An Amateur Radio publication for the Microwave Enthusiast

# scatterpoint

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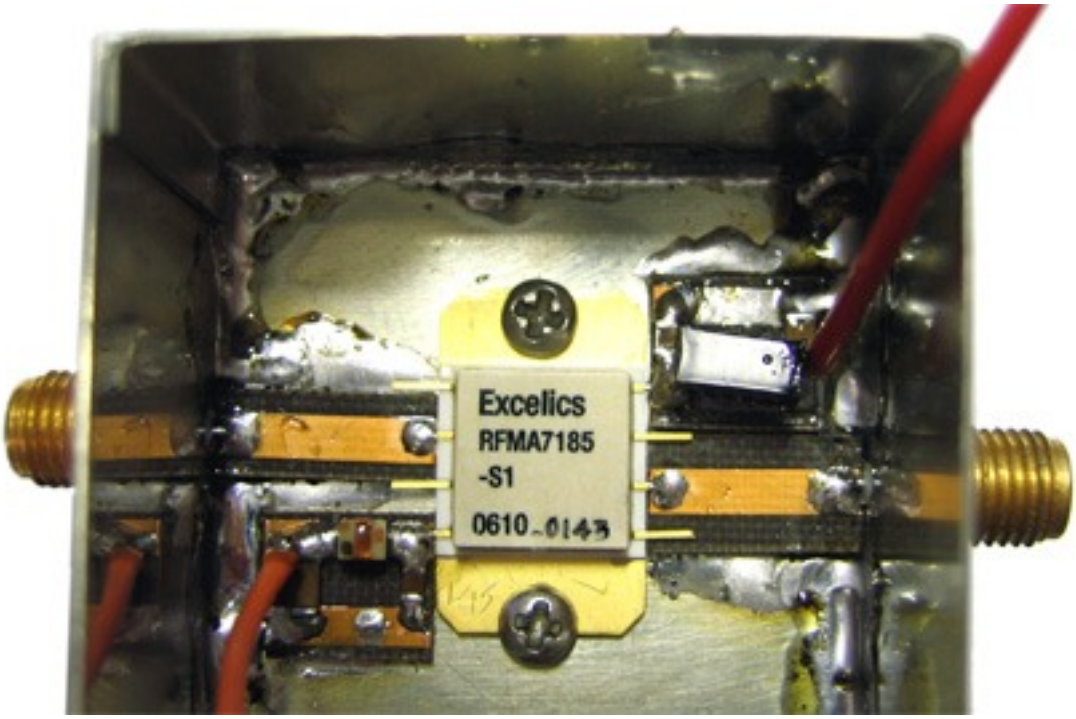
A simple 10GHz power amplifier for beginners

by

Franco H Rota I2FHW

See page 4

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## Latest News

- To make up for missing an issue in March, here is a bumper 32-page edition.
- F2CT First 24GHz EME QSO and a First 24GHz EME F/OK (p.30)
- Most Martlesham beacons were off the air for varying periods of a few minutes to about two hours on 3rd June. All are now back on the air. The only significant change is that the 24GHz beacon is back on 24,048.830 (actually 600Hz high when we left!). The temperature is varying in the equipment room so it is likely to move again but not as far as before! It is still located inside the room so does not have significant coverage. The only beacon that is locked at present is 10GHz (GB3MHX). There is a programme to lock the remainder over a period of time although none of them are very far off .830. For those who are not sure, all bands from 1.3GHz to 24GHz are covered from JO02PB.
- Scottish Round Table, Saturday 5 November – p.32

**Many thanks to all our contributors this month, without whom there would be no Scatterpoint!**

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# Editor's bit

***Greetings from the new boy!***

Peter is having a well-earned rest from the job of editing this magazine and deserves much praise and thanks. He's been doing it since 1984, when Scatterpoint was the RSGB Microwave newsletter.

In a moment of weakness I volunteered to take up the baton so you may see some changes in layout style but, hopefully, no decrease in the quality (and quantity!) of the content – which is, after all, thanks to your activities and, especially, those who contribute news and write articles.

Peter featured on the cover of Issue 1 as

**GM3PHO/P on the**

**CAIRNSMORE OF CARSPHAIRN**

I guess he'll have a bit more time for such things now and possibly the odd article for Scatterpoint?

In case you were wondering, yes, I'm yet another ex-BT Martlesham chap, but not a radio man by profession.

If you want to know any more see g8bhc.info

Thank you for your continued support of UKµG.

**73 de Martin G8BHC**

News, views and articles for this newsletter are always welcome. Please send them to editor@microwavers.org).

The CLOSING date is
the FIRST day of the month

if you want your material to be published in the next issue.

PS As you missed an edition in March due to Peter's absence on holiday, **there will be separate July & August editions this year**. *So get writing!*

Thankyou!

# The new Scatterpoint

Previous editors used MSPublisher.

I'm now using Pages on an iMac.

Please submit your articles in any of the following formats:–

**Text: txt, rtf, rtfd, doc, docx, odt, pages**

**Spreadsheets: Excel, OpenOffice, Numbers**

**Images: tiff, png, jpg**

I can extract text and pictures from pdf files but tables can be a bit of a problem so please send these as separate files in one of the above formats.

Thank you for you co-operation.

**Martin G8BHC**

UK MICROWAVE GROUP

# SUBSCRIPTION INFORMATION

The following subscription rates now apply.

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This basic sum is for **UKuG membership.** For this you receive Scatterpoint for **FREE** by electronic means (now internet only). You will only be able to receive Scatterpoint electronically via the Yahoo group.

Please make sure that you pay the stated amounts when you renew your subs next time. If the amount is not correct your subs will be allocated on a pro-rata basis and you could miss out on a newsletter or two!

You will have to make a quick check with the membership secretary if you have forgotten the renewal date. From now please try to renew in good time so that continuity of newsletter issues is maintained. Put a **renewal date reminder** somewhere prominent in your shack (the previous editor suggested having it tattooed on your forearm!).

Please also note the payment methods and be meticulous with PayPal and cheque details.

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Welcome to the first edition of Scatterpoint under the new editorship of Martin G8BHC. Martin may not be too well known to some of you but he has huge experience in this type of work, and will be ably assisted by the Committee and of course, the readers!

I say that very pointedly because the articles come from you, the membership, and we hope that they will continue to be forthcoming. I am sure that Martin will continue the excellent job done by Peter G3PHO over many years. Much has been said already on the reflectors and elsewhere about the magnificent job Peter has done but I would like to say it one more time.

*Thank you Peter for your contribution to Scatterpoint and to Microwaves in general.*

You will see some changes in Scatterpoint over the next few months; the move to all-electronic distribution will allow us to do some things in a different, and we hope, more 21st century way. That said we aim to continue the tradition of Scatterpoint as an up to date journal, with relevant and well written articles; a source of information you can return to again and again.

**73 John G4BAO – Chairman**

# A simple 10 GHz power amplifier for beginners[1]

**By Franco H Rota I2FHW**

## 1. Introduction

The purpose of this article is to demonstrate how extremely easy it is for beginners in the microwave field to build a 10GHz power amplifier. Can you understand a guy who usually makes things “dead-bug” style (ugly construction) who proposes this for a 10GHz project?

There is no problem building this 10GHz power amplifier in a similar way to “dead-bug” style because the component that I will describe always works without problems. I even made a sample of this device that will shock hard core microwave fans but it shows the reliability of this component.

I also think that, thanks to this article, there will be an incentive to use the 10GHz band because many hams have a transverter with 10mW output that can be raised to 1W with this device. The amplifier can be used with SSB modulation, ATV or any other kind of modulation, including pulse modulation.

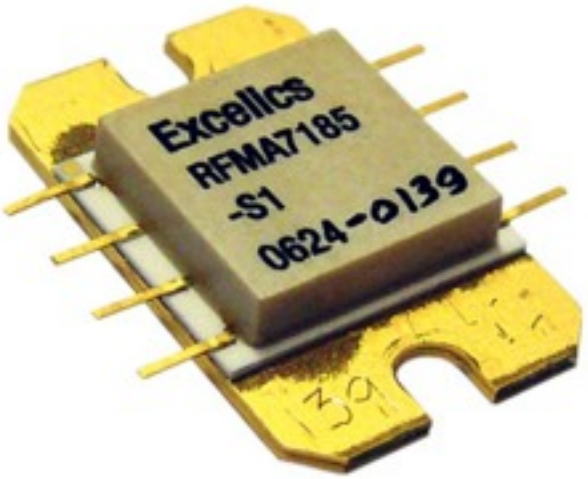
To be really sure of the application of this device, I made eight prototypes with different mounting styles, different serial numbers and different data codes. They all worked well, so I can confidently say that the device has no problems.

## 2. Microwave power devices

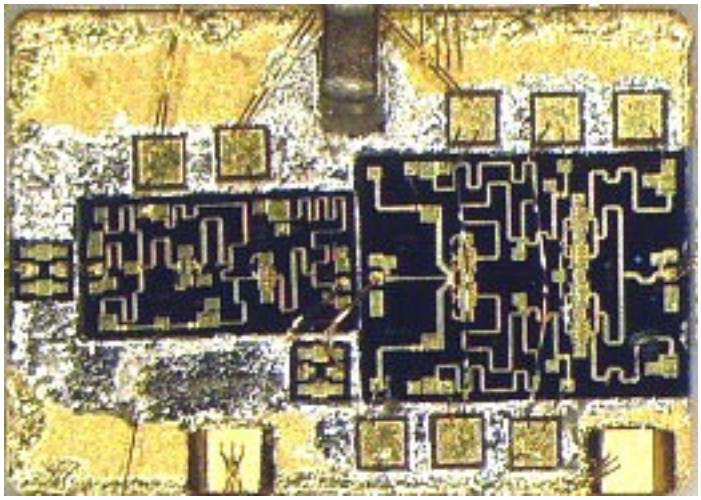
In the microwave field there are two different ways to build a power amplifier:

A The most popular components are broadband power GaAs-FETs, they are a reasonable price, are well known and readily available. Because they are broadband (they can be used at 1GHz as well as at 10GHz) they need matching for all frequencies and this may cause some complications. The advantage is that these components have a wider application and are a little less expensive than an MMIC. They have a small package because they have no internal matching network.

B Another solution is to use internally matched GaAs-FETs (also known as MMIC). They are very simple to use because the internal networks match the impedance around 50 Ω but these matching networks limit the bandwidth.




If we use a high power device, internally matched, the power combiners and the matching networks in the device reduce the bandwidth. The devices for high power have more complicated internal matching networks that reduce the bandwidth quite a lot. If instead we use a medium power device, the power combiners and the matching networks in the device will have a relatively wider bandwidth that will allow it to be used for a wider frequency range than it was designed for.



**Figures 1, 2 – RFMA7185-S1 and Internal view**

The devices tested are made by Excelics with the part number RFMA7185-S1. It was matched for 7.1 – 8.5GHz but being a device with only 1W output it is suitable for frequencies from 6 to over 10GHz.

I took a photograph using a microscope to see the internal parts of the device and I could see the

1. Previously published in VHF Communications 3/2010 p130–135 and reproduced with permission.

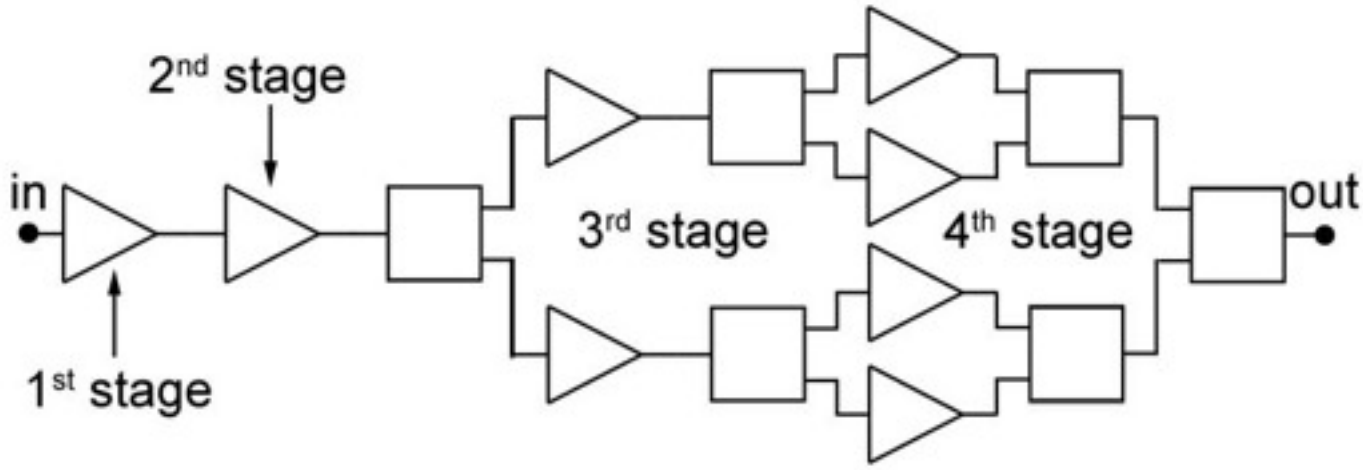



**Figure 3 – Internal diagram of RFMA7185-S1**

internal matching network with the power combiners as shown in Fig. 2.The power combiners have a bandwidth of more or less one octave, with the matching network the overall bandwidth is reduced.

The RFMA7185-S1 has four internal amplifier stages. The first and the second are made from a single GaAs-FET, the third from two GaAs-FETs while the fourth is made of four GaAs-FETs. There are wide band matching circuits and the power combiners for the third and fourth stages. It has a professional gold-plated case that is easy to mount. In fact the case is not SMD or ultra- miniature BGA – it has two little lugs to ease mounting and heat dissipation. (See Figure 1)

## 3. RFMA7185-S1 performance

This device is optimised for 7.1 – 8.5GHz the results obtained with my eight prototypes are the following:

**Table 1 – RFMA 7185-S1**

Test conditions : $V_{DD}$ +9 V power supply , $V_{GG}$ -5 V negative bias , Pout = $P_{1dB}$

| | #1 | | #2 | | #3 | | #4 | | #5 | | #6 | | #7 | | #8 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| freq. | Pout | Pin | Pout | Pin | Pout | Pin | Pout | Pin | Pout | Pin | Pout | Pin | Pout | Pin | Pout | Pin |
| **GHz** | **dBm** | | **dBm** | | **dBm** | | **dBm** | | **dBm** | | **dBm** | | **dBm** | | **dBm** | |
| 10.4 | +30.5 | +8 | +29.5 | +9 | +30.5 | +5 | +29.7 | +10 | +29.8 | +10 | +30 | +8 | +30.8 | +6 | +30.8 | +8 |
| 10 | +31.7 | +4 | +29.5 | +5 | +30.5 | 0 | +30 | +8 | +30.2 | +7 | +30.7 | +5 | +31.4 | +3 | +31.2 | +5 |
| 9 | +31.8 | +2 | +29.7 | -1 | +30.7 | -1 | +30.7 | 0 | +30.6 | -1 | +31.3 | +2 | +31.1 | -1 | +31 | +2 |
| 8 | +31.5 | 0 | +30.2 | -1 | +30 | -1 | +29.8 | 0 | +30.9 | -1 | +30.7 | 0 | +30.5 | -1 | +31.1 | +1 |
| 7 | +31.7 | -1 | +30.1 | 0 | +29.7 | -2 | +30 | 0 | +30.6 | -1 | +31.3 | 0 | +31.2 | -1 | +31.1 | +1 |
| 6 | +31.8 | +2 | +29.6 | +5 | +29.5 | -1 | +29.5 | +3 | +30.2 | -1 | +30.1 | +2 | +30 | 0 | +30.5 | +2 |
| 5.7 | +30.5 | +8 | +27.5 | +10 | +29 | +9 | +28 | +9 | +29.3 | +7 | +29 | +8 | +28 | +6 | +28.3 | +9 |

It can be seen from Table 1 that the device is optimised from 7 to 9GHz and in this frequency range the gain is about 30dB with an output power at least +30dBm (1W). Out of the optimised frequency band the device is still able to provide +30dBm up to 10.4GHz even if the gain is reduced to 20/25dB.

