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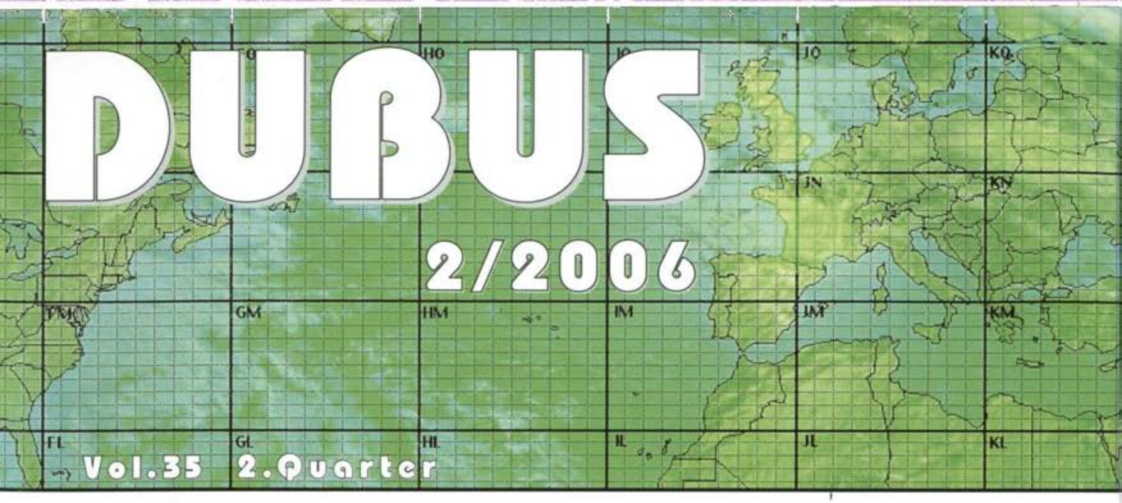
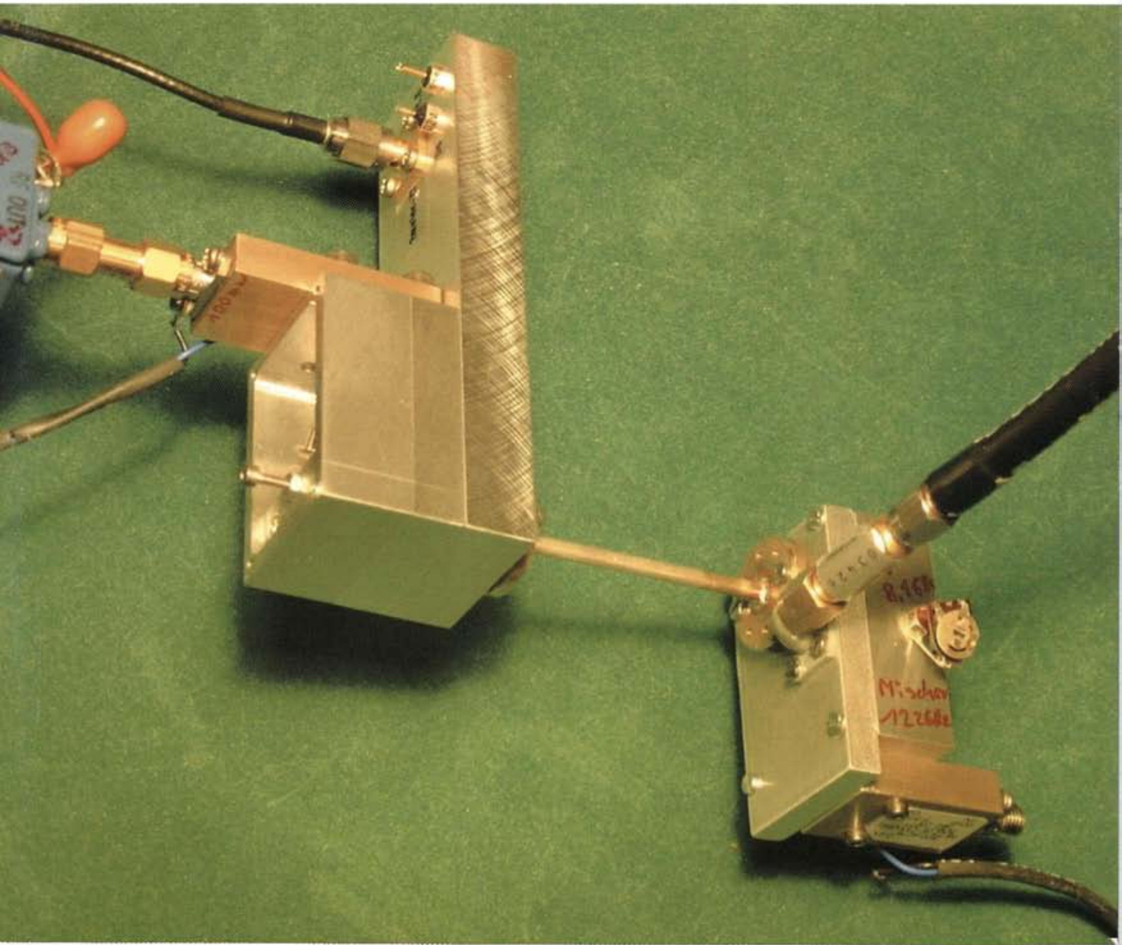


DL2AM`s 122 GHz Transverter



Content / Inhalt 2/06

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Editorial

Dear DUBUS Reader!

we welcome you to an issue with a lot of technical stuff and hope you will enyjoy it. Next issue in August will bring for sure all the activity reports from the hopefully many and big Sporadic E openings and expeditions to rare squares.

DJ5HG`s article in last issue 1/06 has produced a lot of discussions and feedback. Many could not believe that the JT65 mode when using the Deep Search Decoder ("DS") needs to "recognize" just only 2 letters but displays a full callsign. The Deep Search Decoder is needed to "decode" signals at levels from -25dB and less.
And now???
Quite a number of well known EME stations has already started not to use the call3.txt file anymore....

Think about it, discuss and make suggestions for solutions!

Please keep sending your reports and technical articles.

Thank you!

73

from Joe, DL8HCZ / CT1HZE
and the DUBUS team!

Liebe DUBUS Leser!

Wir begrüßen alle zu einer neuen Ausgabe mit besonders viel Technik und hoffen, dass die Beiträge Gefallen finden werden. In der folgenden Ausgabe im August werden dann wieder viele Aktivitätsberichte von den hoffentlich vielen und langen Sporadic-E-Öffnungen und Expeditionen in rare Felder folgen.

DJ5HG`s Artikel, der in der letzten Ausgabe 1/06 veröffentlicht wurde, hat für einiges an Diskussionen und Resonanz gesorgt. Viele konnten nicht glauben, dass bei JT65 in der Tiefensuche (DS) nur 2 Buchstaben „erkannt" werden müssen, um dann ein ganzes Rufzeichen angezeigt zu bekommen. Die Tiefensuche ist nötig, um Signale von -25dB und weniger zu „dekodieren".
Und nun???
Einige bekannte EME-Stationen arbeiten inzwischen bereits ohne das call3.txt-File....

Nachdenken, Diskutieren und Vorschläge machen ist wohl jetzt angesagt.

Für Aktivitätsberichte und technische Artikel sind wir immer weiterhin sehr dankbar.

73

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

122 GHz Transverter with new Multiplier

by Philipp Prinz, DL2AM

As announced in the article about my 76 GHz transverter now follows a description for building a 122 GHz transverter. There are several similar steps in the building and tuning of both versions.

Recently I have built 4 transverters and 3 beacon transmitters (triplers) for 122 GHz and also a mixer for measurement purposes with an IF of 8.251 GHz. Firstly I built a mixer for my HP8569B spectrum analyzer. 12.666 GHz from my synthesiser tripled by the multiplier gives 37.999 GHz tripled again gives 113.999 GHz. 122 GHz minus 113.999 GHz results in 8.251 GHz IF for the mixer. For this I use a RF case for 122 GHz milled for a WR19 output and a 122 GHz mixer PCB from DB6NT and cover plate, DC blocker, multiplier S004079 which was milled by 8mm on the bottom side and a single diode MA4E1317.

The 8.207 GHz IF is delivered to the SMA jack, a snap in type. The tuning on 122 GHz is made, as if we would have a beacon TX, for maximal signal strength with the help of an analyzer and the 40 GHz mixer HP11971 with adapter. See figure 1. When tuning to 113.35 GHz on the analyzer one can see the 122 GHz signal. One has to add small flags to the 38 GHz 50 Ohm stripline. The largest increase in gain is obtained when a flag is located close to the input coupling pin. For the fine tuning please check also my articles about the 76 GHz transverter in DUBUS 4/2005 and 1/2006.
The resistance Ra of the diode is about 200 Ohm, which is equivalent to about 1.95 V.
This mixer can also be used for other frequencies, e.g. 76 GHz:
12.5 GHz x 3 = 37.5 GHz x 2 = 75 GHz. 76.032 GHz minus 75 GHz = 1.012 GHz IF. See figure 2.
Anyway the RF case and PCB has to fit for the QRG. If I mount the multiplier S94-47414 which has an output frequency of 49-51 GHz and WR15 to this RF box, I can detect the harmonics from 40 to 200 GHz, which means that the MAE1317 and HSCH9401 (Agilent) do still work. The needed multiplier needs 12V and 5 V DC and can only triple. See figure 3. By the way this multiplier can be found already at ham radio fleamarkets.

The next step was the beacon TX (tripler) for 122 GHz. This TX consists of the same RF box, 122 GHz mixer PCB, cover plate, and the multiplier S004079 (tripler, 9 V @ 300 mA only). This multiplier can only triple and has a waveguide WR19 output. At about 10 mW already 50 to 90 mW output are obtained.
Here I have also used the single diode MA4E1317. The chain for obtaining the frequency starts with an OXCO from DK2DB at 141.4933 MHz, followed by a multiplier x 96 from DB6NT (= 13.567 GHz / 20 mW).

The tuning on 122 GHz was very easy with the help of the above mentioned mixer. See figure 4. The input of the multiplier was about 12 mW and the outut 80mW. With the Hughes head I have been able to measure power in the microwatt range up to 90 GHz. The resistance Ra of the diode was also about 200 Ohm as mentioned above. One should also try to insert absorbing foam under the cover of the RF box at different locations. The tuning has to be done as described above. For the beacon TX one can also use the larger multipler CHM 382400AUP which can work as tripler and quadrupler as well but delivers less output at 40,7 GHz. I was surprised that I have never destroyed any multiplier yet, because the colours of the wires are mixed up sometimes. Probably because only the colours are mixed but the pins of the jack are connected properly. For all my experiments I have used a homemade adapter plug from the beginning. So this has saved me for sure.

I have tried to build a transverter with the antiparallel diode MA4E1318. See figure 5 and 6. I have used an OCXO of 141.3263 MHz from DK2DB and multiplier x 96 from DB6NT. I discovered that using this diode the LO signal was 10 dB stronger than the upper sideband. I was not able to change this by alignment. So I tried the single diode MA4E1317. When tuning this one I discovered that this diode was better which is easy to understand because of the tripling. Now the upper sideband was 4 dB stronger than the LO. All these measurements are only possible with a spectrum analyzer and a suitable mixer. Selecting 2dB / division can help to make the alignment easier.

It is possible to tune the upper sideband to maximum ouput with the 40.7 GHz tuning. Also these measrurements have been made with the above mentioned mixer. See figure 7.
The power of the lower sideband will be reduced accordingly. Also one can see that the both 144 MHz sidebands at the right and left side have the right distance from each other. See figure 8. To be sure that we have really the 122 GHz I changed the input frequency of the multiplier by 100 kHz with the synthesizer. Then the frequency on the analyzer has to change by 900 kHz which was confirmed. The frequency change of 900 kHz results of the two tripling steps which means 3 x 3 (= x 9).

I have discovered that the upper sideband between 144 and 146 MHz is present two times when working with these two equal transverters. The difference 500 kHz for example and results from the frequency difference of the two LOs. The difference stays unchanged when tuning the VFO of the 2m transceiver. This I also discovered with the 76 GHz transverters, because I have also not used any band pass filters for the upper sideband there. Only if I change the frequency of one OCXO does the separation between the two signals change. I think if I used a filter to suppress the lower sideband and the LO signal the second signal would not appear. But I can not build such a high frequency filter. One can see again that a higher IF (1290 MHz) would be much better. I will make more experiments in the future. For all my tests and measurements I have always taken the upper signal which was 3 dB stronger than the lower one.

Regarding the mechanical construction there are two options. The first is to mill the multiplier S004079 at the bottom side by 8mm, to obtain a small bar at the waveguide, see figure 3. By doing this we do not need the intermediate plate.
The second is to use an intermediate plate of 8mm strength which gets pins in order to adjust the position properly. By doing this we do not need to do the milling of the multiplier.

Now I have sent a beacon TX to Franc, LX1DU, who wanted to test it. We often talk together and exchange experiences. He told me that he was not quite sure if the 122 GHz QRG was right. Anyway I knew that the circular waveguide used (1.7mm inner diameter) should have a cut-off frequency of about 100 GHz. So I could not believe this. Anyway I was astonished and made some more tests. As I had two complete transverters now I could show that the frequency is right: If I use at the one transverter the OCXO of 141,326 MHz and the x96 multiplier and if I tune my synthesizer at the other transverter to 13,567 GHz, then I can detect the SSB signal on the 2m transceiver (FT290). If I increase the frequency by 1 kHz at the synthesizer, the signal at the FT290 has to increase by 9 kHz. This happened indeed! So I was on the right QRG.

Now I also tried the Schottky diode HSCH-9401 from Agilent which I got from Eene, PA3CEG (TNX!). Unfortunately this type is not being produced any more and will be available only for a limited time. When tuning in the way as described above I got 3 dB more output power now. With a second transverter the results were similar.

Also I have discovered that when using a longer circular waveguide the polarisation is shifted. If a FT290R is used as driver it helps to adjust the 2m IF power with VR2006. One has to switch to "low" on the backside of the transceiver. Now one can adjust the power on 40.7 GHz and the power of the IF mixer to maximise the RF level of the upper sideband and best signal to noise ratio in the assembled system. One can not adjust the 100 Ohm pot. on the 47 GHz IF board when the transverter is assembled. See figure 9.

Now it was time for an indoor test but the 9.5cm long WR8 waveguides for the 25cm Procom dish were lacking. I was not able to obtain them in Europe or the U.S. I talked to Franc, LX1DU, and he told me that he would make some. 5 days later I received a parcel with WR8 waveguides and canes (bent WG).

See figure 10. After assembling everything I tried the first indoor test. I located the both stations at a distance of about 10 meters inside my house and was able to make a SSB QSO. The next test was a 2-way SSB QSO over about 1.5 km on February 10th 2006. Signal strengths were about S5 but I think that the dishes were not adjusted properly. For the BBT contest I asked Alex, DL2GWZ, if he would like to try with me on 76 and 122 GHz. On February 4th he arrived but the weather was not very inviting and we had snow predicted. For the test we had chosen a distance of 14km. The equipment consisted of my 4 new transverters for 76 and 122 GHz with 25cm dishes. First we searched each other on 76 GHz in order to adjust the dishes properly. This was no problem and it is really necessary because the aperture of the dishes is only 0.5 degrees. Then we started a first try on 122 GHz on SSB. Both we were quite surprised to have signal strengths of up to S9. Then we made long QSO on FM. This was like a local QSO. I told

Alex, that I could jump 2m high, but my age prevents me... (Figure 11).

During these tests I discovered that the modulation on SSB sounded compressed. So I made further tests. I tried the multiplier with supply voltages between 5 and 9V and got the output reduced by about 6,5 dB with no change in the signal quality. So it was possible to build a circuit that regulates the mixer power with 2 potentiometers for receive and transmit. See figure 12. The potentiometers are chosen so that in both positions a voltage adjustment range of 5 – 9 V can be achieved. This helped to get success: For receive one can adjust for best signal to noise ratio and for transmit for minimal compression. This circuit can be used also for other transverters. For switching the relays I take the negative side of the relays on the 47 GHz IF board.

Here the **measurement results** using a HP 437B and Q8486A and HP 8485A:

Drive power for the multiplier S00-4079 at 13.567 GHz for transmit and receive: 12 mW.
Multiplier output at receive: 20 mW for 5 V DC supply voltage.
Multiplier output at transmit: 80 mW for about 8 V DC supply voltage.
The 144 MHz IF power has to be adjusted individually for maximal output, see figure 13.

Now I test the bent WG sections and feeds for these dishes. Both transverters are located indoor at a distance of 15m. With the potentiometers for the multiplier for transmit and receive one can accurately adjust the signal to just a bit over the noise level and it is possible to make some tests. If one locates some absorbing material (2 x 6cm) into the dish one must detect a change on the signal to noise ratio. If this is not the case the possibilities for measurements are limited. If I feed the 144 MHz IF to the analyzer, the HP141 is also sufficient, and chose 1dB/division it is possible to measure more accurately. A conic transition, which can be easily made with the help of a scalpel, from circular to rectangular WG may improve the signal by 3 dB. If I compare my 25cm Procom dish and Procom feed with other feeds I could not find any significant improvement. For summer 2006 further QSO tests over longer distances are planned on 122 GHz. I wish you a lot of fun with your tests.

Parts for transverter / Bauteile für Transverter

Part	Teil	Source / Quelle
RF case	HF-Gehäuse	Krause
Matching block, WG adapter	Anpass-Block	Krause
IF case	ZF-Gehäuse	Krause
Intermediate plate	Zwischenplatte (zwei Versionen möglich)	Krause
WG feed through	Hohlleiter-Gehäusedurchführung	Krause
PCB 122 GHz mixer	PCB 122 GHz-Mischer	DB6NT
IF PCB 47 GHz, new	ZF-PCB 47 GHz , neu	DB6NT
PCB DC switch	PCB DC-Umschaltung	DL2AM
LT1085 regulator	LT1085-Regler	DL2AM
2 x Potentiometer 1 K	2 Stck. 1 KOhm Wendelpoti	DL2AM
2 Tantalum capacitor 15 + 22uF	2 Tantal C`s 15 + 22uF	DL2AM
Relay 12V	Relais, 12 Volt	DL2AM
Multiplier S00-4079	Multiplier S00-4079	DL2AM
MA4E1317	MA4E1317	DL2AM
HSCH9401	HSCH9401	DL2AM
SMA jack	SMA-Buchse	DL2AM
Input coupling pin 5mm	Einkoppelstift 5 mm	
Output coupling pin 14mm IF, only if intermedate plate is used	Auskoppelstift 14 mm ZF, nur bei Verwendung der Zwischenplatte	
Resistor 1K5	Widerstand 1,5 KOhm	
Resistor 240 or 2x 470 Ohm	Widerstand 240 Ohm oder 2x 470 Ohm	
Mica washer TO220	Glimmerscheibe TO220	
Srews	Diverse Schrauben	
OCXO	OXCO	DK2DB
Multiplier	Vervielfacher	DB6NT
WG WR8 and WR12, „canes“	Hohlleiter WR 8 und WR 12, Krückstöcke	LX1DU
Dish 25cm	Spiegel 25 cm	UKW Berichte

Parts for beacon TX	Bauteile für Baken-Sender	
RF case	HF-Gehäuse	Krause
Matching block / WG adapter	Anpassblock	Krause
Intermediate plate	Zwischenplatte	Krause
PCB 122 GHz mixer	PCB 122 GHz Mischer	DB6NT
Multiplier S00-4079 or CMH382400AUP	Vervielfacher	DL2AM
MA4E1317	MA4E1317	DL2AM
Input coupling pin 5mm	Einkoppelstift 5 mm lang	
Feed through cpacitor 1nF	Durchführungskondensator F 1 nF	
Potentiometer 1K	Poti 1 KOhm	

Parts for measurement mixer	Bauteile für Messmischer	
RF case	HF-Gehäuse	Krause
Matching block / WG adapter	Anpassblock	Krause
Cover panel	Abdeckplatte	homemade / selbstbau
PCN 122 GHz mixer	PCB 122 GHz-Mischer	DB6NT
Potentiometer 1K	Poti 1 KOhm	
Feed through cpacitor 1nF	Durchführungskondensator F 1 nF	
SMA flange jack snap in type	SMA-Flanschbuchse mit Stecksockel	DL2AM
DC blocker	DC-Blocker	
Multiplier S00-4079, milled	Multiplier S00-4079, abgefräst	DL2AM
MA4E1317	MA4E1317	DL2AM
Input pin coupling 5mm	Einkoppelstift 5 mm lang	
Output coupling pin IF 10 to 14mm (depending on plate strenght)	Auskoppelstift ZF 10-14 mm lang (je nach Plattenstärke)	

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DB6NT, www.DB6NT.com	PCBs + Multiplier
DK2DB, www.ID-Elektronik.de	OCXO
UKW-Berichte, www.UKW-Berichte.de	dish/Spiegel
DL2AM, www.DL2AM.de	several parts / verschiedene Teile

References

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DL2AM, cqdl 6/2005
DL2AM, cqdl 2/2006
DL2AM, Dubus 4/2005
DL2AM, Dubus 1/2006

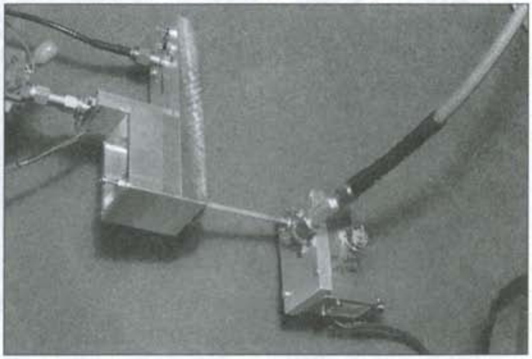


Fig. 7 Measuring with mixer (see also front cover!)
Abb. 7 Messen mit Mischer (siehe auch Titelbild!)

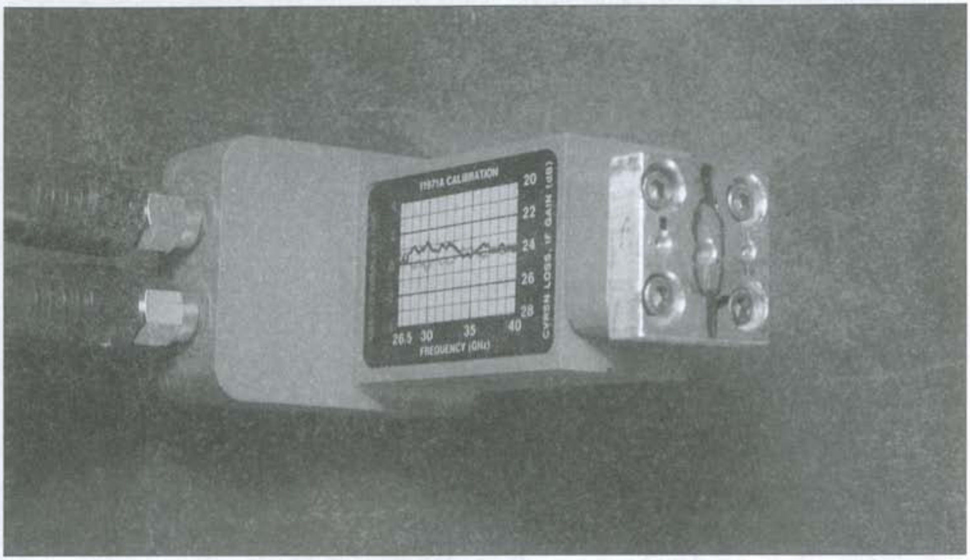


Fig. 1 HP Mixer with adapter srewed on
Abb. 1 HP-Mischer mit aufgeschraubtem Adapter

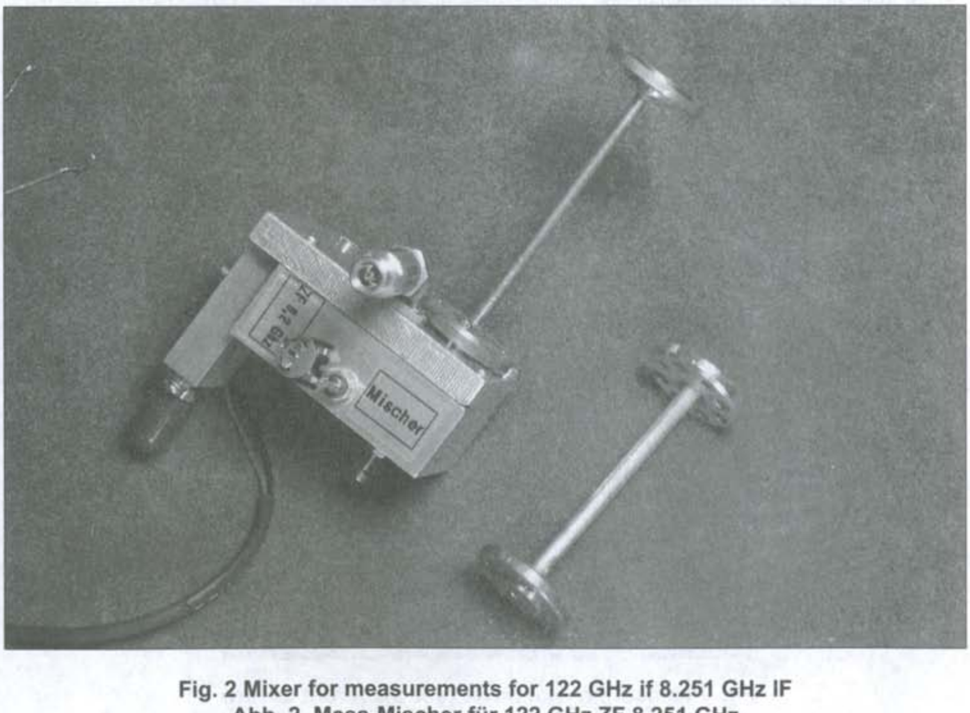


Fig. 2 Mixer for measurements for 122 GHz if 8.251 GHz IF
Abb. 2 Mess-Mischer für 122 GHz ZF 8,251 GHz

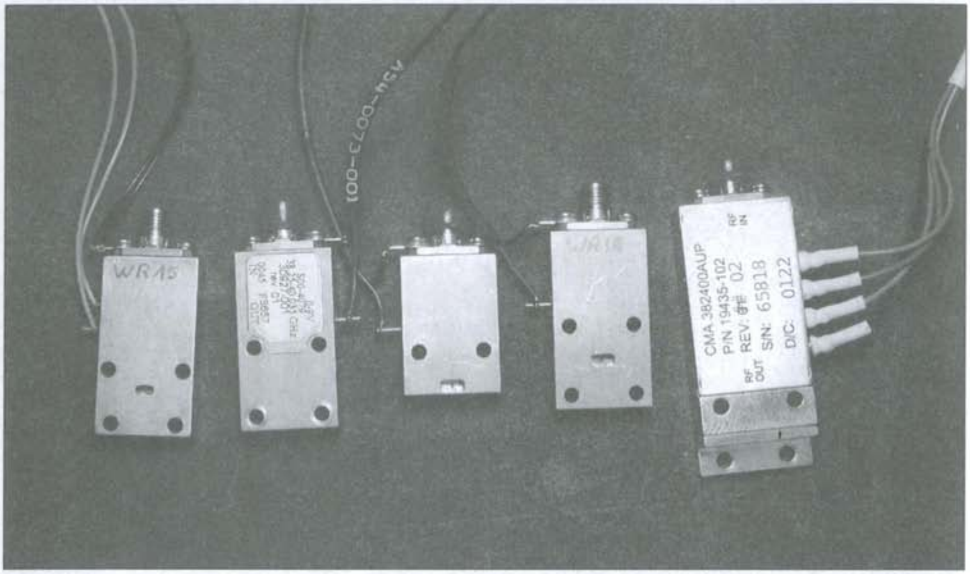


Fig. 3 Several different multipliers
Abb. 3 Verschiedene Multiplier

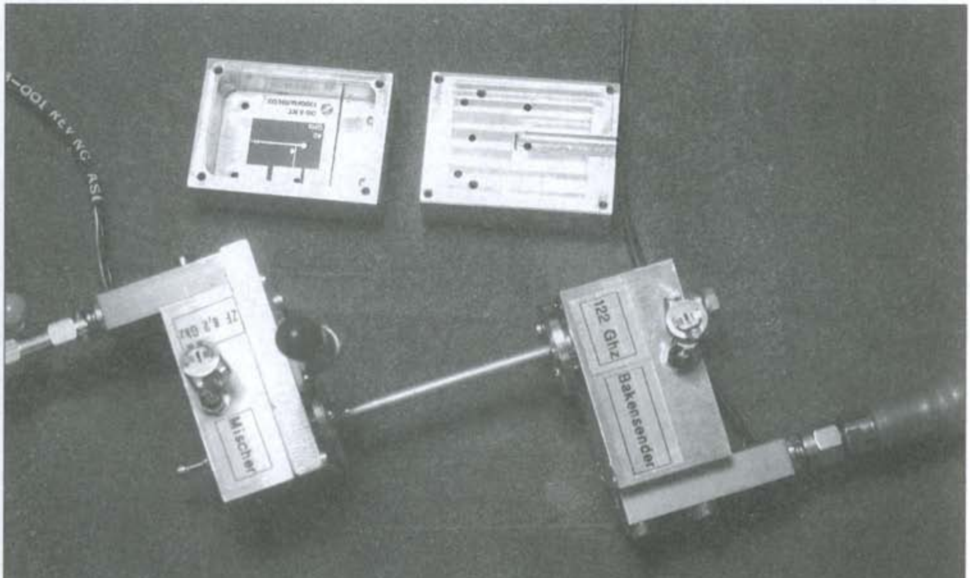


Fig. 4 Beacon TX for 122 GHz with mixer
Abb. 4 Baken-Sender für 122 GHz mit Mischer

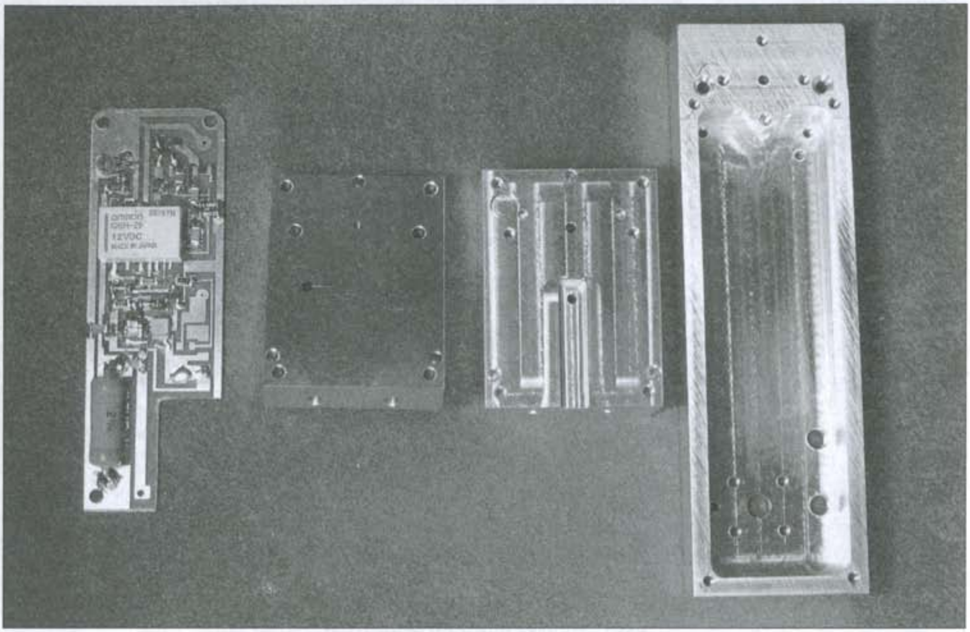


Fig. 5 PCB for IF, Intermediate plate, RF case
Abb. 5 HF-Gehäuse, Zwischenplatte, ZF-Gehäuse, PCB-ZF (426)

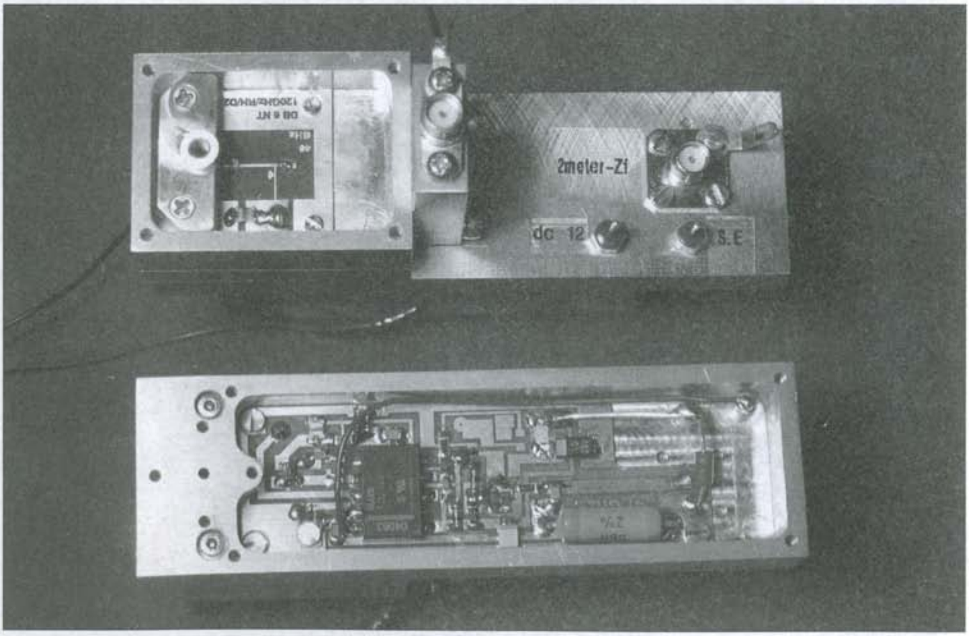


Fig. 5 / Abb. 5 Transverter for 122 GHz

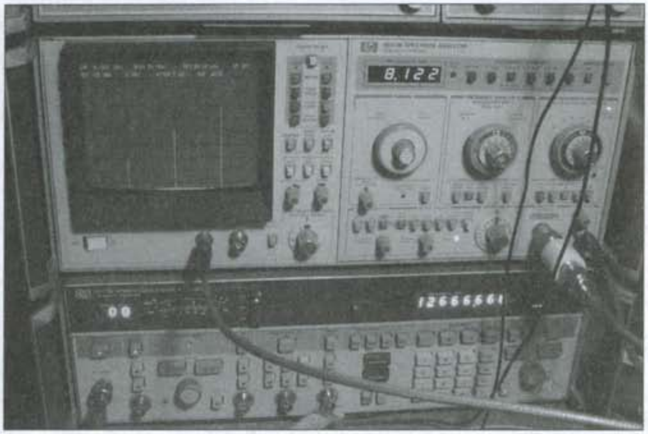


Fig. 8 Diagram measured with mixer - Abb. 8 Diagramm gemessen mit Mischer

Fig. 9 IF tuning and mixer tuning - Abb. 9 ZF-Abgleich am FT 290 + Mischer-Abgleich

Fig. 11 / Abb. 11 BBT-Contest, QSO on 122 GHz, 14 km

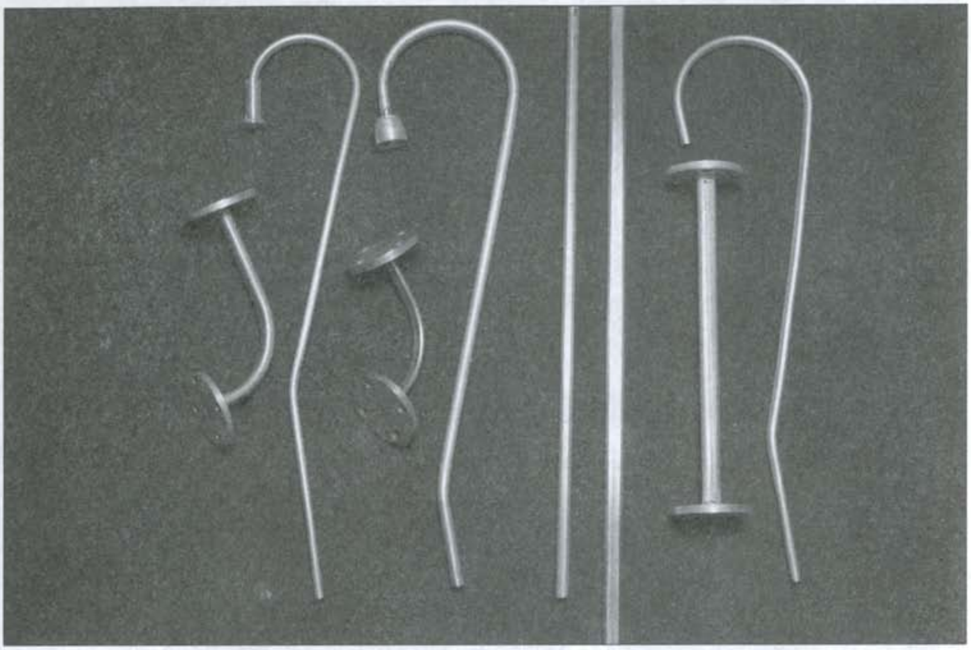


Fig. 10 Waveguides WR8, WR12   Abb. 10 Hohlleiter WR8, WR12, Krückstock

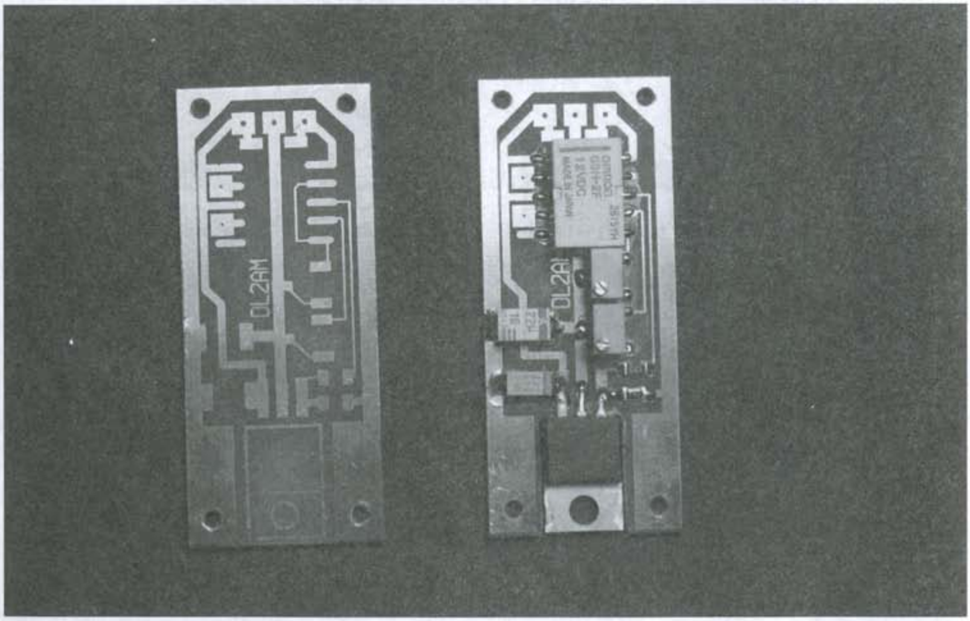


Fig. 12 Power switch for the multiplier - Abb. 12 Leistungs-Umschaltung des Multipliers

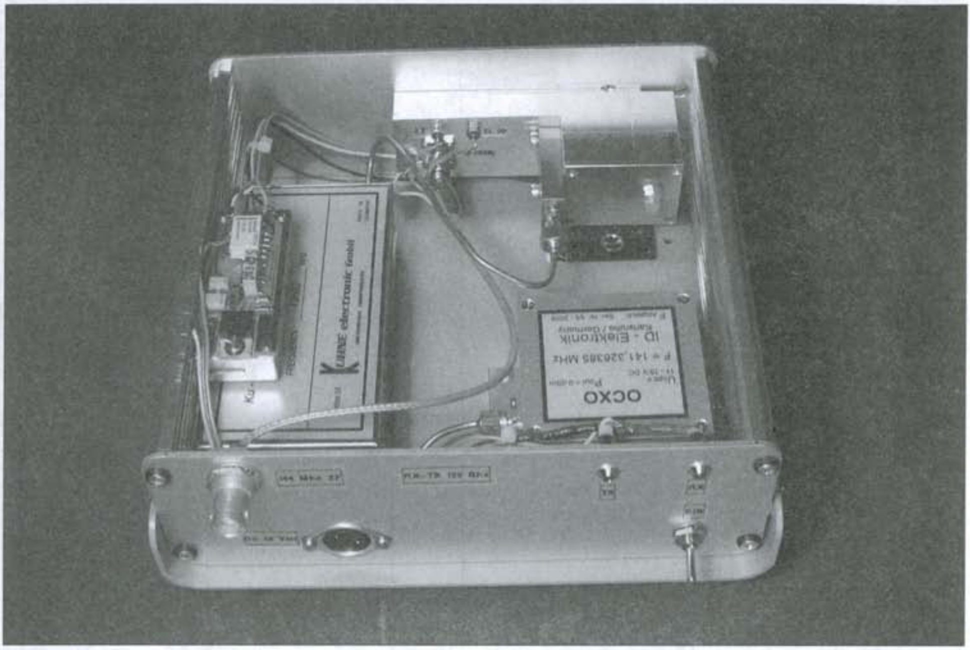
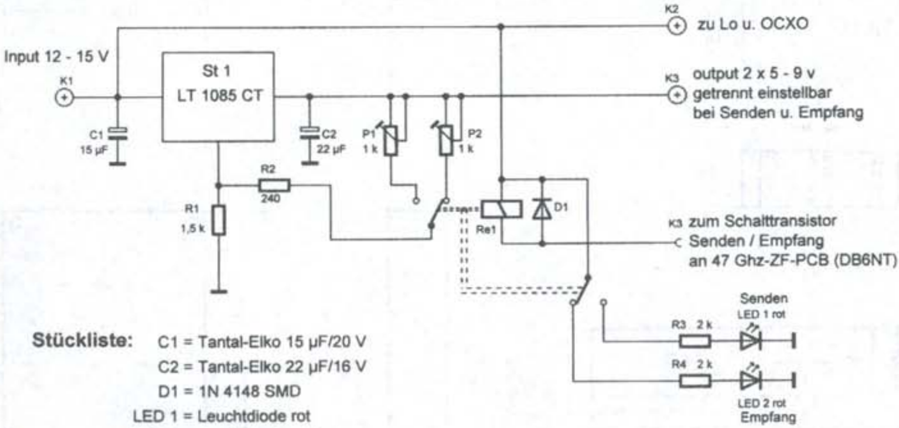


Fig. 13 Transverter for 122 GHz in box - Abb. 13 122 GHz Transverter im Gehäuse



Stückliste:

C1 = Tantal-Elko 15 µF/20 V
C2 = Tantal-Elko 22 µF/16 V
D1 = 1N 4148 SMD
LED 1 = Leuchtdiode rot
LED 2 = Leuchtdiode grün
P 1 = SMD-Poti 1 K (10-Gang)
P 2 = SMD-Poti 1 K (10-Gang)
R 1 = SMD-Widerst. 1,5 k
R 2 = SMD-Widerst. 240 Ohm
R 3 = Widerstand 1/4 W 2 k
R 4 = Widerstand 1/4 W 2 k
Re1 = SMD-Relais 12 VDC/2 x um
St 1 = Spannungsregler LT 1085

Fig. 14 Circuit diagramm DC switch - Abb. 14 Schaltbild DC-Schalter

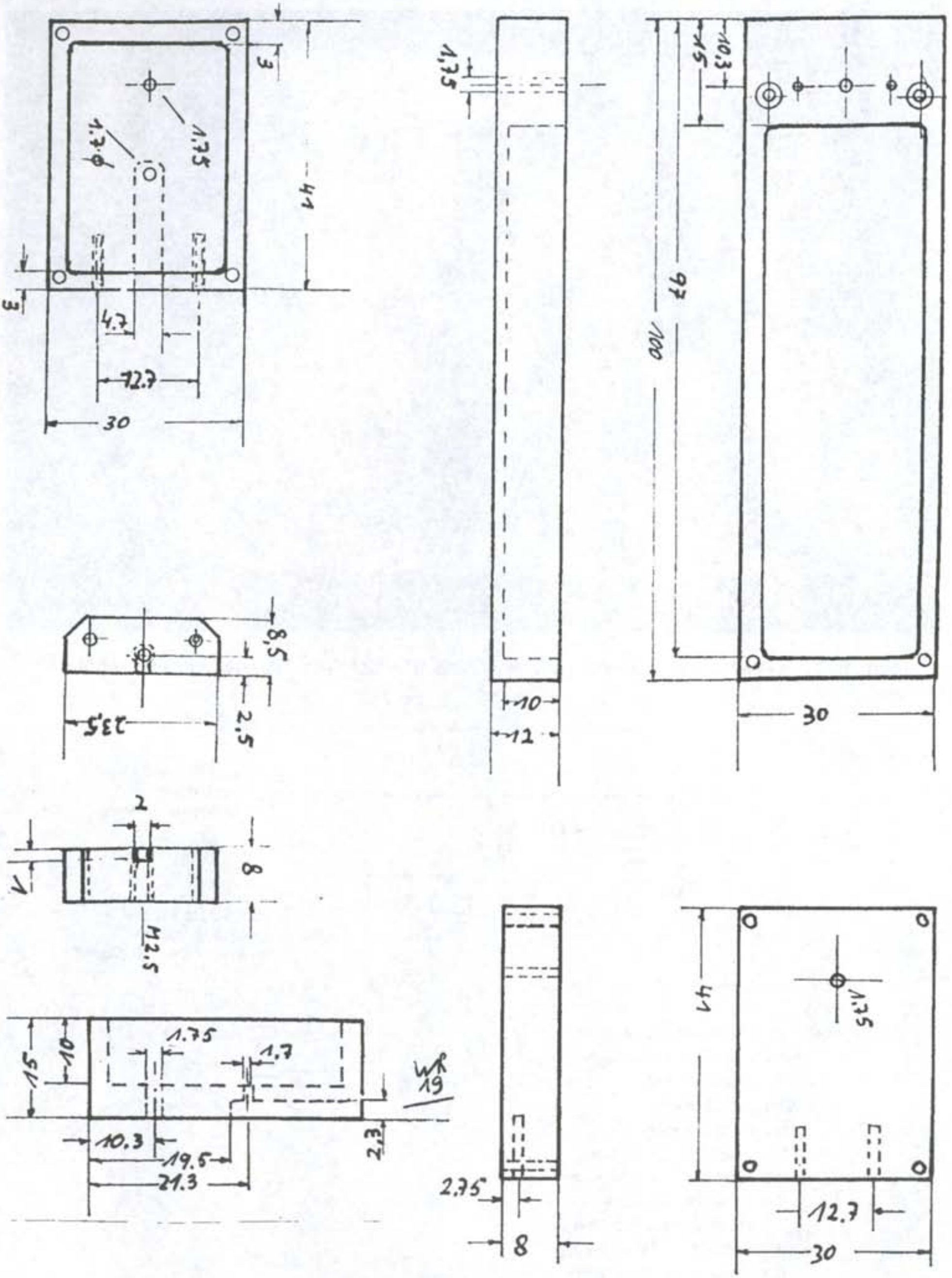


Fig. 15 Mechanical dimensions
Abb. 15 Mechanische Abmessungen

122-GHz-Transverter mit neuem Multiplier

von Philipp Prinz, DL2AM

Wie bei meiner Beschreibung für den 76 GHz Transverter angekündigt, nun eine Beschreibung zum Selbstbau für einen 122 GHz-Transverter. Es sind einige Ähnlichkeiten bei beiden Versionen beim Aufbau und Abgleich vorhanden.

Inzwischen sind von mir 4 Transverter und 3 Baken-Sender (Verdreifacher) auf 122 GHz aufgebaut worden, sowie ein Mischer zum Messen mit einer ZF von 8,251 GHz. Als erstes habe ich für meinen Spectrum-Analyzer HP 8569 B einen Mischer aufgebaut. Meine Überlegung war, daß 12,666 GHz, die ich aus meinem Synthesizer nehme, x 3 durch den Multiplier = 37,999 GHz und nochmals x 3 dann 113,999 GHz ergeben. Die 122,250 GHz minus 113,999 GHz ergeben 8,251 GHz ZF für den Mischer. Ich benutzte dafür ein HF-Gehäuse für 122 GHz mit WR 19 Ausfräsung und 122 GHz-PCB-Mischer von DB6NT und Abdeckplatte und DC-Blocker und Multiplier S004079, den ich unten 8 mm abgefräst habe, sowie die Single Diode MA4E1317. Die ZF von 8,207 GHz bringe ich bis zur SMA-Buchse, die eine Steckfassung hat. Den Abgleich machte ich auf 122 GHz, als ob es ein Baken-Sender wäre, auf max. Signal mit meinem Analyzer und dem 40-GHz-Mischer HP 11971 mit angeschraubtem Adapter. Siehe Bild 1. Bei der Einstellung von 113,35 GHz am Analyzer ist das 122 GHz-Signal zu sehen. Es sind kleine Fähnchen auf der 38 GHz-50-Ohm-Leitung anzubringen. Den größten Verstärkungssprung erreicht man, indem ein Fähnchen am Einkoppelstift platziert wird. Ansonsten verweise ich auf den beschriebenen Aufbau und Abgleich im Dubus 4/05 +1/06 eines 76 GHz-Transverters. Der Ra Widerstand der Diode ist ca. 200 Ohm, das entspricht ca. 1,95 Volt. Dieser Mischer kann auch für andere Frequenzen benutzt werden, wie z.B. für 76 GHz. 12,5 GHz x 3 = 37,5 GHz x 2 = 75 GHz. 76,032 minus 75 GHz = 1,012 GHz ZF. Siehe Bild 2. Das HF-Gehäuse mit PCB muß aber dafür passen. Wenn ich an dieses HF-Gehäuse den Multiplier S94-47414 mit einer Ausgangsfrequenz von 49 – 51 GHz und WR 15 montiere und auf 50 GHz abgleiche, kann ich die harmonischen von 40 - 200 GHz detektieren, d.h. daß diese MA4E1317 und HSCH9401 von Agilent noch funktionieren. Dieser dafür verwendete Multiplier benötigt 12 und 5 V DC und kann nur Verdreifachen. Siehe Bild 3. Auch auf Afu-Flohmärkten ist dieser Multiplier übrigens zu finden.

Der nächste Schritt war ein Baken-Sender (Verdreifacher) auf 122 GHz. Er besteht aus dem gleichen HF-Gehäuse, 122 GHz-Mischer PCB und einer Abschlußplatte sowie einem Multiplier S004079 x 3, der nur 9 Volt bei 300 mA benötigt. Dieser kann nur Verdreifachen und hat einen Hohlleiter-Ausgang von WR 19. Bei ca. 10 mW macht er schon 50 - 90 mW out. Ich habe für diesen auch die Single-Diode MA4E1317 verwendet. Als Frequenzaufbereitung verwende ich einen OCXO von DK2DB mit 141,4933 MHz, einen Vervielfacher x 96 von DB6NT = 13,567 GHz und 20 mWatt. Der Abgleich bei 122 GHz war mit dem vorher aufgebauten Mischer sehr gut möglich. Siehe Bild 4. Der Input des Multipliers lag bei ca. 12 mW und der Output bei 80 mW. Mit dem Hughes Leistungsmesskopf bis 90 GHz konnte ich schon im Microwatt-Bereich Leistung messen. Der Ra der Diode betrug auch ca. 200 Ohm wie oben erwähnt. Auch sollte versucht werden, unter den Deckel vom HF-Gehäuse Leitgummi an verschiedenen Stellen einzukleben. Der Abgleich ist wie oben schon beschrieben zu machen. Für den Bakensender kann auch der größere Multiplier CHM 382400AUP Verwendung finden. Dieser kann ja x 3 und x 4, aber die Ausgangsleistung bei 40,7 GHz ist niedriger. Ich habe mich gewundert, weswegen ich noch keinen kaputt bekommen habe, da doch die Farben der Anschlußdrähte teilweise vertauscht sind. Das Geheimnis ist, daß wohl die Farben der Drähte verschieden sind, aber der Anschluß-Stecker immer richtig belegt ist. Für die ganzen Tests seit Anfang verwendete ich einen selbstgemachten Adapterstecker. Somit war alles klar. Danach versuchte ich den Aufbau eines Transverters mit der Antiparallel-Diode MA4E1318. Siehe Bild 5 und 6. Als Aufbereitung verwendete ich einen OCXO von 141,3263 MHz von DK2DB und einen Vervielfacher x 96 von DB6NT. Dabei stellte ich fest, daß mit dieser Diode der Lo um 10 dB höher lag als das obere SSB-Seitenband. Durch Abgleich war dies nicht zu verändern. Darauf versuchte ich es mit der Single-Diode MA4E1317. Beim Abgleich stellte ich schon fest, daß diese Diode sich besser eignet, was ich auch durch die Verdreifachung verstehen kann. Das obere Seitenband war jetzt 4dB über dem Lo. Diese Messungen sind nur möglich mit einem Spectrum-Analyzer mit entsprechendem Mischer. Wenn die Einstellung 2 dB pro Devision gemacht wird, kann dies den Abgleich erleichtern. Es ist möglich, beim 40,7 GHz-Abgleich das obere Seitenband auf maximale Leistung zu trimmen. Auch diese Messungen habe ich mit oben genanntem Mischer gemacht, siehe Bild 7. Dabei wird sich die Leistung des unteren Seitenbandes entsprechend verringern. Auch sieht man, daß die beiden 144 MHz Seitenbänder rechts und links im richtigen Abstand liegen, siehe Bild 8. Um sicher zu sein, daß es auch die 122 GHz sind, ändere ich die Multiplier-Eingangsfrequenz um 100 Khz. mit meinem Synthezsizer. Dann muß sich die Frequenanzeige am Analyzer um 900 Khz ändern, was sich auch bestätigt hat. Die Frequenzänderung von 100 auf 900 Khz beruht darauf, daß ich zweimal die Frequenz x 3 multipliziere also x 9. Frühzeitig habe ich schon festgestellt, daß das obere Seitenband zwischen 144 und 146 MHz zweimal vorhanden ist, wenn mit diesen zwei gleichen Transvertern getestet wird. Der Abstand voneinander ist z.B. 500 Khz und resultiert aus dem Frequenzabstand der beiden Los zueinander. Durch Verändern des VFO's am FT290 bleibt der Abstand gleich. Diese beiden Signale habe ich auch auf 76 GHz festgestellt, da ich auch bei diesen Transvertern kein Bandpassfilter für das obere Seitenband verwendet habe. Nur wenn ich die Frequenz an einem OCXO verändere, vergrößert bzw. verkleinert sich dieser Abstand der beiden Signale zueinander. Ich denke, wenn ein Filter zur Unterdrückung des unteren Seitenbandes und des LO's verwendet würde, wäre dieses zweite Signal nicht vorhanden. Dieses Filter ist bei einer so hohen Frequenz für mich nicht mehr realisierbar. Man sieht daraus wieder, daß eine wesentlich höhere ZF-Frequenz (1290 MHz) besser wäre. Ich werde dies noch genauer untersuchen. Für alle Tests habe ich das obere Signal genommen, das ca. 3dB stärker erscheint, als das untere.

Beim Aufbau können zwei Versionen gemacht werden. Bei der ersten wird der Multiplier S004079 an der Unterseite um ca. 8 mm abgefräst, bis ein kleiner Steg noch am Hohlleiter vorhanden ist, siehe Bild 3. Dadurch entfällt die Zwischenplatte.

