An Amateur Radio publication for the Microwave Enthusiast

scatterpoint

Formerly the RSGB Microwave Newsletter and now published by the UK Microwave Group

2005 JULY - AUGUST

THE SHAPE OF THINGS TO COME ?

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In this issue ...

Latest News ...

- **411km on 24GHz Rainscatter!**
- **GB3ZME 6cm beacon upgraded**

MANY THANKS TO ALL OUR CONTRIBUTORS THIS MONTH ... WITHOUT YOU THERE WOULD BE NO SCATTERPOINT!

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From the Editor's Desk

Welcome back to the second volume of the "new" Scatterpoint.

It's a whole year since the RSGB Microwave newsletter was metamorphosed into the present Scatterpoint. As the official newsletter of the UK Microwave Group this publication goes out to many countries around the world and its present success is due to the wonderful support from you, the subscribers and members of UKuG.

This month's bonus iof 4 extra pages was necessary because of the volume of mail received over the past few weeks.... many thanks folks!

Our thanks go to the people who have contributed articles and news for this issue...particularly to **Paul W1GHZ, Paul M0EYT, David G6GXK, Grant G8UBN, Kent WA5VJB, Mike G3LYP and Sam, G4DDK** plus all who sent in activity news. Thanks also to our printers**, Mensa Printers of Sheffield**. I'm sure you agree they do a very fine job!

73 from Peter, G3PHO, Editor

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News, views and articles for this newsletter are always welcome. Please send them to G3PHO (preferably by email) to the address shown lower left. **The closing date is the Friday at the end of the first full week of the month** if you want your material to be published in the next issue.

IMPORTANT CORRECTION TO LAST MONTH'S CRAWLEY ROUND TABLE NOTICE

In the announcement of the date of the Crawley Microwave Round table in the last issue of Scatterpoint, the contact e-mail address was out of date.

It should have been: derek.atter@blueyonder.co.uk

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Antenna Tests at AMSAT Colloquium 2005

...by Mike Scott, G3LYP and Sam Jewel, G4DDK

The antenna test range has become a regular feature of the AMSAT Colloquium, held at the University of Surrey the last weekend of July. This year, as last year, the range was limited to the 2.4GHz band as currently there was little need for the other microwave bands.

The range was set up using the same equipment as last year but it immediately became apparent that things were not as they should be, with measured gain figures for different antennas being both higher and lower than those expected based on the manufacturers claimed figures.

When our 2.4GHz source was switched off, strong readings were detected on the Marconi 6593A SWR Meter, and these could be peaked by pointing the reference antenna at several of the University buildings. This was attributed to the presence of new WiFi systems which were not present in previous years.

After some experimentation, reasonably meaningful results were obtained and these are tabulated below, but it is clear that some changes to the equipment, such as the insertion of a filter between the test antenna and the detector and/or the use of a higher power source, will be needed on this band before next year.

As an aside, it was interesting to hear a speaker at the Colloquium say that University campuses were bad places to set up satellite ground stations for just this reason!

Further information on the test range can be obtained from the write up of last years tests (see Scatterpoint, September 2004).

Callsign	Antenna Type	Measured Gain
Reference	Rectangular Horn (W1GHZ design)	15.5dBi (Calculated)
G8JXA	25 Element Tonna	19dBi
G4PGY	Sandpiper Helix	12.8dBiC
G4DDK	Huber Suhner Patch type 2400/27/17/0/V	16dBi
G4DDK	Huber Suhner Patch type SP4 2400/75/9	8.5dBi
G4DDK	Wimo 9 x D. Quad	17.5dBi

These were the gains measured on the day. No claim is made for their accuracy but it is believed that the gain should be within +/-1dB of the true value based on the manufacturers claimed gain for two of the antennas.

Clearly, the number of antennas submitted for test has, this year, fallen dramatically from previous years and we will have to consider whether to take a break from antenna gain measurements next year.

WOULD YOU BELIEVE IT ?

An anagram of “The Morse Code” is “Here Come Dots”
.... rather appropriate to microwavers ... don’t you think?
73 from Chris, GW4DGU

The M0EYT 5.7GHz transverter

After having a few years of operation during the 10GHz cumulative contests and being asked, repeatedly, if I was QRV on 5.7GHz, I decided that it would be a good idea to get on with building up a transverter for this band.

I had tried in vain to tidy out the junk in my garage and decided that, before skipping the stuff, it should go on EBay. Amazingly, the 'rubbish' that I'd cleared sold at good prices and amounted to enough to purchase a 5.7GHz transverter kit. Our local radio club (**www.frars.org.uk**) and another local radio amateur were also interested in getting some Kuhne Electronics (DB6NT) hardware, so we put in a combined order for 4 transverters covering 2.3GHz and 5.7GHz.

After placing the order with Kuhne, it was only a few days before the large box arrived, very well packed and complete with a few of the new catalogues. I started the 5.7GHz transverter construction at once. The instruction / build manual is very straightforward and is well worth a couple of passes before gluing all the hardware together. The tin plate box needed to be drilled and tapped to accommodate the 3 SMA connectors and 4 DC feed through capacitors. In my transverter I added another SMA socket for external LO input as I was intent on using an external G8ACE type local oscillator. The mechanics took about an hour to complete, including soldering the two halves of the tin plate box together and installing the RO4003 Duroid PCB.

If you've not seen a DB6NT transverter kit before, they are nicely presented with all components being supplied in compartmentalised plastic boxes with all values printed on the lid of the boxes. Two boxes are supplied for the 5.7GHz transverter, one containing all the Rs and Cs, the other containing semiconductors, sockets and other mounting hardware. The transverter was built up as per the directions in the manual, starting with the two resonator cavities, helical filters and the discrete components. The power supply semiconductors were installed next, and a DC check performed to make sure the voltages looked right, which they all did.

The MMICs and FETs were added without problem – well *almost* with out any problem! Two transistors in the multiplier chain caught me out with the orientation of the writing on top of them being 180 degrees out compared to the component placement diagram but it was simple to rectify. I should have read the note on the component placement diagram which says "Don't use the orientation of the writing as a guide!!!"

I found it useful to use a good temperature controlled soldering iron for all the steps. The iron and work area was prepared to minimise the possibility of static build up, which could damage the devices.

The next step was the tune up as per the manual. The local oscillator is fairly straight forward, with several multiplication steps from the temperature-stabilised crystal of 117MHz up to the local oscillator of 5.616GHz. The tune up steps recommended measuring voltages at various points along the chain, and peaking for maximum / minimum. This was done and the results checked on a spectrum analyser only to find that no further improvement could be obtained. The remaining cavity filters were tuned as per the instruction – connect a 144MHz receiver and listen for a peak in the noise. The transmit side was pretty similar; apply 144MHz RF and peak for maximum power output, using the built in power monitoring facility. The transverter was checked on air and the local GB3SCC beacon could be heard on about the right frequency.

The next stage was to integrate the transverter into a complete system that I could take out on the local hills. For my portable systems, most of the transverters are housed in lightweight plastic boxes, with an aluminium chassis inside. The boxes used are made in the UK by Gewiss (**www.gewiss.com**) and are of type GW44208 IP56.

Before getting the transverter kit, I had purchased a 5.7GHz power amplifier strip from another UK amateur – it was a TWT replacement and as such had a pretty high gain set of amplifier stages. This PA was to be incorporated into the final transverter design, so the first two stages were removed, giving a PA that needed about 100mW in for 5W out – I built up a simple protected power supply circuit as a module and put that to one side whilst I concentrated on the rest of the transverter integration.

As with any 'high power' microwave transverter, sequencing is recommended to avoid having to replace front-end devices repeatedly. I chose to use the VK5EME EME66 sequencer which has 4 sequenced outputs, and given the current £ to AU$ exchange rate, they are very cheap to import. The sequencer has an output for a receive preamp which gives me the flexibility to add one in the future. The other outputs drive the NMS1212 dc-dc converter for the 24V relay, the antenna change over relay and finally the supply volts to the PA – this was via another small relay to avoid the voltage drop when switched through the sequencers output transistor. I used a latching 4 port transfer relay in my 5.7GHz transverter – it's an R566433 type, brand new from Ebay for a "fiver" – the specification seems pretty good and the isolation is sufficient between the ports.

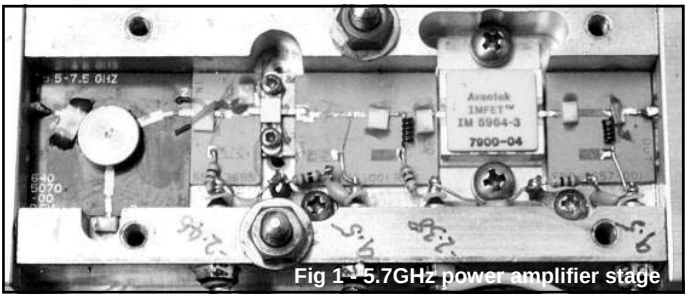

Fig 1 – 5.7GHz power amplifier stage

The other addition was a DF9LN local oscillator module that I bought from the 'flea market' at a Crawley microwave round table meeting – this really has improved the stability of the transverter.

The picture below shows the completed transverter with the temporary (!) wiring that was installed just to test it.

