An Amateur Radio publication for the Microwave Enthusiast

scatterpoint

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

2006 May

Andy Talbot, G4JNT (left) receives the G3BNL Trophy from UKuG Chairman, G3PHO, at this year's Microwave Round Table at RAL. See inside this issue for the full story

In this issue ...

Latest News …

- **New UKuG Operating Award**
- **Record attendance at RAL**
- **Australian 24GHz under threat**
- **UK Contest season starts with the usual gear problems!**

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

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From the Editor's Desk

The past month saw an excellent Microwave meeting at RAL where we had a record registration, excellent lectures and some good "horse trading" at the bring and buy tables. Many thanks to everyone involved with the event. It was nice to see several newcomers to microwaves and most of those became UKuG members on the day, gently persuaded of course by our Secretary!

By the time you receive this issue the first UKuG Microwave Workshop for Beginners will be taking place in Sheffield on the 27 April. It will be a test bed of ideas for future similar events in other parts of the UK. If you have an interest in helping others get on the microwave bands and share in what you obviously enjoy a great deal, then why not consider setting up a similar workshop in your region? UKuG will be on hand to help you with content and planning and might even be able to supply one or two helpers. You'll need to supply the enthusiasm and find a suitable venue. Local Councils often have old schools, etc, which they rent out at very reasonable daily rates. Try it… you'll like it!

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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.

A warm welcome to new members of the UK Microwave Group

Many thanks ….

To all those who have written articles or sent in reports for this month's issue. There are times each month when the editor thinks he'll have nothing to publish but then along comes a couple of articles, some operating reports and, hey presto, we have ourselves a Scatterpoint once again!

This month we have to thank Paul, M0EYT, Bernie, G4HJW, Lloyd, NE8I, John, G3XDY, James, G3RUH for the main items but thanks must also go to Ralph, G4ALY for some of the RAL photos, to Kent, WA5VJB, Sam G4DDK, Chris, G8BKE and all the activity reporters …

If others reading this want an 'honourable mention' on this page they now know what to do!

SUBSCRIPTION ENQUIRIES SHOULD BE SENT TO THE UKuG GROUP SECRETARY AT THE ADDRESS SHOWN AT THE TOP OF THIS PAGE

SUBSCRIPTION RENEWAL …. REMINDER !

Many of you reading this will have joined UKuG or renewed your subscription at this time last year so you'll already be aware that it is now due for renewal on 1 June 2006. If this applies to you please contact the secretary, G8KQW (see page 2) and renew your subscription for another year (well, we sincerely hope you will!). Those of you who receive Scatterpoint in a paper format can find their subscription expiry date on the address label. Please try to renew as soon as possible after that date if you want to ensure newsletter continuity. A proportion of the membership renew at other dates dependant on when they first joined UKuG. I n all cases, you will be sent a reminder by our secretary.

WEAR YOUR BADGE WITH PRIDE !

UKuG is pleased to announce the immediate availability of its handsome LAPEL BADGE (see left). These are similar in size to the standard RSGB lapel badge and those of other national societies. We think they are extremely nice badges with their blue background, black lettering and gold trim. They come in an enamelled metal finish with a simple-to-use pin fastener.

They are available to UKuG members only.

If you want one (or two?) then email our Secretary, Ian Lamb, G8KQW at: **ianlamb@btconnect.com** for more details or, if you are in the UK, simply send him a cheque for £2.50, **payable to UK Microwave Group**. This price includes first class postage within the UK. Ian's postal address is on page 2 of this issue.

Overseas members should email Ian for details of postal charges to their country.

UKuG PROCEEDINGS 2006 NOW ON SALE

We have a small number of these still available after the highly successful sale at RAL in April.

Full details of how to get a copy and its contents can be found on page 12-13 in this issue of Scatter point.

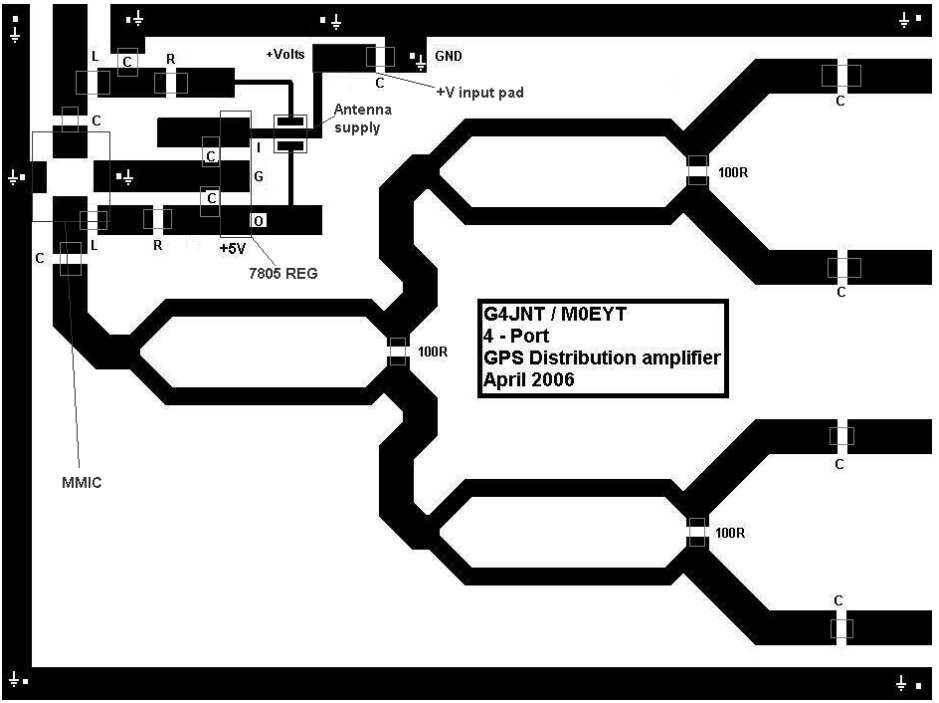
This is the second time UKuG has produced such Proceedings in this manner, although a photocopied collection of technical papers was made several years ago, before UKuG became what it is now.

Those who have already bought their copy remark on the excellent quality of both content and printing. In particular, the print, diagrams and photographs get special praise. This is in no small measure due to our printers, Mensa Printers of Arundel Lane, Sheffield. They also do our newsletter each month. We recommend them to anyone needing high quality / small quantity print runs.

The editor of the Proceedings is Steve Davies, G4KNZ, who did a magnificent job with the varied source materials he was given to assemble into a book …. Word documents, Power Point presentations, text files and the like were all put together in a very professional way, as Proceedings readers will appreciate. Many thanks Steve!

The G4JNT GPS Distribution Amp
Write up and modifications by Paul M0EYT

Having 10MHz GPS locked oscillators in the shack is both useful and problematic – once it's locked, how do you know the quality of the 10MHz output? The simple answer is that you build two or three GPS locked oscillators, and compare the outputs, but this means you need RF feeds to each receiver from a common antenna in order to avoid time of arrival based errors. Andy G4JNT came up with a nice design using three pairs of Wilkinson dividers which worked well, but it was decided that a preamp could be added to overcome losses in long antenna cable runs and the losses in the dividers too.



The above image shows the copper side PCB layout. It's made on standard 1.6mm thick FR4 and the resulting image should end up 79mm by 59mm. The original artwork is on-line at **http://www.uhf-satcom.com/gpsdist.jpg** - I use 'Irfanview' for Windows to print this off at the correct size.