20/25dB gain corresponds to a driver of about +7/+10dBm (5/10mW) that is ideal to be driven by a traditional low power MGF1302 GaAs-FET normally used in 10GHz transverters. During the tests I didn't detect any self-oscillations or any other strange behaviour. I also maltreated some prototypes with mismatched input and output and nothing happened.

The manufacturer suggests using a +6.5V power supply but the device also behaves well at +9V and it even worked at +11V but I suggest not exceeding +9V. The -5V negative bias of about 15mA must be provided on the VGG pin by a traditional ICL7660. Under these conditions of power supply and bias the

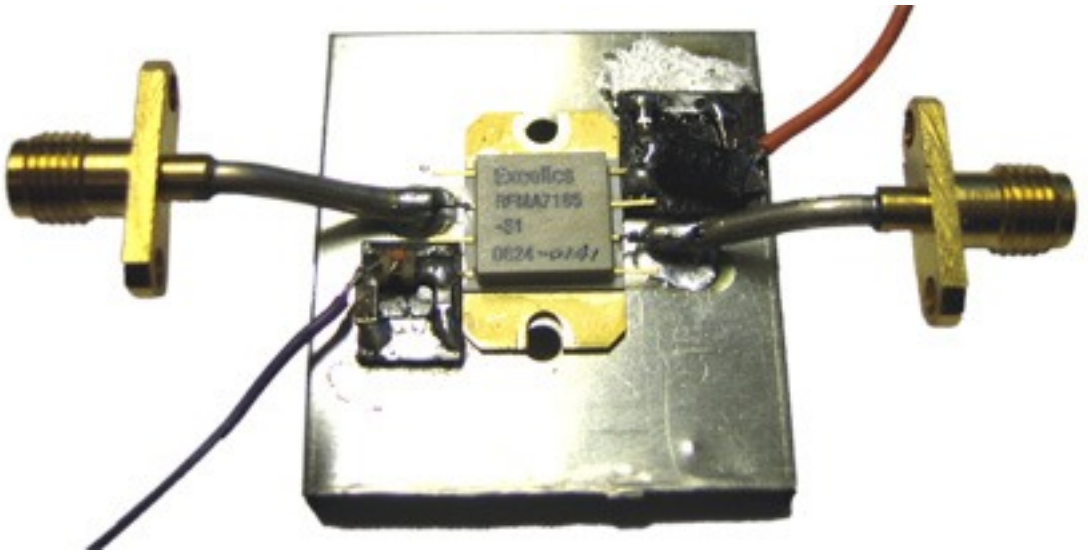



**Figure 4 – Prototype #2: even though it works we don't suggest mounting like this. This only demonstrates that the devices works even in critical conditions.**

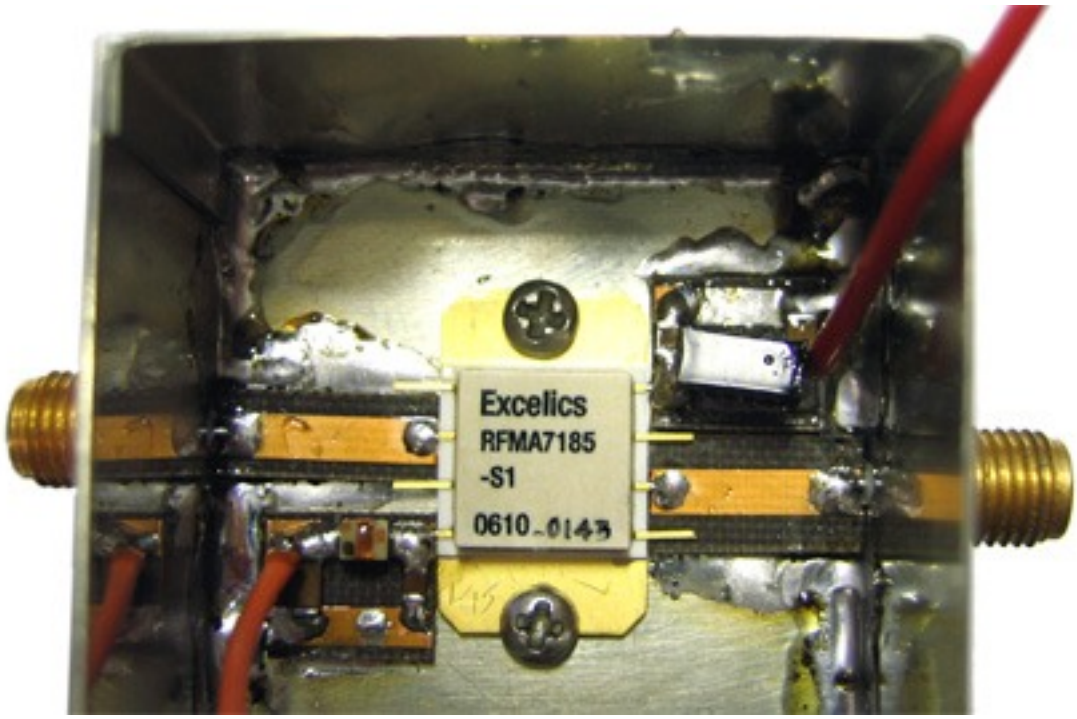



**Figure 5 – Prototype #6**

drain current is about 1A that means the device works perfectly in a linear class, in fact the manufacturer designed them for a class A radio link using digital modulation.

Figure 6 shows the circuit diagram. It contains the 9V positive regulator (IC1), I used the LM217T that is the high performance version of the LM317T, the rating must be at least 1.5A. IC2 is an LM78L06 positive regulator that drives the ICL7660 negative regulator (IC3), because the RFMA7185-S1 needs about 15mA of negative bias and the voltage drop of the ICL7660 is about 1V with that current, we will have exactly -5V as negative bias.

In order to avoid damage to the GaAs-FET it is necessary to sequence the power supply, first the negative bias and then the power supply. To do this we need the BC847 transistor (T1) and 4V7 Zener diode (D1) that enable IC1, if the negative bias is missing it will block the power supply.

The components around the GaAs-FET are not particularly critical, I only remind you that for 1A or more current it is necessary to use a choke that has this current rating, the 17.5nH Coilcraft type B06T choke (L1) can carry 4A.

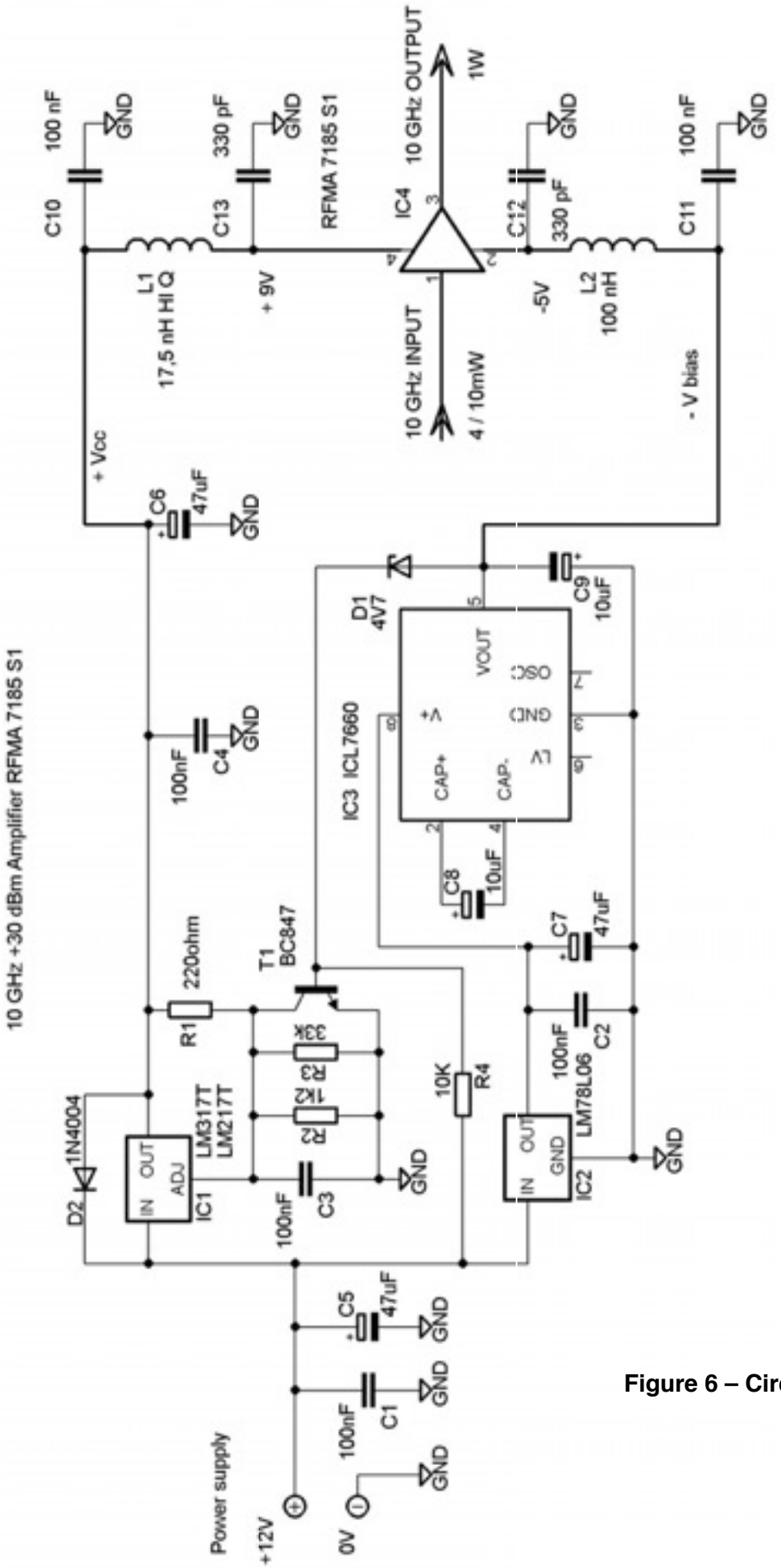



**Figure 6 – Circuit Diagram**

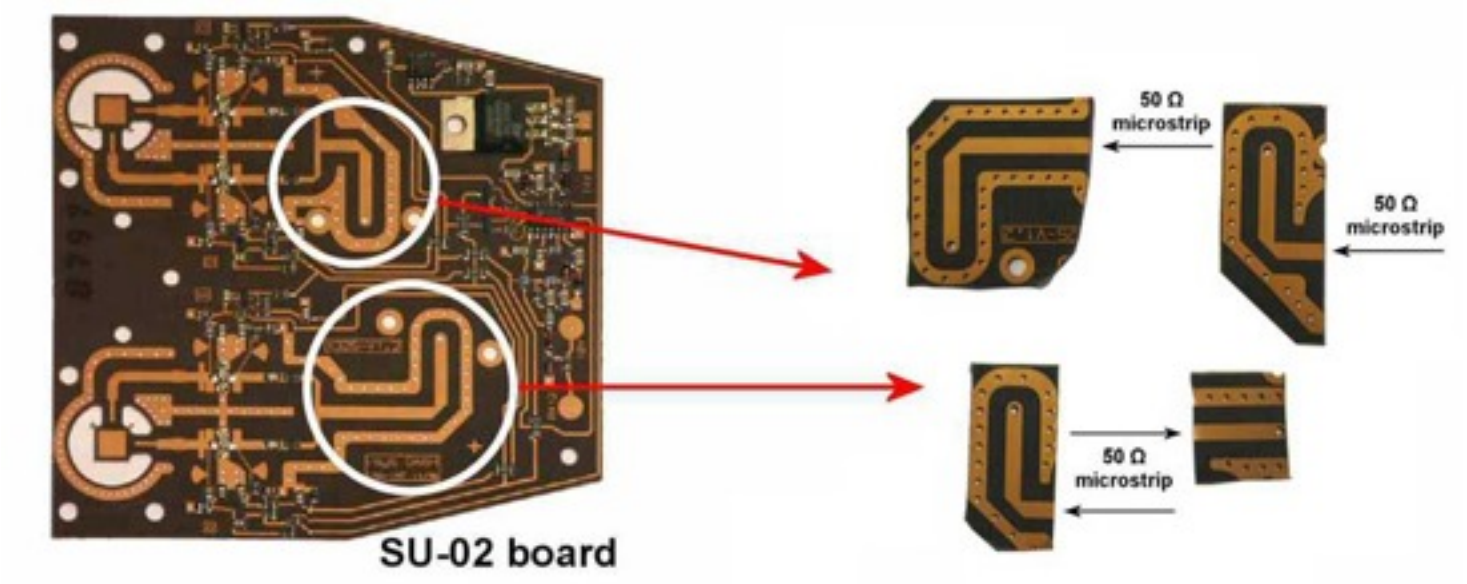



**Figure 7 – shows an example on how to save a piece of RF PC board**

## 4. Assembly

As described, the assembly of the power GaAs-FET is not critical. It means that for a good result it is not necessary to use Teflon printed circuit board, if you keep the tracks short between connectors and pins you can use the normal FR4 epoxy fibre-glass laminate. In this case I suggest using the 30 or 31 mils thickness (0.8 mm) laminate, not the 1.6mm thickness laminate.

The 50 Ohm input and output tracks can be even saved from any kind of surplus PC board, for example from my SU-02. In this case you can cut a piece of the track from the PC board which must, however, be double-sided copper.

Other components can be SMD or not and it is possible to mount them “dead-bug”. Figure 5 shows an example of very simple mounting of the RF parts. As for all microwave components, it is suggested that a microwave absorber is mounted on the inner side of the top of the box in order to avoid any self-oscillations and unwanted resonances of the box. See “Franco’s Finest Microwave Absorbers” in issue 4/2004, which explained how microwave absorbers work and the efficiency of these absorbers.

**Part list**

| Code | Part # |
|---|---|
| C1, C2, C3, C4, C10, C11 | 100nF |
| C5, C6, C7 | 47µF 16V electrolytic |
| C8, C9 | 10µF 10V electrolytic |
| C12, C13 | 330pF |
| D1 | 4V7 0,4W Zener diode |
| D2 | 1N4004 |
| IC1 | LM217T or LM317T |
| IC2 | LM78L06 or any 6V 100mA regulator |
| IC3 | ICL7660 DIL or SMD |
| IC4 | RFMA7185-S1 |
| L1 | 17.5nH HQ SMD inductor |
| L2 | 100nH HQ SMD inductor |
| T1 | BC847 or any NPN general purpose transistor |
| R1 | 220Ω |
| R2 | 1.2KΩ |
| R3 | 33KΩ |
| R4 | 10KΩ |
| RF PCB | see description below or see SU-02 |
| Absorber | see notes |

## 5. Conclusions

As explained, I assembled eight different prototypes with the purpose of testing different solutions and different mountings, therefore it was not possible to build the PC board because every mounting was different but, since many readers will surely want a PC board, I designed one just for the power supply and bias circuits. Figure 8 shows the top of the PC board (components side). It is double sided with plated-through holes for the ground connection, whilst the bottom side is only the ground plane. Figure 9 shows the top side, component side.

Please read my earlier comments for the RF PC board section.

