LNB) and my 4.5 m dish. I use a DJ9BV preamp with FHX35 (unknown NF) and not optimized, but get 7.7 dB CS/Sun - should be > 10dB.

DL7YC: Mnfred is returning to EME after many on 24 GHz – I just finished my 1127 TWTA setup and have some excellent results. With help from DK3UC, DF1OI and a script from G4NNS, I was able to tune my tube to 28.4 W measured at the waveguide output. Additionally I have the automatic dish tracking running, but will improve the software for better alignment (0.01 to 0.02 deg). My transfer switch electronic is ready too and now all I have to do is put everything in boxes for mounting outside. I hope to be ready for the next moon weekend.

ES5PC: Viljo reports on his 13 cm DUBUS Contest results – In the contest on 13 cm I worked 30 stations. This was more than in any 13 cm contest before. I heard but missed JA8IAD. The strongest station was HB9Q and weakest DF3RU. SP6GWN was weak and did not copy my call until Sunday evening when he became noticeably stronger and finally answered my CQ. It was good to see that even the smallest stations were spending time calling CQ. I QSO'd on 12 April VE6TA (2304), NA4N (2304), W5LUA (2304), KL6M (2304), VK4AFL (2301) for an initial (#), OK1CA (2301), OK1KIR (2301), VK3NX (2301), DL4MEA (2320), F2TU (2320), G3LTF (2320), JA4BLC (2304/2424), JA6CZD (2304/2424), F5JWF (2320), PA0BAT (2320), OZ4MM (2320), IW2FZR (2304), HB9SV (2304), HB9Q (2304), G3LQR (2320), SD3F (2304), IK2RTI (2304), K2UYH (2304), WA6PY (2304), WW2R (2304) and K7XQ (2304) (#), and on 13 April JA8ERE (2304/2424), ON5RR (2320) (#) and 1st ES-ON on 13 cm, DF3RU (2304), SP6GWN (2320) (#) and 1st ES-SP on 13 cm. I had once again great help from the SDR-IQ receiver to monitor for the activity on the band. It makes operating much easier, especially when operating remote over Internet. This time all my equipment and my Internet connection worked without any trouble. I hope to be QRV also in the 23 cm contest.

F2TU: Pierre reports good activity and good WX during the April AW and DUBUS Contest – On 13 cm I was disappointed at being unable contacted KL6M and VK3NX (because QRM on 2301) on Saturday. I made 29 QSOs on 13 cm with OZ4MM (559/559), ES5PC (569/579), G3LTF (579/579), VK4AFL (559/579), F5JWF (559/569), JA8IAD (559/569), JA4BLC (569/569), HB9SV (579/579), DL4MEA (569/569), JA6CZD (559/569), OK1KIR (569/569), PA0BAT (559/559), SD3F (559/559), OK1CA (579/579), G3LQR (559/569), IK2RTI (569/579), HB9Q (579/579), VE6TA (559/579), NA4N (559/559), W5LUA (579/579), WW2R (559/O), K2UYH (559/569), WA6PY (569/579), K7XQ (549/559), JA8ERE (569/559), SP6GWN (569/559), ON5RR (559/559), DF3RU (539/559) and IW2FZR (569/579). On 9 cm I heard DL4MEA (559), G3LTF (549), OK1CA (559) and OK1KIR (559). I use my 7.8 m dish all bands with 250 W on 13 cm.

G3LTF: Peter reports on his April activity -- I started the month on 9 April with a 13 cm cross band contact with VK4AFL for initial #54. We could just copy SSB even though the trees were beginning to obstruct Trevor's dish. I then worked G3LQR for a system check out and later in the day on 3.4 GHz DL4MEA for initial #11 on 9 cm. On 10 April was on 432 MHz and managed to work OK1TEH (M/O) on CW for #412. It was great to work Matej after many previous tries. I spent 12 April on 13 cm and worked DL4MEA, VK4AFL, VK3NX, F2TU, ES5PC, JA8IAD, JA4BLC, PA0BAT, HB9SV, F5JWF, IW2FZR, OZ4MM, OK1KIR, SD3F, OK1CA, HB9Q, G3LQR, IK2RTI, WW2R, K2UYH, W5LUA, VE6TA, K7XQ and NA4N #55. Ten of these QSOs were crossband. There was good activity and it was really great to work the VKs. Until about 1800 the wind was strong and the dish was not always on the moon affecting signal levels - I could see the moon noise fluctuating down to 50% of normal. I missed WA6PY and two other JAs. On Sunday 13 April I changed the system over to 9 cm, but something was wrong as my moon noise was low and I seemed to be getting more noise from the trees than was normal for the elevation I was at. I did work VK3NX and then DL4MEA and OK1CA, but signals were definitely down and I decided to check the feed alignment. I found that I had forgotten to fit the strap that steadies the feed to the feed support leg. I put crosswire across the front of the feed and with a small hole at the back of the feed I was able to re - sight it on the dish centre and fit the strap. This was the solution and the signals and moon noise returned to normal. I then worked OK1KIR, W5LUA and VE6TA for initial #12. My Sun noise was 14 dB with a SF of 68. I am now working on new feeds for 13 and 9 cm in the hope of picking up 0.5 dB or so of antenna gain.

JA4BLC: Yoshiro send news of 13 cm DUBUS Contest results in JAPAN – We enjoyed the contest, but were sometimes frustrated by our allocation on 2424. The results were: JA6CZD worked W5LUA, OZ4MM, ES5PC and F2TU. JA8ERE worked W5LUA, VK3NX, ES5PC and F2TU. JA8IAD worked W5LUA, OK1CA, G3LTF, F2TU and HB9SV. I worked K2UYH, W5LUA, WA6PY, VK3NX, ES5PC, HB9SV, G3LTF, F2TU and OZ4MM. I heard VE6TA, JA8IAD, OK1CA, DL4MEA, IW2FZR, F5JWF, PA0BAT and SD3F. I wish more EU/NA stations would listen not only on 2424.100, but over a wider range (2424.070 - 2424.110 plus drift and Doppler) as we should keep 10 kHz separation to live together (avoid QRM). JA4BLC is on 2424.070, JA6CZD is on 2424.080, JA8IAD is on 2424.090 and JA8ERE is on 2424.110.

NA4N: Greg was on 13 cm in April for the DUBUS Contest -- I worked the following stations on 2304, ES5PC, W5LUA, HB9Q, F2TU, HB9SV, OZ4MM, K2UYH, IW2FZR and WA6PY. I also finally worked G3LTF and DL4MEA on 2320/2304 crossband using my new AOR AR5000A. I know I missed a few stations and probably spent too much time listening on 2320. TNX to all the stations I worked.

NA6MF: Jim's (N9JIM) group (the Jamesburg EME team) was QRV on 1296 EME from a portable station at Moffet Field in Mountain View, CA (CM87) on 12/13 April \during the European window. They used a 12' dish and 600 W 12 foot dish on CW/SSB/JT65C. The main purpose was to provide a public demonstration of EME during the Yuri's Night Celebration. Three QSOs were made on 1296.

NA6MF crew at EME demonstration at Moffet Field

ON5RR: Marc with the aid of second op Michel (ON7EH) after several years of inactivity is QRV again on 13 cm – We successfully re-activated our 13 cm station and worked on Sunday afternoon on 2304 or 2320 between 1300 and 1700 HB9SV for an initial (#), HB9Q (#), F2TU, OK1KIR (#) and ES5PC (#). The Doppler shift was between 3.5 and 2 kHz! CWNR on several occasions IW2FZR, F5JWF and SD3F. We were glad to experience the same thrill as when we first started our EME operation at Marc's first EME QTH. The station consists of 60-80 W in the shack, a 0.7 dB NF LNA at a the VE4MA feed for a 4 m dish that is manually controlled.

OZ4MM: Stig writes on 13 cm it was quite confusing to not have a clear view who was on and where. It is time consuming to listen on 2301 + 2304 + 2320 and 2424 at the same time... And then you need to guess where to call (2304 or 2320). I feel we need a better time plan for the different bands. I had very degraded RX on 13 cm during the contest, possibly because of oscillator leakage and need to fix this problem. Even so, I worked the following 21 stations: F2TU, OK1CA, DL4MEA, JA4BLC, JA6CZD, G3LTF, F5JWF for initial #68, SD3F, ES5PC, OK1KIR, HB9SV, HB9Q, IK2RTI, WW2R, K2UYH, WA6PY, NA4N, K7XQ #69, VE6TA, W5LUA and VK4AFL. CWNR were VK3NX, JA8ERE and JA8IAD. Heard were PA0BAT and IW2FZR. The station on 13 cm is 10 m dish with W2IMU horn and around 75 W at the feed. The LNA is MGF4919 in the first stage.

PA0EHG: Hans reports that on 12 April he succeeded in working LX1DB for his first 24 GHz EME QSO -- Willi's signal was very strong signal. In total I made 4 QSOs with LX1DB, DF1OI, DK7LJ and VE4MA. OK1KIR copied my signal as well, but he was not able to transmit. I hope to test with W5LUA and OK1KIR soon depending on the weather. My station is a 3 m Andrew dish, 1.25 dB NF preamp by DB6NT and 10 W from a Hughes TWT directly into my feedhorn.

UT5JCW: Serge is now QRV on 1296 EME besides 432 -- I am using for 23 cm a 3.7 m TVRO dish with an RA3AQ septum feed, LDF-4-50 line to a AD6IW SSPA giving about

250 W at the feed and W7CNK 0.3 dB NF LNA. I use an AlfaSpid BigRas rotator controlled by GM4JJJ's Moonsked software, He has worked several stations including OK1DFC and K2UYH and is interested in skeds.

UT5JCW's QTH – see his 3.7 m dish at the top

VK4AFL: Trevor is now set up for 13 cm and was active on this band during the April part of the DUBUS contest -- I found 13 cm to be definitely a good band and certainly suits a smaller dish such as my 3.7 m dish. It was helped a lot by WD5AGO's excellent preamp. With about 90 W, CW echoes are quite loud and SSB returns Q5. Earlier in the year I had a handful of contacts limited to 2301 and 2304 receive, but I purchased a 2320 receive convertor from Kuhne Electronic, which I switch in and out as required. A few days prior to the contest I had a check contact with G3LTF to confirm that 2320 was working. In the contest I worked W5LUA, WA6PY, WW2R, VE6TA, VK3NX, ES5PC, OKICA, G3LTF, DL4MEA, F2TU, SD3F and OZ4MM. For the next contest I expect to have 2424 receive going for the JAs. Carl, SD3F was my EME contact number 1000. One problem is the continual tuning required to cover the various European frequencies within the 13 cm band, which I found very inefficient and frustrating. I am thinking that a better system might be to announce prior that I will listen 2304 only for a certain time frame and then listen only 2320 for another. Another alternative could be to listen on 2304 for one moon pass then 2320 for the following, although some stations are only on for one of the days. I still have the 13 cm setup in place and will change to the 23 cm feed just prior to the 1296 contest in May.

WW2R: Dave also reports on 13/9 cm activity in the DUBUS Contest – I worked on 12 April VK4AFL for initial #18 and DXCC15, W5LUA, VE6TA, F2TU, HB9SV #19 and DXCC 16, G3LTF (X-band), G3LQR (X-band) #20, HB9Q #21, OZ4MM, OK1KIR, SD3F, ES5PC, K2UYH and WA6PY #22. CWNR were VK3NX and F5FWD. No other signals were heard on 2320, despite having an SDRIQ on each band – (TNX G4DZU!). I deployed my spare Spectrian PA about half way through the weekend as a check in preparation for the upcoming expeditions. Both amplifiers survived, producing around 180 W. At the end of the Eur window, (in the dark), I removed my 13 cm feed and put in the 9 cm feed. Results were much better than last July. On 3400 VK3NX was detectable, but not workable. On 13 April I worked W5LUA for initial #3 and DXCC 3 – the loudest signal of the weekend and OK1CA #4 and DXCC 4. Good signals were received from OK1KIR, but they could not hear me. I also heard G3LTF, and worked W5LUA on JT65C. I look forward to another AW on this band soon. My equipment on 13 cm was a DB6NT Transverter, G4DDK preamp (0.35 dB NF), Spectrian PA and HB VE4MA superfeed, and on 9 cm a HB GPS locked transverter, DEMI preamp (0.6 dB NF) and Toshiba 40 W PA with HB VE4MA superfeed.

DUBUS 70cm CW EME Activity Weekends 2008

JUNE 7 1700-1900 & JUNE 8 1100-1300 z
JULY 27 0000-0200 & 0800-1000 z
AUG. 23 2300-0100 & AUG. 24 0600-0800 z
DEC. 13 1900-2100 & DEC. 14 0400-0600 z

QRG: 432.005 – 432.030 MHz
www.sm2cew.com/dubus-aw-70.html

EUROPEAN EME Contest February 9/10, 2008 Digital - Results

Results 144 MHz

Place	Call	Points	QSO (+Sked)	Multi	Pwr	OP
1	RU1AA	1068200	113	98	QRO	SIN
2	IK7EZN	353400	62	57	QRP	SIN
3	IK1UWL	342000	69	57	QRP	SIN
4	EB1DNK	122100	37	33	QRO	SIN
5	OK1TEH	19600	14	14	QRP	SIN
6	I3EVK	14400	16	9	QRP	SIN
7	SM5CFS	6400	8	8	QRP	SIN
8	CT1HZE	400	2	2	QRP	SIN
Checklogs:						
	RV9JD	125400	38	33	QRP	SIN
	DL1RNW	84100	29	29	QRP	SIN
	F1NWZ	61600	28	22	QRP	SIN

Results 432 MHz

1	OK1TEH	100	1	1	QRP	SIN

Results 1296 MHz

1	G4CCH	34200	19	18	QRO	SIN
1	OK1DFC	32400	18	18	QRO	SIN
2	PA3FXB	12000	12	12	QRP	SIN

Soapbox

I3EVK: only few hours of activity; several stations heard (yes, heard with my ears), called, but no QSO. See you on CW. 73' de Bruno, I3EVK

G4CCH: Should have tried harder, not really a serious effort, much better activity than in previous years, Good to see some different callsigns on Digital.