Bei der zweiten Version verwende ich eine 8 mm Zwischenplatte, die zur genauen Fixierung Pass-Stifte erhält und somit eine Abfräsung nicht erforderlich ist.

Nach all diesen Feststellungen habe ich Franc LX1DU den Baken-Sender zugeschickt zum Testen. Wir sprechen oft miteinander und tauschen Erfahrungen aus. Er sagte mir, er wäre nicht ganz sicher, ob die Frequenz bei 122 GHz stimmt. Ich konnte mir dies aber nicht gut vorstellen, da ich mit einem Rundhohlleiter von 1,7 mm Innen-Durchmesser arbeitete, der nach meiner Feststellung eine Cutoff-Frequenz von über 100 GHz hat und auch den Frequenztest machte. Momentan war ich zwar erschrocken und habe weitere Messungen durchgeführt. Da ich jetzt zwei komplette Transverter zur Verfügung hatte konnte ich nachweisen, daß die Frequenz doch stimmt. Wenn ich an einem Transverter den OCXO von 141,326 MHz und den darauffolgenden Vervielfacher (x 96) verwende und beim anderen Transverter meinen Synthesyzer auf 13,567 GHz einstelle, dann kann ich am FT290 das SSB-Signal feststellen. Wenn ich am Synthesyzer die Frequenz um 1 KHz erhöhe, muß das Signal am FT290 sich um 9 Khz erhöhen, was ich auch feststellen konnte. Also bin ich auf der richtigen Frequenz.

Nun versuchte ich es auch mit den Agilent HSCH-9401 Schottky-Dioden, die mir Eene, PA3CEG, freundlicherweise zukommen ließ. Leider ist diese abgekündigt und wird nur noch begrenzte Zeit lieferbar sein. Beim Abgleich mit o.g. Abgleichmethode stellte ich fest, daß die Leistung um ca. 3 dB höher war. Beim zweiten Aufbau waren die Ergebnisse ähnlich. Die Abgleichmethoden sind dieselben wie schon erwähnt, nur die Bettelei nach Leistung wird wesentlich größer.

Auch habe ich festgestellt, daß bei Verwendung eines längeren Rund-Hohlleiters eine Polarisationsdrehung stattfindet. Wenn ein FT290R als Nachsetzer benutzt wird, ist es hilfreich mit dem Poti VR 2006 im FT 290 Gerät die 2-Meter ZF-Leistung zu verstellen. Dabei ist der Schalter auf Low zu stellen. So kann die 40,7 GHz und die ZF-Mischleistung auf maximale HF vom oberen Seitenband und besten Signal-Rauschabstand im zusammengebauten Zustand eingestellt werden, da man an das 100 Ohm-Poti von der 47 GHz ZF-Platine keinen Zugriff mehr hat, siehe Bild 9.

Nun war ein Indoor-Test fällig. Es fehlten jetzt noch die 9,5 cm langen WR8-Hohlleiter für die Procom 25 cm Spiegel. In Europa sowie USA konnte ich diese nicht bekommen. Ich habe mit Franc LX1DU. gesprochen, was wir des öfteren tun und er sagte mir, er werde mir welche machen. Nach 5 Tagen kam ein Päckchen von ihm mit den WR8-Hohlleitern und Krückstöcken, siehe Bild 10. Nachdem alles zusammengebaut war, konnte ich den ersten Indoor-Test versuchen. Ich stellte die beiden Stationen im Abstand von ca. 10 Metern in meinem Haus auf. Dabei konnte ich ein SSB-QSO machen. Der nächste Versuch war ein SSB-2-Weg-QSO bei einer Entfernung von 1,5 km am 10.2.06. Die Signalstärken waren etwa S 5 aber ich denke, die Spiegel waren noch nicht gut ausgerichtet. Nun stand der BBT-Contest vor der Tür. Ich habe Alex, DL2GWZ, angerufen, ob er sich Zeit nehmen kann für Tests auf 76 und 122 GHz, da er etwa 350 km zu fahren hat bis ins Allgäu. Am 4.2. traf Alex bei mir ein. Das Wetter war nicht besonders einladend und Schnee war angesagt.

Wir hatten eine Entfernung von 14 km gewählt. Das Funk-Equipment von beiden Seiten bestand aus meinen 4 neu gebauten Transvertern von 76 und 122 GHz mit 25 cm Spiegeln. Zuerst haben wir uns auf 76 GHz gesucht um die Spiegel genau auszurichten, was sofort gelang. Dies ist unbedingt notwendig, da der Öffnungs-Winkel nur ca. 0,5 Grad beträgt. Danach starteten wir den ersten Versuch auf 122 GHz, beide Seiten in SSB. Alex und ich waren sehr erstaunt, daß wir Signalstärken von bis zu S 9 hatten. Darauf erfolgte auch ein Versuch in FM über längere Zeit. Es war wie ein Orts-QSO. Ich sagte zu Alex, ich könnte 2 Meter hoch springen, aber mein Alter läßt dies nicht mehr zu (Foto 11).
Bei diesen Versuchen stellte ich fest, daß die Modulation in SSB komprimiert war. Dies hat mich zu weiteren Tests veranlaßt. Den Multiplier habe ich zwischen 5 und 9Volt Betriebsspannung getestet und festgestellt, daß sich dadurch die Leistung um ca. 6,5 dB verringert hat, das Signal jedoch sich nicht veränderte. Somit konnte ich eine Steuerung bauen, die bei Empfang wie auch beim Senden die Mischleistung durch 2 Potis regelt siehe Bild 12. Die Potis sind so ausgelegt, daß in beiden Positionen eine Versorgungsspannung von 5 - 9 Volt eingestellt werden kann. Diese Maßnahme hat schnell zum Erfolg geführt, da jetzt bei Empfang der beste Signalrauschabstand und beim Senden auf minimale Kompression gestellt werden kann. Diese Steuerung kann auch für andere Transverter Verwendung finden.
Zur Relais-Ansteuerung nehme ich aus der 47 GHz-ZF-Platine die Negativ-Seite des eingebauten Relais.

Nun die gemessenen Werte mit HP 437B + Q8486A und HP 8485A:
Multiplier-Ansteuerung bei 13,567 GHz Senden und Empfang 12 mWatt beim S 00 - 4079.
Multiplier-Ausgangsleistung bei Empfang 20 mWatt, bei 5 Volt Dc Versorgungsspannung an diesem.
Beim Senden ist die Ausgangsleistung ca. 80 mWatt, bei ca. 8 Volt Versorgungsspannung.

Die 144 MHz ZF-Leistung muß individuell auf max.OUT eingeregelt werden, siehe Bild 13. Nun geht es daran, einen Krückstock mit Erreger für diese Spiegel zu testen, was ich momentan auch mache. Die beiden Transverter sind in einem Abstand von 15 Meter indoor aufgestellt. Mit den Potis für Senden und Empfang von der Umschalt-PCB für den Multiplier läßt sich sehr genau das Signal knapp über dem Rauschen einstellen. Dadurch ist es möglich, einige Tests durchzuführen. Wenn ich einen Streifen Absorber-Material von 2 cm Breite und 6 cm Länge in den Spiegel halte, muß dies eine Veränderung am Signal-rausch-Verhältnis zeigen. Ist dies nicht der Fall, dann ist die Meßmöglichkeit beschränkt.

Noch besser kann gemessen werden, wenn ich die 144 MHz ZF auf den Analyzer gebe, es reicht auch der HP 141, und 1 dB/Devision eingestellt habe. Wird ein konischer Übergang (geht gut zu machen mit einem Skalpell) von Rund- auf Rechteckhohlleiter gemacht, kann dadurch eine Signalerhöhung bis zu 3 dB erreicht werden. Wenn ich den 25 cm Procom-Spiegel mit Procom-Reflektor als Referenz nehme und mit anderen Erregern vergleiche, ist keine wesentliche Verbesserung zu erreichen. In diesem Sommer werde ich wohl noch einige Versuche auf dieser Frequenz machen um größere Entfernungen zu überbrücken. Weiter viel Spaß beim Experimentieren!

Philipp - DL2AM

Circular Polarized Antenna Feed - for EME on 10GHz and 5.7GHz

by Luis Cupido - CT1DMK, Willi Bauer - LX1DB

On more than one occasion at the EME conferences, circular polarization was agreed to be to be the standard for Microwave EME, so to became used on bands where regular operation can be found. In fact at 1.3, 2.3 (and 3.4) it is the standard in use by all stations. On 5.7GHz there are good number of regular stations using circular while just a few others still remain on linear. On 10GHz the vast majority of stations are using linear polarization. The reason behind this situation is probably related to the fact that a linear setup is somehow seen to be more simple to construct, and the belief that depolarization is so high that the antenna polarizations employed are irrelevant. At the time this article was written, the situation is quite clear for 5.7GHz and circular polarization is the way to go. However, at 10GHz there are still some doubts and there is a need for further observations.

The two main problems are therefore the need for a suitable reproducible feedhorn design for 5.7HJz and 10GHz; and further tests on EME at 10GHz. This article tries to address essentially the first topic. Further tests over the EME path are certainly desirable, but we believe the data presented leaves not much doubt that circular is also the reasonable polarization scheme to adopt at 10GHz. Here we present a no-tune circular polarity feeder for parabolic dishes and some real EME tests done with a prototype.*

(* By "no-tune" we mean no adjustments required for polarity-circularity. Impedance matching adjustments are required but that is a simple task to perform.)

Some introductory comments

It is clear that depolarization occurs at microwave EME and this effect increases with frequency. 10GHz is believed to be on the borderline where moving to circular polarization may no longer constitute an advantage. However, this argument is also assuming that a circular polarized feed setup would be more difficult than linear and would have higher losses, so that any possible small advantage of circular would disappear. Recent observations do indeed show severe depolarization in some situations and therefore little advantage would result from going circular. However, there are still some other situations where depolarization is not so severe. Also observations have shown that Doppler spreading is less severe when using circular polarization.

We realize that, depending on the conditions, depolarization figures as low as 1 or 2 dB are possible but most of the situations we had experimented had depolarization down by 6dB. These figures were not result of a systematic analysis so they are to be considered as an indication and further tests are indeed required.

EME is however a rather untypical telecommunication situation: just one dB advantage is still significant for most of us, and worthwhile to pursue. Just remember that a QSO is a heavily quantized entity: you **make it** or you **don't make** it.

Basic design

The feed system is composed of three distinct parts: the orthogonal launcher or combiner, the polarizer, and the antenna feeder. In a matched condition these three elements are independent of each other and can be designed independently. Not realizing this has been at the base of many misunderstandings about terminology and the actual hardware, and also the driving force behind the belief that it is difficult to build and to get a feed system working properly.

The orthogonal combiner has the function of coupling one port to vertical and the other port to horizontal polarization. Both ports can have coaxial terminations, or one can be coaxial and the other in waveguide, or both can be in waveguide. With both ports in waveguide the combiner is usually called an OMT (ortho-mode transducer). Both ports in waveguide also corresponds to the launching section of a 23cm W2IMU or VE4MA feed [1].

At medium or low power on 10GHz, it may be useful to have the TX port in coax, since all low power and medium power amplifiers and TWTs are also in coax, but to have the RX port in waveguide so it can be followed by a waveguide switch to have the lowest loss possible. Note that a N coaxial TX port would handle more than 250W of power with reasonably low loss.

The polarizer has the function of converting the linear polarized signals into circular ones and vice-versa. This is accomplished by delaying differently the two components of the linear signal, as seen from the polarizing section that is rotated 45 degrees with respect to the signal polarization. From circular to linear it is the same process but in the opposite direction. A detailed explanation of this process can be found in the literature [2] and is outside the scope of this article.

The antenna feeder is the part of the feed system that has the function to illuminate properly the dish surface. Requirements for this are determined by the geometry, and the desire to optimize the geometry for either gain or low noise. It is important to understand that this is totally independent from the aspects we are addressing in the present article. We presume that the user knows what will be a suitable feeder for his dish geometry, and will find or develop a suitable design for this part of the feed system.

In practical terms, if you already have existing feeder that properly illuminates your dish and gives good results, you should continue to use it with the new OMT and polarizer section described here. In the present article, both drawings and pictures show a scalar feeder for prime focus dishes, but of course that part would need to be different for offset dishes, for example.

The orthogonal transition (coax to WG or OMT)

On the drawing you can see an orthogonal section with one port in waveguide and another in coaxial. If you want both ports to have coaxial terminations, you just use the coaxial transition two times with 90 degrees rotation difference between the two. Distance between them is not critical as long as the matching section of the transition at the rear is complete before the beginning of the transition at the front (although since they are orthogonal their mutual influence should be very small). If you want both ports in waveguide, you may use a design of a standard OMT. An OMT all in waveguide is under test and will be published very soon.

Note that all linear ports (whether they are coaxial or waveguide) will need impedance matching for the whole setup to function properly. Tune the screws in front of the coaxial launcher for best impedance match. The waveguide transitions use a 3-screw tuner section for impedance match [3].

The polarizer section

Several designs for a CP polarizer for 10GHz were possible, for example the dielectric polarizer, the squeezed waveguide, the screw polarizer (but not so interesting as it would be quite difficult to adjust properly) and the septum polarizer. Both the all-metal squeezed waveguide polarizer and the dielectric polarizer could be the basis for a simple no-tune design. The all-metal approach will result in virtually no loss, but the one using a dielectric would have some measurable losses, although small. Also in the no-tune category the septum polarizer would be worth considering, although we did not adopt that design as it has a different method for feeding in the linear polarizations.

The polarizer section adopted in the present design is a narrow metallic section at 45 degrees. This is a fixed, no-tune version of the well known squeezed waveguide polarizer, but without all the uncertainties in the tuning procedure. HFSS simulations of such a polarizer were conducted and showed reasonable bandwidth and tolerance to dimensions. The simulation results for the optimum dimensions are presented in Figures 1 and 2.

Figure 3 is the mechanical drawing of a full feed system, with one coaxial port and one waveguide port. As noted earlier, the feeder section is for a prime focus feeder, but is only an example; you should use whatever is more appropriate for the dish in question.

The polarizer and feed designs can be found in more detail on CT1DMK's web pages at:

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

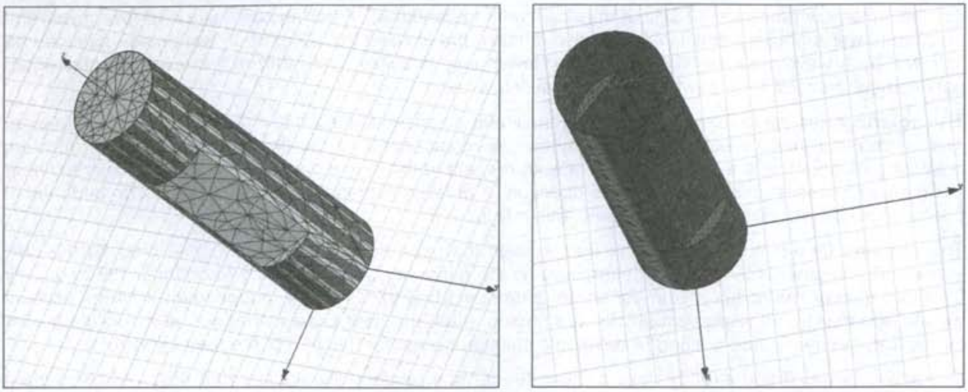


Figure 1 – Model and mesh used for HFSS simulation of polarizer

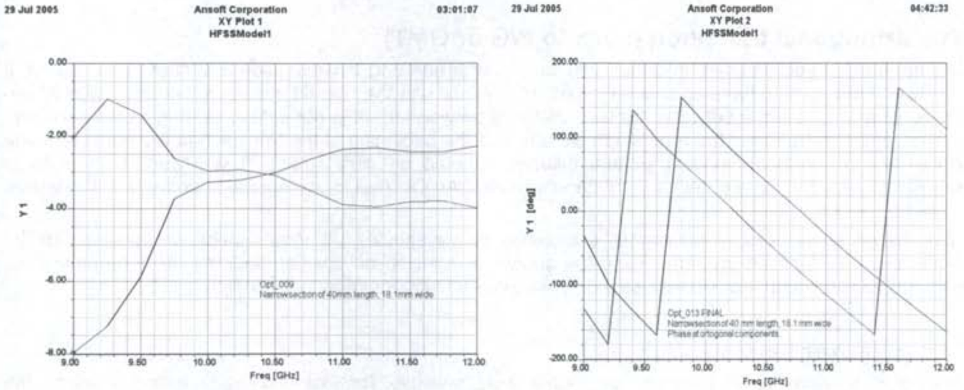


Figure 2 – Split power and phase difference between orthogonal components at the CP port, values used to help evaluating circularity.

Tests and measurements

The measurements were performed on an HP Scalar Network Analyzer equipped with SWR bridge detector probes and calibrated receiving antennas. For the measurements of circularity all the antenna test set was covered by HF absorbing material to form an anechoic chamber.

Tests consisted of analyzing the power arriving at the horizontal and vertical ports of a linear feed system while driving the TX port of the feed system described in the article.

In Figure 4, the field strength at the horizontal measurement antenna is represented by the upper trace, and the field strength at the vertical measurement antenna represented by the lower trace (which was attenuated by 3dB to make the two traces easier to see).

This measurement was verified by turning the TX port from 0 to 45° referred to the horizontal and vertical measurement antennas.

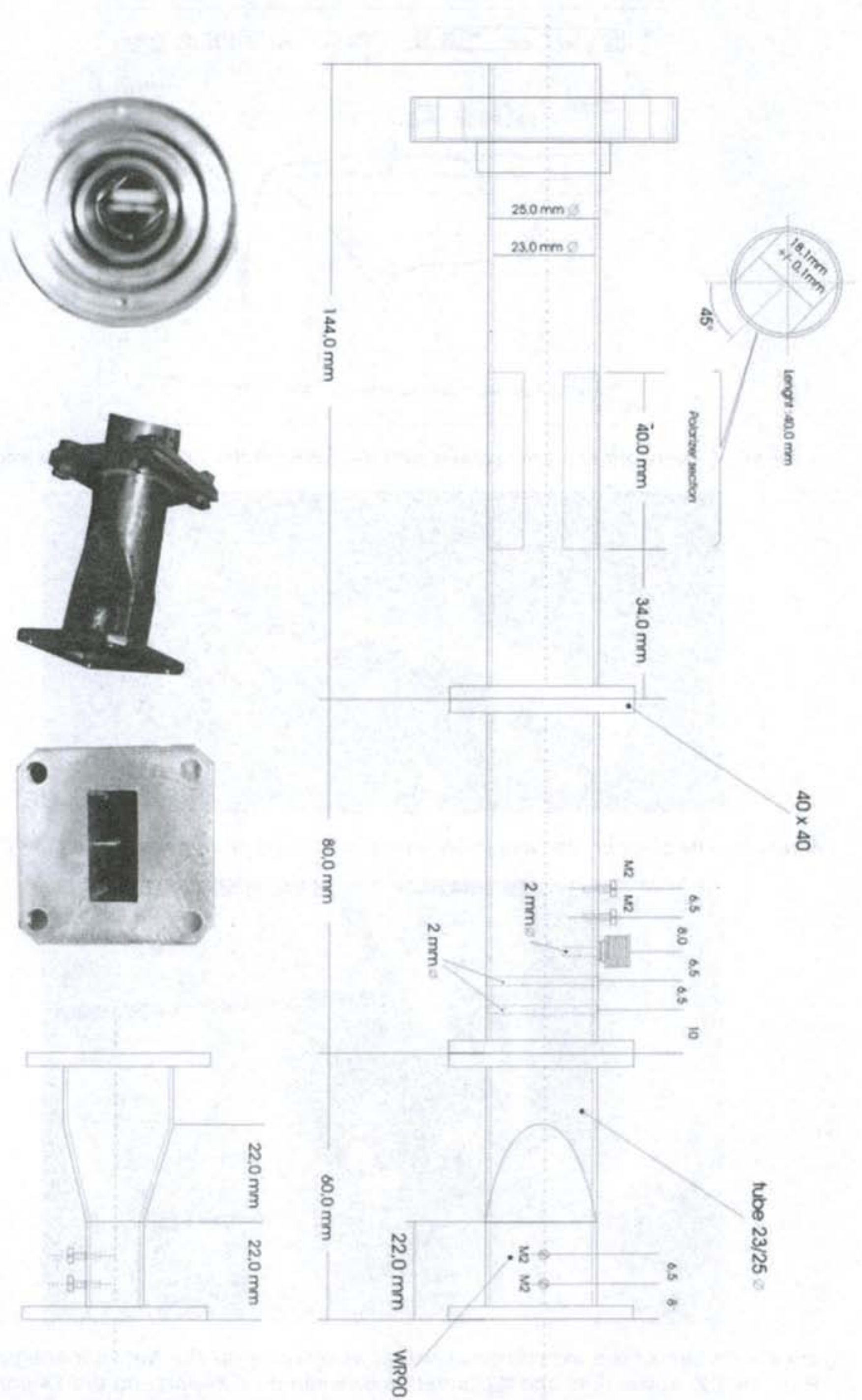


Figure 3 – CP feed system diagram that has a coaxial and a waveguide port.

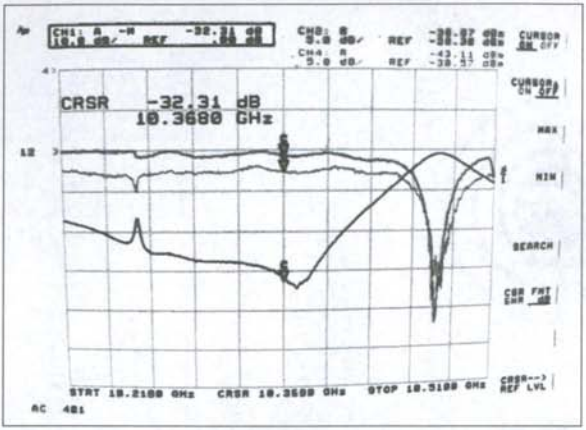


Figure 4 - Network analyzer screen with the SWR on the TX- port (middle trace).

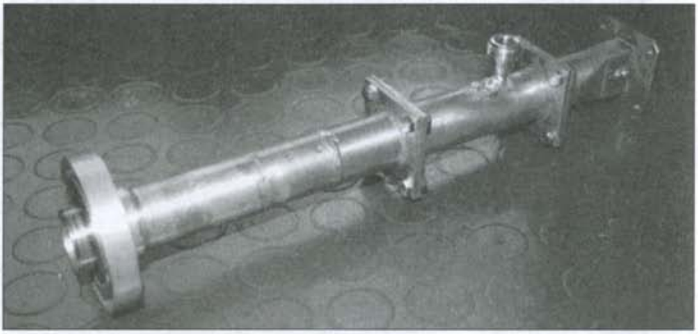


Figure 5 - The circular feed assembly with choke rings positioned for an 0.3 f/D dish.

Figure 6 - Picture of the experimental setup, observable on the Network analyzer is the SWR on the RX (lower line) and the isolation between the RX- port and the TX-port.

Measurement results

Transmitter port return loss: -32dB *(after tuning by adjusting the matching screws)*
Receiver port return loss: -24dB *(after tuning by adjusting the matching screws)*
Circularity: better than 1,5dB *(there are no adjustments required for circularity)*
Isolation between
RX and TX port: 23dB

Note: Do not peak for maximum matching, always try to have a broad matching.

Echo tests

Echo tests on 10 GHz performed at LX1DB's EME station, comparing linear and circular polarized signals, showed that the audio spectrum on the circular polarized echo signal was practically half the width of the linear polarized signals. The tests were performed with a transmission power of 100W on the feeds of the 3m dish, with the same RX for both polarizations and within a time window of 10 minutes (time to change the feed).

During the tests the weather conditions reported by the meteorological service was 8/8 cover by strato-cumulus clouds, a relative humidity of 85%, no rain and temperature 7°C. The moon position was in the range of an azimuth of 210° and an elevation of 55°. The Spectran program was used for the audio analysis and the data files clearly show the narrower bandwidth with circular polarization.

Linear to linear and Circular to linear EME tests

Tests conducted by Willi LX1DB, Brian G4NNS, Chris GW4DGU and Philippe F2TU were done by using linear rotable polarization on reception and transmitting both on linear and circular. Results can be seen in Figures 7 to 10. Note the signals were corresponding to a CQ call hence the variation on the signal. We can use for our interpretation the peaks that correspond to series of dashes on the transmission.

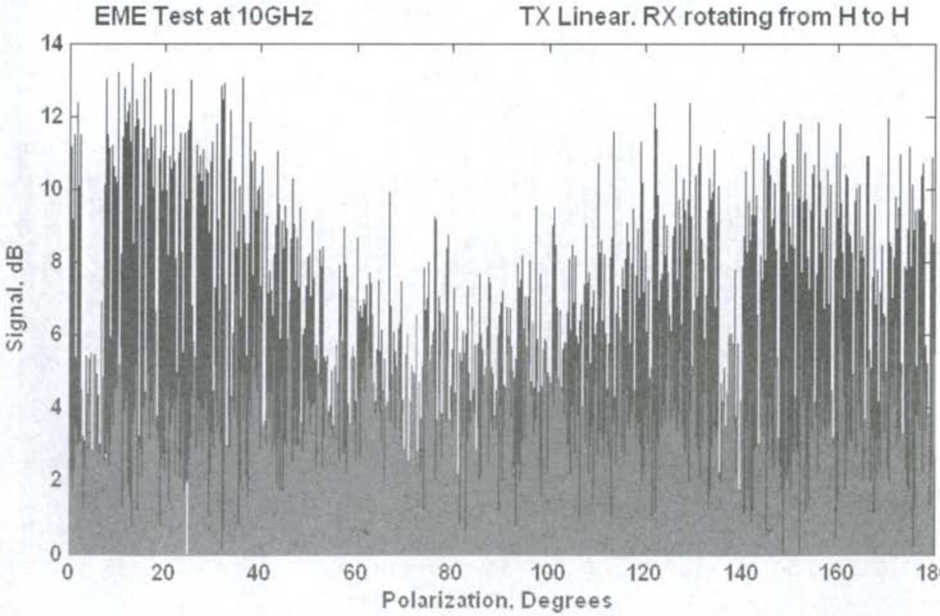


Figure 7 – Received signal in linear polarization while rotating the RX polarization, transmitting with linear fixed polarization. Signal power in dB over a 200Hz bandwidth, signal in black, system noise floor in grey.

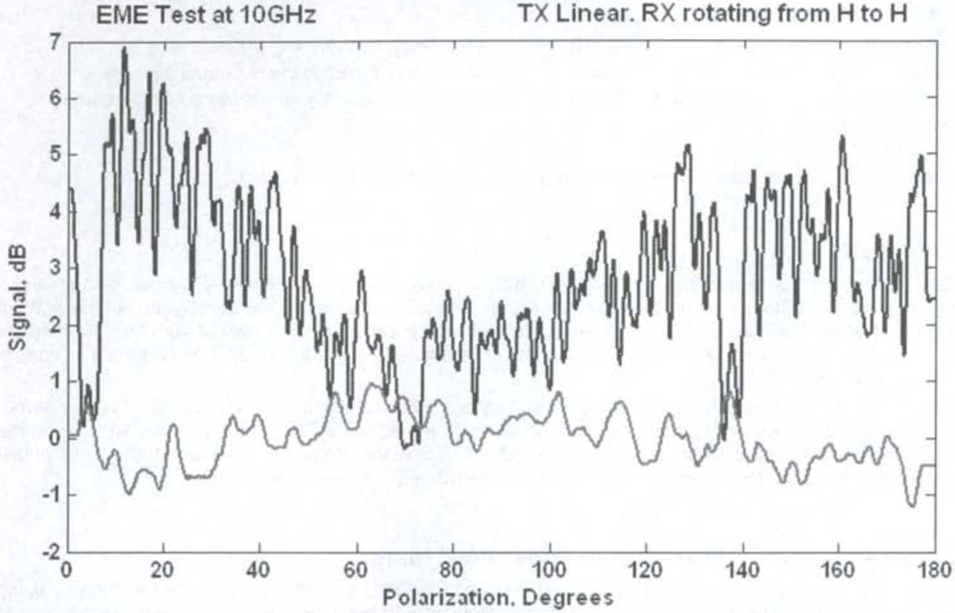


Figure 8 – Same as figure 7 but with signal power averaging for better visualization/interpretation of the results.

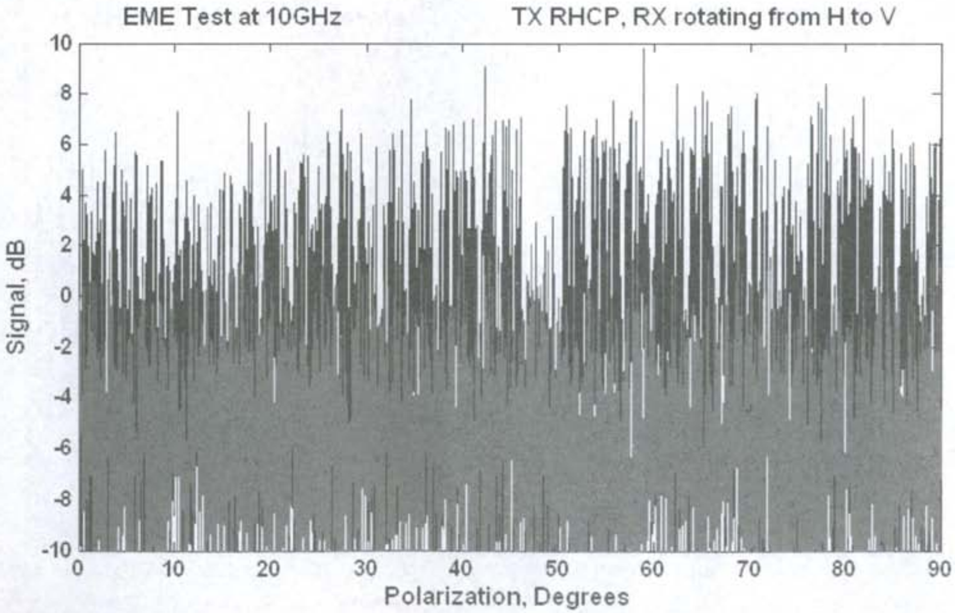


Figure 9 – Received signal in linear polarization while rotating the RX polarization, transmitting with RHCP polarization. Signal power in dB over a 200Hz bandwidth, signal in black, system noise floor in grey.

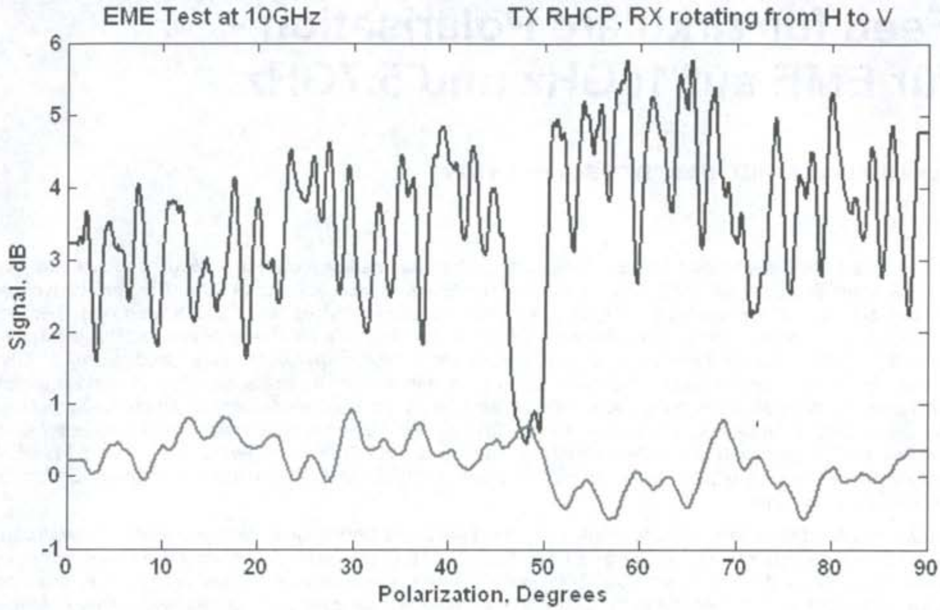


Figure 10 – Same as figure 7 but with signal power averaging for better visualization/interpretation of the results.

On figure 7 and 8 we can see the signal received from a linear transmitting station while rotating the RX polarity. Figure 8 contains the same signal but representation is averaged and it is therefore much more easy to evaluate. If we take the peaks that correspond to individual dashes or series of dashes on the CW transmission and compare them with the average noise floor, the lower trace, we see a signal to noise ratio (S/N) of 6 to 7dB when polarization is aligned. However at orthogonal polarity we observe a S/N of only 1 to 2 dB. Of course this may not represent all possible situations namely at different relative moon position and very different antenna sizes, however worth to note this was a typical EU/EU QSO using average antenna sizes and presumably representative.

Conclusions

The development of a orthogonal combiner (OMT) and a polarizer section was undertaken to meet the need for a suitable CP feed assembly to be used in EME on 10GHz. It was also a design aim that the construction should pose no difficulties for an average equipped mechanical workshop. The OMT section is based on well-known designs and construction principles. It can be made with both ports in waveguide, or with the RX port in waveguide and the TX port in coaxial. The design required no special attention besides the need for good impedance matching. The polarizer section was designed to allow easy reproduction without the need for adjustments for circularity, a feature that is essential to reduce the adjustments to only impedance matching.

From the experimental observations, we can indeed conclude that there is a worthwhile advantage in using circular polarization on 10GHz EME. With the data provided by the EME tests it was possible to observe 6 to 10 dB preservation of polarization, and a narrower received audio signal from CP in echo tests. Signals in circular to linear tests were about 2 to 3 dB below two well-aligned stations using linear polarization. However, 10GHz is probably the highest band where there is still an advantage of using CP over linear polarization.

References

[1] Microwave update -1999, proceedings
[2] Foundations for Microwave Engineering - McGraw Hill
[3] Microwave Handbook, Vol. 3 - RSGB
[4] Electromagnetic Anechoic Chambers - Leland H. Hemming

Feed für zirkulare Polarisation - für EME auf 10GHz und 5.7GHz

von Luis Cupido - CT1DMK, Willi Bauer - LX1DB

Bei mehr als einr Gelegenheit bei den EME.Konferenzen hat man sich darauf geeinigt, daß zirkulare Polarisation der Standard für EME auf den Mikrowellen-Bändern sein soll und auf den Bändern verwendet werden soll, auf denen es regelmäßig Aktivität gibt. Tatsächlich ist es auf 1.3, 2.3 (und 3.4) GHz der Standard, der von allen Stationen verwendet wird. Auf 5.7 GHz gibt es eine größere Anzahl von Stationen, die zirkulare Polarisation benutzen, während einige wenige immer noch linear senden. Auf 10 GHz verwendet die ganz große Mehrheit lineare Polarisation. Hintergrund für diese Situation ist wahrscheinlich die Tatsache, dass die Erzeugung linearer Polarisation in der Praxis etwas einfacher zu realisieren ist und der Glaube, dass die Depolarisation so groß ist, dass es egal ist, mit welche Polarisation verwendet wird. Zur Zeit der Fertigstellung dieses Artikels ist die Situation auf 5.7 GHz relativ eindeutig: Zirkulare Polarisation setzt sich durch. Bei 10 GHz jedoch gibt es immer noch einige Zweifel und es besteht der Bedarf für weitere Untersuchungen.

Die beiden Hauptprobleme, diesen Punkt betreffend sind: Die Benötigung eines passenden reproduzierbaren Designs (für ein Feed) und weitere EME-Tests auf 10 GHz. Dieser Artikel richtet sich besonders an den ersten Punkt. Weitere Tests über EME sind sicherlich wünschenswert, aber wir glauben, dass die vorgelegten Daten nicht viel Raum für Zweifel daran übrig lassen, dass zirkular das vernünftige Polarisationsschema zur Anwendung auf 10 GHz ein sollte. Wir präsentieren hier ein Feed für Parabolspiegel zur Erzeugung zirkularer Polarisation, das nicht abgestimmt werden muss. Mit einem Prototyp wurden bereits echte EME-Tests gemacht.*

(* mit nicht abstimmen ist gemeint, dass hinsichtiich der Polarisation keine Justierung nötig ist; eine Impedanz-Anpassung muß natürlich vorgenommen werden, was jedoch einfach ist.)

Einige einführende Kommentare

Es ist klar, dass Depolarisation bei EME auf den Mikrowellen-Bändern auftritt und dieser Effekt vergrößert sich mit der Frequenz. 10 GHz hält man für den Grenzbereich, an dem eine Verwendung von zirkularer Polarisation keine Vorteile mehr bringt. Diese Argumentation setzt aber voraus, dass eine komplexeres Feed schwieriger zu bauen wäre und höhere Verluste hätte, so dass der mögliche kleine Vorteil der Zirkularität wieder verschwinden würde. Beobachtungen in der Vergangenheit zeigen tatsächlich drastische Depolarisation in einigen Situationen und deshalb würde ein Verwenden zirkularer Polarisation kaum Vorteile erbringen. Es gibt jedoch immer auch andere Situationen, in denen die Depolarisation nicht so stark ist. Auch zeigen Beobachtungen, dass die Doppler-Verschiebung geringer ist, wenn zirkulare Polarisation verwendet wird. Wir sehen, dass abhängig von den Bedingungen, Depolarisationswerte von niedrigen 1 bis 2 dB möglich sind, aber in den meisten Situationen, in denen wir experimentiert haben, bis auf 6 dB ging. Diese Werte sind nicht das Ergebnis einer systematischen Analyse, so dass man sie als Anhaltspunkte nehmen sollte. Weitere Tests sind hier wirklich nötig. EME ist jedenfalls eine ziemlich untypische Kommunikationsart, hier ist bereits 1 dB Vorteil signifikant für die meisten von uns und es Wert gejagt zu werden. Man bedenke, dass ein einzelnes QSO eine schwer zu qantifizierende Menge ist, man **macht es** oder man **macht es nicht**.

Das Grunddesign

Das Feed System ist aus drei einzelnen Teilen aufgebaut: Dem orthogonalen Starter oder Koppler oder OMT (Orthogonal Mode Transducer), dem Polarisator und dem Feed.
Unter angepassten Bedingungen sind diese drei Elemente unabhängig voneinander und können einzeln entwickelt werden. Das Unbekanntsein dieser Tatsache ist die Grundlage für viele Missverständnisse bei Terminologie und Hardware und die treibende Kraft hinter dem Glauben, dass ein Aufbau und ein tatsächliches Funktionieren schwierig ist.

Der orthogonale Koppler hat die Funktion, einen Anschluß an vertikale und den anderen Anschluß an horizontale Polarisation zu koppeln. Es können beide Anschlüsse koaxial ausgeführt sein, oder einer koaxial und der andere als Hohlleiter, oder beide als Hohlleiter. Wenn beide Anschlüsse Hohlleiter sind, nennt man ihn normalerweise OMT (Ortho-Mode-Transducer). Wenn beide Anschlüsse Hohlleiter sind, entspricht dies der Start-Sektion eines 23cm W2IMU- oder VE4MA-Feeds [1].
Bei mittlerer oder kleiner Leistung auf 10 GHz kann es interessant sein, den TX-Anschluß koaxial ausgeführt zu haben, da alle PAs und TWT kleiner und mittlerer Leistung koaxial ausgeführt sind. Den RX-Ausgang sollte man als Hohlleiter ausführen mit einem anschließenden Hohlleiter-Schalter, möglichst niedrige Verluste zu haben. Man beachte, dass eine koaxialer TX-Anschluß in N-Norm mehr als 250 Watt aushält und das bei annehmbar niedrigen Verlusten.

Der Polarisator hat die Funktion des Konvertierens des linear polarisierten Signals in ein zirkulares Signal und umgekehrt. Dies wird erreicht durch unterschiedliches Verzögern der beiden Komponenten des linearen Signals, gesehen vom Polarisator aus, der um 45 Grad gedreht ist in Bezug auf die Polarisation des Signals. Von zirkular auf linear ist es derselbe Prozess, nur in umgekehrter Richtung. Eine detaillierte Erklärung dieses Prozesses kann in der Literatut [2] gefunden werden und kann und soll nicht Gegenstand dieses Artikels sein.
Das Antennen-Feed ist der Teil des Feed-Systems, das die Funktion hat, die Spiegeloberfläche vernünftig auszuleuchten. Anforderungen hierfür werden durch die Geometrie festgelegt und, ob man es auf Gewinn oder niedriges Rauschen optimieren will. Dies ist alles völlig unabhängig von den Aspekten, die in diesem Artikel behandelt werden und wir setzen voraus, dass der Leser weiss, welches der passende Antennen-Feed für seine Spiegel-Geometrie ist oder es herausfindet bzw. designt.
In der Praxis heißt das, um sein derzeitiges Feed-System zu überarbeiten, sollte man die OMT- und Polarisator-Sektion verwenden gefolgt von demjenigen Antennen-Feed, dass den eigenen Spiegel gut ausleuchtet und das man in der Vergangenheit mit guten Ergebnissen benutzt hat. Im vorliegenden Artikel ist auf den Abbildungen und Fotos ein skalares Feed für Prime-Focus-Spiegel zu sehen. Offset-Spiegel z.B. brauchen natürlich hier ein anderes Teil.

Der orthogonale Übergang (Koax auf WG oder OMT)

Auf der Abbildung kann man eine orthogonale Sektion mit einem Ausgang als Hohlleiter und dem anderen koaxial erkennen. Wenn man beide Ausgänge koaxial haben möchte, verwendet man einfach den koaxialen Übergang zweimal, mit einem Versatz von 90 Grad. Der Abstand zwischen ihnen ist nicht kritisch, solange die anpassende Sektion des Übergangs dahinter vor dem Beginn des Übergangs vorne liegt. Auch sollte, da sie orthogonal sind, ihr wechselseitiger Einfluß sehr gering sein. Wenn man beides als Hohlleiter will, kann man ein Design eines Standard-OMT verwenden. Ein OMT mit zwei Hohlleiteranschlüssen wird gerade getestet und wird sehr bald veröffentlicht werden.
Man beachte, dass in jedem Fall alle linearen Anschlüsse, egal, ob koaxial oder Hohlleiter, eine Impedanzanpassung benötigen, damit die ganze Konstuktion ordentlich funktioniert.
Man justiere die Schrauben vor der koaxialen Start-Sektion für beste Impedanzanpassung. Bei den Hohlleiterübergängen sollte eine Abstimmungs-Sektion mit 3 Schrauben für Impedanzanpassung verwendet werden [3].

Der Polarisator

Mehrere Designs für zirkulare Polarisatoren für 10 GHz sind möglich, wie eine dielektrischer Polarisator oder ein verformter Wellenleiter. Der Schrauben-Polarisator wäre eine weitere Möglichkeit, jedoch nicht so interessant, weil eine genaue Justierung ziemlch schwierig ist. Und es gibt natürlich den Septum-Polarisator. Beide, der ganz metallene verformte Wellenleiter-Polarisator und der dielektrische Polarisator können einfache Designs sein, die nicht justiert zu werden brauchen. Die ganz metallene Lösung würde praktisch keinen Verlust haben, die dielektische Variante jedoch würde messbare Verluste haben, die aber gering wären. In der No-Tone-Kategorie wäre auch der Septum-Polarisator zu bedenken, aber wir haben dieses Design nicht gewählt, weil es eine andere Methode zur Speisung der linearen Polarisationen verwendet.

Der Polarisator, der in dem vorliegenden Design verwendet wird, besteht aus einer schmalen metallsichen Sektion im Winkel von 45 Grad. Dies ist eine feststehende Version des bekannten verformten Wellenleiter-Polarisators, die nicht abgestimmt werden muss und deshalb nicht all die Unsicherheiten der Abstimmprozedur beinhaltet.

Die HFSS-Simulationen eines solchen Polarisators wurden durchgeführt und zeigen brauchbare Bandbreite und brauchbare Toleranzen hinsichtlich der Abmessungen. Die Ergebnisse der Simulation für die optimalen Abmessungen zeigen die Abb. 1 und 2.

Abb. 3 zeigt die komplette Zeichung der Mechanik des kompletten Feed-Systems mit einem koaxialen und einem Hohlleiter-Ausgang. Die Feed-Sektion wurde als Referenz als Prime-Focus-Feed eingezeichnet. Man soll hier verwenden, was für den jeweils in Frage kommenden Spiegel am besten ist.

Die Designs des Polarisators und Feeds können in detaillierter Form im Web heruntergeladen werden:

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

Tests und Messungen

Die Messungen wurden auf einem skalaren HP Netzwerk-Analysator, der mit SWR-Sensoren ausgerüstet wurde und kalibrierten Empfangsantennen durchgeführt.
Für die Messungen der Zirkularität wurde die ganze Antennenkonstruktion mit HF-absorbierendem Material umgeben, so dass eine reflektionslose Kammer enstand.
Die Tests bestanden darin, die Leistung zu analysieren, die an den horizontalen und vertikalen Ports eines linearen Feed-Systems ankommt, während der Sender das Feed-System, das hier im Artikel beschrieben wurde, speist.
Die Feldstärke der horizontalen Messantenne entspricht der oberen Spur in Abb. 3 und die Feldstärke der vertikalen Messantenne, die um 3 dB gegenüber der horizontalen abgeschwächt wurde, um eine bessere Darstellung zu ermöglichen, der mittleren Spur in Abb. 3. Diese Messung wurde durch Drehen des TX-Ports von 0 bis 45 Grad bezüglich der horizontalen und vertikalen Meßanntennen verifiziert.

Ergebnisse der Messungen

TX Ausgang SWR:	-32dB	*(nach Justierung durch Abstimmen der Anpaß-Schrauben)*
RX Ausgang SWR:	-24dB	*(nach Justierung durch Abstimmen der Anpaß-Schrauben)*
Zirkularität:	besser als 1,5dB	*(für die Zirkularität ist keine Justierung nötig)*
Isolation zwischen RX und TX Ausgang:	23dB	

Hinweis: Nicht auf eine Spitze bester Anpassung abstimmen, sondern immer versuchen, eine breite Anpassung zu erhalten.

Echotests

Echo-Tests wurden von LX1DB auf 10 GHz durchgeführt, wobei linear und zirkular polarisierte Signale verglichen wurden. Es zeigt sich, dass das Audio-Spektrum des zirkular polarisierten Signals praktisch die halbe Breite desjenigen des linearen hat. Die Tests wurden mit einer Sendeleistung von 100W an den feeds des 3m-Spiegels durchgeführt, mit demselben RX für beide Polarisationen und innerhalb eines Zeitraums von 10 Minuten (um das Feed zu wechseln).
Während der Tests herrschten laut Wetterdienst 8/8 Bewölkung durch Stratocumulus, eine relative Feuchte von 85%, kein Regen und 7°C. Der Mond befand sich im Bereich bei Azimut 210° und Elevation 55°. Für die Audio-Analyse wurde das Programm "Spectran" verwendet und die "Spectran"-Files zeigen klar das Phänomen.

Linear zu linear und circular zu linear EME-Tests

Tests von Willi, LX1DB, Brian G4NNS, Chris GWDGU und Philippe F2TU wurden empfangsseitig mit linear drehbarer Polarisation und sendeseitig mit linearer und zirkularer Polarisation durchgeführt. Die Erbenisse zeigen die Abb. 7 bis 10. Hinweis: Die Signale korrspondieren mit einem CQ-Ruf, daher die Schwankungen des Signals. Für unsere Interpretation kann man die Spitzen verwenden, die einer Serie von Strichen in der Aussendung entsprechen.

In Abb. 7 und 8 können wir das empfangene Signal sehen, das von einer linear sendenden Station stammt während die Polarisation am RX gedreht wird. Abb. 8 zeigt dasselbe Signal, aber als Durchschnittswert. Deshalb kann es leichter ausgewertet werden. Wenn wir die Spitzen nehmen, die einzelnen Punkten oder einer Serie von Punktes des CW-Signals entsprechen, und sie mit dem durchschnittlichen Rauschteppich – der unteren Spur - vergleichen, sehen wir ein Signal-Rausch-Abstand (S/N) von 6 bis 7 dB bei übereinstimmender Polarisation. Bei orthogonaler Polarisation jedoch sehen wir ein S/N von nur 1 bis 2 dB. Natürlich wird dies nicht alle denkbaren Situationen repräsentieren, wie verschiedene relative Mond-Positionen und sehr unterschiedliche Antennengrößen, aber es ist wert zu bemerken, dass es ein typisches EU-EU QSO mit durchschnittlichen Antennengrößen war und daher wahrscheinlich repräsentativ.

Schlußfolgerungen

Aufgrund des Bedarfs eines brauchbaren Feeds für zirkulare Polarisation für EME auf 10 GHz wurde ein orhtogonaler Koppler (OMT) und ein Polarisator entwickelt. Ziel des Designs war es auch, dass die mechanischen Konstruktion keine Probleme für eine durchschnittlich ausgestattete Werkstatt bringen sollte.
Die OMT-Sektion, basiert auf gut bekannten Designs und Konstruktionspinzipien. Sie kann mit zwei Hohlleiter-Ausgängen oder einem Hohlleiter-Ausgang und einem koaxialen TX-Ausgang ausgeführt werden.
Das Design benötigt keine weitere Aufmerksamkeit, außer der Bedingung einer guten Impedanzanpassung. Die Sektion des Polarisators wurde so ausgeführt, dass eine einfache Reproduzierbarkeit gegeben ist und keine Justierung der Zirkularität nötig ist, eine Eigenschaft die essentiell ist, um Justierungen nur auf die Impedanzanpassung reduzieren zu können.
Durch die experimentellen Beobachtungen kann man tatsächlich schließen, dass zirkulare Polarisation einen wertvollen Vorteil bei 10 GHz EME bringt. Mit den durch die EME-Tests erhaltenen Daten war es möglich, 6 bis 10 dB Erhaltung der Polarisation zu beobachten, sowie ein schmaleres empfangenes Audio-Signal bei Echo-Tests mit zirlularer Polarisation. Signale bei Tests von zirkular zu linear lagen etwa 2 bis 3 dB unterhalb zwei gut aufeinander eingestellten Stationen mit linearer Polarisation. Wahrscheinlich ist 10 GHz das höchste Band, wo noch eine Vorteil von zirkularer Polarisation gegenüber linearer vorhanden ist.

Referenzen

Siehe engl. Text.

Bildunterschiften:

Abb. 1 – Model und Gitter für die HFSS-Simulation des Polarisators

Abb. 2 – Leistungsteilung und Phasenverschiebung zwischen den orthogonalen Komponenten am zirkularen Port; die Werte wurden verwendet, um die Zirkularität zu bewerten

Abb. 3 – Abmessungen für zirkulares Feed-System mit koaxialem und Wellenleiter-Port

Abb. 4 – Netzwerk-Analysator-Schirm mit SWR des TX-Port (mittlere Spur)

Abb. 5 – Das gesamte Feed für zirkulare Polarisation mit Choke-RIngen für einen 0.3 f/D Spiegel

Abb. 6 – Bild des experimentellen Aufbaus, auf dem Netzwerkanalysator ist das SWR des RX-Port (untere Linie) und die Isolation zwischen RX-Port und TX-Port zu sehen

Abb. 7 – Empfangenes Signal in linearer Polarisation während die RX-Polarisation gedreht wird, gesendet wird mit feststehender linearer Polarisation. Stärke des Signals in dB bei 200 Hz Bandbreite, Signal in schwarz, Systemrauschen in grau

Abb. 8 – Wie Abb. 7, aber Mittelung der Signalstärke für bessere Visualisierung / Interpretation der Ergebnisse

Abb. 9 – Empfangenes Signal in linearer Polarisation während die RX-Polarisation gedreht wird, gesendet wird mit rechtdrehender zirkularer Polarisation (RHCP). Stärke des Signals in dB bei 200 Hz Bandbreite, Signal in schwarz, Systemrauschen in grau

Abb. 10 – Wie Abb. 8, aber aber Mittelung der Signalstärke für bessere Visualisierung/Interpretation der Ergebnisse

Dual 70cm and 23cm Dish Feed

by Doug McArthur, VK3UM

Background

Over the years there have been numerous designs to provide dual band operation and most followed as a 23cm feed, the W2IMU design. The 70cm feed nearly always consisted of two sets of dipoles arranged in an 'H" configuration which were then switched to provide horizontal and vertical polarization essential for 70cm EME operations. It seemingly was assumed that the dipole impedance in this configuration was about 72 ohms. This was transformed by a transition and multiple quarter wave sections of 72 ohm cable to provide a theoretical 100 ohms. When two of these dipoles in this configuration were connected together in a 'T' the resultant impedance was expected to equate to 50 ohms. With the advent of the VE4MA design it now provides adjustable illumination for dishes in the f/d range of 0.25 to >0.6. In my case, having a 0.43 f/d dish the best illumination would have been achieved by following the VE4MA design but due to the size of the opening it would require the 70cm dipoles to be placed inside the launching ring. Some said it made little difference in performance but I believed degradation would have to occur on both bands. Many operators have taken the easy way out by physically changing their optimized feeds as required. This is certainly the best (and only) way to retain optimum performance on both bands but the physical effort to change the feeds quickly has, I believe seen a decline of stations on 70cms.

Is there a realistic compromise option?

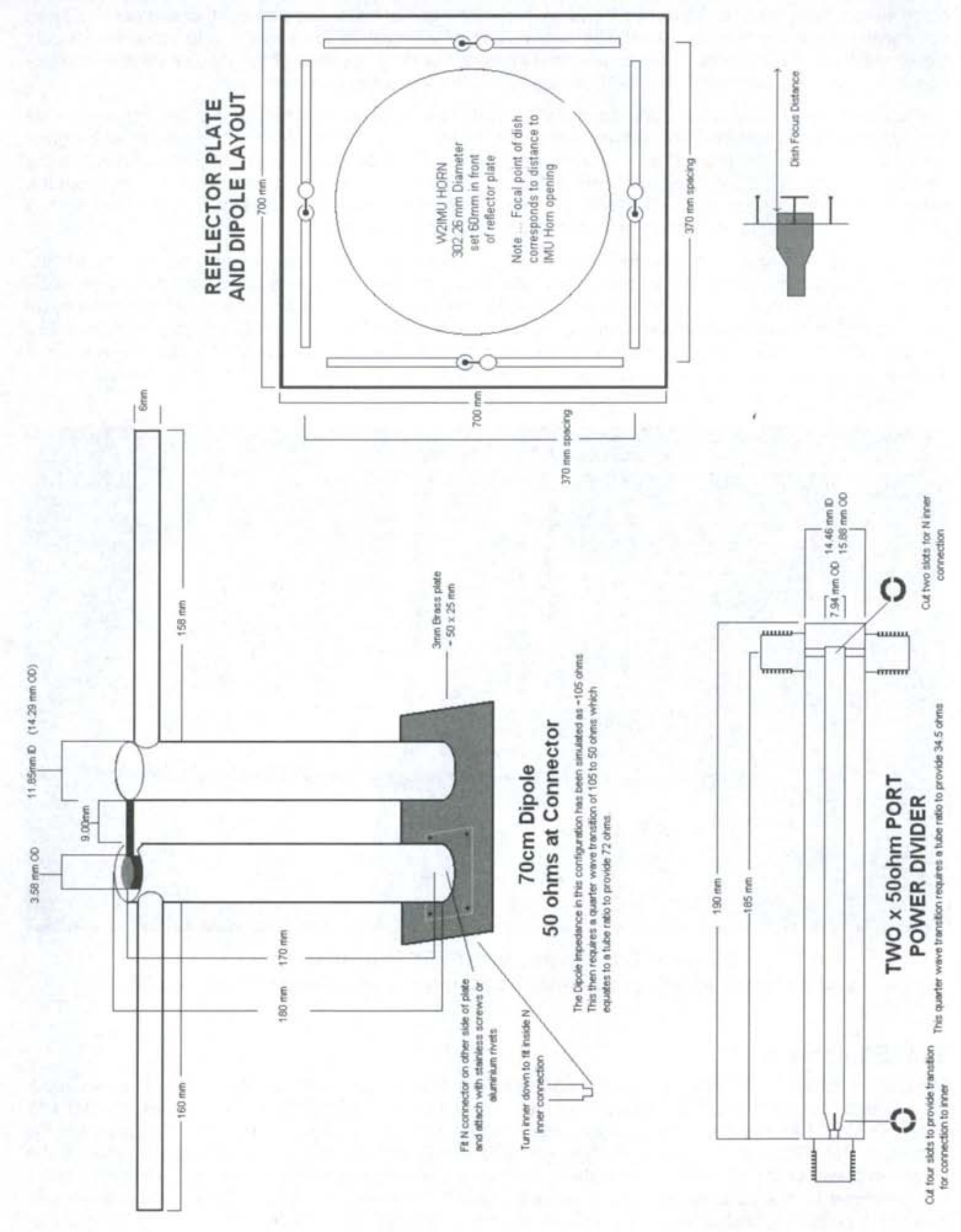
For several years I resisted the proposition to leave 70cm and concentrate on 23cms and although I built a VE4MA feed, which would have provided optimum illumination of my 28ft 0.43 f/d Kennedy dish, I could not entertain the permanent loss of 70cm. I then decided to attempt to build a compromise system that would retain both bands.