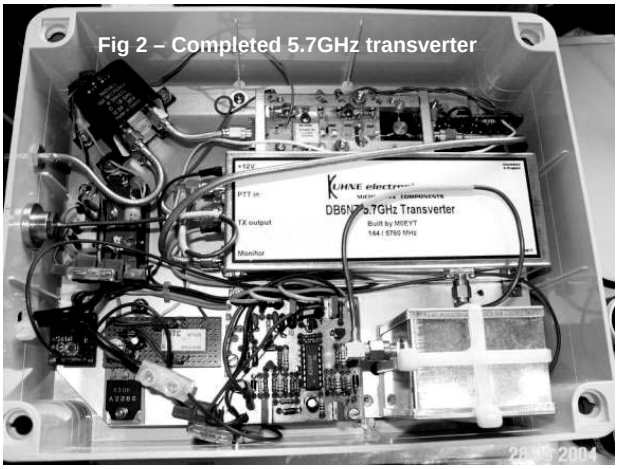

Fig 2 – Completed 5.7GHz transverter

I had my first first 5.7GHz QSO only a couple of days after completing the transverter; I worked Dave G0RRJ via rain scatter on the 2/10/2004. So far, the system has been used in a few cumulative contests and some of the other VHF/UHF/SHF contests that either FRARS or I participate in. I get the feeling that 5.7GHz seems to go better over paths that you might struggle on when working 10GHz. I've had a few QSO's from home with just a feed-horn propped out of the window, successfully working G0RRJ and G4LDR via some scattering mechanism – tree / rain / other at a guess. Certainly rain scatter effects seem to be more pronounced at 5.7GHz that 10GHz – all we need now are a few more 5.7GHz beacons in the UK with which to test.

Overall, I can thoroughly recommend the DB6NT transverter kits, they are easy to build and guarantee very good results on the microwave bands. Have a look at **www.db6nt.de** for more information on the 5.7GHz transverter – you can buy either a ready built one that has been professionally aligned, or save a bit of money and buy the kit, and have a few enjoyable hours building it up and testing it out on the air.

Footnote: I bought a PCB from DB6NT at Friedrichshafen to build up a 5.7GHz amplifier, based on an IMFET I found on EBay – it says on the packet that its P1dB is 43.7dB, which should be an improvement of at least 6dB over my existing output power – hopefully if I can get the machining done for the case, it'll be QRV in the cumulative contests this year. 73 and see you on 5.7GHz – Paul

Using Mitsubishi Power Amplifier modules

Grant Hodgson G8UBN
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Introduction

There have been various discussions on the US microwave reflector regarding the use of the new Mitsubishi RA… series power amplifier modules as amplifiers for both 1.3GHz and for VHF/UHF talkback. This article is intended to explain how to get the most out of these very useful and versatile devices and to counter some of the myths and half-truths that have developed over the years about PA modules in general. At the time of writing, it is anticipated that this article will be in two monthly parts – part 1 outlines the use of the PA modules in general, part 2 will describe in detail the use of the RA18H1213G for use at 23cm, although it may have to be spread over three parts depending on how long the thermal measurements take.

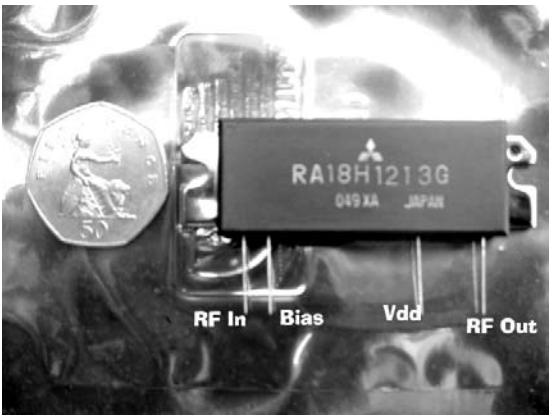
This article may seem rather long but it is surprising how such an easy-to-use component as a 12V 50 ohm PA module can be abused and even destroyed though lack of understanding of how these devices should be handled and operated. So what follows is an attempt to explain in detail some of the more subtle points.

History

The RA... series of Power Amplifier modules from Mistubishi follow on from the hugely successful M5/6xxx series which were introduced in the 1980s as a means of easily amplifying RF power in the VHF and UHF frequency ranges. Literally millions of M5/6xxx series PA modules were sold worldwide to both commercial and amateur radio customers. They offered many advantages compare to RF amplifiers using discrete power transistors and everything was included in a single module – all that was required externally was a heatsink, a main DC supply (which could be taken directly from a 12V car battery), a regulated bias supply and some de-coupling capacitors. Output powers ranged up to 60W at 144 and 432MHz and many of the modules could be used for SSB, although not at the full rated output power.

The M5/6xxx series are now obsolete; the last ones rolled off the production lines around 2003/2004. Many of these PA modules are still available, but as time goes on it is getting ever more difficult to find them, as the old stock gets used up.

Photo below: The new 23cm module on anti-static bag



New RA… series PA modules

One of the main problems for Mitsubishi with the M5/6... series was that the modules did not have a very wide frequency range and consequently, in order to meet the needs of thousands of different customers, together working at nearly all frequencies from 50MHz to 1.3GHz, many different modules had to be produced. In fact, at one time there were more than 200 different types of Mitsubishi PA module in production, each one with a separate part number and the overheads involved in managing such a huge number of relatively similar devices

were enormous. Mitsubishi's solution to this problem was to scrap the old M... series entirely and develop a range of new modules which would offer a much greater frequency range, thus reducing the number of variants. One of the knock-on effects of this was that, generally speaking, the new RA.. series modules are cheaper than their M5/6xxx counterparts.

The technology used for these new modules still uses silicon (as opposed to other semiconductor materials such as Gallium Arsenide amongst others) but, instead of using bipolar transistors, the new modules use MOSFETs. MOSFETs offer a number of significant advantages over bipolar transistors, including wider frequency range, higher gain, higher power output, better linearity and practically no bias current. The supply voltage remains the same, which means that some applications can use the new modules with only a small number of changes, which will be described later. Note that the new modules do not use a technology called 'LDMOS' (Laterally Diffused MOS) – this is a slightly different type of technology, which usually requires a 28V DC supply. The MOSFETs used in the RA... series modules are 'enhancement mode', which means that a +ve gate voltage is required for them to operate, and zero gate voltage completely turns them off.

The modules that will be of most interest to radio amateurs are the high power modules, and these are the ones that will be discussed in more detail.

Part numbering

The M5/6... series of PA modules simply took numbers from a list, in sequence, as they were developed. It was impossible to determine the performance of a module simply from the part number; one had to have access to the data sheet or have a very good memory (think of how many devices there were!) .

The new RA series have part numbers that relate directly to the device's performance. Therefore, it is possible to ascertain many of the operational parameters without access to data sheets, and conversely it is possible to find the part number of a module from a specification.

The new part numbers are of the form :

RAaabccdde

RA	RF PA Module
aa	nominal ouput power in Watts
b	supply voltage code
cc	lower frequency limit
dd	upper frequency limit
e	Frequency Multiplier – either M or G.

The supply voltage code is as follows :-

H	12.5V
N	9.6V
M	7.2V

f the frequency multiplier is M, then the lower and upper frequencies are in 10s of MHz. This gives the operating frequency to within 10MHz, the exact operating frequency limits are specified on the datasheet.

There is only one module with a 'G' suffix, with is the RA18H123G.

Examples:

RA45H4047M	45W, 400 – 470MHz, 12.5V
RA30H0608M	30W, 68 – 88MHz, 12.5V
RA03M8894M	3W, 889 – 940MHz, 7.2V
RA18H1213G	18W, 1240 – 1300MHz, 12.5V

Note that in practice the modules can be used outside of their stated frequency range, for example

the RA30H0608M can be used at 50MHz, with good performance.

Using the new RA series modules

None of the RA series modules are a direct replacement for any of the M5/6... series modules. There are a number of detail changes that the user must be aware of, in order to avoid the possibility of damage to these modules.

Static Discharge

All electronic components that use FETs are susceptible to damage from static discharges, and as such the same precautions must be taken when handling the new PA modules as when handling GaAsFETs and similar devices. The older M5/6xxx series used bipolar transistors and as such were not easily damaged by static.

In addition to the possibility of damage from static, the modules can also be damaged by small leakage currents from the tip of a soldering iron. Therefore, it is imperative that any soldering iron used has a ground connection to the tip, and that this connection is checked with a multi-meter – the author has managed to destroy at least one module due to a fault with the earth connection on a high-quality (Metcal) soldering iron; a fault that took a lot of time to investigate but was easily corrected.

Package and Pinout

All of the new high-power PA modules operate from a nominal +12.5V supply, and can be operated at 13.8V without damage. The package and location of the pins are the same as previously, which is very convenient. However, the new modules have only 4 pins instead of 5 for the M5/6xxx series. The pin connections are :-

Pin 1	RF in
Pin 2	Bias supply
Pin 3	Main DC supply
Pin 4	RF out

Note that the bias connection has moved from pin 3 to pin 2. Therefore, if a PCB is being used which was designed for the M5/6xxx series modules, then the PCB will require modification, although this will usually be a simple track cut and wire link.

Bias supply

This is probably the biggest difference between the M5/6xxx series and the RA... series. Most of the M5/6xxx modules required a bias supply of 9V, although there were some exceptions where an 8V supply was needed. The bias current for the M5/6xxx series varied from module to module but as an example the M57762 used on 23cms required approximately 700mA, which would typically have been supplied from an L78S09CV or similar voltage regulator in a TO-220 package.

The RA... series modules require a bias voltage of between 4.2 and 5V, and the bias current is tiny - in the order of 1mA or so. Therefore it would be possible to use much smaller, lower-current voltage regulators, although high current regulators will still work of course.

With no bias supply, the FETs are completely turned off, and the PA module acts as an attenuator. Therefore, it is possible (and desirable) to connect the main DC supply to a constant +12V supply; there is no need to use a separate high current relay or switch. PTT operation can then be accomplished by keying the bias supply.

The setting of the bias voltage is the subject of some discussion. Unlike the M5/6xx series PA modules, there is no one, single optimum bias supply voltage. In fact it is possible to set the bias voltage to suit individual requirements. The Mitsubishi data sheet is very vague in this area, although the device parameters have been characterised with a bias voltage of 5V. However, many users report good results with bias voltages lower than this, and in one case as low as 4.2V. What is known is that the drain current, output power and gain increase as the gate voltage increases,

particularly above 4V. Also, the RF/DC efficiency of the modules *decreases* as the bias voltage is increased, due to the fact that the drain current increases more rapidly than the output power.