**Franco H Rota I2FHW**

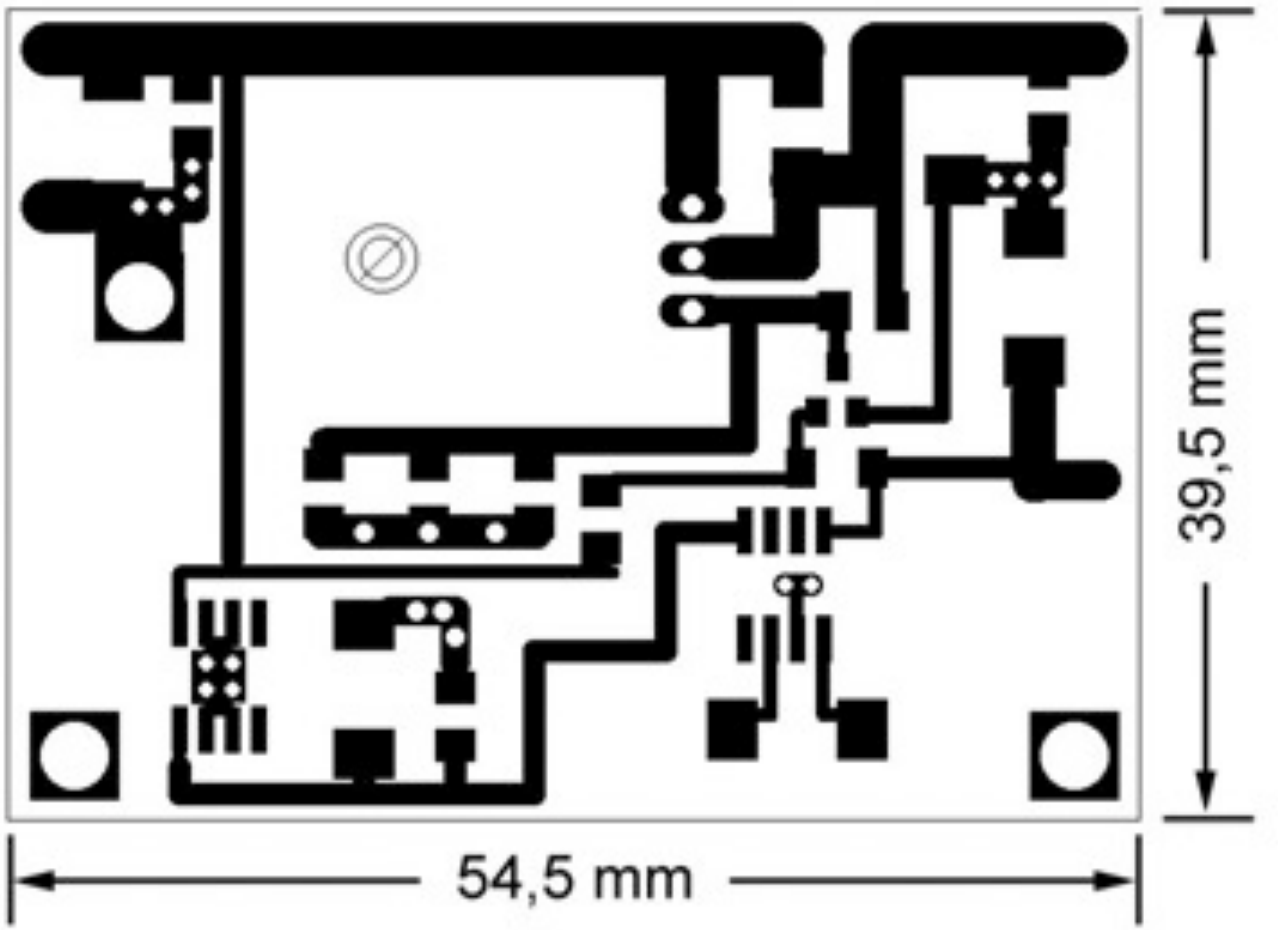



**Figure 8 – double sided FR4 PC board**

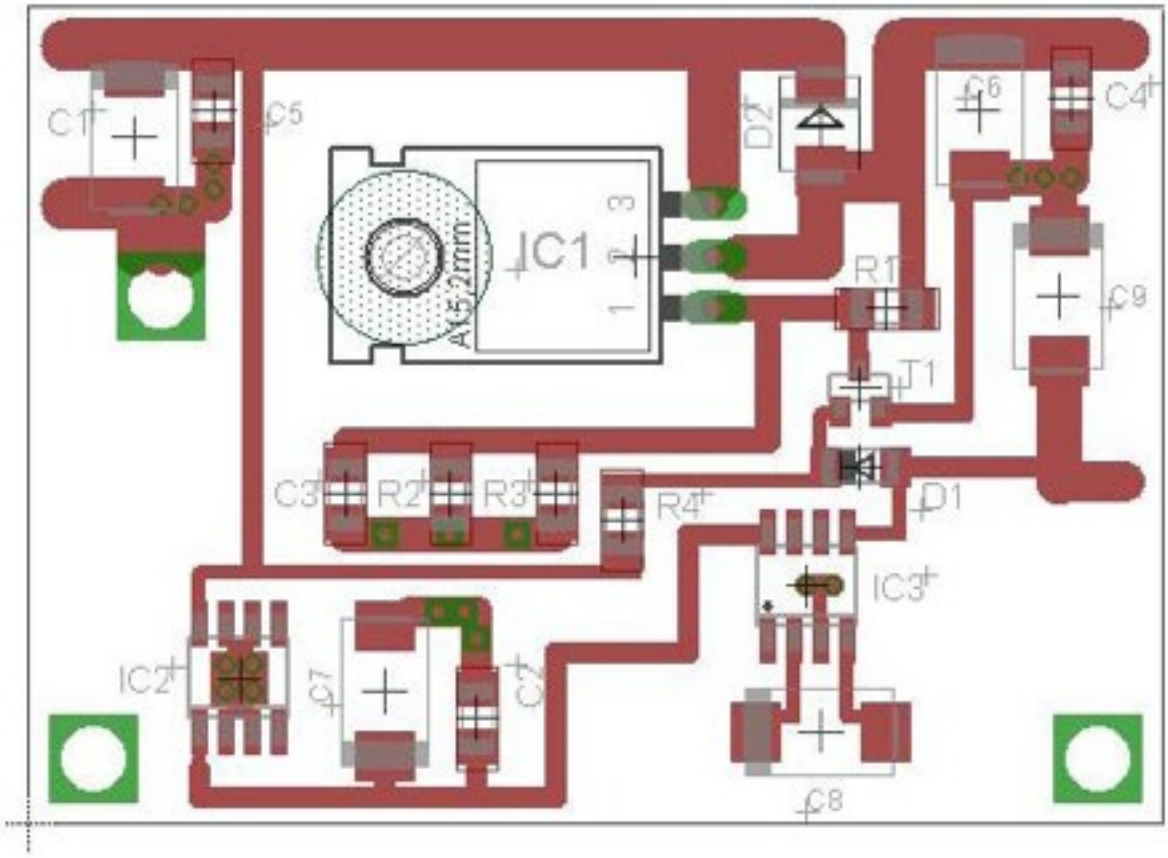



**Figure 9 – Top side, components layer**

# A 15 element Yagi for 1090MHz ADS-B reception

**by John Quarmby G3XDY**

The advent of “virtual radar” has made aircraft reflection contacts a good deal easier to plan and complete. Although there are some good internet sites available, I decided to build one of DL4MEA’s ADS-B “Beast” kits (described at the Martlesham Round Table). To see planes out to the radio horizon a small Yagi would be needed. This antenna is the result.

The DL6WU style yagi was designed using VK5DJ’s yagi design software. A 15 element design was chosen as it would fit on an existing piece of redundant 20mm square boom material. I decided to use insulated standoffs for the elements as there would be no need for any boom correction, hence the dimensions below will work for other boom sizes such as 12mm square.

The T shaped element insulators are sold as fixings for garden plant support mesh. They are each fixed to the boom by a 40mm long M4 stainless steel screw, with a star washer under the insulator to stop it turning, and a nyloc M4 nut on the other side of the boom. Don’t overtighten the screw or the support may split when the element is inserted!

The elements are made from 4mm diameter aluminium rod, they just clip into the insulators.

The driven element was made from a piece of UT141 semi-rigid coax cable. 4mm copper tube would be cheaper if available but UT141 is easy to bend without kinking and happened to be available. The feed point is housed in a small plastic box (35x35x20mm) along with a balun made from 10.2cm of 085 size semi-flexible cable, see Fig. 1. Hot melt glue is used to weatherproof the points where the UT141 enters the box, and silicone rubber seals the joint at the lid of the box (fixed to the boom). A solder-on SMA connector on the UT141 interfaces to the feeder to the shack. The top of the driven element is held by another mesh support, this one is shortened by 7mm, so that the tips of the folded dipole are in line with the other elements, see figure 2.

The measured return loss is 17dB at 1090MHz (centre of the photo) and improves to >20dB above and below that frequency, see figure 3

To the proof of the pudding – with the antenna up at 45 feet and using the feeder from my 23cm system, the plot in figure 4 was created in a couple of hours. It shows that aircraft are being tracked right out to the LOS horizon at about 230 nautical miles (426km) in the main lobe, just beyond the border between the Netherlands and Germany.

The finished yagi in situ is shown in figure 5.

I sourced the aluminium rod and the mesh supports from my local B&Q store.

UT141 and the semi-flex 085 are often found at rallies, and are available from suppliers such as RS and Farnell. The stainless steel screws, washers and nuts came from A2A4 Fasteners. The small plastic box for the feed was from Maplin Electronics, part number N49FK.

Fig. 1 – Dipole feed and balun.

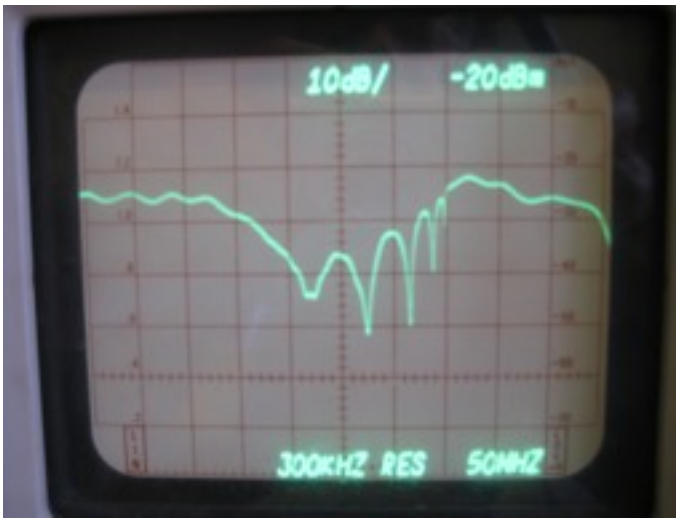



Fig. 3 – Yagi return loss, Ref level -20dB, Centre Frequency 1090MHz, 50MHz/div, 10dB/div

## *VK5DJ's YAGI CALCULATOR*

Yagi design frequency =1090.00 MHz  Wavelength =275 mm

Parasitic elements fastened to a non-metallic or separated from boom

Folded dipole mounted same as directors and reflector

Director/reflector diam = 4 mm  Radiator diam = 3.85 mm

**REFLECTOR**

133 mm long at boom position = 30 mm

**RADIATOR**

Folded dipole 130 mm tip to tip, spaced 55 mm from reflector at boom posn 85 mm

**DIRECTORS**

| Dir # | Length mm | Spaced mm | Boom position mm | Gain dBd | Gain dBi |
|---|---|---|---|---|---|
| 1 | 115 | 21 | 106 | 4.8 | 6.9 |
| 2 | 113 | 50 | 155 | 6.5 | 8.6 |
| 3 | 112 | 59 | 214 | 7.8 | 9.9 |
| 4 | 110 | 69 | 283 | 8.9 | 11.0 |
| 5 | 109 | 77 | 360 | 9.8 | 11.9 |
| 6 | 108 | 83 | 443 | 10.5 | 12.7 |
| 7 | 107 | 87 | 529 | 11.2 | 13.3 |
| 8 | 106 | 91 | 620 | 11.7 | 13.9 |
| 9 | 105 | 95 | 715 | 12.2 | 14.4 |
| 10 | 104 | 99 | 814 | 12.7 | 14.9 |
| 11 | 103 | 103 | 917 | 13.1 | 15.3 |
| 12 | 102 | 106 | 1023 | 13.5 | 15.7 |
| 13 | 102 | 107 | 1130 | 13.8 | 16.0 |

### *Comments*

Spacings measured centre to centre from previous element

Tolerance for element lengths is ± 1 mm

Boom position is the mounting point for each element as measured from the rear of the boom and includes the 30 mm overhang.The total boom length is 1160 mm including two overhangs of 30 mm

The beam's estimated 3dB beamwidth is 32 deg

A half wave 4:1 balun uses 0.70 velocity factor UT085 (PTFE) and is 96 mm long plus leads

### *Folded Dipole Construction*

Measurements are taken from the inside of bends

Folded dipole length measured tip to tip = 130mm

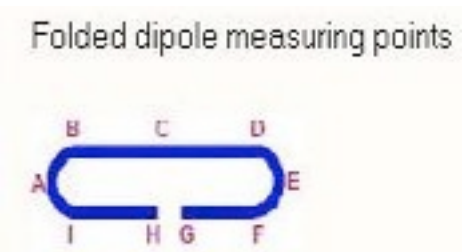
Total rod length =283mm  Centre of rod=142mm

Distance BC=CD=52mm  Distance HI=GF=50mm

Distance HA=GE=70mm  Distance HB=GD=89mm

Distance HC=GC=142mm  Gap at HG=5mm

Bend diameter BI=DF=25mm



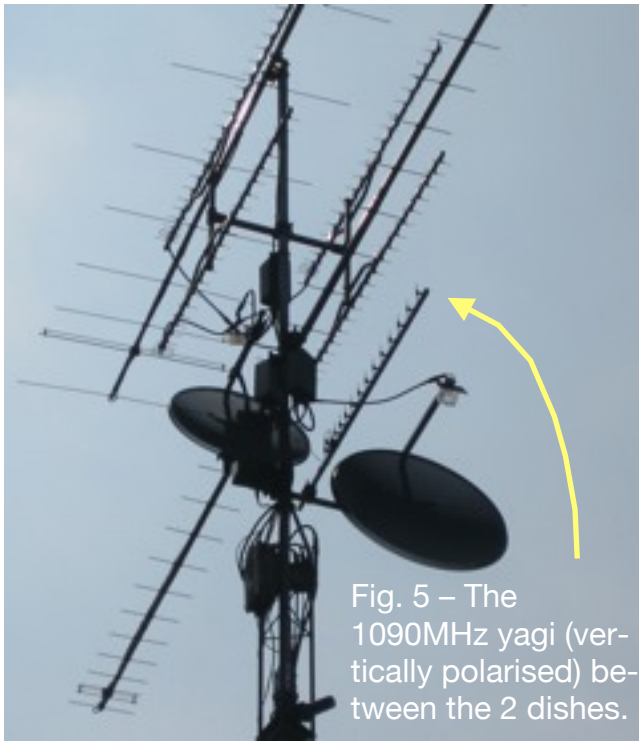



Fig. 5 – The 1090MHz yagi (vertically polarised) between the 2 dishes.

Fig. 2 – Showing the element mounting method.

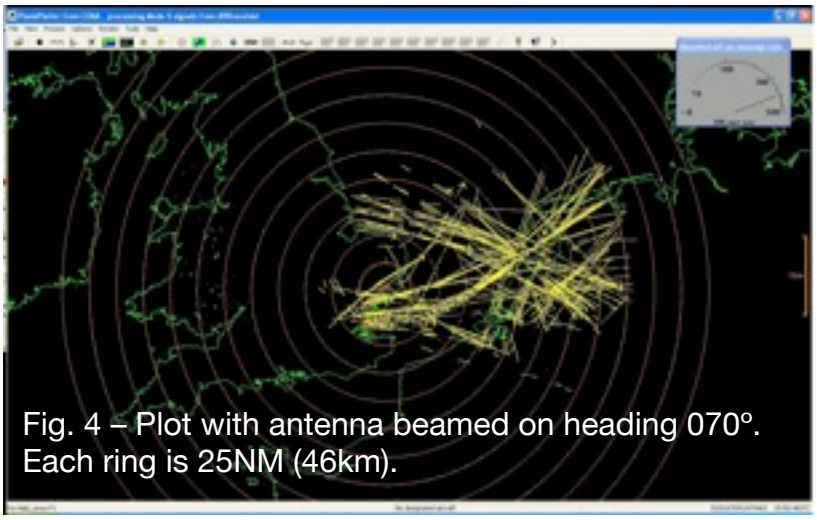


Fig. 4 – Plot with antenna beamed on heading 070°. Each ring is 25NM (46km).