The layout is marked with letters indicating what components need to be placed where. The capacitors are mostly 100pF in the RF line, and whatever suitable DC decoupling capacitors you have laying around for the others. The MMIC goes directly in the RF path – I used one of the Mar-6 specials that were available FOC from Kent at Martlesham, along with the appropriate bias resistors. The MMIC has its DC generated by a 7805 regulator, again use appropriate de-coupling capacitors to make sure it doesn't hoot. On the PCB layout, where there is an 'earth' symbol, a

hole should be drilled through the PCB and a Vero pin inserted and soldered both sides. The whole PCB can be soldered into a tin plate or PCB enclosure. The two inductors were salvaged from an Ionica board, but could be made by winding two or three turns over a 2mm former.

The board I made runs from +13VDC, and feeds DC up the coax to an old marine active GPS antenna. There is a resistor in the DC feed to the antenna, which should be a low value, 10 ohms or so. This is only so if there is a short in the cable the resistor will take the hit and not the tracks on the PCB. Facilities exist on the board for +5V to be fed to the antenna. DC feeds from the GPS receivers could also be used to power the MMIC and the antenna by some simple re-wiring.

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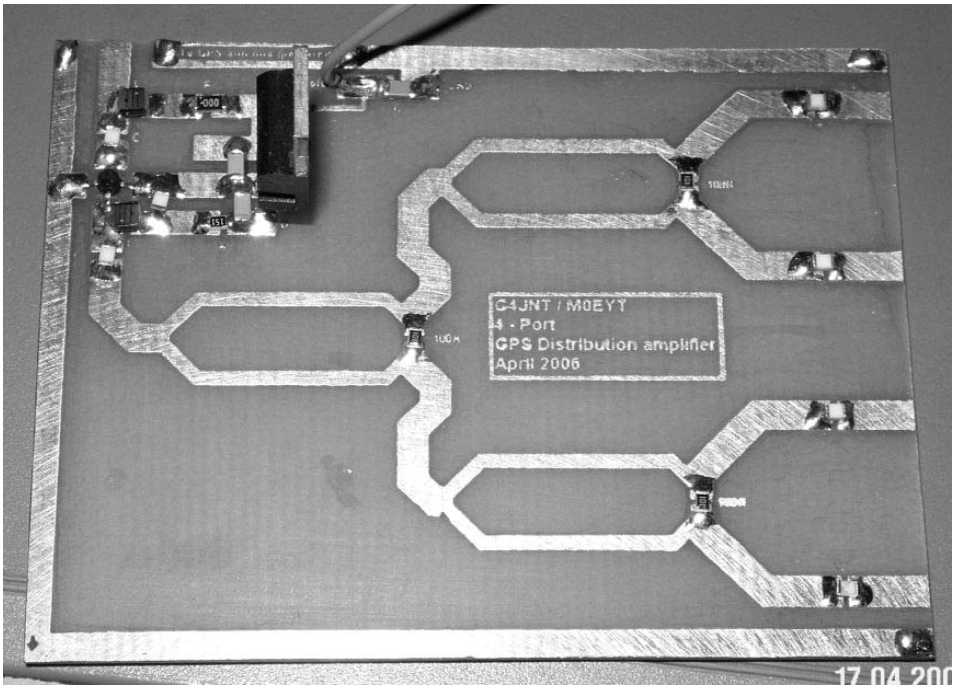


As the circuit is so simple, and can be built with junk box components, it was felt that a schematic wasn't necessary – looking at the above picture should give enough clues as to where the components are placed. Most of the parts can be scrounged off old Marconi LNB boards.

The output connectors can be whatever is convenient. I used SMA females that were salvaged from old Ionica boards, but BNCs and TNCs will be just as good.

10GHz FILTERS …

an assessment of three popular designs from the USA

… by Bernie Wright , G4HJW

About six months ago, prior to building up another 3cm transverter, it seemed a good idea to spend a little time building up some band pass filters. The results were eventually graphed out and filed away but they often get referred to and it may be that they are of interest to others too.

Some unused WR-90 waveguide was donated by G4BAO and a Google search quickly found the 2 pole design that Zack Lau (W1VT) published in QEX (July 1997) – but it's also in Vol 2 of the ARRLs UHF/Microwave Projects Manual.

Using hand-tools and a pillar drill, three units were made up to see what reproducibility could be expected. All soldering (endplates, posts and sma connectors) was done with a hot-air gun. The three filters were pleasingly similar, and one is shown plotted on the accompanying graph. Used as a receive image filter for a 288 MHz, IF, this gives about 50dB rejection which was judged to be good enough. However, for transmit use, the LO rejection is less than 40dB and although two units could and have been used in tandem, it was a good excuse to try the more complicated five section post filter that Chip Angle (N6CA) designed.

(see: **www.ham-radio.com/n6ca/microwave/filters/10368-28bpf.html**)

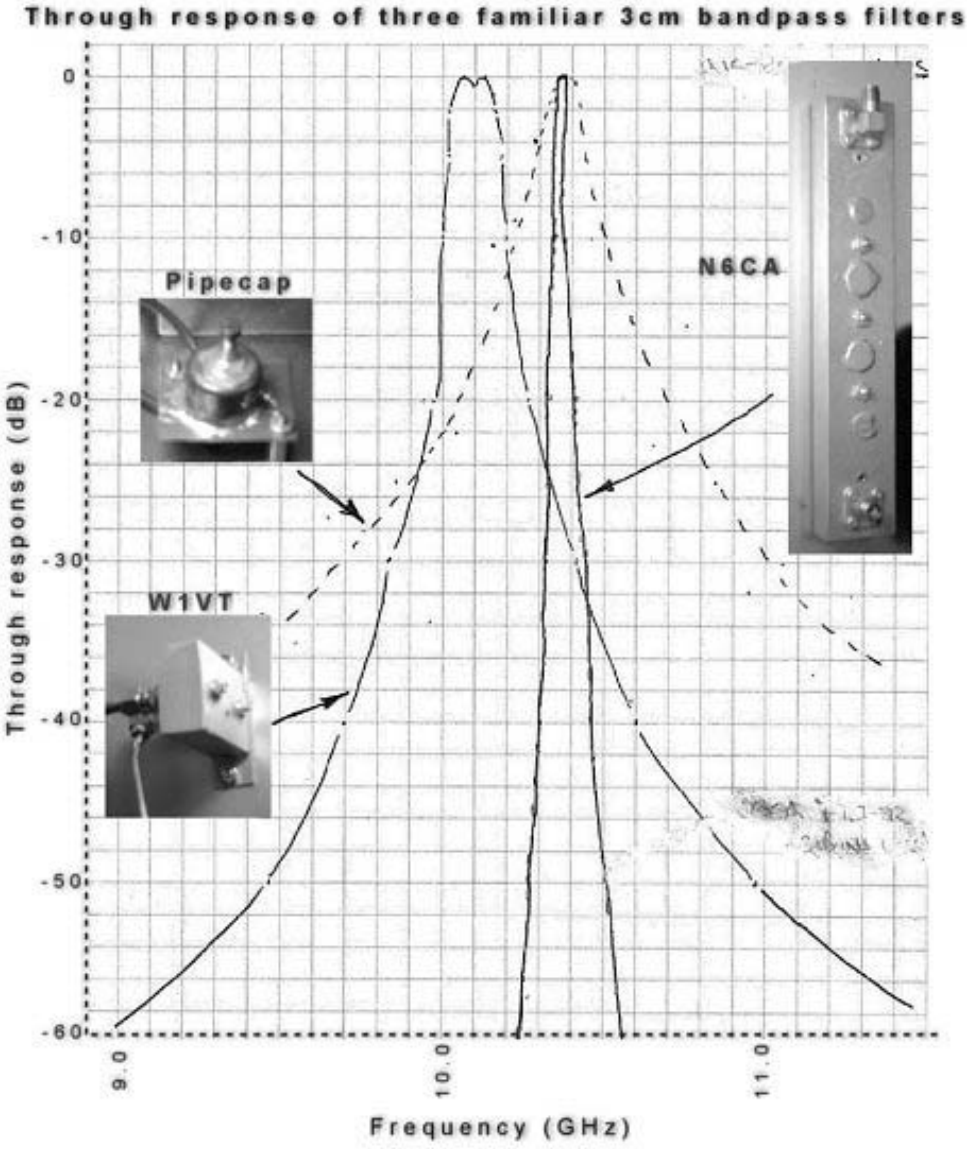
For this, the posts had to be turned on a lathe to get the correct diameter, but the results are quite impressive and more than adequate for the 288 MHz IF transverter. Insertion loss at 3cm was 3dB – a little high compared to N6CA's original but good enough for the purpose in hand so no adjustments were made to improve this.