Tropo Reports

2m, 70cm and up

Editor: Wolfgang Schneider, DJ8ES
DJ8ES@gmx.de

2m

CT1HZE, IM57nh, hrd:
31.1.08 13:10 CU8DUB/B 529 HM49KL 1953km
29.4.08 08:15 CU8DUB/B 579 HM49KL 1953km
several hours open to CU, no stations qrv.

DF9IC, JN48IW, wkd Jan – March ´08:
F2YT (JO10); G0AJJ (JO02); G3CWI (IO92); G4DEZ (JO03); G4IRC/p (JO02); G8HGN (JO01); M0HKB (JO02); OZ1ALS (JO45); OZ1BEF (JO46); OZ1DLD/p (JO45); OZ9KY (JO45); PI4H (JO33); SK7CY (JO65); SK7MW (JO65); F0FHU (JN06); G0KPW (JO02); G3SDC/A (IO92); G4IRC/p (JO02); DK0IZ (JO43); DL6BCT (JO43); G1YLE (JO02); OK1TEH (JO70); OZ1HXM (JO45). tnx for info Henning

DK0IZ, JO43SX, wkd April ´08 (>700km):

01.04.08 17:21 F6IRS	JN38VN	614km
01.04.08 17:41 F4AZF	JN39GG	563km
01.04.08 17:47 ON3EA	JO10WU	517km
01.04.08 17:58 ON6LS	JO10WK	551km
01.04.08 18:17 DF9IC	JN48IW	563km
01.04.08 18:25 F6EBH	JN19WT	604km
01.04.08 18:31 LA2Z	JO59EJ	604km
01.04.08 18:47 OE2SCM	JN67OV	723km
01.04.08 18:48 DF4IP	JN49HE	536km
01.04.08 18:50 DL6MFK	JN67JX	704km
01.04.08 19:29 LA2AB	JO59FV	660km
01.04.08 19:30 LA3F	JO59MS	650km
01.04.08 19:39 SK1BL	JO97HK	685km
01.04.08 20:23 G0KPW	JO02RF	573km
01.04.08 20:36 OK1RW/P	JO70FD	542km
01.04.08 20:44 G4DEZ	JO03AE	632km

rig: FT847, PA 300W, 2x 17 el F9FT
tnx for info Torsten (DJ1TW)

DK3WG, JO72GI, wkd 28. Jan ´08 (>900km):
F5MFI (JN07XT, 1024km); F1YJ (JN17ET, 999km); F1PWS (JN06DM, 1211km); F0EAR IN96JD, 1328km); F6EBH (JN19WT, 793km); F5EQR (JN19UO, 813km); F1CMA (JN19OP, 844km); F5CT (JN08KI, 1061km); F6CBH (JN19BH, 930km); F0DKT (JN18JR, 918km); F5AOL (JN18EM, 956km); F0EHA IN98XC, 1134km); F6ESU (JN19OO, 846km); F5ZO (JN08XL, 985km); F5ABW IN97MQ, 1216km); F6CJA (JN07UU, 1037km); F4DPW (JN09KE, 1018km); F8CHM (JN07IG, 1136km); F8CDM (JN07QM, 1079km); F6AQI (IN96DW, 1308km); F1ISM (JN09VK, 946km); F6GYJ (JN18CU, 948km); F5ROX (JN07QO, 1074km)
tnx for info Jürgen

PA5DD, JO22IC, wkd March/Apr ´08 (>500km):
SK7CY (JO65RJ, 683km); OZ9KY (JO45VX, 545km); 5Q2J (JO55UI, 587km); OZ1BEF (JO46OE, 542km); OZ2TF (JO46PE, 545km); SK7MW (JO65MJ, 660km); OZ2PBS (JO55XJ, 602km). tnx for info Uffe

70cm

DF9IC, JN48IW, wkd Jan – March ´08:
G4DEZ (JO03); OZ9KY (JO45); SK7MW (JO65); OK1TEH (JO70); G8HGN (JO01); OK1RW (JO70); G3YDY (JO01); IZ4BEH (JN54); I4LCK/4 (JN54); LA2Z (JO59); DF0UM (JO73); G0JJG (JO02); OK1VVT (JO60); OZ1DLD/p (JO45); OZ6HY (JO45); PE1EWR (JO11)
tnx for info Henning

DK3WG, JO72GI, wkd 28. Jan ´08 (>900km):
F5ZO (JN08XL, 985km); F5DQK (JN18GR, 934km); F1BQX (JN18DP, 954km); LX2LA (JN39CP, 652km); F6CJA (JN07UU, 1037km); F8CHM (JN07IG, 1139km); F6DKW (JN18CS, 953km); F1ISM (JN09VK, 946km)
tnx for info Jürgen

OK2FUG, JN99GU, wkd March´08:
DK2EA (JO50UF, 490 km); DB6NT (JO50VJ, 485 km); DL6NAA (JO50VF, 484 km); 9A2SB (JN95GM, 482 km); OK1IEI (JO70EC, 300 km
tnx for info

23cm + up

DK3WG, JO72GI, wkd 28. Jan ´08 (>900km):
F5DQK (JN18GR, 934km); F6DKW (JN18CS, 953km); F6APE (IN97QI, 1214km); F1ISM (JN09VK, 946km). tnx for info Jürgen

DK7QX, JO42KH, wkd on 23cm (>500km):

13.02.08 18:25 G8GXP	IO93FQ	714km
13.02.08 18:35 G0EWN	IO93FK	710km
19.02.08 22:07 G3XDY	JO02OB	523km
19.02.08 22:13 G0DJA	IO93IF	691km
19.02.08 22:29 M0GAV	IO93GK	704km
19.02.08 22:45 G4PBP	IO82WO	745km
15.04.08 19:57 G3XDY	JO02OB	523km

rig: 65W, MGF1302, 44 Ele Yagi

G3XDY, JO02OB, worked
1,3 GHz (>600km):

08/02/2008 OZ3ZW	JO54
17/02/2008 DL6ABC	JO62
19/02/2008 OZ1FF	JO45
19/02/2008 GM3UAG	IO87

19/02/2008 DF9IC JN48
02/03/2008 DK6AS JO52
18/03/2008 DF9IC JN48
18/03/2008 OZ1FF JO45
15/04/2008 OZ1FF JO45
15/04/2008 DF9IC JN48

2.3 GHz (>500km):
08/02/2008 OZ3ZW JO54
08/02/2008 OZ2LD JO54
17/02/2008 DL6ABC JO62
19/02/2008 GM3UAG IO87
19/02/2008 GM4LBV IO86
18/03/2008 DF9IC JN48
15/04/2008 DF9IC JN48

3.4GHz (>300km):
3.4GHz > 300km
17/02/2008 DK2MN JO32

5.7GHz (>300km):
08/02/2008 OZ2LD JO54
09/02/2008 OZ1FF JO45
17/02/2008 DK2MN JO32

10GHz (>300km):
08/02/2008 OZ2LD JO54
17/02/2008 DK2MN JO32
tnx for info John

OZ1FF, JO45BO, worked
1,3 GHz (>600km):

2008/01/15 18:39	DL6NAA	JO50VF	646km
2008/01/15 19:21	DF9IC	JN48IW	742km
2008/02/09 17:56	M0GAV	IO93GK	663km
2008/02/19 18:20	DL6NAA	JO50VF	646km
2008/02/19 18:50	DF9IC	JN48IW	742km
2008/02/19 19:02	SM1HOW	JO97GL	671km
2008/02/19 19:14	SM1CJV	JO97EF	655km
2008/02/19 19:21	SM0SBI	JO99CF	725km
2008/02/19 20:02	G3XDY	JO02OB	600km
2008/03/18 18:13	DF9IC	JN48IW	742km
2008/03/18 20:40	G3XDY	JO02OB	600km
2008/04/15 18:38	DL6NAA	JO50VF	646km
2008/04/15 18:50	DB6NT	JO50TI	629km
2008/04/15 19:04	SM0FZH	JO99HI	752km
2008/04/15 19:35	DF9IC	JN48IW	742km
2008/04/15 20:30	G3XDY	JO02OB	600km

2.3 GHz (>500km):

2008/01/22 19:12	DL6NAA	JO50VF	646km
2008/01/22 19:37	SA4Z	JO79OF	584km
2008/01/22 21:02	DF9IC	JN48IW	742km
2008/02/26 18:21	SA4Z	JO79OF	584km
2008/02/26 18:57	DL6NAA	JO50VF	646km
2008/03/25 18:45	DF9IC	JN48IW	742km
2008/04/22 18:48	DL6NAA	JO50VF	646km

5.7 GHz (>400km):

2008/01/22 20:05	SM7GEP	JO77IP	462km
2008/02/09 19:32	G3XDY	JO02OB	600km
2008/03/25 20:10	SM7GEP	JO77IP	462km

10 GHz (>300km):

2008/01/22 19:50	SM6AFV	JO67GQ	356km
2008/01/22 20:38	SM7ECM	JO65NQ	314km
2008/01/22 21:49	SM6EAN	JO57WQ	326km
2008/02/26 20:10	SM7ECM	JO65NQ	314km
2008/03/25 18:16	SM6EAN	JO57WQ	326km
2008/03/25 19:47	SM6AFV	JO67GQ	356km
2008/03/25 21:33	SM7ECM	JO65NQ	314km
2008/03/25 21:44	SM6ESG	JO67CC	302km
2008/04/22 20:48	SM6AFV	JO67GQ	356km

24 GHz (>300km):

2008/02/09 18:49	SM7ECM	JO65NQ	314km

tnx for Info Kjeld

PA5DD, JO22IC, wkd March/Apr ´08 (>400km):
23cm (>400km):
DL7YC (JO62PK, 586km); L0ML/P (JN48QU, 489km); DK6AS (JO52JJ, 417km); DF0YY (JO62GD, 536km); OZ9KY (JO45VX, 545km); OZ2LD (JO54TU, 552km); DF9IC (JN48IW, 451km); SK7MW (JO65MJ, 660km); SM7ECM (JO65NQ, 681km); OZ1FF (JO45BO, 451km); OZ6OL (JO65DJ, 620km); SK7MW (JO65MJ, 660km); OZ9KY (JO45VX, 545km); OZ6OL (JO65DJ, 620km); OZ1BGZ (JO65AP, 623km); OZ2LD (JO54TU, 552km); DF9IC (JN48IW, 451km); OZ1FF (JO45BO, 451km)

13cm (>300km):
DK6AS (JO52JJ, 417km); DF0YY (JO62GD, 536km) tnx for info Uffe

76 GHz

On April 20th 2008 the following QSOs took place:
OK1AIY/p JO70SQ - OK1JHM/p JO70DP - 88 km,
OK1UFL/p JO70SQ - OK1JHM/p jo70DP - 88 km
OK1UFL/p jo70SQ - OK1FPC/p JN79NU - 97 km
ODX and new Czech record on 76 GHz!

Great infomation about Tropo and other DX you can always find on Matej`s OK1TEH websites at **www.OK2KKW.**com Matej does a fantastic job with this pages! (DL8HCZ)

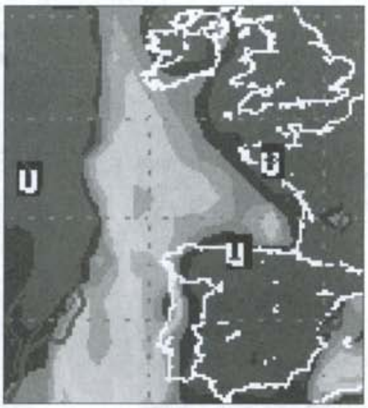
pse ur Tropo-Report to:
DJ 8 ES @ gmx.de

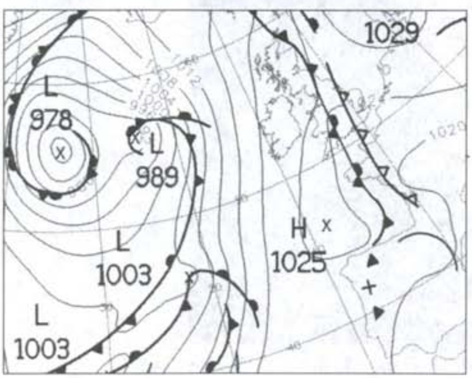
First 2m Tropo QSOs between Ireland and Southern Portugal

__On May 5th 2008 CT1HZE worked on 2m Tropo:__

2034z	**EI2IP**	**52**	**55**	**IO61CX**	**1633km**
2055z	**EI4DQ**	**55**	**55**	**IO51WU**	**1618km**
2056z	EA1VHF/B	599 hrd		IN53RE	654km
2057z	EA1HF	55	59	IN52OD	538km

The QSOs with EI are supposed to be the very first contacts between Ireland and Southern Portugal on 2m via Tropo. In the past there have been Tropo openings from Ireland to CT where mostly stations from Northern CT (IN50, 51) have been worked and during exceptional openings even down to IM59, but for sure never as far as IM57. The path (see the true path map below) from IM57 to IN53 runs over land and has to overcome some 650m a.s.l. in the EA1 area. Thus a strong sea Tropo opening from EI to EA1 and a real Tropo inversion over land between EA1 and Southern CT is necessary at the same time to make such contacts possible. See also Hepburn and pressure maps below for the region for May 5th 2008.