The UK Microwave Group are proud to be hosting the 15th International EME conference in Cambridge in August 2012. That may sound a long way off but, under the Chairmanship of Graham G4FSG, the organising committee is already working hard to make this a highly successful conference (see the conference web site at eme2012.com for more details). For those of you who have not had the pleasure of attending an EME conference, the format includes two days of high quality presentations encompassing every aspect of this challenging mode of operation and the conference provides an opportunity to meet and mix with some of the leading lights within amateur radio from all over the world. Of course, many of the techniques on SSPAs, LNAs, filters, etc., are equally applicable to terrestrial operation.

One departure from previous conferences is that we will be printing a larger run of the conference proceedings, which are a very useful work of reference for both moonbouncers and non-moonbouncers. After the conference these will be marketed and this will help keep the costs of the conference, at this prestigious location, within reasonable bounds.

There will be a call for papers shortly so it's time for all UkuG members to put their thinking caps on and come up with interesting material that can be presented to the conference, either as a short lecture as content in the printed proceedings or on the conference DVD. Keep a watch on the 'ukmicrowaves' reflector and Scatterpoint for the dates for submitting papers.

Also, pencil in your diary the dates of **16th –19th August 2012** and consider volunteering to be a host. We want to make all delegates to the conference, especially our overseas visitors, feel very welcome and give them the best possible experience of our country and our hospitality.

**73 Brian G4NNS**

# Mac software for radio

**By Martin Richmond-Hardy G8BHC**

## *Summary*

As a long time Apple Mac user (and have experienced the joys of DOS, Windows 3 and xP), I thought a brief summary of what's available on the Mac might be of interest. I'll leave, for another issue, the fact that Macs can run Windows, Linux and other operating systems (with the help of several applications like VMware Fusion, Parallels Desktop, BootCamp). You can run some Windows applications without having to install Windows (but probably not most of the radio ones you want) using Wine (I find a good single malt helps too) or Crossover.

This is a list of some of what's available at "own-money" prices (<£100) with a brief description of what each app does. No prices – they change; no comparisons – they're controversial! Next month I'll cover some of the ham radio apps for the iPhone & iPad.

Cocoa is under-the-hood/bonnet Mac stuff. See here.

## *Logging*

**Aether** includes tools to quickly and easily log QSOs while on the air, as well as organize, search and track your QSOs later. aetherlog.com/

**jLog** is written in Java and can therefore run on almost any platform. Installers have been tested with Linux, Windows (98 - - Windows 7) and Mac OS ("Classic" Mac and Mac OS X 10.5) and Solaris. A Radio interface module is included with jLog to allow automatic logging of frequency and mode.jlog.org/

**MacLoggerDX** from DogPark Software is a comprehensive logging application which can also control your rigs and rotators, monitor DX clusters, etc. Doesn't make coffee.

Now available for iPad as MacLoggerDX HD.

**RUMlog** by DL2RUM, is a logging, QSL handling and printing tool, especially made for the shortwave DXer, made by a DXer. Basic logging features are included for the higher bands up to 1.2 cm. RUMlog can handle an unlimited numbers of logs and an unlimited numbers of QSOs per log.

**RUMped**, also by DL2RUM, is logging tool for DX-peditions and contests. It allows real time logging, transceiver control and interfaces with other hard- and software to allow Phone, CW, RTTY,PSK and Hellschreiber operations. You can import logs using the ADIF format and export logs as ADIF, simple text, Cabrillo, Stützerbach (STF) and other formats. To use RUMped you need a MySQL server.

**Cab-converter**, by Scott Andersen NE1RD, works with your station logging program to produce a file in the Cabrillo format.The program is available, free of charge, from the Cab-converter Yahoo! group

**QSLpro** also by NE1RD, provides a label printing function for MacLoggerDX users that is especially handy for DXpedition QSL managers.

**TrustedQSL,** by ke3z, wa1gon, trusted QSL certificate for use with LotW

## *Signal decoding and coding*

**cocoaModem 2.0** by Kok Chen, W7AY – a Mac OS X application which implements modems (modulator-demodulators) for some of the Amateur Radio modulation modes.

- RTTY (AFSK or FSK): basic RTTY interface, narrow-band two-receiver RTTY interface, wideband two-receiver RTTY interface
- PSK : BPSK31, QPSK31, BPSK63, QPSK63, BPSK125,QPSK125
- MFSK: MFSK16, DominoEX 4, DominoEX 5, DominoEX 8, DominoEX 11, DominoEX 16, DominoEX 22, Hellschreiber Feld Hell, FM Hell 105, FM Hell 245
- CW wideband two-receiver CW interface
- ASCII Radioteletype wideband two-receiver ASCII interface
- SITOR-B reception
- HF-FAX reception
- Synchronous AM reception

**DarwinPsk**/LinPSK is a PSK31 and RTTY program for Linux/ Intel and Macintosh /OSX. The PSK31 part is originally based on WinPsk 1.0 by Moe Wheatley, AE4JY. linpsk.sourceforge.net/

**fldigi** by W1HKJ, is a Digital modem program for Linux, Free-BSD, OS X, Windows XP, W2K, and Vista.

**MultiMode** by Black Cat Systems ,allows you to decode and transmit morse code (CW), RTTY, FAX, SSTV, SITOR-B, NAVTEX, PACKET, ACARS, PSK31, ALE, and many other modes on your Macintosh

**MultiScan 2SL** by KD6CJI is for receiving and sending Slow Scan Television (SSTV) pictures. There are two versions of the program: MultiScan 2 which is built for OS X 10.5 and runs on PowerPC or Intel Macs with 1GHz+ processors and MultiScan

2SL, optimized for OS X 10.6 and runs on Intel Macs (32 and 64 bit). MultiScan 2 supports the following analog SSTV formats (digital SSTV is not supported):

- Robot 8/12/24/36 seconds Monochrome
- Robot 12/24/36/72 seconds Color
- Scottie 1 - 4 , DX and DX2
- Martin 1 - 4, HQ1 and HQ2
- Wraase SC-1 8/16/32 seconds Monochrome
- Wraase SC-1 24/48/96 seconds Color
- Wraase SC-2 30/60/120/180 seconds Color
- PD Modes PD50 through PD290
- P Modes P3,5,7

MultiScan 2SL v.1.5 adds support for AVT Modes: Color 24s, 90s and 94s and monochrome 125s.

## *Software Defined Radio*

**DSP Radio 1.2.1** by Sebastian Mrozek DL2SDR

**Qthid** is a Funcube Dongle control application with Qt user interface. It is an evolution of the qthid002 package by Howard Long G6LVB.

The Funcube Dongle is a small software-defined radio receiver for 64 MHz – 1.7 GHz. It fits into a computer's USB port and uses USB audio to transfer complex I/Q data to SDR applications. The control API for setting frequency, gain, filter, etc. uses the USB HID standard, thus the Funcube Dongle does not require any specific hardware drivers as long as the host operating system supports USB audio and HID.

Download from here (Mac, Linux & Windows).

## *Rig control*

**flrig** from W1HKJ & Associates, is a transceiver control program designed to be used either stand alone or as an adjunct to fldigi.

**MacMemoriesManager** from Dog Park Software- I use it for my Kenwood TH-D7 but it will manage the memories in a number of other radios – but not my FT847 :-(

**Serial Tools** - by Kok Chen W7AY, is a set of serial port tools for Mac OS X. It includes a Terminal Emulator, a Protocol Analyzer and a serial port monitor to watch for connections and removals of serial ports. You will, of course, need a usb-serial converter (check it works with a Mac - not all do!).

## *Satellite & EME*

**MacDopplerPro & MacDoppler for Cocoa** by Dog Park Software.The latter is a re-written from the ground up to take full advantage of the Cocoa capabilities in OS X on PPC as well as Intel hardware. MacDoppler will provide any level of station automation you need from assisted Doppler Tuning and Antenna Pointing right on up to fully automated Satellite Gateway operation.

MacDoppler for Cocoa carries on the rich tradition pioneered by MacDopplerPRO which is in use around the world by Amateur Radio operators, satellite spotters, educators and commercial customers from CBS News to the International Space Station Amateur Radio Hardware Management program, Delta Telemetry Tracking and Control at Boeing Integrated Defense Systems, Florida State University, and the CalPoly CubeSat Project.

**MoonSked X** by David Anderson GM4JJJ is a Moonbounce Scheduling and Tracking solution for Macintosh, Linux and Windows.

**N0ONG Keps Editor** www.hffax.de/html/hauptteil_keps.htm

## *Morse*

**Black Cat CW Keyer** from Black Cat Systems lets you send morse code from your computer. You can type the characters to be sent in real-time, type a line then press enter for the entire line to be sent at once, define and send macros, as well as send from a text file.

**Morse Mania** Morse code tutor also from Black Cat does Koch & Farnsworth.

## *EchoLink*

**EchoMac** is a client program for OS X that allows connection to the Echolink system.

echomac.sourceforge.net/

**PortMap** from codingmonkeys enables you to map your networking ports using your Airport Base station or a UPNP router. Enables an application to be reachable from the internet, even in a home networking setup. Can help getting EchoMac to work. Just watch out for the pirates...

## *Other audio tools*

**ElectroAcoustics Toolbox** from faberacoustical

- Dual FFT Analyser
- FFT Analyser
- Meter Bridge
- Octave Band Analyser
- Oscilloscope
- Signal Generator
- Sound Level Meter
- Spectrogram
- XY Plotter

**SignalScope, Signal Scope Pro & SignalSuite** are subsets of Electro Acoustics Toolbox if you want something cheaper with fewer bells & whistles.

**iSpectrum** from Dog Park Software is free!

## *Propagation & DX*

**iDXCluster** DX cluster software from Black Cat Systems

## *Design*

**cocoaNEC2** by Kok Chen, W7AY. comes with an embedded NEC-2 engine. NEC-2 is sufficiently accurate for many antenna modeling purposes, but does not work for buried wires or wires that are close to ground. FREE

**DesignWorksLite** by Capilano Computing – You can draw, save, edit and print complete, professional circuit diagrams using powerful features like bussing, multi-level Undo/Redo, and automatic gate packaging. Use the library of common 74XX and discrete symbols provided or create your own libraries using the built-in symbol editor. Send compact circuit diagram files to friends or colleagues over the net. Now discontinued but still downloadable from here. A good alternative is LogicWorks (which includes a digital simulator).

**EAGLE** – yes, available for the Mac too. FREE Lite edition.

**LogicWorks** from Capilano is an interactive circuit design tool intended for teaching and learning digital logic. Features schematic editing and simulation – display any number of signals simultaneously in the timing diagram.

**MacSpice** – www.macspice.com/ simulates and analyses electronic circuits that can range in complexity from a single resistor to an integrated circuit comprising tens-of-thousands of devices.

It is derived from, and compatible with, Berkeley Spice 3f5.

**MacTXLine** calculates parameters for transmission lines in electromagnetic systems. MacTXLine supports 3 different lines: Microstrip, Striplines and Coaxial lines. Converts between electrical values and physical values. As an example it can convert a length in degrees to a length in mm or convert characteristic impedance in Ohms to width in mm. Also it calculates loss/attenuation of transmission lines. Get it here.

**MININEC Pro** from Black Cat Systems is an antenna analysis program for Windows and Apple Mac computer systems. Usual caveats about NEC modelling apply!

**RF Toolbox** – a nice collection of tools from Antenna design (purists look away now) to wire inductance calculation. Another one from the Black Cat, also available on the App Store.

**SolvElec** draw and analyze electrical circuits functioning in direct or alternating current

- get literal formulas and values for current intensities and voltages defined in the circuit.
- verify circuit related equations.
- draw graphs.
- get the equivalent circuit of displayed circuit

From physicsbox

**Smith Chart** v3.0.1 from the App Store now costs £8.99 (it was free). Details here

Features include:

- lumped element and transmission line matching elements
- point and click selection of each matching component value
- real time reflection coefficient display on the Smith Chart as each element is added
- automatically generated table of matching elements
- tracking and display of impedance, admittance and reflection coefficient
- frequency dependent models or fixed impedance, admittance or reflection coefficient for both the source and load
- display over frequency of resultant match
- VSWR and Q circle overlays

**SimSmith** by AE6TY has a Java implementation of Smith Chart so it will work on Windows and Linux as well as Macs.

## *Other stuff*

**Mac HP GPS Control** by David Anderson GM4JJJ Mac allows owners of the Hewlett Packard HP Z3801A or Z3816A GPS Receiver to setup, control and monitor their receiver by means of a serial connection from an Apple Macintosh computer.

## *One more thing...*

**DOSBox** www.dosbox.com/ for running DOS programs like the late Reg Edwards G4FGQ DOS programs and GEOG2 by Andy Talbot G4JNT.

So, a bit of a selection for you to surf when it's too wet/windy to go /P or too hot in the shack.

If you have any favourites, care to send a review for Scatterpoint?

**73 Martin G8BHC**

# Experimental YTO-based 10 GHz sweeper

**By Andrew Burge G6ALB**


Fig. 1 : External view

## Preface

I recently decided to see if I could use one of the low cost Stellex YIG Tuned Oscillator modules available from eBay in a simple “sweeper” that would allow me to view X band filter characteristics in conjunction with my HP 8569B spectrum analyser.

The Stellex YTOs produce about 13 dBm, require just a single 8.5V supply and are tuneable over a modest frequency range using the main tuning coil. I think these YTOs were phase locked using a synthesiser when in service but they can also be left to free run and tuned simply with DC and/or AC on the tuning coils.

A number of frequencies are available but most seem to be around 9 or 10 GHz. The 8-10 and 9.5-10.43 GHz models I bought are

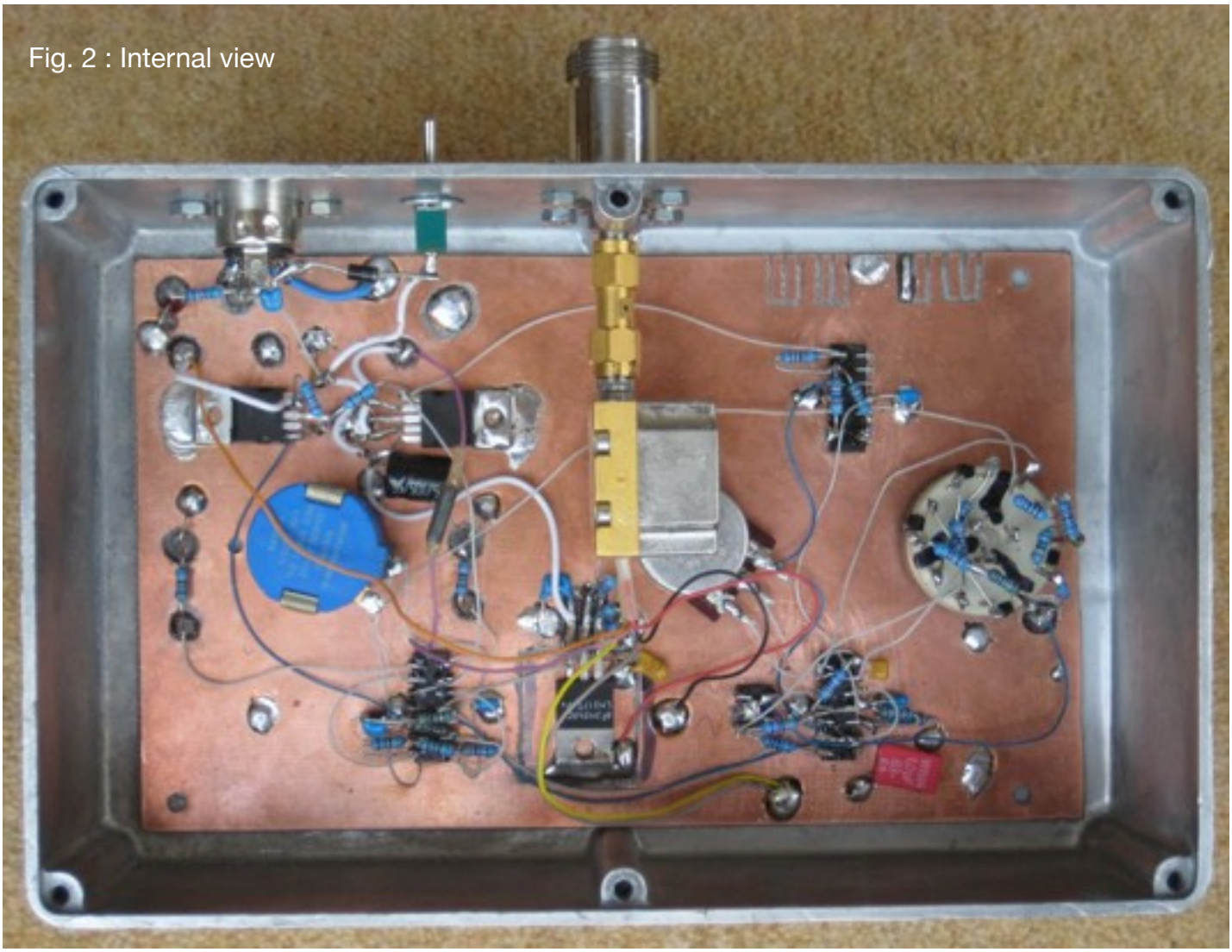


Fig. 2 : Internal view

both “centre zero” in that they have to be driven in *both* directions from a centre frequency to obtain the nominal coverage.