Added to the graph is the response of a typical, lightly loaded pipe-cap filter, as a comparison. These seem to appear in articles everywhere (see the ARRL UHF/Microwave Projects Manual mentioned earlier, for example). Although this looks to have good out of band rejection, the response of all the pipecap filters that I have seem eventually to come back up to only 20-30dB, so more than one is really needed for decent performance. They are very easy to make though and seem quite forgiving in their construction. The particular one graphed used a 15mm cap with a M2.5 brass tuning screw/resonator.

None of the filters shown were adjusted for match or coupling and the two pole item shown clearly suffers from over coupling.

These particular filters are also useful for high multiplication order Los. A typical LNB shottky mixer (back to back pair in an SOT 23 package) driven with 100mW at 280MHz will give useful output at 10 080 MHz (ie x 21) with spurious harmonics all at least 40 dB down.

There is a higher definition version of the graph at:
http://www.earf.co.uk/3cm.JPG


Through response of three familiar 3cm bandpass filters
0
-10
-20
-30
-40
-50
-60
Through response (dB)
9.0
10.0
11.0
Frequency (GHz)
Pipecap
W1VT
N6CA

Adventures in Amateur Microwave Conductive Epoxy

… Lloyd Ellsworth, NE8I
<ne8i@hotmail.com>

Introduction:

While working on building up 78GHz, (1152 x 68 = 78,336 … in the US 76-77 GHz is not available to Amateur use, Automotive radar) I found that it was going to be necessary to use conductive epoxy, with very tiny parts, and avoid solder. Well, I did not have any experience with this. Talking around, I found very few people did. Most did not have very much to say about it other than it was messy, there were an awful lot of tricks and then they did not describe any of them! It would take too much time. There were too many trade secrets, I guess. Looking through my collection of proceedings, handbooks and magazines, there was precious little information. Search the internet on the subject, and well, you could spend a lifetime going through the hundreds of thousands of references. If I cannot find it in 10 minutes on the internet, it is just not going to happen. I don't care to waste hours or days ruining my eyesight in front of a computer screen. I would rather do things and get things done. Instead I will encourage someone with the interest, gobs of time and ambition to spend, sort through and find some potentially practical and useful information on the subject on the internet, and let the interested Ham Microwave community know about it.

The thing is, with what we Amateur Radio Microwave enthusiasts are doing, our goals, are quite a bit different from what is being done commercially. On a production line, you are trying to crank out a pile of uniform product, hurry quick, with minimal man hours spent. Even with lab use, the lab wants some change, quick, test … quick, instant results. Well, what we are doing, is more just two of a kind. Sorry, but when you get on these higher bands, you often have to build two. Seldom is it going to be just one. This so you have someone to talk to. It does not have to be done in an hour. If it takes a week, well, that sounds about normal. Then minimize cost, minimize complexity, use available tools and technology.

Performance is highly desirable. Again, this is different from commercial goals. So, the search was for practical information. I could find very little. What we found, was a couple of commercial built amplifiers that used conductive epoxy technology, and a bunch of pictures that could be dissected and studied. Get out the magnifying lens and carefully inspect them. Between Don, WW8M and myself, Don has decades of experience with working with model RC construction, and quite a bit of it is done with epoxy.

So, what we did was find some silver loaded conductive epoxy. Then, using his experience, try a pile of things to gain confidence before the real thing. We also decided to write up an article for NTMS Feedpoint and thus pass it around, to present our solution of this problem, to stimulate some discussion, ideas and our experiences. If a proper paper is ever written, or conference presentation made, we would need a lot more information and experience before we would do it. I am sure there are lots of Amateurs out there with plenty of experience on the subject, who hopefully will pass along some of their knowledge, experience, skills and horror stories on the subject.

Safety:

Read all the labels before you start. You might learn something! I am a big fan of safety first. Where I used to work, we considered safety as Rule One. With chemicals, MSDS safety sheets were kept in a book chained to the wall by the first aid station in the lab. No new chemistry came into the lab before the safety and proper use information. Epoxy has issues so be careful. If a proper paper is written or talk is prepared on this subject, some of the basic product safety (MSDS) information should be included …. and, yes, OK, I agree I am the oddball. I actually read the included safety pages and I read the instruction manual … first.

Procedures:

We spent quite a bit of time trying things out, trying different approaches, different ideas and tried to gain confidence in techniques. As mentioned earlier, I am certain lots of Amateurs have some experience. The problem is finding practical, useful information. What might work great for you, might be total different from what we are doing and vice versa.

So, this article is a collection of comments about what we did.

The first thing we decided was important was the work area. A large, clean, blank, white paper makes a nice surface to find tiny parts that jump on. From experience, I know that tiny parts will jump. So, I found some 36 inch desk pads of white blank paper. I tape that down on a clear, empty work table. One problem is that this work area is not ESD safe, so be careful. It is designed to find lost tiny parts.

Then find a work time with no disturbances. Disconnect the phone, log off the computer. Put up Quarantine signs outside. Turn off the TV, radio, maybe late at night, when everyone else is sleeping, whatever it takes. Any disturbance could easily create an unfortunate result. Then You'll need lots and lots of light. I can't say just how much you will need, but my recommendation is lots and lots …. a million candlepower is a good start in my opinion. Then you need all the magnifying power that you can get. Then you have to get used to using it and working with tiny parts under it. Microscopes specifically for this kind of work are made but, if your budget says no, and you can't borrow one either, get and use what you can. What you are working on has to be made stable so it cannot move. More stuff that moves equals more potential problems, in my book. For the empty work area, we set up a small table, opposite from the normal work bench.

Epoxy:

We opened the basic parts catalogue, looked up conductive epoxy, found some silver loaded conductive epoxy and got it! I am sure that, from the experienced community, they will specifically recommend brand X, or give reasons why only brand Y can be used or don't use brand Z because … . Well we tried it on a number of microwave and other things to gain some experience using it …. a 10GHz preamp., one for 24GHz, then some 47GHz, then on to 78 GHz.