At 2122 a CW QSO with G4LOH from IO70JC with 419 reports both ways was completed. This was done by scattering on the Tropo inversion over the Biscayan Sea. Signals sounded a bit like Aurora.

This was the first real long distance Tropo opening to the North that I observed within the last 8 years since I am in CT.

IO61 was a new square for me, thank you Robbie! This was square #270 on 2m on terrestrial from the very southerwestern edge of the European continent. Not much left to work.

73
Joe, CT1HZE

Note: Some other CT`s were puzzled and reported this event as Sporadic-E, but it was for sure Tropo.

11.400 km QSO on VHF - no joke!

by Joachim Kraft, DL8HCZ/CT1HZE

In August 2005 there took place several remarkable QSOs on 2m between RW1ZC/MM and G4LOH and EI5FK respectivly. These were new IARU region 1 Tropo records (1):

Aug 7th 2005: RW1ZC/MM IL10GF wkd G4LOH IO70JC over 3493km

Aug 15th 2005: RW1ZC/MM IK18PQ wkd EI5FK IO51RT over 3751km

On August 7th also the 5T5SN 2m beacon on 144.305 MHz was heard by stations in CT and EA1 over about 2600 to 2800km.

On August 15th and 29th D44TD worked into Portugal on 2m over about 2600 km.

Thus August 2005 was definitely a remarkable month regarding Tropo propagation over the Atlantic Ocean.

In April 2008 Alex, RW1ZC/MM who is currently located off the South African coast reports about a recent serious discussion with his second radio officer Alex Andrusenko on the ship about VHF propagation who reported him about a QSO on VHF marine radio on 156.800 MHz in mid (12th to 15th) August 2005. At this time the officer was working on the ship "Sniper" located south of Portugal in direction Gibraltar (ZB2). Between 21:00 and 22:00 local time he received a CQ call from another Russian ship that he answered. This ship was fishing in the area of the South Orkney Islands! Both operators were surprised when they realised their positions. They had a 8 to 10 minute long conservation untill they lost signals. This was on FM using standard marine radio transceivers with about 20 to 30 W output and vertical antennas. Unfortunately there are no more details available at the moment but we have no reason to not believe this report at all. The distance between the two ships is about incredible 11.400 km. See map in fig. 1. Interestingly the first part of about 2600km of this 11.400km path from the CT area via Western Sahara to Mauretania is nearly the same as the repeatedly observed path on 2m from CT to 5T. Consequently a 2m beacon on Falkland, VP8, with a beam to Europe would be an interesting future project.

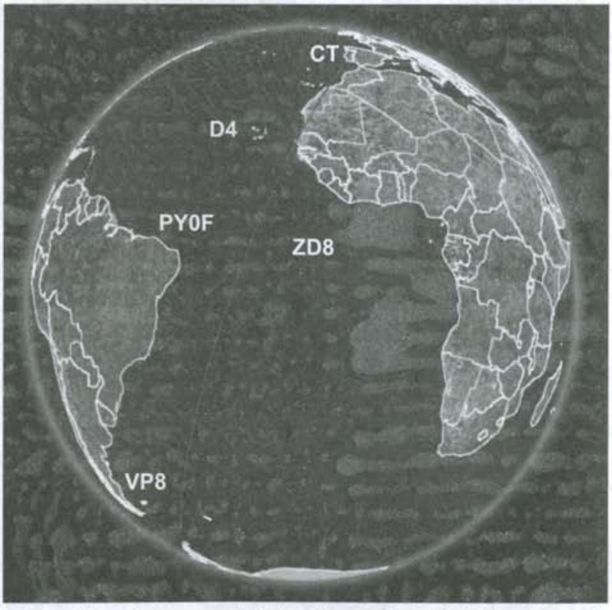


Fig. 1 Path of the phenomenal 11.400 km QSO on 156 MHz. © Google Earth

5183 km on 2m via MS & Tropo

by Joachim Kraft, DL8HCZ/CT1HZE

Recent reports from Australia in the 3000km range and my personal observations of the existing combination of MS and Tropo propagation between EA8 and G (over about 3000km) encouraged me to spend a lot of time to listen for the PY0FF 2m beacon from Fernando de Noronha in the South Atlantic ocean, locator HI36TD. This beacon transmits 30W RF into a 6 element Flexa Yagi beaming Europe and has a clear take off over the ocean. The beacon transmits CW on 144.2983 MHz (USB).

In summer 2007 I have already heard pings on this frequency but was never sure if they were really originating from the beacon.

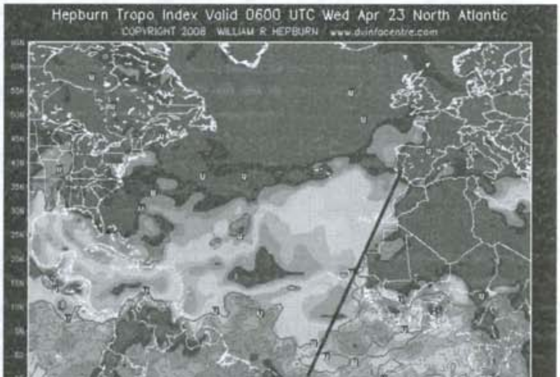
On April 22nd 2008 (Lyrid Meteor shower!) at 21:38 UT I have received a part of the CW callsign of this beacon. The duration of the reception was just a bit more than 1 second but enough to be sure this time.

The distance between HI36TD and IM57NH is 5183km. Not bad at all.

Regarding the propagation mode I assume a first hop from PY0 via Meteor Scatter over about 1800 to 2000km and the rest of the path of about 3200km is covered by Tropo ducting over the ocean. This distance is usual for Tropo propagation in this region. I can often work into D4 (Cape Verde) over 2700km with huge signals.

The Hepburn map for the days around April 22nd indicated a high possibility for strong Tropo ducting between CT and D4 and even further. See the map below.

In August 2007 G4LOH was heard by D44TD over several seconds. QRB just a bit more than 4000km. This was also a combination of MS and Tropo. I was able to hear the same burst from G4LOH on MS (due to mountains there is no Tropo path between us) and the rest of the path from CT to D4 was Tropo ducting again. I heard the D4 even with my beam to G4LOH. For sure this mode is probably not sufficient for making many complete 2-way QSOs allthough it may be the only promising possibility to complete finally a 2m transatlantic QSO.



As one can see from the ERP at PY0FF/B it is not necessary to run EME power level for such mega distance experiments if you have the right location AND you are there at the right time (even more important..) Another example is the 2m double hop Es QSO from June 6th 2007 between Shalom, 4X1UN (KM72UB) and CT1HZE (IM57NH). Shalom was running 50 W RF from a FT-857 and the antenna you can see below! This 3 element antenna has some 4.9 dBD gain. Distance between 4X and CT was 4008 km.

4X1UN, Shalom, with his magic 2m yagi

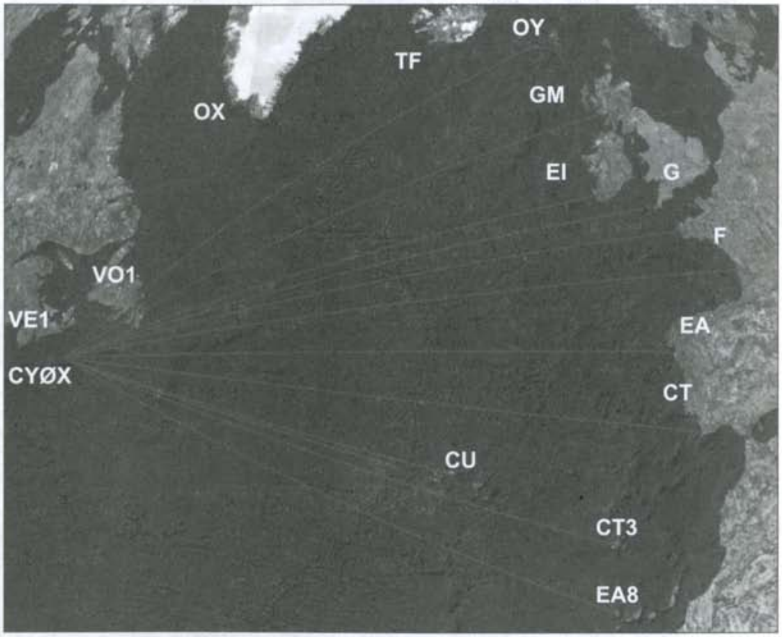
The CYØX – Sable Island 2m Transatlantic Experiment 2008

W3CMP, VE3IKV and K5AND will be qrv with the callsign CYØX from Sable Isl., FN93XV, from June 25th to July 7th 2008. They will be qrv on 6m with QRO and 8 ele. Yagi on 50.117 MHz and will also make a serious effort on 2m. Main target will be Europe and a beacon will be running on **144.300 MHz transmitting CW the first 30 seconds of each minute**. For NA they will transmit on 144.200 every first and third 15 seconds of the minute in SSB/CW. On 2m they will run one long yagi with 14.4 dBD and a 3CX800 amp.

They will also be monitoring frequencies indicators between 55 and 144 MHz towards EU for any indications of propagation to EU. Primary indicators include 70 MHz amateur band, 88-108 commercial FM (EI, GI, Azores, etc) and aircraft tower frequencies from Shannon, EI, and Santa Maria, Azores.

They will have HF liason, most likely frequency is 14.345 MHz. May be they will even have internet access but not sure.

More information about the DXpediton will be posted on **http://cy0x.com/cy0x/**



The map shows the paths from CYØX, FN93XV, to possible 2m customers from Europe.

IP62OA	3942km	OY3JE, OY4TN
IO66XJ	3972km	GM4PMK, GM3SEK (IO74)
IO51RT	3857km	EI5FK, EI4DQ, EI2IP (IO61)
IO70JC	4120km	G4LOH, G4RRA (IO80), G7RAU (IO90), GW4DGU (IO71)
IN78RI	4212km	F8DBF, F0EJW
IN94TR	4636km	F6FHP, F9IE (IN86)
IN52OC	4105km	EA1YV, EA1FDI
IM57NH	4311km	CT1HZE, CT1FFU (IM59), CT1EKD (IM59), CT1ANO (IN51)
HM68KP	2793km	CU3EQ, CU7AAF (HM58), CU7AO (HM58), CU2JX (HM77)
HM49KL	2438km	CU8AO
IM12OP	3927km	CT3HF
IL18AT	4070km	EA8/DL6FAW, EA8TX, EA8BPX, EA8AHH, EA8BEX (IL27), EA8AVI (IL28)

We hope that many stations from Europe will monitor on 2m for CY0X! 73 Chris Patterson, W3CMP

6m News

Reports, Expeditions, Infos

Editor: Joachim Kraft, DL8HCZ

Winter Es USA

N0JK, Jon writes: Somewhat late, but there was a major E-skip opening Feb. 25 - 26 in North America. From Kansas 6M open from 2200 UTC 2-25 to after 0500 UTC 2-26. Numerous double hop Es QSOs spotted such as W7GJ MT to W4TAA FL, XE2WWW MX to NW7O MT, etc. Around 0300 UTC XE2WWW EL06 was working both east and west coast USA. As good as many summer Es. I was watching for an "Es link" to VP6DX while XE2WWW was in, but guess solar flux too low for the 6M F2 hop from VP6DX to Mexico.

Jon, N0JK - Saturday, March 08 2008 at 03:26 (GMT)

Winter/Spring Es Europe

There was more or less no Es on 6m in February and March over Europe. Surprisingly this continued also in April and even until May 7th when a first wider spreaded opening occured from CT to F, G and I.

Expeditions & OPs

3V DL8YHR + EA7KW plan to activate 57 from Tunesia for one week in June. Trip is not confirmed yet as no 6m licence was sure. In case 3V fails DL8YHR will go to

SU Egypt (Loc. KM50) for 6m (and 2m) EME in June.

6W Senegal: T98A went qrt in the end of July as ST2A and is now qrv for about 2 years as 6W1SJ from IK14.

9A Malta: TF3IT, Jonas, has moved to 9H and ist qrv permanently as 9H6BA from Gozo Isl., JM76BA, on 6m.

9Q Kongo: 9Q1EK is qrv fpr another 1 to 2 years on 6m. Loc. is JI75pq.

C9 Mozambique: CT1BXT is qrv as C91R untill August with 100w and a small yagi. – ZS6WB etc plan an expedition from July 16 to 30 incl. 6m EME. Loc. KG64IE.