The data states a 5MHz/mA tuning sensitivity is provided by the main coil. In practice the units can be pushed beyond the stated range, I obtained 7–11 and 8–12 GHz at the cost of using ±400mA but that seems too high for continuous operation.

There is also a fine tune coil with 150kHz/mA sensitivity (ideal for applying voice as FM since it has a wider bandwidth) but in this application it is unused and I grounded the connections to it.

## Premise

The basic concept of this sweeper is very simple. A triangle wave generator (with adjustable amplitude) is added to an adjustable DC bias and the result used to drive the main tuning coil on the YTO. In this way, an arbitrary frequency span with an arbitrary centre frequency can be produced (subject to the coverage of the YTO).

Since this sweeper (as built) is not synchronised to the spectrum analyser, a sawtooth waveform confers no advantage in this application and in fact may bring some disadvantages.

The design presented here uses analogue sweep generation circuitry. There are very many ways to accomplish this task and probably with a lot less components (although it is quicker to build than it looks).

This design need not be followed closely! The tuning coil is not hard to drive and providing it is not overdriven to the point of damage appears quite forgiving.

It would also be possible to make use of a PIC or similar microcontroller to control the sweep but the D/A would require at least 12 bits of resolution.

I was careful to always apply the correct 8.5V for the YTO power – I suspect these are quite easily damaged by over-voltage. I used an LM317 regulator careful “tuned” for the correct voltages before connection!

## Description

IC1B provides a buffered ½ supply rail voltage. All *signal* voltages in the design are referenced to this voltage, Vref; it avoids the need for a split supply.

IC1C and IC1A are a regenerative comparator and an integrator. Together they form a standard triangle wave generator which provides the sweep. A crude limiter (using a small bridge rectifier & LED) is used between the comparator and the integrator to provide a relatively constant input to the integrator thus ensuring its rate of dis/charging is power supply rail independent. Back to back Zeners could be used here as could strings of diodes.

A simple variable attenuator, used to provide sweep width control, takes its output from IC 1A and in turn is followed by a unity gain buffer IC 1D (to eliminate loading on the attenuator).

The output of IC1D is followed by a four position switched attenuator that provides maximum sweep widths of roughly 3000, 1000, 300 and 100 MHz if the adjustable control is at maximum – and proportionately less when that control is adjusted.

The switch used for the attenuator is a 3-pole 4-way type, the other two poles connect one of four different resistors to the integrator input allowing the sweep rate to be automatically adjusted for the set maximum sweep range. This sophistication is required to ensure the sweep isn’t so steep it pulls the YTO frequency through the pass band of the SA too fast to be quantified.

I started with a set of values corresponding to the 1:3:9:27 width control but found that on the 300 and 100 MHz ranges the frequency of the triangle generator was too high for the tuning coil and the scanned width was smaller than expected. So the integrator input resistors follow a 1:3:5:9 relationship, determined empirically!

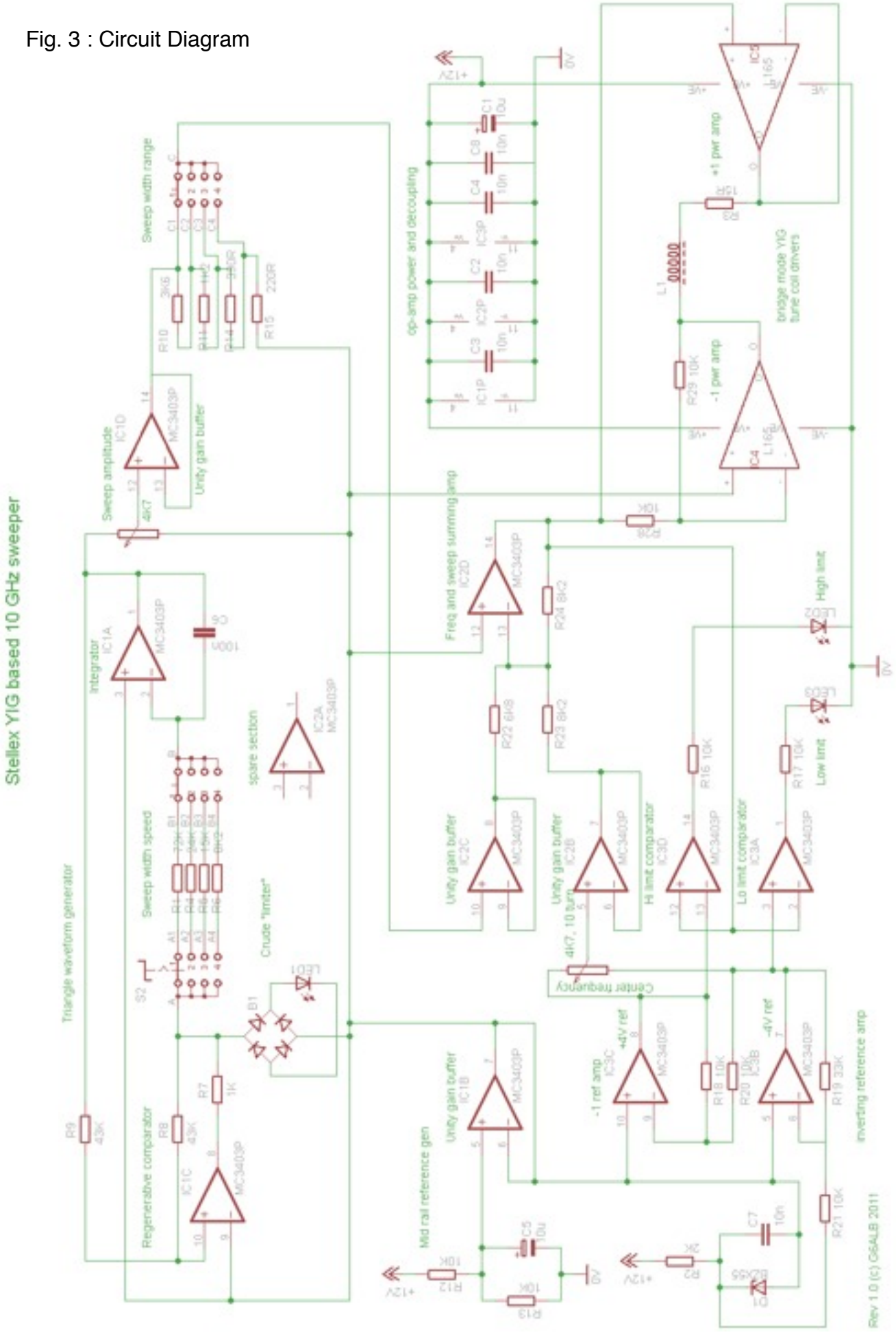
The output of the switched attenuator is buffered using IC2C before being added to a similarly buffered (IC2B) DC offset voltage from the wiper of the centre frequency potentiometer.

The output from the summing IC2D is the final output voltage and drives the two L165 power op-amps. There are configured to drive the tuning coil on the YTO differentially between their outputs. One of these buffers is configured to be an inverting unity gain buffer the other a non-inverting unity gain buffer.

The direction of sweep (which matters only for the centre frequency control) can be reversed simply by reversing the tune coil leads. At this stage the overall “gain” of the system can be altered by adjusting the 15R resistor present in one of the YTO main tune coil leads but since I’d scaled the voltages at that point for my desired 3GHz pk-pk swing I was able to leave this as is.

To provide a regulated supply for the DC tuning control a 1.25V bandgap reference (a low voltage Zener would do well, as shown on the schematic) is buffered and amplified by IC3B to produce a -4volt signal w.r.t. $V_{ref}$. Another, inverting unity gain buffer, IC3C, provides a +4 volt rail w.r.t. $V_{ref}$. These two

Fig. 3 : Circuit Diagram



rails are connected to the track ends of the centre frequency control potentiometer.

The idea was the maximum sweep width and maximum DC offset should provide roughly the same maximum deviation (although you shouldn't use both controls at maximum at the same time).

In practice I increased the gain for the sweep input by using a lower value of resistor at the input of the summing amp IC2D. The maximum DC offset and maximum scan width both now give approx 3GHz scan width.

Since it's possible to over drive the YTO tune coil, IC3A & IC3D are used as simple comparators to drive two blue LEDs. If the coil drive voltage from IC2D exceeds the positive and/or negative thresholds then the appropriate LED(s) will illuminate alerting the user. With only mild forays over-range these LEDs flicker but severe over-range use sees them fully on.

One of the nice things about this approach is all the 10GHz RF is in the YIG and the control circuit is DC or AC of less than 100 Hz! So I prototyped this design "dead bug style" on the piece of copper clad board which, when the design was working, was easily incorporated into a die-cast box I'd measured and marked but had not yet drilled.

The MC3403 shown on the schematic are described as low quiescent power versions of the ubiquitous 741. They work fine but *many* other op-amps types will also.

## Usage

If the sweeper's output is fed into a filter and then into a suitable SA the filter's frequency response can be displayed. It's also possible to plot return loss if a directional coupler is available which allows the set-up to be of some use in optimising matches.

Inevitably there are some complications. Proper sweepers employ ALC systems to provide constant output across the swept frequencies. Using just a YTO the output flatness is only as good as that but, fortunately, the Stellex modules seem adequate for a modest piece of test gear – ripples on mine are <3dB pk-pk total and mainly better than 2dB pk-pk (as measured on a calibrated E4405B). See Fig. 4.

In addition, because the unit's frequency sweep is *not* synchronised with the SA, a wide difference in sweep speeds is required to ensure that all frequencies of interest are "covered". In practice, I ended up using a 1 or 2 seconds/division sweep speed and a resolution bandwidth of 1MHz. So this does require a little patience to use.

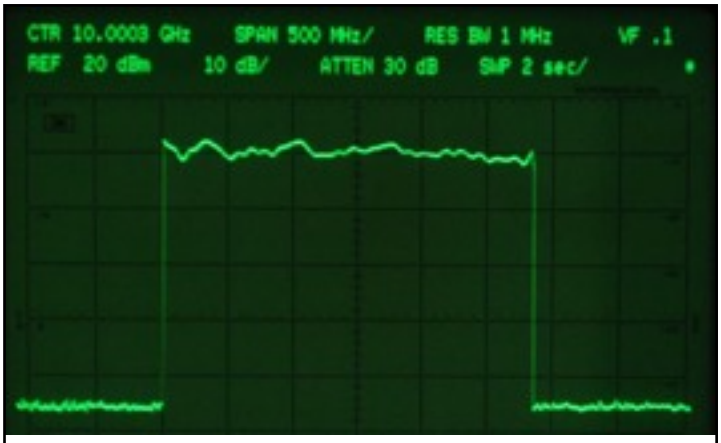



Fig 4 : The sweeper's full span (about 3GHz) showing the output amplitude flatness across that band.

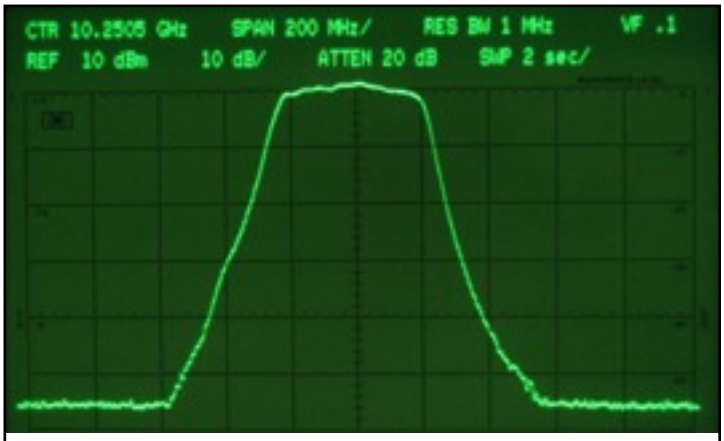



Fig. 5 : Plotted response of a filter G4HJW lent me, centred on 10.25GHz.

The response ties up very well with the paper plotted response shipped with the filter.

## Conclusion

This design is definitely a "work in progress" but has already provided some useful results. I'm having thoughts about providing some means to synchronise with, or accept a sweep from, the SA to allow very much faster trace capture.

That would be much nicer to use, albeit it may not be completely trivial to set-up.

Gain levelling (of sorts) could possibly be a nice feature, perhaps by saturating a low power amplifier stage.

I may also investigate adding an AF modulation capability to the current unit, used when the sweep is off, to provide a YTO based WBFM transmitter.