The first decision was the easy decision, what feed to use on 23cms? The W2IMU horn was the obvious (and only) choice as the interaction between it and the 70cm feed system should be minimal as the dual dipoles could be arranged in a similar way without impinging significantly upon the 23cm feed. The negative side to such an approach was that the pattern from the W2IMU would under illuminate the dish. It has long been considered that an optimum feed would illuminate the dish with a -10dB taper at the edge of the dish. A 'low noise' dish would have this taper point at about -13dB but in my case I was looking at an edge taper close to -15dB. This meant, in simple terms, that my 28' dish will have shrunk to about 24 feet! However, given the gain of the dish, and the resultant lower received noise temperature, indications were that under illumination in this case would actually provide an increase in actual overall performance.
For a long time I wanted to redesign the 70cm feed but the prospect (having retired and not having a network analyzer at my disposal) of getting the phasing exact with my limited test equipment was daunting. What I knew I could have done in a day would now mean days of cut and try, something that all failed retirees would understand only too well!
My objective with the 70cm design was to achieve as close to a 50 ohm zero j impedance at the splash (reflector) plate for each of the dipoles. Having achieved that, then by the use of two way power dividers the ultimate match, and lowest loss feed could be achieved without the use of the notorious and seeming impossible to achieve quarter wave matching sections.

The idea is far from new and Geert (PA3CSG) for one, has used a similar technique and with Graham (F5VHX) simulation calculations (confirmed independently by David VK3AUU) the real dipole centre impedance calculated was in fact ~105 ohms. This was the key factor to the whole re-design. Previously 72 ohms was seemingly accepted as the value. The implementation was going to be a challenge without a network analyser but if the calculations prove correct in reality then it should not be too hard to implement.

The 70cm Dipole configuration

Before I go further, this feed system by simulation, also does not fully illuminate a 0.43 f/d dish, and the theoretical taper is ~ -13dB. This results in a lower than optimum gain but provides a lower effective



VK3UM 70cm and 23cm Dual Feed System

Not to scale - nicht maßstabsgetreu

receive noise temperature. Again like the 23cm feed this was not considered a negative and besides I had been using it unknowingly for years! The only way to fully illuminate the surface is to move the dipoles closer. As the dipoles are as close as practical anyway, bending the ends of the dipoles could be an option. I considered it 'too messy' and likely to add possible unforeseen problems.

The accompanying drawings provide the dimensions that are required to duplicate this design. Importantly the transformations required are shown. It will help to use my software (ZCalculator, which was written during the course of the project) as you will surely find that the tube sizes are not available. Choosing the best combination is simplified by use of the software. Invariably you will most likely have to turn down the inner.. (refer www.sm2cew.com) Ironically, I brought home from the US a stack of hobby tubing for this very purpose only to find the locally available sizes were more applicable!

The key, is the 105 to 50 ohm transformation (72.5 ohm transition) and what ever tube/rod you can obtain, this ratio must be maintained. The inner rod or tube becomes the difficult area of construction where 'near enough' is really not 'good enough'. I have a lathe but my initial attempt to accurately turn down the available rod to that calculated was a disaster. I did not have a 'steady' and required help from an expert. Enter Bob (VK4XV) builder of steam engines and all things mechanical who saved the day. He was most apologetic when he said he could only get it down to 0.02mm accuracy over 170mm and would that be acceptable! Well that was good enough!

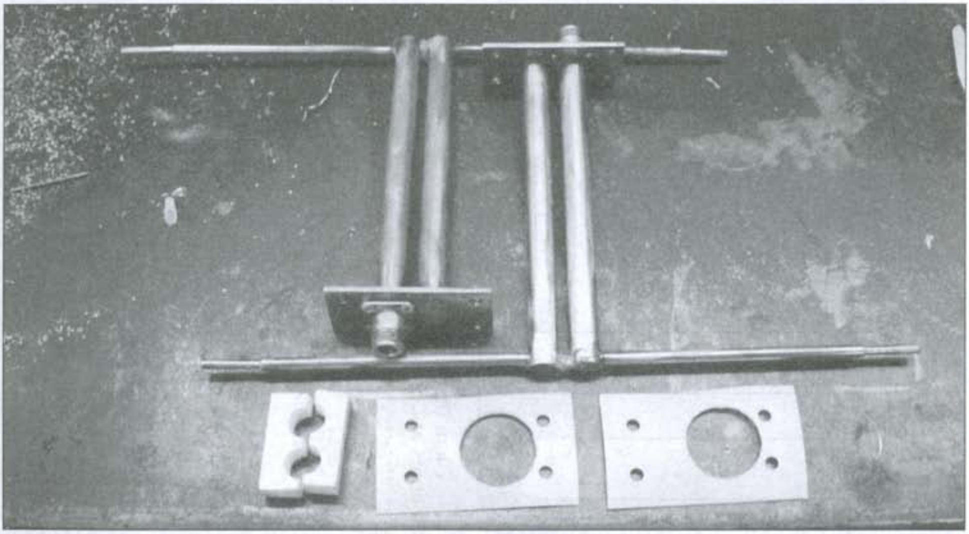


Photo 1: Two dipoles with PTFE insulation sheet and dielectric shorting stub (not used) prior to mounting on splash plate

Test Equipment

My 'test equipment' consisted of a Icom 910H, Bird watt meter, (with a 5 watt slug), a home built impedance bridge (copy from RSGB VHF/UHF Manual 10.17 modified with SMD c's and r's for a better balance), MFJ-269 Analyser (I was disappointed .. to put it politely .. when I found that Z measurements ceased at 150MHz .. they don't spell that out!) and a 6dB through line attenuator used to reduce the minimum power of the IC910H to that suitable to drive the impedance bridge. I also used a HP141T spectrum analyser for the port isolation measurements. Last but not least, a digital set of vernier calipers with selectable metric/Imperial is pretty well essential for those with less than 20/20 vision.

Test Range

Initially I set up a wooden bench outside in the clear but it did not take long before the summer heat became just too much and I moved the bench back inside a large 20x10x4 meter metal walled and roof

Farm shed. Yes there were reflections, but I found that pointing it a certain way inside the shed to I could reciprocate the 'outside readings'. I resumed my fabrication inside the shed. The final result, when tested outside again proved identical ... and I avoided a dose of sunburn! I only raise the aspect of the test range as you can with care get away (like I did) without the requirement of a 'purists outside test range'. It makes for a more pleasant working environment!

The W2IMU horn

Nothing much to add here .. just follow the dimensions and build it! I was most fortunate as a local farmer had a roller he had not used for decades that worked just fine. Finding it under his junk in the 'workshop' proved the biggest challenge! Tuning it, well that's the easy part. Having followed Graham (F5VHX) escapades in meticulously setting up of a test range, building and testing helixes and spending a frustrating week or more adjusting, tuning and proving the resultant measurements to be circular, he then measured the final derived settings and found they were so very close to the published design data !! I set them to these figures. Done!

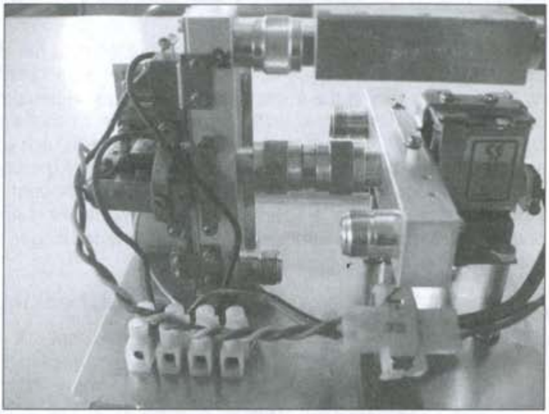


Photo 2: HF400 Transmit and polarity switching relay configuration before fitting in enclosure

Warning. *If you require additional power when checking the return loss or port isolation on 23 cm be aware that the safe distance for 50 watts into the horn will equate to 2.01 meters. Do not look into the horn or 'be out front' when power is applied. If you have to get close do so from the rear. Refer my EMRCalc program for further information.*

Yes I did check each of the probes for return loss and found that is was not 'special' but after varying the length and diameter of the probes I found I still could not do any better and went back to the published dimensions. I did not add the polarizing screw as I measured > 25dB between the ports which I felt was good enough. (Measured with the HP141). I had the whole horn silver plated. It was quite inexpensive and admittedly an over kill but I can now watch it go black instead of green! I then lacquered the outside with the special outside acrylic lacquer 'guaranteed' to resist UV (24 hours?) and covered the opening with 1mm PTFE (Teflon) sheet. This is held in place by two 'in series' hose clamps. Get two the same as you can bet the treads will be different on other sizes. Mount the horn as shown on the splash plate protruding 50mm forward.

This is the actual focal point that should correspond to the dish and this point also corresponds very closely to the dipoles focus as well. Final positioning in the dish may be necessary and will be explained later.

Hints and ideas

I used soft solder through out the construction of the power W2IMU, dividers and dipoles. Silver solder would have been a better option but the cost of gas bottle rental in this country is exorbitant and the extra heat, where necessary, was obtained from the trusty propane gas bottle. I also have a very large 250W electric soldering iron. Admittedly one needs to be an octopus when working on the IMU.

During my previous construction I had mounted the brass dipole plate to the aluminium splash plate with aluminum rivets with so called carbon impregnated aluminum conducting grease. Wrong! I knew it at the time that corrosion/electrolysis would be a problem but after 4 years was far worse than I ever expected. Answer. Use PTFE (Teflon) sheet between the plates and attach with stainless steel screws. (Peter G3LTF's suggestion). If you want to use aluminium rivets be aware that the common hardware variety have ferrous heads and the expanding pin/head will rust ... knock them out after fixing to avoid this rust problem, or use aircraft quality rivets if you can get them. (Dave G4RGK's suggestion).

I also made up a jig to hold things in place whilst soldering. It took some time and effort but not every one still has retained the same dexterity of their youth .. and they all turned out the same!
I suspect that the length of the dipoles could vary a little if you don't use the 6mm tube. Initially I had screws in the end of each which I could vary to obtain the best match as shown. It took quite some time as was not as simple as one would have hoped for there is significant interaction between the dipole ends. When I finally got the lengths correct I replaced the screws with brass rod inserts turned up on my lathe. I also made a set of PTFE dielectric tuning (shorting) stubs on the assumption they would most likely be required for the final tuning.

I have tried many types of sealant to seal the ends of the dipoles. I have as yet to find something that is truly inert to brass and does not leave a tell tale green verdigris mark. It really does not matter too much as the weather seal is the important part. Choose an inexpensive one from your local hardware store 'non corrosive, UV resistant and water proof, suitable for roof and rain water systems!'. Previously I had used Dow Corning 732 (brilliant for corona suppression in high power RF amplifiers) but that too is also corrosive to a minor extent, and expensive. I did several experiments to see if there was any un-toward effects upon the tuning. Yes, slight, not as much as I first thought. Use only as much that is required to seal the very end of the dipoles to keep the dielectric constant change to a minimum. Watch carefully around the bridging strap to get a total seal. Use a moistened finger to form the sealant into a smooth continuous finish.

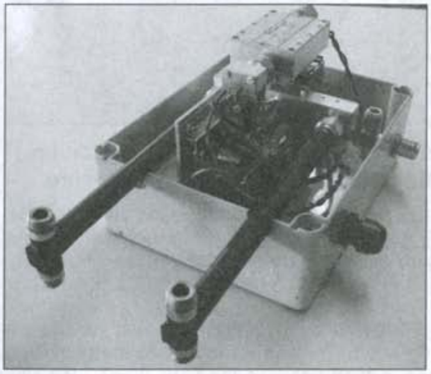


Photo 3: Power dividers, Polarity, Tx Rx switching and Preamp enclosure

Checking each Dipole

Mount all the dipoles on the reflector plate. In the beginning I used a six wavelength length of LDF4-50 (measured as below) to isolate myself from the proximity of the splash plate. I soon found that that was not essential as I connected either the Bird Wattmeter and/or the MFJ-289 directly to the dipole under test. The primary adjustment was the length of the dipole and I was able to monitor simultaneously adjacent pairs and thus see the interaction between them. It took a while to arrive at the dimensions given and I would expect minimal adjustments will be needed in you case if you follow the given lengths. You should expect to see figures with the Bird of 50 watts forward < 0.3W reflected or a VSWR of about 1:1.15.

Warning. *If you need to run power when checking for return loss on 70 cm be aware that the <u>safe distance for 50 watts into the dipoles will equate to 2.5 meters.</u> If you have to get close do so from the rear. Refer my EMRCalc program for further information.*

I found it interesting, (but probably obvious when thinking about it) that whilst the dipole lengths were not exactly resonant, moving your finger up and down the transition would enable you to obtain a perfect match (on the meter). Don't be tempted to replace your finger with a mechanical one as you can do better! As you progress to obtain resonance the effect disappears and the previously constructed dielectric stubs were consequently not needed. (I was using the MFJ-269 not RF at the time!). Not having access to a Network analyser to accurately measure the impedance and j I cannot be sure it is exactly 50 ohms (with little j), but the way it behaves leads me to believe it must be close (as predicted by simulation). Adding random lengths of 50 ohm coax consistently indicated the same (or so very close to it) return loss further confirming theory with practice.

Cutting the phasing sections between the dipoles and power dividers

What ever coax you choose as your connecting cable, the precise dimensions can be quickly obtained from ZCalculator. In my case I chose LDF4-50 to keep losses to the very minimum. The length is best kept to a multiple half wavelength. This is not totally necessary as equal lengths would suffice but I preferred to keep what ever the final Z was at the dipoles transformed to the input of the power dividers. In this case, with the configuration shown, it required a full wavelength to reach the two way power dividers comfortably. (It is a tight fit but it works out fine). These ~600mm lengths can be 'artistically bent' and positioned as per the photos to match the positioning of the power dividers and polarity switching box. It was positioned to provide equal balance and distance to all four dipoles. This is not an easy task and I would suggest bending a length of scrap cable to 'practice' and form a template. When you are finished you will agree that it looks so very pretty that it just has to work! I finally sealed each connector with heat shrink tubing and when in situ covered this with Denso Tape (waxed tape). Our cockatoos (birds with big beaks and an affinity to anything chewable) are not partial to this type of tape.

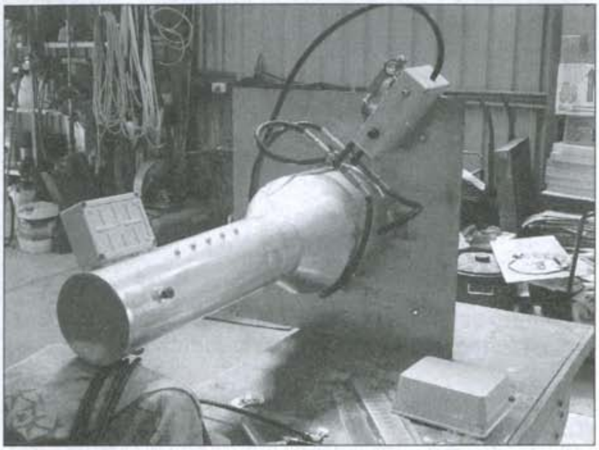


Photo 4: Cabling Layout betw. dipoles & power dividers

To cut the cable length exactly, the first will always be the hardest! If you have not had recent practice terminating LDF4-50 connectors then you are in for a refresher course! Fortunately they are a lot easier than most and some what forgiving if you do happen to make a mistake. Don't put the 'O' rings in place until the final assembly .. and then don't forget them either! Terminate one end and then mark out the calculated distance plus about 10mm. You will find the length very critical to the point where a few file scrapes are only needed to get it exact. It is best to start with a 'test length' so that you can get to know your impedance bridge and what you will see at resonance.

You can choose the open circuit or short circuit method and you will really need to 'go through' the resonant point to get the 'feel' and the actual reading on the Z meter. I preferred to use the open circuit method as I could see the effect with each stroke of the file. It all depends upon the balance of your instrument and once you know when to stop you will be in business! Now you have a length of cable with a connector on one end and an end waiting to be terminated .... I used Andrews' connectors, which may not be the same as yours and even then there are different models of the 'same' connector, so to provide you with a simple way of terminating the final connector and retaining the same electrical length will naturally vary. Take your time and 'work backwards' from the added length of the inner to determine just how much to dress back the cable. Chances are you may not get it right first off and have to start all over again. Once you get one right you can then pull it apart again and duplicate all the 3 remaining cables. Granted it can be frustrating but in the end you can achieve a result that is within a degree or so with the simple equipment described. Remember it will end up as a tip to tip measurement. Purists' will debate this too, but I was not cutting a 6" hard-line feed phasing line to get a precise 1 degree tilt on a 64 bay TV stack as I often had to do in my previous life! Probably you should be looking at a length 2 times less than the tip of the Type N connector inner .. but that's just too hard to do in a practical sense, and its just really not necessary on 70cms.

The two way Power dividers

Just fabricate them as the diagram describes. They are not too critical but again try and get the transformation ratio dimensions as close as possible. Cut four hack saw cuts on the inner end that goes to the single connector and then enlarge the cuts with a small flat file. You can then carefully crush the end to form a taper to fit the inner of N connector. At the other end, cut a single hacksaw cut and then enlarge with a small flat file to accommodate the opposing N connectors. To provide a flat surface, onto which I soldered the two N connectors, I inserted a square metal block (tapered on the end for gradual insertion) just larger than the diameter of the tube and applied generous heat to the brass tube. Then gently (and very slowly) hammer home the block. This transformed the round tube to a square end section for easy mounting of the N connectors. With care and patience you won't split the tube. (well not too many times!) It pays to do the ends first before cutting the tubes to length as Murphy will surely cause one to split! Next check the validity of two terminating resistors. You never know, you may have hit them with too much goo at one stage, and they may not be in the best of health! Then finally check the power divider by terminating each input port with 50 ohm resistors. When using the MFJ 269, you will see a >30dB return loss.

The polarity switching and LNA box

Again a picture tells a thousand words. You will see I have used two HF400 relays (one for the polarization switching and the other for the transmit/receive change over) mounted at right angles. I use a separate feed line back to the shack from the LNA output. The LNA is left on all the time and the isolation (provided by the HF400) is adequate protection (>60dB) when running 1500 watts at the feed. (Yes I have an ACMA high power permit!). The construction requires only one M-M connector and the power dividers screw directly to the HF400 polarisation relay as does the LNA to the Rx side of the Tx/Rx relay.

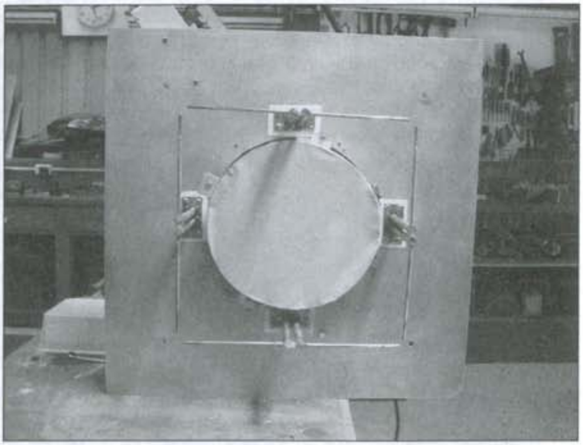


Photo 5: Front view of W2IMU and dipoles. PTFE (Teflon) sheet covering over mouth of horn

You can not get a lower loss set up than that !! ?? Weather sealing is done by applying silicon sealant around the Power dividers after each 'visit'(should be quite rare). No flash plastic bags are used here like some I know! I run separate cables for both the LNA and relay switching with all relays back EMF protected with diodes of course. When I was using my previous cavity LNA I employed a series of regulators starting at 12v to 9v to 5v to a 3.2v zenner. I never had one fail by employing such an over kill method. It did seem good idea at the time!

As an aside my previous LNA and polarity switching configuration consisted of too numerous to mention (embarrassing) 'T's' and bullets that were deemed necessary to achieve an acceptable match. On hindsight it was wrong wrong wrong, but we all do it at times to get going, fully intending to revisit it later and put it right .. which never seems to happen! The above configuration has provided a significant improvement in achieved receiver noise figure.

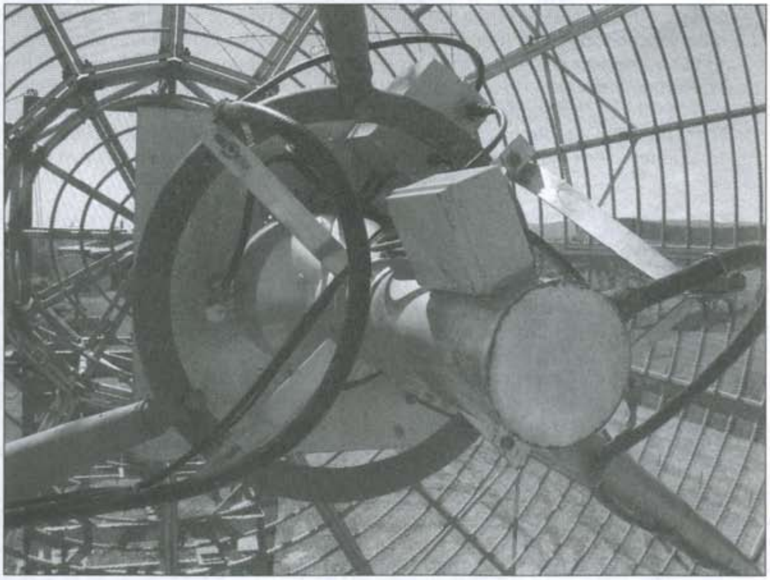


Photo 6: Feed mount in dish. That mounting ring weighs 25kg!

Putting it all into the Dish

I had now reached the stage I feared the most! Mechanically it is a dream to work on the feed from the feed platform and the hardware mounting is rigid in the extreme. I had made provision to be able to move the splash plate back and forth (mounted on four 15mm threaded rods) to accommodate finding the phase centre of the dish. I also paid special attention to the LDF5-50 transmit feeders which would require sufficient slack to facilitate this expected movement.

My major concern was the interaction I had experienced with the previous 70cm feed. This was, to say the least, most profound. I had spent hours raising and lowering the dish and adding those previously mentioned extra bullets and re-cutting and terminating the '75 ohm phasing sections'. Interaction between the dish and the adjacent EME Shack was significant to say the least.

As a first check (I first concentrated on the 70cm feed) I attached the MFJ-269 directly the LNA input on the HF400 and found both polarisation to be so close to the 'test bench figures' that almost made me suspicious! This was with the dish 'over and 2 meters from the shack. I then reverted to applying power to the transmit feeder and confirmed the figures just measured at the LNA. I held my breath as I raised the dish to about 45 degrees, clearing shack, and was delighted (read ecstatic) to find that the return loss actually improved a tad on both polarities. Well that was the 70cm taken care of and attention was then given to the 23cm horn.

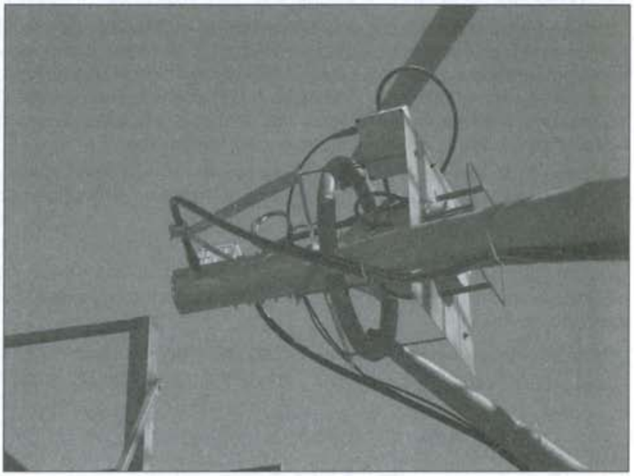


Photo 7: Feed mount in dish

This too was an anti climax as the return loss was also so close to the test bench figures as well. Again little or no difference to the return loss occurred when I raised the dish. My ecstasy had now reached fever pitch!

The next step was to prove, by noise measurements, that all performance figures were being realized. I quickly checked the Sun noise on 70cms and found it to be within the ball park to what I expected, but upon measuring the Sun Noise on 23cms it was well below (estimated 3dB) what it should have been. (EMECalc). Checking my echo's also confirmed something was far from right and both figures pointed directly towards the feed as they were commensurate with each other. The beam width was measured and found to be very close to that predicted (just under 2 degrees). No side lobes that could be measured. Maximum Sun noise was occurring right in the centre of the dish as confirmed by the shadow and the pattern was seemingly correct in all planes. Still I was down significantly in Sun noise to what I calculated. Thoughts went to what could have been happening with the 15dB taper but that too did not add up. My prime suspicion was that the feed was not at the phase centre of the dish. I then contacted several friends (see acknowledgements below) for their diagnosis and prognosis of the situation!

All reservedly agreed that this was the most likely cause but their thoughts did vary in how much could be gained or lost in the situation. The one thing that was bugging me was that I knew the splash plate was set at the focus and that meant the W2IMU horn was 50mm closer to the dish surface that theory dictated. Would such a 'minor difference' cause such a markedly degradation. I did not think so, but one guy turned out to be spot on. Well I waited for one cool day when the sun was on my Northern side of the zenith (yes some things do go backwards down here!) so as the distance between the feed platform and the Sun would mean minimal dish travel. I expected to do this many times and my hydraulic elevation system is not too fast. First to the Sun and carefully measured the noise and watched it for about 15 minutes to observe any variation. Back to the feed platform and confirmed with a long calibrated plastic pipe that the splash plate was indeed 144 inches from the surface (yes we are bi unitized here too!) I then shifted it away from the dish by 50mm. Back to the Sun and wow! ... the missing 3dB had appeared like magic.

I could not believe my eyes but repeating the measurement many times confirmed the significant improvement. The Moon had risen and I just could not wait to check for echo's. They too were now as predicted ... and .. the real confirmation .. I was now seeing Moon noise (0.5-0.8dB). No I did not go back and move the feed any more ... I should have, but for mine the Moon noise was my confirmation that I was unlikely to do any better.

On air performance

I could be tempted to say I was able to work this rare un-inhabited rock at 59+ using 5 watts on a winters' day with my Long John M cubed with the cat on my lap, but I will resist such a description of performance evaluation and leave such valued reports to other less salubrious publications.

The acid test of performance was being able to duplicate the predicted values of Sun and Moon noise, as well as noise sources of Cygnus and Taurus. (I can't see Cassiopeia down here as we are too far South and Sagittarius is not a point source). Measuring cold sky to ground (cs-g) is a challenge and a practical impossibility in my case due to my dish being positioned on a ridge line 15 meter wide falling away some 150 meters at 60 degrees. (try walking up it!). As a consequence I thus decided to include a terminating resistor (for 23cm) as a indication of ground temperature.

On 23cm Sun Noise is within ±5 sfu (Solar Flux Unit) of predicted values (VK3UM EMECalc) whilst Taurus measures ~0.6dB and about Cygnus ~1.1dB. My cs-g when pointing at my closest hill some 1.5 km away and noting under illuminating the aperture at such angles, measures about 6.8dB whilst cs/term measures ~7.1dB. The figures do indicate the known difference in illumination.

On 70cm Sun Noise is also within ±5 sfu of predicted values whilst Taurus measures ~1.1dB and Cygnus ~2.3dB. Cold Sky to Ground is ~5.8dB. In both bands, by simply using Sun noise, side lobes cannot be detected (>22dB).

I should point out that my measuring method is far from optimum as I am currently performing it at AF in a USB (2.4kHz) bandwidth in conflict to recommended methods requiring band widths >300kHz.

Summarizing

In summary the figures do indicate that the performance is very close to those predicted in theory. On 23cm the loss in aperture illumination has been shown to have been compensated by improved noise performance by the figures and the transmit gain loss is minimal and of little consequence given the size of the dish. Any apprehension that performance would be degraded has proved to be unfounded in fact it appears that the net result has been positive.

Finally, there are two points I wish to revisit. Firstly the little or no degradation from test bench to dish of the new 70cm feed when compared with the previous one as well as the lack of proximity interaction with the adjacent structure and, Secondly the significant effect the focal positioning had with respect to the 23cm feed.

I feel satisfied that there is little further that could be done to improve the current dual feed system given the constraints of the dish and to prime requirement to retain the two bands. I also feel confident that the system, if followed with due care, may be duplicated by others with corresponding results singularly or as a dual configuration. The overall 70cm feed configuration is a significant improvement on previous designs and provides a very low loss coupling commensurate with switch able polarity.

Acknowledgements

During the course of this undertaking many were an inspiration and provided help, ideas and encouragement. The key to the whole project, the modeling and defining of the actual feed impedance, I place at the feet of Graham F5VHX and Geert PA3CSG and with Hannes OE5JFL, Peter G3LTF, Peter SM2CEW, Dave G4RGK, Paul WA6PY, Al K2UYH, and David VK3AUU, all provided a forum of discussion and assistance. W1GHZ's Microwave Antennae book was used extensively as a reference as well.

Addendum

High resolution drawings and photos are available on Peters SM2CEW website at **www.sm2cew.com**.

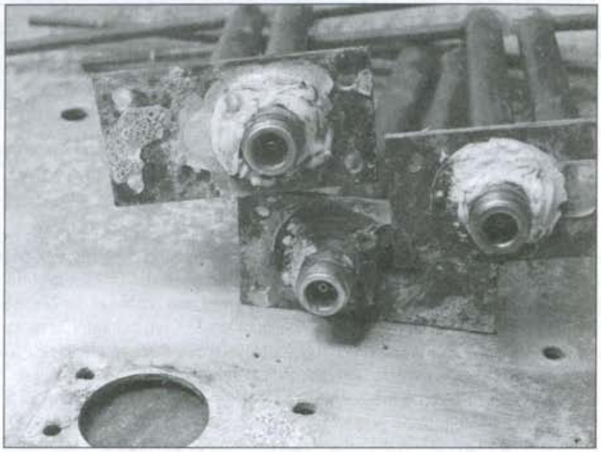


Photo 8: Corrosion - electrolysis of old feed system after 4 years

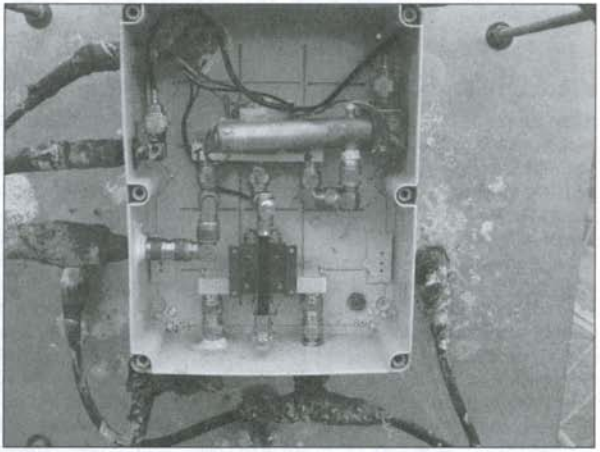


Photo 9: Old 70cm system .. note all the connectors! ... how not to do it!

Duales Feed für 70 & 23cm

von Doug McArthur, VK3UM

Hintergrund

In den letzten Jahren gab es einige Designs, um Zweiband-Betrieb zu ermöglichen und die meisten orientierten sich beim 23cm-Feed am Design von W2IMU. Das 70cm-Feed bestand fast immer aus 2 Gruppen von Dipolen in H-Konfiguration, die dann umgeschaltet wurden, um horizontale und vertikale Polarisation zu ermöglichen, was essentiell für 70cm-EME-Betrieb ist. Anscheinend wurde vorausgesetzt, dass die Dipol-Impedanz in dieser Konfiguration 72 Ohm beträgt. Diese wurde mit Übergängen und vielen Viertelwellenstücken von 72-Ohm-Kabel transformiert, um theoretisch 100 Ohm zu erreichen. Wenn zwei dieser Dipole in dieser Anordnung als „T" zusammengeschaltet werden, wird als resultierende Impedanz 50 Ohm angenommen. Mit dem Erscheinen des VE4MA-Designs wird nun eine justierbare Ausleuchtung für Spiegel mit f/d im Bereich von 0.25 bis >0.6 möglich. In meinem Fall mit einem 0.43 f/d Spiegel wird die beste Ausleuchtung durch Verwendung eines VE4MA-Designs erreicht, aber aufgrund der Größe der Öffnung wird es nötig, die 70cm-Dipole innerhalb des Halterings zu positionieren. Manche sagen, dass das kaum Unterschiede in der Performance ausmacht, aber ich glaube, dass eine Verschlechterung auf beiden Bändern auftreten müsste. Viele OPs haben den einfachen Weg gewählt und wechseln einfach ihre optimierten Feeds aus, je nach Bedarf. Dies ist sicher der beste (und einzige) Weg, die optimale Performance auf beiden Bändern zu erhalten, aber der physische Aufwand, die Feeds schnell austauschen zu müssen, hat – so glaube ich – zu einem Rückgang der aktiven Stationen auf 70cm geführt.

Gibt es eine realistische Option für einen Kompromiß?

Für mehrere Jahre widerstand ich der Absicht, 70cm zu verlassen und mich auf 23cm zu konzentrieren. Und obwohl ich ein VE4MA-Feed gebaut habe, das optimale Ausleuchtung für meinen 28-Fuß-Kennedy-Spiegel mit f/d 0.43 gehabt hätte, konnte ich den dauerhaften Verlust von 70cm nicht erwägen. Die erste Entscheidung, welches Feed für 23cm zu verwenden sei, war leicht. Das W2IMU-Horn war die offensichtliche (und einzige) Wahl, weil die Wechselwirkung zwischen ihm und dem 70cm-Feed-System minimal ist, weil dessen Doppel-Dipole in gleicher Weise angeordnet werden können, ohne signifikant störenden Einfluß auf 23cm zu haben. Die negative Seite einer solchen Lösung war, dass das Diagramm des W2IMU-Feeds meinen Kennedy-Spiegel nicht genügend ausleuchten würde. Es wurde lange angenommen, dass ein optimales Feed den Spiegel mit einem -10 dB Abfall an den Kanten des Spiegels ausleuchten müsste. Ein „Low-Noise" Spiegel müsste diesen Abfallpunkt bei etwa -13dB haben. In meinem Fall aber fand ich einen Abfall am Rand von nahe -15dB. Dies bedeutete, dass – einfach ausgedrückt – mein 28 Fuß Spiegel auf etwa 24 Fuß schrumpfen würde. Jedoch, mit dem Gewinn des Spiegels und der resultierenden niedrigeren Rauschtemperatur, sollte diese Unterstrahlung in diesem Fall zu einem Anstieg der tatsächlichen Gesamt-Performance führen.
Für lange Zeit hatte ich bereits den Wunsch, das Design des 70cm Feeds zu überarbeiten, aber die Aussicht (seit ich Rentner bin, habe ich keinen Netzwerk-Analyzer mehr zur Verfügung), die Phasen exakt mit meiner begrenzten Ausstattung am Messgeräten hinzubekommen, war entmutigend. Wovon ich wusste, dass man es an einem Tag hätte erledigen können, würde nun mehrere Tage Herumversuchens bedeuten, etwas, was alle erfolglosen Renter nur zu allzu gut nachvollziehen können!!

Mein Ziel für das 70cm-Design war, möglichst nahe an eine Impedanz von 50 Ohm, Null j Impedanz an der Reflektor-Platte, für jeden Dipol zu kommen. Wenn man das erreicht hat, dann kann durch Verwendung von Zweiweg-Leistungsteilern die ultimative Anpassung und verlustärmste Zuleitung erreicht werden, ohne die berüchtigte und anscheinend nicht realisierbare Viertelwellen-Anpassung zu verwenden. Diese Idee ist nicht neu und Geert (PA3CSG) hat eine ähnliche Technik verwendet und Graham (F5VHF) hat in Simulationen berechnet (unabhängig von David (VK3AUU) bestätigt), dass die Impedanz im Speisepunkt des realen Dipols **tatsächlich ~107 Ohm** beträgt. Dies war der Schlüsselfaktor für das ganze geänderte Design. Zuvor war anscheinend 72 Ohm hierfür der akzeptierte Wert. Die Umsetzung ohne Netzwerk-Analyzer würde eine Herausforderung sein, aber wenn sich die Berechnungen in der Realität als korrekt herausstellen würden, dann sollte die Realisierung nicht so schwierig sein.

Die Anordnung der 70cm Dipole

Bevor ich weiter ausführe: Dieses Feed-System leuchtet in der Simulation einen Spiegel mit f/d 0.43 auch nicht voll aus und der theoretische Abfall ist ca. -13 dB. Dieses resultiert in geringerem Gewinn, führt aber zu einer niedrigeren Rauschtemperatur. Wie beim 23cm Feed wird dies nicht als negativ befunden und außerdem habe ich es unwissenderweise so jahrelang verwendet! Die einzige Möglichkeit, den Spiegel voll auszuleuchten, besteht darin, die Dipole enger anzuordnen. Da die Dipole jedoch aus der praktischen Sicht schon so dicht zusammen sind, wie möglich, könnte das Biegen der Enden der Dipole eine Option sein. Dies fand ich aber zu „unordentlich" und es liegt nahe, dass irgendwelche anderen unvorhersehbaren Probleme dabei auftreten.

Die zugehörigen Zeichnungen liefern die Abmessungen, die nötig sind, um das Desin nachzubauen. Wichtig sind die gezeigten Transformationen. Es ist hilfreich, meine Software (Z-Calculator, die im Laufe des Projekts geschrieben wurde), zu verwenden, da man ganz sicher die verwendeten Rohrdurchmesser so nicht vorfinden wird. Die Auswahl der besten Kombination wird durch die Verwendung der Software vereinfacht. Ausnahmslos wird man das innere Rohr herunter drehen müssen (siehe SM2CEW.com). Ironischerweise habe ich mir aus den USA ein Sortiment von Rohren für diesen speziellen Zweck mitgebracht, um dann herauszufinden, dass die zuhause erhältlichen Maße besser passen!

Der Schlüssel ist die Transformation von 105 auf 50 Ohm (72.5 Ohm-Übergang), und was auch für ein Rohr/Stab man verwendet, dieses Verhältnis muss erhalten bleiben. Der innere Stab oder Rohr ist die schwierige Stelle der Konstruktion, bei der „fast" nicht wirklich „gut genug" ist. Ich habe eine Drehbank, aber mein erster Versuch, den verfügbaren Stab akkurat auf das berechnete Maß abzudrehen, war ein Desaster. Ich habe keinen Freund, der mir den benötigten Rat eines Experten geben konnte. Dann kam Bob (VK4XV), der Dampfmaschinen baut und alle mechanischen Dinge, der mich rettete. Er bedauerte es, dass er nur auf 0.02 mm Genauigkeit auf 170mm Länge arbeiten konnte, und ob das akzeptierbar sei? Naja, das war nun wirklich gut genug!

Test-Equipment

Mein Test-Equipment bestand aus einem Icom 910H, Bird Wattmeter (Mit 5-Watt-Kopf), selbstgebauter Impedanzmeßbrücke (aus Ham Radio, July 1976, modifiziert mit SMD-C's und R's für bessere Balance), MFJ-269 Analyser (Ich war -höflich ausgedrückt - enttäuscht, als ich herausfand, dass Z-Messungen bei 150 MHz aufhören...) und ein 6dB-Durchgangsdämpfungsglied, um die minimal mögliche Ausgangsleistung des IC-910H auf einen passenden Pegel für die Impedanzmeßbrücke zu bringen. Um die Isolierung der Ports zu messen, habe ich auch einen HP141T Spektrum-Analyzer verwendet. Und eine digitale Schublehre soll zum Schluß noch erwähnt werden, bei der metrisch und Inch eingestellt werden kann, unverzichtbar für die, die nicht mehr 100% Sehkraft haben...

Test-Gelände

Anfangs habe ich eine hölzerne Testbank draußen aufgestellt, aber für mein endgültiges „Testgelände" habe ich die Bank in ein 20 x 10 x 4m großen metallwandenen Schuppen verfrachtet. Ja, da waren Reflektionen vorhanden, aber ich fand eine bestimmte Richtung, auf die ich drinnen zielen musste, so dass ich die „Außenmesswerte" reproduzieren konnte. Ich setzte die Fertigung innen im Schuppen fort. Das Endergebnis zeigte, als es außen getestet wurde, wieder identische Werte... und ich vermied so einen Sonnenbrand bei mir. Ich erwähne hier nur den Aspekt des Testgeländes, weil man mit Sorgfalt wegkommen kann (so wie ich) von einem Erfordernis eines „Außen-Testgeländes für Puristen". Dadurch hat man dann eine Umgebung, die netter fürs Arbeiten ist.

Das W2IMU-Horn

Da gibt es nicht viel hinzuzufügen – einfach den Abmessungen entsprechend nachbauen. Ich hatte Glück, da ein Bauer hier vor Ort eine Ackerwalze hatte, die er jahrzehntelang nicht benutzt hatte, die passte perfekt. Die größte Herausforderung war es, die unter dem ganzen Krempel in seiner Werkstatt zu finden! Die anzupassen war der leichtere Teil. Graham (F5VHX), mit seinen „Eskapaden" von peinlich genauem Aufbau eines Testgeländes, Bauen und Testen von Helixen, dem Verbringen von über einer Woche mit Abgleich, Justieren und dem Beweisen, dass die resultierenden Messergebnisse zirkular sind, maß dann bei den schließlich erhaltenen Einstellungen und fand, dass diese extrem nahe an den publizierten Daten des Design lagen! Ich nahm diese Werte und fertig!

Warnung! *Falls man zusätzliche Leistung benötigt, um das SWR oder die Isolation zwischen den Ports auf 23cm zu messen, sollte man sich bewusst sein, dass der Sicherheitsabstand bei 50 Watt am Horn 2.01m beträgt. Nicht ins Horn schauen und weg von der Vorderseite sein, wenn Leistung anliegt. Wenn man nahe ran muß, dann von hinten. Für weitere Infos, siehe mein EMR-Calc Programm.*

Ich habe das SWR bei beiden Sonden getestet und nichts besonderes festgestellt. Ich habe Länge und Durchmesser variiert und keine Verbesserungen erreichen können, so dass ich zu den publizierten Werten zurückgekehrt bin. Ich habe nicht die Polarisator-Schraube hinzugefügt, da ich schon >25dB zwischen den Ports gemessen habe, was gut genug ist (mit HP141 gemessen).
Ich habe das komplette Horn versilbern lassen. Es war recht billig und selbsverständlich zuviel des Guten, aber nun kann ich zuschauen, wie es anstatt grün dann schwarz wird! Dann habe ich es von außen lackiert mit einem Spezial-Acryl-Lack für außen, der garantiert UV-beständig sein soll. Die Öffnung habe ich mit 1mm PTFE-(Teflon)-Material bedeckt. Dieses wird mit 2 Schlauchschellen „in Serie" fixiert. Man sollte möglichst zwei gleiche bekommen, da man wetten kann, dass bei verschiedenen Größen die Weite verschieden ist. Das Horn auf der Reflektorplatte 50mm herausragend montieren, so wie abgebildet. Dies ist der tatsächliche Fokus-Punkt, der zum Spiegel korrespondieren sollte und dieser Punkt liegt auch sehr nahe zum Fokus der Dipole. Eine Fokus-Einstellung im Spiegel kann ggf. nötig sein und wird später erklärt.

Hinweise und Ideen

Ich habe Weichlot für die Konstruktion des W2IMU-Horns, der Teiler und Dipole verwendet. Silberlot wäre besser gewesen, aber in diesem Land sind die Kosten für eine Leihflasche Gas exorbitant hoch, und die extra Hitze wurde, wo es nötig war, von einer treuen Propanflasche erhalten. Ich habe auch einen sehr großen 250W Lötkolben, allerdings muß man eine Krake sein, wenn man damit am IMU-Horn arbeiten will.

Bei meiner vorigen Konstruktion hatte ich die Messing-Dipolplatte mit Aluminium-Nieten auf der Aluminium-Reflektionsplatte befestigt und sogenanntes carbon-imprägniertes leitfähiges Fett verwendet. FALSCH! Ich wusste es schon vorher, dass Korrosion/Elektrolyse ein Problem werden würde, aber nach 4 Jahren war es noch viel schlimmer als ich es je erwartet hätte. Die Lösung: PTFE (Teflon) Folie zwischen den Platten verwenden und mit Edelstahlschrauben befestigen (Tipp von Peter, G3LTF) Wenn man denn Aluminium-Nieten verwenden will, sollte man bedenken, dass die üblichen Typen eisenhaltige Köpfe haben und Rost auftreten kann. Also diese entfernen, um das Rostproblem zu vermeiden oder Qualitäts-Nieten aus der Luftfahrt verwenden, wenn man sie bekommen kann (Vorschlag von Dave, G4RGK).

Ich habe mir auch eine Einspannvorrichtung angefertigt, um die Teile zum Löten zu fixieren. Das kostet zwar etwas Zeit und Mühe, aber nicht jeder hat mehr die Geschicklichkeit seiner Jugend...

Ich vermute, dass die Länge der Dipole etwas variieren könnte, wenn man kein 6mm Rohr verwendet. Anfangs hatte ich bei jedem in den Enden eine Schraube, die ich variieren konnte, um - wie gezeigt - die beste Anpassung zu erhalten. Das hat einige Zeit gekostet, da es nicht so einfach war, wie gehofft, da es signifikante Wechselwirkungen zwischen den Dipolenden gibt.
Als schließlich die Längen korrekt feststanden, habe ich die Schrauben durch Stücke aus Messingstab ersetzt, die ich auf meiner Drehbank angepasst habe.

Auch habe ich einen Satz aus dielektrischen Kurzschluß-Abstimm-Stubs (PTFE) angefertigt, da ich annahm, dass man die höchstwahrscheinlich für eine Feinabstimmung benötigen würde.

Ich habe viele Arten von Dichtungsmitteln ausprobiert, um die Enden der Dipole zu versiegeln. Ich bin immer noch auf der Suche nach etwas, das wirklich inert gegen Messing ist, und keine geschichtenerzählende Grünspanmarke hinterlässt. Das ist natürlich nicht so wichtig, weil die Versiegelung gegen das Wetter der wichtige Faktor ist. Man sollte billiges Silikon aus dem lokalen Baumarkt wählen, was nicht zersetzend ist, UV-resistent und wasserfest ist und geeignet für Dächer und Regenwasser. Zuvor habe ich „Dow Corning 732" benutzt (hervorragend für die Unterdrückung von Lichtbogen in Leistungsendstufen), aber auch das wirkt etwas zersetztend und ist teuer. Ich habe diverse Experimente durchgeführt, um zu sehen, ob dadurch irgendwelche unerwünschten Effekte bezüglich der Abstimmung auftreten. Ja, es gibt sie, aber nicht so stark, wie ich zuerst dachte. Also nur soviel verwenden, wie gerade zur Versiegelung der Dipolenden nötig ist, um die Änderung der Dielektrizitätskonstante möglichst gering zu halten. Die Berührungszone rundherum besonders beachten, um dort eine totale Versiegelung zu haben. Mit einem angefeuchteten Finger das Dichtungsmittel in eine glatte durchgehende Form bringen.

Kontrolle der Dipole

Alle Dipole werden auf der Reflektor-Platte montiert. Am Anfang habe ich ein sechs Wellenlängen langes Stück von LDF4-50 Kabel (gemessen wie unten) verwendet, um mich von der Nähe der Reflektor-Platte zu isolieren. Schnell habe ich bemerkt, dass das nicht wichtig war, da ich entweder das Bird-Wattmeter und/oder den MFJ-289 direkt an die zu testenden Dipole angeschlossen habe. Die wichtigste Einstellung war die Länge der Dipole und ich war in der Lage gleichzeitig benachbarte Paare zu beobachten und so die Interaktion zwischen ihnen zu sehen. Es hat eine Weile gedauert, bis ich bei den angegebenen Maßen angekommen war, und ich denke, dass, wenn man sich an die hier angegebenen Längen hält, nur noch miminale Justierungen zu erwarten sind. Man sollte für 50W Vorlauf mit dem Bird <0.3W Rücklauf erwarten bzw. ein VSWR von etwa 1:1.15.

Warnung. *Falls man den Return Loss auf 70cm mit Leistung messen will, sollte man beachten, dass der Sicherheitsabstand für 50 Watt an den Dipolen bei 2.5 Meter liegt. Falls man nahe ran muss, sollte man sich von hinten nähern. Für weitere Informationen, bitte mein EMR Calc Programm konsultieren.*

Ich fand es interessant (wahrscheinlich klar, wenn man darüber nachdenkt), dass, solange die Dipollängen noch nicht exakt in Resonanz sind und man einen Finger am Übergang hin- und her bewegt, eine perfekte Anpassung (auf dem Messinstrument) erreichbar ist. Man sollte nicht versucht sein, den eigenen Finger durch einen mechanischen zu ersetzen, weil es anders besser geht! Wenn man weiter macht und Resonanz erreicht, verschwindet der Effekt nämlich wieder und die zuvor konstruierten dielektrischen Stubs waren also nicht mehr nötig. (Ich habe das MFJ-269 verwendet, und keine HF zu diesem Zeitpunkt!). Da ich keinen Netzwerk-Analysator habe, um die Impedanz und j am Anschluß exakt zu messen, kann ich nicht sicher sein, dass es genau 50 Ohm sind (bei kleinem j), aber so wie sich alles verhält, komme ich zu dem Schluß, dass es sehr nahe dran sein muß (so wie in der Simulation vorhergesagt). Das Hinzufügen von zufällig ausgesuchten Längen von 50 Ohm Koaxkabel hat durchweg den selben Return Loss gezeigt (oder sehr nahe daran), so dass die Theorie weiter durch die Praxis bestätigt wurde.

Zuschneiden der Phasenleitungen zwischen Dipolen und Leistungsteilern

Welches Kabel man auch immer als Verbindungskabel aussucht, die präzisen Maße kann man schnell mit ZCalculator erhalten. In meinem Fall habe ich mich für LDF4-50 entschieden, um die Verluste auf ein Minimum zu beschränken. Die Länge wählt man am besten als Vielfaches einer halben Wellenlänge. Das ist nicht unbedingt nötig, da gleiche Längen auch ausreichen, aber ich zog es vor, wie auch immer das endgültige Z an den Dipolen war – dieses an den Eingang der Lesitungsteiler zu transformieren. In diesem Fall ist mit der gezeigten Anordnung eine volle Wellenlänge nötig, um die beiden Zweiweg-Leistungsteiler komfortabel zu erreichen. (Es sitzt stramm, aber es geht prima). Diese Längen von ~600mm können "artistisch" gebogen werden und wie auf den Fotos erkennbar positioniert werden, um die Leistungsteiler und Box für die Polarisationsumschaltung zu erreichen. Es wurde so positioniert, dass gleiche Balance und Abstand zu allen 4 Dipolen erreicht wird. Das ist keine einfache Angelegenheit und ich würde vorschlagen, mit etwas altem Kabel zu üben und ein Muster zu biegen. Wenn man fertig ist, wird man nur zustimmen können, dass es so gut aussieht, dass es einfach funktionieren muss... Am Schluß habe ich jeden Stecker mit Schrumpfschlauch versiegelt und nach dem Einbau mit Denso Tape (gewachstes Klebeband) umwickelt.

Beim exakten Zuschneiden der Kabellänge, ist das erste das Schwierigste. Wenn man nicht mit der Steckermontage für LDF4-50 wirklich vertraut ist, sollte man seine Kentnisse auffrischen. Zum Glück gehen die einfacher als die meisten und nehmen es einem nicht gleich übel, wenn man eine Fehler macht. Die O-Ringe erst am Schluß zufügen – und nicht vergessen! Ein Kabelende konfektionieren und dann die ausgemessene Länge markieren plus 10mm. Man wird den Punkt der Länge sehr kritisch finden, an dem nur noch ein paar Mal Feilen nötig ist, um richtig zu sein. Man sollte also mit einer Test-Länge anfangen, so dass man die Impedanzmessbrücke damit kennenlernen kann und sieht, was man bei Resonanz heraus bekommt. Man kann wählen zwischen der offenen Kreis- oder der Kurzschlussmethode und man muß wirklich „durch" den Resonanzpunkt „gehen", um das nötige Gefühl und den Wert auf dem Z-Meter dafür zu bekommen. Ich habe die Methode des offenen Kreises bevorzugt, da ich damit den Effekt mit jedem einzelnen Feilen sehen konnte. Alles hängt von der Balance des Instruments ab und, wenn man erstmal weiß, an welchem Punkt man aufhören muss, ist man „im Geschäft". Nun hat man eine Kabellänge mit einem Stecker auf der einen Seite und einem Ende, das auf den Stecker noch wartet. Ich habe Andrew-Stecker verwendet, jeder mag hier etwas anderes verwenden, und selbst dann gibt es auch noch verschiedene Modelle ein- und desselben Steckers. Der Weg, den abschließenden Stecker zu montieren und dieselben elektrischen Längen beizubehalten, wird also unterschiedlich sein. Man muß sich die nötige Zeit dafür nehmen und „rückwärts" arbeiten von der addierten Länge des Innenleiters aus und herausfinden, wieviel vom Kabel zurückgeschnitten werden muß. Es besteht die Möglichkeit, dass das nicht beim ersten Mal klappt und dann muß man von vorn anfangen. Wenn man ein Kabel fertig hat, kann man es beiseite legen und die 3 übrigen Kabel genauso machen. Zugegeben, das kann frustrierend werden, aber am Ende kann man mit diesen einfachen Mitteln ein Resultat erreichen, das innerhalb etwa eines Grades liegt. Erinnern wir uns, am Ende ist es eine Messung von Tipp zu Tipp. Puristen werden das auch diskutieren, aber ich schneide ja kein 6-Zoll-Phasen-Kabel, um ein päzises Grad für eine 64-fache TV-Verteilung zu erreichen, so wie ich es in meinem Vorleben oft machen musste. Wahrscheinlich braucht man zweimal weniger auf dieses Kabel zu schauen, als auf den Innenleiter des N-Steckers.