CY0 Sable: VE3IKV, K5AND, W4TAA and W3CMP plan to be qrv from June 25 to July 6, main station 800w + 7 ele in **FN93XW CY0X 50.117**, second station 100w + 5 ele from **GN03CX CY0RA 50155**.

FP St. Pierre&Miquelon: FP/KV1J and FP/W1MAT will be qrv on 6m from July 9-14th from GN17. 100 watts into verticals QSL via their home callsigns, info www.kv1j.com/fp/

HB0 Liechtenstein: HB0/ON4IPA ist qrv from 28.6. to 5.7. from JN47qf also on 6m.

HK0 San Andres: K7BV is qrv as 5J0M on 6m from 28.6. to 6.7. with 1 KW + 7Ele for EU. Loc. EK92DM. See also V3.

IM86 EA7/DH6DAO will be qrv from IM86ar on 6m from Juen 25th to July 9th.

JW Svalbard: JW/PE1L is qrv from June 4 to 14 with 100w and 4 ele fixed to EU. Loc. Is JQ78 at JW5E.

JX Jan Mayen: JX/G7VJR + SQ4MP are qrv from 25.6.- to 6.7. on 6m in CW. Info: www.jx08.eu

LA9JKA is qrv from 27.3. to 8.10. as JX9JKA on 6m in SSB and Digi. QSL via Homecall.

KL7 Alaska: KL7/W6JKV ist qrv on 6m from 18. to 30.6. with 800w and long yagi for EU. Loc.: BP64

/MM UT1FG/MM Yuri is back again now in the Pacific area cruising beween Peru, Panama and Caribbean. He is always qrv on 50.110 in USB only. He will be on the ship untill July.

OH Finland: From June 12 to 15 there will be qrv a special event station from the Scandinavian VHF Meeting from KP21GJ also on 6m.

OJ0 Market Reef: OJ0VR ist qrv from July 11 to 14 on 6m. Loc. JP90. QSL via OH1VR.

T6 Afghanistan: VK1UN (ex EX1UN) is qrv as T61AA untill at least March 2009 on 6m with 8 ele and 600W. Loc. MN21.

V3 Belize: K7BV is qrv on 6m from 20. to 26.6. with 1 KW + 7 ele. on 6m as V31BV. Loc. EK57xr.

Infos: www.qth.com/k7bv/caribe2008 See also HK0.

VP2M Montserrat: M0AEP is qrv again as VP2MDD on 6m from June 6 to 19.

VP5 Turks&Caicos: VP5/K0OK ist qrv from May 21 to 28 with 100W + 7 ele from FL31.

ZD7 St. Helena: KC0W went QRT as ZD7X in June and moved to ZD9 where he will stay for 4 to 6 months. Also 6m operation was announced. QSL via WØMM.

ZF Cayman Isl.: K4BI + K2ZD are qrv on 6m as ZF2BI or ZF2ZD from 29.6. to 8.7. with 1KW + 5 ele yagi. Loc.: EK99GI. Take off to EU is perfect. Beacon on 50.095 MHz.

Beacons

SR5FHX 50.023 MHz, KO02LL, 3 W, 3 ele, 240 deg, is qrv again since April 28th 2008. (ex call SR5SIX)

CT1FFU plans future 6m beacons for C9 Mocambique and D2 Angola.

W6JKV-K5AND Six Meter BBQ

Another 6m BBQ will take place on September 26-27 in Austin, Texas at the QTH of W6JKV.

4m News

Reports, Expeditions, Infos

Editor: Joachim Kraft, DL8HCZ

Czech Republik on 4m in 2008

20 experimental licences for 4m operation were granted. QRG range is 70.200 to 70.300 all modes and 10 W ERP. The licences are valid untill Dec 31st 2008. Several stations are qrv and many "firsts" have been worked already. The first DL QSO was OK2POI JN99 to DI2PM JO30 on Feb 26th 1420z.

Italy, Sardinia, SMOM and Vatican back on 4m now

Italy is back on 4m: From April 30tt to December 31st 2008 all Italian amateurs can use the same QRGs again as in 2007: 70.1, 70.2 and 70.3 (all modes) +/- 12.5 kHz. Max. 25 W EIRP. The I0JX beacon from JN61 on 70.088 MHz was switched on already on April 30th.

DL again on 4m: DI2PM, DL3YEE + DI2AW

All current DL 4m licences are issued for the QRG 69.950

MHz and max. 9.9. WEIRP. Hans, DL8PM, continues to be qrv as DI2PM from JO30. DL3YEE is qrv again since May 1st from JO42 and DL4VCG, the UKW manager of the DARC district Saarland, is qrv on 4m as DI2AW untill Jan. 31st 2009. Also DD7PC (JN48) and DL9USA (JO71) have applied for licences and should be qrv soon.

France on 4m?

The French Radio Club REF announced in a recent bulletin that they negotiate with the French PTT also about 4m access and that there are some positive signs. Keep fingers crossed!

Portugal on 4m in 2008

The CT PTT ANACOM plans to release sections of the 4m band arround 70.2 MHz to all class A licence holders in CT very soon. The beacons CQ5FOUR from IM59, CU8B from HM49, and a new one CQ3FOUR from Madeira (IM12) will be back and QRGs will change into the beacon band below 70.1. **CU3EQ (HM68KP)** will be qrv on 4m soon from Azores Isl.

Finland on 4m in 2008

The OH radio club RATS (Radio Amateur Technical Society) has decided to apply for a 4m special licence for the Scandinavian VHF meeting (June 13th to 15th 2008). The location of the station will be in KP21. Also a 4m beacon will be installed that should be activated already in May.

New 4m Beacon from Croatia

9A2SB/B is a new beacon on 70.080 MHz from JN95GM running 1 W into a 3 ele yagi beaming 300 deg.

New 4m Beacon from Italy

IZ1DYE/B is a new beacon on 70.109 MHz from JN45AC running 1W into a 3 ele yagi at 450m a.s.l.

70 MHz Initiative

The CEPT Working Group on Frequency Management, WGFM, was being asked at its meeting in mid February in Athens, to consider a secondary allocation to the Amateur service at 70 MHz. There was not the necessary majority of votes to add 4m officially as a possible amateur radio band in the footnotes of the ECA table. Countries like DL, F and even SV and OZ did not vote in favour the proposal. Strange as in OZ and F there are already existing national 4m allocations for amateur radio. However, it was agreed that there will be added a footnote in the ECA that "in some countries 4m is used for amateur radio". This may help other PTTs to justifiy a national release, too.

The 2008 Edition of the 70-MHz and Cross-Band Contest

GENERAL

The Rome branch ("Sezione di Roma") of the Italian Amateur Radio League - ARI institutes the 70-MHz and Cross-Band Contest, with the main aim to promote the utilization of the 70-MHz band that is getting available in a growing number of countries.

DATE

The 2008 edition takes place on Sunday 15th of June.

TIME

The contest starts at 06:00 UTC and ends at 20:00 UTC (14 hours).

THE PLACE

Four meters (70 MHz) and six meters (50 MHz).

SECTIONS

There are three sections:

• Section #1 "70-MHz stations". Stations participating under this section:

- are located in a country where 70 MHz operations are authorized;
- must make all contacts transmitting on 70 MHz only, and receiving either on 70 MHz (inband) or on 50 MHz (cross-band).

• Section #2 "50-MHz stations". Stations participating under this section:

- are located in a country where 50 MHz operations are authorized;
- must make all contacts transmitting on 50 MHz only, and receiving on 70 MHz only (crossband).

• Section #3 "70-MHz SWL stations". Stations participating under this section:

- can be located in any country;
- may only report 70-MHz receptions of stations participating in the Contest.

For each section no distinction is made among fixed / portable, single / multi-operator, European / non-European, QRP / QRO stations.

A given station may participate in just one of the three above sections.

ALLOWED MODES

• USB
• CW

CONTEST CALL

• on USB: "CQ four contest"
• on CW: "CQ FC"

EXCHANGE

A contest exchange consists of:

• Call-sign;
• RS(T);
• four-character WW Locator (e.g. JN61);
• DXCC country (only if the country cannot be uniquely determined on the basis of the utilized prefix).

FREQUENCIES

• stations transmitting on 70 MHz may only use the band segments authorized in his country and anyway within the 69.900 - 70.500 MHz range. Split-frequency contacts within that range are allowed;

• stations transmitting on 50 MHz may only use the 50.250 - 50.300 MHz band segment. It may be convenient to transmit with a 5-kHz channelization (i.e. precisely on 50.250, 50.255, 50.260 ... MHz).

SCORE

The score is obtained multiplying the number of worked Contest stations by the total number of worked DXCC countries (including your own country) and then by the total number of worked WW Locators:

Score: worked Contest stations * worked DXCC Countries * worked WW Locators

A station may be worked just once, with no distinction between USB and CW. Repeated contacts or heards do not count for the score.

When counting the number of worked DXCC countries and WW Locators no distinction is made between in-band and cross-band contacts.

OTHER RULES

All licence conditions must be observed

Use of the DX cluster is permitted, however self-spotting is not allowed (except, sporadically, for any station having permit to transmit only below 70.000 MHz). Use of Internet chats during the Contest is not allowed.

Non valid contacts are:

- those made via repeaters or passive reflectors (EME).
- those made with the aid of a PC (e.g. PSK, JT or other digital modes), except for CW.

ENTRIES

Participation in the Contest is formalized by delivering via e-mail the Contest Summary Sheet and the Contest Log within July 30th 2008 to the Contest Manager Stefano Castriotta IW0CZC (e-mail: stefano.castriotta@tiscali.it). It is the entrant responsibility to verify the delivery acknowledgment, and to solicit it if not received within two days. Il Contest Summary Sheet (on PC file, whatever common text format) must show:

- Callsign used;
- Name of callsign licensee;
- Contest section;
- Operator(s);
- Station WW Locator;
- E-mail address;
- Regular mail address;
- Working conditions;
- Operational condition (fixed, portable ...);
- Total number of worked stations (after discarding duplicates)
- Total number of worked DXCC countries;
- Total number of worked WW Locators;
- Declared score.
- Signature.

Contest Log

For each contact / heard, the Contest Log shall show:

- Date;
- Correspondent call-sign;
- Transmit band (or receive band for SWLs);
- Transmit mode (or receive mode for SWLs);
- Given RS(T);
- Received RS(T);
- Correspondent WW Locator;
- Correspondent DXCC country.

Moreover the cross-band and duplicate contacts shall be clearly identified.

The Contest Log shall be submitted on PC file in ADIF format. You are kindly required to comply with the ADIF utilization criteria indicated in the Attachment. Submission of file in PDF format instead of ADIF is also acceptable though discouraged. In absolutely exceptional cases the Contest Summary Sheet and the Contest Log may be instead submitted via regular mail to the following address: A.R.I. - Sezione di Roma, CP 361, 00100 Roma San Silvestro - Italy.

PRIZES

Prizes consist in personalized plaques and silver key rings offered by the Contest sponsor (company Space Engineering, www.space.it). A personalized plaque and a silver key ring will be won by:

- the Section #1 station achieving the highest score in absolute;
- the Section #2 station achieving the highest score in absolute;

Excluding those two stations, a personalized plaque will be won by:

- the Section#1 station achieving the highest score in his nation (not distinguishing among the DXCC countries of a nation), provided that at least two Section#1 logs are submitted from that nation;
- the Section#3 station achieving the highest score in absolute.

The contest results will be published on web page http://www.ariroma.it/ within year 2008.

DISQUALIFICATION

An entrant may be subjected to disqualification if:

- not strictly observing his licence conditions;
- not strictly observing the Contest frequency limitations;
- claiming contacts / heards that did not actually take place;
- not showing the duplicate contacts / heards in his log;
- self-spotting his call-sign on the DX cluster;
- utilizing the Internet chats.

The Contest Manager decision is final.

Attachment - Contest Log file specifications

Please make sure that the following ADIF field are used in your log:

- Date: field QSO_DATE
- Time: field TIME_ON
- Correspondent call-sign: field CALL
- Transmit band: field BAND
- Transmit mode: field MODE
- Given RS(T) : field RST_SENT
- Received RS(T) : field RST_RCVD
- Correspondent WW Locator: GRIDSQUARE
- Correspondent DXCC country: field DXCC
- QSO type: field COMMENT

In the QSO type (COMMENT field) please write:

- CB for cross-band contacts;
- and / or DUP for duplicate contacts.

For an easy management of ADIF files, you are advised to use the free ADIF Master program which can be downloaded at http://www.dxshell.com/

News & Comments

Editor: Joachim Kraft, DL8HCZ
Funk-Telegramm@t-online.de

Expeditions and DX

IN86 F/ON4IMM will be qrv from August 10 to 14 with 250w and 10 ele on 2m FSK-MS (144.370). Loc.: IN86UX.

JM99/KM09 SV8/DL3ZAL is qrv from Juli 4 to 27 on 2m for Es with 10 ele and IC706 qrv. QTH is Korfu Isl.

JP51 LA/PA5DD plans to be qrv in the Geminids in mid December on 2m via FSK-MS.

JP91 OH6ZZ/MM is qrv on June 7 from about 10z on 2m FSK-MS. Rig: 2 x 8 Ele. + QRO.

KM46 A group from SV1 is qrv as SX5A from July 27 to August 4 on 2m FSK-MS and 70cm and 6m. Loc. KM46tc.