Decoupling and PCB

The supply pins require decoupling in order to reduce the possibility of instability. Mitsubishi recommend a 4.7nF capacitor in parallel with 'at least 22uF'. The 4n7 needs to be placed as close to the PA module as practicable. This is easily accomplished, especially since there are only 2 DC supplies.

The gain of the RA... series modules is much greater than the M5/6xxx series. The modules have been designed to be stable into any output load with a VSWR of up to 3:1. However, this assumes that the supply pins are sufficiently de-coupled. In order to achieve the best de-coupling performance, a very low impedance path must be provided to ground. The best means of achieving this is with a printed circuit board that uses plated-through holes. These PCBs are more expensive to produce than 'non-PTH' boards, but give much better performance than boards where the grounding has been achieved by other means, especially at 1.3GHz. This is one case where it really is worth spending a little extra in order to achieve the best performance.

One further note which is related to both de-coupling and static discharge – it is worth placing a high-value resistor in parallel with the 2 DC supply pins and the RF output pin in order to further reduce the possibility of damage due to static discharge. This is best done by soldering the resistors to the PCB before the module is fitted; that way the pins of the module will be grounded as they are soldered. The authour uses 68k, but any value from 10s of kohms to 1Mohm could probably be used. Note that the RF input pin is internally connected to ground with a PI-attenuator, and does not require an external resistor.

Grounding

There is some considerable confusion as to how the PA modules are grounded. The modules are designed to be mounted on a large, flat heatsink. With theM5/6xxx series modules, the best thermal performance is achieved by applying a thin, even layer of thermal compound on the flange of the heatsink. The application of the thermal compound means that a good electrical contact between the flange of the module and the heatsink cannot be guaranteed. Therefore, the electrical ground path for both DC and RF from the module to the PCB *is via the mounting screws and the heatsink*! This may seem totally counter-intuitive, but this is indeed the situation, which leads to some interesting points that need to be considered :

The mounting screws should be made of brass and be bright zinc plated; screws made of other materials such as steel will not give as good performance and should be avoided.

The mounting holes in the heatsink must be tapped; it is not sufficient to drill clearance holes in the heatsink and use long screws with a nut on the other side.

The mounting holes must be clean – this means that any residual cutting fluid must be removed with a cotton bud or similar, and great care must be taken to ensure that no thermal compound gets on the screw thread. (The author is aware of several 1.3GHz amplifiers that were unstable and actually oscillated; in all cases the instability was cured simply by cleaning the mounting screws.)

Black anodised heatsinks can be used without the need to remove the anodisation from under the module.

The real confusion arises with the new RA.... series, which have an indentation in the centre of the module. It is hoped that this will be discussed in detail either in part 2 of this article if time allows, otherwise a part 3 will be written.

Next month – specific details regarding use of the RA18H1213G module for 23cm, including detailed measurements of linearity (2-tone, digital modulation & harmonics), thermal performance (hopefully) and more…

MORE INFORMATION ON THE MITSHUBISHI AMPLIFIERS

[Mw] Mitsubishi RA18H1213G 23cm amplifier
From:SAM JEWELL <jewell@btinternet.com>
Date:Fri, 8 Jul 2005
To: microwave@lists.valinet.com

Folks,
Some time ago I said I would post results of some professional measurements on the linearity of my Mitsubishi 23cm RF MOS amplifier module. Unfortunately I have not yet been able to obtain those results so I decided to do my own measurements.

These are the results I obtained earlier today in my own shack workshop. Please note that these results are for my module, operating at 13.4V and with the bias set to 5V. The module heat spreader has not been sanded flat and the module is mounted to its (substantial) heatsink with two screws into the heatsink and a small amount of standard silicon heat sink compound used between the module and the heatsink. Prolonged use in this way has not resulted in any failure (so far!). No screen has been used over the top of the module and the output connections are via UT141 coaxial cable as shown on my web page at: **www.btinternet.com/~jewell**

The test system consisted of one R&S SMG signal generator and one HP 8640B signal generator combined with a Hatfield Instruments 3257-03 hybrid combiner. The combined generator output was carefully measured on the R&S FSB spectrum analyser to ensure 3rd order products were <-46dBc at 144MHz. The separation of the two tones was 100kHz (1296.250 and 1296.350MHz).

The resulting 40mW PEP 144MHz IF signal was fed into my new homebrew 23cm transverter. A Minicircuits ZHL42 broadband amplifier was connected at the output of the transverter and with the transverter TX IF input attenuator carefully adjusted to give 40mW PEP at the ZHL 42 output the 3rd order products were measured at -42dBc. The transverter couldn't quite achieve this good an IMD performance at it's rated 50mW output, hence the assistance from the ZHL42 in order to reduce any contribution from the transverter IMD.

The ZHL42 40mW PEP output was then connected to the Mitsubishi amplifier and the RA18H1213G amplifier output power measured on an HP435 power meter with HP8481B sensor and Weinschel 30dB/50w attenuator. The indicated power was 10W. Since the amplifier was driven by two tones at equal level, the output PEP was 20W.

When measured on the FSB the 20W PEP output spectrum showed the 3rd order products to be -17dBc, with the 5th order about -24dBc.

At 16W PEP output the 3rd order products were -20dBc, the 5th order -30dBc and the 7th order -42dBc. Higher order products were well suppressed.

My conclusion is that the amplifier, whilst not outstanding on 3rd order, has very acceptable 5th and higher order IMD performance and should sound very clean on air (assuming it is used with a sufficiently clean IF rig and transverter.....).

Note that this is a single amplifier measurement. Varying the operating conditions could and probably would cause significant changes in the IMD performance.

I am happy with what I've seen and I hope this will go some way towards redressing the balance about these new amplifiers. Some previous posts have been quite pessimistic.

As always, your mileage may vary. I hope this information will be of some interest to other 23cm band users.

73 de Sam, G4DDK

Ham Radio 2005 @ Friedrichshafen

– a brief report by Paul, M0EYT

This is the fourth year I've been to the Friedrichshafen Ham Radio event. This year was certainly the hottest in terms of weather,and the show seemed busier than the previous year, which is a good sign. Our group of eight stayed in Immenstaad, which is around 10 miles northwest of Friedrichshafen and about a 25-minute drive through pleasant country-side. A couple of our 'other halves' also came along, and went out visiting local attractions during the day, then met up with us in the evening for food and drink – the annual trip to Friedrichshafen makes a nice social break if there are a few people going. We all managed to get into the same hotel which makes things generally easier.

We arrived at the show around 8.30am on the Friday, queued for about 10 minutes to get an entry pass, then got into the show – the barriers were closed until 9am, and then it looked like the start of the London marathon with people running straight to the flea-market halls in order to grab the goodies.

Our first stop was the third flea-market hall, probably about the size of a football pitch, with about 10 rows of back-to-back traders. This year there seemed to be a lot more microwave goodies, including plenty of solid state PA's around the 5 to 6 watt mark, for various bands including 3.4GHz and 5.7GHz, for 20 to 30 euros each. Many stands were selling foot long pieces of quick form 141 with a SMA plug or socket for around 1 euro each – of course a quantity discount could be haggled. The second of the flea market halls seemed to be the best for microwavers – we found a stand selling PA's for microwave bands including 20 watt TWT's with matching 24V power supplies for 150 euro (£100). The same stand also had large quantities of SSPA's for various bands including 2.2GHz, 3.4GHz and 6.5GHz, all using the familiar Fujitsu IMFETs. The quantity of TWT's and matching power supplies was truly staggering, probably 50 to 70 units, and the seller was offering pretty good quantity discounts. One stand was offering 75 watt PA units for 13GHz that were based on a TWT, but these were heavy units and probably not possible to get back to the UK via Ryan air. Flexible WG16 was also plentiful, in 4 and 6 foot lengths for 10 euros each – probably a good price.

Communications during the event is essential if you are in a fair size group – we used 2m for talkback once we had found a clear frequency. The comms were used to locate bargains, as our group had split up, so we could sweep the flea Market halls in an efficient manner.

There were a few stands offering >10GHz divide by 1000 prescalers at good prices, including DG0VE who also has an excellent website. DD7MH had a nice display of his single and multi band ring feeds covering 23cm to 10GHz – it was interesting to see the construction techniques used and to chat to him about the feeds. Another stand offering microwave bits had nice directional couplers covering 23cm to 13cm for a few euros each – handy items for power measurement in our high-power transverters for these bands. Other items like Narda power dividers and directional couplers were in plentiful supply at reasonable prices.

The catering at the event is also second to none – probably equivalent to that provided at the RAL round table, but on a bigger scale. The prices are reasonable and the food is certainly tasty and they sell beer!

The Saturday pretty much mirrored with Friday, with most of the day being spent doing further passes of the flea market halls – there is just too much stuff to see everything in a couple of passes. On Saturday afternoon, some of the UK microwavers met up at the excellent Kuhne Electronics stand, and rag-chewed with Michael and Lorenz about some of the nice products on show – they too were selling 8 watt IMFETs for 10GHz ! Of our group, Jules G0NZO and John G7ACD bought transverters including 10GHz kits and pre-built modules, so we should hear them on the air very soon. Lorenz kindly took a photo of the UK Microwavers gathering. The DB6NT stand, (shown in the photo above) was in hall A1 which was allocated to non-flea-market traders and all the big names in Ham Radio were in there showing off their latest offerings. This hall also hosted international amateur radio societies including the RSGB.

On the Saturday night, the Ham Radio event hosts some live bands, which are mostly made up of Radio Hams. The music was good and it was a chance to meet up with some of the other Brits for a chat about the show and our bargains. Our group was sat away from the main stage so we could actually converse. We met up with Mike G0MJW, John G7JTT and Simon DL4PLM (pictured on the right here). Good food at cheap prices was available including lots of local dishes, and of course fine German beers, which we had to taste. The evening weather started off very nicely with a clear sky, but around 9.30pm, the heavens opened providing rain that would make for some wicked scatter. We decided to drive back to Immenstaad and visit the local bar. Later that evening we watched a fantastic lightening display, which lasted several hours.