Epoxy is a gooey mess! It is just going to get all over. Get used to it. Deal with it ... even just teensy, tiny amounts. It's amazing where it shows up. Preparation helps. Well, an epoxy solvent handy is a good idea. The question is what solvent? Paint thinner can work here. Paint remover can work too. What is in the garage or basement, that I don't have to go out and purchase? The thing is experience. Read the ingredients on the label and apply some basic chemistry. Then, lots of tissue and paper towels and a receptacle to concentrate the waste. Try to limit the spread. The conductive epoxy we used thins easily with isopropol alcohol, so have a bottle handy. Also helps with the clean up. Learning to work with the epoxy was tricky. Learning to thin it to the desired consistency was also tricky. Lots of tests were needed. We figured that from looking at commercial equipment, we wanted to use only a little … teeny tiny amounts. Keep it neat and under control. This is where the thinning works. So what if the overall process takes hours or weeks … it's not important. Getting it to work and work well is. This is not production or lab work!

Tools:

My original thoughts were to just use my Xacto (tm) knife and some toothpicks. Actually, in trying some things, I did quite well with this. Things at least that I am proud of. Toothpicks … I sharpened them; making a sharper point helped with tiny parts. Don kind of looked at me and frowned. Here, his RC model experience came into play. Tiny parts, are easily affected by magnetism and static cling. Metal tools seem to enhance this affect. So Don said "no" to metal tools. His suggestion was wood, inexpensive, easy to shape and form. Plastic, well, the epoxy, paint remover and alcohol could adversely affect the plastic, so no to plastic. Toothpicks are really just too tiny to use as tools in big hands. His solution was whittling up a set of what I will call chop sticks, or that is what they look like to me ... very pointed sharp points, balsa wood, or whatever is laying about and using the normal work bench behind to

work on them. Where my approach was to place a tiny dot of conductive epoxy on the pcb, then move the part into it. Let it set overnight, then dab the other side of the diode. Don did not like this. He preferred to hold the part in place with one chopstick and paint on the thinned epoxy on one end with the other. Every time the one chop stick was used with epoxy, or any got on the other, he would then cut off the end and make a new point, with knife and sanding block to do the final shape. Use a simple card, a small dab of A and B on it. Then using another hand-made wood mixing tool, sort of a paddle or spatula, to grab a tiny amount of each, then mix it and add the thinner with a toothpick. tiny drip by tiny drip. Although the working time for this epoxy is something like a half hour, a new micro batch was mixed for every use or trial.

Now, what I described here in a few sentences, took literally hours to do. What we did might work for you, might not. It might disagree with your experience. It's definitely not what would work for production or general quick results desired lab work. Find what works for you. As I mentioned earlier, I would rather spend the hours here, than wasting it on some internet search engine. Don's goal was to create a conductive epoxy bond, that would be small, smooth, and follow the general soldering looks guidelines on lower microwave bands. Avoid any bumps, lumps or unneeded bulges. First do the one side. Let it set overnight or whatever, then come back and finish the other side. Don looked at what I did and said it looked too lumpy. When we test things, we will find out what works, doesn't or what works better.

Parts:

These parts are very tiny. They can be difficult to find and obtain. What you are working with is very tiny. Having all the right tools helps. Again, our choice in tools will be different from yours, even if you have the budget to get whatever. Parts come in various packages. New ideas in packaging happen all the time. So even if you are used to one type, another order or another parts source, and the packaging is different again. It might take some getting used to. If you are lucky, you might find some information on it. Otherwise, best guess. This is what we did … lots of guessing. Tweezers are nice, but most I have are magnetic. This causes problems. Non magnetic, and ESD safe tools are around. Instead, what we did was far more simple. Using one of the pointed shop sticks I mentioned previously, dip the end of it in either alcohol or water and touch the part. Should be able to easily pick it up. Then position it. As I mentioned previously, Don then held the part down and painted one end of the tiny diode with epoxy to hold it in place. Commercially, one of the recommended ways, is to first place a tiny dot of adhesive glue where you want the part, then place the part on top of it. Well, in the case of 78GHz, we did not know how this might work or affect the performance, so, we decided against this. With parts, ESD, Electro Static Discharge, is a major consideration. It is easy to loose a part to ESD. Please be careful. Commercially, one uses a ESD safe work station, the work surface is grounded, the work table is grounded and the worker wears grounded wrist bands, ankle bands, that are tested regularly. All tools and parts are grounded at some point to the work surface, before and during use. Then I can mention static cling. Lots of fun and entertainment. There are lots and lots of articles on this subject, take your pick, and experience helps. If you have some unidentified, SMD parts they make a good source of volunteers for experiments in learning to work with the epoxy, and trying out various experiments.

Tiny parts jump like fleas! Tiny parts are easily lost and hard to find. This can create hours of fun, thrills and entertainment. Extra on hand parts can be nice to have but also can be expensive for the Amateur. Another hint ... nany parts are simply not labelled and can be hard to test. It is worthwhile to keep everything in labelled containers (ESD safe).

Have fun!

73 from Lloyd, NE8I

RECORDING AND RECOGNISING "FIRSTS"

Keeping track of "Firsts" on the microwaves in the UK has been a rather hit and miss affair to date. Records can be found in many places, such as Radcom, the Microwave Newsletter, EME Newsletters and possibly a few others as well but there has been no central recording of this data.

The UK Microwave Group is introducing a new award that recognises the achievements of British stations in making first contacts with other countries, and to build a comprehensive list of firsts as a historic record of the development of microwave operating techniques in Great Britain.

Should you not wish to claim a certificate we would still be very grateful for details of your First to ensure the records are accurate.

Certificates will be awarded to stations that can demonstrate that they completed the first contact between one of the countries in Great Britain and Northern Ireland (Prefixes M, MM, MI, MW, MU, MJ, MD and the G and 2E equivalents) and any other country on a particular band above 1GHz. Contacts between parts of Great Britain are valid for this award (eg Scotland to Guernsey).

Only one First will be recognised per band, irrespective of the propagation mode (eg tropo, rainscatter or EME)

Initial claims should be made before 1st October 2006 for contacts that took place before 1st April 2006. Claims will be adjudicated using information available from other claimants and from historical records in magazines and other sources. It is anticipated that the first certificates will be issued during the summer of 2006. Claims for contacts made after 1st April 2006 may be made as soon as QSL confirmation is available.

Claims should contain the following details:

Name, Address, Callsign and email address.
Band; Date; Time; Callsign of the station worked; Mode; Propagation type;
Locators of the stations. Equipment details may be included if available.
A QSL will be required for award of a certificate (but are not required to provisionally enter a First in the database) QSL cards should not be sent until requested.
All claims should be sent to John Quarmby G3XDY, UKUG Awards Manager, 12 Chestnut Close, Rushmere St Andrew, Ipswich, IP5 1ED, or by email to g3xdy@btinternet.com.

A fee of £2.00 will be charged to cover printing and postage costs when a certificate is issued.

Please note that data provided for the above awards will be held by the UK Microwave Group for the purposes of providing a published list on the UKUG Web Site and in the group's newsletter Scatterpoint, of achievements by stations in Great Britain and Northern Ireland. Data will not be used for any other purposes.

You do not have to be a member of the UK Microwave Group to claim these awards.

The decision of the UK Microwave Group committee is final on the validity of claims.

The initial database will be published in July 2006 on the UK Microwave Group Web Site.

NOW ON SALE!