Die Zweifach-Leistungsteiler

Die Leistungsteiler werden gebaut, wie in der Zeichnung angegeben. Sie sind nicht so kritisch, aber man sollte die Transformationsverhälnisse so genau wie möglich einhalten. Mit einer Bügelsäge am Ende für den einzelnen Anschluß viermal einsägen und dann diese Öffnungen mit einer kleinen, flachen Feile vergößern. Dann vorsichtig das Ende so drücken, dass eine Verjüngung geformt wird, die für das Innere des N-Verbinders passt. Um eine flache Oberfläche zu schaffen, auf die ich die zwei N-Verbinder auflötete, habe ich einen quadratischen Metallblock (kegelförmig am Ende für eine stufenweise Einführung) eingeführt, der gerade etwas größer als der Durchmesser des Rohrs war und habe das Messing reichlich erhitzt. Dann den Block vorsichtig und langsam einhämmern. Das verwandelt das runde Rohr am Ende in eine quadratische Form, so dass die N-Buchsen leicht montiert werden können. Mit Vorsicht und Geduld wird man das Rohr nicht zum Reißen bringen. Es zahlt sich aus, die Enden vor dem Zuschneiden der Rohre herzustellen, da Murphy sicher eines sonst hinterher zerreißt. Dann die beiden Abschlusswiderstände überprüfen. Schließlich den Leistungsteiler prüfen, indem man jeden Eingang mit 50 Ohm-Widerständen abschließt. In meinem Fall habe ich dann mit dem MFJ 269 >30dB Return Loss gesehen.

Die Polarisations-Umschaltung und Vorverstärker-Box

Wieder sagt ein Bild mehr als tausend Worte. Man sieht, dass ich zwei HF400 Relais verwendet habe, eines für Polarisations-Umschaltung und eines für TX/RX-Umschaltung, beide im rechten Winkel aufeinander montiert. Ich verwende ein separates Kabel zurück ins Shack vom LNA-Ausgang. Der LNA ist immer angeschaltet und die Isolation (durch das HF400) ist ein angemessener Schutz (>60dB), wenn 1500 Watt am Feed anliegen. (Ja, ich habe eine QRO-Sonderlizenz!). Die Konstruktion braucht nur einen M-M-Adapter und die Leistungsteiler werden direkt auf das HF400-Polarisationsrelais geschraubt, genauso wie der LNA an der RX-Seite des TX/RX-Relais. Man kann keine verlustärmere Konstruktion haben! Wetterschutz wird mit Silikon um die Leistungteiler herum gemacht, bei jedem "Besuch" am Feed (sollte ziemlich selten sein). Plastiktüten –wie bei einigen Bekannten- verwende ich hier nicht. Ich verwende getrennte Kabel für LNA und Relais-Schaltung, alle Relais sind mit Dioden geschützt.

Seit meinem letzten Cavity-LNA verwende ich eine Kette von Regulatoren beginnentd mit 12V, dann 9V, dann 5V, dann 3.2V Zener. Ich hatte durch dieses „zuviel des Guten" nie einen Ausfall. War wohl eine gute Idee.

Nebenbei sei angemerkt, dass mein voriger LNA und die Polarisationsumschaltung aus viel zu vielen (peinlich) T-Stücken und Adaptern bestand, die für eine akzeptable Anpassung für nötig gehalten wurden. Im Nachhinein war das falsch, falsch und nochmal falsch. Aber man macht das, um es erstmal zum Laufen zu kriegen und beabsichtigt, es später vernünftig zu machen, was natürlich dann niemals geschieht. Die obige Konfiguration hat eine signifikante Verbesserung gebracht bei der erreichten Rauschzahl des RX.

Montage des Ganzen im Spiegel

Nun war ich an der Stufe angekommen, die ich am meisten fürchtete. Mechanisch gesehen ist es ein Traum, am Feed von der dafür vorgesehenen Plattform aus zu arbeiten und das Montieren der starren Hardware ist extrem. Ich habe Vorkehrung getroffen, in der Lage zu sein, die Reflektor-Platte vor- und zurück bewegen zu können (durch Montage auf vier 15mm Gewindestangen), um das Finden des Phasenzentrums des Spiegels zu ermöglichen. Auch habe ich Acht gegeben auf das LDF5-50 TX-Kabel, das genügend Spiel haben muß, um die Bewegung mitmachen zu können.

Meine große Sorge war die Wechselwirkung, die ich bei meinem vorigen 70cm-Feed festgestellt hatte. Dies hatte, gelinde gesagt, einen tieferen Hintergrund. Ich habe Stunden damit verbracht, den Spiegel hoch und runter zu drehen und extra Adapterstücke hinzuzufügen und die 75-Ohm-Phasenleitungen neu zuzuscheiden und abzuschließen. Die Beeinflussung zwischen Spiegel und angrenzendem EME-Shack war „signifikant".

Als ersten Test (zuerst habe ich mich auf das 70cm-Feed konzentriert), habe ich den MFJ-269 direkt an den LNA-Eingang am HF400-Relais angeschlossen und fand, dass die Werte für beide Polarisationen so nahe an den Werten des „Testaufbaus" waren, dass es mir schon komisch vorkam. Dies war mit dem Spiegel über dem und 2m vom Shack entfernt. Dann wurde mit Leistung sendeseitig am Feed gestestet und die Werte, die am LNA gemessen wurden, konnten bestätigt werden. Ich hielt den Atem an, als ich den Spiegel auf 45 Grad elevierte und aus dem Bereich des Shack herauskam und war erleichtert (soll heißen begeistert), als der Return Loss sich sogar ein bisschen verbesserte bei beiden Polarisationen. Nun, das war 70cm, jetzt sollte 23cm dran kommen.

Dies war auch kein negativer "Höhepunkt", da der Return Loss auch so nahe an den Werten des Testaufbaus lag. Und auch kein oder nur wenig Unterschied beim Return Loss, wenn ich den Spiegel elevierte. Mein Freudentaumel erreichte Fieber-Stufe!

Der nächste Schrittt war, durch Rauschmessungen zu beweisen, dass alle Leistungsdaten realisiert werden. Schnell wurde das Sonnenrauschen auf 70cm gemessen und es befand sich im Bereich der Erwartungen. Auf 23cm aber war das Sonnenrauschen deutlich unter (etwa 3 dB) dem, wie es sein sollte (EMECalc.). Tests mit den eigenen Echos bestätigten, dass da was nicht richtig war, und beide Ergebnisse deuteten direkt auf das Feed hin, da sie etwa gleich groß waren. Die Beambreite wurde gemessen und war sehr nahe am berechneten Wert (knapp unter 2 Grad). Nebenzipfel konnten nicht gemessen werden. Das maximale Sonnenrauschen trat genau im Zentrum des Spiegels auf, was durch den Schattenwurf bestätigt wurde und das Diagramm war anscheinend in allen Ebenen korrekt. Das Sonnenrauschen war immer noch deutlich niedriger, als nach den Berechnungen zu erwarten wäre. Ich dachte über den 15dB Abfall am Spiegelrand nach, aber das ergab nichts. Mein erster Verdacht war, dass das Feed nicht genau im Phasenzentrum des Spiegels war. Ich habe dann verschiedene Freunde nach Diagnose der Situation und Prognose befragt (siehe Danksagung).

Alle stimmten zu, dass dies wahrscheinlich der Fall sei, aber die Aussagen variierten darin, wie viel in dieser Situation gewonnen oder verloren werden könnte. Die eine Sache, die mich nervte, war, dass ich wusste, dass die Reflektorplatte auf den Fokus gesetzt war, was bedeutete, dass das W2IMU-Horn 50mm näher an der Spiegeloberfläche dran war, als die Theorie vorschreibt. Würde solch „kleine Differenz" so eine bemerkenswerte Verschlechterung verursachen? Ich glaubte es nicht, aber einer der Freunde sagte, dies im Blick zu behalten.

Ich wartete auf einen kalten Tag, an dem die Sonne auf meiner Nord-Seite des Zenits stand (ja, einige Dinge gehen hier unten anders!), so dass der Abstand zwischen Feed-Plattform und Sonne nur eine geringe Spiegel-Bewegung bedeuten würde. Ich erwartete nämlich viele solcher Bewegungen und mein hydraulisches Elevationssystem ist nicht so schnell. Zuerst auf die Sonne und sorgfältig das Rauschen über 15 Minuten gemessen um Schwankungen zu sehen. Zurück auf die Feed-Plattform und mit einem langen geeichten Plastikrohr nachgemessen, dass die Reflektorplatte tatsächlich 144 inch (ja, wir verwenden hier auch zwei Systeme von Maß-Einheiten) der Oberfläche weg war. Dann habe ich sie um 50mm vom Spiegel weggeschoben. Zurück auf die Sonne und wow...! Wie magisch waren die fehlenden 3dB da. Ich konnte meinen Augen kaum glauben und ich wiederholte mehrfach diese Messung und bestätigte so die signifikante Verbesserung. Der Mond war aufgegangen und ich konnte es kaum erwarten, meine Echos zu testen. Sie waren nun wie erwartet und die wirkliche Bestätigung war, dass ich nun Mondrauschen von 0.5-0.8dB hatte. Nein, nun änderte ich am Feed nichts mehr....

Vielleicht sollte ich, aber für mich war das Mondrauschen die Bestätigung, dass es unwahrscheinlich war, noch irgendeine Verbesserung zu erreichen.

Ergebnisse in der Praxis auf dem Band

Ich könnte versucht sein zu sagen, dass ich diesen seltenen unbewohnten Felsen locker mit 59+ und 5 Watt und der Katze auf dem Schoß arbeiten kann, aber ich lasse solche Performance-Beschreibungen lieber und überlasse solche wertvollen Berichte lieber anderen weniger gesunden Publikationen.

Die Feuerprobe der Performance war, in der Lage zu sein, die vorhergesagten Werte von Sonnen- und Mondrauschen nachvollziehen zu können, so wie die Rauschquellen Cygnus und Taurus. (Cassiopeia kann ich hier unten nicht sehen, weil wir zu weit im Süden sind und Sagittarius ist keine punktförmige Quelle). Die Messung des kalten Himmels gegen die Erde (cs-g) ist eine Herausforderung und in meinem Fall praktisch unmöglich, weil mein Spiegel auf einer 15m breiten Erhöhung steht, die 150 weit im 60 Grad Winkel abfällt (man versuche mal, da hochzulaufen....). Als Konsequenz habe ich deshalb entschieden, einen Abschlußwiderstand (für 23cm) als Indikation für die Temperatur der Erde zu verwenden.
Auf 23cm ist das Sonnenrauschen innerhalb ±5 SFU (Solar Flux Unit) der vorhergesagten Werte (VK3UM EMECalc). Taurus ergibt ~0.6dB und Cygnus ~1.1dB. Mein cs-g, wenn ich auf den am nahesten gelegenen Hügel (1.5km weg) ziele, bei solchen Winkeln wird der Spiegel unterstrahlt, messe ich mit etwa 6.8dB, während cs/term ~7.1dB ergibt. Diese Zahlen weisen auf den bekannten Unterschied in der Ausstrahlung hin. Auf 70cm ist das Sonnenrauschen ebenfalls innerhalb ±5 SFU der vorhergesagten Werte, während Taurus ~1.1dB und Cygnus ~2.3dB ergeben. Kalter Himmel gegen Erde sind ~5.8dB. Auf beiden Bändern können, mit einfacher Verwendung des Sonnenrauschens, keine Nebenzipfel entdeckt werden (>22dB).

Ich möchte betonen, dass meine Meßmethode weit vom Optimum entfernt ist, da ich zur Zeit nur mit der NF in USB-Bandbreite (2.4 kHz) messe, was im Widerspruch zu den empfohlenen Methoden steht, die eine Bandbreite von >300kHz benötigen.

Zusammenfassung

Zusammenfassend zeigen die Werte, dass die Performance sehr nahe an die Werte herankommt, die in der Theorie vorausgesagt werden. Auf 23cm konnte gezeigt werden, dass der Verlust durch die Ausleuchtung durch besseres Rauschverhalten kompensiert werden konnte und der Verlust auf der TX-Seite ist minimal und hat kaum Konsequenzen bei der Größe des Spiegels. Jede Befürchtung, dass die Perfomance sich verschlechtern würde, konnte als unbegründet bewiesen werden, in der Tat scheint es, dass das Ergebnis unter dem Strich positiv ist.

Am Schluß einige Punkte, die ich nochmals erwähnen möchte: Erstens, kaum oder keine Verschlechterung beim Wechsel vom Testaufbau in den Spiegel beim neuen 70cm-Feed, beim Vergleich zum vorherigen, genauso wie keine Wechselwirkung mit benachbarten Strukturen und, zweitens, der signifikante Effekt, den die fokale Positionierung beim 23cm-Feed hatte.

Ich bin zufrieden, dass es kaum etwas gibt, dass beim jetzigen dualen Feed-System noch verbessert werden könnte, unter den vorgegebenen Sachzwängen des vorhandenen Spiegels und der Vorgabe, auf beiden Bändern zu bleiben.
Ich bin auch zufrieden, dass das System, wenn gebührende Sorgfalt verwendet wird, als Einzel- oder Dual-Feed von anderen mit entsprechenden Resultaten nachgebaut werden kann. Die gesamte Konfiguration des 70cm-Feeds ist eine bedeutende Verbesserung gegenüber vorherigen Designs und liefert eine sehr verlustarme Kopplung und Polarisationsumschaltung.

Danksagung

Während dieses Unternehmens waren viele eine Inspiration für mich und lieferten Hilfe, Ideen und Ermunterung. Der Schlüssel für das ganze Projekt, das Modellieren und Definieren der Impedanz des Feed verdanke ich Graham, F5VHX und Geert, PA3CSG und zusammen mit Hannes, OE5JFL, Peter, G3LTF, Peter. SM2CEW, Dave, G3LTF, Paul, WA6PY, Al, K2UYH und David, VK3AUU bildeten alle ein Forum für Diskussionen und Hilfe. W1GHZ's Microwave Antenna Book wurde oft als Referenz verwendet.

<u>Bildunterschiften:</u>

Foto 1: Zwei Dipole mit PTFE-Isolationsfolie und dielektrischem Verkürzungs-Stub (wurde nicht verwendet!) vor der Montage auf der Reflektorplatte.
Foto 2: HF400 Relais für TX/RX- und Polarisationsumschaltung vor dem Einbau
Foto 3: Leistungsteiler, TX/RX- und Polarisationsumschaltung, Vorverstärker
Foto 4: Anordnung der Kabel zwischen Dipolen und Leistungsteilern
Foto 5: Ansicht von vorne auf das W2IMU-Horn und die Dipole. PTFE-(Teflon)-Folie verschließt die Öffnung des Horns.
Foto 6 und 7: Das im Spiegel montierte Feed. Der Ring alleine wiegt 25kg!
Foto 8: Korrosion und Elektrolyse beim alten Feed-System nach 4 Jahren.
Foto 9: Das alte 70cm-System, man beachte all die Verbindungsstücke... wie man es nicht machen soll!

EME Dishes: Position Finding without Sun Noise

by Heinrich F. Reckemeyer, DJ9YW

Introduction

For the exact adjustment of a dish toward the moon one needs its data for azimuth and elevation. For this I use the great 32-bit Windows EME System V.6.0 [1] from F1EHN. At the beginning the rotator has to be calibrated at its start and end positions. Additionally with the F1EHN program it is possible to include corrections for linearity errors in 10° steps, if one knows the necessary error data and feeds them into the software. Up to now, position measurements have typically been made with the help of sun noise and solar position data, adjusting the antenna for the maximum audio noise level or S-meter reading. An exact determination of maximum sun noise is difficult to achieve with the usual transceivers because of the AGC, and statistical fluctuations at typical bandwidths of 2.4 kHz. Thus I use a broadband measuring system with 1.6 MHz IF bandwidth that will accurately indicate to 0.1 dB, which with my dish is equivalent to a position error of 0.1°.

But what can we do during winter, when the sun is always low? In many countries, antenna positioning at typical values for the moon elevation can only be checked against sun noise during the summer months. Furthermore this is only a quasi-measurement and one has to trust that the software for moon and sun are suitable and convergent for one's QTH and calculate properly. A better solution would be to check the antenna positioning by direct monitoring of one's own moon echoes, as this would be possible independently from seasons.

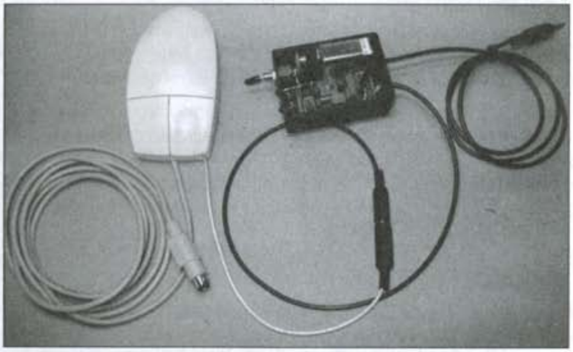


Fig. 1: Pulse generator and modified mouse – Impuls-Generator und modifizierte Maus

Measuring EME Echoes

An evaluation of the echo strength with the help of the receiver audio or the S-meter is hard to achieve in practice. But there are also some great PC programs available for analysing weak signals; for example I use the program *Spectran* V.2.0-213 [2] from I2PHD and IK2CZL. From the audio output of the receiver, *Spectran* can evaluate the signal-to-noise ratio of the echo with respect to the background noise (combined cold sky noise plus moon noise) as peak values in dB.

But if one tries this, the maximum echo length of 2.5 seconds cannot produce a useful level measurement within this short time. So, again no solution? With the help of a small circuit, that I have developed for this purpose (Fig. 1), it can be done. Fortunately *Spectran* has a "Freeze" facility where it is possible to hold the accumulated values. My circuit produces a string of pulses in order to control this function, with a sequence of 2.75 seconds for TX and 2.35 seconds for RX. This is necessary to prevent gaps at the closest and farthest distance of moon orbit. The transmitter control switch is supplied directly to the CW input jack, while exactly at the beginning and the end of the RX cycle, pulses of 40ms are also supplied to the PC. See Fig. 3 for the plan of the pulses. By using these pulses to trigger the freeze switching, the last RX

value can be stored in the display on the screen and the peak value and dB level of the echo can be easily read out during the TX cycle.
In the next RX cycle the latest results are integrated and one need not to wait for a new complete setup. Thus the echo data would be available without interruption and also in the waterfall spectrum (Fig. 2).

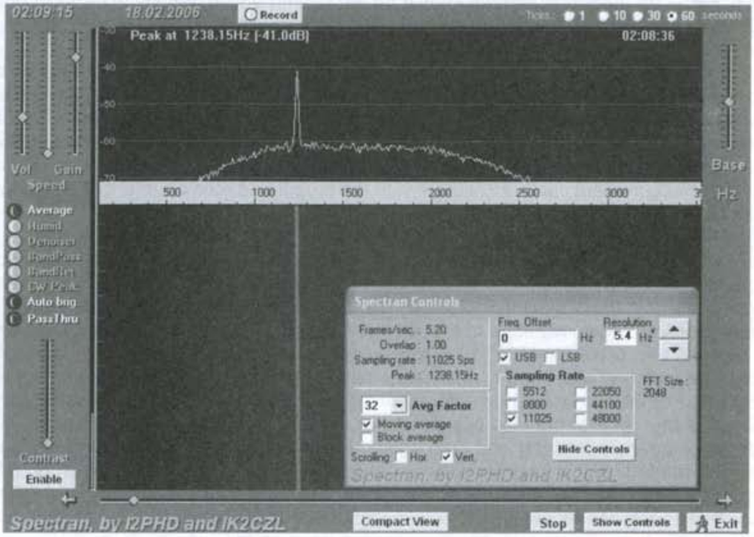


Fig. 2: Spectran screenshot of a real EME echo on 23cms with a peak of -41dB
Note: "Freeze" enabled (button at lower left)
Spectran Sreenshot eines echten EME Echos auf 23 mit einem Peak von -41dB - wichtig: die Aktivierung der „Freeze"-Funktion (unten links „enable")

Switching the PC

How can one get the pulses into the PC? The best solution would be a connection over the serial COM port. But this is not available with this program. So, this is the end of the project now? No, there is another solution: I use an old two-key PC mouse and solder a shielded wire directly to the contacts of the left button, and switch this with my pulse generator. In all other ways, the PC can be used completely like before. But when I place the cursor on the "Freeze" button (lower left in Fig. 2) and switch on the pulse generator, the switching starts to run automatically. One only needs to check that the mouse is not moving.
If one has adjusted the dish toward the moon and transmits the CW signal, the results of the measurements will be building up. (If there is no audio level building, there is an inverted sequence and one can start the synchronization with a double-click on the left mouse button.) The settings for *Spectran* should be made as shown in Figure 2. I have adjusted the basic noise in the display to the -60 dB line with the help of the WSJT interface.

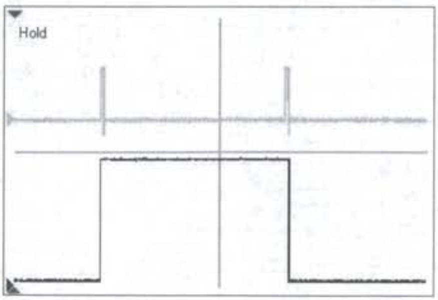


Fig. 3: Cycle of pulses - Impulsablauf

Measurement

With the help of the RIT one should adjust the echo peak, preferably into the flat part of the receiver passband that is visible in the display, and readjust from time to time according to the Doppler value.
The frequency range for the measurement should be set to start above 100 Hz in order to prevent distortions from hum or other low frequencies from the sound card (above 120 Hz in countries with 60Hz mains).
When checking the accuracy of the azimuth readout, the value for the elevation control of the antenna should be adjusted according to the tracking software readout (even if it has not been optimized yet) in order to minimise measurement error. The same is valid vice-versa for the adjustment of the elevation.
The adjustment to the maximum echo strength is normally possible only with a step controlled rotator. I use 0.13° steps. Easier and more exact is a differential measurement that is feasible for all kinds of rotators. This kind of measurement can not compete with the broadband measurement of the sun noise, but is to my knowledge the best system using moon echoes.
The differential measurement has to be made as follows. First, the maximum of the echo is determined approximately with *Spectran* and by turning the antenna and this level is set to e.g. a peak value of -44 dB with the PS control of the soundcard. For the "difference points", -50 dB would be a good reference level, because there is a line in the display that provides good orientation. The first measurement is not a differential one, and is only to get an estimate of the offset error. One starts the echo testing, and waits until the peak value reaches the -50dB line due to the movement of the moon. Then one writes down the values for the angle of the antenna and the moon from the tracking program and calculates the approximate deviation in degrees. For the first of the true differential measurements, one moves the antenna ahead of the moon, by about 2x the value of the previous difference of the angle, and waits for a pair of -50dB results, first when the echo strength is rising and then again when it is falling. If one gets differences of e.g. -2° and +4° from the readout of the tracking software at maximum echo strength, then in the F1EHN setup the offset has to be changed by 1° to get a central -3° and +3°. In the same way the elevation is calibrated. The F1EHN program allows also one to include correction factors for the linearity, e.g. if the antenna's mast is not vertical.
During this measurement procedure, one can continuously read out the angle difference between the moon and the antenna in the window of the tracking program, and so determine the beamwidth of the antenna. However, one have to consider that the echo measurement shows 2x the actual dB value, because besides the RX attenuation also the radiated TX power is reduced accordingly. So, for the real 3 dB aperture of the antenna, one needs to determine the 6 dB points for the echoes. These measurement results also allow one to calibrate the RX system sensitivity at a known output power, although one also needs to consider variations due to changing moon distance (which are included in the F1EHN program) or due to rare unfavourable weather conditions.
In all cases, one should make several measurements from which one takes the average.

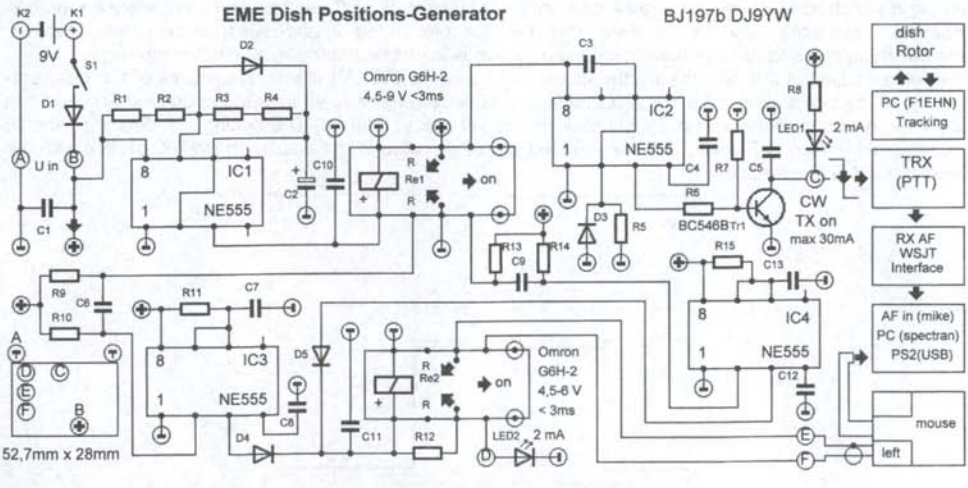


Fig. 4: Circuit diagram - Schaltbild

Pulse Generator

Mostly standard parts were used. See circuit diagram (Fig. 4) and parts list. Only the four resistors and the tantalum capacitor of the oscillator need to be measured for accuracy, in order to give exact RX and TX sequences. The carrier control and mouse control outputs are both free-of-ground, through relays. At the transceiver the CW input and a volume-independent AF output are used. Instead of the 9V battery one can use also an external PSU. A WSJT interface is convenient, but the circuit works even without it, if one adjusts the AF levels correctly and the frequency response is OK. Fig. 1 shows the complete hardware assembly.
I wish many success for the assembly and checkout.
73 de Heinrich, DJ9YW

Literature

www.dj9yw.de
[1] http://www.f1ehn.org
[2] http://www.qsl.net/i2phd/

Parts List - Stückliste

IC 1, 2, 3, 4	NE555 (DIP8 package)
Relais 1, 2	Omron G6H-2 (DIP10 package)
Tr 1	BC546B NPN
D 1	1N4001
D 2, 3, 4, 5	LL4148 (mini MELF package)
LED 1, 2	Low current 2mA, 3mm
C 1, 5, 10, 11	100nF, Z5U 1206
C2 10µF	16V Tantalum RM2,5 +/- 2%
C 3, 6, 7, 9, 13	100nF Folie (foil) RM5.0
C 4 , 8, 12	10nF , X7R 1206
R 1 , 4	220k 1206 +/-2%
R2	120k 1206 +/-2%
R3	100k 1206 +/-2%
R5	470k 1206
R6	15k 1206
R7	47k 1206
R8	3,3k 0207
R9, 10, 13, 14	100k 1206
R11, 15	390k 1206
R12	2,2k 1206
R0	6x 0,00 Ohm 1206
7x	Lötstifte (solder pins) 1mm dia

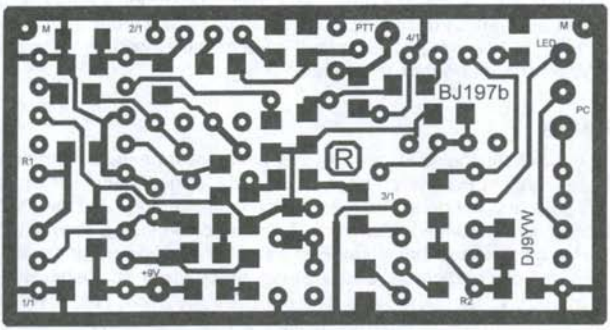


Fig. 6: PCB Layout - 52.7 x 28mm

EME-Spiegel: Positions-Bestimmung ohne Sonnenrauschen

von Heinrich F. Reckemeyer, DJ9YW

Einleitung

Für die genaue Einstellung des Spiegels zum Mond benötigt man bekannterweise dessen Daten für Azimut und Elevation. Ich verwende dazu das hervorragende 32bit Windows Programm "EME System" V.6.0 [1] von F1EHN. Dazu muss der Rotor jedoch erst einmal an den Anfangs- und Endpunkten kalibriert werden. Mit dem F1EHN Programm sind dann zusätzlich Linearitäts-Korrekturen in 10° Abständen interpolierend möglich, wenn man die Daten dafür kennt und eingibt. Bisher machte man solche Messungen anhand des Sonnenrauschens (SFI) bei gleichzeitigem Ablesen des NF-Pegels oder des S-Meters für das Maximum. Eine exakte Erkennung ist aber mit üblichen Transceivern wegen der AGC, sowie bei Bandbreiten von 2,4 kHz wegen der Unruhe nur ungenügend möglich. Ich verwende deshalb ein Breitbandmesssystem mit 1,6 MHz ZF-Bandbreite, welches auf 0,1 dB bzw. 0,1° genau anzeigt. Was macht man aber im Winter bei tiefstehender Sonne? Die in vielen Ländern üblichen Elevationswerte für den Mond lassen sich mit der Sonnenbahn nur in den Sommermonaten voll nachstellen. Weiterhin handelt es sich ja nur um eine Quasi-Messung, bei der man darauf vertrauen muss, dass die Programme für Mond und Sonne passend zum QTH konvergent sind und richtig rechnen. Eine bessere Lösung wäre also eine echte Üüberwachung des eigenen Mond-Echos, zumal dies auch jahreszeitlich unabhängig durchführbar wäre.

EME-Echo-Messung

Eine Auswertung des Echos über die RX-NF oder das S-Meter ist dabei praktisch kaum machbar. Es gibt aber inzwischen tolle PC Programme zum Ermitteln von schwachen HF-Signalen. Ich verwende dafür das Programm "Spectran" V.2.0-213 [2] von I2PHD und IK2CZL. Dieses zeigt über den NF Ausgang des Empfängers den Signal/Rauschabstand des Echos zum kalten Himmel bzw. zum Mondrauschen als Peak und in dB Werten an. Wer dies nun ausprobiert, wird feststellen, dass das Echo von nur 2,5 Sekunden Länge weder in der Zeit den Peak noch eine verwertbare Pegelangabe aufbereiten kann. Also wieder keine Lösung? Mit einer kleinen Schaltung, die ich dafür entwickelt habe, geht es aber doch. Es gibt erfreulicherweise das Feld "Freeze", wo man die aufgelaufenen Werte einfrieren kann. Mein Generator erzeugt nun eine Impulsfolge zur Steuerung dieser Funktion, wobei eine Sequenz für TX mit 2,75s und für RX mit 2,35s erzeugt wird. Dies ist erforderlich, damit bei der geringsten und weitesten Entfernung der jeweiligen Mondbahn keine Lücken entstehen. Diese Schaltfunktion wird zum Senden direkt der TX CW-Eingangsbuchse zugeführt. Weiterhin werden 40 ms Impulse erzeugt, welche genau am Anfang und am Ende innerhalb der RX Phase auftreten. Impulsplan siehe Bild 1. Wenn man nun diese Impulse zur Freeze-Umschaltung verwenden könnte, bliebe der jeweils letzte RX-Wert in der Display Anzeige auf dem Bildschirm erhalten und während der Sendephase kann man sowohl den Peak, als auch den dB Level des Echo-Signals bequem ablesen. In der nächsten Empfangsphase würden nun die neuen Ergebnisse mit einbezogen und es braucht kein neuer Gesamtaufbau abgewartet werden. Somit wären die Echodaten lückenlos, auch im Wasserfalldiagramm, verfügbar.

Die PC-Umschaltung

Wie bekomme ich nun die Schaltimpulse in den PC. Am besten wäre eine Zuführung über den seriellen Com-Port. Selbiges ist bei diesem Programm aber bisher nicht vorgesehen. War es das dann nun also, oder doch nicht? Ja, es geht auch anders! Dazu verwende ich eine alte 2-Tasten-PC-Maus und löte ein abgeschirmtes Kabel direkt an die Kontakte der linken Taste und verbinde dieses mit meinem Generator. Der PC lässt sich weiterhin ganz normal bedienen. Erst wenn ich den Generator einschalte und den Maus Zeiger auf das Feld "Freeze" setze, läuft die Umschaltung automatisch ab. Dabei ist lediglich zu beachten, dass die Maus nicht verrutschen darf. Sollte sich der NF-Pegel nicht aufbauen, liegt ein invertierter Sequenzablauf vor und man kann durch einen einmaligen Zwischenklick mit der linken Maus-Taste die Synchronisation einleiten. Nun bauen sich die Messergebnisse auf, sofern man den Spiegel auf den Mond gerichtet hat und der CW-Träger mit abgestrahlt wird. Die Spectran-Einstellungen sollten, wie in

Bild 2 dargestellt, vorgenommen werden. Dabei habe ich im Display das Grundrauschen mit dem WSJT Interface auf die –60dB Linie einjustiert.

Der Messvorgang

Mit dem RIT Regler sollte man den Peak möglichst im geradlinigen Bereich der im Display sichtbaren Durchlasskurve stellen und entsprechend des Dopplerwertes gelegentlich anpassen. Die Frequenzleiste sollte zu Beginn auf 100 Hz verschoben werden, damit weder Brummeinstreuungen noch Eigenpfeifstellen der Soundkarte stören können. Beginnt man nun mit der Azimut-Kontrolle, ist der Elevationswert der Antenne, auch wenn dieser noch nicht optimiert wurde, zeitlich entsprechend der F1EHN Mond-Anzeige anzugleichen, damit sich dort kein Messfehler einschleicht. Das gilt dann auch umgekehrt bei der Elevations-Eichung. Das Einstellen des Maximums ist jedoch meist nur mit einer Rotor Schritt-Steuerung möglich. Ich verwende dort 0,13° Steps. Leichter und genauer ist es aber oft, eine Differenzmessung durchzuführen, welche dann bei allen Rotortypen machbar ist, und nachfolgend erklärt wird. Dazu sind mehrere Messungen zweckmäßig, aus denen man dann den Mittelwert errechnet. Die Messung kann zwar mit dem Sonnenrauschen-Breitbandmesssystem nicht mithalten, ist aber als Mond-Echo-Anzeige das mir bis dato noch beste bekannte System. Zuerst wird das Echo-Maximum mit Spectran und dem Drehen der Antenne grob ermittelt (zum Beispiel als Peak Spitze –44dB). Für die Differenz wären dann –50dB recht günstig, weil dort eine Displaylinie verläuft und somit eine gute Orientierung gegeben ist. Vollzieht man diesen Vorgang zu beiden Seiten des Spiegels, kann daraus auch der Öffnungswinkel des Systems ermittelt werden, wobei man die Winkeldifferenz zwischen Mond und Antenne im F1EHN Programm Fenster ablesen kann. Entsprechend sind auch alle anderen Winkeldämpfungen messbar. Allerdings ist zu berücksichtigen, dass bei der Echo-Messung der doppelte dB Wert angezeigt wird, weil neben der RX-Dämpfung auch die TX-Strahlungsleistung entsprechend reduziert wird. Für den echten 3dB Öffnungswinkel (+/-1,5dB) müssen also vorher die 6dB Eckpunkte (+/-3dB) für die Gradzahl ermittelt werden.
Bei der Differenzmessung geht man wie folgt vor: Nachdem, wie vorgeschlagen, die Spitze mit etwa -44dB, notfalls über den Soundkartenschieber des PC´s, eingestellt wurde, wartet man einfach ab, bis die Peak-Spitze durch die Mondbewegung die –50dB Linie erreicht. Nun notiert man die Winkelwerte der Antenne und des Mondes im F1EHN Programm und erhält daraus die Abweichung in Grad. Danach dreht man die Antenne um cirka den doppelten Betrag der vorausgegangenen Winkeldifferenz in Grad vom "Maximum" zur anderen Seite und wartet wieder auf das –50dB Ergebnis. Wenn sich nun zum Beispiel –2° und +4° ergeben, muss im F1EHN Setup der Offset um 1° geändert werden und es entstehen danach mittig –3° und +3°. Ebenso geht man bei der Elevation vor, muss jedoch darauf achten, dass man ab dem Zenit das Verfahren wegen der Abwärtsbewegung umdrehen muss. Ist der Spiegel nun auf Mondkurs, kann man beim F1EHN-Programm noch Linearitätsfehler bei nicht senkrecht stehendem Antennenmast oder anderen Einflüssen in einer Korrekturliste mit einbeziehen. Die Messergebnisse lassen auch jederzeit eine Kontrolle des eigenen EME-Systems bezüglich RX-Empfindlichkeit oder anderen Fehlern bei bekannter Sendeleistung zu. Hier sind lediglich die im Programm angegebenen Mondabstands-Schwankungen oder recht selten auftretende ungünstige Wetterlagen zu berücksichtigen.

Der Impuls Generator

Die Modulausgänge zu beiden PC´s sind erdfrei aufgebaut. Am Transceiver werden der CW Eingang sowie ein Lautstärke unabhängiger NF-Ausgang genutzt. Es kommen vorwiegend Standardbauteile zum Einsatz. Siehe Schaltbild und Stückliste. Lediglich die 4 Widerstände und der Tantal-Kondensator des Oszillators sollten mit geringer Toleranz passend ausgemessen werden, damit genaue RX/TX Sequenzen eintreten. Statt der 9V Batterie kann auch ein Netzteil Verwendung finden. Es ist sinnvol, den Transsceiver bei CW auf „full BK“ zu schalten. Es geht natürlich auch ohne ein WSJT-Interface, wenn man die NF-Pegel angepasst bekommt und der Frequenzgang stimmt.

Nun wünsche ich allen Interessenten viel Erfolg beim Aufbau und der Erprobung.
73 de Heinrich, DJ9YW

Literatur

www.dj9yw.de
[1] http://www.f1ehn.org
[2] http://www.qsl.net/i2phd/

Icom`s Compact Transceivers for DXpeditions with JT65

by Heinrich F. Reckemeyer, DJ9YW

For the digital modes like WSJT/JT65 the frequency stability or the tranceivers for RX and TX is of great importance due to the narrow bandwidths that are used by the software. This has great influence on the quality of the received signal. For other wider modes this would not be of such importance but then one could not use the common SSB tranceivers with 2.4 kHz bandwidth anymore. In the meantime the usual SSB transceivers have got significantly more stable reference oscillators, e.g. the IC703 or very well the IC7000. The oder IC706MKIIG can be used also quite well after being modified as described under www.mods.dk. Like shown in Figure 1 on 50.200 MHz there are only deviations of about +/-10Hz between 15°C and 50°C ambient temperature. For the IC7000 the variation was so low that the result was almost a straight line. This is untypical for a crystal and one must assume a microprocessor controlled correction. All comparing measurements were made on 50.200 MHz in order to get also data for the IC703.

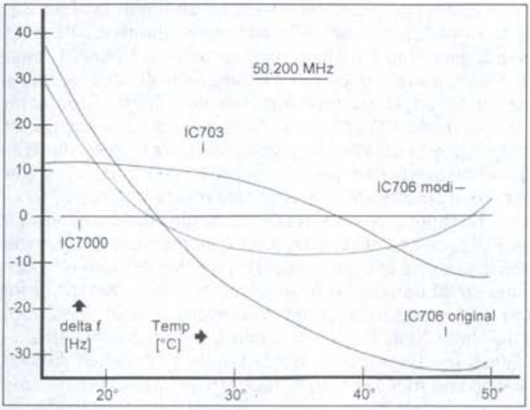


Fig. 1

For other frequencies one can calculate this proportionally. The IC703 and IC7000 work well already from 10 V DC. Thus they show at alternating supply voltage little change in frequency. Anyway the output goes down at 10V, of course.

Short term stability at PTT

Almost more important as the above described long term stability for JT65 is the frequency stability within the according TX and RX sequences of "one minute". Only within this time frame the decoder is active and integrating and the frequency should be stable. Of course this is true for the cooperating RX and TX systems of the two QSO partners. For JT65 the deviation should not exceed 3Hz/min in order to get the full depth of the decoder. If one looks at the curve that is shown in Fig. 1 one could assume that this may be achieved easily. Anyway, obviously the crystal manufacturer and ICOM`s designer of the power supply have not agreed on this. Like with the IC706MKIIG the voltage stabilisation of the reference oscillator of the IC7000 was obviously neglected again.

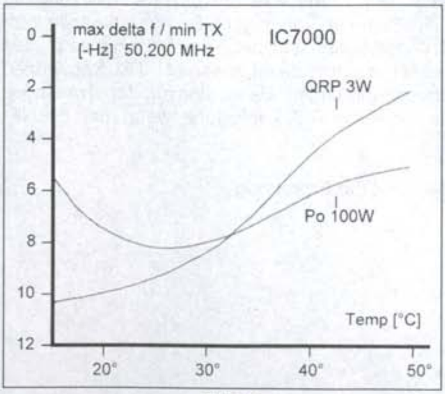


Fig. 2

Figure 2 shows the maximal deviations of the TX frequency per minute for different ambient temperatures, which run back again accordingly during the RX sequence.

This frequency drift may be caused due to the differences of the oscillator`s supply voltage, which occurs due to the internal temperature compensation of the voltage regulators at different currents for RX and TX. A simple solution would have been the cascading of two stabilizing stages at which the second stage should work independently from the current only for the oscillator.

Modification & Results

In order to eliminate this awkward effect normally one should make modifications inside the transceiver which are barely to realize retroactively due to the midget-SMD technics.

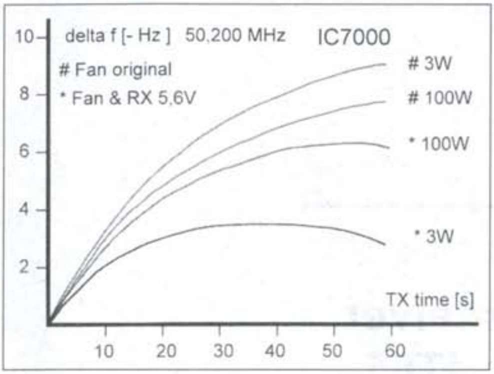


Fig. 3

Like with the IC706 also for the IC7000 a forced ventilation brings a certain corrective like shown in Fig. 3.

At e.g. 3 W QRP operation for feeding a transverter the change has the largest effect. Now the fan keeps working at RX almost audible with 5.9V and keeps the operating points of the voltage regulators more stable.

Fig. 4 shows the quite easy conversion for the IC7000 by inserting 3 components. At 25°C room temperature and 3 W QRP TX operation the IC706MKIIG and also the IC7000 reach on 50.200 MHz a deviation of less than 3Hz/min. The IC703 delivers similar values already without modification.

For JT65C with 8Hz/min already about 2dB of sensitivity are lost and with 17Hz/min 6 dB!

From this we can see that a very good frequency stability of the transceivers has to be considered for the digital modes like the first-class system from K1JT, in order to get good results for the RX signal and correlative successes.

More about the IC7000 with it`s digital IF

The new DSP work much better now for noise reduction (NR). This is also very effective for weak CW EME signals as shown in Fig. 5 unless the computer between one`s ears has not yet done this.

For WSJT signals under the noise this brings no improvement but rather some perturbation in the demodulation and the NR should be turned off. The IF noise blanker can be switched on at 60% in JT65 and also CW/SSB all the time but has not such a deep cancellation like an analog system.

Like with the IC703 Icom seems to have a better philosophy now for the RX input circuits. For normal operation a much better dynamic range compared to the IC706. For very weak signals the preamp can be switched on in order to get the maximal sensitivity.

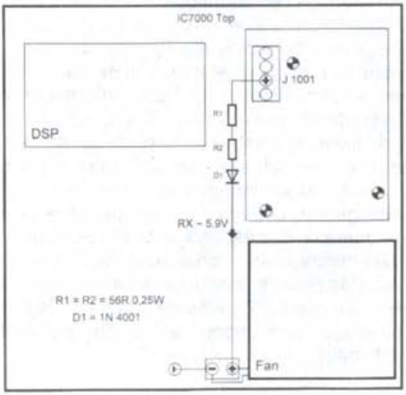


Fig. 4

Sensitivity for 10dB S+N/N at 14,100 MHz and 2,4kHz BW / IP3 20kHz:

IC7000	solo	-118dBm / +6,5dBm	preamp on	-128dBm / -6,5dBm
IC 703	solo	-117dBm / +5,5dBm	preamp on	-127dBm / -2,5dBm
IC706MKIIG	solo	-122dBm / -3,5dBm	preamp on	-127dBm / -14dBm

If external premplifiers or transverters are used the internal preamp always should be switched off. Like with analog receivers here als the last IF stages and/or the demodulator reach their dynamic limits and get overloaded. Too much gain effects rather a degradation of S/N than the wanted improvement. Many rigs can not work with more than 25 dB. A rule of thumb is that the s-meter should not be moved by the normal background noise, especially because mostly the first 5 S stages are now shown at all.

Despite some technical intricacies or familiarization of handling the IC7000 is a felicitous new development with a clearly arranged display and a weight and size that fits for aircraft luggage for any Dxpedition but also for at home.

Many success für all DXers on HF/VHF and with EME and JT65. DJ9YW

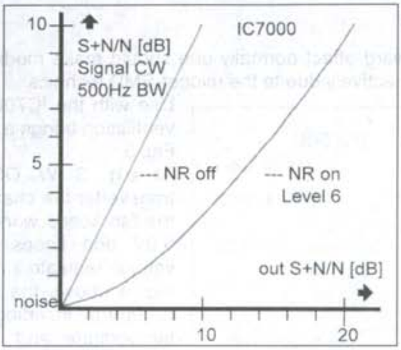


Fig. 5

Icom Kompakt-Transceiver für DXpeditionen mit JT65

von Heinrich F. Reckemeyer, DJ9YW

Für die digitalen Betriebsarten, wie etwa WSJT-JT65 ist wegen der schmalen Auswertungs-Bandbreiten, besonders die Frequenzstabilität der Funkgeräte sende- wie auch empfangsseitig sehr wichtig. Damit steigt und fällt dann die RX-Signalqualität. Bei anderen breiteren Modulationssystemen wäre das zwar nicht so kritisch, aber man könnte dann die üblichen SSB Transceiver mit 2,4kHz Bandbreite nicht weiter verwenden. Inzwischen haben die neuen SSB-Funkgeräte entsprechend erheblich stabilere Referenz-Oszillatoren, wie etwa der IC703, oder recht extrem der IC 7000. Der ältere IC706mkIIG lässt sich durch Modifizierungen aber auch noch gut einsetzen, wie unter http://www.mods.dk beschrieben. Wie in Abb. 1 zu erkennen ist, ergeben sich danach bei 50,200 MHz zwischen 15°C und 50°C Umgebungstemperatur nur noch Abweichungen von etwa +/- 10Hz. Beim IC 7000 waren die Schwankungen so gering, dass fast eine gerade Linie erreicht wurde. Dies ist untypisch für eine Quarz, so dass eine Mikroprozessor programmierte Korrektursteuerung vermutet werden muss. Alle Vergleichsmessungen wurden bei 50,200 MHz durchgeführt, damit auch die Daten des IC703 mit einfließen konnten. Für andere Frequenzen lässt sich das einfach proportional umrechnen. Weiterhin ist zu bewerten, dass der IC703 und der IC7000 bereits ab etwa 10V arbeiten und sich somit bei schwankender Spannungsversorgung kaum Frequenz-Abweichungen zeigen, wobei dies verständlicherweise jedoch eine Ausgangsleistungsreduktion nach sich zieht.

Kurzzeitstabilität bei PTT

Fast noch wichtiger als die oben beschriebene Langzeitstabilität ist für JT65 das Frequenzverhalten in den jeweiligen TX und RX Phasen von "Einer Minute". Nur in dieser Zeit ist der Decoder integrierend aktiv und dabei sollte die Frequenz stabil stehen. Das gilt dann natürlich für die zusammenarbeitenden Systeme des Empfängers und des Partnersenders und umgekehrt. Die Abweichung sollten bei JT65B nicht über 3Hz/min liegen, um die volle Dekodiertiefe zu erzielen. Wenn man die in Abb. 1 gezeigte Kurve anschaut, könnte man vermuten, dass dies bequem zu erreichen wäre. Offenbar haben sich aber der Quarzhersteller und der Icom Entwickler der Stromversorgung wohl nicht genügend abgesprochen. Wie schon beim IC706mkIIG, wurde offenbar die Spannungsstabilisierung des Referenzoszillators auch beim IC7000 wieder vernachlässigt. Abb. 2 zeigt die maximalen Abweichungen pro Minute der TX Frequenz bei verschiedenen Umgebungstemperaturen, welche dann in der RX Minute entsprechend wieder zurücklaufen. Diese Frequenzdrift kommt möglicherweise durch die Differenzen der Oszillator-Versorgungsspannung zustande, welche durch die interne Temperaturkompensation der Spannungsregler bei unterschiedlichen Strömen zwischen RX und TX auftritt. Eine einfache Lösung wäre ein Kaskadierung von zwei Stabilisierungsstufen gewesen, wobei die zweite von der Stromaufnahme unabhängig nur für den Oszillator zu arbeiten hätte.

Modifikation & Ergebnisse

Um diesen unangenehmen Effekt zu beseitigen, müsste man im Gerät Umbauten vornehmen, welche aber wegen der Miniatur-SMD-Technik nachträglich kaum durchführbar wären. Wie schon beim IC706, bringt auch beim IC7000 eine Zwangsbelüftung eine gewisse Abhilfe, wie aus Abb. 3 zu erkennen ist. Bei 3W QRP Betrieb zum Beispiel zur Ansteuerung eines Transverters, wirkt sich die Änderung am stärksten aus. Dabei läuft bei RX der Lüfter kaum hörbar mit etwa 5,9V weiter und hält die Arbeitspunkte der Spannungsregler konstanter. Abb. 4 zeigt den relativ einfachen Umbau für den IC7000 durch Einfügen von 3 Bauteilen. Bei 25°C Raumtemperatur und 3W QRP TX Betrieb erreicht der 706mkIIG ebenso wie der IC7000 auf 50,200 MHz dann eine Abweichung von unter 3Hz/min. Der IC703 liefert ähnliche Werte bereits ohne Veränderung. Bei JT65C gehen bei 8Hz/min schon etwa 2dB verloren und bei 17Hz/min sind es immerhin 6dB. Daraus erkennt man, dass in jeder Hinsicht eine gute Frequenzstabilität der Funkgeräte für digitale Modulationsarten, wie das hochwertige System von K1JT, für gute RX-Signalergebnisse und entsprechende Erfolge zu beachten ist.

Weitere Erkenntnisse des neuen IC7000 mit digitaler ZF

Die neue DSP hat eine erheblich bessere Wirkung der Rausch Reduktion (NR). Dies ist bei schwachen CW-Signalen, wie bei EME, besonders effektiv, wie aus Bild E hervorgeht, sofern der "Ohr-Computer" dies nicht bereits erreicht hat. Für unter dem Rauschen liegende WSJT-Pegel ist damit jedoch keine Verbesserung möglich, sondern bringt eher etwas Unruhe in der Demodulation und sollte dort abgeschaltet werden. Der ZF-Noiseblanker hingegen kann mit 60% sowohl bei JT65, als auch CW/SSB immer aktiviert bleiben, hat aber nicht so große Austasttiefen, wie bei analogen Systemen gewohnt. Wie schon beim IC703 hat Icom wohl nun eine bessere neue Empfänger-Philosophie bezüglich der Eingangsstufen. Bei Normal-Betrieb wird eine erheblich bessere Großsignalfestigkeit gegenüber dem IC 706 erzielt. Bei ganz schwachen Stationen kann man dann den Preamp dazuschalten und hat die maximale Empfindlichkeit.

Empfindlichkeit für 10dB S+N/N bei 14,100 MHz und 2,4kHz BW / IP3 20kHz

IC7000	solo -118dBm / +6,5dBm	preamp on	-128dBm / -6,5dBm
IC 703	solo -117dBm / +5,5dBm	preamp on	-127dBm / -2,5dBm
IC706mkIIG	solo -122dBm / -3,5dBm	preamp on	-127dBm / -14dBm

Werden externe Vorverstärker oder Transverter verwendet, sollte der interne Preamp immer abgeschaltet bleiben. Wie bei analogen Empfängern, kommen auch hier die letzten ZF Sufen oder/und der Demodulator an die Dynamikgrenzen und werden übersteuert. Zu hohe Vorverstärkung bewirkt dann eher eine Verschlechterung des Signal-Rauschabstandes, als die angestrebte Verbesserung. Viele Geräte können da nicht mehr als 25dB verarbeiten. Als Faustformel gilt, das S-Meter sollte durch das Grundrauschen noch keine Anzeige liefern, zumal auch hier wieder die ersten 5 S-Stufen erst gar nicht zur Anzeige kommen. Abgesehen von einigen technischen Feinheiten oder der Eingewöhnung der Bedienung, ist der IC7000 eine gelungene Neuentwicklung mit einem übersichtlichen Display und ein in Gewicht und Größe Fluggepäck taugliches Gerät für jede DXpedition, natürlich aber auch für zu Hause.

Allen DXern viel Erfolg auf KW/UKW oder mit EME und JT65. DJ9YW

IC703 and IC7000

23cm TVTR
and IC706MKIIG

Receiving Weak CW Signals

by Leif Åsbrink, SM5BSZ

Different opinions

Among weak signal enthusiasts there are different opinions on what is the best way to receive a marginal signal. The two main points of view are:

(1) Use a narrow filter to get better S/N.
(2) Use a fairly wide filter to avoid the ringing of a narrow filter.

The fact that both alternatives have many supporters is perhaps unexpected, since the S/N, the signal to noise ratio is inversely proportional to the bandwidth, and typical bandwidths for the two alternatives may be 1kHz and 25Hz - a difference in S/N of 16dB. The explanation why the difference between the two methods is so small that there is an argument on which method to choose lies in the fact that the signal processing does not end at the ear phones!! The human brain is a good signal processor and under optimum conditions it acts as a very narrow filter. Nothing will be gained by putting a wider filter in front of it!!!

My own personal experience is as follows:

1. It is much easier to copy a weak signal if all external noise is suppressed. I am using head-phones intended to protect the ears in noisy environment while listening to something pleasant - radio or a CD... I can not even hear when the telephone rings!!

2. Using both ears simultaneously through head phones is more safe than using a loudspeaker in a quiet room. Multi path propagation of sound waves may suppress certain frequencies. It may be a good idea to switch the two wires to one side of the headphones now and then to produce a 180 degree phase shift between the ears - this can relieve fatigue when trying to hear a weak signal in noise. (Another way of relieving fatigue is to change the pitch of the signal.)

3. If the bandwidth is too large, above 1kHz, the "signal processor" between my ears gets overloaded and a significant loss of performance occurs.

4. Only at bandwidths below about 50 Hz I can get any improvement over what I get at 1kHz - but only at slow or moderate CW speeds, and with signals that are very frequency stable. This indicates that my "brain bandwidth" is about 50 Hz. I can work for much longer times without loss of performance when the bandwidth is low. I practically never use bandwidths above 100 Hz. Only for aurora, when a bandwidth of maybe 300 Hz together with a high pitch gives an improvement. (For aurora, using a matched filter one looks for small amplitude changes of the noise without any change in the character of the sound, so a high pitch is better. With a low pitch the ear automatically listens for variations in the signal frequency contents and the small amplitude variations become more difficult to distinguish.)

5. Noise and hum in the AF part of the receiver (and all other parts as well) has to be kept well below the noise floor originating in the preamplifier (or antenna). Some hams may argue that this is not necessary, but I do not accept less than a 20dB increase of the voltage across my headphones when switching on my pre amplifier up in the antenna. I do count unnecessary losses by tenths of a dB.

6. When using bandwidths above about 30 Hz it is important to avoid any signal distortion for signals within the passband. The AF part has to be of HIFI quality. 5% intermodulation between two carriers (same peak amplitude as noise floor has in weak signal mode) means roughly that 5% of the signal energy is smeared out into the noise, while intermodulation between noise components raises the noise floor at the signal frequency by 5%. This kind of degradation can not be removed by a good filter after the non-linear part of the signal chain.