Sunday was the final day of the event. We made a quick trip to the show to pick up some last minute bargains from the flea market then left just before lunchtime. We took a quick trip down the lake to Lindau, had some lunch and washed that down with more beer and some nice local ice cream, then spent the afternoon lazing around chatting about the show.

In all, our group enjoyed the event and we are already looking forward to next year's but we are also considering organising a trip to Dayton or to the Italian radio-fest.

Why not Microwave Update instead? ... editor

Photos by M0EYT and GM4PLM
...many thanks

Radio Astronomy Group Meeting

8th October 2005
The Humfrey Rooms, Castilian Terrace, Northampton, NN1 1LD

Dr Tim O'Brien(of Jodrell Bank)**:** Jodrell Bank's 6.4m Robotic Radio Telescope
Dr Laurence Newell: The Activities and Work of the BAA Radio Astronomy Group
John Cook: A Simple VLF Receiver for Solar Flare Monitoring
Richard Lines: The Schumaker-Levy - Jupiter Impact at 21MHz, and Solar Observations at 600MHz
Bob Marriott: The History of Radio Astronomy in the BAA
James Wilhelm: The John Smith 408MHz All Sky Survey
Murray Niman: Challenges to the Radio Astronomy Spectrum
Peter King: The Mullard Radio Astronomy Observatory 151MHz Array

The afternoon session will include short presentations from members.
Please come along and tell us what you have been doing.

Contact Karen Holland for further details on: karen.holland@xcam.co.uk.

Frequency Standards Article - Questions

Following on from my talk/article at the RAL Microwave roundtable in April this year, I have had some queries about exactly what level of OCXO input is required into the modified DDK004 and the externally excited DB6NT LO. This is for use with an externally generated/locked oscillator.

In order to answer these questions, I carried out some measurements to check these levels. For my modified DDK004 unit the G8ACE OCXO (106.5MHz) was giving out about 2mW into the DDK004. This gave an output at 2.556GHz of about 10mW.

I checked the DB6NT LO for 24GHz - with the old internal 125.25 Xtal - it gives out 42mW at 12.024GHz measured on Marconi Power meter. Note that this LO is built on my own PCB from the original published info in Dubus. There may be some differences from the current DB6NT product but the input level requirement should not be different.

I then removed the link inside (I have modified the PCB just a little to allow it to be easily changed from internal or external Osc) and fed the LO with 125.25MHz from a Marconi 2022 Signal Generator.

Result as follows:

Input(mW)	Input (dB)	Output(mW)	
	-1	0	
1	0	2	
	1	13	
	2	31	
2	3	40	(about the same as the internal oscillator)
	4	44	(definitely into limiting from here)
	5	47	
4	6	48	

So ,from that, we should be looking at about 2mW output from the OCXO. whether for the DDK004 or the DB6NT LO. The G8ACE OCXO conveniently provides this level.

This info may be of some use to others who have read the article in the 2004-5 UKuG Proceedings.

73 David, G6GXK

THE TALKBACK DEBATE !

Following the, at times, heated debate on the use of ON4KST for microwave talkback I have been investigating what I hope will be a less controversial technique. I have recruited an ex racing pigeon and am beginning training it for this task.

The photograph on the left shows Percy at the initial interview whilst the other picture show him undergoing familiarisation with the equipment. It's early days yet but I imagine that I will need to recruit a whole flock of pigeons and send one to each of the portable stations prior to the contest. Of course, range would be limited to the distance the pigeon can fly before the contest ends but I imagine that these and other snags could be ironed out given time. Of course, when purchasing your racing pigeon from a "fancier" it might be best to avoid using the word MICROWAVE or he might get the wrong idea.

73 Brian, G4NNS

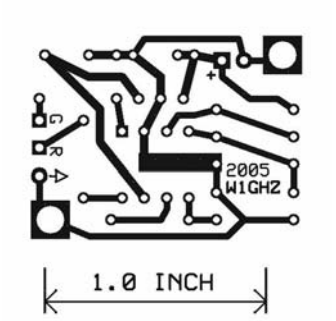
Editor' comment ... this talkback system looks to be quite "cheep" to set up!

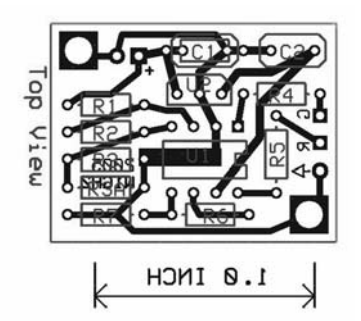
A Single-sided Printed-circuit Board for A Single LED Battery Status Indicator for the Rover

Paul Wade W1GHZ ©2005
w1ghz@arrl.net

In the previous Scatterpoint, I described a battery status indicator. The unit was built on a printed-circuit board from ExpressPCB, since I find them more convenient than the mess of making my own boards.

Something on the microwave reflector reminded me that some folks still make their own printed-circuit boards. Usually, these are simple, single-sided boards without plated-thru holes. Since this layout was pretty simple, I went back to see if I could do the PCB layout on a single side. I made the lines and spaces larger, to allow for kitchen-sink technology, so the board came out slightly larger. Here is the PCB pattern, seen from the metal side, and the parts placement, looking from the other side – go for it!





BEACON NEWS .....

GB2SC ### series Bell Hill, IO80UU

Last night, 1st August, we went up on site to finish off the latest installation and changes to the beacons.

GB3SCF has been reinstated, now with a frequency locked source.

GB3SCS has had its keyer replaced and hopefully won't start giving inverted keying again.

GB3SCF frequency has been shifted closer to its target value

An **RTTY transmission** has been added to GB3SCF with the standard 170Hz shift (Unlike that on GB3SCX with 850Hz shift) but otherwise the settings are the same - 50 Baud, rest at Fcarrier, shift 170Hz high when sending data.

The frequency standard that controls **GB3SCX and GB3SCF** is now GPS locked. The locking circuitry uses a Jupiter-T GPS receiver with a 10kHz output, controlling a 10MHz PLL with a 30 second time constant - consequently the 'standard' will follow many of the short term variations on the GPS reference. When I measured these last year they typically looked to be a random wander of a few parts in 10^-9 over a period of tens of seconds which will refect in 10 - 30 Hz random wander on GB3SCX and a few Hz on GB3SCF. The long term average frequency will, of course, be 'exact'

GB3SCX uses a 32 bit DDS to define its frequency, so the actual frequency resulting is dependant on this step size - here it results in a carrier +6.85Hz above 10368.905MHz

GB3SCF uses a 48 bit DDS so its frequency is just 114 micro-Hz below the design value of 3400.905

We also tweaked the frequency of **GB3SCC slightly**, but after measuring it later the tweak still wasn't enough. At 2200z yesterday, **GB3SCC** was sitting on 5760.8877MHz. At 0530z today, it was on 5760.899MHz - ie still about 6 - 7kHz low. Better than it was, but far short of the accuracy of the 3.4, 10 and 24 beacons.

73 from Andy G4JNT

GB3ZME 5.7GHz Shropshire

The GB3ZME beacon on 5760.910 MHz is now back on after a 2 month break.

the PA is now 15 watts, fed to 8+8 slotted waveguide via 25' of LDF550.

We are trying a different approach to crystal stability, based around DSB6NT's current temperature control module .I wish he'd a 60 deg version available! The 40 degree standard can well be exceeded on a hot summer's day in a stuffy loft area, where two of the 'ZME microwave beacons reside.

As I can't monitor this one at home, I would very much appreciate reports, for both normal "flat conditions" and enhanced propagation. (email to: **ukv@ukv.me.uk**)

Acknowledgements are due to Telford Electronics who donated the Andrew's coax.

Note: All three GB3ZME beacons now fully operational, viz:

3400.910MHz (HF in warm weather) 15 watts, Ionica antenna, 120deg. beamwidth, centred approx. SE.
5760.910MHz 15 watts, 8/8 slot. Omni
24192.048MHz 1 watt, omni 40 slot. Omni. HF on warm days.

All sponsored by the Telford & DARS.
Site: Locator IO82SQ (NGR SJ 686080). QTH 200m ASL

73 from Martyn, G3UKV

LA4SHF 10GHz beacon update

From:"JAN LUSTRUP\(lustrup\)" <lustrup@start.no> 3 Aug 2005

I have received today the beacon from DB6NT and it is now being tested at JO28UX.
I am still waiting for the 1 Watt PA to arrive.
The final **QTH is JO28UO** and this is 150m over sea level and a seapath to UK, OZ, PA, F and DL.
ERP is approx 50 watt, transmitting in 2 directions:
1: SW with homemade 13 dB horn, very low el. / but wide az. angle.
2: North with high gain 17dB horn. Keying is via a WW2R module with fsk skift of 10 kHz.
I will get back with more info when the beacon is in normal operation.

73 de LA3EQ Jan

We're well into the summer contest season and there has actually been quite a lot worked outside those organised weekends also. However, to date there are only two entries in the 2005 Microwave league Table! You can see the latest positions by going to my website at **www.g3pho.org** and clicking on the link to be found on the left hand side of the menu page. Let's have lots more entries so that the table can be published here in Scatterpoint next time. So now onto the various UKuG Contest reports....

June 5.7 and 10GHz Cumulative

From Gordon, G0EWN/P: (Stanage, IO93EI)
Phew what a scorcher-- the air temperature exceeded 36C at one point . A mixed day with 8 stations worked on 3cm: G3LRP, G3PHO/P, G4RQI/P, G3JMY, M0EYT/P, G3PYB/P, G8BKE/P and G0MJW/P -- best DX around 281km. On 6cm: G3PHO/P, G3LRP, M0EYT/P, G3PYB/P, G8BKE/P, G0MJW/P and **GI3ZME/P** who was a new country and best DX at 310km.