UK Microwave Group Proceedings 2005-6

A limited number is now available for postal applicants

ORDER YOURS NOW BEFORE THEY ARE ALL GONE!

After a successful direct sale of this year's Proceedings at the Microwave Round Table at RAL, we have a small number of copies available for purchase by post. To obtain one please do the following (if you haven't already done so!):

(1) **Email G3PHO** to reserve your copy and to check on availability.

(2) send the total required (see below) to Steve Davies, G4KNZ, UKuG Treasurer, whose address is on page 2 of every copy of Scatterpoint, or email him at:

[steve.davies@nokia.com].

Money should be send in any one of the following formats:

either: PAYPAL (contact Steve first to obtain his PayPal account info). PREFERRED.
or : Cash Euros or US dollars (if you wish to take the risk!)
or : UK Sterling cheque
or : Bank draft (contact Steve first about this)

Once G3PHO hears from Steve that your funds have arrived he will post your book to you immediately.

If you are a UK resident, you can, instead, send a UK bank cheque (payable to UK Microwave Group) direct to:

G3PHO, Peter Day, 146 Springvale Road, Sheffield S6 3NU, U.K.

Doing things this way is the fastest method of getting your copy! This is only for UK residents.

Overseas purchasers MUST pay via G4KNZ but reserve their book by emailing G3PHO as well.

PRICES: inclusive of packaging and First Class or airmail postage)

UK : £7.00 (7 UK Pounds)

EUROPE: £8.00 (8 UK Pounds) or 12 Euro

REST OF WORLD: £10 (10 UK Pounds) or $18 US

SURFACE MAIL PRICES TO REST OF WORLD (outside Euro):

£8 (8 UK Pounds) or $14 US

Sorry... no credit or debit cards.

If you use PayPal please add 4% as Steve will otherwise have to bear the charges on his account.

The European and US dollar prices have been rounded up to the nearest dollar (only a few cents difference!) to facilitate sending cash notes if you wish to chance it. If you do this we suggest you wrap the notes in metal foil or put inside a folded card to make it more secure.

CONTENTS

BOCHUM EME TESTS

... a follow up by James Miller, G3RUH

Apropos comments in the April 2006 Scatterpoint regarding the hi-power 10 GHz test at Bochum, here are some notes.

A few Scatterpoint issues ago, there was a snippet from Kent Britain about circular polarisation and EME, in which he called for "tests". In the 2006 March issue Brian G4NNS raised the subject again.

As luck would have it, the Bochum team would be at the dish on the weekend of April 01/02 to try and detect Voyager-1 on March 31st, the Amsat-DL AGM on the 1st, and an uncommitted Sunday 2nd. I offered to run the 10GHz transmitter for an extended period after lunch. Brian accepted, and organised the listening troops. The operators were G3RUH, Freddy ON6UG and Hartmut DL1YDD.

The frequency was 10368.5MHz with the Kuhne transverter LO referenced to a Rubidium oscillator. The TWT is an ex-satellite TV uplink unit, suitably modified, and can sustain 1 kW indefinitely. We operated it at 700 W continuous from 1300-1500 utc excepting CW identification every 15 minutes. Polarisation was vertical. Locator JO31OK. We were also logged into the ON4KST chat room.

The antenna beamwidth at 10 GHz is about 0.1 degree so all our power hits the Moon. If we assume that 7% is reflected, then our signal appears to earthlings rather like a 50 Watt beacon on the Moon.

Assuming a receiver system noise temperature of 100K, you could hear it with a dish of effective area 0.1 m^2 and random RX tuning. That's smaller than a typical 60 cm satellite dish. G8BKE did in fact achieve this.

Brian reports that various stations made measurements of signal strength as they rotated their feeds. At the time of writing, the data is still being analysed.

In the future we hope to repeat the show using circular polarisation.

73 de James G3RUH

RAL ROUND TABLE A RESOUNDING SUCCESS!

The UKuG Microwave Round Table, held at the Rutherford Appleton Laboratories near Didcot Oxfordshire, at the end of April, was an undoubted success. Some 107 callsigns were on the registration list and, while not everyone actually turned up on the day, you got the impression that there must have been at least 90 attendees, including a UKuG member from the USA. The place was very busy all day, with a really brisk fleamarket (that also saw lots of Proceedings and lapel badges being sold) and some excellent lectures. What might have been a catering problem evaporated into nothing due to everyone who wanted a meal being willing to pay a small cover charge for the extra staff needed to feed us.

The event really got underway the night before, when Geoff, G3NAQ, organised a dinner at a nearby hotel. Those who attended said it was most enjoyable and well worth the effort, so many thanks go to Geoff. By 10am on Sunday, cars were beginning to arrive at the security gate and some had to be held there until the meeting rooms were finally set out. Once the masses were let off the leash there was a mad dash for the bring and buy table, upon which were many interesting and useful surplus items, many of which were usable in the 24GHz region.

The lectures were of an excellent standard. Chris Bartram, GW4DGU, gave a thought provoking talk based on his experiences in getting on 10GHz EME, while Andy Talbot, G4JNT and John Fell, G0API, gave a very interesting and informative presentation on the Bell Hill microwave beacons and the technology involved. It became very obvious that there is a lot more involved in getting a reliable beacon on the air other than building the beacon electronics. In fact the RF side is possibly the easiest part! John Wood, G4EAT, brought us up to date on his 24GHz home station. He's been making some exceedingly good contacts, several over 200km and one heard at 300km+. A remarkable home-to-home, overland QSO between him and Gordon, G0EWN in Sheffield, at over 200km, was completed with S9++ssb signals both ways! With the availability of relatively high power (ie 1 to 3 watts) on this band, there is now an opportunity for some really interesting propagation studies to be made.

The end of the morning session saw the presentation of contest certificates, trophies and other awards.This was very ably carried out by Dave Powis, G4HUP, the UKuG Trophies Manager, in the absence of the Contest Manager, G4KNZ. The presentation included two new UKuG contest trophies, one each for the 24GHz and 47GHz cumulative contests. Andy Talbot, G4JNT was presented with the G3BNL (Les Sharrock) Trophy for his outstanding work in the field of beacon design and related frequency standards. Much of Andy's work will probably be seen in future UK beacons up and down the country.

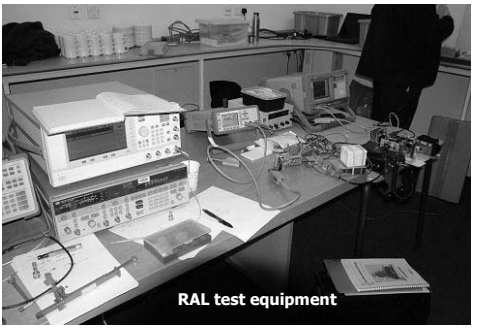
The afternoon concluded with a talk and open forum on Beacon Planning for the 21st Century, presented by Murray, G6JYB. This topic is one that UKuG intend to seriously follow up. Indeed we are already setting up a separate beacon working group whose brief will be to draw up a kind of "roadmap" for the next decade of beacon building. You'll see and hear more of this as the year rolls on!

The UKuG Committee would like to thank all involved with RAL, Mike Willis and his team, the authorities at RAL, all our speakers and helpers and of course the attendees, for a tremendous weekend.

RAL and Martlesham are the highlights of the UK Microwave year and this is in no small measure to those who organise them. In RAL's case it was Mike Willis, G0MJW and a small group of colleagues at RAL, plus Geoff, G3NAQ, who arranged such a great venue.