7. When using bandwidths below about 30 Hz it may be a good idea to introduce distortion to the signals within the passband. When the receiver has already filtered the signal to the extent that the ear - brain

can not hear any difference between different frequencies within the passband, then the only task for the ear - brain is to analyse amplitude changes. The ear is not very good at this - it is logarithmic in nature and developed to watch for signal character, not amplitude. Therefore expansion of the dynamic range or symmetric clipping can make receiving much less tiring, and even improve the detect threshold for a weak signal.
Symmetric clipping at a suitable level will add odd overtones that rapidly change the characteristis of the sound as percieved by the ears when the amplitude grows above the clipping level.

Der Empfang leiser CW-Signale

von Leif Åsbrink, SM5BSZ

Verschiedene Meinungen

Bei den DXern gibt es unterschiedliche Ansichten darüber, wie man am besten ein schwaches, im Rauschen liegendes, Signal empfängt. Die beiden wichtigsten Punkt sind:

(1) Verwendung eines schmalen Filters, um ein besseres Signal-/Rauschverhältnis zu erhalten
(2) Verwendung eines ziemlich breiten Filters, um das "Klingeln" eines schmalen Filters zu vermeiden.

Die Tatsache, dass sich für beide Alternativen viele Unterstützer finden, mag unerwartet sein, da das Signal-/Rauschverhältnis (S/N) umgekehrt proportional zur Bandbreite ist und typische Bandbreiten für beide Alternativen vielleicht 1 kHz und 25 Hz sind – ein Unterschied von 16dB im S/N. Die Erklärung, warum der Unterschied der beiden Methoden so gering ist, dass es eine Auseinandersetzung darüber gibt, welche Methode man wählen sollte, liegt in der Tatsache, dass die Verarbeitung des Signals nicht beim Kopfhörer aufhört!! Das menschliche Gehirn ist ein guter „Signal-Prozessor" und unter optimalen Bedingungen verhält es sich wie ein sehr schmales Filter. Nichts kann durch Vorschalten eines weiteren Filters gewonnen werden!!

Meine eigene Erfahrung ist wie folgt:

1. Es ist viel leichter ein schwaches Signal aufzunehmen, wenn sämtliche externen Geräusche unterdrückt warden. Ich verwende Kopfhörer, die dafür gemacht sind, die Ohren in einer geräuschvollen Umgebung zu schützen, während man etwas Erfreuliches hört, wie Radio oder CD... Ich kann nicht mal hören, wenn das Telefon klingelt!

2. Beide Ohren gleichzeitig mit einem Kopfhörer zu benutzen, ist sicherer als einen Lautsprecher in einem ruhigen Raum zu benutzen. Mehrfach-Ausbreitung von Schallwellen kann bestimmte Frequenzen unterdrücken. Es kann auch eine gute Idee sein, die zwei Drähte ab und zu auf eine Seite des Köpfhörers zu schalten und dann eine 180-Grad-Phasenverschiebung zwischen den Ohren zu erzeugen – das kann Ermüdungserscheinungen abbauen, wenn man versucht, ein schwaches Signal im Rauschen zu hören. (Ein anderer Weg die Ermüdung abzubauen, ist die Tönhöhe des Signals zu verändern.)

3. Wenn die Bandbreite zu groß wird, bei mir über 1 kHz, wird der "Signal-Prozessor" zwischen meinen Ohren überlastet und es tritt ein signifikanter Verlust der Performance ein.

4. Nur bei Bandbreiten unter etwa 50 Hz kann ich eine Verbesserung gegenüber dem erhalten, was ich bei 1 kHz erhalte – aber nur bei langsamen oder mittleren CW-Geschwindigkeiten und bei Signalen, die sehr frequenzstabil sind. Das weist darauf hin, dass meine „Gehirn-Bandbreite" ungefähr 50 Hz beträgt. Ich kann für viel längere Zeit ohne Performance-Verlus arbeiten, wenn die Bandbreite niedrig ist. In der Praxis verwende ich nie Bandbreiten über 100 Hz. Nur bei Aurora, wenn eine Bandbreite von vielleicht 300 Hz zusammen mit einer hohen Tonhöhe eine Verbesserung ergibt.

(Bei Aurora bei Verwendung eines entsprechenden Filters hält man nach geringen Änderungen der Amplitude im Rauschen Ausschau ohne irgendeine Änderung des Charakters des Tons. Deshalb ist ein hoher Ton besser. Bei einer tiefen Tonhöhe hört das Ohr automatisch nach Schwankungen des Frequenz des Signals und die kleinen Änderungen der Amplitude werden dann schwieriger zu unterscheiden.)

5. Rauschen und Brummen im NF-Teil des Empfängers (und in allen anderen Teilen ebenso) muß deutlich unterhalb des Rauschens, das im Vorverstärker (oder der Antenne) entsteht, bleiben. Einige Amateure mögen einwenden, dass das nicht nötig sei, aber ich akzeptiere nicht weniger als einen Spannungsanstieg von 20 dB über dem Kopfhörer, wenn ich meinen Vorverstärker oben in der Antenne einschalte. Ich zähle unnötige Verluste in Zehntel eines dB.

6. Wenn man Bandbreiten von über ca. 30 Hz verwendet, ist es wichtig, jegliche Verzerrung der Signale innerhalb der Durchlaßkurve zu vermeiden. Der NF-Teil muss HiFi-Qualität haben. 5% Intermodulation zwischen zwei Trägern (gleiche Spitzen-Amplitude wie das Rauschen bei schwachen Signalen), bedeutet annähernd, dass 5% der Energie des Signals ins Rauschen verwischt wird, während Intermodulation zwischen Rauschkomponenten das Rauschniveau auf der Frequenz des Signals um 5% ansteigen lässt. Diese Art der Verschlechterung kann nicht durch ein gutes Filter im Anschluß an den unlinearen Teil der Signal-kette wieder entfernt werden

7. Wenn man Bandbreiten von unter ca. 30 Hz verwendet, kann es von Vorteil sein, dem Signal innerhalb des Passbandes eine Verzerrung zuzufügen. Wenn der Empfänger das Signal bereits so weit gefiltert hat, dass das System Ohr–Gehirn keinen Unterschied mehr zwischen verschiedenen Frequenzen im Passband hören kann, ist die einzige Anwendung für das System Ohr-Gehirn, die Analyse von Änderungen der Amplitude. Das Ohr ist darin nicht besonders gut, es ist von Natur aus logaritmisch und dafür entwickelt den Charakter des Signals zu hören, nicht die Amplitude. Deshalb kann die Ausdehnung des Dynamikbereichs oder symmetrisches Clippen den Empfang viel weniger ermüdend machen und sogar die Schwelle für den Empfang eines schwachen Signals verbessern. Symmetrisches Clippen auf einem angemessenen Niveau addiert Obertöne, was schnell die Charakteristik des Tons verändert, wie es von den Ohren bemerkt wird, sobald die Amplitide über das Clipp-Niveau ansteigt.

Fig.: 47 GHz Pocket Transverter - Backside of the turn arround mechanic
Abb.: 47 GHz Pocket Transverter - Blick auf die Rückseite der Wendemechanik

Pocket Transverter for 47GHz

by Jürgen Dahms, DCØDA, Vinklöther Mark, 44265 Dortmund

I am qrv since a couple of years am am qrv with a 47 GHZ mixer (P= 100µW SSB / F= 8dB DSB) and a 47GHz-CW-TX (P= 25mW). Now I wanted to build a little transverter for portable use with the amplifier unit MKU 472B from DB6NT. With the help of a special turnaround mechanics from DG1KBF (www.micro-mechanik.de) this amplifier can be used as preamp for the RX and after turning by 180° for TX amplification. This mechanics works almost without any losses and the good technical features of the amplifier are still available at the flange of the dish. For the case I have selected a small type that is supplied by Bürklin (www.buerklin.com, case no. 70 H 4000). Dimensions are W 185, D 180 and H 65 mm.

In order to keep the old transverter still working as a second rig another 12GHz-LO (DB6NT) and also a new mixer were built. Into the oscillator unit I have attached the crystal heater from DB6NT. Frequency stability is very good and an external OXCO was not necessary anymore. Anyway there would still be enough space insice the case to add it at one side vertically.

Due to the high gain of the 47 GHz amplifier module it was necessary to ad a 100Ω SMD potentiometer on the mixer unit after the output of the IF preamplifier on the DC board. Thanks to the quite good suppression of the LO signal by the subharmonic mixer itself and the following 2 stage resonator filter (OE9PMJ type), I got a LO suppression of 48 dB at the output of the transverter. Filters for 47 GHz are being manufactured also by DG1KBF and they are pretuned to 47088 MHz.

Anyway basically I have made the experience in many projects that if the filter is integrated into the assembly due to different matching conditions a decent additional adjusting is necessary.
The filter should always be tuned to minimal noise and not to maximal gain because in practical use it is of more advantage to have a low noise figure, e.g. for sun noise measurements.

See the photos for details of the assembly. The plate on which the amplifier is turned is screwed on a profile. This profile is fixed to both sides of the case. This solution was suggested and realized from DG1KBF. The complety mechanical part is very stable. The amplifier works despite it`s very high amplification totally stable in this assembly without any sign of unwanted oscillation also during the turnaround procedure. Sure, there are many other solutions possible.

The two screws which press into the plate have to be screwed in quite deeply in order to ensure secure locking of the amplifier for the RX and TX direction. In order to prevent unscrewing after multiple turnarounds one can fix the screws with paint or glue. Anyway this was not my choice and I fixed the screws with the help of a piece of T shaped aluminium that was screwed on the back. One can see it on the photo with the turnaround mechanics.

In general all my microwave transverters have two switches on the front plate. One for switching the LO separately – one can erect the antenna when the LO warms up – and another for the transverter to switch between OPERATE and STAND BY. The oscillator unit always gets an output to the front plate for measuring the third or second multiple of the crystal frequency. With this one can check the frequency any time also whith a closed case, especially just before a portable use.

The timmer on the LO unit for adjusting the crystal frequency is accessable via a drilling in the front plate. With only four units I have got a very small but powerful tranverter. The achieved technical data are interesting. The measurement protocol from DB6NT showed Psat of 40mW and NF of 4.7 dB und gain of 31 dB. In the completed assembly on the flange for the dish I measured 37mW SSB power and 5.4 dB NF on SSB. Thus an assembly that is almost free of losses was realized.

If one wants to buid also the oscillator and mixer oneself – both are available as ready made modules from DB6NT – there are also the necessary PCB`s available. I want to thank DB6NT for the outstanding 47 GHz amplifier module and DG1KBF for the mounting construction of the turnaround mechanics in the case.

Fig. Front view - Abb.: Sicht auf die Frontplatte mit Bedienelementen

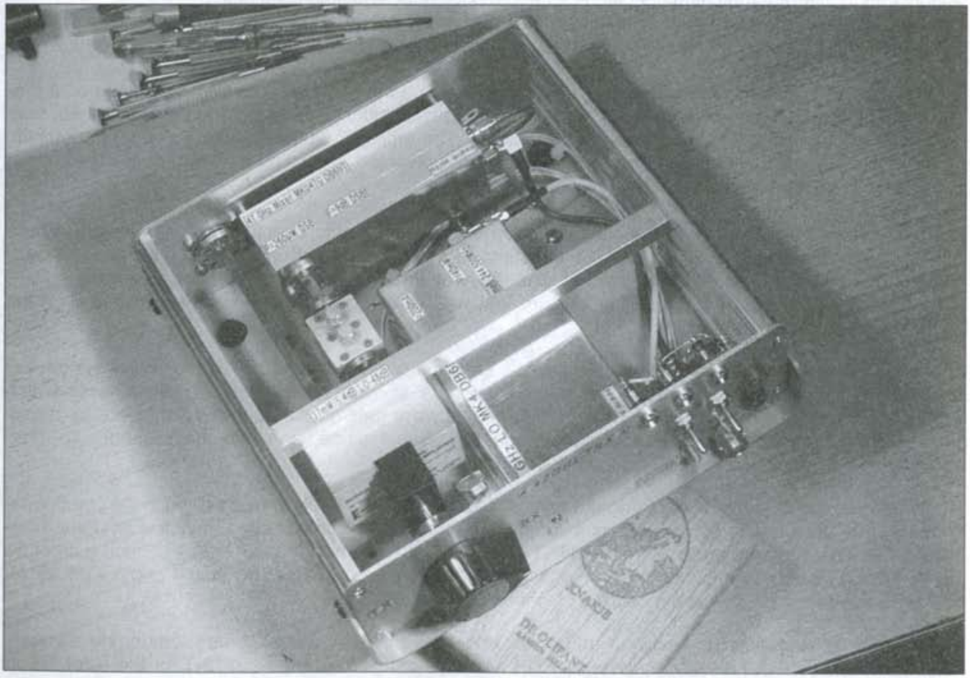


Fig.: Transverter assembly - Abb.: Gesamtanordnung der Bausteine des Transverters

Pocket-Transverter für das 47GHz-Band

von Jürgen Dahms, DCØDA, Vinklöther Mark, 44265 Dortmund

Seit Jahren bin ich mit einem 47GHz-Mixer (P= 100µW SSB / F= 8dB DSB) und einem 47GHz-CW-TX (P= 25mW) qrv, jetzt sollte für die Portabelsaison ein kleiner Transverter mit dem 47GHz-Verstärkerbaustein MKU 472 B von DB6NT aufgebaut werden. Mit einer Wendemechanik von DG1KBF (www.micro-mechanik.de) kann dieser Verstärker einmal als RX-Vorverstärker und nach dem Drehen um 180° als TX-Nachverstärker benutzt werden. Diese Mechanik arbeitet fast verlustfrei und die guten technischen Daten des Verstärkers stehen auch noch am Spiegel-Anschlussflansch zur Verfügung. Als Gehäuse habe ich ein kleines Schalengehäuse der Fa. Bürklin ausgesucht (www.buerklin.com, Gehäuse-Nr. 70 H 4000). Die äußeren Abmessungen sind: B 185, T 180 u. H 65mm. Um den alten Transverter als Zweitgerät weiterhin funktionsfähig zu halten, musste ein neuer 12GHz-LO nach DB6NT und auch ein neuer Mischer aufgebaut werden. In den Oszillatorbaustein habe ich den Präzisionsquarzheizer von DB6NT eingebaut, die Frequenzstabilität ist erstaunlich gut, so konnte ich auf einen externen OCXO verzichten, dieser ließe sich aber noch nachträglich hochkant an einer Seitenstrebe des Gehäuses einbauen.
Durch die hohe Durchgangsverstärkung des 47GHz-Verstärkermoduls musste ich im Mischerbaustein nach dem ZF-Vorverstärker am Ausgang ein 100Ω SMD Poti in die DC-Platine integrieren. Durch die schon relativ gute Unterdrückung des LO-Pegels im Subharmonic-Mixer selbst und dem eingesetzten 2-stufigen Resonatorfilter nach OE9PMJ erhielt ich eine LO-Unterdrückung am Ausgang des Transverters von 48dB. 47GHz-Filter werden ebenfalls von der Fa. micro-mechanik gefertigt und sind bereits auf 47088 MHz vorabgeglichen. Grundsätzlich hat sich bei mir aber in vielen Aufbauten gezeigt, wird dann das Filter in einen fertigen Aufbau integriert, ist immer durch unterschiedlich vorliegende Anpassungsverhältnisse ein geringfügiges Nachjustieren erforderlich. Das Filter sollte im Transverter immer auf minimales Rauschen und nicht auf max. Verstärkung abgestimmt werden, denn im praktischen Einsatz oder bei Versuchen, Sonnenrauschen auf 47GHz aufzunehmen, ist eine geringe Rauschzahl immer von größerem Vorteil. Die einzelnen Fotos sollen den Innenaufbau verdeutlichen. Die Gegenplatte zum Verstärker, auf der dieser gedreht wird, ist mit einer Strebe aus Vierkantmaterial fest verschraubt. Die Strebe wiederum liegt fest verankert in dem jeweiligen Seitenprofil. Diese Idee wurde von der Fa. micro-mechanik vorgeschlagen und auch technisch ausgeführt. Die gesamte Mechanik sitzt sehr stabil. Der Verstärker arbeitet trotz seiner sehr hohen Durchgangsverstärkung in dieser Anordnung völlig ruhig ohne Anzeichen von wilden Schwingungen auch während des Drehvorganges. Sicher gibt es hier eine Vielzahl von Lösungen.
Vielleicht noch ein Wort zur Arretierung der beiden Druckschrauben in der Gegenplatte, diese müssen zum sicheren Einrasten des Verstärkers in der jeweiligen Drehrichtung RX/TX ziemlich tief eingedreht werden. Damit sie sich nicht beim vielfachen Wenden des Verstärkers von selbst wieder herausdrehen, kann man sie mit Schraubenlack oder Sekundenkleber fixieren. Dies wollte ich nicht und habe ein T-Stück aus Alublech rückseitig angeschraubt, welches die Schrauben in einer bestimmten Position arretiert. Zu erkennen ist dies auf dem Foto mit der Nahaufnahme der Wendemechanik.
Grundsätzlich haben bei mir alle Mikrowellentransverter zwei Schalter an der Frontplatte. Einen Schalter nur für den LO zum Vorheizen (in dieser Zeit wird bei Portabelbetrieb das Stativ aufgebaut und weitere Vorbereitungen getroffen), erst danach kann durch Reihenschaltung mit dem zweiten Schalter der Transverter auf OPERATE bzw. auf STAND BY geschaltet werden. Der Oszillatorbaustein erhält immer einen Messausgang für die dritte oder zweite Vervielfachte der Quarzfrequenz, dieser Anschluss wird auch mit an die Frontplatte geführt. Jetzt kann die Frequenzgenauigkeit bei geschlossenem Transvertergehäuse jederzeit überprüft werden, besonders vor einem Portabeleinsatz. Der Variationstrimmer für die Quarzfrequenz in der Seitenwand des Oszillatorbausteins zeigt über ein Bohrloch in der Frontplatte nach außen zum Nachjustieren.
Insgesamt gesehen ergab es mit nur vier Bausteinen einen sehr kleinen leistungsfähigen Transverter.
Interessant sind die erreichten technischen Daten. Das von DB6NT mit dem Verstärker mitgelieferte Messprotokoll wies eine Sättigungsleistung von 40mW, eine Rauschzahl von 4,7dB und eine Durchgangsverstärkung von 31dB aus. Nach dem Einbau wurden am Anschlussflansch für die Parabolantenne eine SSB-Leistung von 37mW und eine Einseitenbandrauschzahl von 5,4 dB gemessen. Somit ist ein fast verlustfreier Aufbau gelungen. Wer seinen Oszillator und auch den Mischer selber aufbauen möchte, DB6NT bietet beides als Fertigmodule an, aber man kann aus dem umfangreichen Platinenangebot auch die entsprechenden Platinen beziehen. Mein Dank gilt DB6NT für ein ausgezeichnetes 47GHz-Verstärkermodul und DG1KBF für die Befestigungskonstruktion der Wendemechanik im Gehäuse.

AGC-OFF feature for Kenwood TS450/690 Transceivers

by Cristian Negru - YO3FFF

Audience: Radioamateurs, amateur radio astronomers, radio technicians or radio professionals.
Skill: The audience should have some experience with soldering SMD components.
Tools and materials: various screwdrivers, sharp knife/cutter, solder iron (25-30W), short isolated wire for connection.

Abstract

In order to do some radio astronomy, noise temperature measurements, etc. all receiver stages should work in a linear mode. Also, the power variation of the signal presented at the input of the receiver should be on the same factor at the AF output . Most of the modern and old receivers use AGC (Automatic Gain Control). If the AGC is **ON,** the measured variation of the AF output signal won't be proportional with the variation of the RF input signal. Various transceivers, including Kenwood TS450S has this design feature, but it cannot be turned off. This article will recommend you how to modify TS450S in order to switch **OFF** the AGC with minimum hardware modification.

Disclaimer: I take NO responsibility or liability of any kind for any possible personal and/or equipment damage or any other inconvenience resulting from this modification. The user agrees to follow this modification procedure on his/her own risk and expertise. This modification was tested only on my TS450S and it is performing as is described in this article.

1. Theory of operation

On the front panel, right middle of the transceiver, we have a push button named "AGC". Once it's pressed, the display will light "SLOW". Another push and display will light "FAST". That means the AGC can't be turned it OFF. In order to use the same button to turn OFF the AGC, we should cancel one function and transform the corresponding switch function into AGC OFF. I chose to cancel the "SLOW" function and replace it with AGC ON_FAST.
Like a consequence of performing the modification described in this document, it means the TS450S's display will light **"FAST"** and that's equivalent with new **AGC OFF** feature. When the display will light **"SLOW"** that's equivalent with **AGC ON-FAST** as previous function.
Looking over the TS450S service manual, or IF Unit (X48-3090-XX) schematics (see **Fig. 1**), we can see how the AGC voltage is collected from the output of Q9 and rectified by D26 to drive the base of Q36 transistor. Q36 acts as a variable resistor and varies the DC voltage across the AGC line. When the RF signal at the input of the receiver is above the AGC threshold, a positive voltage is presented on the base of Q36 through R136, will open Q36, and lower the resistance of the collector-emitter junction. This will further lower the voltage across the AGC line and reduce the total receiver's gain.

2. How to switch OFF practically the AGC of TS450S

In order to shut down the AGC circuit, we should disconnect the Q36 from the AGC line in a 1st step. Thus, the terminal of R137 connected to R138 and AGC line should be disconnected as seen in the **Fig. 2**. This way, the factory designed AGC circuitry will stay unchanged, and won't affect the receiver's overall gain. After this modification, the TS450S's **RF Gain** control knob is still operating as was designed.
Now, in order to switch the AGC ON and OFF, we should perform the 2nd step. We will disconnect IC7's Pin 3 from the existing circuit and will be connected to the free terminal of R137, as found after 1st step. Then, C117 and C118 will be short circuited as seen in the **Fig 3** (right, bottom). For this task we will use the IC7 2/4 switch to close and open the circuit between Pin 3 and Pin 4. When Pin 3 and Pin 4 is closed, the TS450S's AGC display will light "**SLOW**". When Pin 3 and Pin 4 circuit is open, same display will show "**FAST**". After this change, previous "**AGC FAST**" will become "**AGC OFF**" and previous "**AGC SLOW**" will become "**AGC ON_FAST**".

Like a consequence of this modification, when AGC display will light "FAST" it means AGC OFF, and the S-meter will not work! Without AGC in operation, the operator should adjust the RF Gain according to the RF input signal strength in order to keep the receiver chain in the linear operating area.

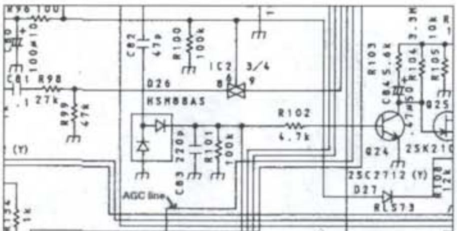
3. Apply the modification in practice in two simple steps

Open the bottom lid of the transceiver. As seen in **Fig. 4**, at the right side, there is the IF Unit single board circuit. As 1[st] step, with great care, you should disconnect all the right and bottom connectors from this unit and unscrew the six screws which fasten the board. Then you will be able to turn the IF Unit board upside down and gain access to the SMD components side. In order to disconnect the R137 from AGC line, you should identify first the resistor and the AGC line and then, you should cut the printed circuit with a sharp knife or a cutter (please look very carefully at **Fig. 5**). If you are not interested to further use the AGC feature, the modification is done.

If you want to further use the AGC factory feature (as I did), you should continue with a 2[nd] step this modification, as follows: on the components side of the IF Unit bord, you need to identify IC7. Then, from IC7's Pin 3 it's easy to find the connection to Pin 2 as well. You should cut that interconnection with a sharp knife/cutter close to the Pin3 (please look very carefully at **Fig. 6** before to perform this change). You should prepare a small isolated conductor and finally solder it between IC7's Pin3 and the disconnected side of R 137, as was previously described and can be seen also in **Fig. 7** and **Fig. 8**. At the end of listed operations, put back the disassembled board and all connectors together, close the bottom lid and your transceiver will be ready for operation.

How to check proper operation: connect an antenna, set **RF Gain** control knob at the maximum (turning clockwise), tune, no matter which band, to a strong signal, lock the frequency knob, and set the AGC front button in order to find on the AGC display the indication "**SLOW**" (that means after modification the previous **AGC ON_FAST**). You should be able to hear in the loudspeaker the previous clear and undistorted AF signal as you was used too, before the modification, and will also notice the correct operation of the S-meter. After this check, set the AGC button in order to find the AGC display indication showing "**FAST**" (that means after modification **AGC OFF**). You may notice the strong signal as little bit AF distorted since now and the S-meter indication none or less than S1. Turning the **RF Gain** control counter-clockwise till the signal will become clear (reduce the RF Gain) will fix this issue. You'll notice also that the S-meter variation works accordingly to the **RF Gain** control position and not the signal strength. This is normal and not a fault. Now everything is done and you are ready to enjoy the new **AGC OFF** feature of your TS450S or TS690 transceiver.

Good luck and I will be very excited to hear from your experience at yo3fff@rnc.ro 73 de YO3FFF Cristi



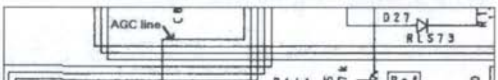


Figure 2 Switching off the AGC by disconnecting R137 from AGC line

Abb. 2 Ausschalten der AGC durch Abtrennen von R137 von der AGC-Leitung

Figure 1 ***Schematic diagram of AGC circuit from IF UNIT – Abb. 1 Schaltbild AGC***

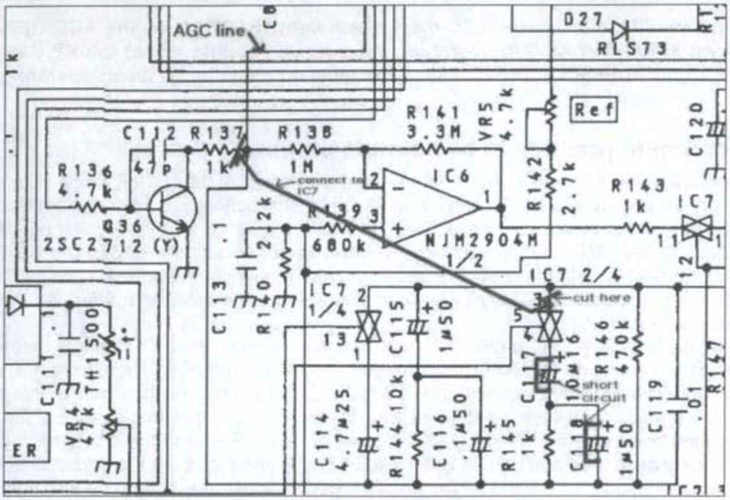


Figure 3 Modification for using IC7 2/4 as AGC ON/OFF switch

Abb. 3 Modifikation, um IC7 2/4 als AGC AN/AUS-Schalter Zu verwenden

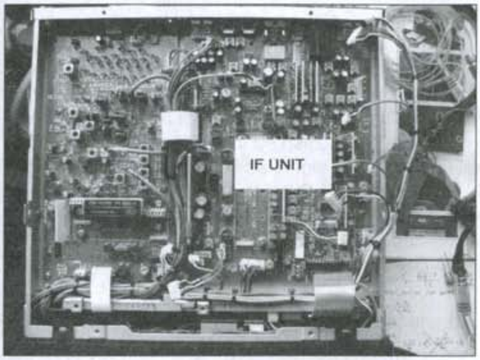


Figure 4 IF UNIT board – Abb. 4 ZF-Platine

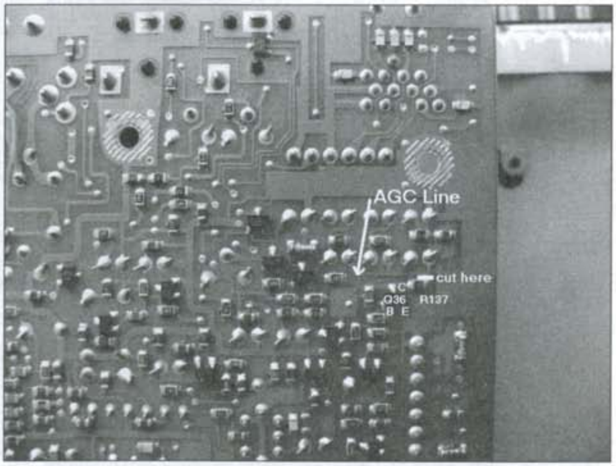


Figure 5 Cutting the circuit from one end of R137
Abb. 5 Durchtrennen der Leiterbahn am einen Ende von R137

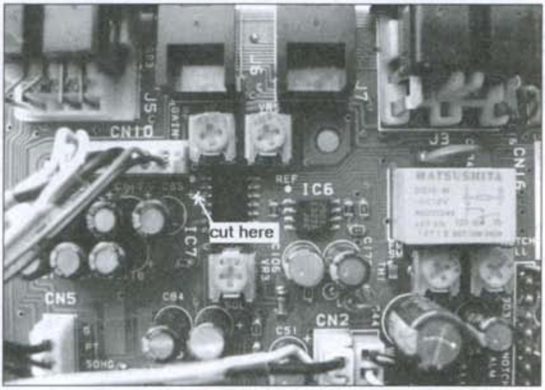


Figure 6 Cutting the circuit from IC7 pin 3 - Abb. 6 Abtrennen von Pin 3 des IC7

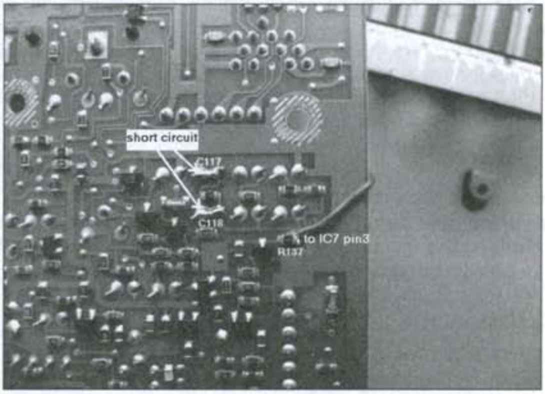


Figure 7 The wire connecting the open end of R137 to IC7 pin3; view from the PCB
Abb. 7 Der Draht, der das Ende von R137 mit Pin 3 von IC7 verbindet, aus PCB-Sicht

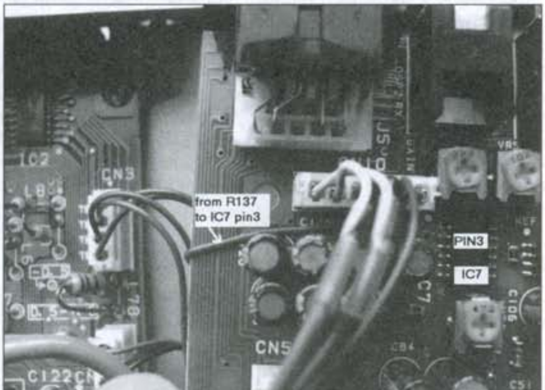


Figure 8 The wire connecting the open end of R137 to IC7 pin3;
view from the component circuit board
Abb. 8 Der Draht, der das Ende von R137 mit Pin 3 von IC7 verbindet, Bestückungsseite

AGC-AUS-Funktion für Kenwood TS450/690 Transceiver

von Cristian Negru - YO3FFF

Adressaten: Funkamateure, Amateur-Radio-Astronomen, Funktechniker.
Voraussetzung: Etwas Erfahrung mit dem Löten von SMD-Bauteilen.
Werkzeuge und Material: Verschiedene Schraubenzieher, scharfes Messer / Cutter, Lötkolben (25-30W), kurzer isolierter Verbindungsdraht.

Einleitung

Um Radio-Astronomie, Rauschmessungen u.a. machen zu können, sollten alle Stufen eines Empfängers linear arbeiten. Auch sollte die Schwankung eines Signals am RX-Eingang genauso groß am NF-Ausgang wieder auftreten. Die meisten der moderenen und alten Empfänger verwenden eine AGC (Automatische Verstärkungsregelung). Wenn die AGC eingeschaltet ist, ist die gemessene Änderung des NF-Ausgangssignals nicht proportional zum HF-Signal am RX-Eingang. Verschiedene Transceiver, inklusive dem Kenwood TS-450S haben diese Eigenschaft und man kann das nicht abschalten. Dieser Artikel gibt Tipps, wie man beim TS450S die AGC abschalten kann mit einem Minumum an Änderungen der Hardware.

<u>Hinweis:</u> Ich übernehme keine Verantwortung oder Haftung für irgendeine Art von Schäden bei Geräten und/oder Personen, die durch die Durchführung dieser Modifikation entstehen. Eine Durchführung dieser Modifikation geschieht auf eigenes Risiko. Diese Modifikation wurde nur an meinem eigenen TS-450 getestet und funktioniert so, wie in diesem Artikel beschrieben.

1. Theorie der Arbeitsweise

Auf der Vorderseite des TRX haben wir rechts in der Mitte einen AGC-Druckknopf. Wenn er gedrückt ist, zeigt das Display "SLOW" an. Nochmaliges Drücken und das Display zeigt "FAST" an. D.h. die AGC kann nicht abgeschaltet werden. Wenn man denselben Schalter für das Ausschalten der AGC verwenden will, muß man also auf eine Funktion verzichten und für die Stellung AGC OFF verwenden. Ich habe mich entschieden, auf die „SLOW"-Funktion zu verzichten durch AGC ON FAST zu ersetzen.
Als Konsequenz wird der TS450S nach Durchführen der hier beschriebenen Modifikation im Display **„FAST"** anzeigen, wenn die neue **AGC-AUS**-Funktion aktviert ist. Wenn das Display **"SLOW"** anzeigt, entspricht das der vorherigen **AGC-AN-FAST**-Funktion.
Wenn man ins Service Manual des TS450S schaut, oder den Schaltplan der ZF-Platine (X48-3090-XX) (siehe **Abb. 1**), können wir sehen, wie die AGC-Spannung vom Ausgang von Q9 kommt und mit D26 gleichgerichtet wird, um die Basis von Transistor Q36 anzusteuern. Q36 agiert als variabler Widerstand und verändert die Gleichspannung auf der AGC-Leitung. Wenn ein HF-Signal am Eingang des RX anliegt, das über der AGC-Schwelle liegt, wird eine positive Spannung durch R136 and der Basis von Q36 präsentiert, öffnet Q36 und erniedrigt den Widerstand der Kollektor-Emitter-Strecke. Dies wird die Spannung auf der AGC-Leitung weiter erniedrigen und die Gesamt-Verstärkung des Empfängers herabsetzten.

2. Ausschalten der AGC des TS450S in der Praxis

Um den AGC-Kreis auszuschalten, sollten wir als ersten Schritt Q36 von der AGC-Leitung abklemmen. Dazu sollten das Ende von R137, das mit R138 und der AGC-Leitung verbunden ist, wie in **Abb. 2** zu sehen, abgetrennt werden.

Auf diese Weise wird das vorgegebene Design der AGC nicht verändert und wird die Gesamtverstärkung des RX nicht beeinflussen. Nach dieser Modifikation funktioniert der RF-Gain-Regler des TS450 immer noch so wie zuvor. Um die AGC AN und AUS schalten zu können, muß nun der 2. Schritt durchgeführt werden. Wir werden den Pin 3 vom IC7 von der vorliegenden Schaltung abtrennen und mit dem freien Ende von R137 verbinden, so wie es nach dem 1. Schritt vorliegt. Dann werden C117 und C118 kurzgeschlossen, wie in Abb. 3 rechts unten zu sehen. Wir verwenden den Schalter IC7 2/4, um dein Kreis zwischen Pin 3 und Pin 4 zu öffnen und zu schließen. Wenn Pin 3 und Pin 4 geschlossen sind, zeigt das Display des TS450S "**SLOW**". Wenn Pin 3 und Pin 4 offen sind, zeigt dasselbe Display "**FAST**". Nach dieser Modifikation wird das vorige "**AGC FAST**" zu "**AGC OFF**" und das vorige "**AGC SLOW**" zu "**AGC ON_FAST**".

Als Folge dieser Modifikation bedeutet die Anzeige "FAST" im AGC-Display AGC OFF und das S-Meter arbeitet dann nicht! Ohne die Arbeit der AGC sollte der OP den RF-Gain-Regler passend zur anliegenden Stärke des HF-Eingangssignals justieren, um die Stufen im Empfänger im linearen Bereich arbeiten zu lassen.

3. Anwendung der Modifikation in der Praxis in zwei einfachen Schritten

Die untere Gehäuseabdeckung des TRX abnehmen. Wie in **Abb. 4** zu sehen, befindet sicha uf der rechten Seite die ZF-Unit als einzelne Platine. Als erstes werden mit großer Vorsicht alle Verbinder rechts und unten entfernt und die sechs Schrauben, die die Platine halten, entfernt. Dann kann man das ZF-Board umdrehen und hat Zugang zur Seite mit den SMD-Bauteilen. Um den R137 von der AGC-Leitung abzutrennen, sollte man zuvor den Widerstand und die AGC-Leitung genau identifizieren und dann die Leiterbahn mit einem scharfen Messer oder Cutter durchtrennen (bitte sehr genau auf **Abb. 5** schauen). Wenn man die AGC-Funktion gar nicht weiter braucht, wäre die Modifikation damit abgeschlossen.

Wenn man die bestehende AGC-Funktion weiter verwenden will (wie ich), muß man mit dem 2. Schritt der Modifikation fortfahren wie folgt: Auf der Bauteile-Seite der ZF-Platine muß man IC7 identifizieren. Dann ist das Finden von Pin 3 des IC7 leicht und ebenso das Finden der Verbindung zu Pin 2. Diese Verbindiung soll mit einem scharfen Messer / Cutter nahe am Pin 3 durchtrennt werden (bitte ganz genau auf Abb. 6 schauen, bevor dies durchgeführt wird). Nun einen kurzen isolierten Draht vorbereiten, der zwischen Pin3 von IC7 und der abgetrennten Seite von R137 eingelötet wird, wie zuvor schon beschrieben und wie es in **Abb. 7** und **Abb. 8** gesehen werden kann.

Zum Schluß das ZF-Board wieder einbauen und die Stecker wieder aufstecken, das Gerät wieder zudsammenbauen. Fertig.

Man testet nun, ob alles richtig funktioniert wie folgt: Antenne anschließen, **RF Gain** auf Maximum stellen (im Uhrzeigersinn), egal auf welchem Band auf ein starkes Signal abstimmen, den VFO-Knopf feststellen, den AGC-Schalter auf der Vorderseite betätigen, so dass im Display "**SLOW**" erscheint (was nach der Modifikation dem vorherigen AGC ON_FAST entspricht). Nun sollte man im Lautsprecher das gewohnte, klare, unverzerrte NF-Signal hören, wie man es von vor der Modifikation kannte. Auch das S-Meter arbeitet korrekt. Nach diesem Test mit der AGC-Taste im Display auf "**FAST**" schalten (was nach der Modifikation **AGC OFF** entspricht). Man wird das starke Signal nun als etwas NF-verzerrt empfinden und das S-Meter zeigt nichts an oder weniger als S1. Ein Drehen des **RF-Gain**-Reglers entgegen dem Uhrzeigersinn solange bis das Signal klar ist, (HF-Verstärkung wird reduziert) klärt diese Angelegenheit. Man wird auch bemerken, dass die S-Meter-Anzeige entsprechend der Position des **RF-Gain**-Reglers anzeigt und nicht mehr die Signalstärke. Das ist normal und kein Fehler. Nun ist alles fertig und man kann sich an der neuen **AGC OFF**-Funktion des TS450S oder auch TS690-Transceivers erfreuen.
Viel Erfolg und ich wäre sehr an Erfahrungsberichten interessiert per email an yo3fff@rnc.ro
73 de YO3FFF, Cristi

Virgo - A Meteor Radiant Visualization Tool for Meteorscatter

by Sabine Cremer, DL1DBC

Visualization is thought to be one of the milestones in modern data processing. We all can understand even a complex situation on the fly if it is presented as an image. Data describing the path of meteor showers' radiants might not be as complex as a vector field representing turbulence along an airplane's wing – but why deal with numerical data when visualization is possible? The answer on this question is Virgo, a Java applet for tracking meteor radiants on a projection of the visible sky. Virgo visualizes drift corrected data for meteor showers provided by the International Meteor Organization to serve for meteor-scatter work without updating an planetarium program with right ascension and declination data day by day.

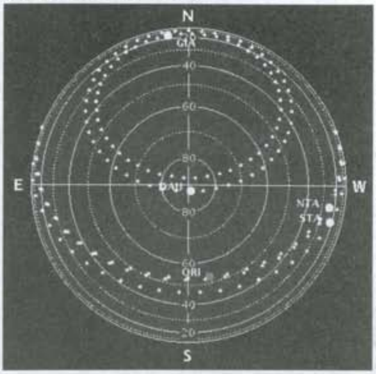
The data source

Starting in 1995, the International Meteor Organization (IMO) [1] publishes celestial and activity data for meteor showers which produce definite visual or radio activity. Right ascension (RA) and declination are the astronomical coordinates that, transformed to our own geocentric view of the world, give azimuth and elevation for each point in time the meteor radiant moves through our visible sky. The activity data tells us, in which period of the year the specific meteor shower is active, when it reaches its maximum and what zenithal hourly rate the shower produces throughout its peak. The IMO is definitely not the only organization providing this data, but this data source has one advantage over others, offering a table with information about the drift positions of the meteor showers' radiants [2].

Using drift corrected celestial data

Due to the earth's orbital motion around the sun, RA and declination of meteor radiants are of no fixed value. Most meteor organizations give RA and declination for the maximum of activity only because lots of the visual observers prefer watching the falling stars around the meteor shower's peak. However, meteor-scatter enthusiasts often use the whole activity period of a specific meteor shower as most of the older showers appear widely broadened. In this case drift correction of the celestial data becomes absolutely necessary. During the Geminids' activity period for example, rise and set time differ by half an hour (rise time) and nearly one hour (set time), respectively. Virgo uses drift corrected celestial data by inter- or extrapolating the given data from the IMO for each day of observation.

Virgo's sky view



Virgo's sky view (see fig. 1) displays the visible sky centered on the locator you entered into the corresponding input field. So the midpoint of the diagram is where your antenna is located and the outer margin represents the visible horizon at sea level. Concentric circles around the center of the diagram depict the elevation of celestial bodies rising from 0 degrees at the outer margin to 90 degrees in the center (the zenith). East and west seem to be mixed up, but if you are familiar with other astronomical projections you will know that this a common practice, because those sky views are thought to be hold over the head when used to locate celestial bodies in the sky.

The celestial pole, i. e, the point in the sky where all celestial bodies seem to move around, is always located at an elevation that complies with the geographical latitude of your location. Circumpolar meteor radiants will travel around the celestial pole with their track being visible for the whole pass.

Fig. 1: Virgo's sky display showing the situation on 2006-10-09 at 19:03 UTC with five active meteor showers and their tracks seen from JO31oj

Meteor radiants which are not visible for the whole pass will rise in the east and set in the west, their tracks always describing an arc centered at the celestial pole. So the radiant's path is represented by an arc or a circle of cyan colored dots. Each of this dots marks an angle of 7.5 degrees or half an hour travel time of the corresponding meteor radiant.

Classifying the meteor showers

In Virgo's sky view, the current position of the meteor radiant is depicted by a filled circle with the short reference of the correspondig meteor shower near to it. For example, you will find orange dots for meteor showers that issue up to three meteors per hour at maximum, red dots for meteor showers with up to ten meteors per hour. The colors represent a classification developed 2006 by Robert Lunsford from the American Meteor Society (AMS) [3], slightly modified for meteorscatter purposes. It is based on the zenithal hourly rates (ZHRs) the meteor showers reach in their maximum [4]:

Class I: The strongest annual showers with ZHRs normally ten or better.
Class II: Reliable minor showers with ZHRs normally three or better.
Class III: Showers with widely variable rates. They may be strong one year and totally inactive the next.
Class IV: Weak minor showers with ZHRs rarely exceeding three.

Virgo uses one class more, extending the scale over the upper end: class 0. If Virgo displays a magenta colored meteor radiant, this means that the meteor shower pour out at least 60 specimen per hour or one meteor per minute when it reaches its activity peak. Class 0 is thought to provide at least one of the qso partners with a ping or burst per cycle on peak time.

The azimuth indicator

Fig. 2: Virgo's azimuth indicator showing the meteors path orientations

This section (see fig. 2) is especially designed for palp* stations (I own one, too). Success in meteorscatter is affected by two concepts: the path loss and the trail efficiency. Basic papers tell us that there is a lower signal loss when the meteor trail is is parallel to the propagation direction [5, 6]. On the other hand, pointing your antenna parallel to the meteor swarm will lower your chance to hit one's trail with your rf. When the radiant's azimuth is perpendicular to the propagation plane, most meteor reflections can be observed (trail efficiency) [6]. OH5IY gives us a clear statement to this seemingly contradiction in terms: "The higher the indicated trail efficiency is, the better" [6]. The azimuth indicator shows you the path orientation of the meteors dipping into the atmosphere. All pointers are colored corresponding to the meteor shower, which trail direction they represent. You are free to choose the best trail efficiency rotating your antenna perpendicular to the radiant's azimuth or trying to get a minimum of path loss orienting the antenna parallel to it. Maybe you just ignore the azimuth indicator.

Some table work

Basic data of the active meteor showers are summarized in a table located under the sky display and the azimuth indicator (see fig. 3). The table will dynamically grow and shrink depending on the number of meteor showers being active on each day of observation. The table starts on the left with the meteor shower's name and its short reference, followed by information on rise and set (all times in UTC!). Meteor showers that will never reach the horizon of your visible sky are marked as „not visible". As well, meteor showers that will never go under your visible horizon are marked as „circumpolar" in this section. In the middle of the table, you will find the celestial data for the corresponding meteor showers as inter- or extrapolated by Virgo for verification.

The right side of the table reveals important information for meteorscatter success: the zenithal hourly rate of meteors issued by the radiant near peak time, the Lunsford class the shower belongs to (including a graphical representation) and to the most right, data describing the (visible) activity peak. Date and time show when the meteor shower reaches its peak. The little pyramid on the right displays in a simple way whether the shower activity is before, past or within the activity peak.

Meteor Shower	Ref.	Rise	Set	RA	Decl.	ZHR	Class	Activity Peak
Orionids	ORI	11:08	01:54	87	15	23	1	2006-10-21 15:26
Delta-Aurigids	DAU	circumpolar		94	49	5	2	2006-09-09 14:56
Taurids South	STA	07:59	21:25	30	8	5	2	2006-11-05 15:55
Taurids North	NTA	07:18	21:49	28	14	5	2	2006-11-12 15:11
Giacobinids	GIA	circumpolar		262	54	var	3	2006-10-08 22:18

Fig. 3: Numerical data give information on rise and set, the activity peak and other data of each meteor shower displayed

Where to find Virgo

Virgo is located under the URL **http://dl1dbc.net/Meteorscatter/.** You will find a screenshot for easily understanding Virgo's capabilities and a detailed help page for quick information.

Notes on the runtime environment

Virgo is a Java program embedded in a HTML page. Once you load the page, Virgo's op code is transferred to be executed by a Java virtual machine on your local computer. If needed, you have to update your Java Runtime Environment to JRE 5.x prior to run Virgo [7]. Please follow the hints on the web site to easily download and install the JRE.

Virgo is connected to a database located on the server dl1dbc.net, but an internet connection is needed only on program start or when passing 00:00 UTC to load data for current active meteor showers, besides when your personal information (call and locator) is to be saved (see fig. 4).

Virgo's displays are updated every minute. For this action no internet connection is necessary. Please note, that the accuracy of Virgo's clock (see fig. 5) is dependent on your system clock as Virgo is not running on the server but on your own computer!

Fig. 4 (left): Input fields for call sign and locator, besides some controls for the sky display

Fig. 5: Virgo's status display: date, time, and particularly important: the position centered in the sky display (here it is JO31oj)

Acknowledgements

Many thanks to Rainer Arlt from the IMO, always answering my questions, to him and Robert Lunsford from the AMS for their efforts maintaining meteor shower data for the public. Special thanks to Peter Duffett-Smith, whose book „Easy PC Astronomy“ [8] was fundamental creating Virgo. Through very friendly personal communication he provided me with an update of his astronomical script software AstroScript which was used to verify main computing sections of Virgo.

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Virgo: ein Tool zur Bahnverfolgung von Meteorradianten für Meteorscatter

von Sabine Cremer, DL1DBC

Der Mensch ist ein Augentier. Wir alle können rasch den Wirbel in einer ansonsten laminaren Strömung erkennen, wenn uns die Daten nicht in endlosen Zahlenkolonnen, sondern grafisch aufbereitet begegnen. Nun sind Bahndaten von Meteorradianten nicht so komplex wie ein Vektorfeld, das die Strömung entlang einer Flugzeugtragfläche beschreibt – aber warum sollen wir uns mit Zahlen herumschlagen, wenn eine Visualisierung möglich ist? Die Antwort auf diese Frage ist Virgo, ein Java-Applet zur Bahnverfolgung von Meteorradianten über eine Projektion des sichtbaren Himmels. Virgo visualisiert driftkorrigierte Daten, die durch die International Meteor Organization bereit gestellt werden, und ermöglicht so den unkomplizierten Meteorscatterbetrieb, ohne Tag für Tag eine Planetariumssoftware mit von Hand interpolierten Daten für die Rektaszension und die Deklination füttern zu müssen.

Die Datenquelle

Die International Meteor Organization (IMO) [1] publiziert seit 1995 Himmelskoordinaten und Aktivitätsdaten für Meteorschauer, die entweder durch direkte Beobachtung oder durch die Rückstreuung von elektromagnetischen Wellen nachgewiesen werden können. Rektaszension (RA) und Deklination sind die Himmelskoordinaten, die die Grundlage zur Berechnung der Koordinaten in unserem Bezugssystem liefern. Transformiert in Azimut und Elevation, beschreiben sie den Weg, den ein Meteorradiant oder ein beliebiger anderer Himmelskörper über den sichtbaren Himmel nimmt. Die Aktivitätsdaten sagen uns, in welcher Zeitspanne jeder Meteorschauer über das Jahr aktiv ist, wann er sein Maximum erreicht und wie hoch die Anzahl an Meteoren ist, die er maximal ausschüttet. Die IMO ist natürlich nicht die einzige Organisation, die diese Daten für interessierte Beobachter bereit stellt, aber diese Datenquelle hat einen großen Vorteil gegenüber anderen: sie enthält zusätzlich zu den gängigen Himmelskoordinaten für das Maximum des Meteorschauers Daten zur der Drift des Radianten während der gesamten Aktivitätsphase [2].

Driftkorrigierte Himmelskoordinaten

Rektaszension und Deklination von Meteorradianten sind keine fixen Werte. Das hängt ursächlich mit der Bewegung der Erde um die Sonne zusammen. Viele Meteororganisationen beschränken sich darauf, ihre Mitglieder mit RA- und Deklinationsdaten für das Aktivitätsmaximum zu versorgen, weil ein Großteil der Beobachter von Sternschnuppen sich auf das Schauermaximum konzentriert. Funkamateure, die sich für Meteorscatter begeistern, nutzen jedoch häufig die gesamte Aktivitätsphase eines Meteorschauers, zumal viele der älteren Schauer bereits sehr stark in die Breite gegangen sind. In diesem Fall ist eine Driftkorrektur für die Himmelskoordinaten des Radianten unerlässlich. Nimmt man die Geminiden als Beispiel, verschieben sich die Uhrzeiten für Auf- und Untergang während der Aktivitätsperiode um etwa eine halbe bzw. fast eine ganze Stunde. Virgo verwendet die Himmelkoordinaten, die für Fünftagesintervalle durch die IMO gelistet werden, und berechnet für jeden Tag Zwischenzustände durch Inter- bzw. Extrapolation.

Virgos Himmelsprojektion

Virgos Sky View (vgl. Abb. 1) stellt den gesamten sichtbaren Himmel dar, wie er sich am Standort des Benutzers präsentiert. Im Mittelpunkt des Sky Views befinden sich der Benutzer und seine Antenne, der äußere Rand der Himmelsprojektion stellt die Horizontlinie des sichtbaren Himmels auf Meeresniveau dar. Konzentrische Kreise markieren die Elevation, die ein Himmelskörper auf seinem Weg über den Himmelsausschnitt in jedem Zeitschritt erreicht. Sie reicht von 0° am äußeren Rand bis zu 90° über dem Scheitel des Benutzers (dem Zenit). Es sieht so aus, als wenn Osten und Westen vertauscht wären, tatsächlich ist das aber nur die übliche Art und Weise, wie astronomische Projektionen orientiert sind. Himmelsprojektionen werden normalerweise über den Kopf gehalten, um Himmelskörper einfach lokalisieren zu können.

Der Himmelspol, d. h. der Punkt am Himmel, um den sich scheinbar alle Himmelskörper herum drehen, befindet sich grundsätzlich auf einer Elevation, die der geografischen Breite des Beobachters entspricht.

Meteorradianten mit zirkumpolaren Umlaufbahnen wandern daher in einem durch die Projektion verformten Kreis um den Himmelspol herum, wobei ihre Bahn während des gesamten Umlauf sichtbar bleibt. Meteorradianten, die nicht während des gesamten Umlaufs sichtbar sind, gehen im Osten auf und im Westen wieder unter. Ihre Bahn beschreibt einen Kreisbogen, der wiederum den Himmelspol als Mittelpunkt hat. Virgo stellt die Bahnspur durch eine Aneinanderreihung von türkisfarbigen Punkten dar, die entweder einen Kreisbogen oder einen kompletten Kreis formen. Jeder dieser Punkte markiert einen Zeitabschnitt von einer halben Stunde und einen Winkel von 7.5°, den der Meteorradiant in dieser Zeit weiter wandert.

Untergliederung der Meteorschauer

In Virgos Himmelsprojektion wird die gegenwärtige Position eines Meteorradianten durch einen ausgefüllten Kreis angezeigt, der mit der Kurzreferenz des jeweiligen Meteorschauers gekennzeichnet ist. Orangefarbene Kreise bezeichnen beispielsweise einen Meteorschauer mit einer maximalen Individuenrate von drei Meteoren pro Stunde (im Schauermaximum), rote Kreise beschreiben Meteorschauer mit maximal zehn Meteoren pro Stunde. Die Farben beziehen sich auf eine Klassifikation, die Robert Lunsford von der American Meteor Society (AMS) [3] im Jahr 2006 entwickelt hat. Für die Anwendung bei Meteorscatterverbindungen wurde die Klassifikation leicht angepasst. Grundsätzlich basiert die Einteilung auf der Individuenzahl sichtbarer Meteore, die während des Schauermaximums pro Stunde beobachtet werden kann (ZHR = zenithal hourly rates) [4]:

Klasse I: Die stärksten jährlich wiederkehrenden Schauer mit einem ZHR von 10 oder besser.
Klasse II: Zuverlässig wiederkehrende kleinere Schauer mit einem ZHR von 3 oder besser.
Klasse III: Schauer mit Raten, die über einen weiten Bereich variieren können. Sie können in einem Jahr sehr stark vertreten sein, in einem anderen ganz ausfallen.
Klasse IV: Schwache, untergeordnete Schauer mit einem ZHR, das selten 3 Exemplare pro Stunde überschreitet.

Virgo benutzt genau eine Klasse mehr, die die Skala der AMS nach oben erweitert: die Klasse 0. Wenn Virgo einen Meteorschauer mit einem magentafarben gefüllten Kreis abbildet, bedeutet das, dass dieser Schauer im Maximum wenigstens 60 sichtbare Meteore pro Stunde ausschüttet, d. h., einen Meteor pro Minute. Die Klasse 0 sollte in einem MS-QSO während des Schauermaximums wenigstens einer der beteiligten Stationen einen Ping oder Burst im einminütigen Zyklus ermöglichen.