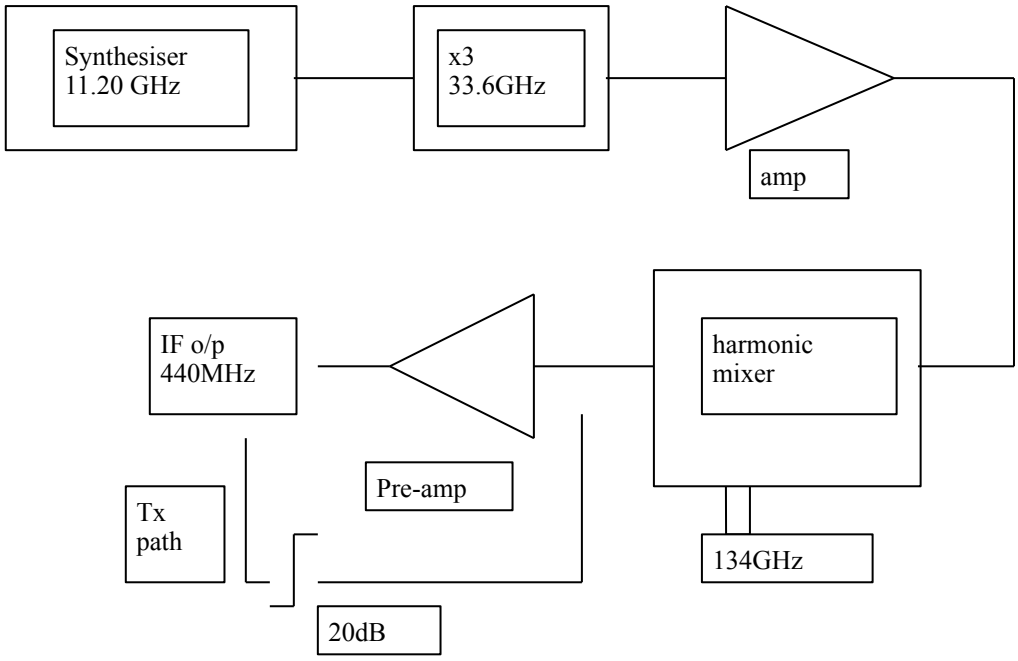
**73 es GL Andrew G6ALB**

# 134GHz Transverter

**By Roger Ray G8CUB**

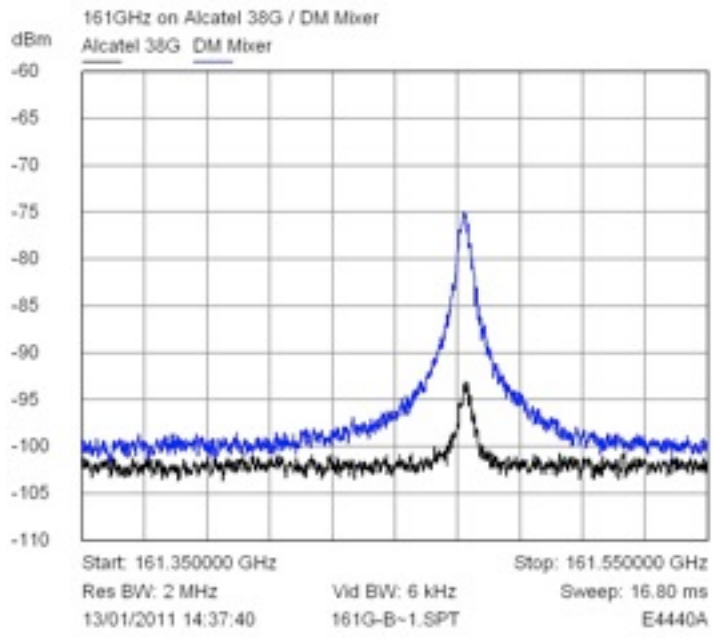
The idea for a 134GHz system started about 18 months ago. Initially, I intended to use an Impatt diode source. This proved to be very noisy and hence requiring a large bandwidth.

The plot shows the oscillator on 161GHz. The higher (blue) trace was measured with a commercial mixer (110-170GHz); the lower used a 'test module' from an Alcatel 38GHz 'white box'. This shows that even at 160GHz the test modules work as a low cost mixer! The signal bandwidth is much greater than the spectrum analyser 2MHz bandwidth, so the true power is greater than the plot.




Simplified 134GHz transverter block diagram

Having rejected the Impatt diode idea, I looked for a way of using an Elcom synthesiser to drive a harmonic mixer. The Elcom lowest frequency is 11.200GHz, with 3.333MHz steps. Doing the maths, showed that 11.206666GHz x12 gave 134.480GHz. It would be also possible to produce a TX signal at 134.920GHz (11.243333 x12), giving a 440MHz IF. With a 134.48GHz LO, it would be also possible to receive the existing sub-band of 134.928 – 134.930, and transmit using a modified FT817 (448-450MHz IF).




[Also a 135.360GHz LO (11.28 x12) could be used to give an IF of 432 – 430MHz]

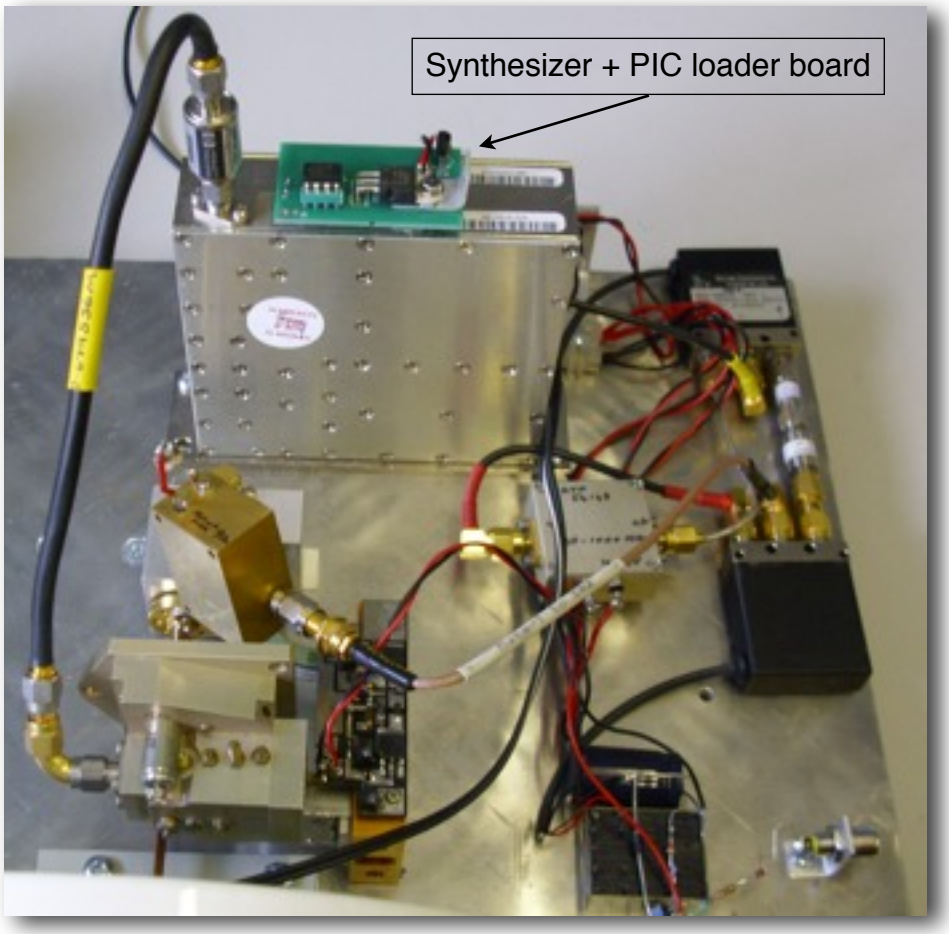
The synthesiser is at the top of the picture (p.21), with it's PIC loader board on top. Firmware is from Dave G4FRE, and is available on his website. In the foreground is a x3 tuned multiplier, which drives a mm-tech 23 -36GHz WR-28 amplifier. It was the appearance of these amplifiers on eBay for €20, that sparked of this version of the project. On the right are the TX/RX relays and UHF pre-amplifier (ATF54143).

The harmonic mixer is a DB6NT PCB No.47. The case used is a 122GHz housing from Philipp DL2AM.

The only difficult bit here, is that the case is designed to use a DML type 38GHz multiplier. To use a waveguide input, I modified a WR-28 bend by machining off part of the flange. This can be seen in the next photo, together with

the mixer block, and mm-tech amplifier. After machining (or sawing/filing), it is then drilled to match the tapped holes in the block.

The only part to mount on the PCB is the diode. Here there is a choice. Starting at under €7 is an MAE1317, up to an HSCH-9165 at €45. The potentially difficult part is mounting the diode – they are VERY small. There are various schools of thought as to the best mounting method. I used 2 part silver loaded epoxy to attach the diode. A good microscope is a must, preferably binocular. The adhesive is applied to the board, then the diode put in place using an alcohol wetted cocktail stick. The board is then cured at 100ºC for 2 hours. I then fitted the board into the block, which is held down by the two tuning element blocks. Articles in Dubus suggest that the board should be glued in place with silver epoxy. I have not done that, as I prefer the freedom of being able to change the board. The diode is self biased, using a 1k pot to ground. I used a bias-T to separate RF and DC. However a simple choke and capacitor would have sufficed.

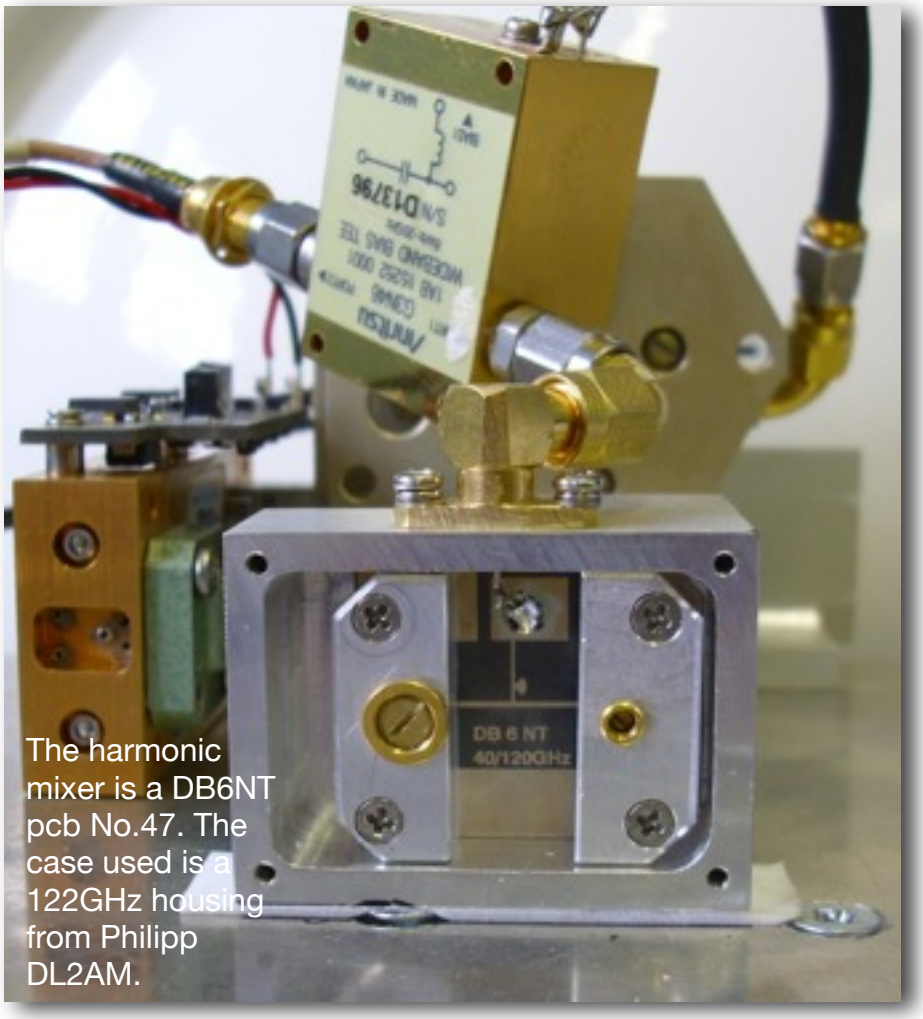



The amplifier was hard into saturation with an input of -2dBm. After tuning the 3 screws in its output waveguide, I obtained an output of +15dBm at 33.6GHz. With the pot set to mid-range the voltage across it was 1.33V. This is after adjusting the tuning elements for maximum voltage.

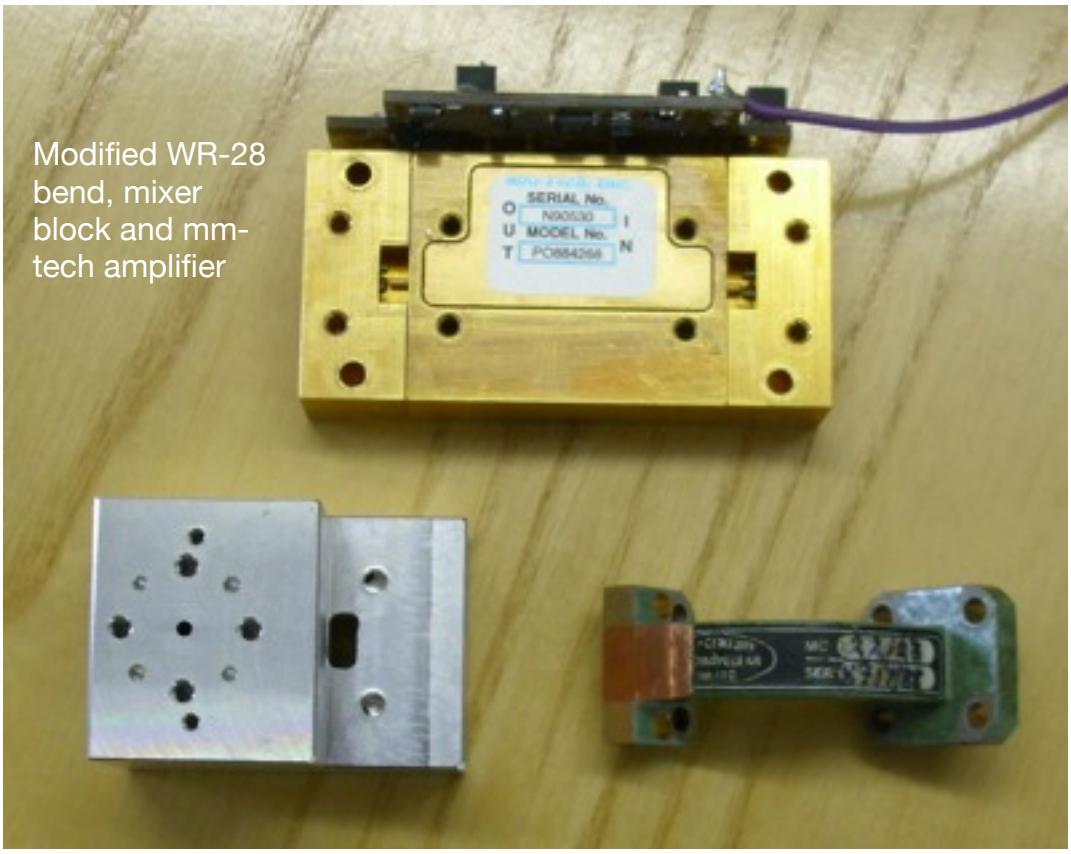
Do not do as I did the first time, by adjusting in the element over the diode and crushing it! I suggest setting the screw just over the diode and tuning out. This screw is finally set for best received signal, or maximum output.

A pre-amplifier is necessary. I used an ATF-54143. A low cost PCB is available from RF Bay on eBay.

The selectivity of the mixer, is defined by the hole size in the block



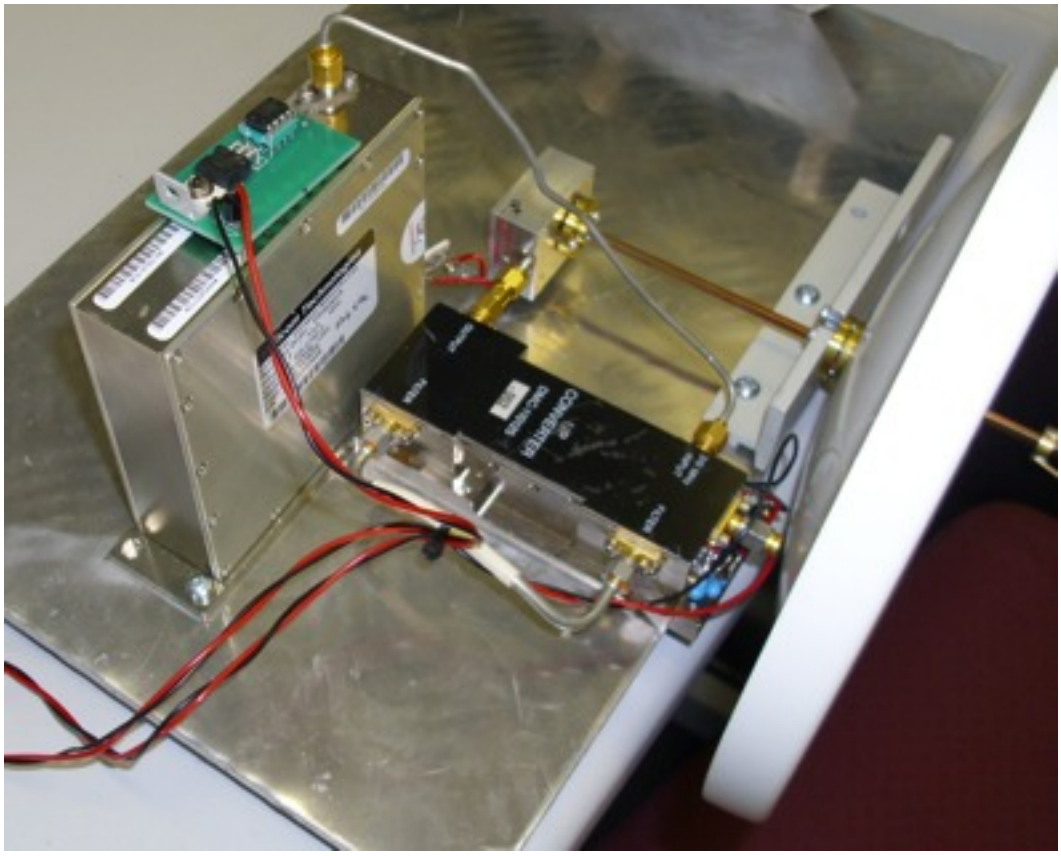

The harmonic mixer is a DB6NT pcb No.47. The case used is a 122GHz housing from Philipp DL2AM.




under the diode. This is used as a circular waveguide. The 122GHz block came with a 1.85mm hole. This works fine at 134GHz, but does not remove the unwanted signal at 101GHz. A possibility here would be to drill out the block and fit $^{1}/_{16}$ inch i/d brass tube. So far I have not done that.