The following page gives just a glimpse of what went on at RAL this year. If you haven't been to a Microwave Round Table, then you should really try to get the one this year.The next once scheduled is at Crawley in S.E. England in September. Further details will be published here in Scatterpoint. After that it will be Martlesham, a two day event that draws visitors from Europe and the USA(and possibly Australia this year). **See you there!**

73 from Peter, G3PHO



RAL test equipment

An attentive audience

Ian, G8KQW/P won the 2005 24GHz Trophy

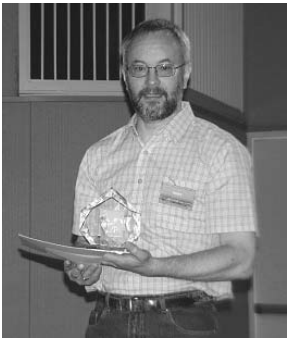
Peter, G3PHO/P won the 2005 47GHz Trophy

Left: Roy, G3FYX/P, received his 2005 24GHz cumulatives runner up certificate from G4HUP

Below Left: John, G3EAT, won the 2005 10GHz Cumulatives Trophy (the G3RPE Cup)

Below Right: Peter, G4ZXO received the 10GHz Cumulative Restricted Section Trophy (The G3JMB trophy) on behalf of Jim, G4WYJ/P

RAL 2006 PHOTOS BY G4ALY & G3PHO



The UKuG contest season is now well under way with the Lowband (23,13 and 9cm) and the first of the 24/47GHz cumulatives having already taken place. Tales of non-working gear, bad weather and other problems litter many of the reports that have come in, including that of your scribe! It's the same every year and we have only ourselves to blame for not making a thorough check of every item we use, especially, if like myself, you are mainly a portable operator. Here the equipment tends to take heavier punishment than home station gear.

The Lower Microwave Bands

The first report comes from **Keith, GW3TKH (Cardiff): Low Band Contest, 23 April**:
It was the first outing for my bread boarded 13cm equipment, 1W to a 25 element yagi. My first contact on 13cm was with G4ALY IO70VL 137km. Thanks Ralph. Best dx: 23cm & 13cm G4WYJ/P IO90WV 225km. 9cm G4ALY. Conditions were poor and most of my 16 contacts were using cw, it was hard going!

For the **RSGB 432MHz & Up, 6/7 May**. I operated /P on the Saturday and took my 70cm, 23cm, 6cm & 3cm gear to Foel Eryr, Mynydd Preseli, IO71OW. It was dry, with a force 6 southerly wind blowing, when I arrived. Erecting the antennas was difficult. Luckily I was inside the car when the torrential rain started!

Best dx: 70cm, 23cm, 6cm DENG IO74QD 246km. 3cm G4ALY IO70VL 167km.

No 3cm contact was possible with GD0EMG, apparently the gear was in many pieces on the shack bench. Perhaps next time? After 3 hours and the batteries dying, I packed up and headed home when, of course the weather was now perfect!

In the last few hours of the contest on Sunday, I worked a few more from home. Best dx: 70cm, 23cm PA6NL JO21BX 507km. 9cm EI5HN IO62OO 274km. Thanks to all. **73 Keith**

Peter, G3PHO/P Houndkirk Moor, IO93EH98, took 23cm and 9cm gear out in the Low Band Contest on 23 April. From the outset it was obvious that little 144MHz talkback was going to be evident and so the old Toshiba laptop was reluctantly switched on for the KST chatroom. This was bursting at the seams with callsigns with hardly anyone except himself advertising that they were also listening on 2m. It's essential for the vast majority of portables that 144MHz talkback continues in parallel with KST as it is all they have for liaison in most cases. Peter found the Telnet connection once again unreliable as it stopped several times during the day and the thing had to be re accessed, thus losing contacts in the process. In spite of the situation, some 25 contacts were made on 23cm, for an average of 202 points per contact, with F1PYR/P in JN19BC being best DX at 536km with GM4LBV (IO86RQ) at 377km , G4ALY (IO70VL) 365km and GM4OGI (IO85DX) 326km being nice catches.

On 3.4GHz, only 9 contacts (average 195 points per QSO) were made, with G1EHF/P (IO80WP) at 302km the best DX. At the end of the day, when attempting to work G4ALY, the 3.4GHz transverter developed a fault (no output on TX and no RX!!). A quick check revealed a dead short across the +12V DC feed to the DB6NT transverter module. This lead is fused and it blew 2 fuses before Peter realised nothing could be done on site. At first a faulty transient suppressor across the feed was suspected(M0EYT had had an identical fault) but the whole unit worked again after he checked it out on the bench at home! It would surely to go again on the next time out so the diode was replaced as a matter of course..

Our next report for the Lowband Contest comes from **Mike, G0DPS/P** who operated from **IO93AO** with 23cm gear.He's an old hand at ATV contests as your scribe well knows. He writes:

Thanks for the contact yesterday. I enjoyed the contest but, by 2pm, I was worn out & called it a day. Valuable lessons learned...

- **Do** not pick a site where the public have access, too many noisy motor bikes, ice cream vans, & well intended questions like "are you trying to contact the space station" etc !!
- **Don't** forget to bring the compass for beam alignment !!
- **Next time** put the 2m beam on the same pole as the 23cm beams !!

All things considered it was an enjoyable experience, which will be repeated . **73 Mike G0DP** *(Most /P folk can identify with you Mike! They've gone through the same traumas! .. editor).*

Roger, G4BEL, JO02BI, supplies the following report on the recent RSGB 432 up contest held the first weekend of May: Another disappointing weekend on the lower bands where

the rain didn't help. Conditions early Saturday morning were excellent with all the beacons many dBs up but then the rain came and things just went down hill.

Looking on the bright side, 3 & 6cm were very good with all the scatter about Saturday evening. I managed to work both G3LRP and G0EWN, which I can't usually due because of a large tree in their direction but the rain was just a bit further north and it cleared the trees.

It was disappointing to hear about the EI5HN group having all their problems with faulty gear and broken aerials. I could hear them at a solid 529 on 13cm. They were running 150w but they couldn't hear my 200 watts, so I guess they may have water in the preamp as well.

EME Activity

From: Peter Blair, G3LTF <pkb100@btinternet.com> Fri, 21 Apr 2006

Here's the material on my operation on 2320 EME in the April 2006 Dubus contest. I had 18 QSOs in all. X) =crossband QSO. #=initial contact (eg #35 = my 35th station on 13cm eme). There was good activity especially from Europe. My new PA worked FB , located at the base of the dish in the new, enlarged enclosure and gave about 180W at the feed. Further improvements to the feeder and the PA PSU should give me another 1dB at least. It certainly made a difference. I was not able to be on for the first moon pass but later on the 8th April I worked JA8IAD# 34 (X) =JA6CZD, (X), OZ4MM, F2TU, OK1KIR, OE9ERC, OH2AXH, OH2DG, (X), HB9SV(X), SK0UX, ES5PC, G3LQR, OK1CA, VE6TA.

On the 9th April: WW2R #34(X) W5LUA (X), JA4BLC (X), DL4MEA #35. Heard and called ,cross band, without reply were WD5AGO, WA6PY, WA9FWD, NA4N and IK2RTI. I also heard HB9JAW. I also ran a test with G4DDK, who was running 50W to a 2.3m dish. I copied him at "T" level. I copied my call and his "O" report but couldn't dig out his call. On April10th I made a set of sun noise measurements on the three bands. The 10.7cm flux was 89. The results were 2304 16.4dB, 2320 16.7dB and 2424 15.8dB. I think that the 2424 result is low because the feed match has degraded to 10dB return loss. My apologies for the slow cycling in frequency on my 13cm signal, I need to build a proper oven and will elevate that up the job list.