Der Azimutanzeiger

Dieser Anzeigebereich (vgl. Abb. 2) ist speziell für palp*-Stationen gedacht (so wie ich zum Beispiel eine betreibe). Zwei Faktoren beeinflussen den Erfolg von Meteorscatterverbindungen: der Verlust an Signalstärke entlang des Ausbreitungspfads (path loss) und die Nutzbarkeit von Meteorbahnen (trail efficiency). In Grundlagenbeiträgen lässt sich nachlesen, dass der Verlust an Signalstärke (path loss) am geringsten ist, wenn Meteorbahn und Ausbreitungsrichtung parallel orientiert sind [5, 6]. Andererseits ist die Chance bei dieser Antennenausrichtung deutlich geringer, eine oder mehrere Meteorbahnen mit der HF-Aussendung zu berühren. Wenn der Radiant dagegen senkrecht zu der Ausbreitungsrichtung orientiert ist, wird eine größtmögliche Anzahl an Reflexionen beobachtet (trail efficiency) [6]. OH5IY löst diesen scheinbaren Widerspruch mit den Worten auf: „The higher the indicated trail efficiency is, the better".

Der Azimutanzeiger beschreibt die Bahnorientierung der Meteore beim Eintritt in die Erdatmosphäre. Die Zeiger, die für jeden Meteorradianten über die Skala wandern, tragen die Farben des Schauers, zu dem sie gehören. Abhängig davon, welches Konzept man verfolgt, kann man seine Antenne senkrecht zu der angezeigten Richtung stellen (trail efficiency) oder versuchen, den Verlust an Signalstärke zu minimieren, indem man die Antenne parallel zu der Meteorspur einrichtet (path loss). Natürlich kann man den Azimutanzeiger auch schlichtweg ignorieren.

Ein bisschen Tabellendarstellung

Virgos Visualisierung beschränkt sich auf die abgeleiteten Daten, die für Meteorscatterbetrieb direkt greifbar sein müssen. Weitere Basisdaten werden in klassischer Weise durch tabellierte Zahlen dargestellt (vgl. Abb. 3), in einem Fall ergänzt durch eine kleine Visualisierungshilfe. Die Tabelle verändert ihre Größe dynamisch in Abhängigkeit von der Anzahl der aktiven Meteorschauer. Sie beginnt links mit dem Namen und der Kurzreferenz des Meteorschauers und setzt sich nach rechts mit Informationen zu Auf- und Untergangszeiten fort (alle Zeiten in UTC!). Meteorschauer, die auf Grund ihrer Bahndaten nie den Horizont des Beobachters erreichen, erhalten in diesem Bereich den Hinweis „not visible". Radianten, die niemals untergehen, werden als „circumpolar" gekennzeichnet. In der Mitte der Tabelle finden sich die Basisdaten Rektaszension und Deklination, die Virgo aus den driftkorrigierten Himmelskoordinaten der IMO für den jeweiligen Beobachtungstag inter- bzw. extrapoliert.

Auf der rechten Seite der Tabelle folgen schließlich Daten, die wichtige Informationen enthüllen, die den Erfolg einer Meteorscatterverbindung entscheidend beeinflussen: das ZHR als Maß für die Stärke des Meteorschauers im Maximum, die Lunsford-Klasse, zu der der Schauer gehört (zusammen mit einer grafischen Abbildung) und in der letzten Spalte die Daten, die den Aktivitätspeak beschreiben. Das Datum und die Uhrzeit geben einen Hinweis darauf, wann das (sichtbare) Aktivitätsmaximum erreicht wird, die kleine Pyramide ganz rechts zeigt, ob sich der Meteorschauer vor oder nach oder direkt im Aktivitätsmaximum befindet.

Virgos QTH

Virgo findet sich unter der Internetadresse **http://dl1dbc.net/Meteorscatter/.** Die Realtime-Darstellung ist für einen raschen Überblick über die Möglichkeiten, die Virgo bietet, durch Links zu einem Screenshot und eine detaillierte Hilfeseite ergänzt.

Ein paar Hinweise zu Virgos Laufzeitumgebung

Virgo ist ein Java-Programm, das als Applet in eine HTML-Seite eingebettet ist. Wenn diese Seite geöffnet wird, wird der Op-Code an den anfordernden Computer übertragen und dort durch eine virtuelle Java-Maschine ausgeführt. Virgo benötigt das Java Runtime Environment JRE 5.x. Sollte Virgo auch nach wiederholtem Reload der Seite nicht starten, ist ein Update des aktuell installierten JRE nötig. Virgos Homepage enthält im Kopf einen Link zu java.com [7], über den ein automatisierter Update für das jeweilige Betriebssystem problemlos möglich ist.

Virgo steht in Kontakt mit einer Datenbank auf dem Server dl1dbc.net. Eine Verbindung zum Internet ist allerdings nur in drei Fällen nötig: einmal bei Programmstart, sobald um 00:00 UTC ein neuer Tag anbricht (in beiden Fällen liest Virgo die aktuellen Meteorschauerdaten aus der Datenbank) und wenn die persönlichen Daten des Benutzers (Rufzeichen und Locator) in der Datenbank abgelegt werden sollen (vgl. Abb. 4).

Virgos Displays werden einmal pro Minute aktualisiert. Für diesen Update ist keine Internetverbindung nötig. Bitte eins beachten: Virgos Uhr (vgl. Abb. 5) läuft so genau wie die Systemuhr des Benutzerrechners, denn das Programm wird nicht auf dem Server, sondern auf dem lokalen Computer ausgeführt!

Danksagungen

Ich möchte mich an erster Stelle bei Rainer Arlt von der IMO und Robert Lunsford von der AMS dafür bedanken, dass sie viel Zeit und Mühe investieren, um die breite Öffentlichkeit Jahr für Jahr mit fundierten Daten zu Meteorschauern zu versorgen. Rainer Arlt, der geduldig meine Fragen beantwortet hat, gilt in diesem Zusammenhang besonderer Dank. Ohne Peter Duffett-Smith' Buch „Easy PC Astronomy" [8] wäre aus Virgo wahrscheinlich nichts geworden. Ich möchte mich auch bei ihm für seine Hilfe bedanken, speziell dafür, dass er mir einen Update seiner Skriptsoftware AstroScript geschickt hat, um Virgos Berechnungen zu verifizieren.

Abbildungstexte:

Abb. 1: Virgos Sky Display am 09.10.2003 um 19:03 UTC mit fünf aktiven Meteorschauern und ihren Bahnen (projiziert für JO31oj)

Abb. 2: Virgos Azimutanzeiger: je eine "Nadel" für jeden aktiven Meteorschauer beschreibt die Bahnorientierung

Abb. 3: Tabellierte Informationen zu den dargestellten Meteorschauern, darunter Daten zum Auf- und Untergang und zum Aktivitätsmaximum

Abb. 4: Eingabefelder für Rufzeichen und Locator, außerdem einige wenige Kontrollelemente für das Sky Display

Abb. 5: Virgos Statusanzeige: Datum, Uhrzeit und besonders wichtig: der Standort, für den die Projektion gilt (hier JO31oj)

Microwave Parts

Hittite MICROWAVE CORPORATION v00.1005

HMC-C022

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Typical Applications

The HMC-C022 Wideband LNA is ideal for:

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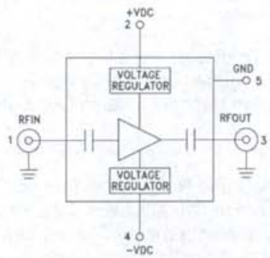
- Microwave Radio & VSAT
- Military & Space
- Test Instrumentation
- Fiber Optics

Functional Diagram



Features

Noise Figure: 2 dB @ 8 GHz

Flat Gain: 14 dB ± 0.5 dB

P1dB Output Power: +18 dBm @ 8 GHz

Spurious-Free Operation

Regulated Supply and Bias Sequencing

Hermetically Sealed Module

Field Replaceable SMA connectors

-55 to +85°C Operating Temperature

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The HMC-C022 is a GaAs MMIC PHEMT Low Noise Distributed Amplifier in a miniature, hermetic module with replaceable SMA connectors which operates between 2 and 20 GHz. The amplifier provides 14 dB of gain, 2 to 3 dB noise figure and up to +18 dBm of output power at 1 dB gain compression. Gain flatness is excellent from 2 - 18 GHz making the HMC-C022 ideal for EW, ECM RADAR and test equipment applications. The wideband amplifier I/Os are internally matched to 50 Ohms and are internally DC blocked. Integrated voltage regulators allow for flexible biasing of both the negative and positive supply pins, while internal bias sequencing circuitry assures robust operation.

Electrical Specifications, T_A = +25° C, +VDC = +8V to +16V, -VDC = -3V to -12V

Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range		2.0 - 6.0			6.0 - 12.0			12.0 - 20.0		GHz
Gain	12	15		11	14		10	13		dB
Gain Flatness		±0.25			±0.5			±0.5		dB
Gain Variation Over Temperature		0.008	0.015		0.008	0.015		0.008	0.015	dB/ °C
Noise Figure		2.5	4.5		2.0	3.0		3.0	5.0	dB
Input Return Loss		17			17			18		dB
Output Return Loss		13			15			8		dB
Output Power for 1 dB Compression (P1dB)	15	18		13	16		9	13		dBm
Saturated Output Power (Psat)		22			21			19		dBm
Output Third Order Intercept (IP3)		28			27			23		dBm
Positive Supply Current (+IDC)		75			75			75		mA
Negative Supply Current (-IDC)		1.8			1.8			1.8		mA

Also new: HMC-C016 for 7-17 GHz and HMC-C017 17-27 GHz

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RoHS✓ EARTH FRIENDLY

HMC341LC3B

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Typical Applications

The HMC341LC3B is ideal for:

- Point-to-Point Radios
- Point-to-Multi-Point Radios & VSAT
- Test Equipment & Sensors
- Military End-Use

Features

2.5 dB Noise Figure

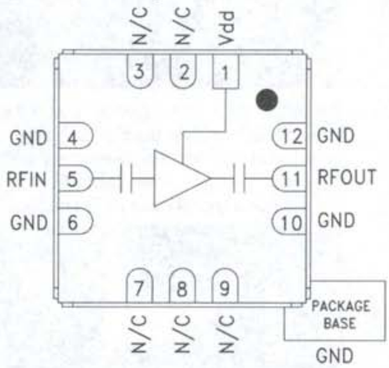
13 dB Gain

+3.0 V @ 35 mA Supply

50 Ohm Matched Input/Output

RoHS Compliant 3x3 mm SMT Package

Functional Diagram



General Description

The HMC341LC3B is a GaAs PHEMT MMIC Low Noise Amplifier housed in a leadless RoHS compliant SMT package. Operating from 21 to 29 GHz, the amplifier provides 13 dB of gain and a noise figure of 2.5 dB from a single +3.0 V supply. The RF I/Os are DC blocked and matched to 50 Ohms requiring no external components. The HMC341LC3B eliminates the need for wire bonding, allowing the use of surface mount manufacturing techniques.

Electrical Specifications, T_A = +25° C, Vdd = +3V, Idd = 35 mA

Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range		21 - 24			24 - 26			26 - 29		GHz
Gain	10.5	13.5		10	13		9	12		dB
Gain Variation Over Temperature		0.016	0.025		0.016	0.025		0.016	0.025	dB/ °C
Noise Figure		3.25	5		3	3.5		2.5	3	dB
Input Return Loss		10			11			9		dB
Output Return Loss		14			10			9		dB
Output Power for 1 dB Compression (P1dB)		8			8.5			8.5		dBm
Saturated Output Power (Psat)		11			11.5			11.5		dBm
Output Third Order Intercept (IP3)		19			19			19		dBm
Supply Current (Idd) (Vdd = +3V)		35			35			35		mA

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Microwave Europe

Editor: Simon Lewis, DL4PLM
SimonM.Lewis@vodafone.com

Hello and welcome to another Microwave Europe. Well we have already seen the first RS openings in the past weeks but we are still having the cool evenings and mornings so summer is not here just yet! We have lots of get through this month so I will get on with the news and information – please do not forget the summer radio events where you will find lots of well known faces – so see you at Friedrichshafen and Weinheim! 73 Simon DL4PLM

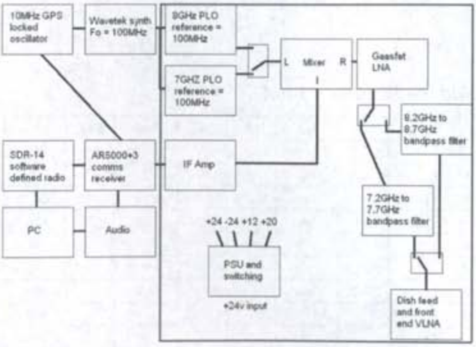
M0EYT 8.4GHz DSN receiver

As many people who attended the UK Martlesham microwave meeting back in November 2005 saw, James G3RUH and Freddy ON6UG gave an amazing demonstration of the reception of deep space probes, which are on their way to various planets. At the time the Venus Express spacecraft was 750,000 miles away, but the best DX came from the Mars Reconnaissance Orbiter at 27,000,000 miles, not bad DX.

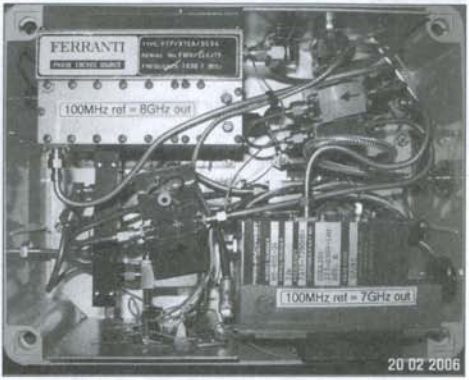
After having seen the demo, and chatting with James and Freddy, it was clear to me that I needed to build a receiver and hear this stuff for myself. This article gives the technical details of what I did in order to hear the signals.

Following the demo, I managed to pick up some very useful items from the 'flea market' at Martlesham, including a phase locked oscillator that originally ran on 7997MHz – this would be used as the 8GHz LO. I found some other components that were useful, and also managed to scrounge a mixer and some isolators off local amateurs.

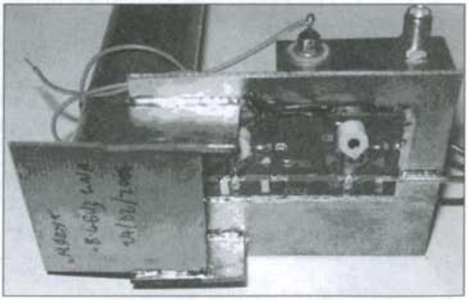
The diagram below shows the final iteration of the down converter, after about 10 experimental builds:



The 10MHz reference oscillator is the G4JNT simple GPSDO that was published a while back in the old RSGB 'Microwave Newsletter' (now the UK Microwave Groups "Scatterpoint". This feeds an eBay Wavetek synthesiser that in turn feeds an accurate 100MHz reference signal to the down converter which is mounted behind the dish or directly at the feed in the case of the FRARS 3.7m dish. In the 'final' design of the converter, it was decided to also include a 7GHz LO to allow system checks to be made on signals from geostationary satellites – this was for two reasons, 1) to verify the az/el calibration of the dish, and 2) to perform an RF end to end checkout and to help with optimisation of the dish feed point. Switching in the relevant LO also switches in band pass filters for the band in question – for 7GHz LO there is a 7.2 to 7.8GHz filter, whilst for 8GHz LO there is a 8.3 to 8.8GHz filter. The down converter runs from +24v and has remote switching to allow the band to be changed on the fly.



The picture above shows the final build of the down converter including the switched band pass filters – a further single stage gaasfet preamp was added after the filters / SMA relays to increase the signal a little before it hits the mixer. After the mixer, a mar-6 special is used as a broadband IF amplifier.

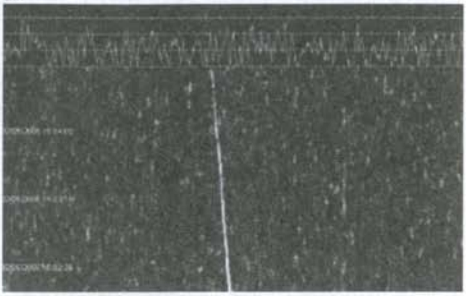


At the front end, a dual stage LNA is used, this was built around the sat-TV LNA boards sold by www.rfmicrowave.it from Italy, and costing around £2 per board for which you get 4 gaasfet preamplifiers. The gaasfets are NE32584's and with two the LNA gives around 25dB gain and 'should' give less that 1dB NF. The LNA is directly coupled into B&Q 28mm waveguide, and a scalar ring had been constructed to match the feed to the dish.

The LNA and down converter have been tried on two dishes, with great success. Firstly the 1m offset here at M0EYT was used to DX MRO and VEX. The first VEX signals were copied with the space craft at a touch over 4 million miles, and the last copied signals from MRO were with the space craft at 69,593,573 miles.

The second dish we tried was the FRARS 3.7m EME dish – this allowed some better DX. Firstly the LNA / feed position was peaked using a CW carrier from a geostationary satellite

– it was possible to get a quieting FM signal in 15 KHz of bandwidth. Addition of the scalar made an amazing improvement, with a fully quieting 110KHz wide FM bandwidth! The signals from MRO, this time at 120,594,960 miles from Earth were a good copy in SSB bandwidth, and could be tuned by ear with no problems. But, the best DX of the day was with the ESA's Rosetta space craft at 242,730,000 miles – not bad at all.



Rosetta in the FFT! – peaking abt. 18dB in 1Hz

The next step is to try and DX the 'New Horizons Pluto Charon' mission which will take 10 odd years to arrive at its destination – hopefully amateur technology can keep up and allow us to hear signals from space craft.

Incidentally, we have created a yahoo group for discussion of Amateur-DSN topics – its online at http://groups.yahoo.com/group/amateur-DSN/ .If you already are a member of the UK microwaves group, joining this one will be easy! 73's Paul M0EYT

"Quatres Anglais" at Seigy 2006, Peter Day G3PHO

Seigy 2006 (or "Cj" 2006 as they seem to prefer down the Cher et Loire region) took place this year over the first weekend of April. Four of UK travellers, G3PYB, G8ACE, G4ALY and myself (G3PHO) decided to make the effort to meet all those French microwavers we had worked on the bands over past years. Ralph, G4ALY, had been to the event in 2005. This time he travelled independently as he was part of a big 60th surprise birthday party for André, F1PYR (but that's another story!) while the rest of us travelled down in G3PYB's car from Le Havre, after taking the overnight cross Channel ferry from Portsmouth. The superb new motorway from Le Havre to Tours was a delight to drive on, with very little traffic, so the 400km journey was speedily done.

L to r G3PHO, G8ACE, G3PYB, ON4IY, ON4CDU

CJ is a VHF to Microwave meeting, held once a year at Seigy, a small village to the SE of Tours. The village green and meeting hall are pressed into service for the weekend to provide a day and a half of fleamarketing, lectures and socialising. Two nearby hotels provided two evenings of excellent wining an dining until the midnight hour! Hundreds of French amateurs come from all parts of the country for this most popular event. This year there were also visitors from Switzerland, Belgium, UK, German and Italy, as well as a few expatriate Gs now living in France.

The French microwavers had a special meeting of "Hyper" during the Saturday afternoon, during which "les Anglais" were very warmly welcomed (in French of course!). Meeting the French microwavers was a particular delight for the writer. It was great to meet Eric, F1GHB, Herve, F5HRY, André F1PYR and Maurice, F6DKW after having 5.7GHz or 10GHz QSOs with them from across the Channel. André had been of special assistance to us as he had prebooked our hotel and Friday night dinner and had driven Ralph, G4ALY down from Paris. Many thanks indeed André!

The social aspects of CJ were immediately apparent. Everyone was very friendly and much more general chit chat took place than we seem to get at our UK Microwave Round Tables, so much so that it's possible we may give a little more time to it at Martlesham and RAL from now on! Facilities such as test gear were not at the Martlesham and RAL level however but, nevertheless, there was a large pile of equipment left for test at the noise figure measurement table in the main hall! A "Concours de réalisations" (equipment construction competition) attracted a sizeable number of excellent examples of home-made microwave and VHF gear, including the "Rover Box" by Christophe, ON4IY. This is an LCD display of GPS information such as: Date, UTC time, Maidenhead grid square, Odd/even minute indication (very useful for weak signal or airplane scatter work), Validity of GPS data, number of sats used for fix, height in meters above Mean Sea Level, HDOP - will indirectly reflect 10MHz quality, warning on display if threshold exceeded or validity lost, Sun azimuth and elevation.

Familiar Microwave Faces... Left to Right: F6AJW, G3PHO, F1PYR, F6DKW

On the Sunday, we decided to drive to the Normandy coast for a look at the D Day landing beaches and to check out a few possible microwave locations in case we decide to visit again next year! Arromanches looked ideal but would we be allowed to set up our portable stations on the lookout above the town? Only time may tell! Many thanks to all our French friends for a wonderful welcome and a most enjoyable week-end. ... and also for the free bottle of special CJ white wine, bottled just for the event ... every one gets one when they register at the door ! 73 from Peter, G3PHO

Seigy Fleamarket ..... happy faces!

French Activity Days 2006

Here the dates for the 2006 series of French activity days:

20 & 21 of May
17 & 18 of June
29 & 30 of July
19 & 20 of August
23 & 24 of September
28 & 29 of October

For all these Weekends, activity on 23 cm and up will begin on Saturday 17 PM to 23 PM French local time (15-21 UTC) and then on Sunday 06 AM to 17 PM (04-15 UTC) French local time.

Past Copies Of UKuG "Scatterpoint" Now Available Online!

As a follow on from the announcement made in last month's Scatterpoint, the UKuG Committee has decided to make available, to anyone in the public domain, all copies of Scatterpoint printed during 2004. At the end of this year all the 2005 issues will also be added to the free archive. In this way UKuG members will not be penalised as their current year's issues will remain their privilege. To enable an easy-to-use archive download system we have acquired www.scatterpoint.org as the URL. Just go there and follow the links!

VHF South America

Flàvio Archangelo, PY2ZX
archangelo@mandic.com.br

TEP on 2m from FJ/FM to PY

Note that we are already in the minimum of the solar cycle!

FJ5DX (St. Barthelmy Island, FK87NV) wkd/hrd on 2m (144.200 MHz) via TEP with 50w + 5/8 vertical, 3m a.g.l.:

Date	UT	Call	Mode	TX	RX	Loc
19/02/06	0017	PP5XX	CW	319	519	GG53QW
8 minutes opening – 5125km						
24/02/06	0125	PP5XX	CW	539	519	GG53
						15 minutes opening
26/02/06	0100	PU5YFT	CW	319	hrd CQ DX	GG54
	0105	PY5EW	SSB	54	57	GG46KQ 4757km
	0112	PY5HOT	SSB	54	54	GG46
	0155	PP5XX	CW	519	hrd CQ DX	GG53
	0200	PY5EW	SSB	52	hrd CQ DX	GG46
27/02/06	0019	PY5EW	SSB	52	2. QSO	GG46
	0020	PY5HOT	SSB	53	2. QSO	GG46
28/02/06	0022	PY5EW	SSB	52	hrd	GG46
	0126	PU5YFT	CW	319	hrd	GG54
01/03/06	0020	PY5EW	SSB	52	53	GG46
	0040	PY5YFT	CW	319	319	GG54
09/03/06	0018	PY5EW	SSB	52	51	GG46
13/03/06	0045	PY5EW	SSB	53		GG46
	2354	PY5EW	SSB	56	52	GG46
14/03/06	0100	PY5EW	SSB	41	hrd	GG46
14/03/06	2340	PY5AQ	SSB	52	QSO	GG54HO
	2354	PY5EW	SSB	hrd		GG46
19/03/06	0040	PY5AQ	SSB	51	QSO	GG54HO
Now working with 150W and 11 ele. Yagi:						
26/03/06	0134	PP5FMM	SSB	52		GG52KH
5281 km - his rig: 50w + 17 ele						
26/03/06	0139	PP5AMP	SSB	51		GG52KH
26/03/06	0141	PP5KE	SSB	51		GG52KH
26/03/06	0142	PP5JR	SSB	52		GG52KH

FM5JC, FK94LO, wkd 2m TEP:

28/02/06	0025 -0034	PU5YFT	CW	539	419	GG54JC 4682km
01/03/06	0137 -0144	PP5XX	CW	559	579 max	GG53 4717km

Meteor Scatter in Brazil

Several contacts were made in December, 2005 and January, 2006 by PY2SRB, PY2OC, PY1NB, PY1RO, PY3DU and PT9PA involving 4 states of 3 different geographical regions. They worked on 2 meters and 6 meters using WSJT (FSK441 and JT6M). The stations had different conditions, PY2SRB for example worked with 2 x 10 ele DK7ZB, TS790A and Mirage B 1060 (160 W) while PY2OC used single 12 ele PY2NI, FT847 and 50 Watts.

YV5LIX SK

Very sad news came in April, 2006: Mr. José M. Valdez, YV5LIX, well known VHF-DXer, died in Venezuela. He was planning to be QRV from Aves Is. Expedition (YV0X / YV0LIX) in 144 MHz for possible TEP paths. He was very active in this mode and made one beacon on 2 m toward the south (PY, CX and LU). Mr. Gabriel (EA6VQ), founder of TEP144 mailing list and collector of many articles, papers and logs about TEP wrote: "He was one the most active VHF DX'rs in South America... although I personally never had the chance to work him on the bands I will certainly will miss very much his regular e-mails, always showing a very positive, cooperative and friendly personality". Roberto Paiol (YV5IAL) on the YVDXVHF, list founded by YV5LIX: "remember the participation of Valdez in the 4M9YY expedition and ee-qsl YV coordination". He states that this is one "irreparable loss for the amateur radio community in Venezuela". Days ago, in private communication with VHF-DX List coordinator, Mr. Hamilton T. Horta (PY2NI), I've suggested that Valdez could be one reference for spreading the CQWW VHF to all Spanish speaking countries of South America, considering his serious work, wide network and enthusiasm. No doubt that Valdez was prepared for several other great events, newer experiences and we suffered a terrible loss of one important DXer and friend. According Paiol, the Valdez family members received on April, 23 by the Radio Club Venezoelano the post-mortem "Ordem al Mérito Francisco F. Andersen", the most important position given to one radio amateur in the country.

YV5LIX SK

Beacon Info

On 6 meters, PY2LDS is the new beacon located at LABRE Campinas, in the interior of São Paulo, with 2 watts in 50,003 MHz and dipole antenna at the moment. On 2 meters, PY5XX beacon of JDXG is off for repairs.

220 MHz Converter

Despite the low DX activity on that band in South America, some operators are active in PY2 and PY5. Luciano Sturaro (PY2BBS) designs one interesting converter from 144 MHz to 220 MHz. The project's link on the web:
http://www.msxpro.com/py2bbs/220mhz_conv.html

Contests in South America

The next big 2m contest CB144 (Concurso Brasileiro de 144 MHz, Brazilian 144 MHz Contest) is scheduled for June, 23 to 25, 2006. It's on CW, SSB and FM for point-to-point QSOs andopen for international stations. The website with more informations is at http://www.gbvudx.org.

Some teams already test operations in April searching for good contest places. PY2HL, PY2OE, PY2MDD, PY2EJ and PY2EB went to Careca Mountain, very near the Marins Peak, the second highest point of the São Paulo. They transmitted from over 2000 m a.s.l. and made 25 contacts with PY2/PY4 stations. PY2BF and PY2HL went to Campos do Jordão city, and made 40 PY2/PY4 contacts. PR2T team tried Piracaia city, on 1610 m a.s.l. (GG66vv) while ZZ1ARE and ZZ1EBJ were at Cruzeiro Mountain, near Vila Velha city (GG99vs) in the State of Espírito Santo (PP1), a rare region on weak signals on 144 MHz and up. They made contacts with PP1/PY1 stations and plan to go to another point for better DX performance.

In this year the CQWW VHF will also take publicity in South America since some of the announcements are on Portuguese language, too. More information about this contest on www.cqww-vhf.com

Correction of latest edition

Peter Zoch Sprengel is on the air as PP5XX when in his station at Itapoá (Santa Catarina) and as PY5CC when located in Matinhos (Paraná).

PY0AEB

Fabiano Moser, PY5RX, was one the most active hams during the PY0AEB ARISS operation, covered by the most important national TV network of Brazil, providing good wide spread of the ham service good practices. Moser is also active for weak signals experiences from Curitiba, Paraná. (From PD0RCK site)

Brazil finally launched the first astronaut in space, Mr. Marcos Pontes, on board of Soyuz/ISS, Mission 13. He made several contacts with hams and schools in Brazil and Portugal by ARISS program as PY0AEB, a special call given for the Agência Espacial Brasileira (AEB, the Brazilian Space Agency). Mr. Cor (PD0RCK) made one incredible site covering the mission from the amateur radio's perspective, with several photos, MP3 files and links to the Brazilian media files about PY0AEB. Check http://pd0rkc.ontwikkel.nl/

WRTC in Florianópolis

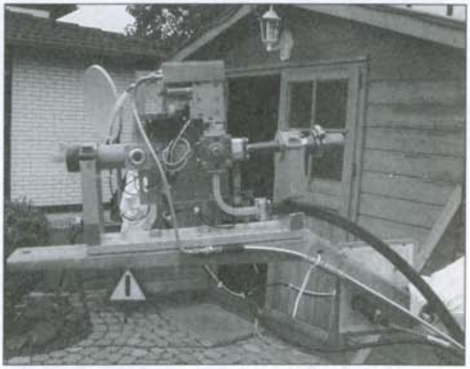
The next World Radiosport Team Championship, the most important event in contest field, will be in Florianópolis, at the Atlantic coastal area in southern Brazil, from 05 to 10, July, 2006. For more information visit the web site: http://www.wrtc2006.com

Microwave USA
Editor: Kent Britain, WA5VJB

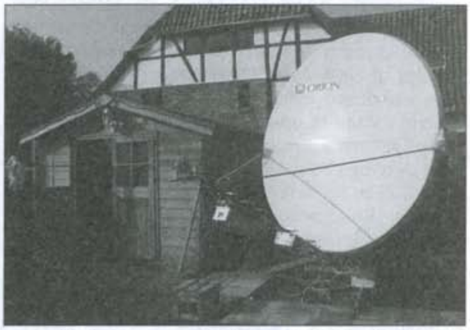
Hawaii-California on 10 GHz in 2006?
Paul KH6HME, Chip N6CA and others are planning a very serious attempt at the 4000 km California/Hawaii path on 3 cm. QSO's have been made on all the ham bands up to 3 cm over the years, but despite several near misses, and a handful of technical problems, despite 15 years of serious attempts, 3 cm has not yet bridged the path. This would be a new world record, of course. They are currently installing a low power 3 cm beacon 50 km from KH6HME exactly along the path for Paul to be used as an aim point. Chip already has his site surveyed. 1.2m Prodelin offset IMU fed dish, 1.5 db noise figure, 10.3 watts will be used at both ends. The stations are locked to a ruby standard.

24 GHz EME: VE and W to DL
VE4MA and W5LUA are dusting off their 24 GHz EME stations. DF1OI (JO42TF) has built a 24 GHz EME station and is looking for QSO's.
Johannes only has a 30-45 minute window into NA but is hoping for contacts. He has got a 2.4m offset dish, 30 watts at the feed, 1.2 NF and is hearing his echoes.

Johannes, DF1OI



DF1OI 24 GHz hardware



DF1OI 2.4m dish for 24 GHz EME

Microwave Update 2006
Midwest VHF-UHF Society will host Microwave Update 2006 the 19th of October. For more info check the North Texas Microwave Site www.ntms.org or contact Tom Holmes, N8ZM tholmes@who.rr.com. We enjoy having speakers from the EU.

Microwave Japan
Seiji Fukushima, Ph.D, JH6RTO

249GHz JA Distance Record Updated
JA1KVN, Bunpei, reported that he established a new domestic distance record of 21.7km on 249GHz. He and JA1GLD, Yoshi, used transverters employing an Agilent diode, HSCH-9201 as a final device that output about -20dBm. The mm-wave output was fed into Bunpei's 45cm and Yoshi's 60cm dish antennas. Some details are as follows: Date 9-4-2006, UTC 0524 or JST 1424, Mode: FM, RS 42-42, WX at Bunpei's QTH (N36:09:41.25, E139:40:12.70), Sunny, 21C and 21%, WX at Yoshi's QTH (N36:21:24.9, E139:42:00.4) Sunny, 22C and 20%.

2-m-EME News

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

EME QSOs and Logger Assistance

The past years have seen many controversies about the validity and the value of QSOs made with the WSJT software compared to CW QSOs. Sometimes this even went deep into the basics of information theory. Apparently the vast majority now accepts WSJT made contacts as valid EME QSOs. Personally I believe these contacts are even much better provable since the received signals can be stored in a WAV file and therefore the QSO data can be reproduced by anyone at any time provided he knows how to adjust the program parameters properly.

However, at least to me it seamed very often that it were not so much the sheer JT-mode QSOs that were put into question. The – sometimes incorrect - use of web-chats and DX clusters which was the real focus of the discussion because some hams believe(d) most of the JT mode QSOs were made by exchanging QSO data during the contact try. The culmination point was that some fellows even can't resist commenting "cluster QSOs" or "Internet QSOs" (anonymously in general) when QSO data was exchanged after the contact was complete.

Recently this issue was targeted on the EME related Email reflectors. Rules for the logger use were asked for. Sometimes it was even close to splitting hairs, for example by discussing whether it was acceptable to make some polarisation tests before the sked start to check at which polarisation which sked partner copies the other one best (provided they both had xpol antennas).

What is the current situation? Most EME stations no longer make skeds via SKD87 exchange or meeting frequencies on HF, they make their skeds either via direct email or ad hoc when meeting other stations in a web chat. Most popular is the chat provided by Chris, N0UK: http://www.chris.org/cgi-bin/jt65eme. But there's also a chat organised by Alain, ON4KST: http://www.on4kst.info/chat/login.php?band=5, and not to forget, there was and is a mainly for CW used chat http://www.dxworld.com/emelog.html by Bob Colyard. This one exists at least for 6 years now.

The use of chats is not generally wrong or bad. Only, the point is that no QSO progress information must be exchanged there during a QSO try. This should actually be a banality, shouldn't it? The fact that this sometimes happens all the same is the focus of the sometimes very justified criticism. And it could be that simple if all would adhere to the basic rule: **All necessary QSO information must be exchanged on the air and without any help of a third medium as chat or email or telephone.** Only with the introduction of WSJT this became an issue because it is so easy and tempting to cut/copy and paste decoded messages into a chat. Not with evil intent, only by carelessness. The problem is not new, it has happened with CW before when people posted messages like "I found you now". Whatsoever, no station should post something like "I copied you at -21 dB", "sending Os now" or "sending RRRs". This is simple to understand because the partner knows beforehand what this station is sending. But it could also be more sophisticated: Even statements like "your DT is wrong" or "pse check DT" are not admissible because they basically say "I copy you" (just like the CW example given before) and the other station can assume that a report is being sent. Also "keep going" could – not always does – have the same basic meaning. However, discussing a change of frequency because of QRM is of course allowed – as long as no information about the QSO progress is disclosed.

Third Parties

Often third parties could invalidate a contact by posting something like "I copy DF2ZC's single tones" as this would mean DF2ZC is either transmitting ROs, RRRs or 73s (in JT65 mode). Even worse is displaying a full line of information like 062900 4 -19 2.4 137 30 * DF2ZC OH6ZZ KP12 1 10; even "062900 4 -19 2.4 137 30 *" or "070300 3 -23 2.2 264 2 #" would be not acceptable as for the experienced user the "*" means that only callsigns are being sent and the "#" means callsigns and reports are being sent. In this case only the post "DF2ZC -23 here" or would be permissible as it says nothing about the message contents.

What to Do?

The proposals for redressing this problem are simple: If everybody - either the two stations currently testing or the third parties – would always check if the post they plan to make would reveal QSO progress information we would not have the discussion here. Just think twice, is the post really helpful and necessary?

And what needs to be done if QSO information is being displayed? It is up to the personal integrity of the station in a test: If you do get knowledge it is better to start over again instead of being looked at as somebody who doesn't take QSO rules serious. And the best is to leave the logger during the QSO try, even by losing the possibility for a arranging a QSY in case of QRM or birdies.

Personally I think we shouldn't install a big paper with rules (who is going to enforce them, what are the penalties?). There have been far too many ideological discussions amongst the EME community the past years which sure have not helped to fuel newcomers' interest in becoming a part of the EME group. We should just proceed commonsense and in case somebody has mistakenly pasted something he should be informed of this in a friendly way, straight away.

I always regarded loggers as a benefit...if properly used.

73 Bernd DF2ZC

Random Operation in JT modes

Somewhat related to the logger discussion is the discussion about Random QSOs vs. sked QSOs in general and JT mode QSOs in particular. The latter is often regarded as "sked only" which is not true. No question we all agree that working Random is a big thrill. The only problem is to generate more random activity: Tuning the band with the help of a FFT display such as Spectran, JT65 signals often are not harder to find than weak CW signals.

When working Random outside contest times, in CW most stations call CQ between 144,030 and 144,060 MHz. A similar frequency range needs to be proposed for the JT modes. Let's start with 144,120 – 144,130 MHz ? Working JT Random

QSOs is easy and thrilling. Just give it a try, start calling CQ somewhere between **144,120 and 144,130 MHz**!

DUBUS EME Activity Contests

This year for the first time saw two DUBUS/REF EME contests, one for JT modes only on February 11/12 and one for CW/SSB only on April 8/9. The objective was to leave every mode the maximum activity without distraction by the other technology. Jimmy, SV1BTR, reports his experience from the CW part: "I compare my EU WW (DUBUS) Contest 2006 2m score to 2005 when all modes co-existed, and is the same with 63 stations. In 2003 I had 53 stations with another array, H pol. only with 19dbd gain (-2.5 vs current one) and from my previous QTH in Athens where I had bad QRM problems.

So all in all I do not notice any drop in the number of stations I have worked from 2004 until today in all contests (DUBUS-ARRL-ARI). In some, with same array and power, I even notice an increase in my cw totals, regardless of mixed contest or cw only section. The same applies for me on 70cm."

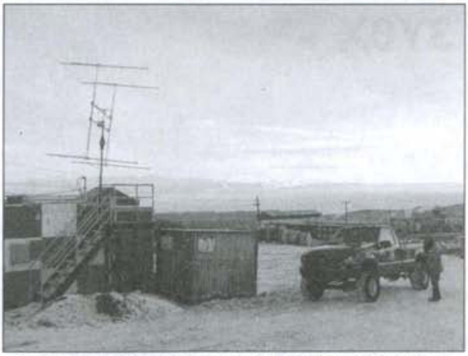
Having worked some hours in the JT mode part with 37 QSOs my (DF2ZC) observation is that the activity here was substantially higher. It is not very surprising since the average equipment for JT mode QSOs is substantially less than that for CW so the number of stations QRV consequently is higher – and so is the number of QSO per time. It appears that the decisions by DUBUS/REF and ARI to split their contests and in fact organise two contests instead of one is welcomed by many.

KC4/W1MRQ - An EME Activity Update out of the Dark

Ernie, W1MRQ, has started his new work term at McMurdo Base in Antarctica (RB32HD) in Antarctic winter. The new array was assembled on April 9th put up in place with rotors on both axis. That day began pretty ominous with temps at -30°C and windchills hovering around -60°C with blowing snow, so putting up on the tower had to be postponed. However by noontime, the temps didn't rise but the winds abated and the sun came out and shone brightly through cloudless deep blue skies. Ernie called his helpers and finished bolting the array together and in 10 minutes flat had it in place and all tightened down. The system now is 4 x 6 ele., still not very high up, a FT-847 and a TE Systems 200 watt amplifier with preamp. Since Ernie had still other tasks to do before operating with it, he wasn't QRV yet. (He had to heat and insulate the rotators so they will turn in the expected -40° C or so ambient temperatures. Also the azimuth rotator had to calibrated, a feedline installed etc. On April 23 the mission was accomplished. The array was finished and all seems well with the system. The heaters seem ok, so Ernie is ready for skeds now. E-mail for skeds to w1mrq@yahoo.com KC4/W1MRQ looks forward to many QSOs this austral winter. Ernie especially wants to run with those he missed last winter. As he lost his log in his computer, he has to start over with some skeds. Anyone needing a QSL should pse email him. QSL via K1CA only, not to Ernie's home address in New Hampshire.

Ernie KC4/W1MRQ in front of shack and antenna

It's good to wrap and heat the antenna rotor if you're in Antarctica..



Local circumstances at McMurdo Station

DZ1JP (Philippines)

A short 144 MHz EME activity took place in Los Baños, Philippines (PK04NC) past March, From March 10th to 12th, 2006. DZ1JP worked 2m EME in JT65 running 300 watts to 2 x 11 elements yagis. More than 30 QSOs were completed by OP Kazu, JA1RJU, who sure had only little sleep during that activity. However, this expedition was only the forerunner of the planned re-visit to **Spratly Islands (for 2m and 6m EME)** later this year. Some hams may be in the position to yet add another very rare DXCC entity after the 3Y activity in February this year. Here the list of worked stations by DZ1JP:

DF2ZC, DF7KF, DF9KT, DK3BU, DL8GB, DL8YHR, DL9MS, EA6VQ, EI4DQ, ES6RQ, F6HVK, HB9Q, JHØMHE, JH2COZ, JH5FOQ, OH6ZZ, OH7PI, PAØJMV, PA2CHR, PA3FPQ, RA3AQ, RA6DA, RK3FG, RN6BN, RU1AA, RX1AS, UA9FAD, UA9SL, S52LM, SM5CUI, SM7BAE, SP6GWB, SV8CS

QSO not completed - DL2RMC, ES2CM, G8UUR, KM5ES, RAØFU, W1IPL, W1XE.

Philippines on 2m EME: DZ1JP, PK04nc

VU4AN – Hamfest on the Andaman Islands

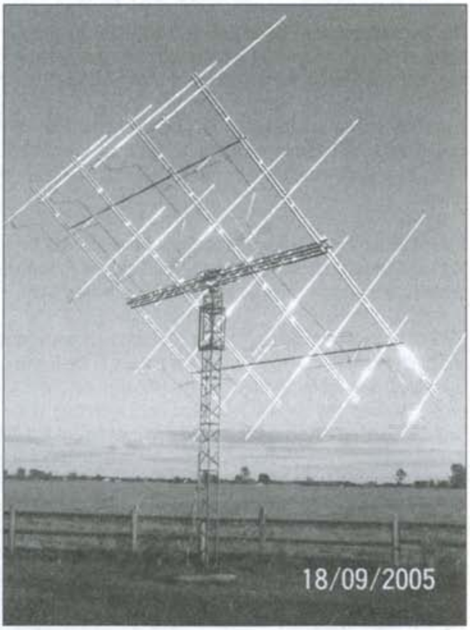
Joe, DL9MS/VU3RYF, attended the hamfest on the Andamanes from April 18th to 24th. He had arranged for 144 MHz EME activity in JT65 with a 2MXP28 antenna and some 600 watts out. Sadly he faced a fair amount of problems. As the powerline voltage was more or less amplitude modulated with +/- 40 V the equipment suffered. Moreover strong static electricity from local thunderstorms destroyed both preamps. Consequently from day 1 the operation was running at reduced rx sensitivity. Heavy static noise didn't make things easier in VU4. Though the odds were against him, Joe managed to work using the call VU4AN on April 20/21 the first QSOs: DF7KF, RN6BN, HB9Q, RA3AQ and ES6RQ. Totally some 20 stations were worked even down to a single yagi with OZ1LPR. The last two days of the operation wx became stormy with heavy rain so again there was mostly NIL from and in VU4.

ARRL International EME Contest 2006

The results of the annual ARRL EME contest date survey by Lionel, VE7BQH show the weekends October 14/15 and November 11/12, 2006 as the most likely dates for this year's contest. The entire result of the conducted survey has been forwarded to ARRL but it can't be wrong to pencil the dates into the diary...

IS0 on EME

Enrico, IK0BZY plans to activate Sardinia in JM49 square via EME (JT65B and CW) on 2m from 16th to 29th August 2006. He will also be QRV on DXC, world Wide Convers as well as on JT65B chat. The station will be 1 x 8el 2,5 wl ik0bzy full elevation+polarity switching and 300 W out.



After losing his 4x(21 el.H + 21 el.V) in a storm Chris, SP7DCS, built a new one: 16 x 8el. SP7DCS YAGI (based on WB9UWA 6el. YAGI). Doesn't it look beautiful? And it performs well as we know from Chris' fb CW signals.

EME Operations from 3Y0X – Peter 1 Island, 2006

by Gordon Hardman, W0RUN

The 3Y0X dxpedition to Peter the First Island in February 2006 was the largest and most expensive dxpedition in history. As part of the effort, three EME stations were assembled, tested and shipped to the island. 114 QSOs were made on 2m, and the 6m signal was copied. This paper describes the equipment, the preparations and the operations.

Peter the First Island (P1) is the most remote and difficult DXCC entity to activate. At 68S/90W, this uninhabited island is further south than the majority of Antarctic bases. It can only be reached after a sea voyage of over 1,600 km and all equipment and personnel must be transferred from the ship via helicopter as there is no suitable spot to offload directly to the island. There were 22 team members and 11 tons of equipment on our vessel, the MV DAP Mares. Travel involved commercial air transportation to Punta Arenas, the southernmost city in Chile. From there, a charter flight took the team to a Chilean base on King George Island in the South Shetland group. We met the ship there, already loaded with the 40-foot shipping container with all the equipment, and commenced a four day voyage across the Bellingshausen Sea to P1. Our contract with the vessel called for us to have a total of 16 days "in the vicinity of" P1.

Three EME stations were assembled for the trip. For 6m, an Icom 756 Pro 3 fed an Alpha 6 amplifier giving 1.5 kW. The antenna was a 7-element M2. 100 feet of LMR 400 comprised the feedline, and a Mirage preamp was available between the radio and linear.

The 2m station comprised an Icom 910 and a TE Systems 2m amplifier/preamp, capable of 350 Watts. Four 9-element M2 antennas were mounted on an H-frame with full az-el capability, although manually operated. The amplifier was located 100 feet from the shack, along with a battery and charger. There was an additional 30 feet of LMR 400 from the amplifier to the antenna.

The 70cm station used another 910 and an Alpha/RFC 110W 70 cm amplifier. The amplifier was also mounted remotely and shared the same battery and charger as the 2m amplifier. There was a Landwehr preamp mounted at the antenna feedpoint. Four K1FO style yagis were mounted on an H-frame, and an Alfaspid az-el rotator was available to give full azimuth and elevation control.

Home-built interfaces were used between the radios and computer sound cards. The latest version of WSJT (5.9.3) was installed. Moonsked was available as well as NMEATIME with a Holux GPS-mouse for synchronizing the PC clocks. All stations were checked out for the appropriate version of JT65 as well as CW.

EME contacts were made in Boulder, Colorado, on each band using the actual hardware. The stations were then disassembled and made ready for shipment and either packed in the team container or (in the case of the 70cm station, which was the last to be completed) shipped by air directly to the offices of our agent, DAP, in Punta Arenas.
All preparations and travel to the island went according to plan. The MV DAP Mares, based in Punta Arenas, is entirely suitable for this type of operation, and her crew were competent and supportive.

When we arrived at the island, plan and execution began to part company. The weather was unsuitable for helicopter operations for the first two days (Feb 6 and most of 7th). This meant that our original plan to spend these two days getting the 9 HF stations on the air had to be modified. When the weather broke there was only enough of a window to get a portion of the equipment and 18 of the team on the island. The base was built and HF stations put on the air incrementally over the 9th through the 12th, in the face of high winds, snow and rain. The surface of the ice field (Radiosletta) on which the base was built was consequently extremely slushy making movement difficult and manual movement of some of the heavier items impossible. The team worked hard, with few breaks for sleep, and with most of the kitchen equipment being among the last items to arrive on the island, with rather unappetizing food.

No moon was visible until the 13th. The original plan had called for the period after the HF stations had been assembled to be used to set up the EME gear, but when the 12th dawned we were still conducting helicopter operations, setting up base infrastructure and getting the HF signals on the air. Clearly we could not get three EME stations assembled in the few remaining hours, in the face of poor weather and exhausted personnel. A decision was made to get the 2m station going on the 12th, and see if more could be done on the other bands later.

After some frenzied activity, 2m was activated at "first moon". Pointing was done by compass, as the weather was completely overcast, windy and snowing. Successful contacts were made with several stations, although we were inadvertently using JT65A instead of JT65B as had been originally advertised. This can only be put down to tiredness on our part. JT65B was used for subsequent contacts. The first QSO was W5UN, whom we subsequently worked on CW as well. Most of the assembly was done by PA5M and myself, with lots of help from other team members. But we had only had a few hours sleep in the preceding few days, and that was in cold and wet conditions. The battery charger system proved to be a huge problem. The charger was the one piece of equipment that had not been checked out in Boulder prior to shipment. It had been procured in Atlanta and sent directly down. It was a modern switchmode unit, with a microprocessor for control, and could be set for different charge rates and battery types. On paper it appeared ideal for the purpose. However, the controller in this unit proved to be extremely sensitive to the RF floating around from the HF stations. The unit would reset itself and stop charging frequently, requiring manual intervention. We checked almost every time we adjusted the antenna pointing, but the severity of the problem only became apparent over time, as the battery became seriously over-discharged.

Buoyed by this first-night success, we decided to forego some more sleep and get the 6m station on the air. This was accomplished before the next moon, but it was immediately obvious that we had a very noisy situation on our hands. With the Mirage preamp in circuit, we were getting S7 noise, some from the HF stations, and some from unidentified sources, most likely the switchmode chargers for all sort of equipment around the base. There was an unknown number of these, for everything from satellite phones to computers, network equipment and cordless drills. An attempt was made to locate the worst of these using an FT817 with a rubber duck antenna as a makeshift direction finder. All we could determine was that the worst interference was coming from "Op A" where the EME stuff was also located, but with HF QSOs being made at a great rate, we could not do the logical thing and turn everything off and then turn things on one at a time. Removing the antenna from the preamp, the S meter went down to S1, so we knew the noise was coming in through the antenna and not through the power supply or sound card interface. The worst HF interference came from 80m CW operations for some reason. The 80m HF ops were very accommodating, but much of our "horizon" moon time coincided with their best gray line operations, so there was a problem. In the end, W1JJ got one complete CQ decode from us on 6m. We never saw anything that looked like a JT65 signal.
At this point, we made the decision to not put up the 70cm equipment. The box containing this gear was the last one to be helicoptered to the island, so we had no chance to unpack and prepare anything. Given the poor weather and awful snow surface conditions, we had to be careful to be sure we could disassemble everything and be ready to leave in the appropriate amount of time. After a lot of discussion with the team leaders, we reluctantly left the 70cm equipment in its shipping container. Bear in mind when considering this that PA5M and myself were also trying to contribute to the total of HF QSOs, and moonbounce was an additional activity, albeit an important one.

For the middle part of the operations we existed on short "cat naps" of less than 2 hours, randomly distributed and very confusing for body clocks. Any spare time was spent trying to resolve the interference issues and make the stations work better. Mike single-handedly dragged another generator around to provide "isolated" power for the charger, and this helped a lot in terms of keeping our battery voltage up. I took the charger and added an impressive quantity of ferrites on the input and output wiring. We put both our batteries in parallel and coiled all the wiring up to provide additional "chokes". Toward the end, with these measures, the battery was just able to hold its own, and this is reflected in our increasing QSO totals. In some cases we were forced to go "barefoot", and with 130 feet of coax, this was only possible with bigger stations, and required considerable patience on both ends.
The team leaders were keeping an eagle eye on the weather, and "de-construction" of the camp started 2 days earlier than planned, as this was mandated by the weather. 6m was taken down first, as this was proving fruitless. 2m was kept on longer, as QSOs were still being made. Op B was disassembled, and CW/SSB and EME operations were confined to Op A. Team members began to leave the island, and eventually the whole camp was removed, although the weather was indeed a serious factor, and the decision to start early was probably the right one.

In the end 114 QSOs were made on 2m with 33 DXCC entities, and we had one "swl" report on 6m, from W1JJ. Given that weather ate into planned operations at both ends of our stay, this is perhaps not a bad result. Some of the pileups were impressive, and when things were "jumping" Mike and I had a lot of fun. On one occasion we were making more QSOs than the HF stations, as all the bands were dead.

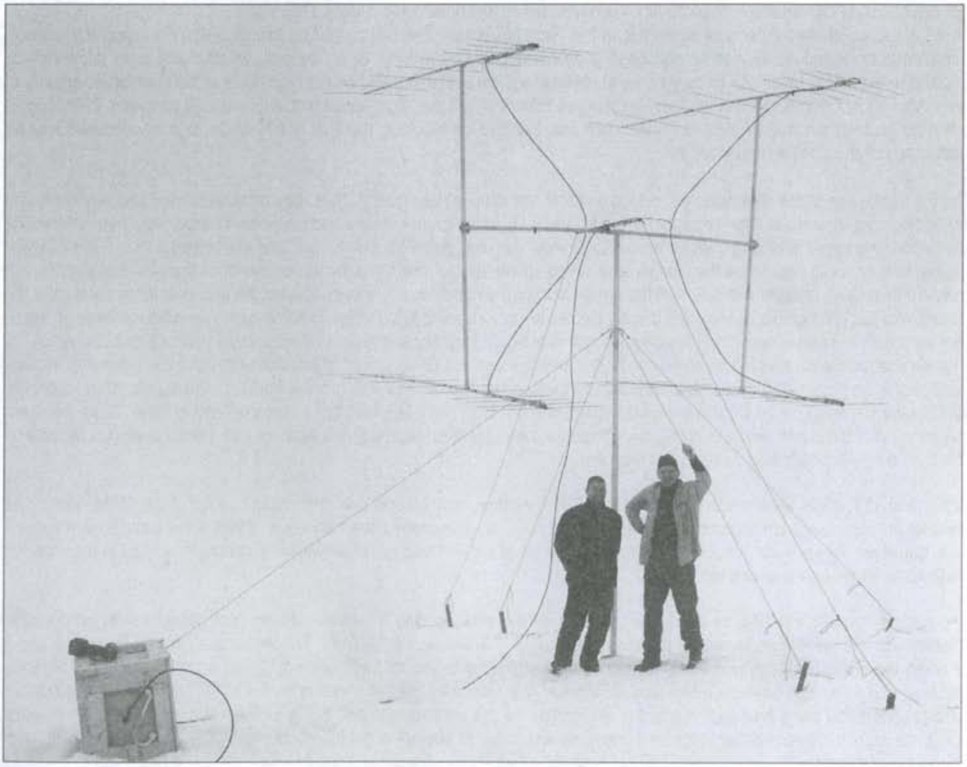
In summary, this was a worthwhile effort. The failure of 6m was disappointing. There was clearly more going on than just our local interference. We were able to always put out more than 800W, frequently 1200+W. The antenna appeared fine, Mike and I checked the assembly twice, and the SWR was excellent (10W reflected for 1kW forward). There were many big gun stations listening, and we should have been heard by all of these. We monitored the transmission on the FT817, and it appeared clean. I would suggest that some propagation effect is responsible for this discrepancy, and this is an interesting result in itself. In retrospect, we might have done better to ignore 6m entirely and make an attempt to get the 70cm station QRV, but we could not have known this at the time.
Manual antenna pointing under these harsh conditions was marginally acceptable at best. To re-tie the Dacron antenna rope, we had to remove our gloves, and then the azimuth stakes had to pulled out of the snow and "replanted". When the wind was high and the temperature low, it was tough to get the antenna pointed- we had to use a flashlight to illuminate the compass, and site

along the antenna booms since the moon was seldom visible. All this on unstable snow and with wind gusts that could almost blow you over. We had to unzip the flap of the tent and go out every 10-20 minutes, and this let in a blast of cold air and snow, sometimes to the annoyance of the HF ops. The Op tent was kept rather warm (about 90F), and repeated trips out into the cold air and snow were, to put it mildly, "bracing". Both Mike and I had sinus/head/throat problems. I would suggest to anyone contemplating this type of operation that an antenna rotator would be well worth the extra effort and expense. Also, remote monitoring of battery charge condition would have been a big help. In the end, the zipper on the tent flap failed, and this is probably largely due to the number of trips out to the EME antennas. We found it easier when both of us were available, but with a good rotator setup and reliable remote power, a single operator would be adequate, and could probably handle two simultaneous bands with practice.