My test source used another Elcom synthesiser driving a DML up-converter, used as a doubler amplifier. The mixer with RF on it's IF port, and is then connected to the amplifier section. The output was +19dBm at 22.4GHz. This then drove a 76GHz block using an MA46H146 diode. A small amount of RF at 134GHz is produced, and is selected by the WR-7 waveguide, connected to a Procom dish.

This worked surprisingly well, with the test signal being around 60dB above noise at 8 metres away.



It is intended to later convert this test source to another 134GHz transverter.

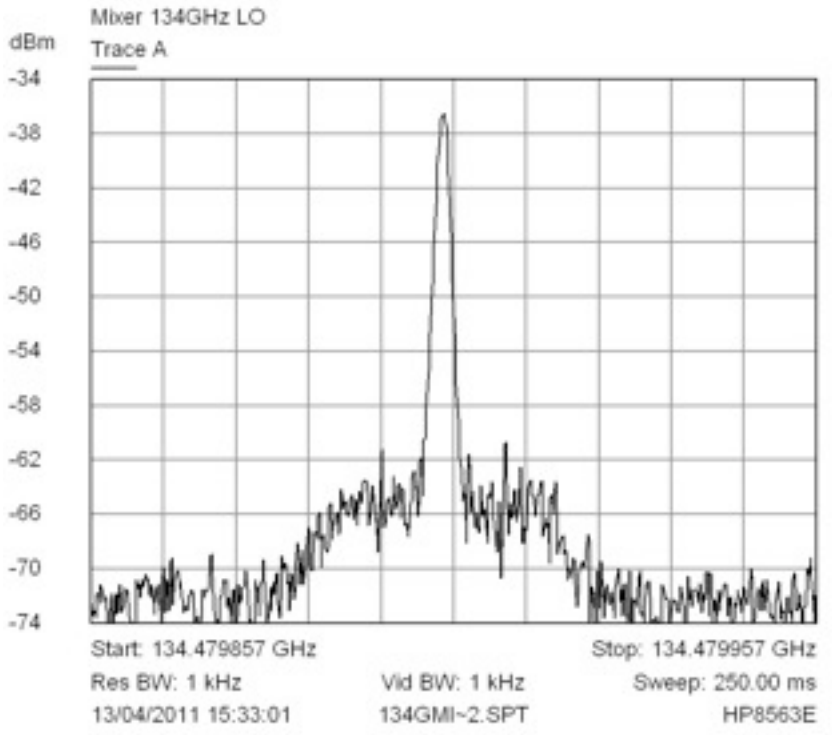
The first on-air tests were with Chris G0FDZ. After an initial false start, where it was found that Chris's transverter had a 1.4mm circular waveguide hole, that was cutting off at 134GHz! It was drilled out to 1.6mm, and we were away. Well, we could copy each other at a couple of metres.

We struggled to find a clear test range, but eventually tried over a 500m distance. Alignment proved a challenge. The Procom 44dB dishes are very sharp, with a stated beam-width of 0.8°. Reports were exchanged on SSB to complete a QSO.

The spectrum plot of the LO signal at 134.480GHz. This using the internal 10MHz reference in the synthesiser. I am staggered how clean and stable the signal is!

However since that first QSO, I found that the signal was not as clean when on battery. I was using a series diode in the supply. When the supply dropped below 11.4V the LO moved frequency and spurs were produced. Something I have never noticed at fundamental! It is fine on 12.0V.

**Roger Ray G8CUB**




The very well constructed G0FDZ transverter, at the 'farm' end of the link. Chris uses a 144MHz IF.

The transverter in action – yes I forgot about having to plug the microphone into the FT817!

# 24GHz EME Activity – May 2011

**Brian Coleman G4NNS**

During the winter a number of the existing 24GHz operators and a number of newcomers to the band were busy building, improving or, in my case, completely rebuilding our 24GHz Systems. These activities started to come together during the week of 2nd May.

Following the demise of Moon-Net, the preferred methods of discussing and planning activity on this band are the 24GHz list set up by DL7LAU and the HB9Q 2304 and up logger, so it is possible that this activity has slipped in under the RADAR of the EME community at large.

At today's date, 12th May, DF1OI, F2CT, G4NNS, LX1DB, OK1KIR and W5LUA have all had EME QSOs during this session. Contacts are normally made by sked (scheduled time and frequency) but on the 6th May OK1KIR came on without telling anyone and I and others had completely random QSOs with the team. This is probably another first for the band.

There were a number of challenges to 24GHz EME operation starting with the moon being at near apogee and so adding getting on to 2dB to the path loss. The weather is another important variable when using this band. For most of us, only LX1DB is all solid state as far as I know, equipment on the dish is operating at high voltage, for TWT supplies, and does not enjoy damp weather and still less rain!

Also, absorption of 24GHz due to water vapour in the atmosphere is a problem. I estimated an additional 3dB of path loss due to high humidity (~60%) when beaming at the moon at low elevations, compared to the high elevations at Zenith. Another challenge to cope with is spectral spreading and during these tests this was in the region of 150-250Hz. I find it easiest to resolve such signals when the side tone is centred on about 500-700Hz and with a relatively wide filter width of at least 2.5KHz.

Yet another challenge is finding the weak signals with considerable and rapidly changing Doppler shift. During my QSO with Al W5LUA I noticed that my echoes were appearing on 24048.077 while his signals were on 24048.115MHz. We were both transmitting on 24048.100 and most of us are GPS locked and we need to be !

I and some of the other new boys on the band are using the ubiquitous RW1127 TWT modified according to the recipe from Ulli DK3UC to convert it from 12GHz SMA in and out to harmonic mode at 24GHz with WG in and out and a potential for up to 40W. I have only achieved 25W or so but am more than happy with that. I may have more as my measurements could contain significant errors and judging by the way that flexible waveguide dumping the RF out of the shack window was getting quite warm, I suspect that my measurements might understate the output power. ( don't even think about using flexible waveguide in your EME system unless you know it to be very good and you have power to spare).

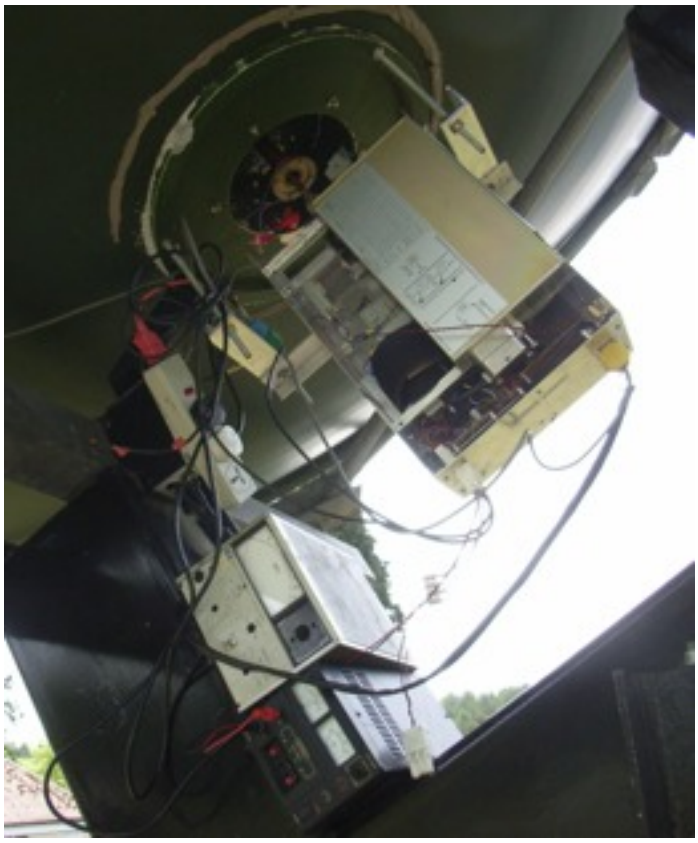
Others, known to me to be striving to get on the band this year (hopefully) include :-

CT1DMK, DL6LAU, DL7YC, PA0EHG, F6DRO, LZ1DX, WA6PY, and VE4MA returning to 24GHz.

Sorry if I've missed anyone. Some sound recordings and pictures can be found here

So there has never been a better time to get on the band!

**73 Brian G4NNS**



Transverter and PSUs fitted to back of dish

# View from the Drey

## *Reflections on a Reflector*

**By Secret Squirrel**

***Good Morning all.***

Up here in my tree, whilst I'm pretty busy dealing with the advances of Faraday the local cat, (a REAL mismatch if there ever was one) I can't help "reflecting" on what's been concerning the old codger that lives in the "big drey" and puts out the peanuts for me.

When he's not chasing me out of that that up-side-down umbrella he calls a 'dish' on a sunny day (it does get nice and warm in there when he's doing sun noise measurements) he's been concerning himself with a number of odd topics.

First of all, Birds. I'm not sure quite why he needs to fill birds with refined mineral oil, but maybe it's to make it more difficult for them to cling to my bag of nuts? He also he seems overly concerned with the accuracy of these birds, but having seen the state of his car roof, parked underneath the big metal tree with bird perches on top, I can probably understand that one.

Birds really do seem to have been the topic of the month, with a reported sighting of a 32- way McMurdo Blue this month. These really do have beautiful plumage, and are very, very rare, especially east of the meridian.

Discussions about weatherproofing I can understand, no one wants to get their equipment damp in the summer do they? But it seems obvious that the last thing you want to stick in your box is something called "damping foam?" Beats me….

And another thing,,,,,, what's this huge obsession with tails? TNC or otherwise? Speaking as one whose tail is just magnificent, (it's my American ancestry, you know!) I feel very qualified to comment. I can only assume that, as microwavers tend not to like to expose their tails and bind them up in black sticky tape when they're outside, it's clearly a very personal thing.

**Squirrels, Beware!**


**It's one way to stop ice forming on your tower & antennae, but how will this affect the NF?**

# Italian XX EME Conference

**Enrico Baldacci I5WBE**

**Saturday, April 30 and May 1** we held the Italian XX EME Conference [linked site in Italian only. Ed.] at the Hotel Joseph, via Roma 323, Marina di Pietrasanta Versilia, Lucca, (Prop. Giacomo I5JUX) on the waterfront just 100 metres from the sea. There is a swimming pool above the restaurant with panoramic views over the Versilia.

- Welcome to the participants, afternoon and evening discussions and EME sector projects, or free evening in Tuscany.

**Sunday, May 1** 9:00 am : The attenders are welcomed by the Regional Committee of Tuscany.

***Reports on the topic of space communications***

- QSB ionospheric interactions in 144 MHz EME communications by IK1UWL and IK3XTV
- LNA low noise with ATF 54143 for 144 – 432 to 1296 MHz by I0FTG
- Power devices in the 6-metre band by I0FTG
- RTX Digital SDR and SDT by I0CG and I2PHD
- Italian EME Contest Awards 2010
- EME Marathon Award Ceremony 2010
- Lunch and final farewell greetings

**Award to a distinguished amateur radio operator, I1ANP Mario, for the EME and DIY activities**

by the Tuscan Regional Committee
in memory of I5TDJ Piero Moroni

**Sergio IK5NFD,**
**Giacomo I5JUX,**
**Franco I5XFD**

**73 'Henry de I5WBE**
**ARI EME Coordinator**

# G3UYM and M/VK4OE Portable

**By Doug Friend VK4OE**

Two images taken during Harold's and my portable operation at Therfield (IO92XA) in the May Cumulative. There was a gusting cold wind that was making everything a bit of a challenge, including not assisting with the atmosphere's facilitation of long distance 10GHz contacts. Also, there were relatively few stations around. There was some conjecturing that it was the grand prix motor race that presented some folk higher priorities, and the windy weather surely didn't help. We each made only 2 completed contacts, but the challenges of attempting QSOs with other stations were always enjoyable for us both!


Harold G3UYM

I hasten to add that my equipment is low power (60 mW) and a little down in receive sensitivity (suitably so in a way that matches the transmitter power!), I greatly appreciated the couple of contacts that I did have and the several tries with other portable stations. The longer of those QSOs was with Russ G4PBP (~150 km) which was established using CW, but after careful optimisation of dish directions at each end (as you do), we actually completed using SSB each way, weak, of course, but great to do!

It was also interesting that, from the same site, Harold and I were 'doing' about equal to each other – my limited equipment into a nice (borrowed – thanks Sam!) 600mm dish and Harold's state-of-the-art 1 watt transverter (ex-G8CUB) into an approximately 20dB horn.


Doug VK4OE

Also, using the dish on a tripod in the gusting wind was a challenge. I did set up one guy rope directly up-wind of the dish, but I needed a second one. So, some adhesive tape stretched between the tripod and the adjacent car (visible in the picture) was pressed into action to manage the sideways thrusts that were generated by the dish acting like an aeroplane wing when the wind was flowing across it rather than into it.

Incidentally, still talking about portable operations, in the preceding week when I was operating as MW/VK4OE/P, Chris GW4DGU and I also enjoyed a 5x9+++ local contact which Chris described as quite rare from his location!

I love bringing microwave equipment here to the UK when I visit. Perhaps what I bring will be even more effective next time!

**Best 73,**

**Doug Friend, M/VK4OE.**

# Activity News

## *from the world above 1000MHz*

**By Robin Lucas G8APZ**

The first major events in the microwave calendar this year took place over the weekend of 7th/8th May. I was out with M1CRO/p on the Essex coast at Walton on the Naze (JO01pu).

The weather in Essex seemed to be much better than in other parts of the country, where others were complaining of wind and rain. We had warm sunny weather for most of the weekend, but for a few hours of squally conditions. At about midnight, we decided that, with the wind getting up, we had better go out and check all the guys and hammer the stakes in harder!

At M1CRO/p we were testing a new prototype mast which John, G4ZTR has developed (Aerial-Parts of Colchester). It is known as Alimast, and comes in 2.5m lightweight sections.

As a result of the trial, some minor design changes will be made during the next few weeks, after which, John will be offering Alimast sections as a product via his website: www.aerial-parts.co.uk

We used four mast sections to support the high bands dishes and transverters at 10m, and the mast performed entirely to expectations.

### 10GHz Trophy Contest

The Trophy contest runs parallel to the first 8 hours of the IARU event in the UK. What better way to describe the event than to include a cross section of the contestant's comments:

G8OHM/p (IO92) summed it up with "Dire weather, activity and conditions" and G3Z (contest callsign) offering "Activity abysmal". From G4EAT (JO01) "Tropo condx poor", and G3CKR/p (IO93 ) "Conditions flat", whilst G8DTF/p (IO83) said "Very windy".