KO09 OH6ZZ/0 is qrv on June 8 on 2m FSK-MS. Rig: 2 x 8 Ele. + QRO.

KP21 During the Scandinavian VHF Meeting (June 12 to 15) there will be activity from KP21GJ from 6m to 23cm.

C9 Mozambique: ZS6WB etc plan a 2m/6m EME expedition from June 16 to 30. Loc. KG64IE.

CN Marocco: HB9HLM will be qrv again as CN2DX from July 26 to August 8 on 2m and 6m from IM63BM.

CT3 Madeira: CT3/DK2ZF will be qrv October 11 to 22 on 2m EME in JT65 with 4 x 11 ele and 500w. Loc.: IM12js

CY0 Sable Isl.: VE3IKV, K5AND, W4TAA and W3CMP will be qrv from June 25 to July 5 as CY0X from FN93XW on 2m with 1 long yagi and 3XC800-PA for transatlantic experiments with Europe. They will run a CW beacon on 144.300 MHz transmitting always the first 30 seconds of the minute.

HL Korea: HL4GHT is qrv on 2m (and 6m) EME from PM35 in JT65.

JW Svalbard: JW5E (PE1L and PA0ZH) will be qrv 2m EME in JT65 and FSK-MS from June 3 to 14. Rig: 800w and 2 x 10 ele xpol. Loc: JQ78tf. EME QRG: 144.110 MHz.

IQ50 Jan Mayen : LA9JKA ist qrv untill about October 10th as JX9JKA on 6m and also 2m and 70cm EME is planned with 2 yagis and 1 KW each. Loc. IQ50.

OJ0 Market Reef: A group from SM plans to be qrv on 2m FSK-MS in the first week of June. Loc. JP90.

OX Greenland: OZ1DJJ will be back and qrv as OX3LX in late June from GP60 and GP70 and may be other squares. From mid July to about 5 August he will be qrv from HP15. Bo will be on 6m and 4m mainly for Es but considers also a 2m EME activation with one long yagi and a 500w-1W PA.

Z3/E7 Mazedonia/Bosnia: Z3/OK1DFC & E7/OK1DFC planned to be qrv in the second week of June from KN02 + JN92 on 70cm and 23cm EME with 3.2m dish and 1500 and 800W respectively.

F1HDI (ex J79DI) plans to be qrv on 2m EME in Sept./Oct. 2008 from S9 Sao Tome.

HP Panama: HP3XUG (ex KG6UH/DU1, HL9UH) plans to be back soon on 2m EME with 4 x 17 ele Xpol + KW, 70cm EME with 4 x 28 ele + 8874 and also 6m EME. Loc. EJ88SK.

R1M Malyj Vysotskyj: OH5LID, OZ2M and a team from UA1 will be qrv as R1MVE from June 5 to 12 on 2m FSK-MS and EME in JT65. Loc.: KP40GP. They will also have a Tropo station for 70cm (may be EME) and 23cm. No 6m operation!

T6 Afghanistan: VK1UN is qrv as T61AA untill at least March 2009 on 6m. He is already qrv on 2m EME in JT65 with a single 9 ele and 750W and worked many QSOs. New location is MN21OE.

UK Usbekistan: UK/DL9LBH has got his licence now and builds his 2m EME station with 2 x 11 ele and 750w. Later he plans to upgrade to 4 x 11ele. Loc.: MN41OG.

ZD8 Ascension: W1MRQ is now on ZD8 and plans to be qrv for a few months this year on 2m EME. From August 2009 he will be back as KC4/W1MRQ from McMurdo / Antarctica.

IM86 EA7/DH6DAO is qrv from June 26th to July 9th from IM86AR on 6m and 2m in SSB/CW for Es/Tropo.

IP62 OY4TN is qrv permanently on 2m with 300W + 9 ele on FSK-MS and EME (JT65). He will ad a second 9 ele soon.

SU DL8YHR + EA7KW plan to be qrv from June 28 to July 7 as SU8EME from Cairo/Egypt on 2m (1KW + 12 ele) and 6m on MS and EME. No 70cm as no licence is possible for this band in SU. They did not get a 6m licence for Tunesia.

ZB2 ZB2/DH7FB & DF2ZC had to cancel their expedition that was scheduled for the end of May. Currently only VHF licences for QRP are granted for ZB2. This was requested from the ZB2 PTT by the Gibraltar Amateur Radio Club. It looks like that they do not like to welcome big VHF expeditions from foreigners any more, like in Monaco and Andorra. They plan now to activate **GJ – Jersey** (or GU) arround the 19th of October on 2m EME and ME.

JT Mongolia: PA4EME will be qrv in August 2009 as JT1EME on 2m EME (JT65). Rig: 1k + 2x16

JP42 LA/PA5DD plans to be qrv in Perseids on 2m FSK-MS.

F/LA0BY/p Perseids 2008 activity from JN02SV

This year I plan to activate this relatively rare square in the French Pyrenees on 144 MHz during the maximum of the Perseid shower. I will participate in the QRP class of the MMMonVHF/DUBUS MS-Sprint Contest and will therefore be QRV for random SSB on 12.08.2008 from 00:00 to 23:59 UTC. My location will be at 1400 m asl with superb take-off from Northwest (EI) over North to Southeast (LZ/SV). My

equipment will be a single 9-ele-F9FT yagi and 150W RF power into the antenna. Operation will be in SSB only, with 1 min periods (breaks every 10-15 s). Please make sure that final RRR are exchanged so the contact is complete. I will use the frequency 144,195 MHz (perhaps +/- 2 kHz depending on QRM). On site I will not have access to the Internet or DX-Clusters, but can receive/send SMS through my French cellphone +33-6-86913388.
Note: From the same location I plan to participate also in the VHF Contest on 5./6. July 2008. Probably being QRV from early evening on Saturday to late morning on Sunday.
73, Stefan (LA0BY) Email: la0by@nrrl.no or la0by@darc.de

Silent Keys

The following operators became silent keys recently:

SM5MIX, Ulf Gustavsson, another well known SM EME and 2m DX ham is SK.

YO7VS, Dietmar Schmidt, YO7VS, from KN15, 6m and 2m DXer died on March 29th in the age of 69.

UT5EU, Vladimir I. Chalapko, (ex RB5EU), KN78, VHF/UHF-Dxer died in March 2008.

LY2IC, Vytas Matonis, 2m DXer from KO14, only 54 years.

SP1JX, Andrezej Wlodarczyk, who was also the Polish DUBUS distributor for many years, died in March 2008.

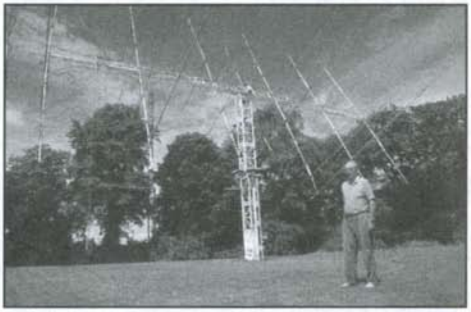
SP7NJX, Andrzej Pajak, VHF Dxer from JO91, died on March 27th 2008.

SP9AFI, Kazimierz Gaszczyk, Microwave operator, died on March 1st 2008.

SM7BAE, Kjell Rasmusson, well known 2m and 6m EME operator died on March 22nd in the age of 79.
DUBUS has decided that Kjell is member #2 in the DUBUS Hall of Fame of VHF/UHF/SHF operators.

SM7WT, Stan Gulich writes:

In memoriam. It is always a heavy burden when one of our mentors has passed away. Their eagerness to improve technology and our knowledge about what can be achieved has paved the way for us. Kjell was one of these outstanding forerunners. When the first attempts were made to use the Moon as a passive reflector, almost all the active hams could be found in North America. Kjell was the one, who accepted the challenge to try EME from Europe. Kjell and Yngve/SM7BCX decided to build a 160 element array at Kjell's farm and their first step was to attend a training course – in welding! Shortly after the first successful QSO:s, a tremendous storm destroyed the antenna. This would probably make most hams give up any further attempts, but Kjell and Yngve just started rebuilding the antenna and Kjell's EME activity continued. In 1981 Kjell became the second one – after VE7BQH - outside the USA to have worked all states and in 1983 he became the third one in the World to get DXCC for 144 MHz. His QSO with ZL1AZR became the World record, which remained unchallenged for many years. Kjell was also definitely one of the very few, who after calling CQ on 144 MHz had been answered by ZS8IR and ZF8OC. For someone with Kjell's energy, 160 elements were not enough. The lawn offered space for an enormous 360 elements array, but large could be larger and after a while the 24 x 15 elements were replaced by 24 x 20 elements. Now, if you can work DX via EME on 2 Meters, why not on 6 Meters? Some of the 2 Meter Yagis were replaced by 6 Meter antennas and Kjell could continue to work DX on 6 even when the number of sunspots was low. DXCC on 2 and 6 was not enough. Kjell is probably the only one in the World to have DXCC on all 11 bands from 2 to 160 Meters. (If there is another one, it must be W5UN.) It is easy to envisage Kjell as someone, who spent his life, working DX and building antennas, but first of all, he worked on his farm. Even after one of his sons took over, Kjell helped out on the fields, whenever needed. It is tragic that someone, who has lived a healthy life and who less than a year ago still had his enormous energy, shall slowly be defeated by cancer just a month prior to his 80'th birthday! Kjell's own words were: "It's unfair!" We will always remember Kjell not just for his achievements and his outstanding energy, but also for his modest approach and his helping hand! Carin, Irene, Anders, and Arne, we are many who share your sorry!
Stan SF7WT



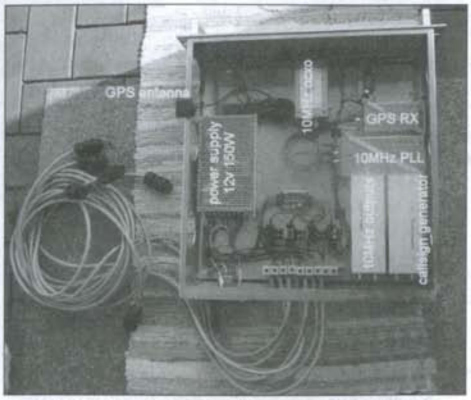
SM7BAE and his EME antennas

Beacons

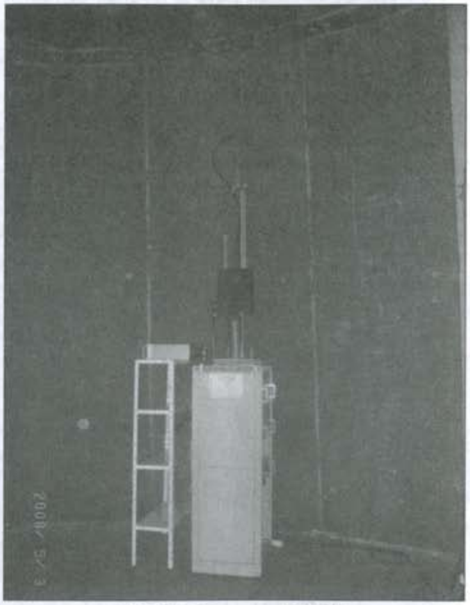
CU2VHF 144.401 MHz, HM77DT, 30W, 2 x yagi, EU + USA, 835m a.s.l., proposal for June 2008.

IQ0OS/B 144.449 MHZ, JN61ES, 2 x Big Wheel, 3W. QRV

DB0FGB, JO50WB, 1100m asl, 60m agl, is back qrv since May 7th with new hardware. Frequencies:
2320.833 MHz, 3400.833 MHz, 5760.833 MHz, 10368.833 MHz, 24048.833 MHz, 47088.833 MHz, measured on May 7th: 47088.800,0 MHz, GPS controlled and ant to north: 76032.833 MHz, measured on May 7th 76032.800,0 MHz.
See pictures on the next page.



DB0FGB Beacon controller with GPS, JO50WB



DB0FGB Beacon, JO50WB

DB0FGB Beacon, RF rack for 2.3, 3.4 & 5.7 GHz

OK0EW/B, JO60RN, is running on the new QRG 10368813.0 MHz since the end of April with 1.5W and 2x8 slot, omni.

F6APE/B is back qrv on 5760.949 MHz from IN97RL.

SR6KBL/B is a new beacon from JO80JG (same as SR6NCI/B on 10 GHz) on 24048230.0 MHz, running 0.5W.

IK7UXW/B is a new beacon from JN80XP on 144.467 MHz with 10w 5 ele to 320 deg and also on 1296.800 MHz.

SR6LHP/B is a new beacon from JO81LD on 1296.952 MHz running 150mW to an omnidirectional antenna.

EA9A/B, 10368.910 MHz, IM85MH, 30m asl, 2.5W, sector horn to EA/F/I. QRV since March 17th. ea9ha@hotmail.com

IQ9PA/B, 144.472 MHz, JM68QE, 5 ele Yagi, 360°, 35W, proposal for 2008.

IQ9BF/B, 144.479 MHz, JM77NO, 2xBig wheel, omni, 3W, proposal for 2008.

F5XAR/B, 144.405 MHz, IN87XW, 9 ele. This transatlantic beacon has changed QTF in April from 290 deg to SW.