We had made a list of skeds before the trip, as a precaution against equipment problems etc, but in the end this proved to be unnecessary. Random operation was far superior in terms of results, and as our familiarity with the software improved, we were able to handle the "pileups" easily. Our EME pilot, Lance, W7GJ provided good feedback to us and allowed us to focus our efforts. We sent daily logs to him using Iridium dataphone hookups, and hopefully this allowed folks to relax when they saw their calls in the log.

The WSJT software works very well, and is resilient in the face of a surprising quantity of QRM from HF stations. One improvement would be if the "effective" decode area could be wider. We occasionally saw strong signals at frequencies above the "green line", and would have been curious to know who was up there while we were busy with a station down at 1250 Hz or lower.

In the end, I estimate that at least 6 man-hours of effort went into each QSO, when all the work is averaged out. The dxpedition is still struggling to make ends meet financially. Keep this in mind when sending in your QSL. Nevertheless, Mike and I have both asked ourselves "Was it all worth it?, and the answer is a resounding "You bet!"



Michael, PA5M and Gordon, W0RUN and the 2m yagi array for EME on Peter 1 Isl.

EUROPEAN EME Contest 2006, Digital - Results

by Patrick Magnin, F6HYE

Results 50 MHz

Place	Call	Points	QSO (+Sked)	Multi	Pwr	OP
1	K1SG	400	2	2	QRP	SIN

Results 144 MHz

Place	Call	Points	QSO (+Sked)	Multi	Pwr	OP
1	RU1AA	552000	115	48	QRO	SIN, ASS
2	RA3AQ	380800	95(+2)	40	QRP	SIN, ASS
3	EA6VQ	270000	75	36	QRO	SIN, ASS
4	RA0FW (Ops: RA0FW, RA0FCA)	240900	73	33	QRO	MUL
5	IK1UWL	220100	71	31	QRO	SIN, ASS
6	RK3FG	189000	70	27	QRO	SIN, ASS
7	S52LM	179800	62	29	QRO	SIN, ASS
8	IK7EZN	81400	37	22	QRP	SIN
9	JH5FOQ	72390	38(+1)	19	QRO	SIN
10	SM5CUI	51000	30	17	QRP	SIN, ASS
11	S54T	50400	28	18	QRP	SIN
12	EA1YV	33600	21	16	QRO	SIN
13	S51ZO	30800	22	14	QRO	SIN, ASS
14	OH6ZZ	19000	19	10	QRP	SIN, ASS
15	IK2DDR	18000	15	12	QRO	SIN
16	JF4TGO/8	14000	14	10	QRP	SIN
17	UX3LV	13000	13	10	QRO	SIN, ASS
18	UR5LX	8800	11	8	QRO	SIN, ASS
19	KL7UW	1890	1(+11)	9	QRP	SIN, ASS
20	W5UWB	520	1 (+3)	4	QRP	SIN
21	RA3WDK	400	2	2	QRP	SIN

Results 432 MHz

1	S54T	900	3	3	QRP	SIN
1	OK1KIR (Ops: OK1DAI, OK1DAK, OK1DCI, OK1VAO)	900	3	3	QRP	MUL
3	S51ZO	400	2	2	QRP	SIN, ASS

Results 1296 MHz

1	VA7MM (Ops: VE7CMK, VE7CNF)	400	2	2	QRP	MUL
2	SM5LE	220	1 (+1)	2	QRP	SIN

Multiband

1	S54T	65100	31	21	QRP	SIN
2	S51ZO	38400	24	16	QRO	SIN, ASS

We are unhappy about the low participation on 50 MHz, 432 MHz and 1296 MHz. Anyway we give it another try in 2007 and will decide if we cancel these sections. (DL8HCZ)

Soapbox

IK2DDR: My qsos are all on pure random. No internet, packet, logger or whatever. Many thanks to the committee for organizing so good contests.

OH6ZZ: All qso's random, reply to cq. But assisted, I had JT65-logger open to see cq but many of these call use 'own' freq, so logger often not needed. But didn't asked for skeds.

IK1UWL: Faraday was heavily present, in first half I used H-H or H-V Tx/Rx polarization,in second half mainly V-V (typical one way conditions, easy with pol control). I made 16 H-H qsos, 26 H-V or V-H qsos and 29 V-V qsos. Ionospheric turbulance perceivable expecially at low elevations. 43 qsos were made on my CQ, after self spotting, 26 looking for spots and 2 ops tailended me. Age and weariness limited me to 20 hours of operation out of the 26 approximately available.

S52LM: 50 % of contest time here is bad conditions and QRM.

S54T: All QSO made without DX cluster, logger, internet etc.

K1SG (50 MHz): Only the 2 contacts; not much activity that first night, and we had a major snowstorm the next day, and the antennas were all tied down. I hope to be much more active next time.

JH5FOQ 28ele xpol

RK3FG Shack

Congratulations to all winners! The certificates will be sent in August.

EUROPEAN EME CONTEST 2007

sponsored by DUBUS and REF

The European EME contest is intended to encourage world-wide activity on moonbounce. Each different call prefix forms a Multiplier.

1. Contest Dates & Bands:

First weekend	**February 24/25**	**00 - - 24 UTC**	**50, 144, 432 & 1296 MHz - Digital only**
Second weekend	**March 24/25**	**00 - - 24 UTC**	**432 MHz and 5.7 GHz and up CW/SSB**
Third weekend	**April 21/22**	**00 - - 24 UTC**	**144 MHz and 2.3 / 3.4 GHz CW/SSB**
Fourth weekend	**May 19/20**	**00 - - 24 UTC**	**1296 MHz CW/SSB**

2. Sections and Awards:

QRP 144MHz <100kW EIRP 432MHz <400kW EIRP 1296MHz <600kW EIRP
but no separate QRP/QRO categories
QRO On 144, 432 and 1296MHz, stations with EIRP equal to or greater than stated above.
PRO Non-amateur equipment or antenna. PRO stations will have scores listed separately.
CW/SSB All QSOs in CW and/or SSB mode – no other modes used
DIG All QSOs in digital mode (e.g. all the "JT" modes) – no other modes used
MULTI Multi-OP is >1 OP – but no separate category

Multi-operator and QRO stations will be highlighted in the general classifications. All QRP/QRO band winners and QRP/QRO multiband winners will receive a year's free subscription to DUBUS magazine. The multiband section contains weekend 2, 3 and 4 only. In each band/section certificates will be sent to ALL entries

3. Rules:

3.1 For the purpose of the contest only one scoring per valid QSO with the same station can be logged in each band.

3.2 During the European EME Contest dates & times, communication via the Earth-Moon-Earth path is the only type of communication permitted by participants and stations worked.
Therefore during Contest time, participants are not allowed to use other communications medium such as internet or packet radio, to make skeds, announce their CQ frequency, spot other stations, exchange any QSO progress info, confirm in real time whether the QSO was valid or not.

3.3 When moon is not visible to participants, public comments on QSO accomplishments and moon conditions are permitted.

3.4 Stations participating in the Microwave bands (2.3GHz and above) are permitted to announce their time plan of proposed band segment activity, during times when they have no moon visibility.

3.5 Stations deviating from the rules are not eligible to submit logs for the European EME Contest.

4. Contest Exchange:

For a valid EME QSO, both stations must have copied all of the following:
4.1 Both callsigns from the other station
4.2 Signal report from the other station (using TMO procedure or RST)
4.3 R, from the other station, to acknowledge complete copy of 4.1 & 4.2

5. Logs:

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

Bottom line: Total points, Total multipliers, Total claimed score.
Note: For WSJT Digital EME QSOs signal levels of stations worked, must be included in the log.

6. QSO Points:

6.1 CW/SSB:

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

6.2 DIGITAL:

100 points for each random QSO completed at signal levels up to -25db.
10 (ten) points for each sked QSO, as well as QSOs at signal levels exceeding -25db, except if the necessary information has been displayed properly in the average display.

7. Multipliers:

Each different call prefix is a multiplier (e.g. DL1, DK9, SM2, S51, S54, G6, KM5, W5, JA6, VK4, WA6, K6, PA1, PE1, etc). See example of WPX Contest rules for further details on prefix multipliers.

8. Total Scores:

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

9. Contest Entries:

Copy of the log for each band with details of points, multipliers and total points.
The following information **MUST** also be included for each band: 1. Output power, transmit cable loss, antenna type and gain. 2. Categories: QRO/QRP - single/multi operator - CW/SSB – DIG 3. Name(s) of all operators 4. Grid locator. Other info is welcome: Comments, conditions, station details, photographs, etc.
Note: For WSJT Digital EME QSOs signal levels of stations worked, must be included in the log.

10. Sending Your Entry:

Contest entries **MUST** be sent no later than 28 days after the end of the last contest weekend (i.e. in the mail or e-mail by 19 JUNE 2007). Entries for the **FIRST weekend**

(Digital) must be send no later than 28 days after February 25th (i.e. in the mail by 23rd March 2007)
Mail address: Patrick Magnin, F6HYE, Marcorens, F-74140 BALLAISON, France
You can also e-mail your contest entry in ASCII format to: **info@dubus.de or DUBUS@web.de**
All email entries will be acknowledged within one week. For further questions contact: info@dubus.de

Good Luck in the Contest!

For REF: Patrick Magnin, F6HYE — For DUBUS: Joachim Kraft, DL8HCZ/CT1HZE

Referee: Dimitris Vitorakis, SV1BTR

DUBUS CW Activity 2006 - Dates for 2m:

May 20	**0015-0315 and 0700-1000**
June 3	**1030-1400 and 1930-2230**
July 1	**0930-1230 and 1800-2100**
August 12	**2000-2330 (moonset) and**
August 13	**0430-0800**
December 2	**1345-1800 and 2300-0230**
Frequency	**144.040-144.060 CW**

More info at http://web.telia.com/~u37031777/

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

Intro: Pushing 70cm activity!

Extra **logger for 432 EME.** A new logger is available at www.emeham.com/432.

The main purpose of the 432 EME Logger is, to concentrate, **at one place**, online information about current and future 432 activity. Furthermore it is the place to find links to all needed information to successfully QSO on 432. Of course this logger is open for ALL people ALL modes interested in 432. I would very much appreciate if you would tell me

- what needs to be changed (like there must be a log-in somehow, user-list and so on)
- which links you think are useful to be added to this logger
- what information you think should be displayed permanently

Many thanks for your help!

Vy 73 Dan, **HB9Q** - dan@hb9q.ch

If you do agree to the 432 logger, please let us know. In my personal view the idea is really very good because:

a. Such an addition to Chris site can improve a lot crossmode and cw/ssb eme activity on all bands, outside contest time.

b. It can improve the percentage of stations currently qrv on digital eme, try cw also. Most important is through this interaction, newcomers or qrp stations could acquire faith that cw eme is possible with one's smaller setup.

c. At the same time, the addtion of a cw/ssb page could help cw stations try digital eme.

d. Many mixed stations present at jt65 page could do some cw also with stations who have already worked via jt65.

e. Through this process, as we are a community who always have helped each other, knowledge and operating skills for all modes can be significantly improved.

Please be constructive. As you know even though I operate cw eme random, I do find this proposition interesting and exciting, resulting to the overall benefit of both modes. If it does materialize, I do plan to visit it, use it and promote it outside Contest time. From private mails I have received over this week, many cw only stations from all bands are interested to do the same.

This could be a matter of great interest to all stations and should be dealt accordingly. Therefore, if you do feel this way please express your support. Thank you for your attention & 73, Jimmy **SV1BTR**

Some hints for using JT65 on 432

JT65B is used as standard. (JT65C on 1296!)
Used Frequency band 060-090, cq-QRG is 065
More at : http://www.zen70432.zen.co.uk/JT65/JT65.htm

The DUBUS **432 EME Expedition found** is still active, all are invited to help with a little sponsoring. Joachim Kraft, Acc. 810967, BLZ 20069177 (for DL) IBAN DE88200691770000810967, BIC GENODEF1GRS (for EU).

The Next **DUBUS CW activity** dates:

May 21 02:00-04:00 UTC and 08:00-10:00 UTC
June 4 13:00-15:00 UTC and 20:30-22:30 UTC
July 15 23:30-01:30 UTC and July16 06:00-08:00 UTC
Aug 12 21:30-23:30 UTC and Aug 13 05:30-07:30 UTC
Updates at www.sm2cew.com/dubus-aw-70.html

ARRL contest 2006

The following are the results of the survey taken to determine the best times for both the ARRL International 1296 and down and Microwave contests in 2006.

1. 1296 and Down (2 Weekends)

Oct 15 Nov12 16 votes

Others 3 or less votes

2. Microwave (1 Weekend)

Sept 17 5 votes
Oct 15 5 votes

Others 3 or less votes. The results have been copied to the ARRL for their consideration. 73, Lionel, VE7BQH

432 Activity time March

SV1BTR was qrv for only 1 hour, instead of the designated 4, in cw random. Had lot of fun, wkd 7 stations with great signals and 559 to 569 report exchanges between us with almost all of them and fantastic S5 to S6 echoes on peaks with 500Hz narrow filter. Missed 2-3 stations in the deep qsb & libration fading. Thank you all; 73 Jimmy

KL6M: That was great fun. Got a couple new ones. Amazing signals. Log is here: www.qsl.net/kl6m/data/AW3-06.gif Mike

EA3DXU: I was QRV in both windows and completed several QSO, see good activity on the band, also spend some time testing Winrad from I2PHD this was a very nice experience for CW EME. This program is still in progres, but is doing FB. I can easily see 3 Khz activity on the band. Worked 7 and 2 cwnr. Not bad for 2x38 el + GS23B. 73 de Josep

VE6TA Worked 11 Stations and cwnr W8TXT with a great signal if he is running only 4 yagis and 250 w. Heard KU4F as well just before I went QRT. I also noted quite a bit of polarity smearing during the Sunday pass, especially at low elevations. Seemed like a pretty good turnout and I am hoping for more. 73's Grant

OZ6OL worked 8 stations with signals 449-559. and hrd two more THANKS FOR THE QSOs ! 73 Hans

DUBUS Digital contest

7M2PDT found low activity, only 3 QSO all JT65B, but was very lucky to work with VK7MO Rex because he has just 1x35el with 120W power. Please look for me at 432MHz EME JT65 chat: http://www.emeham.com/432/default.asp 73 Shu

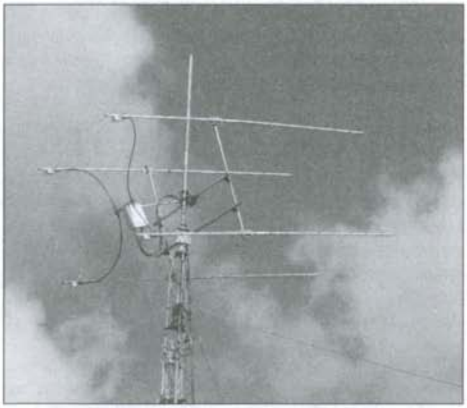
DUBUS CW contest

OK1DFC: I was really looking forward so much to be QRV during whole weekend, but bad weather changed it. From Sat

night we have had a snow storm where I could not turn the "small" dish. First night when I was QRV were conditions strange and not as good as a week ago. I wkd 13 Stations.I have made also a couple of MP3 files see:
www.ok1dfc.com/EME/MP3%20files/MP3.htm 73 Zdenek

SV1BTR worked unassisted 37 stations on random, that's 3 up since last year; even though I missed about 10 hrs in total due to a thunderstorm and other commitments. Saturday morning all signals were noticeably weaker in strength. Rest of Saturday & Sunday were extremely poor (-8 to -10db on average) until 2100 utc, echoes also. Numerous stations who i usually work at 529-539 rst levels were for 2 days at O copy. I was certain my system was faulty somewhere but Sun noise measurements indicated it is ok. However, mystery was solved as from 2100-2340 utc Sunday night signals improved at excellent levels, echoes also. This has been quite strange for me as I have not previously experienced a lockout or bad attenuation for 2 consecutive days. I am curious what stations running dishes and polarity rotation will report. For one more year DUBUS has been a Great EME Contest, especially useful for reaching out in rx limits, testing one's patience & skills on random. 73, Jimmy

K3MF conditions were strange, I rd HB9Q but only got QRZ. Called SV1BTR but no reply, I thought something was wrong with my system but then worked OZ4MM, VE6TA and KL6M, locked out in certain areas? Only worked 9 stations. All signals were down at my end. Not a total loss wkd 3 new initials. F6KHM and NC1I were beacons both passes! 73 Wayde



GD0TEP 4 yagi for 432 MHz

K4EME: After getting all my control and RF cables repaired due to a rotor issue, I was able to get on during the Dubus Contest. I worked 9 Stations, I could see a few other stations replying to my CQ's, but could not pull them out. Not bad all and all for a few hours of operation. I had a lot of fun! Thanks, Cowles

HB9Q: During the Contest we were active for a total of 12 hours only. Conditions were at times difficult. On Sunday night however they were excellent. We did work a total of 38 stations in 18 DXCC and 5 US-states and 1 VE-province. It was great to work 2 more states on 432 for a total of 32! Many thanks especially to Martin, KC3RE, who did go portable to Delaware. We had a great CW-QSO even though Martin was QRP! See the band-pages for more details. Vy 73 Dan

OZ4MM: Great to take part of the EME contest again. I was limited due family conflicts and a bad shoulder which gave lot of pain. Also a power supply went dead, so need to replace transformer before I could turn the dish. Anyway were active about 10 hours and worked 41 stations here. Saturday evening I found good condx during the night. But sunday evening was found very bad here. Own echos was weaker and also other signals was found down. Only EA3DXU signal convinced me all was OK here at my end, and condx was fooling instaed. Jose's signal was great during sunday evening, despite other signals were down. I dont know what Jose are doing, but he has always a great signal with his 2 yagi. Went QRT sunday at 2000utc as the shbulder gave to much pain. Sorry to lose the good condx after 2100utc as reported by SV1BTR. 73 de Stig

SM3JQU: was a nice experience as long as the equipment where operational! After a slow start at Friday night to Saturday morning and moonrise on Saturday with the feeling of having a lot of time al of a sudden the preamp was blown early Saturday evening in the middle of a CQ after abut 3 hours of effective activity. I managed to work 7 qso's and identified at least another 10 stations with good signal. Thanks to all I worked and hope to work the rest of you next time we are active on 432. 73 Per

OZ6OL wkd 20 Stations. Conds was good Saturday night, but Sunday was very very bad with no sharp, but diffuse polarisation (or some plus-mius 45dg from my horizontal or vertical pol.?) as the signals was same strenght in horz/vert. pol. for hours. (Fast rotating dipol could show it???) is it diffuse or just out of polarisation? Many thanks for the QSOs friends. 73 Hans

SM2BYA / SM3BYA: I arrived at the farm after a 12 hour, 920 km drive. Friday morning I got organised, powered up the shack, switched on the heaters and tried out the rig - which worked OK. The weather stayed cold all weekend, however, and the shack was still uncomfortably cold most of Saturday. Touching up the PA was decidedly unpleasant - it's in an unheated closet next to the shack, where the temperature must have been close to -10 C. In spite of the cold I put in a total of 11 operating hours, which was about what the old body could take: Saturday 00-04 and 1530-1830, Sunday 00-0230 and 1600-1730. Had to close down early on Sunday evening to prepare for the return drive and so missed the period of good conds that others report about. Apogee and long periods of stable Faraday lockout didn't make things easy. Many signals were at the edge of readability. Even so I managed a total of 20 QSOS. Had a NC with SM3AKW who disappeared before we could complete. Heard several others, e.g. SM3JQU, SP6JLW, S51ZO. 73 Gudmund

PE1ITR: Saturday 11 march I was qrv with 2x28el yagi in a portabel style setup with manual az/el "control". The sky was clear so I could point the antenna visual to the moon. I found signals much weaker than usual and thought there was something wrong with the system. Reading now other station reports indicate the conditions where not so good. wkd random in cw HB9Q, NC1I (#23) and OZ4MM. 73 Rob

G3LTF: I found conditions pretty good (considering that it is apogee) over the parts of the weekend that I was able to operate. The PA bias supply failed in my QSO with VK3UM on Saturday afternoon and it took a long time to locate the fault and to get it repaired. Polarisation here was sharply defined and a lot of the time, especially Sunday, Faraday was around 45 degrees. As well as listening to echoes, I established this by rotating my feed and listening to my signal relayed by phone from G3LQR who had a dual dipole feed at 45 degrees in his dish. Wkd 26 stations, someone called me on a CQ at 0014 saturday morning with a "7" and a "Q" in the call sign but didnt stop around long enough for me to get the rest, I'd love to know who it was please. Thanks to all for the activity and the fun, 73 Peter

Shack of GD0TEP

EA3DXU: The weather did not cooperate this weekend, high wind blocked my activity several hours, finally was QRV saturday evening and sunday for 10 hours, conditions were excellent time to time with very good echo for long periods and other with very poor or no echo and no sigs on the band, was calling CQ for long time and got many replies, but was unable to get all answering stations, very sorry for the stations from which I could not get the call, finally completed 14 random unassisted QSO. 73 de Josep

VK3UM wkd 35 Stations, you can only work those that come on during your window! Sadly many regular stations were not present this Year. Conditions provided mixed polarity for most of the time on 70cms. I even suspected my polarity switching was not functioning as signals were identical in both planes. (proved by return loss measurements to be quite normal). Signals had little Libration on 70 but noticeable on 23 (I can now echo test simultaneously on both bands) I considered conditions were stable and significantly better than normal. (new feed, pre amp or just 'conditions'?) Towards my Moon Set on the 12th polarity was ~90 degrees. My Y count was 3 for the whole weekend ! Regards Doug

OK1KIR were active in DUBUS digi contest. It was our first JT65B contacts. 11/12.feb we wkd:
GW3XYW, HB9Q, OK1DFC (vy strong tropo signal as well)
Then we worked in DUBUS 5.7 & 10 GHz contest:
10 GHz – 11/12.March
F2TU, F5JTA #33, WA6PY, IQ4DF, OK1CA, LX1DB, F5JWF,VE4MA not completed due TWT PS failure. We heard F3VS M, IK2MMB M both in QSO with IQ4DF.
Our condition was 4.6 m dish (cover by ice and snow), 0.7 dB and 50 W TWT, linear rototable polarization. It seems that we lost power supply for TWT because of high humudity during heavy snow. On 5.7. GHz wkd:
LX1DB, F2TU, IK2RTI, nothing in sked with JA6CZD on 12.3..
Our condition was 4.6 m dish (cover by ice and snow), 0.7 dB and 70 W SS PA, cirular polarization.
73 Tonda, Vlada and Jan, OK1KIR team

VE6TA The weather was a bit of a challenge with mother nature dropping another 15 cm of snow on us over the weekend. Polarity was again a big issue on 432, with NA locked out for the fixed polarity guys most of the weekend. The first night there was quite a bit of polarity smearing below about 25 deg elevation for me, and then signals cleaned up and peaked nicely. Had to mostly tx at 90 degrees to the received signal for intercontinental QSO's and tx at 45 degrees to received for NA QSO's. For all you fixed polarity guys in NA it must have seemed pretty quiet, as most of the variable polarity folks will target the other continents horizontal polarity on CQ's. Doesn't do much for stimulating activity in NA I'm afraid.
Still managed a respectable 24 QSO's and 4 new initials from out west so am pretty happy with the contest and its format. I also managed to give the new dish and dual dipole feed a good work out, and no fire this time! 73's to all Grant

I-DIGITAL CONTEST

K3MF: I was QRV during the contest and posted my frequency while CQ'ing. Worked 12 stations, 8 were initials bringing my total up to 44. The transmit hardline going to the t/r relay developed a kink and actually caught fire! Had to replace a connector and the hardline. It was fun and I am happy to see more activity on 432. Great job to everyone. 73 Wayde

KI0LE: I spent the weekend spinning the dial and working random on 432 while taking breaks from constructing an amp for 23cm. I wkd 6 Staions on 432. Rig TS-790A, ~450 Watts from 2x4CX250 into 4x19 elements @50ft w/preamp on mast, and elevation. It was a lot of fun. 73, Bryce

W7AMI: I was on for parts of the contest. Wish there had been more Italian stations on 432 MHz. Only saw one and did not work him. I worked 9 Stations, some random and others were arranged on the EME Link. Nice to see so many stations on 432, made for lots of fun. Thanks to all. 73 Terry

OK1DFC: short message from ARI contest. I was basically QRV most of Saturday, because on Sunday lot of work in the garden and also weather was very poor. Condx were good on Saturday. I have had worked 3 stations on sked, all other find me on the band during my CQ on 432,073. I have worked: 12 Stations. I can say, that if somebody has dish and power like me, is possible working easy random thanks to strong signal. Stations on opposite site can find you also easy because as a first hearing you speaker copy, as a second you are very good visible on the spectran screen. It is very similar situation like we know from classic CW traffic with big guns. That's all and hope to work you all again. Zdenek

SM5LE: Wonderful EME weekend on 1296 MHz both CW and the dig. contest activity from Haninge, Sweden. In the contest I had to work "assisted" as I am a small station and no other small station could ever heard me or seen on a waterfall. Thanks for all support both technical and with skeds, all the EME people are so helpful and kind. Worked: G4CCH random CW, G4DDK JT65c, VA7MM JT65c, DJ9YW JT65c, G4CCH JT65c, JH5LUZ CW sked, SM2CEW random CW, HB9BBD random CW (also heard 55 SSB), K2UYH JT65c. 73 Sven

HB9Q: We enjoyed very much the ARI Digital EME Contest. It was very nice to find a lot of activity with many new stations! 432: we have reached a total of 139 points (41 stations). We have worked GD0TEP for DXCC #65! It was great to work 3 more states for a total of 35! 12 new initials and 7 new grids worked during the 2 days. See www.hb9q.ch. Vy 73 Dan,

Expeditions

DL1YMK is still looking for a light-weight 432MHz >500w solid state PA for his **CT3** operation, **anyone can help**?

IK0BZY is planning to be QRV from **IS0** Sardinia Island **JM49** from 16th to 29th August on 2m & 70cm EME on JT65B and CW. I will also be QRV on DXC, World Wide Convers as well as on JT65B chat. 70 cm station: 1 x 10wl DJ9BV full elevation + 250w. Meet you then 73 de Enrico

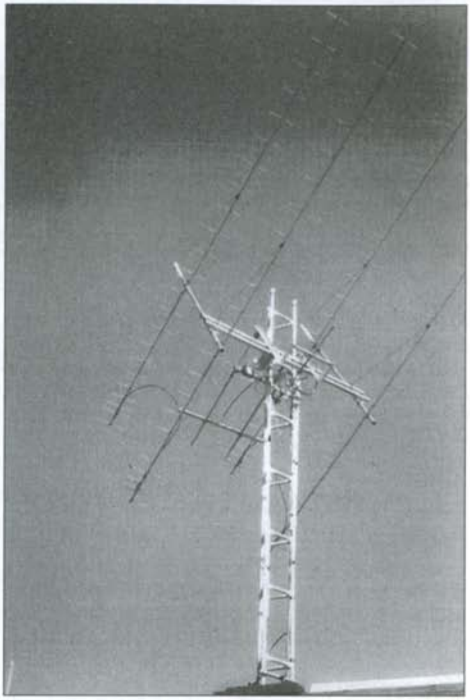
432 & up (net) news

DJ6MB wkd lately: In Contest 3 new, FR5DN # 374, RW1AW # 375, K4EME # 376. On feb 2nd he wkd I1NDP # 377 on random. vy 73 Uwe

WA9HIR Bill reports that WA9KRT has the hole dug for 100' tower in preparation to put up 8x70cm yagis as well as 4x2 meter yagis.

K9KL I am planning to putting a 432 mhz 432-13 WL's on a tower with other antennas. Gregg

N1BUG I will not be QRV for the contest as planned. There is no time to gather new material and correct the problems. Most likely will be 3 to 4 months before I can try again. 73, Paul



W8TXT 432MHz

SM5DGX: I hope to back again on the moon late this summer with my new 13 meter dish. My latest QSO was for more then 15 years ago. See www.epj.se. 1296 is the first band to activate but it will also be 144 and 432. I have a good 4m dish so perhaps also on 10Ghz with 50watts. 73 Anders Florin

W4TJ: trying to get on 70cm and put up a yagi and preamp to scan the local area and found noise that was not there 10 years ago. Noise comes from the remote reading power meter for electric service. does any one have any experience or solutions to this. Frequency is centered 432.025 MHz and neighbors is 432.035 MHz. 73 Bill

Here are the 70cm-result from the R/U-stn Feb.:
UA4AQL - JT65B QSO with OK1DFC.
UA9FAD - JT65B new with SM2ILF and OK1DFC.
73, gl via moon Jurgen, DK3WG

WA9HIR is in touch with WA9KRT and Don has the first 2 of 8 70cm yagis up and testing them.

N8CQ: still working on amps and the GS35B is cooking on 70cm at 1.5kw. will have the 70cm array up soon.

DL1YMK: been inactive. nothing new. thinking about a 70cm ring feed for the 4.1 mtr dish in CT3 expedition. limited to 400w on 70cm. still looking for more than 400w amp [light-weight] for 70cm.

23 cm

At this place we would like to say **thank you** to **Heinrich, DJ9YW** for all his quite help to many 23cm EME stations. Heinrich made many experiments to let DL3OCH go portabel or helped over many month RW1AW to become qrv on this band, to give only two examples of his doing. Heinrich stay healthy and have still fun with our hobby. DL7APV & RW1AW

VK3UM reports: Dual feeds 23&70 now fully commissioned and working satisfactory, (see article in this issue!!) 23cms W2IMU 15dB edge taper (well under illuminated). (LNA <0.4 ATF 36077), Sun Noise within ±5 sfu of predicted values VK3UM EMECalc. Taurus 0.6dB, Cygnus 1.1dB, c/s - gnd .6.8dB (under illum), c/s term 7.1dB. The following are my first QSO's with new feed system. All contacts random CW unless where indicated as SSB. Weekend 4th/5th March 2006: VK4AFL, K0YW, K5SO, K5JL, K0YW SSB, K5JL SSB,SM3LBN, G3LTF, SM2CEW, IW2FZR, PA3CSG, SM5LE, G4CCH, G3LTF, K5JL, WA6PY, W5LUA, LA8LF, VK4AFL, LA9NEA, OZ4MM, K2UYH, K9BCT, WA5WCP. (weakest 53n from a 2.2M dish 250W) 73 Doug

WW2R reports: On Jan 7 AW heard LX1DB ragchewing on SSB, also heard G4CCH, IW2FZR & G3LTF. Worked K4QI (#10), VE6TA, OZ6OL (#11), OZ4MM (#12). On 4 Feb, worked ZS6AXT on a cw sked. In the SSB contest thanks to the perseverance of LX1DB I had my 1st SSB QSO off the moon. Also worked F6HKM (SSB/CW, no response to calling on SSB), K5GW (SSB/CW too much QRM/too close for SSB/SSB). On random CW worked LA8LF and OK1CA. CWNR W6IFE, WA6PY, DL0SHF. On 5 Feb, good signals from ZS6AXT at moonrise. CWNR for 40 minutes WA6PY so worked K9SLQ to make sure equipment still ok! On Feb 11 nil on sked with LA9NEA, but immediately afterwards worked RW1AW on a sked, but CWNR SM3LBN, WA6PY. On Feb 12 worked IK2MMB on a sked; AW on Mar 5. Heard VK4AFL but not consistently loud enough to work. On Mar 11, worked SM5LE on JT65C sked. Subsequently got a request from VK7MO for a JT65C sked at 0200 (local) Nil for first 20 minutes of sked then signals got good and QSO with VK7MO completed easily.! Worked G4DDK on JT65C sked, again i heard him before start of sked getting set up.

10 GHz

OK1KIR is out of order on 10 GHz unfortunately for a longer time. We lost probably TWT PS due to too much snow and high humidity in the dish focus place. We continue on 5.7 GHz (fortunately completely solid state rig). 73 Vladimir

F5JTA: I am really pround with first random QSO with OK1KIR, F2TU, F5JWF and IQ4DF, just a little disapointed by only get QRZ with OK1CA at 16:51 on 11/03 and no reply with LX1DB around 21:00 on 12/03 during his 5MN periods! Moreover I have heard in QSO IK2MMB and F3VS and I am still waiting to hear at least G4NNS, F6KSX and also some stations outside Europe. To improve my signal, I have put the amplifier at the feed to reduce the TX losses in my previous guide line and to win 10 degrees on elevation. Anyway I am really happy to hear some activity on 3cm from my farther landscape and already waiting for the next opportunity to retest. 73s de Guy, 20w in 3,5m Cassegrain

W8TXT in his Shack

F5JTF: I was on the air for the 3cm EME Dubus contest and I worked F5JTA (initial), F2TU, IQ4DF, OK1KIR, LX1DB, G4NNS. Echoes of few station are available in mp3 on my web site. http://f5jwf.free.fr/Audio%20File%20EME%2010GHz.htm Good fun this week exept as usual the snow on the antenna which degrade RX performance Not so many people active on 3cm for my standing point. Condition 3.7m and 20watt Best 73's Phil

Last

Aug. 25-27 EME conference: www.eme2006.de

Sept.9/10 ARI contest see www.i0jxx.it/**contest**/EME**2006**.pdf

For **more** info, sked & Newsletter see:
www.nitehawk.com/rasmit/em70cm.html
And the links there.

SUUUPER DX at CT1DMK, after two nights without sleep Luis received signals from Voyager. Full details are at http://w3ref.cfn.ist.utl.pt/cupido/dsn.html That's DX

73 Bernd DL7APV

Balkan DX Tour on 23cm EME – YU, Z3, ZA & T9

by Bodo Fritsche, DL3OCH

My vacation this year combined rare DX, beautiful countryside and a little bit of adventure. There are still some pretty countries in Europe where you can create a nice pile-up on short wave. Most of these DXCC in Europe were already activated on both, short wave and 23cm by me. I picked the Balkan area as a destination for my vacation in April 2006. As far as I know, there was never an EME QSO on 23cm from Serbia and Montenegro (YU), Macedonia (Z3), Albania (ZA) and Bosnia-Herzegovina (T9). Since I have never been in these countries, I had reason enough to go there. Unfortunately I was not able to plan everything in advance, and left for the trip knowing that I would still need a license in these DXCCs - except T9. The only contact I had in advance was to Geni (ZA1B) who offered me his help to get a license in Tirana. My plan was to go there anyway and try to get the license once I reached each destination.

My sister Kathrin and her husband Thomas joined me on my trip. They are always open for new things and they were interested in the low-budget vacation. We planned on camping wherever we stopped. April was a perfect month for this vacation based on the climate, in addition to extra cargo space in my car or groceries that won't spoil. We packed my old Passat on the first of April full with all kinds of camping gear and ham equipment. I took a DK3 mobile antenna and a TS-450S for all short wave bands as well as a 59 element yagi, transverter and IC-7000 for 23cm. Because I did not have all the approved documentation for operating HAM equipment in these countries, I made sure that when I packed up the car the equipment would not be evident, preventing any border patrol's unnecessary questions. I just wanted it to look like we were on a camping trip so I could get on with my operation.

The first stop was in Ljubljana (S5) for one night. After that we headed straight forward to Belgrade, the capital city of Serbia and Montenegro. I wanted to get a license there on Monday morning the 3rd of April to operate from KN04. I tried to find the ministry of telecommunication after a night in a hotel that reminded me of something that I have seen in the 80th Century in East Germany. The ministry moved; therefore it took me quite a few hours to find it. Once I did, I was finally able to talk to the person that is in charge of ham radio licenses. At first it didn't seem like it was possible to get the right stamps on the right documents. However, I got the papers signed, stamped and approved. This was very exciting for me and I was looking forward to the first few QSOs that night. Five skeds were made in advance and I told everybody via e-mail that I am QRV from KN04GO. We found a nice little place to set up our tents. Even though it was not raining, there were enough clouds in the sky covering the moon making it difficult for me to point my antenna exactly at the moon. From past experience we found that JT65C really works best. I wanted to concentrate on this type of mode. JT65C is more tolerant regarding the fast moving Doppler shift on 23cm. All QSOs were done after three hours of operation. Howard's (G4CCH) signal was extremely weak that night but the width-value "W" in WSJT showed less than 5Hz so we wanted to try JT65B the next time. After that successful night with five QSOs, we drove as close as possible to the border between Serbia and Macedonia because I planned to be in Skopje (Z3) by Wednesday morning.

DL3OCH´s portable 23cm EME setup

We found Strezovce, a little village just before the border to Macedonia. There was a little house with a huge backyard where we could settle down for the night. Through Internet connection via GPRS I informed everyone that I would be operating from KN02ug. I had six skeds for that night. To supply enough power to the remote location I have to keep the engine running. Due to the fact that I operate late night, I did not want to disturb Kathrin and Thomas and drove my car about 20 meters away from our camp site. I just powered up and waited for the first decoding from HB9Q when somebody from the village arrived wondering what I was doing. He was looking at my antenna pointing to the moon and he thought that I am a journalist since he detected my laptop and my camera. I tried to explain what I was doing and from then on it was clear to the whole village, I must be a spy. It took about 30 minutes until everybody there knew that a spy is active from their peaceful village. Henceforth, it was very difficult for me to continue my operation because at least 15 people or more surrounded my car and I had to make sure that nobody touched the equipment or the antenna. Who would have thought I would have to have safety top of mind when I am in such a sparsely populated area just trying to make a few ham contacts? Thomas tried to keep everybody satisfied with German beer and cigarettes. A police man in civil showed up as well and I showed him proud my documents from Belgrade. He still didn't really understand what I was doing but the stamps on the paper seemed to solve the problem and he let me go. However, he said I may continue for one more hour until the police will come again to check if I stopped operation. The weather for EME was anything but perfect that night. It was windy, very cloudy and I could not see the moon. Only three QSOs could be completed. The signal of G4CCH, HB9Q and OH2DG were visible in specJT but no decoding at all. Only a minute after I shut everything down a fully loaded off-road police car reached our camp. The guys went at first to Thomas who was near our tents because that meadow was easy to access and he had a warming campfire in that "cool" night. They just wanted to talk and explained to us that the whole village was excited about our action. There was nothing bad or illegal. I guess the residents only wanted the police to be present to confirm that we are harmless so they can calm down. Well, that exciting night was short because a few people from the village showed up early in the morning to wake us up with coffee.

On Wednesday, April 5th we drove to Skopje. The drive was calm and nice. The ministry for telecommunication moved a couple times making it very hard to find out who is responsible for the authorization. We walked all day long from one office to another only to find out on Thursday that I don't need a license if I stay less than three month. Macedonia tries to conform to the CEPT rules making it possible to operate like from every other CEPT country. However, I wanted to have some official papers that I can show in case I run into trouble like in Serbia. They just smiled about my story and gave me something including their private phone number that I may call if I have any difficulties.

A place for the night close to the border to Albania was exactly what we needed, because I wanted to be in Tirana (ZA) on Friday to obtain a license before the weekend. We found a cheap hotel in Struga, very close to the lake Ohrid. This made it possilbe to park and operate my car near by the hotel. I was QRV at 2000z from KN01ie as Z3/DL3OCH. It was probably the very first time that somebody operated on 23cm from Macedonia. The weather was contrary and the moon was only visible a few times. My first QSO with G4CCH was not completed because I could not decode the call signs. Howard and I communicated thru Instant Messenger and arranged a second try which worked well. I made five QSOs in that night. The night in the hotel was low standard. We paid only 15 Euro for all three of us. The pipe of our shower had more holes than the shower head. We also had to let the water run for about one hour until it became at least a little bit warmer than the water in the purling brook the day before.

Friday, April 7th, I wanted to arrive as fast as possible in Tirana to make sure that I will receive my license before the office closes for the weekend. The people at the border worked slow and were not really interested in our camping gear. It took us about one hour to cross the border. Worth mentioning is the huge road hole at the border. Somebody in a white coat was already expecting us a few meters after that hole. He charged us 3 Euro for the bird flu disinfection installation that we just passed. Wow, that hole was certainly there on purpose. We were finally on our way to Tirana which was about 115km to go. The road was still good but became worse with each km. We still had to drive 60km after one hour, still 30km after two hours. It took us more than three hours till we arrived in Tirana. The roads are awful and filled with huge holes. The manhole cover was usually missing. Driving down the road took all my concentration just to avoid the many large holes from damaging my car. Many people do not care about red traffic lights, road signs are scarce, pedestrian and animals are walking on the streets. I met Geni (ZA1B) in a hotel in downtown Tirana. We went to the ERT (Entity Regulator Telecommunication). A civil servant stayed longer in the office to accept my license application. How nice of that lady. Unfortunately, she could not bring the papers to completion at that time. I had time until Monday morning to enjoy the country without a single QSO. It was already late and we had to find a hotel before dusk. Finding a hotel after dark would be impossible due to the condition of the roads to drive after dark and of course there were no street lights, so we only drove in the day light. We arrived in Durres at the Adriatic Sea where we stayed for the night. The people in Albania are very nice and helpful. I had no fear to leave most of my expensive equipment in the car during the night. The most common car in this country is Mercedes. They have such bad road conditions but most of the cars look still well kept. You may let wash your car on each corner but it doesn't last long with all the dirty puddles. Almost the entire roadside is full with garbage. Even the beach was very scruffy due to trash. You can see a many old bunkers scattered all over the country and especially along the beach. We actually found a pretty nice place for camping where I could also do my ham operations without being disturbed by others. To bad that the GSM cell phone worked but not the GPRS service. I had to find an internet café and contact Heinrich (DJ9YW). He managed my skeds and informed everybody where I was. I wanted to pick up my license Monday morning. As expected it was not done. I had to return to the office a couple more times until all the paperwork went thru the right hands. I finally received the license just a few minutes before the office closed. The license was valid until Wednesday only and I therefore wanted to make as many QSOs as possible in these two days. We went back to the nice camp site where I started my operation on the 30m band. It worked great and the pile up was fantastic. I only took a short break for dinner and stopped on short wave at about midnight. 700 QSOs were already in the log and it now was time for EME on 23cm. The sky was mostly clear. All six QSOs were completed successfully. I slept long the next day and worked more on short wave until my goal of at least 2000 QSOs was reached.

Mobile EME shack

The rest of the trip we made our way back to Germany with just one stop for only one night in Bosnia where I wanted to be active as T9/DL3OCH. Bosnia has never been on the air via 23cm EME. We asked in Trebinje for a hotel but they seemed to expensive for us. Therefore we decided to camp again and just opened our eyes for a nice calm spot. Only a few km outside of Trebinje were beautiful and huge mountains. Near by a place where we wanted to camp was an old house and I decided to ask if we may camp over there. The man was very nice allowing us to camp there. He then added, that we also may sleep in that house. It was a scout house and the men were preparing it for the group that was expected for the next day. It was a really cool place and we could use the kitchen and the fire place and quite everything. We were sitting in the kitchen having a beer and telling stories about our vacation. The one guy wanted to have a copy of the one picture that I just did and so he wrote down his e-mail address. I was very surprised to see the ending ...@qsl.net. There were two guys from YU4DPR that are working in the radio club as well as for the local scout society. I had to visit their club station and returned just in time for my skeds back in the scout house. This night was very cold, only a few degrees above zero. I was well prepared by drinking enough beer and Slibowitz with our new friends. After all I was able to do five more EME QSOs from T9. At about five in the morning I went extremely tired and exhausted to bed. How good that the expected group already arrived just one hour later. I needed some coffee and a cold shower to finally wake up so early. It really was a pleasant surprise to have meet the guys down there. We had a very good time.

Even though I planned a few more QSOs on the way thru Croatia, I decided to cancel all further operations for this vacation. I was just to exhausted and needed at least the two last days to relax at the wonderful beach of Croatia. The last two weeks went by so quickly. We saw a lot of beautiful countryside and met nice people. JT65 worked good and showed once more its real potential. Many thanks for everybody who supported me so well. A special thank you goes to Heinrich DJ9YW who made sure that I take the right equipment on my vacation. I made 2300 QSOs with my mobile antenna on short wave and 24 EME QSOs on 23cm. It was a very successful and interesting vacation for all of us.

Vy 73 de Bodo, DL3OCH

23cm EME Expedition Log

Date	UTC	My Call	My Loc	Wkd	Loc	First ever	Mode	Reports
03.04.06	18:35	YU/DL3OCH	KN04GO	K2UYH	FN20QG	YU-W	JT65C	O O-25
03.04.06	19:15	YU/DL3OCH	KN04GO	DJ9YW	JO42QA	YU-DL	JT65C	O O-25
03.04.06	20:20	YU/DL3OCH	KN04GO	G4CCH	IO93QL	YU-G	JT65C	O O-26
03.04.06	20:35	YU/DL3OCH	KN04GO	OE9ERC	JN47VL	YU-OE	JT65C	O O-19
03.04.06	21:10	YU/DL3OCH	KN04GO	HB9Q	JN47CG		JT65C	O O-24
04.04.06	20:20	YU/DL3OCH	KN02UG	DJ9YW	JO42QA		JT65C	O O-25
04.04.06	20:50	YU/DL3OCH	KN02UG	G4CCH	IO93QL		JT65B	O O-26
04.04.06	21:35	YU/DL3OCH	KN02UG	OE9ERC	JN47VL		JT65C	O O-24
04.04.06	22:10	YU/DL3OCH	KN02UG	K2UYH	FN20QG		JT65C	O O-26
06.04.06	20:45	Z3/DL3OCH	KN01IE	G4CCH	IO93QL	Z3-G	JT65B	O O
06.04.06	21:20	Z3/DL3OCH	KN01IE	DJ9YW	JO42QA	Z3-DL	JT65B	O O
06.04.06	21:35	Z3/DL3OCH	KN01IE	OE9ERC	JN47VL	Z3-OE	JT65C	O O-21
06.04.06	22:10	Z3/DL3OCH	KN01IE	HB9Q	JN47CG	Z3-HB9	JT65C	O O-23
06.04.06	22:45	Z3/DL3OCH	KN01IE	K2UYH	FN20QG	Z3-W	JT65C	O O-23
10.04.06	22:45	ZA/DL3OCH	JN91TM	OH2DG	KP30CG	ZA-OH	JT65C	O O
10.04.06	23:20	ZA/DL3OCH	JN91TM	G4CCH	IO93QL	ZA-G	JT65B	O O
10.04.06	23:50	ZA/DL3OCH	JN91TM	DJ9YW	JO42QA	ZA-DL	JT65B	O O
11.04.06	00:10	ZA/DL3OCH	JN91TM	OE9ERC	JN47VL	ZA-OE	JT65C	O O
11.04.06	00:45	ZA/DL3OCH	JN91TM	HB9Q	JN47CG	ZA-HB9	JT65C	O O
11.04.06	01:15	ZA/DL3OCH	JN91TM	K2UYH	FN20QG	ZA-W	JT65C	O O
13.04.06	22:40	T9/DL3OCH	JN92EP	G4CCH	IO93QL	T9-G	JT65B	O O-28
13.04.06	23:20	T9/DL3OCH	JN92EP	DJ9YW	JO42QA	T9-DL	JT65B	O O-25
13.04.06	23:40	T9/DL3OCH	JN92EP	OE9ERC	JN47VL	T9-OE	JT65C	O O-21
14.04.06	00:15	T9/DL3OCH	JN92EP	HB9Q	JN47CG	T9-HB9	JT65C	O O-26
14.04.06	02:20	T9/DL3OCH	JN92EP	K2UYH	FN20QG	T9-W	JT65C	O O-23

Tropo Reports

2m, 70cm and up

Editor: Wolfgang Schneider, DJ8ES

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2m

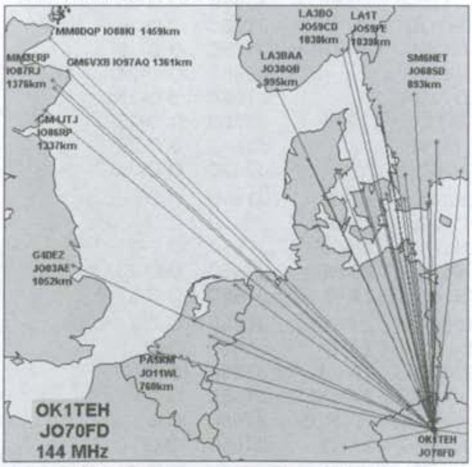
CT1HZE, IM57nh, hrd:

10.3.2006

1350-1400	CU8DUB/B	HM49kl	519	1953km
1755	CU8DUB/B		419	
1945	CU8DUB/B		559	
2210	CU8DUB/B		529	

QRG 144.419 in USB.