At M1CRO/p the GPS 10MHz oscillator wasn't working since someone (me!) had forgotten the GPS antenna. Conditions were pretty poor to say the least, and a test with GD0EMG who is normally workable proved too difficult to get into the log. We managed 18 QSOs with our best DX to F6DKW (348km).

## IARU May Contest

With various comments on the poor WX, we received reports that the expedition station on Heligoland (DR3M group) had some difficulties caused by the high winds.

Thorsten, DG7TG said that the group had problems with the dish on 10GHz, and big problems on 23cm with the tower - at times, causing what looked like 20° elevation on the 23cm antenna, but they did manage to work some stations from G, PA, and DL.

With only two operators, they concentrated on 144MHz and 432MHz getting some good DX to GM, G, LY, OE, HB9 best DX 919km SSB.

Thorsten says that maybe they will try again on 23cm from JO34 in October.

Another report suggested that PA0WMX had a mast fall down in heavy wind, due to a broken guy, but I have no details of this.

M1CRO/p were QRV on all bands from 432MHz to 24GHz, and especially pleasing was a QSO with PA6NL on 24GHz. The path across the North Sea has been hard to break in the past due to atmospheric water vapour, but on this occasion, the signal was found with ease! It may have worked on SSB, since on finding the signal, it was about 539, but rather than take chances, an exchange was made on CW with 519 reports both ways over the 195km path.

### ** The new M5 Rule

*UK QTH Locator Multipliers. The multiplier is the sum of the number of different large locator squares (e.g. JO01,IO91 etc.) worked on that band.*

*Only contacts with UK stations (G, GW, GM, GI, GD, GU, GJ) count for multipliers.*

*Contest exchange is RST plus serial number and QTH Locator*

## DX Cluster Spot Duplicates

Some of you may have noticed that in the past few months, DXC spots on the higher bands (23cm and up) are sometimes duplicated, and more recently, the duplicated spots are derivatives of the real ones! In these instances, the real spot will appear a second or so before a second version, in which the frequency appears to be rounded.

DXC software is built with duplicate detection, and will eliminate duplicate spots, but a spot with the wrong frequency isn't considered to be a duplicate!

Since the DXC is a collection of nodes all over Europe and beyond, it is not possible to predict the routing of any spot, and almost impossible to determine where these rogue spots originate. My hypothesis is that there is a node out there in which the sysop allows only seven significant digits - enough for HF and VHF, but not when you get to 23cm.

## Beaconspot Rejects Dupes

When duplicate (erroneous) spots appeared, they had to be identified and removed daily (or soon after). This became an annoying chore!

The spot validation routine has now been amended to consider these "rogue" spots with a wrong QRG as "duplicates" of the original, and they are now rejected automatically.

It is hoped that the sysop responsible for the node which is causing these recognises the problem and rectifies it.

## Beacon News

The four 13cm beacons (non amateur) run by Belgian broadcaster VRT are closing down. The beacons at TV sites around Belgium were used so that outside broadcast crews could line up their link dishes on the TV towers.

As non amateur beacons, they did not have callsigns, but were known in amateur circles as ON0VRT, ON1VRT etc!

Pedro, ON7WP who is a broadcast engineer with VRT informs us that the license has been terminated, and that the band in Belgium is to be sold to WiMax operators.

## UK Beacons

GB3CEM (10GHz) was recently taken off air for maintenance after a long period of service.

Russ, G4PBP discovered that the sectoral horn had rotted, making it almost unsalvageable, and the slotted waveguide (inside a radome) was full of water! Russ sent an update:

"GB3CEM is currently on test to check the new PA and the re-built sectoral horn. I have also completed and tuned a new slotted waveguide antenna but still have to construct a radome for it. Both antennas are giving > -25dB RLR after a lot of 'fiddling'!

The plan for upgrading GB3CEM is as follows:–

- Stage 1: GB3CEM will shortly be returned to normal service at ~ 25W ERP with the new PA courtesy of G4DDK. Initial operation will be with the 80 degree sectoral horn centred SE.
- Stage 2: This involves moving to a GPS locked RDDS source, thus finally eliminating the 'noisy' Adret 4104. This should happen quickly, thanks to G8ACE who has lent me a pre-configured RDDS module, to get going with. I've already completed and commissioned the VE2ZAZ frequency locked, GPS 10MHz source for it.
- Stage 3: A change to a GPS locked RDDS source with JT4G MGM included. I still have to construct my own RDDS module.

I would like some reports, please, as I want to do antenna comparisons! If the sectoral horn is much better than the slotted waveguide, I will arrange to excite both antennas as before.

If the slotted waveguide is reasonable, I will stay with the single, omnidirectional antenna."

Whilst Dave, G4FRE/WW2R (IO82uc) was in the UK for the Martlesham RT, he was checking the gear by listening to GB3LES. During the morning of 21st April, he heard a selection of beacons. On 13cm, DB0GW was +9dB, whilst GB3MHS was only +4dB and heard for just a short time all morning.

On 9cm, DB0GW was +5dB and DB0JL +3dB, whilst on 6cm, DB0JL was +5dB.

Dave called CQ but there was no activity, and by 10:45 the bands were quiet again.

The recently installed beacon GB3SEE on 24GHz had an intermittent problem of low RF output, and has been taken out of service for investigation.

## GB3DUN Returns to 23cm

The Dunstable beacon GB3DUN (IO91SV) on 1296.890MHz made a welcome return to the band on 22nd May, after a three year absence.

Bryan, G8DKK repaired the beacon, but it took some time to re-install it. At present, the antennas are low on the mast, so there exists some room for improvement.

Please spot the beacon via the DXCluster if you hear it.

## 13cm EME

**From: Peter Blair, G3LTF, Andover, IO91**

On 6th May I was QRV for the 13cm Dubus contest (*indicates crossband) and worked F2TU, SP6OPN, SV1BTR, JA8IAD*, LZ1DX, RK3WWF, JA4BLC*, PA0BAT, SM2CEW, JA8ERE*, G4DDK, ES5PC, DL1YMK, OK1CA, SP6GWN, SD3F, G3LQR, PY2BS, OH2DG, LA8LF, S50C #93 DXCC 36, VE6TA, OK1KIR, IW2FZR, GW3XYW, IK3GHY #94, G4CCH, SV3AAF, CT1DMK, K2UYH*, WW2R*, OZ4MM, DL4MEA, WD5AGO*.

On 7th May I worked VK3NX with a very nice signal, G4RGK#95 and finally WA6PY* and NA4N*. Heard were LX1DB, IZ2DJP, W7JM, and W5LUA all on 2304MHz only and G4BAO on 2320MHz. I heard and called SM3JQU and OH1LRY on 2320MHz but they couldn't get my call.

The total worked was 37 (plus 7 more heard). I was very pleased to note that there were 7 UK stations making EME QSOs on 13cm over the weekend. I measured 18dB sun noise on 13cm with SF101, and 0.7dB moon noise and, I've never looked for it before, just over 0.2dB from Taurus.

**From: Philippe Pierrat F2TU, JN38LG**

On 6th May, I had QSOs with LZ1DX 569/579, PY2BS 569/589 , and on SSB CT1DMK 53/52, IK3GHY 559/589 #111.

There was very good activity over the w/e of 7th/8th May during the Dubus contest, and I think I contacted every station that was QRV.

49 calls/52 QSOs. Initials: OH1LRY, G4RGK, ES50C DXCC 35, S59DCD #115 DXCC 36.

Best DX was an SSB QSO with VK3NX 43/55. The weakest signals were from OH1LRY, G4BAO, and SM3JQU.

## F2CT First 24GHz EME QSO…

**From: Guy, F2CT (IN93FL)**

After 3 unsuccessful attempts tonight (6th May) with OK1KIR, W5LUA, and DF1OI, I finally made a contact at 17:00utc with Willi LX1DB via EME on 24GHz.
Conditions in terms of attenuation were far from favourable especially for "QRP" equipment like mine, but by dint of spending hours and hours to optimise the system both mechanically and electronically, a result was finally achieved.

Thank you to everyone who helped me, and a special mention of Jean François F1LVO and Andre F9HX.

## … and a First 24GHz EME F/OK

On 13th May at 21:00UTC, I had the pleasure of a contact with OK1KIR via EME on 24GHz with excellent signals for the first F/OK!

I could hear Brian, G4NNS at about +6dB/n, but he did not hear me. It could have been high humidity at G4NNS end [or differences in power or cross polarisation].

Unfortunately, Al W5LUA broke his encoder just before our test! Tonight, the “world” was on 24GHz! DF1OI, G4NNS, LX1DB, OK1KIR and myself!

## ... and SSB on 24GHz EME

**From: Brian Coleman, G4NNS, Andover**

On 13th May, I had a random 24GHz EME QSO with OK1KIR and QSO with LX1DB where we exchanged 569 both ways – EME’ers S6 ! but good signals – followed by my first 24GHz EME SSB QSO. I gave Willi 31 and he gave me 41. I think he was being generous. It wasn’t exactly armchair copy! With ~200Hz of spreading, where do you reinsert the carrier? It was like a very weak rain-scatter signal on 10GHz.

It was not a world first though, Willi had worked Al W5LUA on SSB some years ago.

## 23cm UKAC 17th May

Ray, GM4CXM had his usual haul of stations, but noted a difference in the aircraft reflections from Kjeld, OZ1FF. Ray says that normally, the signal slowly appears and burbles between 519 and 539 for a minute or so before gradually vanishing into the noise.

On this occasion, after a typical start and quickly completing all the necessary information exchanges, Kjeld went on to call CQ and Ray stayed on frequency to listen, in case any other contacts ensued. The signal just got louder and louder, eventually peaking 569 and the duration must have been in the region of 5 or 6 minutes. Apparently it was very impressive to listen to.

Ray also had unusual multi-path distortion on a handful of stations which took out letters and numbers on both CW and SSB. Despite having no problems with many other stations in IO83, G3WBB on CW was lost due to unreadability of his very good morse whilst signals from Ian, GM3SEK were very difficult to read.

## 10GHz Tropo

In the evening of 20th May, Guy, F2CT/p was in IN93gj. Whilst he didn’t find any rainscatter, a couple of good tropo contacts went into the log. F1FIH/p (JN23) at 485 km (peaking 55 on SSB), and F6DWG/P (JN19) at 719 km with a nice peak up to 599!

Ralph, G4ALY (IO70vl) reports some good distances on 3cm. On 27th May F9OE/p was on Belle Ile (IN87) off the Brittany coast with 55/55 SSB reports over the 369km path, and on 29th May, before the activity contest, F90E/p (IN87km) in Quiberon at 338km.

The contest “started with a bang” according to Ralph, with F2CT/p (IN93hg) 830km on both 3cm and 6cm 59 in SSB. F2CT/p was on the Spanish border at Col d’Artzatey. However, Ralph says this session had the poorest inter G turnout since he started contest working.

## EA on 3cm and 6cm

On the 4th June, during the morning, Ralph G4ALY(IO70vl) worked EB1RL/1 (IN83fd) on both 6cm and 3cm at a distance of 813km. The signal reports were 529/519 on both bands, but conditions were described as "quite difficult". This represents a first tropo contact from G-EA with a Spanish callsign (rather than EA/callsign).

The chaps at the EA end of the contact were "delighted".

## ...AND FINALLY

There have been some excellent distances covered on microwaves this month, and the rain-scatter season has been good so far, although the activity has largely favoured France.

From the end of June, I shall be F1VJQ (IN95ol) with 6m, 2m, 70cm, 23cm, and 3cm. Do look out for me!

**73, Robin, G8APZ**

***Please send your activity news for this column to:***

***scatterpoint@microwavers.org***

# Events calendar

| | | |
|---|---|---|
| Jun 24-26 | Ham Radio, Friedrichshafen | www.hamradio-friedrichshafen.de/ |
| July 9–10 | Finningley Microwave Weekend | www.g0ghk.co.uk/event/roundtable-2011 |
| Jul 29-31 | Amsat-UK Colloquium, Holiday Inn, Guildford, Surrey | www.uk.amsat.org/Colloquium/ |
| TBD | Scottish TBD | |
| Aug 13-17 | IARU Region-1 Conference, Sun City, South Africa | www.iaru2011.org.za/ |
| Aug-21 | RAL Roundtable | 10:00 AM Natter and testing; Lectures from 1pm to 4pm |
| | Rec Soc building as 2010. We will not be using the RAL site so there is no need to register for security but Mike Willlis would like to know how many people to expect. | |
| Sept 10 | 56.UKW Tagung Weinheim | www.ukw-tagung.de/ |
| Sept 11 | Crawley Roundtable | awaiting details |
| Sept 30 – Oct 1 | National Hamfest | www.nationalhamfest.org.uk/ |
| Oct 7-9 | RSGB Convention, Horwood House, Milton Keynes | www.rsgb.org/rsgbconvention/ |
| Oct 9-14 | European Microwave Week, Manchester | www.eumweek.com/ |
| Oct 13-16 | Microwave Update, Enfield, Connecticut, USA | www.microwaveupdate.org/ |
| | Crowne Plaza Hotel, 1 Bright Meadow Boulevard, Enfield, CT 06082,. Rooms $99. Sponsored by N.E.W.S. Group. This is where the Eastern VHF/UHF Conference has been held for the past 10 years. Additional info email n2liv@arrl.net and w1ghz@arrl.net for details. | |
| Nov 5 | Scottish Microwave Round Table | www.rayjames.biz/microwavert/ |
| **2012** | | |
| Aug 16-19 | 15th International EME Conference, Cambridge, UK | eme2012.com |
| Oct 29 – Nov 2 | European Microwave Week, Amsterdam | www.eumweek.com/ |

# Contests & Activity Dates

***June***

| | |
|---|---|
| 21 Jun | 1900 – 2130 1.3GHz Activity Contest<br>Arranged by VHFCC (RSGB Contest) |
| 26 Jun | 1000 – 1600 2nd 5.7GHz Cumulative |
| 26 Jun | 1000 – 1600 2nd 10GHz Cumulative |
| 26 Jun | 1000 – 1600 2nd 24GHz Cumulative |
| 28 Jun | 1900 – 2100 2.3GHz+ Activity Contest<br>Arranged by VHFCC (RSGB Contest) |

***July***

| | |
|---|---|
| 2/3 Jul | 1400 – 1400 VHF NFD (1.3GHz)<br>Arranged by VHFCC RSGB Contest |
| 17 Jul | 0900 – 1700 24/ 47/76 GHz Contest<br>(New Format) |
| 19 Jul | 1900 – 2130 1.3GHz Activity Contest<br>Arranged by VHFCC (RSGB Contest) |
| 26 Jul | 1900 – 2100 2.3GHz+ Activity Contest<br>Arranged by VHFCC (RSGB Contest) |
| 31 Jul | 1000 – 1600 3rd 5.7GHz Cumulative |
| 31 Jul | 1000 - 1600 3rd 10GHz Cumulative |
| 31 Jul | 1000 - 1600 3rd 24GHz Cumulative |

***EME Activity weekends***

2–3 July 3.4GHz loss 0.8-0.4dB sun separation ~10°, declination 19-13°

**30–31 July** 5.8GHz loss 0.7-0.4dB sun separation ~ 4°, declination 17-11°

***FRENCH JOURNEES d'ACTIVITE (JA)***

Activity dates cover all bands from **23cm** up.

**25-26 Jun** Activity weekend - 26th matches UKuG

Plus « Grande Bleue » activity

**30-31 July** Activity weekend - 31st matches UKuG

**27-28 Aug** Activity weekend

**24-25 Sept** Activity weekend - 25th matches UKuG

**29-30 Oct** Activity weekend

Duration of all JA is 1700 Saturday - 1700 Sunday

**The RSGB 2011 VHF+ Contest Calendar is now available at www.rsgbcc.org**