ON4GHZ/B is qrv since May 5th 2008 from JO20KV on 2320.975 with 15 WERP and 5760.975 with 50W ERP. Antennas are omnidirectional slotted WGs 110 m asl. (ON4IY)

DL0UB-DM0HVL: Ein bewegtes Bakenleben

DM0HVL sendet aus JO62KI auf 144,450 MHz seit dem 3.2.08 und auf 432,450 MHz seit dem 8.12.07. Das ist der „vorläufige Endzustand" einer langen Reihe von QTH's und mehreren Rufzeichen für eine im Grunde einzige Bake. Geboren wurde sie 1971 auf 70 cm in Berlin-Schöneberg in der Martin-Luther-Straße von DC7AN (jetzt DL7QY). Geburtshelfer war DL7HG, der sein „Auswärts"-Kennzeichen DL7HGA zur Verfügung stellte. Bald wurde das Signal für Aktivitäten auf 70 cm störend und der erste Umzug fand 1972 unter der Ägide der DUBUS-Gruppe statt, und zwar auf das Dach des Universitätsklinikums in Berlin-Steglitz. Dort kam noch ein Verdreifacher hinzu, der nun auch auf 23 cm sendete. Nach vielen Jahren wurde das Material etwas ältlich und es entstanden neue Geräte, die auch ein neues Rufzeichen, nämlich DL0UB, erhielten und ab 1977 auf einem Postgebäude in Berlin-Tempelhof ihr Signal auf 2m, 70 und 23cm ausstrahlten. Erweiterungen auf 13, 6 und 3 cm folgten. Nach der Wende zog die Bake nach Phöben bei Werder in Brandenburg um, auf einen Mast der Telekom. Mit der Erweiterung auf 9 cm wurden nun alle Mikrowellenbänder erreicht. Die Antennen befanden sich in 110 und 115m ü.NN. 2007 mussten 2m, 70cm und 9cm das hervorragende QTH verlassen, weil die DFMG pro Standort nur noch 4 Antennen zuließ. 23 cm, 13 cm, 6 cm und 3 cm sind weiter-hin unter DL0UB in Phöben, JO62KK, qrv. Doch nun hören wir wieder - vorläufig auf zwei der „ausgela-gerten" Bänder - das typische Signal mit dem charakteristi-schen „Hickser" im Dauerton und mit dem neuen Rufzeichen DM 0 HVL. Das passt besser zu dem QTH nahe bei der Ha-vel. Es bestehen gute Aussichten, auch 9 cm wieder zu Gehör zu bringen, wenn auch wiederum in einem anderen QTH. Es geht also weiter mit dem „Nomadenleben". Der Betrieb in den letzten Jahren ist DL7ACG, DL7YC, DL7APV und besonders DL7AIG zu danken, auf dessen Grundstück derzeit DM0HVL sendet. (DL7HG, ACG, APV)

New Transatlantic 2m beacon N7BHC/B from FM15PA

N7BHC, Dave, is very interested in 2m Transatlantic experiments and by the end of May he will run a 2m beacon from the QTH of W4SLH at the Atlantic Coast in North Carolina, grid FM15PA. Dave will use a 17 element horizontal yagi and 100 W output. The beacon will key N7BHC/B on 144.291 MHz beaming to Europe.

2m N7BHC beacon QTH in FM15PA with path to EU

W4 to CT: A crazy 5959km path

2m Beacon qrv from Reunion to ZS

FR5DN, Phil, writes: I'm thinking about the way to "re-explore" tropo propagation in our area. I'm also working with Dave N7BHC on that field. I'm in process to change my internet provider, and so have to look for another place for my website. As soon as this is done, i would like to build a page dedicated to tropo in our area. With all necessary info, details, contacts, pictures, etc...

Also will have to get other local hams involved and interested to test. We need to get beacons permanently on the air. I think we may need 4: 1 to ZS, 1 to VK, 1 for TEP, and 1 for general indian ocean (5R8/VQ9/S79 etc). That would be approaching the "ideal" situation. I'm quite confident that we have potential between ZS and FR. It may be THE qso that will attract attention from other hams/locations...

Almost every morning i check visually the horizon, and i can see so "fog" around, some days stronger than others. It deseappears around 0830/0900 local time. Not much seen in the evening by now. So far the Hepburn has not been very exciting between us. So we'll see what's happenning next.

We carried some interesting tests some years ago with VK6HK, and FR1GZ. We monitored VK6RBU on 144.560 and he got positive rx on 2 times, but did not manage a qso. Alerting each others was one of the major problem, and maybe FR1GZ probably didn't believe that the signal he heard was really vk6rbu. It's after contacting VK6HK, Don, on 20m and asking him to play the sound of the VK6RBU that FR1GZ said that it was what he heard! He rxed that from his old home location on the NE coast of Reunion, with clear horizon, altitude maybe around 50/100m or so. My location is somewhat blocked towards VK because of the volcano.

Currently a personal beacon under the call FR5DN ist running from LG78qs with 800w ERP, horizontal to South Africa on 144.400 MHz in CW. Vy73 - Phil - FR5DN

Cell : +(262) 692 56 26 97 - fr5dnpm@wanadoo.fr

DB0JK/B Informationen

DK2KA schreibt: Bitte stellen sie alle 4 Frequenzen von DB0JK auf „zur Zeit außer Betrieb". Es betrifft die Einträge 1296,865 MHz 10.368,865 MHz, 24.192,865 MHz, 47088,865 MHz. Eine Wiedereinschaltung ist nur mit kleiner Leistung möglich, ändern sie die maximale Leistungen auf folgende Werte und den 24 GHz Eintrag auf 24.048,865 MHz.

Bake DB0JK, QTH: Köln Fernmeldeturm Colonius

öL: 6° 55' 59" nB: 50° 56' 55" JO30LX

Verantwortlicher: DK2KA DOK: Z12

H. G. Thum, Speyererstr. 22, 50739 Köln, 0221/1701490

Sendefrequenz	ERP	Ant.	Strahlung	ü. NN
1.296,865 MHz	15W	?	Omni Hor.	244
10.368,865 MHz	15W	Slot	Omni Hor.	244
24.048,865 MHz	15W	?	Omni Hor.	244
47.088,865 MHz	1W	?	Omni Hor.	244

Ob mit diesen HF-Leistungen auf 10 GHz und 24 GHz die Bake dann noch als Regenscatter Indikator nutzbar ist, ist fraglich. Man kann sich schon denken, was der Grund für diese Abschaltung ist. Wegen den gravierenden Änderungen am Standort ist erst mal Bauzeit angesagt. Durch den VFDB-Vertrag mit der DFMG ist ein Betrieb wie bisher nicht mehr möglich. Installationen und technische Einrichtungen, die vor Jahren vom FTZ-Darmstadt installiert wurden, sind nicht mehr zulässig. Auch wenn von den örtlichen DFMG-Verantwortlichen der Betrieb als nicht störend einstuft wird, so müssen sich jedoch alle an den Rahmenvertrag halten.

Im Außenbereich gibt es nur einen 10 GHz-Hohlleiter, der nutzbar ist. Die Antennen für 23 cm, 24 GHz und 47 GHz sind aus dem geschützten Bereich zu entfernen.

Der Status für eine höhere Sendeleistung, der aus einem Europäischen-Forschungsprojekt stammt, ist nach 25 Jahren entfallen. Hier arbeitet die RegTP gut mit dem VFDB zusammen. Bei den reduzierten Strahlungsleistungen müssen dann auch 100 Watt Netzleistung ausreichen.

Was ist zu tun, um wieder QRV zu werden:

Verlegen von 30 Meter langen Koaxialleitungen über den Kabelrost im Außenbereich, bei einer Höhe von 200 Meter über Grund. Mit Blitzschutz und Druckwasserfestigkeit, wenn das eine Firma macht sind ca. 8.000 Euro pro Kabel anzusetzen. Auswechseln der 10 GHz Röhren-TWT in eine Transistor-Endstufe, für den Wirkungsgrad bei kleiner HF-Leistung zu verbessern. Auswechseln der 24 GHz Röhren-TWT in einen Transistorverstärker mit ca. 4Watt HF.

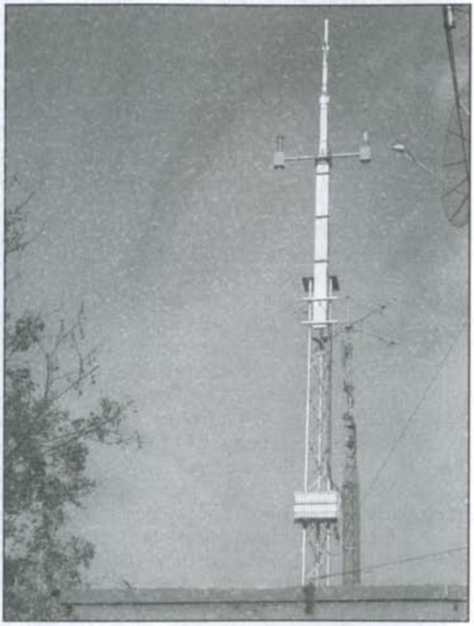
Bau von wetterfesten Außenanlagen Frequenzaufbereitung und Antennen für die Frequenzen 24 GHz und 47 GHz.

Bau von einem wetterfesten Rundstrahler für 23cm.

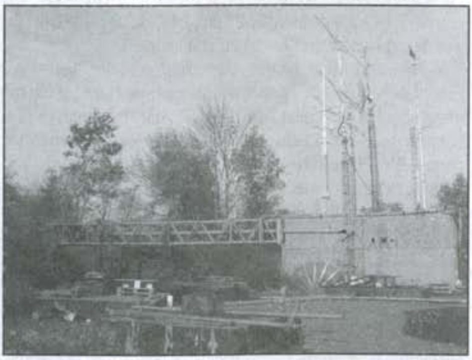
Für alle Komponenten, die aus dem geschützten Bereich in den Außenbereich verlegt werden, wird eine Statik notwendig. Das alles zu machen ist etwas schwierig, bei einem Ortsverband aus Ü50-Mitgliedern. Hinzu kommt noch, wenn der VFDB die Turmgebühren an den OV weiterleitet, muss der OV sich auflösen. Die Turmgebühren von zwei Standorten sind höher, als die OV-Anteile vom VFDB-Gesamtverband.

Also weitermachen mit dem Kölner-Spruch auf den Lippen „ET kütt wie et kütt und et hätt noch immer jot jejange"

vy 73 de Horst, DK2KA, Frequenzverantwortlicher von DB0JK



DK2MN, JO32PC, beacon antenna tower 1296.900 (currently .903), 2320.900, 3400.900 5760.900, 10368.820 & 24048.900 MHz



DK2MN, beacon and contest QTH in JO32PC - in the foreground a tower for DK2FD`s new 2m EME project

Dates

The Scandinavian VHF Meeting 2008

will take place from June 13 to 15 in Finland in the area of Espoo (KP21). Organizer is Erik, OH2LAK. www.rats.fi

Microwave Update 2008

Microwave Update 2008 will be held **October 17-19** in Bloomington, Minnesota. The site is near the Minneapolis airport and next to "Mall of America" The largest shopping mall in North America. In case you are bringing the XYL. In 2009, MUD will be hosted by W5LUA and WA5VJB in the Dallas area. Watch www.microwaveupdate.org for additional information.

UKW-Tagung Weinheim 2008

The next Weinheim VHF-Meeting will take place in Bensheim/Weinheim on **September 13/14 2008**. For more info see www.UKW-Tagung.de

CJ Pictures

Some pictures from the French CJ 2008 meeting are on: http://www.df6na.de/df6na/CJ2008.htm

Sheffield Microwave Round Table

The Sheffield Microwave Round Table takes place on 12 and 13 July 2008. Location details are as follows: Sheffield Transport Sports Club, Greenhill Main Road, Sheffield, S8 7RH. Precise location details can be found online by visiting the club's website at http://www.sheffieldarc.org.uk and following the "Finding Us" link from the homepage.

The conference or "Round Table" will be on the lines of UKuG's other annual events held at Martlesham, Crawley and the Rutherford Appleton Laboratories. It will include up to four lectures, an antenna test range, an all day Bring and Buy and plenty of time for meeting friends and socialising. An informal Saturday evening dinner may also be arranged in a local hotel, again if there is sufficient interest.

It is essential to register for both events so that catering and overnight accommodation can be organised accordingly. Once the organiser has your details he will supply details of overnight accommodation if you require it.

Please register your interest with the organiser, Peter Day, G3PHO (QTHR) at: sheffieldmicrowaves@g3pho.org.uk.

SP Activity Contest – Open Class

The SP VHF Club invites all licensed radio amateurs outside Poland to participate in the SPAC - SP Activity Contest - Open Class. This contest takes place on the same data as the Scandinavian Activity Contest (OZ, OH, LA, SM, LY, ES...). Latest information, rules, results are available at: www.pk-ukf.org.pl/contest/spac.php

Comments

X-band TWTs on 24 GHz

One of the reasons for the growth in 24GHz EME over the last couple of years has been the realisation that it's possible to operate (at least some!) X-band TWTs at 24GHz, and to generate rather significant power. Is there anyone here who understands the physics of this? As a working hypothesis I've

assumed that the helix is operating in a harmonic mode and the device is operating, in terms of the interaction between the beam and helix, very vaguely in a manner akin to a parametric amplifier. I've had a quick look at my books and the wider professional literature, and I can't find anything which refers to the (presumably) harmonic operation of TWTs.
One of the reasons for asking this question is that there are a lot of TWTs for the 15 - 16GHz region available. If they can be persuaded to operate on 47GHz, that might make EME on that band more practicable...Vy 73 Chris, GW4DGU

DJ5AP comments to the article "Simulation and discussion of a multiband feed" in DUBUS 1/2008, p. 29.