I also tried with a number of stations which failed: MW0GHZ/P, G4ZXO/P, G8KQW/P, G0API, G0UPU (heard but then faded). Also heard on 2m: G4ALY and GW3TKH/P.

At one point in the day my FT817 decided it was far too hot and decided to do its own thing. The /P location also very noisy with tourists/ helicopters/ trail bikes etc. I wound things up at 2.30pm GMT when the sky darkened and thunder looked imminent.

Observations: I didn't hear a single station from JO square on ANY band--most stations worked were other portables--fewer home stations than last year (all on KST?). It was very hard work trying to manage on two bands compared with a single band! Signals consistently stronger on 6cm than 3 cms both ways. My day was made by the contact with Martin GI3ZME/P who was a very strong signal via rain scatter some 30 degrees or so off the direct heading for a new square and country and best DX (QSL card Martin please). My thanks to G3PHO/P who helped alert me to Martin's presence.

From Peter, G3PHO/P IO93EH98 (Houndkirk Moor)
I was just a km or so SE of Gordon, G0EWN/P for this event but there were no real problems with mutual QRM, etc.The highlight of the day was the 5.7GHz QSO with **GI3ZME/P(IO74AI)** at 1340z for what we believe is **the first GI to G contact ever on 6cm.** Martyn's signals started off at only RS54 but rapidly developed into S9+++ by 1400z as a rain-storm developed in the Irish Sea between us. By 1420z I was copying him at RS56 on just the N connector of my FSJ1-50 Heliax dish feedline!!...ie with no feedhorn or dish. Best DX of the 12 stations worked on 6cm was, as ever, **Andre F1PYR/P (JN19BC)** at 536km. This went straight away on CW at RST559 both ways.

On 10GHz 22 stations were worked, the best being once again **F1PYR/P** (536km)at RST519 both ways. The late afternoon's activity was curtailed sharply by an horrendous electrical storm which had to be sat through in the van, hoping the 2m antenna would not get struck by lightning. This was the day when the same storm caused flooding and damage to homes just a hundred miles north in North Yorkshire, IO94.

Once again it was very noticeable how quiet the 144MHz talkback channel was for hours at a time, only the portables seemingly able to produce sufficient RF to be heard on it!

It was a real pleasure to work two 10GHz veterans who have retruned to the band.... Ian, **G8KQW/P** (a massive signal on 2m talkback from IO91RU) and Julian, **G3YGF**, who had a remarkably strong signal with his 300mW home station in IO90IX). Welcome back you two!

From: Paul, M0EYT/P Bell Hill, IO80UU (pjmarsh@compuserve.com)
Firstly, the wx was good for a change, with solid sunshine and temperatures around 28-30C. Andy, G4JNT and myself spent about 45mins setting up the 2m talkback and the microwave stations. The day started off a little slowly; a few local stations were worked but with signals that were drastically reduced compared to previous contacts. As the day progressed, more stations were worked.

144.175MHz was very quiet despite a lot of calling CQ but it did account for about 75% of contacts made. KST was quiet, possibly as fall out from the recent shenanigans on the reflector. **The best DX of the day was F1PYR/P** on both bands with reasonable reports being exchanged. We were pleased to work F1GHB/P on both bands - with 59 being exchanged each way. We tried twice with GI3ZME/P but couldn't make the QSO - it seems that Wales was in the way. The most impressive contact must have been with G4RQI/P running a barefoot DB6NT transverter at 359KMs - 519 was exchanged each way; the CW from RQI was possibly the weakest I've ever had to copy! In all, 19 contacts were made on 10GHz and 10 were made on 5.7GHz. Next month should feature the new 20W 5.7GHz SSPA.

From:Steve, G1MPW/P (JO00AU) "sjc.2" <sjc.2@virgin.net>
Steve G1MPW and Dave G6KIE operated from their new site again near Firle Beacon , JO00AU, and had a good day despite the very hot sun and a strong breeze -- a dangerous combination . We managed

to work 15 stations - the best Dx being David G4RQI/P at 347 Km, He was only running 250mW so CW was required from him but after a bit of patience it worked in the end - TNX OM. It was also very nice to work Ian, G8KQW, again after many years - first time since the wideband days -- nice to have a QSO again Ian .

Report from N. Ireland GI3ZME/P 19 June 2005

The Telford Group visited N.I. twice this year, the first time to reconnoitre various sites in March, the second for the 'real thing' – which was to put in a serious entry for the RSGB 50 MHz Trophy contest. Having donated a superb 'Ironbridge Replica' trophy years ago to the RSGB, the Club's intention was to win it back. As it turned out, the results were good, but not good enough, in that department!

However, since the site (Slieve Croob, IO74AI21) is 534 metres ASL, and two participants (G3UKV and G4NKC) have microwave tendencies, we took 10 watts of 5.7 GHz with us. As the 6 metre contest thrust was dying down on Sunday afternoon, another small tent was put up, together with a 7 ele and 100 watt 2 metres station. Not the ultimate, perhaps, but contacted easily down to Sussex and France with this talkback. A couple of tries on 6cm were made with the group on Bell Hill (IO80UU – M0EYT/P), but no sigs. As the afternoon wore on, contact was made with G3PHO/P on Houndkirk Moor (IO93EH), and carriers were exchanged, and what we claim as the first G/GI QSO took place at 13:40 on SSB, exchanging 55/54 reports at 309 km. We then heard and QSOd that other Peter, G3LRP (Wakefield, IO93HO, 309 km). With a bit of fiddling, signals peaked 599/599 at 13:59, with strong rain-scatter characteristics. Peter 'PHO also called back to say signals were now were S9+. It turned out that this was the start of the monsoon season in Yorkshire, unfortunately with subsequent media reports of severe flooding in places. Gordon, G0EWM/P, running QRP from IO93EI followed at 14:15 559/579, on the same rain reflection patch at 306 km.

By this time, we were all smiling, especially as it remained sunny on Slieve Croob! The G4ZXO group then called us (yes – on 2 metres, even though we had 'KST available after 14:30) from Ditchling Beacon (IO90WV). By our reckoning, that's 550 km away, and quickly rain-scatter carriers were heard, and we exchanged 55/55 SSB reports with G0EWN/P at 15:26. Fantastic!

We went on to exchange with G4NNS (IO91FF, 457 Km), G3XDY (JO02OB, 541 km), G0RRJ (IO91FE, 461 km), and G4LDR (IO91EC, 464 km). That last successful QSO was at 17:18 hrs.

We stayed active until about 18:30, but no further signals were heard. Unsuccessful attempts were made with F1GHB/P, G4ALY, G4BRK as well as M0EYT/P mentioned earlier. They were outside the rain-scatter 'window' (except Eric F1GHB at 15:20), which seemed to be from about 13:30 to 17:30. It will be interesting to see how this fits in with other UK 5.7 GHz long-haul QSOs that day.

We hope to return to Croob. It's a superb site with 360 deg. clear views, about 1750' high. Whether we shall have 'KST available again remains to be seen, but the laptop (with appropriate card) we used was subject to a total Saturday over-night soaking under a leaking tent window panel. It was suitably drained and gently warmed on Sunday before being successfully switched back on, but perhaps it should be taken as a warning shot from the gods in the current 'KST debate .... **73 Martyn G3UKV and Mike G4NKC.**

July 24/47GHz Cumulative Contest

This event saw the usual small group out on the hills plus a welcome "new face" in the form of Ian, G8KQW/P. The warm and humid conditions were not condusive to long DX contacts but everyone had a good time neverthless. 24GHz, in particular, is suffering badly fromlack of activity. We know there is much more working gear out there that is heard on the air and that some of it hasn't yet been brought down to 24.048GHz even though it **is** more than 18 months since the move was made "official"! It doesn't take long to do, provided you already have the crystal. So come folks... get back on the band and let's see a revival in UK millimetre band work.

There's a real problem in the southern region of England finding suitable sites so that each operator can have one to himself, rather than many congregating onto one site. This was apparent in this contest when three stations found themselves at Walbury for the day. This obviously limits the number of contacts and paths that can be worked. In the North of England that's not a problem as there are many hilltops that provide either LOS paths to each other or offer the chance of "roving" from one to another. The big problem is trying to bridge the gap between the Northern and Southern stations. In spite of the higher powers and bigger dishes used these days (up to 3 watts on 24GHz) it's still a struggle to work more than 150km overland. We need more active stations in the area between the Chilterns and the Peak District.

From: Chris, G8BKE/P <ctowns@care4free.net>

My original idea was to activate Charterhouse for this contest but when it was realised that G4EAT and G4ZXO were going to be on, the best chance to work them seemed to be to go to Walbury and it would maximise our chances of making contact with as many stations that were out since Walbury is probably the best site to work northwards. In the end it wa the three of us at Walbury(G8ACE. G3PYB and myself) who lost out , since for instance, Mike G0MJW/P made three contacts with us, to our one from him! It is a challenge in the south to find 3 sites where you can work successfully north and east in the same way that you can on Walbury, recognising that probably THE best one, Buster is now out of bounds. Also bear in mind that we wished to work on 47G too, which again precluded anywhere else, while still being in with a chance to work east. Peter G3PYB/P used the "roving" option to give G0JMI/P who was limited on time, a contact to the south.

Had we used the "usual" southern sites, Walbury, Lane End and Povington only one of the three would have been in with a chance to work north successfully, although we might have been able to work each other and thus perhaps ended up with more, but shorter distance contacts?

From:Ian, G8KQW/P <ianlamb@btconnect.com>
For various reasons not all of us are able to fully test our equipment before we venture out into the world of the unknown (I finished the final assembly of my 24GHz at home 10pm the previous night!!) and for me living in a totally useless UHF - microwave location means that operating portable is my only option. ….. as it happened the commercial 23GHz dish that I procured as working turned out to be faulty on both polarisations so to work 2 and a half contacts with a QRT dish was a bonus.