OK1TEH, JO70FD, wkd Jan – Apr ´06 (>800km):
MM0DQP (IO88KI, 1459km); GM6VXB (IO97AQ, 1361km); MM3ERP (IO87RJ, 1376km); GM0TGE (IO87TF, 1358km); G4DEZ (JO03AE, 1052km); GM0TGE (IO87TF, 1358km); LA3BAA (JO38QB, 995km); LA1T (JO59FE, 1039km); LA3BO (JO59CD, 1038km); GM4JTJ (IO86RP, 1337km); SM5CUI (JO89WW, 1111km); SK6HD (JO68SD, 893km); SM0KAK (JO89XK, 1058km); SM4BDQ (JP80FG, 1134km); SM6RME (JO78DH, 909km); SM1CD (JO97HR, 887km); SM6NET (JO69SD, 893km); SM1CIO (JO97HR, 887km); SK6EI (JO68VK, 924km); SP2SC (JO94BD, 511km); SK4BX (JO79OF, 1012km); SM1YHX (JO97DN, 863km); SM0EPO (JO89XM, 1067km); SM0KAK (JO89XK, 1058km); SM4QA (JO78HX, 983km); OH1NOR (KP00XL, 1243km); ES2RJ (KO29KM, 1237km). tnx for info Matej



OK1TEJ during great opening at Jan/Feb ´06

PA5DD, JO22IC, wkd (>600km):

07/03/06	18:01	OZ1IEP	JO55XU	633km
07/03/06	18:14	SK7MW	JO65MJ	660km
07/03/06	18:20	SK6JX	JO66GV	736km
07/03/06	18:40	SK7CY	JO65VK	704km
19/03/06	09:09	OK1KZE	JN79FX	722km
04/04/06	17:00	OZ1IEP	JO55XU	633km
04/04/06	17:03	OZ2PBS	JO55XJ	602km
04/04/06	17:07	OZ8ZS	JO55RT	606km
04/04/06	17:15	OZ5GX	JO57DJ	690km
04/04/06	18:08	SM7UYS	JO65MN	670km

tnx for info Uffe

SP6MLK, JO80IK, wkd Jan/Feb ´06 (>700km):
DK5QI/SM7 (JO87KD, 746km); SK6HD (JO68SD, 881km); SM6RME (JO78DH, 889km); SM1CIO (JO97HR, 820km); SK6EI (JO68VK, 909km); SM0KAK (JO89XK, 1003km); SM4BDQ (JP80FG, 1093km); SM1YHX (JO97DN, 798km); SM7XWI (JO86EX, 727km); LY2LE (KO24OQ, 743km); LA3BAA (JO38QB, 1040km); LA1T (JO69FE, 1009km); LA4JNA (JO59EC, 1044km); LA3BO (JO59CD, 1052km); GM4AFF (IO86ST, 1441km) tnx for info Stan

70cm

OZ1FF, JO45BO, wkd (>700km):

10/01/06	18:02	SM0FZH	JO99HI	752km
10/01/06	20:13	DF9IC	JN48IW	742km
30/01/06	10:52	GM4CXM	IO75TW	781km
30/01/06	16:52	MM0DQP	IO88KI	746km
30/01/06	16:58	G0UWK	IO83VC	724km
31/01/06	12:54	F6FEO	JN09NW	786km
31/01/06	13:18	F9ZG	IN99KC	956km
31/01/06	14:10	F6EAS	IN98LV	971km
14/02/06	18:10	SM0FZH	JO99HI	752km
14/03/06	19:13	DF9IC	JN48IW	742km

tnx for info Kjeld

OK1TEH, JO70FD, wkd Jan – Apr ´06 (>800km):
MM5AJW (IO88KI, 1459km); MM0DQP (IO88KI, 1459km); G4DEZ (JO03AE, 1052km); SM1MUT (JO97CJ, 844km); SK6EI (JO68VK, 924km); SM7GEP (JO77IP, 835km); SM3BEI (JP81NG, 1250km); OH1NOR KP00XL, 1243km); ES2RJ (KO29KM, 1237km); YL3AG (KO26AW, 986km); ES1RF (KO29IF, 1205km); RA3LE (KO64AR, 1296km). tnx for info Matej

OZ1IEP, JO55XU, wkd (>600km):
GM4CXM (IO75TW, 1016km); G8LHT (IO93JM, 883km); G0UWK (IO83VC, 963km); F8DBF IN78RI, 1396km); G3YDY (JO01FQ, 885km); G4PBP (IO82WO, 982km); ON3CP (JO21IG, 698km); GM4MOX (IO86KC, 937km); G0PQF (JO01BU, 893km); PE1KXH (JO21XD, 656km); G4PBP (IO82WO, 982km); F6FEO (JN09NW, 978km); PC5D (JO21WA, 671km); PE1EWR (JO11SL, 737km); DK5WO (JO30AS, 688km); DL4EBV (JO31HK, 603km); DL4EAX (JO31IG, 616km); ON4POO (JO20DP, 771km); G4AJC (IO91VJ, 941km); G3MWQ (IO82RQ, 1003km);

GW4DGU (IO71SV, 1159km); GM4ISM (IO85AR, 993km); DJ0UO (JO31BQ, 601km); F8BRK IN99VF, 1101km); G8AHK (IO91QF 975km); DK2BJ (JO30BS 685km); ON4IMM (JO11UB 762km); ON4PS/P (JO20KQ 742km); DL9EAJ (JO31DH 628km); ON8AB (JO10TW 776km); PA7DW (JO30AV 676km); G0FYD (IO83LS 986km); G3TA (IO81XS, 1022km); G0HIU (IO83LS, 986km); G4RGK (IO91ON, 963km); G6HKS (IO92GA, 974km); SP9SOO (JN99OV, 821km); SP7OGS (JO91RQ, 676km); SP9JDP (JN99HW, 794km); SP9OJQ (JN99IW, 798km); OK1KT (JO70WE, 682km); G8CUL (IO91JO, 984km); GM0ELP/P (IO76XA, 994km); PA5DD (JO22IC, 631km); DB6NT (JO50VJ, 607km); DF9IC (JN48IW, 800km); DK2GR (JN59IE, 746km); SM3BEI (JP81NG, 672km); OH0JFP (KP00AB, 667km); DL5FN (JO40F,B 685km); DD0PX (JO30WR, 631km); DL0EE (JN49GK, 749km); PA6V (JO22GE, 632km); OH0JFP (KP00AB, 667km); DF9IC (JN48IW, 800km); PA5DD (JO22IC, 631km); DL5FN (JO40FB, 685km); PD0EBF (JO21LQ, 652km); DD0PX (JO30WQ, 635km); DF5NK (JN59UL, 709km); DJ7RST (JN59UL, 709km); SM3BEI (JP81NG, 672km). tnx for info Carl

SM7ECM, JO65NQ, wkd Jan – March ´06:
SP4JCQ (KO13NC, 707km); OK2BRD (JN99ET, 742km); SP9SOO (JN99OP, 787km); SP9APC (JN99QU, 772km); SQ9W/P (JO90SK, 724km); SP9FG (JN99XF, 854km); GM4CXM (IO75TW, 1095km); GM4ISM (IO85AR, 1068km); GM0ELP/P (IO76XA, 1069km). tnx for info Anders

PA5DD, JO22IC, wkd (>500km):
OZ2LD (JO54TU, 552km); OZ0XX (JO54RS, 538km); DJ8MS (JO54VC, 524km); OZ9KY (JO45VX, 545km); SK7MW (JO65MJ, 660km); OZ2PBS (JO55XJ, 602km); OZ1IEP (JO55XU, 633km); OZ9KY (JO45VX, 545km); OZ2LD (JO54TU, 552km); DJ8MS (JO54VC, 524km); OZ8ZS (JO55RT, 606km). tnx for info Uffe

23cm + up

OZ1FF, JO45BO, wkd:
23cm (>600km):

17/01/06	18:52	DF9IC	JN48IW	742km
17/01/06	20:42	DB6NT	JO50TI	629km
30/01/06	11:01	GM4CXM	IO75TW	781km
30/01/06	14:59	G1GEY	IO94FW	616km
30/01/06	15:26	GM4OGI	IO85DX	740km
30/01/06	18:49	F5HRY	JN18EQ	862km
30/01/06	19:20	F6DKW	JN18CS	859km
30/01/06	19:28	F6CBH	JN19BH	808km
30/01/06	21:48	F1ANH	IN88MR	1072km
30/01/06	21:57	G4EAT	JO01HR	655km
30/01/06	23:08	F9OE	IN78QG	1192km
30/01/06	23:12	F5PEJ	JN09XT	765km
30/01/06	23:17	G4AJC	IO91VJ	722km
31/01/06	13:20	F9ZG	IN99KC	956km
31/01/06	13:22	G0EBB	IO91XB	740km
31/01/06	13:24	G4KIY	IO92WN	635km
31/01/06	15:21	F8DBF	IN78RI	1181km
31/01/06	15:29	F1CXW	JO20JC	651km
31/01/06	17:11	GM3UAG	IO87XJ	654km
31/01/06	17:15	GI0PCU	IO74CS	886km
31/01/06	19:18	G4BEL	JO02BI	635km
31/01/06	20:39	GM3SBC	IO85IX	714km
31/01/06	21:43	G4BAO	JO02CG	636km
01/02/06	11:53	DM2AFN	JO61WB	632km
01/02/06	20:01	G8PNN	IO95EF	616km
02/02/06	15:10	GM4LBV	IO86RQ	671km
21/02/06	18:46	DF9IC	JN48IW	742km
21/02/06	20:18	G3XDY	JO02OB	600km
18/04/06	19:58	DF9IC	JN48IW	742km

13cm (>500km):

24/01/06	18:13	SM4FXR	JO79OF	584km
30/01/06	19:01	F5HRY	JN18EQ	862km
30/01/06	19:14	ON4IY	JO20IV	570km
30/01/06	19:33	F6CBH	JN19BH	808km
30/01/06	22:51	F1PYR/P	JN19BC	829km
30/01/06	22:55	F1DEB	JN09XC	834km
30/01/06	22:56	F6DWG/P	JN19AJ	803km
31/01/06	13:26	G4KIY	IO92WN	635km
31/01/06	19:25	G4BEL	JO02BI	635km
01/02/06	11:57	DM2AFN	JO61WB	632km
01/02/06	20:03	G8PNN	IO95EF	616km

3cm (>300km):

24/01/06	20:11	SM6EAN	JO57WQ	326km
24/01/06	21:30	SM7ECM	JO65NQ	314km
30/01/06	15:47	GM4OGI	IO85DX	740km
30/01/06	17:17	GM4LBV	IO86RQ	671km
30/01/06	18:27	G0EWN	IO93GK	663km
30/01/06	22:04	G4EAT	JO01HR	655km
31/01/06	08:19	DJ5BV	JO30KI	590km
31/01/06	12:01	ON4IY	JO20IV	570km
31/01/06	17:44	G4PBP	IO82WO	746km
31/01/06	18:14	ON4IY	JO20IV	570km
31/01/06	19:27	G4BEL	JO02BI	635km
31/01/06	20:06	DK2MN	JO32MC	395km
31/01/06	20:18	LA3EQ/P	JO28UX	402km
31/01/06	20:43	G8ACE	IO91IB	802km
28/02/06	18:17	SM6ESG	JO67CC	302km
28/02/06	18:34	PA3CEG	JO33FB	302km
28/02/06	20:31	SM6EAN	JO57WQ	326km
28/02/06	20:49	SM6AFV	JO67GQ	356km
04/03/06	18:03	PI9A	JO33FB	302km
28/03/06	17:34	SM6ESG	JO67CC	302km
28/03/06	17:38	PA3CEG	JO33FB	302km
28/03/06	18:55	SM6AFV	JO67GQ	356km
28/03/06	20:31	SM7ECM	JO65NQ	314km

tnx for info Kjeld

SM6AFV, JO67GQ, wkd Jan - Mrz ´06 (>600km):
1296 MHz:
DL9EAJ (JO31DH, 815km); DJ6JJ (JO31LG, 799km); PAØJUS (JO22OO, 732km); PA3EAQ

(JO31CI, 813km); ON4CDF (JO21EE, 894km); DK2MN (JO32MC, 713km); F5PEJ (JNØ9XT, 1115km); F6CBH (JN19BH, 1155km); F5HRY (JN18EQ, 1205km); F6DKW (JN18CS, 1203km); G4EAT (JOØ1HR, 1010km); F1ANH (IN88MR, 1428km); F9OE (IN78QG, 1546km); G4AJC (IO91VJ, 1076km); F1ISM (JNØ9VK, 1157km); G4KDH (JOØ1HO, 1020km); G8TOK (JOØ1BI, 1064km); F1PYR/P (JN19BC, 1175km); F1DBE (JNØ9XC, 1181km); GIØPCU (IO74CS, 1174km); GM6VXB (IO97AQ, 860km); G4DDK (JOØ2PA, 954km); F1CXW (JO2ØJC, 983km); GØJBA (JOØ1KD, 1045km); G3ZEZ (JOØ1NT, 979km); PE1KXH (JO21XD, 842km); PE1AXM (JO11VM, 886km); G8XIR (JOØ1EK, 1045km); F1ANH (IN88MR, 1428km); F8DBF (IN78RI, 1535km); DL6NCI (JO5ØVI, 817km); DB6NT (JO5ØTI, 817km); DK3WG (JO72GI, 606km); PA3DZL (JO21HM, 853km); OK2POI (JN99AJ, 990km); OK2VSO (JN99AJ, 990km); G8OHM (IO92AJ, 1092km); F1ANH (IN88MR, 1428km); DK2MN (JO32MC, 713km); G4XUM (IO83SB, 1075km); G4KIY (IO92WN, 984km); G4RGK (IO91ON, 1092km); GØRRJ (IO91FE, 1159km); G4BEL (JOØ2BI, 986km); G8AIM (IO92FH, 1075km); GW8ASD (IO83LB, 1107km); G8XVJ (IO83RJ, 1059km); G8GXP (IO93FQ, 986km); G4YTL (IO92MB, 1063km); G4ZFJ (JOØ1HO, 1020km); G4IEV (IO92EJ, 1074km); DL9EAJ (JO31DH, 815km); DJ6JJ (JO31LG, 799km); PAØJUS (JO22OO, 732km); PA3EAQ (JO31CI, 813km); ON4CDF (JO21EE, 894km); DK2MN (JO32MC, 713km); F5PEJ (JNØ9XT, 1115km); F6CBH (JN19BH, 1155km); F5HRY (JN18EQ, 1205km); F6DKW (JN18CS, 1203km); G4EAT (JOØ1HR, 1010km); F1ANH (IN88MR, 1128km); F9OE (IN78QG, 1546km); G4AJC (IO91VJ, 1076km); F1ISM (JNØ9VK, 1157km); G4KDH (JOØ1HO, 1020km); G8TOK (JOØ1BI, 1064km); F1PYR/P (JN19BC, 1175km); F1DBE (JNØ9XC, 1181km); GIØPCU (IO74CS, 1174km); GM6VXB (IO97AQ, 860km); G4DDK (JOØ2PA, 954km); F1CXW (JO2ØJC, 983km); GØJBA (JOØ1KD, 1045km); G3ZEZ (JOØ1NT, 979km); PE1KXH (JO21XD, 842km); PE1AXM (JO11VM, 886km); G8XIR (JOØ1EK, 1045km); F1ANH (IN88MR, 1428km); F8DBF (IN78RI, 1535km); DL6NCI (JO5ØVI, 817km); DB6NT (JO5ØTI, 817km); DK3WG (JO72GI, 606km); PA3DZL (JO21HM, 853km); OK2POI (JN99AJ, 990km); OK2VSO (JN99AJ, 990km); G8OHM (IO92AJ, 1092km); F1ANH (IN88MR, 1428km); DK2MN (JO32MC, 713km); G4XUM (IO83SB, 1075km); G4KIY (IO92WN, 984km); G4RGK (IO91ON, 1092km); GØRRJ (IO91FE, 1059km); G4BEL (JOØ2BI, 986km); G8AIM (IO92FH, 1075km); GW8ASD (IO83LB, 1107km); G8XVJ (IO83RJ, 1059km); G8GXP (IO93FQ, 986km); G4YTL (IO92MB, 1063km); G4ZFJ (JOØ1HO, 1020km); G4IEV (IO92EJ, 1074km)

2320 MHz:

DJ6JJ (JO31LG, 799km); PAØJUS (JO22OO, 732km); PA3EAQ (JO31CI, 813km); DK2MN (JO32MC, 713km); F6CBH (JN19BH, 1155km); F5HRY (JN18EQ, 1205km); G4KDH (JOØ1HO, 1020km); G3XDY (JOØ2OB, 955km); F1PYR/P (JN19BC, 1175km); F1DBE (JNØ9XC, 1181km); F6DWG/P (JN19AJ, 1151km); G4DDK (JOØ2PA, 954km); DL6NCI (JO5ØVI, 817km); DB6NT (JO5ØTI, 817km); G4KIY (IO92WN, 984km); GØRRJ (IO91FE, 1159km); G4RGK (IO91ON, 1092km)

5.7 GHz:

F5HRY (JN18EQ, 1205km); F6DWG/P (JN19AJ, 1151km); ON4IY (JO2ØIV, 909km); DL6NCI (JO5ØVI, 817km); DB6NT (JO5ØTI, 817km); G8OHM (IO92AJ, 1092km); DK2MN (JO32MC, 713km)

10 GHz:

PAØJUS (JO22OO, 732km); DJ6JJ (JO31LG, 799km); DK2MN (JO32MC, 713km); G4DDK (JOØ2PA, 954km); DL6NCI (JO5ØVI, 817km)

tnx for info Jens

SM7ECM, JO65NQ, wkd Jan – Mrz ´06:

23cm (>500km):

SM4DXO (JP70VO, 569km); SK4AO (JP70TO, 566km); PA5DD (JO22IC, 680km); DF9IC (JN48IW, 809km); DL8NSB (JO50TI, 602km); SM0DFP (JO89VL, 505km); SM3LBN (JP80IO, 586km); PA3CEG (JO33FB, 521km); ES2RJ (KO29KM, 820km); SP3BEK (JO92DF, 513km); SM4DXO (JP70VO, 569km); PA5DD (JO22IC, 680km); PA3AWJ (JO21GW, 701km); SK0CT (JO89XJ, 503km); SM0DFP (JO89VL, 505km); SM3BEI (JP81NG, 663km); F6CBH (JN19BH, 1028km); PA2CHR (JO22XA, 623km); F1ISM (JN09VK, 1034km); F6DKW (JN18CS, 1069km); PA2JWN (JO22QD, 643km); ON4IY (JO20IV, 773km); GM4CXM (IO75TW, 1095km); F1ANH (IN88MR, 1396km); DK2MN (JO32MC, 564km); G4AJC (IO91VJ, 1003km); GM2SBC (IO86JC, 1020km); G0RRJ (IO91FE, 1093km); G3LTF (IO91GG, 1083km); DL1ATI (JO50QU, 550km); DJ6JJ (JO31LG, 639km); F1ANH (IN88AR, 1396km); DK1VC (JO31RG, 619km); F5PEJ (JN09XT, 996km); DJ5BV (JO30KI, 726km); G3LTF (IO91GG, 1083km); G0RRJ (IO91FE, 1093km); G4HUP (JO02PC, 873km); F9OE (IN78QG, 1467km); PA5DD (JO22IC, 680km); SM0DFP (JO89VL, 505km); SK0CT (JO89XJ, 503km); PI9A (JO33FB, 522km);

13cm (>400km):

SP3BEK (JO92DF, 513km); SM5QA (JO89WJ, 501km); SM4FXR (JO79OF, 414km); SM0DFP (JO89VL, 505km); SM4DHN (JP60VA, 484km); ON4IY (JO20IV, 773km); DK2MN (JO32MC, 564km); DJ6JJ (JO31LG, 639km); PI9A (JO33FB, 521km); PA3CSG (JO33FB, 521km); SM0DFP (JO89VL, 505km); SM5QA (JO89WJ, 501km)

6cm (>300km):
ON4IY (JO20IV, 773km); DK2MN (JO32MC, 564km); SM5QA (JO89WJ, 501km); SM0DFP (JO89VL, 505km); DL7VTX (JO62TM, 354km); SM0DFP (JO89VL, 505km); SM5QA (JO89WJ, 501km)

3cm (>300km):
SM5QA (JO89WJ, 505km); OZ1FF (JO45BO, 314km)
tnx for Info Anders

PA5DD, JO22IC, wkd
1296MHz (>500km):
DL0GTH/P (JO50RK, 505km); G8XVJ (IO83RJ, 508km); DK0NA (JO50TI, 520km); DF0YY (JO62GD, 536km); OZ2OE (JO45VV, 538km); OZ9KY (JO45VX, 545km); DM7A (JO60OM, 617km); OZ6OL (JO65DJ, 620km); OZ6OL (JO65DJ, 620km); OZ1BGZ (JO65AP, 623km); SK7MW (JO65MJ, 660km); SM7ECM (JO65NQ, 681km); OL3Z (JN79FX, 722km).

2320MHz (>300km):
G4BEL (JO02BI, 312km); DL3YCW/P (JO41PU, 316km); F6DWG/P (JN19AJ, 353km); DL3IAS (JN49EJ, 396km); DK6AS (JO52JJ, 417km); G0RRJ (IO91FE, 441km); DF9IC (JN48IW, 451km); DL0GTH/P (JO50RK, 505km); DF0YY (JO62GD, 536km); SK7MW (JO65MJ, 660km).

3400MHz (>300km):
DL3IAS (JN49EJ, 396km)
tnx for info Uffe

Personality – OZ1FF

DUBUS wants to introduce active dxers from europe and overseas. Today: OZ1FF - Kjeld
I was born in 1943 in the city of Haderslev (Denmark). In 2004 I retired and now live in Vejers Strand (JO45BO) in West Jutland. My hobbies are travels, photography and of course to be a radio amateur.
The history of my life as a radio amateur:

1960 Member oF EDR (Danish Radio Club)
1962 Licensed as OZ9KY
1964 Licensed as OZ1FF
1962 QRV 144 MHz
1964 QRV 432 MHz
1965 QRV 1296 MHz
1969 - 1970 Licensed as DJ0XB
1977 - 1998 QRT
1998 QRV again 144/432 MHz
2000 QRV 1296/10368 MHz
2001 QRV 2320 MHz
2004 QRV 24048 MHz
You can see also a lot of further information about my amateur radio activities on my homepage: **http://www.oz1FF.dk/**

OZ1FF during VHF convention Weinheim 2005

pse ur Tropo-Report to:

DJ 8 ES @ gmx.de

RK3FG 2m antenna

Aurora Reports

Editor: Stefan Heck, LA0BY

LA0BY@darc.de

Hi fellows,

Not much to report on. The solar minimum still has its grip on us. The few openings that we experience are triggered by coronal holes rather than sunspots and solar flares. It is expected that the solar minimum will be reached in mid 2007.

73, Stefan (LA0BY)

-------------------- 144 MHz --------------------

LA0BY in JO59IX/FW wkd on 144 MHz:

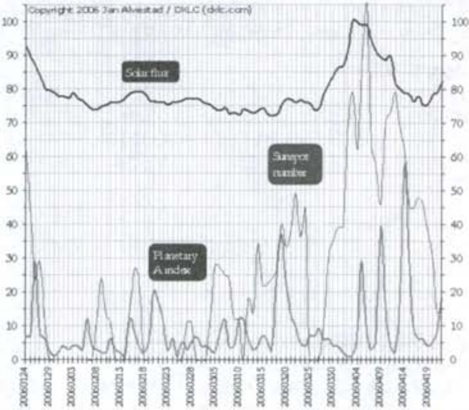
2006-04-04 (JO59IX)

1650	UA1AMG	KO49WW	54A	57A	40°	1063km
1652	OH6NG	KP03TC	55A	56A	30°	674km
1658	SM3AKW	JP92AO	59A	59A	30°	488km
1700	OH6PA	KP02PL	56A	55A	30°	630km
1701	OH6QR	KP22BN	59A	59A	30°	771km
1703	OH6NG	KP03TC	55A	56A	30°	674km
1704	SM2R	KP04EU	53A	55A	30°	734km
1706	OH3BJL	KP11VL	55A	55A	30°	729km
1707	SM3AKW	JP92AO	57A	57A	30°	488km
1708	SK3BP	JP81MH	59A	55A	30°	376km
1709	SA6Z	JO58RJ	55A	55A	30°	181km
1710	SA5Z	JO88CN	56A	57A	30°	350km
1713	OH5LK	KP30ON	59A	59A	30°	910km
1714	SM4GRP	JO69HF	56A	59A	30°	136km
1716	OH1ND	KP00XL	57A	59A	30°	623km
1717	SK3BG	JP82PJ	57A	59A	30°	443km
1718	OH1F	KP01TK	57A	57A	30°	615km
1722	OH4LA	KP20LG	57A	57A	30°	788km
1723	ES5PC	KO38HJ	55A	55A	30°	921km
1727	SK6HD	JO68SD	59A	59A	30°	260km
1729	OH6A	KP03SD	57A	57A	30°	672km
1732	SA5V	JP71EB	56A	59A	30°	234km
1734	SK7MW	JO65MJ	59A	59A	30°	528km
1739	SM3JLA	JP93LH	55A	54A	30°	571km
1741	SK1BL	JO97HK	57A	59A	30°	537km
1742	ES7GM	KO28TI	55A	59A	30°	867km
1743	SM0OY	JO89XK	52A	55A	30°	411km
1746	SK4AO	JP70TO	57A	55A	30°	280km
1750	LA2RZ	JP20ON	55A	55A	0°	310km
1754	SM5CUI	JO89WW	57A	57A	30°	399km
1809	SM4DXO	JP70VO	55A	55A	30°	289km
1810	SK6QW	JO68WR	55A	55A	30°	227km
1812	SM3MXR	JP80GR	59A	59A	30°	331km
1814	ES2DF	KO29GF	52A	55A	30°	781km
1817	SM4BDQ	JP80FG	55A	55A	30°	320km
1821	SK0UX	JO99BM	56A	56A	30°	418km
1822	SL0CB	JO89WI	52A	53A	30°	408km
1913	7S2AT	KP03BU	55A	55A	20°	654km

2006-04-14 (JO59FW)

1105	DJ5HG	JO53IM	56A	56A	30°	714km
1115	LA8KV	JP52QQ	55A	54A	10°	310km
1144	DL4KUG	JO64PD	53A	55A	30°	666km

RIG: IC-821H, PA 180W, antenna 2 x 9-ele-yagi



Geomagnetic activity
24.01. - 19.04.2006

SK4MPI, JP70nj, Beacon Reports on 2m via Aurora:

Date	Time	from area
21.2.	1425-1500	LA (JP33), OH6 (KP02), EW (KO45)
22.2.	1600-1610	OH5 (KP30), LA (JP53)
6.3.	1730-1830	OH5 (KP30), SM (JO66)
	2200	SM0 (JO99)
9.3.	1827	SM2 (KP03)
15.3.	1745-1805	OH5 (KP30), SM (JO99)
16.3.*	1525-1535	OH5 (KP30), SM4 (JP80)
18.3.	1100	OH6 (KP02)
	1430-1830	OH6 (KP02), DL (JO53), ES (KO28)
	2100	OH6 (KP02)
19.3.	0415	OH8 (KP24)
	1400-1700	UA1 (KO49), ES (KO28), LA (JO48)
20.3.	1540-1800	OH6 (KP02), DL (JO53), ES (KO28)
21.3.	1500-1810	SM2 (KP03), DL (JO42), UA1 (KO59)
26.3.	1703	SM2 (KP15)
27.3.	1603	OH6 (KP02)
4.4.	1420-1800	OH6 (KP02), DL (JO53), SM2 (KP03)
5.4.*	0350	OH5 (KP30)
	0540	SM2 (KP15)
	1200-1545	YL (KO37), DL (JO32), SP2 (JO92)
	1935	SM2 (KP15)
6.4.	0530	SM2 (KP15)
9.4.	0550-0630	SM0 (JO99), LA (JO59)
	1310-1700	OH6 (KP02), LA (JO48), SM2 (KP15), ES (KO28)
	2045-2140	OH6 (KP02), PA (JO20), DL (JO93), SP (JO93)
10.4.*	0420	OH5 (KP30)
14.4.	0500-1800	SM2 (KP15), OH1 (KP01), DL (JO42), ES (KO39),
	2120	SM2 (KP15)
15.4.	1525-1730	SM2 (KP25), LA (JP33), DL (JO53)
16.4.	1535	SM2 (KP15)

* LA2VHF JP53EG

FAI News

Reports, Info, Theory

Editor: Dom Dehays, F6DRO
f6dro@aol.com

Hi friends, this years`s FAI season will start very soon. We wish you many QSOs and ask you to send your reports.
73's Dom/F6DRO

2005 Summary, part 2

Date	QTR	STN1	STN2	LOC1	LOC2	QRB	QTF/SCP	Rem
June 11	1835	S54T	G4LOH	JN75EW	IO70JC	1521		
	1840	S54T	G4RRA	JN75EW	IO80BS	1447		
	1841	HA8CE	G7RAU	KN06EN	IO90IR	1651	310/???	
	1843	G7RAU	YO/OK1CDJ	IO90IR	KN26US	2016		qso?
	1846	OK2POI	G4RRA	JN99AJ	IO80BS	1565	300/???	hrd
	1847	SP6GWB	G4LOH	JO80HK	IO70JC	1547	292/???	
	1848	HA1FV	G4LOH	JN87JJ	IO70JC	1635		hrd
	1850	HA8AR	G7RAU	KN06MQ	IO90IR	1692		
	1851	IK2YXK	G4LOH	JN45OP	IO70JC	1182	,	hrd
	1912	HA1FV	EA6VQ	JN87JJ	JM19MP	1401		hrd
	1913	OE6IWG	EA6VQ	JN77PK	JM19MP	1311		
June 12	1620	IK2YXK	G4LOH	JN45OP	IO70JC	1182	JO20?	hrd
June 19	1128	G4LOH	S50C	IO70JC	JN76JG	1537		
June 24	1043	9A1UN	G4LOH	JN65TF	IO70JC	1506		
June 26	0749	HA8CE	RN6BN	KN06EN	KN95LC	1446	80/ ???	
	0810	RN6BN	YU1IO	KN95LC	KN04IQ	1435		
	0908	RN6BN	SV8SC	KN95LC		????		FAI ?
July 4	2026	YU1IO	F1CVI	KN04IQ	JN05MM	1542		
July 5	1740	F4BWJ	I8MPO	IN93MP	JN70FP	1312		
	1910	S57LM	G4LOH	JN76HD	IO70JC	1531	325/???	
	1913	S57EA	G4LOH	JN76HE	IO70JC	1529		
	1923	F8DBF	DK5RQ	IN78RI	JN68BV	1224		hrd
	1928	DK3SE	S57EA	JN37VP	JN76HE	544	330/???	FAI?
	1933	G4LOH	DF1CF	IO70JC	JN57FP	1176		
July 6	1849	G4LOH	IC8FAX	IO70JC	JN70CN	1843*		
	2029	OE6IWG	I8MPO	JN77PK	JN70FP	758	277/100	FAI?
	2041	OE6IWG	I6BQI	JN77PK	JN72BK	564	279/100	FAI?
	2044	G7RAU	I6BQI	IO90IR	JN72BK	1491		
	2047	IC8FAX	F6EAS	JN70CN	IN98LV	1515		
	2052	G4LOH	IC8FAX	IO70JC	JN70CN	1843*		hrd
	2056	IK0BAL	G4LOH	JN62FB	IO70JC	1624	0/???	hrd
	2126	I6WJB	F6EAS	JN72CK	IN98LV	1382		
	2141	F6EAS	I7CSV	IN98LV		?		Call?
	2151	F6EAS	I8YZO	IN98LV	JM78WO	1770		
	2151	IZ4BEH	G4LOH	JN54WL	IO70JC	1428		
	2154	IV3DXW	G4LOH	JN65QQ	IO70JC	1469		
	2205	IZ4BEH	F6EAS	JN54WL	IN98LV	1923*		
	2208	S57MSU	G4LOH	JN76EF	IO70JC	1465	330/???	
	2210	F6EAS	IZ4BEH	IN98LV	JN54WL	1428	75/???	
	2221	G7RAU	I6WJB	IO90IR	JN72CK	1496		
July 7	0616	EA3DXU	HA3UU	JN11CM	JN96JO	1437	45/???	
	0620	EA3DXU	HA1AG	JN11CM	JN87TQ	1396	45/???	
	0800	IW0GPN	EA1BFZ	JN62FB	IN81SS	1233	330/???	
July 17	1811	SP7OGP	F6HRE	KO01AM	IN93GK	1839		FAI?
July 27	1904	HA1FV	G4LOH	JN87JJ	IO70JC	1635		hrd
July 30	2133	F6FHP	YU1IO	IN94TR	KN04IQ	1662		
	2141	F6FHP	YU1EV	IN94TR	KN04CN	1624		
Aug 1	1025	I1DMP	YO3FFF	JN35UB	KN24ND	1380	60/???	
Aug 8	0805	F4BWJ	YU1IO	IN93MP	KN04IQ	1727		

	0813	F6FHP	YU1IO	IN94TR	KN04IQ	1662		
	0843	F6FHP	LZ9X	IN94TR	KN32AS	2124*		FAI?
Aug 10	2107	I8MPO	F5GHP	JN70FP	IN96LE	1397		
Aug 24	2021	S57TW	LZ3GM	JN75EX	KN32RL	1111	60/ ???	
	2128	UT5ER	S57LM	KN78ER	JN76HD	1509	270/60	
Aug 30	1947	F5GHP	9A1CCY	IN96LE	JN85LI	1396		
	1951	F4BWJ	9A1CCY	IN93MP	JN85LI	1431		

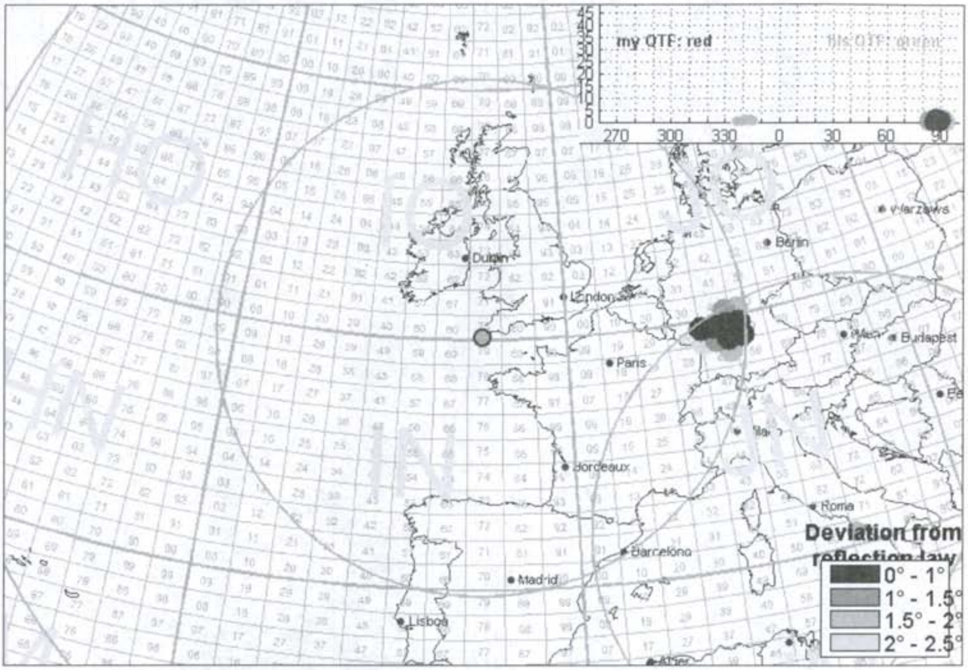


Fig.: Location of possible scatterers for the G4LOH to IC8FAX QSO on July 6th 2005

4m News

Reports, Expeditions, Infos

Editor: Joachim Kraft, DL8HCZ

New countries on 4m now! 3A, LX and SV, SV5, SV9 qrv

As a big surprise und quite unexpected also the amateurs in Monaco (3A), Luxembourg (LX) and Greece (SV, SV5, SV9) got 4m allocations recently. Details:
3A: 70.0 – 70.5 MHz, 100W out.
LX: 70.150 – 70.250 MHZ, 10 W ERP.
SV/SV5/SV9: 70.200 – 70.250 MHz.

OD qrv soon

EI3IO reports that there will come a secondary allocation from 70.0 – 70.5 MHz for amateur radio in the Lebanon soon.

CQ5FOUR beacon QRV

The CT 4m beacon got the callsign CQ5FOUR instead of CQ0BFM and is transmitting on 70608 kHz since the beginning of April with 10w and horizontal halo. Loc.: IM59QD.

CU8DUB beacon proposal

CU8DUB/B is expected to be qrv on 70612 in the beginning of May with 10W from HM49KL.

CT1HZE qrv 4m

CT1HZE (IM57nh) will be qrv on 4m during summer 2006 arround the clock. He will TX always on 70.625 MHz and listen on 70.200 MHz (stand bye RX QRG). For OZ he will listen on 70.110 MHz. For crossband he TX and RX on 50.180 +/- QRM.

FT847 mods for 4m

G4FUF has updated some interesting mods for the FT847 on www.70mhz.org/847mods.htm

6m News

Reports, Expeditions, Infos

Editor: Joachim Kraft, DL8HCZ

Expeditions and News:

5T Mauritania: Nicolas, 5T5SN, IK28AC, has announced that he will not be very active on 6m and 2m in 2006.

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

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

Carribean: ON4IQ is planning the next 6m QRO expedition for summer 2006. He considers PJ7, FJ and / or VP2E.

CN Marokko: W7EJ will be active again as CN2R in the end of October and will try also 6m EME.

DU Philippines: DU7/PA0HIP is qrv until Oct. 6th from PK10wh on 6m, then 2 months back in PA and again 7 months in DU.

FM Martinique: F5JKK is qrv on 6m untill August 2007 as FM5JC. Locator is FK94LO.

FR/G Glorioso: F5OGL, F5JKK, F5CW etc. have again delayed there expedition.

HA Hungary: 6m band was released on a secondary basis on March 29th. 50-52 MHz, 10 WERP.

HB0 Liechtenstein: PA5MW etc. plan a 6m only DXpedition in June / July.

HH Haiti: HH/W3CMP will be qrv from June 18th to 27th on 6m with 200w (may be 700w) and a 5 ele beam. Loc.: FK39.

JW Bear Isl.: JW4GHA Roger is qrv on 6m until about July 6th. QSL via LA4GHA

JX Jan Mayen: JX9JOA stays until October 2006 and may show up on 6m.

KL7 Alaska: K6MYC + W6JKV have cancelled their joint 6m/2m expedition to BQ13.

OX Greenland: OZ1DJJ will be active again from OX in summer 2006.

PR8 Brazil, GI16GL: PR8/CT1DYX has got now his own call PR8ZX. He is qrv on 6m.

TA Turkey: TA2ZAF (ex TA2/OK1MU) is qrv for several years from Ankara, KM69KV, also on 6m. Pavel will try to activate several rare squares in TA on portable operations.

V4 St. Kitts: W6JKV will be qrv on 6m with QRO from June 20th to July 1st.

VP2E Anguilla: VP2E is expected to be qrv on 6m in June / July. Loc. FK88.

VP2M Montserrat: M0AEP, will be active as VP2MDD from July 1-14th on 6m with 350w + 5 ele. QSL via M0ARP.

VP2V British Virgin Isl.: VP2V/K5AND + W7XU will be qrv on 6m with QRO from June 22 to July 3. A Beacon will run probably on 50106.

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

VP9 Bermuda: VP9/N0UK will be qrv on 6m from June 8th to 12th on 6m with QRO. Loc. FM72.

VQ9 Diego Garcia: G4FJK is qrv as VQ9JK until the end of 2006 on 6m. Loc.: MI62EQ.

ZD8 Ascension: G8WVW is qrv until mid 2008 as ZD8I. Loc. II22TB.

IM96 EA7AH/p will be qrv from rare IM96bw on 6m from June 3 to 4. QRG 50130.

IO37 LA3OHA and others plan to activate Rockall sometime between June 13 and 28. There is a chance for 6m operation.

IO57: G4ODA etc. will be qrv from June 1 to 8th on 6m, 4m, 2m as GM4SIV.

IN69 G0VJG, G4BUO, M0MYC, M3CVN, G7GLW and G0FDZ will be qrv from IN69uw from July 26 to August 2 on 6m.

JP31 LA/DF1VB will be qrv from May 2 to 10 mainly on 2m MS, may be also 6m.

KM06/KM16 SV1VS/SV3 will be qrv from August 17 to September 10 also on 6m.

KH6IAA SILENT KEY: Al, KH6IAA, well known 6m DXer has passed away in April.

Beacons

CQ3SIX, IM12, 50.035, 10w, loop, QRV since Jan 11th

DF0ANN 50.083 MHz, JN59PL, 3dBW, new beacon

DB0HGW 50.083 MHz, JO64QC, 3dBW, proposal for summer 2006

EI0SIX, 50052.0 MHz, IO63, 10w, halo, soon qrv.

LU1DMA/B 50.008 MHz, GF05XI, 10W, qrv on new QRG

LU4HH/B 50060.0 MHz, FF78UP, 1W, 3dB 5/8 vertical, 36m a.g.l., qrv since March 2006.

S9SIX, JJ30HE, 50082 MHz, proposal

Z2...SIX, KH52, 10w, halo, proposal

ZD8VHF 50.032 MHz is qrv again with a NEW antenne since April 24th and was already hrd the same day in CT.

ZS6TWB/B 50.044 MHz, KG46 – is QRT & QTH change

Aurora-E in April 2006

K1TOL reports: In the night from April 13th to 14th all the European "beacon/TV carriers" started after local midnight with the OX3/b in first, followed by the OY/b & JX7/b......also probably heard the JW5/b but too weak to ID. The 5 or 6 TV videos were in via Aur-Es from 0400-0900Z. Called many "cqs" on .110 but to no QSO. –

EU videos and beacons made it as far west as N8CJK and K9MU. - Kevin, VE3GIB worked Alaska with 100W & a 5 el beam, and reported some of the KL7s were 59/599.

DDFM (French Departments Contest)

To improve the activity on 6 meters and give a chance to work many french departments, the REF is organizing a 6 meters contest. The contest will take place from 16.00 z on Saturday 10th June to 16.00 z on Sunday 11th June 2006 (24 hours duration).

Meteor Shower Calendar

by Guido Jünkersfeld, DL8EBW

July to September 2006

Name	Date	Max.	ZHR	RA	DEC	v (km/s)	Source
24-Vulpeculids	30.06.-13.07.	4.-7.07.	var.	303	+24		BMS50
pi-Sagittariids	02.07.-19.07.	6.-10.07.	9	285	-21		BMS50
Caprocornids	04.06.-02.08.	08.07.	10	311	-14		BMS50
kappa-Aurigids	03.07.-17.07.	10.07.	20	094	+28		BMS50
Pegasids	07.07.-13.07.	09.07.	3	340	+15	70	IMO06
alpha-Oriionids	**09.07.-15.07.**	**12.07.**	**50**	**087**	**+12**		**BMS50 *1**
nu-Geminids	**09.07.-18.07.**	**12.07.**	**60**	**098**	**+21**		**BMS50 *1**
lambda-Geminids	**04.07.-29.07.**	**12.07.**	**30**	**110**	**+15**		**BMS50 *1**
beta-Cancrids	**09.07.-15.07.**	**12.07.**	**20**	**122**	**+13**		**BMS50 *1**
July Phoenicid	**10.07.-16.07.**	**13.07.**	**var.**	**032**	**-48**	**47**	**IMO06 *1**
beta-Capricornids	10.07.-25.07.	15.07.	14	314	-14		BMS50
sigma-Cassiopeids	12.07.-21.08.	15.07.	7	002	+56		BMS50
Pisces Austrinids	15.07.-10.08.	28.07.	5	341	-30	35	IMO06
S.Delta Aquarids	**12.07.-19.08.**	**28.07.**	**20**	**339**	**-16**	**41**	**IMO06 *2**
a-Capricornids	03.07.-15.08.	30.07.	4	307	-10	23	IMO06
gamma-Pegasids	12.07.-15.09.	1.-10.08.	10	005	+11		BMS50
S.iota-Aquarids	25.07.-15.08.	04.08.	2	334	-15	34	IMO06
Aquar-Capricornids	11.07.-15.08.	06.08.	11	327	-11		BMS50
N.delta-Aquarids	15.07.-25.08.	08.08.	4	335	-05	42	IMO06
delta-Cassiopeids	20.07.-12.08.	10.08.	10	018	+59		BMS50
Perseids	**17.07.-24.08.**	**12.08.**	**100**	**046**	**+58**	**59**	**IMO06 *3**
upsilon-Pegasids	01.08.-17.08.	12.08.	10	350	+19		BMS50
kappa-Cygnids	03.08.-25.08.	18.08.	3	286	+59	25	IMO06
N.iota-Aquarids	11.08.-31.08.	20.08.	3	327	-06	31	IMO06
gamma-Leonids	14.08.-12.09.	25.08.	low	155	+20		IMO06
alpha-Aurigids	25.08.-05.09.	01.09.	10	084	+42	66	IMO06
alpha-Hydrids	01.09.-02.09.	01.09.	9	030	-62		BMS50
epsilon-Perseids	21.08.-16.09.	3.-7.09.	10	062	+37		BMS50
pi-Cetids	28.08.-10.09.	05.09.	8	051	-16		BMS50
delta-Aurigids	05.09.-10.10.	09.09.	5	060	+47	64	IMO06
Piscids	01.09.-30.09.	20.09.	3	005	-01	26	IMO06
kappa-Aquarids	08.09.-10.10.	21.09.	3	339	-02		5IY97
Sextantids	09.09.-09.10.	27.09.	med.	152	0		IMO06

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

***2** Ein kleiner, aber auf große Distanzen, sehr effektiver Schauer. So gelangen dort in den letzten Jahren sehr oft QSOs zwischen 2000-2300km, bei denen man sich vorher nicht den großen Erfolg ausgerechnet hatte! Allerdings ist dieser Schauer nicht jedes Jahr ergiebig und das Maximum ist nur weinige (2-3) Stunden kurz.– A small shower but over the last years very good for QSOs up to 2300 kms. Anyway not every year the results are so good and the maximum is quite short (2-3 hours). -

***3** Die Perseiden (bekannt als Laurentiustränen) sind sicherlich einer der attraktivsten MS-Schauer im ganzen Jahr, da es im Maximum immer wieder zu langen Bursts kommen kann, die speziell die SSB-MS-Freunde begeistern. Das erste Maximum wird in der Nacht vom 12. auf den 13.8. erwartet.

– The Perseids are for sure the most attractive shower of the year and especially the SSB-MS OP's will like it. This year's 1st maximum is expected for the night from August 12th to 13th. 73 de Guy, DL8EBW.

Legend / Erklärungen: see DUBUS 4/2005, page 100

News & Comments

Editor: Joachim Kraft, DL8HCZ
info@DUBUS.de

- Beacons

EA3UHF qrv again on 23cm

After several months being QRT because of lighting, the EA3UHF, 23cm, beacon was activated again on 22-March-2006. Frequency: 1296.927 MHz, message: VVV EA3UHF JN01WU, power: 10w, Antenna: 2 antennas of 5 and 6 elements, one beaming Barcelona and the other beaming EA5, ASL: 608 m.

Pau, EA3BB, working on EA3UHF antennas

W2ETI 23cm EME Beacon qrv again

The SETI EME beacon W2ETI is back on 1296.000 and copiable off the moon. It was QRT for more than one year. They have a new DB3NT PA that they are presently running at about 350 W, but still have not changed their antennas, so it is a good test of system sensitivity. (The new antennas are on order). They also appear to have some tracking problems and appear to be better aligned when the moon is high. Info on the beacon and minute-by-minute updates can be found at www.PriUPS.com/emebeacon. (from K2UYH NL)

DL0PR now DM0PR

The N-DL Aurora-beacon DL0PR has changed call to DM0PR and is qrv again since March on 144.486 MHz from JO44JH.

VO1ZA/B QRT

Don't waste any time to listen for this one on 144.400 MHz! This transatlantic beacon (Loc. GN37) has been QRT since January 2005 without informing anybody about this, unfortunately. The beacon is not supposed to come back. Obviously there is currently no interest in any 2m transatlantic proagation tests from VO1/VE1.

IH9GPI: New 2m beacon on Pantelleria Isl.

IH9GPI has switched on a new 2m beacon inn March. Callsign is IH9GPI/B on 144.469 MHz. Locator JM56XT. 10W, 2 x 3 ele to 360 deg.

TS2DUB canceled

The TS2DUB 2m beacon project was cancelled due to the appearance of the new close IH9GPI beacon.

TK5ZMK Beacon qrv from Corsica

Since April 23 the new beacon TK5ZMK/B is qrv on 144,485 MHz from JN41JS with 10W to a big wheel from 635 m a.s.l. Keeper is Patrick, TK5EP. http://tk5ep.free.fr/index_f.htm

DB0FGB back on 10 and new on 3.4 GHz:

The beacon DB0FGB (JO50WB) is back again on 10 GHz. New is the 3.4 GHz part: QRG is 3400.833MHz, 2W out and sloted WG (2 x 8). Latest infos for DB0KI and DB0FGB are on the web at: www.dl6nci.de/ at "jo50-bcns". (DL6NCI)

ZD8I Ian and his son Simon installing the new vertical for the ZD8VHF 6m beacon on April 23, 2006

- Expeditions

Baltic VHF Expedition 2006 to KO23, 34, 35, 36

After some very successful VHF expeditions during the last few years the well-known expeditioner's of the German North Eastern Contest Gang (DFØTEC/DMØY) will start a tour into the Baltic region again. The crew will consist of: DG1BHA (Heiko), DG1BRS (Stephan), DH8BQA (Olli), DL3BQA (Uwe) sowie DO3GMG (yl Gabi). Activity is planned from the following grid squares:

KO23 16. - 20. June '06 (incl. IARU 50 MHz contest on 17/18.6.06)

KO35 21. - 27. June '06 (base QTH)

KO34 one day between 23. and 26. June '06 (side-trip) and

KO36 one day between 23. and 26. June '06 (side-trip), KO34 and 36 if weather permits

They will be QRV on 6 m (Tropo, ES, Aurora) and 2 m (Tropo, ES, Aurora, MS). Meteor Scatter in FSK441 will be random only on 144.358 MHz (+/- QRM). Callsigns in use will be LY2AAM and LY/homecall + YL/homecall (KO36) according to CEPT regulations respectively. The crew will try to keep their website http://www.necg.de/ up to date also from abroad. So take a regular look there for news and completed QSOs lists.

Vy 73, Olli – DH8BQA

LA/PA5DD qrv from JP54

Uffe, PA5DD, will be qrv from July 8th to 17th on 6m, 2m and 70cm from JP54. Incl. FSK-MS. May be also JP64 will be activated. Check: http://home.hccnet.nl/uffe.noucha/

IS0 on 2m & 70cm EME

IK0BZY plans to be QRV from IS0 Sardinia Island JM49 from 16th to 29th August on 2m & 70cm EME on JT65B and CW. Rig: 2m: 1 x 8el 2,5 wl ik0bzy full elevation+polarity switching + 300w; 70 cm: 1 x 10wl DJ9BV full elevation + 250w.

GM6VXB/p qrv from IO99 and IP90

Work is taking GM6VXB to the Shetland Isles some time in May. He will be taking equipment for 6, 4 and 2 m, and hope to operate from IO99, and IP90. Operation will be evenings and weekends only (due to work), but will be there for at least three weeks. Incl. FSK-MS. Rig: 100 Watt and 5 elements on 50/70, and 100 Watt and 9 element on 144. 73, Martin

- More expeditions

G0KZG/MM plans to be qrv again during summer via FSK-MS on 2m from the North sea and Atlantic ocean close to Ireland and may be the Biscaya.

/MM DL2SB will be qrv as OH5SB/MM from JO85, JO96, KO07, KO08 on July 3 and July 28. Rig: 50W and HB9CV. QRG: 144.288 and 144.300 MHz.

IM96 EA7AH/p is qrv on 6m/2m/70+23cm from June 3 to 4.

IN69 G0VJG, G4BUO, M0MYC, M3CVN, G7GLW + G0FDZ will be qrv from July 26th to August 2nd from IN69uw on 6m.

IN77 F/DL1GI is qrv from June 3 to 23 on 2m, incl. FSK-MS, Loc. IN77uu.

IO57 G4ODA will be qrv from July 1 to 7 on 6, 4, 2m, 70cm with the call GM4SIV.

JN60 IK0BZY/p is qrv on May 20/21 on 2m FSK-MS.

JO13 PC7CW/MM plans to activate JO13 on 2m and 6m during June or July during a weekend trip.

JO34 DA0T/p (DG3XA) will be qrv on 2m with 50w + 9 ele from July 29 to 31 from Helogoland for Tropo/Es.

JP74 SM6CMU will be qrv again from northern SM and LA in from several squares the end of July and beginning of August. He is qrv on 2m and 6m but also wants to try 70cm FSK-MS from JP74xf.

KM06/KM16 SV1VS/SV3 will be qrv from 20.8.-29.9. on 6m, 2m and 70cm qrv. QSL via SV1VS.

KM19 SV/OE6IWG is qrv from August 28 to Sept. 9 on 2m via FSK-MS. Loc. KM19uw.

KO08 ES/DK2ZF will be qrv from July 21 to August 3 on 2m via FSK-MS. Also qrv 6m and 70cm.

KO98, LO04, LO05 RW3PF and RW3PN plan to a activate these squares on 2m FSK-MS from August 8 to 13. Call will be RW3PWJ/3.

KP43 and 53 The **OH8K/OH9O** group plans to go there from June 9 to 13 for 2m FSK-MS and 6m. For August (Perseids) they plan to activate **KP49.**

KP70, KO79 OH5LID, RA1AS and RX1AS will be qrv from June 4 to 7 as RK1B/p on 2m FSK-MS. On June 8 they change to KO79.

LN04 RW1ZC/6 is qrv now until August on 2m and 70cm.

1S Spratly: JA1RJU (Op DZ1JP) plans a 2m and 6m EME expedition to Spratly Isl.

3A Monaco: PE1LWT and/or PA2CHR plan to go there again for 2m FSK-MS this year. Loc. JN33RR.

5A Libya: DL8YHR, DL9USA etc. will be qrv on 2m (EME + FSK-MS) operation in the end of November with the call **5A7A**. Licence is o.k.! Loc: JM62. QSL via DL9USA.

7Q Malawi: ZS6JDE plans to be qrv on 2m EME from June 25 to July 12 as 7Q7JE. Loc. KH65.

C9 Mocambique: K5LUA, ZS6JR etc. plan to be qrv on 2m EME in JT65 from June 29th to July 13th.

CT3 Madeira: CT3/DL1YMK will be qrv in CW from June 1st to 16th on 23cm for EME qrv. Loc. IM12. May be also qrv 70cm EME and 2m Tropo.

EA8 Canary Isl.: EA8/DL4DWA will be qrv from August 1st to 22nd on 2m for Tropo and Es qrv. Loc.: IL18CP.

EA8/DL7AJA/p will be qrv from July 20th to Aug. 3rd on 2m, 70cm, 23cm and 10 GHz. From IL18.
On 22./23.7. and 28./29.7. he will activate IL08 for one day each. He will run a beacon close to 144.300 to EU.

GU Guernsey, IN89: M0BPQ plans to be qrv in the last week of July on 2m, 4m, 2m and 70cms incl. FSK-MS.

HB0 Liechtenstein: PA5MW etc. plan a 6m expedition in June/July.

HH Haiti: HH4/W3CMP will be qrv from June 18th to 27th from FK39 on 6m with 200 (may be 700w) and 5 ele. yagi. Also 2m operation is planned with a 9 ele yagi and 170w.

KH6 Hawaii: W7EME will be qrv on 2m again in July. He will change QTH from BL02 to BK29.

SV5 Dodecanese: SV5/ON4IMM is qrv from May 28 to June 5 on 2m for Es with 40w and 5 ele.

TF Iceland: TF/DL2NUD will be active from several squares (HP.. + IP..) from May 30 to June 15. FSK-MS and EME on 2m with 1KW and 12 ele M2. Hermann will also try to work /MM on the way to TF on May 28 to 30 and back on June 15 to 17 if he gets permission from the captain.

- OPs

YV5LIX SK

Well known 2m and 6m DXer Jose Manuel Valdes Rodriguez, YV5LIX suffered a massive heart attack in April while on Aves Island with the YX0A team and passed away at 57 years of age. The operation continued under a new call YX0LIX.

- News

Good UWB News

CEPT has released a final decision permitting UWB in the 6-9.5GHz band and a further consultation for it in the 3.4-4.8GHz area. The 'high' band decision is largely in line with a joint UKuG/RSGB/Amsat-UK submission at Christmas last year. Further info is on: www.ero.dk , www.microwavers.org and http://www.rsgb-spectrumforum.org.uk/microwaves.htm
At the very least, the 5.7 and 10GHz amateur bands look fairly safe from this particular threat. It will be interesting to see what impact we get at 3.4GHz (along with the Radar and WiMAX community) where the bulk of the UWB chipsets are aimed at present. (from Scatterpoint)

Australia: Threat for 24 GHz band

Australian radio amateurs could lose one of their most important amateur satellite bands. The country's telecommunications regulator – the Australian Communications & Media Authority – is proposing to change the Australian radio frequency spectrum plan to accommodate ultra wideband vehicle radar technology in the 22 to 26.5GHz frequency band. If given the go-ahead, this plan would result in Australian radio amateurs losing their primary access to the 24 to 24.05GHz amateur satellite segment and being severely curtailed in experimenting in the secondary access segment of 24.05 to 24.25GHz. (RSGB)

Voyager received by CT1DMK

Voyager 1 was detected by Luis, CT1DMK, on April 14th 2006 using a 5.6m dish on 8420.4286 GHz with extremely long integration time. It is about 98AU from earth that is aprox. 14698 million Km (3 times further away than Pluto). Luis writes: To detect this signal that is expected to be 13dB/Hz below the noise floor I had to aquire and integrate spectrograms for a long time. I did several aquisition periods of 15 minutes (900s) the minimum I would expect to see something. More than 15min in each chunk is also undesirable because of the doppler change correction scheme used. The receiver is operated at fixed frequency and the doppler variation was corrected by skewing sucessive spectrograms in software while accumulating. Positive identification of the V1 signal arises from the fact that signal is only visible for the right skew ammount that corresponds to the doppler variation as predicted by the relative velocity calculation." G3RUH has checked the recorded files also and came to the conclusion that Luis has properly received Voyager 1. More info on the web at: http://w3ref.cfn.ist.utl.pt/cupido/dsn.html

CT1DMK`s 8.4 GHz converter

Voyager 1 also received in Bochum

On March 31st 2006 Voyager 1 also has been received with AMSAT's 20m dish in Bochum (IUZ) by the radio amateurs Freddy de Guchteneire, ON6UG, James Miller, G3RUH, Hartmut Päsler, DL1YDD and Achim Vollhardt, DH2VA.

- Dates

1. DUBUS Atlantic Activity Weeks DAAW

In order to promote VHF/UHF/SHF activity via Tropo over the Atlantic Ocean DUBUS wants to introduce the 1st DUBUS Atlantic Activity Weeks (DAAW). Dates are July 22nd to August 6th. All stations around the Atlantic Ocean should try to be qrv as much as possible on 144.300, 432.200, 1296.200 and higher bands also. There will be activity from EA8 by EA8/DL7AJA, EA8/DL4DWA, EA1DDO/p, 6W1SA, 5T5SN, CN2DX (hopefully), D44TD, CU8AO, CT1HZE and hopefully more portable activities from G, F, EA, EI and others.
This will not be a contest but an opportunity to try and work very long distance QSOs over sea paths and study propagation. Please check for more info and updates in due course in the NEW FORUM on the DUBUS website at www.dubus.de

12th International EME Conference in Würzburg/Germany

It's only a few months until the start of the 12th International EME Conference from August 25 to 27, 2006 in Würzburg / Germany. More than 100 attendees from all over the world have already registered for the conference (which is not focussing on a single band or mode).
So far the following lectures are confirmed:
Josep M Prat EA3DXU: C31TLT Expedition
Paul Chominski WA6PY: Interference into 13 cm EME bands from 2.4 GHz ISM band
Paul Wade W1GHZ: High-efficiency Feeds for Parabolic Dishes
Michael Kohla DL1YMK: EI/DL1YMK Expedition
Peter Blair G3LTF: 13cm FAQs and their answers
Ingo Gaspard DF1VH: Building a simple PANFI - 'SPANFI'
Zdenek Samek OK1DFC: Building a big dish
Paul Shuch N6TX (SETI): W2ETI 23cm EME Beacon Update
Klaus v.d. Heide DJ5HG: Forward Error Correction in Ham radio weak sigal applications
Michiaki Watanabe JH1KRC: JA EME activities
Freddy de Guchteneire ON6UG: Amsat-DL and the Voyager 1 receiving experiments at the IUZ Bochum 20m dish
Andrea Mancini IW4CJM: 2004 test/study whit bistatic radar, at 10GHz on the Moon
Goliardo Tomassetti I4BER: Cassegrain configurations
Moreover Al Katz K2UYH, Jim Vogler WA7CJO, Joe Taylor K1JT and Jeffrey Pawlan WA6KBL will also hold a presentation at the conference.
Lates news about the conference can be found on the dedicated website **www.eme2006.de/eme2006.htm**

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Deadline for DUBUS 3/2006 is August 1st 2006

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In this issue:

“Virgo” by DL1DBC – www.DL1DBC.net

47 GHz Pocket Transverter by DCØDA