From the point of view of a UK operator, restricted to 2320 on transmit, the 2320/2304 cross band working method of calling on the corresponding frequency, (i.e 16MHz above or below) is working out well, especially with the European stations. My own system allows me to listen virtually simultaneously on all three bands after a CQ. Having now got the 2320 PA sorted out I shall now return to the 3.4 GHz project, I also want to try out, on one of the bands, some of the variations in the VE4MA feed suggested in the recent paper by W1GHZ and WD5AGO.

The Millimetre bands

The first of the 24/47GHz cumulatives contest took place on the Sunday of the RSGB's 24 hour May UHF/SHF Contest. The aim of this was to hopefully provide more millimetre band contacts for everyone and also give out contest groups a few points in the RSGB event. Mixed reactions to the idea have been received . Some thought it was an excellent idea and indeed they did work a few more than usual but others, especially those in the contest groups, thought it led to a dilution of effort, the smaller groups not being able to provide enough people to man the 144MHz talkback link and sit there waiting for the one or two contacts they could expect on these higher bands. Some of those engaged as solo portable in the UKuG 24/47 Contest also thought the parallel scheduling of the contests diluted the activity, as more than one millimetre operator also took out gear for the other bands such as 5.7GHz and 10GHz, thus effectively spreading their time across more bands, away from the real purpose which was to make contacts on 24 and 47GHz! If people want more bands then why not make all contests all band affairs? What do readers think? Please send us your comments. Now onto the individual reports on this contest:

From: G0MJW/P, Mike Willis, Walbury IO91GI <m.j.willis@rl.ac.uk>

Conditions were poor I think, though at least I know know my 24GHz systems is deafer than that of Brian, G4NNS who was on the same site as me. The site was good, as was the weather but, for me, working anyone on 24GHz was a struggle, even over paths that should have been easy. I know my system is not as sensitive as it could be but even so, signals were below what I expected. A grand total of 4 stations were worked. G4MAP/P and G8IFT/P were 79km, G8KQW/P 147.5km. There was a lot of haze and I think the high humidity was the main reason for the weak signals. The Gas loss for a 147km path could be over 30dB and maybe that is why G8KQW was a struggle but, for G4MAP/P, the loss would be only 20dB and it is only half as far, so they should have been much stronger. The profile calculated by my path profile software shows it is not such a good path. Resorting to the LF bands, I managed to work a few locals plus G3ZME/P on Brown Clee GD0EMG/P on the Isle of Man on both 10GHz and 5.7 GHz. I never heard Peter, G3PHO, on the talkback, which I am sure we would have done had he been on when we were trying to work him around 13:30 - 15:00. His phone was not working either. (*It was Mike! I went QRT at 1300 ..Editor*) **73 Mike**

Another of the three millimetre stations on Walbury was John, G8ACE/P. He writes:
I thought a good days enjoyment on the Walbury Hilltop with better than expected weather.
Stations worked:
G8IFT/p, G4MAP/p, G8KQW/p, G3FYX/p, G4LDR and G4EAT

which were just about all the stations in sensible range (I think). 144.175 MHz talkback seemed dead for long periods and **I think having this 24/47 activity co-incident with other bands dilutes attendance**. There is no doubt in my mind that using 3cm for lineup greatly increases one's chances of a contact when using a larger dish. The low wind enabled a 90cm centre fed dish to be used with feeds for 3cm 24G and 47G able to be quickly swapped. Comparing Locator.exe from the RSGB website to the G4JNT database shows a five degree calculation discrepancy, no doubt true/magnetic difference and, coupled with that, the total lack of precision from an ordinary compass means I am still no convert to trying 24G and above dx without the prior line up. Unless you have all day just for that particular try.

Nothing was worked on 47G as no activity in sensible LOS range.

Quite pleasing was the contact with GD using the 'Plug n Play' 6cm rig which was on the table at RAL.

G8KQW/P Ian Lamb <ianlamb@btconnect.com> worked alongside G3FYX/P on Brown Clee, IO82QL:
Roy G3FYX and I worked 9 contacts each on 24GHz and one each on 47GHz (93km) today from Clee Hill. There was plenty of activity on144MHz but **lots of stations involved in the IARU contest meaning that in some cases there were several 24GHz operators tied up on one site and not operating on 24GHz**.In my opinion the experiment to organise cumulatives the same day as an IARU contest was a total failure and we should organise the cumulatives on different dates in 2007.

Again it was extremely disappointing that so many stations who have 24GHz portable capability were not out (or we didn't hear them)

The sun shone all day in Shropshire and the tan is looking good! 73 .. Ian Lamb - G8KQW

From Harold Groves, G3UYM/P, IO92XA:
I had some problems during the 24/47GHz contest. First the inline fuse holder in the dc power lead to the FT817 fell apart then I realised i had forgotten to bring the microphone for the 817!! I think I must be getting to old for this /p lark! *(many of us have the same feelings about ourselves OM!...editor)*

From: G8APZ, Robin Lucas (out with M1CRO/P in JO1) <robin.lucas@ntlworld.com>
I can see both sides of the coin but it is hard enough to get enough ops out in a contest group, and even though we were aware of the 24/47 activity, and prepared to do some tests, **we were simply too busy on the other bands**. **So unless a dedicated resource is available to operate 24GHz, the co-ordinated activity between the two contests is not possible to use to any benefit.**

As it happens, my new 24GHz went out and I had a problem on TX. Apart from a QSO across the field, we had two 2-way contacts on the Sunday with PI4Z and G4EAT for half points. I dropped the mast around 11am in the rain to investigate and found that the WG relay wasn't going over on TX. I could have fixed it, but was in no mood to, having been on the go since Friday and having just 4 hrs sleep during the at
At 12 noon I decided not to put the mast back up, since on the Sunday morning, we had only managed 2 QSOs on 5.7Ghz, 2 on 10Ghz and 2 on 24GHz. It was difficult to get any takers either on KST because people were busy, or 144.175 because it was quiet, so I felt our time could be better spent.

Peter, G3PHO/P Winter Hill IO83RO had a TX problem on 24GHz from the outset. At first he thought it was at the other end of the 150km path to GD0EMG when he was hearing the I.o.M station at a good S7 but they weren't hearing him. He convinced G0FDZ at the GD contest end to take his transverter arpart and look for an RX fault but later, when trying with G8KQW/P at Brown Clee (S9+++), he realised the fault must be in his own gear! Without the vital allen key to remove a front panel knob, the 24GHz transverter could not be checked. Back home the problem was nothing more than a disconnected DC feed to the 2W PA. It could have been fixed on site had the allen key been on the tool box! The final tally was three one-way contacts...GD0EMG (IO74QD), G8KQW/P and G3FYX/P (both at IO82QL). No contacts were made on 47GHz. Peter retired "hors de combat" after only 3 hours on site, the 120 mile round trip being done in poor, wet weather for most of the time. With the cost of fuel now at almost £1 a litre (£4.50 a gallon) he is seriously thinking of retiring from the /P game at the end of this year.