In contrast my 47GHz system is 100% tested and runs 50mW ssb to a 0.3 dish, yet there was unfortunately nobody available to work on any suitable paths from IO81XW yesterday!!! - am I complaining? - NO - there's always next time.

I left home at 05h30, collected Roy G3FYX at 08h00, left Cleeve Common at 18h00 and arrived home at 21h50 - for 2and 1/2 QSO's on a faulty dish! We called CQ on 2m for two hours without a response before closing down.

144 MHz talkback was a nightmare even though conditions on 2m were ok. I understand that G3UYM and G4ZXO were out but we never heard them, only G3PHO and G3UKV registered on the 2m S-meter on call-in and both were good signals.

I don't agree at all that we need 10 GHz for dish alignment (apart from the fact that my 10GHz station wouldn't have fitted in the car with the 2m talkback station and G3FYX's 24 & 47). I have been using dishes on portable tripods with compass roses for 30 years and once the compass rose is aligned there is no readjustment required and absolutely no error whatsoever so for me heading is not an issue unless condx affect. In fact I believe to suggest using 10GHz for alignment is the wrong mindset for 24/47GHz events, in my experience. 10GHz behaves in a totally different way to 24GHz; some days 24G just will not work.

I hope that we can all put in more effort in future, make and publicise more contacts and experiences in an attempt to encourage more newcomers onto 24 & 47. Congratulations to Mike G0MJW/P for working so many stations!

From:Mike, G0JMI/P <mike.karen1@tesco.net>
I managed to work two stations on Sunday's 24/47GHz contest as follows from Lane End 8km west of Winchester,Loc 1091JA, on 24048.1GHz:
G3PYB/P at IO91GI (Walbury Hill) RS 59 both ways Distance 41Km
G0RRJ/P at IO91GI (Walbury Hill) RS5/9 both ways Distance 41km. I was running 1w to 18 inch dish

From Peter, G3PHO/P, IO93FB and IO93AD
Operating from Alport Height (IO93FB) during the morning produced 2 way contacts on 24GHz with G0EWN/P (IO93AD), G3UKV/P and G8VZT/P (both at IO82QL, Brown Clee). Unsuccessful attempts were made with G0MJW/P (IO91IN) and G3FYX/P (Cleeve Common, IO81XW) a path which has worked in the past. After lunch I QSYd to IO93AD (Merryton Low) and worked G4MAP/P (Titterstone Clee, IO82QJ), G3UKV and G8VST both portable at Brown Clee, finishing off with G0EWN/P on Alport. This was a total of 7 contacts with 4 separate callsigns.The best distance were the two qsos at 96.4km from Alport to Brown Clee. Sadly there was no one out within range who had working 47GHz equipment.

From:John, G8ACE/P <hazell@dsl.pipex.com>
We worked one station from Walbury north. I could hear G0JMI over the top of Walbury but he couldn't hear me. Something was wrong at Cleeve, I gather, since that Ian's filter was incorrectly tuned. Dunno what the problem was for Roy.

With no 24GHz, 47G was a dead duck as it's always needed to align on 24G first for that obstructed path. Yes, if we had split up we would have made more contacts amongst ourselves but south of Walbury that would present a barrier to the north. Anyway we have worked most paths around Hampshire.

Regarding 10G, well all three of us had it with us. We also all have experience of working 76G and know whats required for line up ... does that say anything? My own view is the second knife edge still presents the barrier to distance. Higher gain dishes just means harder to point and even more need for line up. LOS is easy, after that its not is my conclusion. I still find a compass useless. On Walbury I was getting more than 5deg variations moving a few feet. If you have a 2deg dish its just not good enough. The two main obstacles are pointing and frequency. This event shows its necessary to tune ± 200kHz not the ± 100kHz I usually do, plus if two stations badly set up try to contact we could be looking at 400kHs tuning range. I pleased to say my GPS PLL system stayed locked the whole time despite the box getting very hot.

It comes into its own on 47G with Chris, G8BKE, as you just need to swing dishes to find the signal the frequency being known. Until we get to that stage with everyone line up is useful. It's only necessary for one end to align accurately by the way. Open wg Tx is fine the other. The important thing is one dish should be correct. That's what we do on 76G The other dish then pans. Two dishes panning is like the lottery trying to get the bearings right together.

It would be interesting to profile plot successful paths on 24G just to see how many break the one knife edge limit. K must =1 on these plots. For 76G to work experience has shown K=0.9 is required. Plus trees can be quite tall and are often forgotten when looking at the fresnel zone breazeway on plots.

Re 24GHz ….

From: Chris, GW4DGU <yahoo@blaenffos.org>
Re 24GHz, I still have a brand-new (Nortel) 1W 'beacon kit' for 24GHz which I'm prepared to donate to anyone who can convince me that they are going to do something with it. I suspect that all it needs to get running is a stable signal source at ~1301MHz.

Peter's comments about the recent contest are interesting. Firstly, there is a surprising amount of system gain to be obtained over ssb/cw by the use of digital signal processing…

Secondly, if 'ZXO and 'EAT (in the so-called 'Home Counties') are 'on the edge' where does that leave those of us who live in very much more remote places? Over the next

few months, work and other commitments permitting, I'm intending to get 24GHz receive running, and to update the tracking on my little 2.4m dish. However, I suspect the first (and probably only!) signals I detect will be from astronomical sources...I do have some TWTs which might be modifiable, for 24, but QSOs are a bit further away. I don't have the luxury of being even semi-retired!

Of course, if I do eventually manage to make contacts they will almost certainly have to be by **EME**, as this site is marginal for 10GHz tropo and very marginal at higher frequencies. But then EME isn't valid for contests in the UK, effectively disenfranchising those of us who develop our stations, technical and operating skills to the point where we can use the mode.

Funny old world, ain't it? **73 from Chris, GW4DGU**

EHF Day in New England

From: Tom Williams,WA1MBA, <tomw@wa1mba.org>

Sunday, July 3rd 2005 New England saw a New England record 47GHz contact.

Generally, Dew Points were in the 50s.

This is an edit of some email summaries.

47 GHz:

N1JEZ arrived on Mt. Washington around 8:45. WX was low 50s Fahrenheit, sun and 1 mph wind. He was joined by KT1J.

The Wachusetts crew was WA1MBA, W1RIL, KA1OJ and W1FKF. **24 GHz** worked quite well. Signals at N1JEZ end were S9+ 20 or better. Hard to tell on an FT-290..... They were just very loud over the **205 km** path.

N1JEZ(Mike)set up to work **47GHz** and started sending dashes, then a carrier. Everyone on Wachusetts heard the ~25 mW! N1JEZ sent an , transmitted to Mike. It was a struggle with signals up and down into the noise, but we made it!! Unfortunately Mike didn't hear any other signal.

WA1MBA - N1JEZ FN42bl to FN44IG 205 km
1443 UTC, 3 July 2005
This is probably the greatest DX on 47 GHz in New England so far.

Next Mike swung the dish around to try and work KA1LEX who was in FN34wk. Mike copied Randy S5 with no QSB in CW. Distance was 69 km. Randy runs just a mixer and 0.25 meter dish.

Randy then took off for Ascutney. He was very loud on 24 GHz, but his signal would fade after 10-15 secs..... We then tried 47 GHz. Mike was S9 to him and sent 1/2 of the exchange. Randy had hardware problems and was unable to complete..Distance is 132 km.

78 GHz

After the Mt Wachusett / Mt Washington 47 GHz contact, Ken W1RIL went to a spot in Paxton approximately 12 miles from Wachusett and he and I set up for 78 GHz. Ken worked us on 10 GHz and then 47 GHz to help get the direction under control. Don W1FKF had a good direction (rose) readout and transferred it to Tom's WA1MBA 78 GHz radio. Ken put his key down and there was his carrier!!! Talk about luck. WA1MBA was dead on in azimuth and improved with some elevation adjustment. What was truly amazing was the frequency and the signal levels.

Ken was S5 carrier with some QSB. We switched to SSB and had a pleasant armchair quality Q5 QSO. **This is, as far as we know, the first New England 78 GHz narrowband contact outside of the W2SZ crowd**. With several of our group readying equipment for this band we might have a lot more activity before the 2005 season over.

Frequency 78,192.070 with Open Mixers, at both ends ...432 IF

73 from Tom, WA1MBA

From Dave WW2R (aka G4FRE):

Here are some 'piccies' of my recent activity on **47GHz** giving W5LUA his 3rd grid (EM12) from my works QTH ... note the sophisticated dish mount!

REAL DX ON 24GHz !

On Thursday 28 July 2005, a remarkable **24GHz** contact was made between Michael, **DB6NT** and **PA0BAT.** The distance was **411km** and is one of the few 24GHz terrestrial QSOs ever made in the world beyond 400km. What makes this even more exciting is that it was done via rainscatter! This opens up enormous possibilities for those of us who have a few watts of 24GHz and especially if the station is operational from home, so as to catch the rainstorms as they occur.

This QSO must be a **world record for 24GHz rainscatter** though the Eu tropo record remains with IW3EHQ/3 and I0LVA/3 at 459 km.

DB6NT was running 5 watts to a 1.2m (!) dish while PA0BAT used 2.5W to an 80cm dish. I have no details of signal levels or mode used. That 4 foot dish of Michael's must have been hard to point ... or was it, in RS conditions?

Meanwhile, brush the cobwebs off those one and half watt PAs you got a couple of years ago. You can also get 2 to 3 watt ones from the USA at reasonable cost. All you need is the "get up and go" attitude (and maybe a little spare time off work!)

Congratulations to both DB6NT and PA0BAT on a great contact...