Gerhard Schmitt, DJ5AP, send a long letter and wrote that he totally disagrees with the results which were published in the above cited article. He says that several amateurs use this feed with success in Tropo contests and he supplies the following return loss diagramm of such a feed that he has constructed himself. He concludes that the SWR on 13cm could be better, the SWR is rather usable on 9cm, and quite o.k. on 6cm. DJ5AP assumes that there must be a mistake in the simulation may be due to wrong dimensions used or any other weakness in the simulation. However, OM6AA has checked all again and confirmed that there are no mistakes and the result of the simulation still remains as it is.

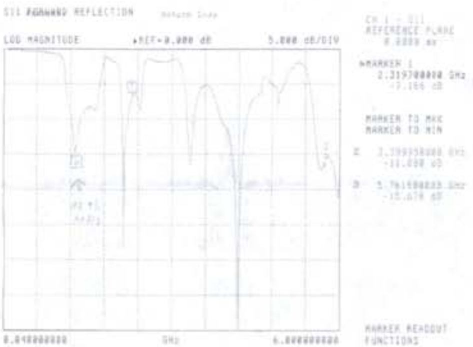


Fig.: Measured return loss of HB9MPU multiband feed

News

LinearAmp U.K. Information

Notice to all our customers. We would like to announce that from March 2008 Elite Interfaces Ltd have taken over the production and support of Linear Amp UK. Contact details:
Elite Interfaces Limited
Elite House
5 Trafford Road
Reading
RG1 8JP
United Kingdom
Telephone: +44 (0) 1189 584600 Fax: +44 (0) 1189 584900
Contact Paul Cullen G4KTZ

23cm EME with QRP

In the first leg of ARRL EME contest we operated from Jamesburg big dish with new 350W SSPA amplifier, and new feed. Signal was the blast, and we made many SSB contacts with S9++ reports. We operated 2m and 23cm at the same time, and we made 111 QSO's on 2M, and 75 QSO's on 23cm. Conditions was good, too.
In the second leg of the contest, we had no access to big dish. Just for experiment and for fun we decided to try 1.2M offset dish and the SSPA amplifier on 23cm EME.
I completed CW QSO with OZ4MM. The video is on You tube. This is maybe the smallest setup for analog 23cm EME ??? (If not, we still have smaller dish) Stig, OZ4MM had impression that we were running big dish with milliWatts. Next day for another experiment we installed W6BY 8 footer TVRO dish on the tripod, on side walk. I completed 7 CW QSO's in in less than 2 hours. We used N9JIM, W6BY and AD6IW callsigns.
73, Goran AD6IW

IARU Region 1 Conference Croatia

In autumn 2008 there will take place another IARU Region 1 conference in Cavtat, Croatia. It looks like that the VHF managers from some national clubs prepare to change the bandplans for several of the VHF/UHF/SHF bands. The main criterion for the subdivision will be the bandwidth of the modes. This could effect that current narrow mode segments (SSB/CW, beacons) may shift again. Of course, all this will happen again without any discussion or participation of the majority of the active Dxers on these bands.... (DL8HCZ)

RW1ZC/MM Report

Alex, RW1ZC, currently off the ZS coast writes:
"My log is very tiny. I had 4 EME QSO in JT65 on 2m - 3 with KB8RQ (from JF94, KF04, KF14) and 1 with W5UN (from JF94). Received abt 10 different stations. Got no more replies - my 100 W is too poor.
TROPO openings along south coast RSA up to 500 km are usual, but only FM repeaters and dozens of ZS2 stations already worked. MS QSOs with ZS6WB, ZS6OB, ZS6BUN on 144 and ZS6BUN on 50 MHz from all possible grids were completed. A couple of MS and Tropo QSOs with ZS2ND up to 700 km were completed.
The beacon ZS1NAZ from KF14 is audible via Tropo with 55-56. But main beam of NAZ antenna is to Reunion island. Anyway, from Cape Town nobody works SSB or CW. All is sadly. This my last trip with the RW1ZC call. In summer I'll change my home from Murmansk area to south Russia in Krasnodar region, to Armavir city. Also I will change my callsign to RA6... or RW6... I suppose in next september i'll be working with new callsign.
Now I have permission from SARL to work as ZS1/RW1ZC, when I am in harbour. Thus I can work on 6m also now."

MMMonVHF and DUBUS

144 MHz Meteorscatter Sprint Contest 2008

The VHF-DX-Portal MMMonVHF (http://www.MMMonVHF.de) in cooperation with the magazines DUBUS and Funk-Telegramm (by Joachim, DL8HCZ) invite you to take part in our new 144 MHz Meteorscatter Sprint Contest, which will take place for the first time in the 2008 Perseid shower. The 144 MHz Meteorscatter Sprint Contest will take place each year on the day of the from IMO (International Meteor Organization) announced maximum of the Perseid shower. Participants may submit all their QSOs done between 0000 UT to 2359 UT. Contest dates for 2008 will be:

Date: August 12th 2008

Time: 00h00m to 23h59m UT (end time of last QSO).

Reference in 2008 from IMO http://www.imo.net/calendar/2008): Perseid maximum 2008: Aug. 12th 11h30m to 14h00m UT (λsol = 140°0 — 140°1)

Logs: Logs have to be sent until September 30th 2008 to: mssprint@mmmonvhf.de with the header: MSSPRINT "CALL" The MMMonVHF team together with the DUBUS and Funk-Telegramm team will take the chance to increase the MS activity in the probably best meteor-shower of the year - the Perseid shower.

Note: No single / multi classes, no extra points for shifting (QSY), no FM / AM - QSOs!

Rules:

Class 1: QRP – up to 150 watts Pout or less and single Yagi antenna

Class 2: QRO – over 150 watts Pout and any Yagi system (single or stacked).

Modes:

all Random QSOs in WSJT (FSK441), HSCW and / or SSB

To count a QSO as complete for this contest it is necessary that both operators must have copied both callsigns, the report and a confirmation that the other operator has done the same. This confirmation can either be an "R" preceding the report or a string of "RRRR..." as explained in paragraph 8.d.ii in App.4 – Revised MS Procedure - interim meeting, Vienna (2004).

Points for a QSO:

The distance between both stations (in km) will give the points for the QSO (e. g. DL8EBW JO31NF wkd LA4XGA JP33VC = 1321km are 1321 points)

Total amount of points (Final Result):

QRB (km) QSO 1 + QRB (km) QSO 2 + QRB (km) QSO "x" = Total amount of distances will be the "Final Result" (e. g. 1000km + 1500km + 1800km = 4300km equal 4300 Points).

Log head:

CALL:

ADRESS:

LOCATOR:

RIG (Pout + Antenna system):

MS-Contest-Class (1 or 2):

Logform:

DATE TIME CALL RST(s) RST(r) LOCATOR KM / POINTS

The total amount of km (=points) shall be written under this table as the "Final Result".

Contest Limitation:

DXCluster and chat will be allowed as long as NO report - and status messages (e.g.: 26 / R26 / CR / QSO complete... etc.) will be spotted. So a spot should look like "DK5EW 144370 PA4EME JN47<MS>JO20" or "OZ1LPR 144355 CQ for MS SPRINT" to show the MS activity on the band without any sign of report or status!

Contest Winner:

Winner of each class (1 + 2) is the station with the highest amount of km (= points=. If there are stations with equal amount of points, both will share the place.

Awards (see picture below):

The first 3 places of each contest class will get an award. As well the results will be published on the VHF-DX-Portal MMMonVHF (http://www.MMMonVHF.de) and in the DUBUS and Funk-Telegramm magazines (both by Joachim, DL8HCZ / CT1HZE) about mid October 2008.

http://www.MMMonVHF.DE

Kind regards, Erwin, DK5EW (MS Sprint Contest Manager) in the name of the MMMonVHF team and in cooperation with the DUBUS / Funk-Telegramm team

MMMonVHF und DUBUS

144 MHz Meteorscatter Sprint Contest 2008

Das VHF-DX-Portal MMMonVHF (http://www.MMMonVHF.de) in Zusammenarbeit mit den Fachmagazinen DUBUS und Funk-Telegramm (Herausgeber Joachim, DL8HCZ/CT1HZE), laden herzlich zum neuen 144 MHz Meteorscatter Sprint ontest ein, welcher das erste Mal während des diesjahrigen Perseidenschauers 2008 abgehalten wird. Der 144 MHz Meteorscatter Sprint Kontest wird von nun an jährlich, jeweils am Tag des Maximums des Perseidenschauers stattfinden. Grundlage ist die Berechnung des Maximums durch die IMO (International Meteor Organization). Die Teilnehmer reichen bitte Ihre kompletten QSOs per Log im Zeitraum 00:00 UT bis 23:59 UT ein. Kontesttermin für 2008:

Datum: August 12th 2008

Zeit: 00h00m bis 23h59m UT (Ende des letzten QSO).

Referenz in 2008 von IMO (www.imo.net/calendar/ 2008): Perseiden-Maximum 2008: Aug. 12th 11h30m to 14h00m UT (λsol = 140°0 — 140°1)

Logs:

Logs sind bis spatestens 30 September 2008 zu richten an: mssprint@mmmonvhf.de Betreffzeile: MSSPRINT "CALL" Das MMMonVHF-Team in Zusammenarbeit mit dem DUBUS- und Funk-Telegramm-Team möchte mit diesem neuen Kontest die Chance nutzen, die MS-Aktivitäten, unter Berücksichtigung des wohl jahresbesten Meteorschauers - den Perseiden (bekannt auch als Laurentiustränen) - zu steigern!

Hinweis:

Es gibt in unserem Kontest keine Einzel- bzw. Mehrmann-Wertung, keine Extra Punkte für einen Frequenz-wechsel (QSY), noch gelten FM und / oder AM - QSOs!

Regeln:

Klasse 1: QRP - bis 150 Watt P out oder weniger und eine Einzel-Yagi Antenne.

Klasse 2: QRO - über 150 Watt P out und / oder Mehr-Yagi Systeme.

Modes:

Es zählen alle Random-QSOs in WSJT (FSK441), HSCW und / oder SSB. Um ein QSO für diesen Kontest als "komplett" zu zählen, bedarf es, dass beide Stationen beide Rufzeichen, den Rapport und eine Bestätigung dessen erhalten haben, dass die andere Station das gleiche empfangen hat! Diese Bestätigung kann entweder ein "R" in Zusammenhang mit dem Rapport sein, oder ein Bestätigungsstring mit "RRRR..." wie es auch unter: Paragraph 8.d.ii in App.4 - Revised MS Procedure - Interim Meeting, Vienna (2004) beschrieben wird.

Punktwertung für ein QSO:

Die Distanz zwischen den am QSO beteiligten Stationen (in km) ergibt die Punktzahl fur das jeweilige zu wertende QSO (Bsp. DL8EBW JO31NF wkd LA4XGA JP33VC = 1321km = 1321 Punkte)

Gesamtanzahl der Punkte (Endergebnis):

QRB (km) QSO 1 + QRB (km) QSO 2 + QRB (km) QSO "x" = Die gesamt überbrückte Distanz aller QSO's zusammen ist das Ergebnis (1000km + 1500km + 1800km = 4300km gleich 4300 Punkte).

Kopf des einzusendenen Logs:

CALL: ADRESSE: LOKATOR:

RIG (P out + Antennen System):

MS-Kontest-Klasse (1 oder 2):

Log:

DATUM ZEIT CALL RST(s) RST(r) LOKATOR KM / PUNKTE

Die gesamt überbrückte Distanz (=Endpunktzahl) muss als Endergebnis unter der QSO-Aufstellung als Endergebnis ausgewiesen werden.

Kontest-Einschränkungen:

DX-Cluster und Chats sind erlaubt, solange keine Rapporte oder der QSO-Status (wie zum Beispiel: 26 / R26 / CR / QSO komplett... usw.) ausgetauscht wird. Dies ist strikt untersagt! Ein Aktivitätsspot könnte aber wie folgt aussehen, "DK5EW 144370 PA4EME JN47<MS>JO20" oder "OZ1LPR 144355 CQ for MS SPRINT" um zusatzlich eine Steigerung der MS-Aktivität auf dem Band durch DXC oder Chat zu erreichen!

Gewinner des Kontest:

Gewinner jeder der beiden Klassen (1 + 2) ist die Station mit der hochsten Endpunktzahl. Gibt es am Ende Gleichstand innerhalb der Klasse, so wird der erreichte Platz geteilt.