Finally, for the UkuG 24GHz and the RSGB May Contests, we have a most interesting report from **John Wood, G4EAT(home station JO01HR)**

Saturday 6th May.
After a hot previous day and assumed temperature inversion overnight, we had an early morning 7am local, tropoenhancement towards Bell Hill.
GB3SCX 599+20; GB3SCK 539; but GB3SCS Nil ??
(hearing ON0KUL/B so rx system works!)
Useful opening that allowed me to calibrate azimuth of newly installed 60cms offset dish. Yes, I confirmed 60cms is narrow, approx +/-2deg on 24GHz
The tropo opening all over by 9am local.
From 3pm local I participated in 10G Trophy. Tropo by now very poor and hard going to work 400km**.** Livened up by local RS and activity level high. 21 qso's in total.
Sunday 7th May
Overnight rain, tropo still poor and Wx +11C, 99%RH which equates to 0.175dB/km on 24G. Hence repeat 24GHz qso with PI4Z in October not possible

this time. On 24GHz I worked:
M1CRO/P JO01 Walton on Naze (1-way CRO tx problem)
G3UYM/P IO92 Therfield
G8ACE/P IO91 Walbury
G4NNS/P Walbury also but 1-way

The QSO with ACE (0.5W 90cms dish) was set up with strong signals 59+20 on 10G allowing dish alignment. An SSB qso then possible on 24G. Very pleasing since all attempts last year to Walbury failed with my 30cm antenna. G4NNS was also 0.5W but had only a 30cm antenna so only the 1-way was possible.

I think alignment of the 24G Cumulative with the RSGB/IARU Contest is good for increasing potential contacts, especially if you're on the East coast (and fixed station) away from main UK /P activity, but just unlucky on this occasion that the best conditions were a day earlier. C'est la vie!

24GHz Distance attempts in New Zealand

From: Stephen ZL1TPH <stephen_hayman@xtra.co.nz> 15 Apr 2006

Today, myself and Ted, ZL2IP, were unsuccessful in our **253km** attempt between Mt Egmont and Mt Donald McLean. It appears the water absorption at distance and non-LOS provides the real challenge for any 24GHz contacts over a sea water paths.

Here is a list of attempts so far in order: 2005/2006
(Yes = contact) (No = no contact)
ZL1TPH - ZL1AVZ
Muriwai to Maunganui Bluff (146k) 5/2 Non LOS by 20km. (Yes)
Stratford Plateau to Muriwai (273km) Non LOS by 60km. (No)
ZL2IP - ZL1AVZ North Egmont to Muriwai (270km) non LOS by 50km (N)
ZL1TPH - ZL2IP Raglan to North Egmont (169km) LOS 5/9+ (Yes)
Klondyke to North Egmont (221km) 5/5 non LOS by 20km (Yes)
Mt Donald McLean to North Egmont (253km) non LOS by 40km (NO)

It appears that any more that 20km of water in the path upon the true LOS path does, in fact, attenuate signals to a point that no contact will ensue. The 4/3 or radio LOS rules do not apply at 24GHz it seems.

When myself and Brian attempted 270km on 24GHz in 2005 between the Stratford Plateua and Muriwai we experienced 5/9+ signals on 10GHz. Also 5/9 on 5.7GHz but no go on 24GHz. They say overseas that 24GHz is clearly a very difficult band at distance over non-LOS paths. This I can now well believe!

I have enjoyed these challenges and hopefully others can extend the distance on 24GHz in New Zealand shortly.
Cheers, Steve ZL1TPH

That's all we have space for this month folks... see you in June ... Peter, G3PHO

Thanks Martlesham Radio Society!

I have just received a cheque for £362 from the Martlesham Radio Society, which is the donation to the UKuG from those who chose to give their meal refunds from last November's Martlesham RT dinner to UKuG.

Firstly, thanks are due to John G3XDY, Chairman of MRS, for organising this.

Secondly, we also thank all those who donated their refund.

73 from Steve G4KNZ,
UKuG Treasurer

23cm Transverter article update

From: G4DDK, Sam Jewell <jewell@btinternet.com>

I have up-issued the 23cm transverter info, layout, etc. since the version that went into the 2006 Proceedings. Whilst I don't want to send out a 'mini' procs with all the info, maybe there would be room to mention the up-issue in the Scatterpoint and mention that for anyone contemplating building the transverter they should contact me for the latest info?

I hope to make PCBs available soon. WW2R has been providing me with invaluable feedback in his usual and inimitable way. Nothing escapes his eagle eye. It must be the American in him that's having an effect! **73 de Sam**

Old MP3 players

Not exactly microwave, but we all seem to need portable memory for our technical talks.
I've been buying up "Broken" MP3 players at the boot sales and customer returns at Radio Shack. 3 to 5 quid is the most I'll pay even for a 1 Gig. These have broken LCD displays, blown out audio amps because the battery was put in backwards, missing battery bits, dead logic, etc, but thus far over 80% still had good USB memory. I've picked up over 5 Gig of portable USB memory this way for less than 20 quid.
73 Kent WA5VJB

From: chris.towns@tiscali.co.uk

Not really "radio" but a lesson on how NOT to do it....

http://www.wrightsaerials.tv/roguesgalleryview.html

CAPTION COMPETITION ...

Last month's issue contained a photo which we jokingly suggested could be used in a caption competition. The source of the photo was incorrectly attributed to WA5VJB when in reality it came via Richard, G1SLE who took it a European

Good on ya Poms!

The UK Microwave Group, as a result of our "eagle eyed" committee member Murray Niman, G6JYB, was recently able to alert the Wireless Institute of Australia to a possible threat to their 24GHz amateur band. WIA had somehow missed seeing a notice of intention by the Australian Communications and Media Authority as shown in the following RSGB news clip which appeared before the Aussies seemed to find it:

"Threat to Australian amateur bands
Australian radio amateurs could lose one of their most important amateur satellite bands. The country's telecommunications regulator - the Australian Communications & Media Authority - is proposing to change the Australian radio frequency spectrum plan to accommodate ultra wideband vehicle radar technology in the 22 to 26.5GHz frequency band. If given the go-ahead, this plan would result in Australian radio amateurs losing their primary access to the 24 to 24.05GHz amateur satellite segment and being severely curtailed in experimenting in the secondary access segment of 24.05 to 24.25GHz. The Australian Communications & Media Authority is currently inviting comments on the proposed changes to the spectrum. The deadline for the comments is close of business on 19 April 2006. "

Murray sent this information along to VK via Doug Friend, VK4OE and to the WIA President Michael Own, VK3KI, and received this reply:

Dear Murray
Thank you very much for drawing this matter to out attention. I appreciate it, as with so many matters on the run, it is too easy to miss something. We have put in a submission, now.
Regards
Michael Owen VK3KI

Our own RSGB news then reported the whole incident as follows:

"The Radio Society of Great Britain, the Spectrum Forum and the UK Microwave Group are working with the Wireless Institute of Australia in an attempt to safeguard the 24GHz band. Australian radio amateurs currently have primary access to this band but they could lose this as a result of plans to accommodate ultra wideband vehicle radar technology in the 22 to 26.5GHz band. The RSGB and the UK Microwave Group have put a lot of effort into protecting amateur's primary status in parts of the 24GHz band over the past 18 months in IARU Region 1. Now they are using the expertise and knowledge they gained during this process to help the Wireless Institute of Australia safeguard 24GHz in Region 3."

So the Poms have a use after all ..... bonza!