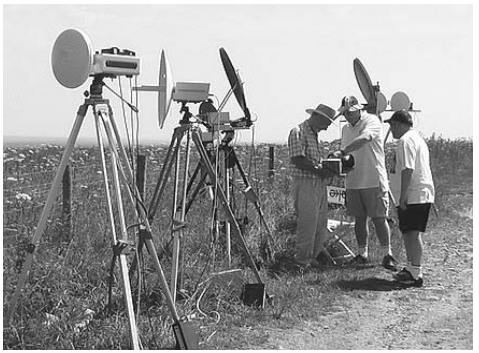


Photo above: The Summer Wine boys (!)

left to right: G8BKE, G3PYB &G0RRJ (contest rules inspector, self appointed) on Walbury Hill, IO91GI, during the June 24/47GHz contest. Gear, in particular order from foreground: ACE 47GHz, ACE 24GHz , PYB 24GHz, PYB 47GHz hidden behind 24GHz, BKE 24GHz, BKE 47GHz.

July 5.7/10GHz Cumulative Contest

This event saw a marked reduction in 144MHz talkback activity, even more so than the previous contests this year. However, it was made up for by some excellent Rain Scatter conditions which allowed contacts to be made on the microwqave bands without any form of non microwave liaison! .. Read on and drool ...

From: Ralph, G4ALY, IO70VL, Cornwall <Ralph.Bird@btinternet.com>

Conditions were patchy with added local light rain to hinder things across the moor. Some good RS contacts to the north were made whenthe wx system was midway between stations worked. 15 stations were worked on 3cm but 6 attempts failed. 9 stations worked on 6cm, 1 of which was one way. 1 failed. 90% were taken off 2m Most KST attempts for contacts failed!!

Total Km worked on 3cm 3138.7km, average 230km per contact. Odx for 3cm 397.km.

Total Km worked on 3cm 2075.1km, average 209km per contact Odx for 6cm 434.6km

73 and thanks to all for the contacts. Especially the portable stations who were having a hard time with the wx conditions. **Ralph G4ALY.**

From Peter, G3PHO/P, IO93PW37

In view of the recent discussions on the merits or demerits of using the KST chat room from a portable location I made the effort to get on with a cheap system... an old (but free!) Toshiba laptop computer which, with only 16MB RAM, only just staggers along running the minimum Windows 98 required for KST. I'll describe this /P KST system in more detail next month.

There was a stark contrast between the activity on KST (Over 40 UK stations online plus many DL, PA, F stations) and 144MHz ssb where the lonely portables and the occasional home station could be heard calling CQ for microwaves for long periods! The reality is that 2m talkback could eventually disappear by next year if KST fans continue to leave it alone. What we need is BOTH systems to be used at once. Please announce on KST that you are also listening on 144.175MHz. I felt I had an distinct advantage over the other portables by having the computer with me. HOWEVER A BREAKDOWN OF THE QSOs MAKES INTERESTING READING .... I worked 26 stations on 10GHz of which 6 were directly worked without talkback, 5 were KST assisted and 15 were via 144MHz talkback. On 5.7GHz I worked 10 stations and used KST with four of them, with one being direct via RS. The rest were via 144MHz. Had most of the 40 UK stations on KST listened on 2m as well there could have been many more contacts in my log. KST seemed to take a lot longer per QSO than did 2m talkback. Best DX on 10GHz was G1MPW/P and G6KIE/P (JO00AU)and G4WYJ/P (IO91WV) on 5.7GHz . For some reason the usual QSO with F6DKW did not materialise and F1PYR was away on holiday!

From Ian, G8KQW/P (IO81PH):
Great day yesterday .. shame about the weather! We missed most of the rain scatter because it was raining on our heads most of the day. Here is a summary of my 3cm activity from IO81PH:
QSOs 27: Average km/QSO 143
Best DX to portable G3PHO/P @ 321km
Best DX to fixed station G4DDK @ 287km
Of the 27 QSOs, 9 were established using ON4KST and 18 via 144MHz talkback.

From: Steve G1MPW/P and Dave G6KIE/P
We were near Firle Beacon (JO 00 AU) for the July event but should have listened to the weather forecast more closely !! On site at 0845 -- rain starts 0850 — worst weather we have had for a long time but at least it wasn't cold. Only managed 12 contacts all day -- the best DX was G3PHO/P at 346 Km.

Handy hint for the future -- if you need a cheap wave guide attenuator just let it fill it with water. It stops 99% of all known signals as I found out to my cost but at least the gear worked after I had emptied it!!

From Mike. G0JMI,IO91MD (Alton,Hants)
The heavy rain kept me at the home QTH for Sunday's 10GHz conest. However,I did manage to work the following stations on 10.368GHz:G4LDR IO91EC 47km,G3YGF CW IO91IX, G4ZXO/P IO90WV 66km, G4WYJ/P IO90W 66km, G1MPW/P JO00AU 77km (first qso with MPW) G6KIE/P JO00AU 77km (first qso with KIE). I was running 10W SSB/CW to an 18 inch dish feeding the flyswatter at 25 feet.

From Mike, G0MJW/P (IO91GI)
It rained heavily for most of the time. I managed 16 completed, with 2 failures. Of those, ALL were organised via 144MHz talkback, I clearly suffered badly from not having KST, though Brian G4NNS did help me out there. I did not even know G4DDK was on, I never heard him. My best DX to fixed was probably G3XDY and to a portable G3PHO/P.

Interestingly, apart from 'PHO, there was no activity whatsoever from the Midlands and the North. Walbury is an excellent site to the North, East and North West, but there is clearly little point going there in future as the path south is not good any more. I will have to find somewhere good to the South and East/West.

From: John, G3XDY <g3xdy@btinternet.com>
It's been an eventful month or so on the microwaves, with some exceptional rainscatter and tropo.
Tropo on the 8th June gave 23cm QSOs with F6FHP (IN94), OZ8AFC (JO45),F5PEJ (JN09) and GM4LBV (IO86), whilst on 3cm OZ8AFC and G4BEL (JO02) were worked.
I missed most of the 5.7/10G cumulative on the 19th June but worked G8APZ on both bands in the late afternoon, and kept a lookout for the expedition to GI. I didn't expect to be able to work them but some very strong rainscatter from the Yorkshire Pennines area provided a 54S contact on CW with GI3ZME/P (IO74) for a new country and square on 5.7GHz, at 541km this is my best DX yet on rainscatter on 6cm.

Conditions for UK activity contest on 21st June were slightly abovenormal,and activity levels were good, so QSO tallies were a bit higher this month. Best on 23cm was SK7MW in JO65, and on 13cm it was DL3IAS (JN49), who was also worked on 9cm.On the 23rd it was rainscatter again, this time to G4BRK and G4MAP on 3cm.

An excellent tropo opening to Scandinavia ran through the 26/27/28th June here. On the 26th SM7FMX (JO65) and SM6ONH (JO68) were worked on 23cm, the latter was at 1037km for the best DX this year. On the 27th SM6EAN (JO57) was worked on 23 and 13cm.

The 28th June was the Scandinavian Microwave contest date, and thanks to some good tropo I worked the following:
1.3GHz - GM4LBV (IO86) at 59+20dB
2.3GHz - SK7MW (JO65), OZ1FF (JO45), SM6EAN (JO57), SM6AFV (JO67)
3.4GHz - GM4LBV (IO86) 59+ This may be the first G to GM on 9cm
5.7GHz - SM6EAN, SM6AFV
10GHz - OZ1FF, SM6EAN, SM6AFV, OZ1CTZ (JO46)
And in the midst of this a good rainscatter opening to the west and south:
10GHz - G0RRJ, G3LTF (IO91), F6DWG (JN19) all 59S
5.7GHz - G0RRJ 57S/59S
3.4GHz - G0RRJ 55S/55S with definite RS enhancement evident.
The weekend of **VHF NFD** saw good tropo conditions too. The EAs didn't seem to make it to this part of the country on 23cm but tropo conditions moved round to the East on Sunday and gave a good haul of DX, including 3 new squares on 9cm, 2 new ones on 6cm, and one on 3cm.

On 1.3GHz, DX over 600km included:SK7MW(JO65) at 861km, DK6AS JO52), DK0FLT(JN59), DL0GTH(JO50), OZ1ALS/P JO44), DK0SF/P(JN49), DH9NFM(JO50), DK2AN (JO51), DL0TUD (JO60) at 836km, and DF0YY(JO62).

On 2.3GHz contacts over 500km were made with the following: DL3YEE (JO42), DF0OL(JO40), DL0GT (JO50), DK0SF/P(JN49) and DL0MWW(JO41)

On 3.4GHz the best QSOs were:
DL3YEE(JO42), DF0OL(JO40), DL0GTH(JO50) at 683km, and DL0MWW(JO41)

On 5.7GHz the DX included:
DL3YEE(JO42), DF0OL(JO40), DL0GTH(JO50) at 683km and 10GHz QSOs over 400km: DJ6JJ(JO31), DJ5BV(JO30), DK2MN(JO32), DL0GTH(JO50) at 683km, DL3YEE(JO42) DL3YEE, DF0OL, DK2MN, DJ6JJ and DL0GTH provided "clean sweeps" from 23cm -3cm, in addition to the usual PA stations. **73 John G3XDY**

GM4ISM is now back QRV on 10GHz from home IO85AR
The transverter has been partially rebuilt to give about 20mW, enough to drive the TWT amp. I have 40W in the shack and a 35cm dish. Take off South not usually good enough for tropo.

With the weather as it has been of late, the possibility of Rainscatter at the 400 Km plus required to reach the bulk of activity is a real possibility.

Anyone wishing to try rainscatter or other modes, please call 01698 440628, email, skype (gm4ism) or try to reach me by ON4KST (usually on the 6m page)Hope to hear something other than noise on 3cm soon! **73 from Mark**

There's a couple of reports from G4HUP and G8AYY that will have to be carried over until next month ... sorry folks ... no space left!
73 from Peter, G3PHO, Scatterpoint Editor

From:Jules G0NZO"<g0nzo@amsat.org> VHF NFD 2005 G4RFR/P 23cms station

2005 NDF was run from Little Mintern, 14miles north of Dorchester, a good site that served us well last year. The antenna was the 2.4mtr dish and tin can feed, at approx 40ft, as used in the 2004 NFD and the April and May contests this year.