Zertifikate (siehe Abb. oben):

Die ersten drei Stationen jeder Klasse erhalten ein Zertifikat. Zudem werden alle Ergebnisse im VHF-DX-Portal MMMonVHF (http://www.MMMonVHF.de) und in der DUBUS, als auch im Funk-Telegramm (von Joachim, DL8HCZ / CT1HZE) ab ca. Mitte Oktober 2008 bekannt gegeben.

http://WWW.MMMonVHF.DE

Mit freundlichen Grüßen, Erwin, DK5EW (MS Sprint Kontest Manager) im Namen des MMMonVHF Teams und in Zusammenarbeit mit dem DUBUS / Funk-Telegramm Team

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The HB0/DF1SR 3m mobile dish for 23 and 13cm EME in May 2008

G4IGO, Ken, writes: This article was intended to be a single stand alone article – however as I started to write the article my view changed and also I found that the project is going to be bigger than I thought – and as time was getting on I decided to offer this part for print – and will compose a second article a little later on. I hope this will become one of several. I base the contents on my 30 years or so of observation on the VHF bands between 28 and 160 MHz, and I offer these articles to promote discussion and thought on the subjects contained. I invite all of you to add to this discussion and also to put your views, and observations into print – whether or not you agree with my observations etc. I hope that you all will be more observant of what is going on and not just rely on what the books etc tell you – times have moved on.

I am not a regular article writer nor am I skilled in the profession so please forgive any errors or lack of cohesion. Also if you don't have an open mind, or have your views and opinions firmly embedded in the past, or are just biased don't bother to read any further – this will not be of interest to you.

How long is a hop ......? Single or otherwise

My prime aim initially using my observation skills was to be able to "predict" when a Sporadic E (E's) opening would take place on 144 MHz. I did this so as to maximise my chances of being around when an opening occurred and therefore to maximise my chances of working rare DX.

I came to several definite conclusions – 1) that E's on 144 could be predicted – about 15 minutes before it occurred and 2) that it could occur on virtually any day between about Mid May to Mid August – with some days having a better chance that others!! 3) That when the band opened (on 144 and latterly on 50 / 70 MHz) the "weakness" that gave the path opening stayed for that year – resulting in the majority of openings occurring in the same direction and to the same basic geographic area. Nothing has changed – it's still as true today as it was when I first started. This is applicable to E's (Sporadic E) and was most clearly seen on 144 MHz – this is NOT the same for E layer propagation – this mode is the main mode that exhibits itself on 50 MHz.

Initially I used the TV frequencies to assist me (48 to 95 MHz), and as time went on the observations of what was occurring on the 50 MHz Amateur band became more and more useful. The additional information gleaned did not alter my conclusions in any way but added vastly to my knowledge.

As activity grew it became clear that we were observing openings that we had not even considered in the early years – the long distance "multiple hop" events. As time passed they in fact became an almost daily occurrence.

What has interested me of late is the continued roll out of the HF theory that many of the openings are 2 or 3 or 4 or more "hops" – but with what proof? I have therefore taken some time to look at certain aspects of this situation and I give my thoughts below.

I have thought about this double / triple or more hops situation and have plotted the maximum hop that can be obtained for a given layer height.

The following are used in my calculations for ease of convenience.

1 The Worlds Circumference is 40076 kms (24903.23 miles)
2 The Earths Radius is 6378 Kms (3963.29 miles)
3 I have assumed, to start with, a non-expanding laser beam of no size - a pencil beam.
4 That the ant is horizontal at ground level (therefore at a 90 degrees tangent to the Earth)
5 That the height of the reflecting layer is constant above the Earths surface
6 That the layer is a mirror of no thickness – a perfect reflector.

I have then calculated various Hops (skip distances) for - A) the same layer height but altering the elevation angle of the "laser beam". B) Altering the layer height. This gives a series of graphs which give the various distances that should be achieved if all is perfect.

Tangent angle is the angle that the aerial exhibits with regard to the Earth's radius, Earth angle is the angle around the circumference of the Earth which in turn gives the Earth range – the distance around the Earth which is the point directly under where the ray hits the layer. Slant range is the distance from the aerial to where the ray hits the layer. Skip is the Hop distance.

HEIGHT OF LAYER = 80 KMS

Tangent Angle /Elevation Angle	EARTH ANGLE Degrees	EARTH RANGE KMS	SLANT RANGE KMS	SKIP Distance kms
120 (30)	1.21	134.70	157.13	269.40
115 (25)	1.48	164.76	184.19	329.51
110 (20)	1.87	208.17	223.88	416.35
105 (15)	2.45	272.74	286.22	545.48
100 (10)	3.44	382.95	394.64	765.90
95 (5)	5.31	591.12	599.92	1182.24
90 (0)	9.03	1005.24	1013.95	2010.48

HEIGHT OF LAYER = 100 KMS

Tangent Angle /Elevation Angle	EARTH ANGLE Degrees	EARTH RANGE KMS	SLANT RANGE KMS	SKIP Distance kms
120 (30)	1.50	166.98	195.57	333.97
115 (25)	1.83	203.72	228.77	407.44
110 (20)	2.30	256.04	277.08	512.08
105 (15)	3.01	335.08	351.89	670.16
100 (10)	4.16	463.10	477.47	926.20
95 (5)	6.24	694.65	706.90	1389.30
90 (0)	10.08	1122.13	1134.00	2244.26

HEIGHT OF LAYER = 120 KMS

Tangent Angle /Elevation Angle	EARTH ANGLE Degrees	EARTH RANGE KMS	SLANT RANGE KMS	SKIP Distance kms
120 (30)	1.78	198.15	233.69	396.31
115 (25)	2.18	242.68	272.81	485.36
110 (20)	2.73	303.91	329.30	607.82
105 (15)	3.54	394.08	415.67	788.16
100 (10)	4.85	539.91	557.33	1079.83
95 (5)	7.10	790.39	805.78	1580.78
90 (0)	11.03	1227.88	1243.00	2455.77

HEIGHT OF LAYER = 150 KMS

Tangent Angle /Elevation Angle	EARTH ANGLE Degrees	EARTH RANGE KMS	SLANT RANGE KMS	SKIP Distance kms
120 (30)	2.21	246.02	290.31	492.04
115 (25)	2.69	299.46	337.92	598.91
110 (20)	3.35	372.93	405.95	745.86
105 (15)	4.31	479.80	508.16	959.60
100 (10)	5.81	646.78	670.82	1293.56
95 (5)	8.27	920.63	942.42	1841.27
90 (0)	12.31	1370.38	1391.37	2740.75

HEIGHT OF LAYER = 180 KMS

Tangent Angle /Elevation Angle	EARTH ANGLE Degrees	EARTH RANGE KMS	SLANT RANGE KMS	SKIP Distance kms
120 (30)	2.62	291.66	346.28	583.33
115 (25)	3.18	354.00	401.96	708.01
110 (20)	3.95	439.72	480.74	879.45
105 (15)	5.05	562.18	597.24	1124.35
100 (10)	6.71	746.97	777.97	1493.94
95 (5)	9.34	1039.75	1068.15	2079.50
90 (0)	13.46	1498.40	1525.00	2996.79

HEIGHT OF LAYER = 200 KMS

Tangent Angle /Elevation Angle	EARTH ANGLE Degrees	EARTH RANGE KMS	SLANT RANGE KMS	SKIP Distance kms
120 (30)	2.89	321.72	383.24	643.44
115 (25)	3.51	390.74	444.08	781.48
110 (20)	4.34	483.14	529.63	966.28
105 (15)	5.52	614.50	654.93	1229.00
100 (10)	7.28	810.43	846.40	1620.85
95 (5)	10.00	1113.22	1147.12	2226.44
90 (0)	14.16	1576.32	1609.72	3152.65

Basically this shows that with a layer height of between 80 and 200 kms the skip distance Maximum will lie between 2010 kms and 3152 kms. It is a known fact that the E layer (or E's layer) ***does often rise*** to heights of at least 200 kms if not more – you can see what effect that can have on the skip distance. You only have to check on the Web to find this – there are many papers, observations etc that show that the height of the E layer / E's layer isn't just set at one height – it varies monthly, weekly, daily, hourly.
However the question posed is – "How long is a hop?" – Well as can be seen it depends – doesn't it – on the layer height or the angle the beam hits that layer. But there is another question – still the same – but a different answer. For the following assume a layer height of 120 kms – the "Standard". This gives a Hop length of 2486 kms.

There is an opening to KM17 grid – about 2500 kms from southern UK –
so 1 hop maximum distance (for 120 kms height)
There is an opening to JN90 grid – about 2100 kms – 1 hop
There is an opening to JN70 grid – about 1780 kms – 1 hop
There is an opening to JN64 grid – about 1373 kms – 1 hop
There is an opening to JN45 grid – about 1052 kms – 1 Hop
There is an opening to JN37 grid – about 800 kms – 1 hop
There is an opening to JN29 grid – about 584 kms - 1 hop
There is an opening to JO10 grid – about 424 kms – 1 hop.

So as you can see there is no such thing as "1 hop range". How far is 1 hop? – it can be from 424 kms to 2500 kms – at least. There cannot obviously be a half hop, or a quarter hop to explain the distances below maximum distance – it can only be 1 hop. So how many hops to KM17?? – Well it can be 1 hop or it can be 2 hops, or it can be 3 hops or in fact it can be 4 or 5 hops – cant it??
The presumption is that there can be 1 or 2 or 3 reflecting areas within the layer, or via a ground reflection, that line up correctly to forward each "hop" and that the loss from layer or ground reflection is negligible. The former I can accept within EU can occur – the latter I am not so sure about. For a layer to have reflecting points that can line up to reflect signals that have also been reflected from the ground and take signals over paths of 4000 kms is, IMHO not possible.

As regards the 424 kms hop with a layer height of 120 kms – this is achieved with an elevation angle of around 30 degrees – this is more than likely the first null on most 5 or 6 ele yagis – in my opinion it is more likely that the layer has dropped to at least 80 kms height, if not less – this gives an elevation angle of 20 degrees – probably on the 3 db point of the aerial. What ever the elevation angle if is not 0 degrees and the reflection from the layer is clean then the ray will come back to earth in such a fashion that, in my opinion, lossless reflection will ***NOT*** take place and the chances of the reflected ray getting back up to the layer to again reflect to give the second hop is very small. This again further convinces me that the chances of even a double hop are limited and as for 3 hops – then little chance.

What I feel that can happen is what we know as chordal hop(s). (Ducting or layer trapping are also possible – more later.) If the ray that returns from the layer is not reflected 100% and with the same return angle then the chances of the ray continuing to pass ABOVE the earths surface – maybe only by a couple of kms or even less, - is high and it can then continue on until it meets the layer again, at about the same distance as a "2 hops" and then returns back to Earth. This will give a much larger variation in distance as there are several areas for variation.

Having been observing the yearly occurrences of E layer / E's propagation for these many years I have come to the conclusion that, when E's is involved , the reflecting point in the layer is very small – only being some few minutes of a degree in size (probably only a few tens or hundreds of metres long / wide / deep etc). Also that the reflecting area may either reflect – or refract the signals. As regards the E layer propagation I am inclined to think that the reflecting area is more than likely to be of the refracting type – yes a contradiction I know – but you understand me!

I base my feelings about the size of the reflecting / refracting area on this scenario – which I have observed time after time on 50 and 144 – it is much easier to see on 144 MHz though.

I beam to the Caribbean. I hear a station in IO90/91 directly behind me calling/working a Caribbean station – I can't hear him. Why not? We both have 6 ele yagis, or thereabouts, and therefore the same vertical beam widths – about 2 to 30 degrees useful. The signal from the Caribbean to the station in IO90/91 is arriving at say 5 degrees – but its only 6 for me – both our beams cover the same area of shy so why don't I here the Caribbean station? Also a station in front of me in say IO70 doesn't here either - why? – If he has a 6 ele beam he is again covering the basic same areas of sky as us others – and he should be getting the Caribbean station at about 7 degrees – well within the capture area.

Then the propagation moves – the station behind me loses the Caribbean station – I now here him – IO70 still doesn't. Then propagation moves again – IO70 hears it and we two lose it – again why? – again I believe it is due to the very small area that is reflecting / refracting.

Of course there are times (many) also when we all hear the same station for hours!! – this I believe is the E layer in operation – and the ducting, bending wave guide effects is in operation – but even then how often have you heard the same situation occurring?

As I say this situation is very apparent on 144 – and also occurs similarly on 50 MHz – but most people miss it as they don't "observe" – they are of course looking to work the DX.

What also happens, many times, but seems to more prevalent of late is the E layer opening, usually indicated by much more stable signals and the area being covered being much bigger that this E's. I have to say that I have not any knowledge of E layer occurring on 144 – this, IMHO, is always E's. The openings we get to the Caribbean are IMHO, E layer openings. We have too little activity to the east to really see the same amount of propagation, but I suspect that the same does occur.

I hope this will cause some of you at least to observe and try and question A) the statements been trotted out time after time (5B is in and double hop, Caribbean is in - must be 3 hops), B) your own views, C) my thoughts. If you can add to this debate please do so – write your own views etc, observations etc – and if your views are different either to mine, or to the establishment views then point us to areas that support your view.

A last couple of thought for you to mull over – tidal effects on the layers due to A) the Sun, B) the moon,C) the strength of the Solar wind, - is it the effect that causes the mid day drop out – and the 2 peaks either side at 0800 and 1600 local??, D) gravitational waves – amongst many other possible causes.

Good hunting – and enjoy the magic band – what ever your view – and always be tolerant of the other persons point of view – none of us may be right – and then again we all may be right.

(Ed.: Take this article as an inspiration for a discussion! Sure many will daubt that there is E layer propagation on any heigth from below 80 up to 200km possible on 6m and 2m respectively.)

Greek YL EME Power: SV2KBS

Enhanced Loop Feed for 23 & 13cm by OM6AA