This year we were using FRARS newly acquired IC910 and matching preamp, with the addition of some c/o relays and a couple of runs of heliax and a PA loaned by G0API. We began with a deaf receive system, which turned out to be splayed fingers in the N connectors on the preamp.

This fixed, we had a pretty respectable RX system, with the Martlesham beacon coming in at S9. Problems really began with the 2x 2C39 PA becoming unstable. This had never given problems in the past, but the new drive radio and c/o relays must have presented an odd impedance. We eventually started 2 hours late running barefoot, with approx 3 watts at the feed!

Contacts were steady during the rest of the day and surprisingly, every station we could hear, we could work, although it was hard work at times. We managed to complete with DF0HS/P, which given our 3 watts and my atrocious CW, was quite amazing!

Day two was a little harder, with the easy stations being worked on the previous day. With a couple of hours till the end of the contest and we managed to tweak the PA into submission, also a laptop arrived with KST access, so things began to take off.

We ended up with 33 contacts, which was about the same as last year, but even having the PA, our ODX was still the DF0 made on flea power. The whole weekend was good fun, the technical problems just adding to the challenge. I'm looking forward to doing it again in the October contest.

Microwaves USA .... de WA5VJB

There has been a lot of talk about switching all Microwave EME activity to circular polarization. Back in 1988, WA7CJO and I discussed using CP with our 3 cm EME experiments but went with linear polarization for some very sound technical reason.

When CP microwaves bounce off a flat surface, they reflect with mirror image polarization. But when Circular Polarization is scattered off a complex target, the necessary phase relationships to maintain CircularPolarization are not maintained.

The Moon is not a flat surface. 5.5 GHz Radar studies of complex targets like the moon show that the returned signal has -35 dB cross polarization in the exact center of the moon. But only -4 dB cross polarization over most of the surface. of the moon.

Several years ago, WA7CJO echo tested with a linear feed. Jim then took off the linear feed an replaced it with a CP feed. Since this feed did not switch polarization between TX and Rec, his returned echoes were cross polarized. To his ear, there was NO DIFFERENCE between linear echoes and cross polarized 3 cm echoes.

As we go higher and higher in frequency, the surface of the moon looks more complex and the returned signal begins to look like 'Black Body'radiation. That is, the reflections start to look like Sun or Moon noise without any primary polarization.

What we need now is data .... one station to illuminate the moon while another station rotates polarization measuring the peaks and the nulls. 'CJO and I tried this in 1988, but did not have enough signal-to-noise at that time. We expect the nulls to be lower and lower as frequency goes up.

For those who think all the energy bounces off the flat parts of the moon, Radar studies show that the brightest point on the moon is the crater Tyco and it's ejecta blanket. If you have a dish with .05 deg beamwidth, you might find better signals pointing at Tyco instead of the center of the moon. The rough surface works better.

Reconsider CP on 13 and 9 cm? Radar studies of complex targets show an additional cancellation effect, when using CP, from the opposite sides of a target. This suggests that CP would have more liberation fading and a wider returned signal than a linear signal. With DSP processing, Linear Polarized signals may need fewer bins and a more easily processed signal.

Gentlemen, we need data!

Some interesting propagation...

A brief opening occured on **3cm** on the evening of the **28th June, 2005**. The event was first noticed at around 20.30 in the evening local time with enhanced propogation to Europe on VHF and increasingly severe interference to TV channels, both analogue and digital. On 2m beacons were heard from OZ , SK and DL as well as enhanced signals from usual beacons in PA, F and Kent. Around 21.00 I tried to alert G3PHO, but Peter was busy building an interdigital filter for 23cm for use on the VHFNFD event.

Following the phone call I assembled the portable equipment to point out of an east-facing bedroom window and quickly found that the PI7EHG beacon on 3cm was up to 579 with some QSB. However, unlike the event of December 2004 no other beacons could be heard at this location. Using ON4KST I arranged one test with Brian OZ1CTZ who was 319; much weaker than the 59 report of December 04. Around 22.10 local time PI7EHG started to quickly fall in strength followed 10 minutes later by a severe thunderstorm! The TV also returned to normal.

Looking at weather reports, the Hepburn Tropo index and internet postings, it seems that a number of propagation modes were present that evening. A cold weather front aligned roughly NW to SE passed over the UK. Ahead of it some ducting formed over the North Sea--stations on the East coast were working some great paths eg G-SK on 3 cm. Stations to the south and inland were working rain-scatter as the front passed over. I think the reason that the PI7EHG beacon was so strong at this location, when no others were audible, could be accounted for by enhancement along the line of the cold front. The event was interesting if somewhat short-lived.

Gordon, G0EWN

Our thanks to Kevin Murphy, ZL1UJG, editor of the ZL F.U.N Newsletter, for these interesting items.... Editor

Two of the most active stations on Microwave bands, Brian, ZL1AVZ and Steve, ZL1TPH have been hard at work on the 47 GHz band. Over the previous few months both stations have constructed portable stations using DB6NT equipment comprising 47 GHz transverters (TX power ~ 0.4 mW) and associated local oscillators. In April this year they completed their stations and tested their equipment over about 1 km. They decided to try to extend the distance. On the 1st May, Brian set up at Mt Eden, while Steve had his portable station at Moir's Hill. Brian used a 45 cm dish while Steve had a 30cm dish. The signals traversed through the Auckland sky to give 52 to 55 signals at both ends. Contacts were made on SSB. However some drift was apparent and Steve had to escort Brian up the band (the local oscillator was multiplied of the order of 480 X, from near 100 MHz to reach final frequency !!.)

Steve and Brian are looking to extend the distance over coming months and CW contacts should improve the signal margin.

Looks like a ZL record contact on 47 GHz. Well done both of you. A point to note is that the VK record on 47GHz is of similar distance.

Another person active on the microwave bands is Dave, ZL1AKW in Tauranga. Over the last months, Dave has constructed a permanent station on 1296 MHz using a Swedish transverter, 44 element loop Yagi and and a IC202 prime mover. He hears the Hamilton 1296.256 MHz Beacon at excellent strength (579) and is looking for contacts. The scribe tried to pass signals across the Kaimai ranges to Dave.However the less favourable path, due to height disadvantage, weakened signals considerably. Contact Dave at **davetts@clear.net.nz** toarrange contacts. Dave is also looking at the 2424 MHz band in the future.

Simon has generated a low level signal (~ 15mW), from a transverter made from surplus modules. It made the grade to Harry ZL1BK over a 2.6 km water path. Simon is looking to increase power over the next few months.

Calling CQ?... by Chris Bartram,GW4DGU

I know it sounds obvious, but the more people get on 1.3/2.3GHz and call CQ, the more contacts we'll all make.

Like a lot of people I guess, when I'm working I tend to have receivers on, tuned to beacons. I'm currently listening to GB3MHL on 23cm, which is usually detectable here, and PI7CIS on 432MHz, which is consistently a few dB above the noise at ~600km. There's little point in monitoring .200 as experience says that unless there's a contest or conditions are up, no-one will call CQ.

We should all call CQ more frequently!!

I find calling CQ a drag, but it doesn't have to be like that! Some people now posess CW keyers which can be set-up to call regularly, and we could make more use of them. But, the main reason for writing this is to bring to people's attention that there's also a little Windoze (wash my mouth out and sterilise my fingers and keyboard!) freeware programme called MultiKeyer **<www.qsl.net/hamscope>.** This can be set-up to use the same interface as the WSJT software, and will not only will operate as a keyboard CW keyer, but also allows you to transmit store and transmit speech (stored as .WAV files as well. It also has quite a nice waterfall spectrum display and audio filter a la Spectran.

I've no excuse for not calling CQ now... So, look for me on 1296.200

73 from Chris GW4DGU

Beacon problems

from: Bob, G8DTF, IO83UM
<Bob.Price@uk.intervoice.com>

I have not been active on microwaves again until quite recently. Now I'm trying to resurrect some of my old gear, for 23, 13 and building new for 9cm.

The first major difficulty I have encountered is the lack of audible beacons, so I am looking at building some personal ones. I have just looked at the beacons list on G3PHO's web site and the only thing I can hear regularly in Manchester on 23 is not on the list! GB3SE in Stoke is a repeater which runs in beacon mode when not in use. I'm ot sure of any of its other details though.

I used to be able to hear GB3CLE when I lived about a mile from my current QTH, but it doesn't seem to be audible now, even with a nice new DEM preamp.

Activity and beacons are pretty scarce here (compounded no doubt by very lossy roofing felt as my antennas are normally in the loft). Even when I have put the 23cm antennas on a mast outside in contests there doesn't seem to be a lot happening, although I did work the Isle of Man recently.

Maybe I will have to get my act together to go portable, when the gear is in a better state of repair!

G(M)3DXJ 10GHz DXer of the 70s now 'Silent key'

It was sad to read in the July Radcom about the death, on 22nd April 2005, of Tom Holbert G3DXJ. I knew Tom as GM3DXJ, in the 1970s, when a small group of microwave enthusiasts, comprising GM3OXX, GM3FYB, GM8HEY (now GM4JJJ), Tom and myself, were involved with making 10GHz wideband operation popular in GM land.

Tom was always energetic and enthusiastic and, as a Ferranti man, helped us all with surplus parts at that time. Indeed, he said that microwaves was the best time of his amateur radio days.

He also took part in many super-refraction attempts between GM & G and managed to break the UK and European distance record on 3cm - 322Km from Luce Bay in Wigtownshire to St David's Head in May 1975.

Latterly he moved back to G land and went into further education to keep his mind active. He will be sadly missed by his family and his fellow radio amateurs.

From Chris, G8BKE

GM3DXJ/P is seen on the right in this photo taken at Luce Bay, IO74, Galloway,SW Scotland