An Amateur Radio publication for the Microwave Enthusiast

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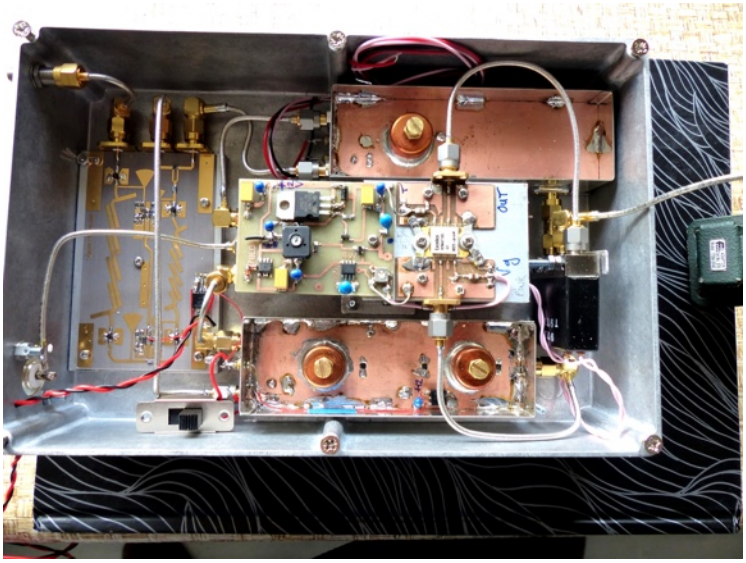
A 10 GHz Transverter

Geoff Pike GI0GDP



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UK Microwave Group Contact Information

Chairman: TBA
Email: chairman @microwavers.org
Located:
Address:
Home Tel:

General Secretary: G3XDY
John Quarmby
Email: secretary @microwavers.org
Located: Suffolk JO02ob
Address:
12 Chestnut Close,
Rushmere St Andrew
IPSWICH IP5 1ED
Home Tel:
01473 717830

Membership Secretary:
G8DKK Bryan Harber
Email: membership @microwavers.org
Located: Hertfordshire IO91vx
Address:
45 Brandles Road
Letchworth
Hertfordshire SG6 2JA
Home Tel: n/a

Treasurer: G4BAO
Dr. John C. Worsnop
Email: treasurer @microwavers.org
Located: Cambridgeshire JO02cg
Address: 20 Lode Avenue
Waterbeach
Cambs CB25 9PX
Home Tel:
+44 (0)1223 862480

Scatterpoint
Editor: G8BHC
Martin Richmond-Hardy
Email: editor @microwavers.org
Located: Suffolk JO02pa
Address:
45 Burnt House Lane
Kirton
Ipswich IP10 0PZ
NB editor & scatterpoint email addresses go to both Bob and myself

Scatterpoint
Activity News: G8DTF
Bob Price
Email: scatterpoint @microwavers.org

Contest & Awards Manager: G3XDY
John Quarmby
Email: g3xdy @btinternet.com
Located: Suffolk (JO02OB)
Address:
12 Chestnut Close
Rushmere St. Andrew
Ipswich
Suffolk IP5 1ED
Home Tel:
+44 (0)1473 717 830

Beacon Coordinator:
GW8ASD
Tony Pugh
Email: beacons @microwavers.org
Located: Essex (JO01)
Address: Gwersyllt
WREXHAM
LL11 4AF
Wales
Home Tel:
01978 720183

UK Regional Reps

John Cooke	Scotland	GM8OTI	john@marwynandjohn.org.uk
Gordon Curry	NI	GI6ATZ	gi6atz@qsl.net
Chris Bartram	Wales	GW4DGU	

Assistants

Kent Britain	USA	WA5VJB/G8EMY	wa5vjb@flash.net
Dave Powis	Trophies	G4HUP	g4hup@btinternet.com
Noel Matthews	ATV	G8GTZ	noel@noelandsally.net
Robin Lucas	www.beaconspot.eu	G8APZ	
Chris Whitmarsh	24GHz and up	G0FDZ	chris@g0fdz.com
Mike Scott	Chip Bank	G3LYP	

Editor's corner

From the skinny last month to the full-cream – this month's Scatterpoint runs to lots of Megabytes with all its pictures. There's NoV news, ChipBank updated, EME2014 and GM RT reports plus technical articles. Enjoy.

73 de Martin G8BHC

Subscription Information

The following subscription rates apply.

UK £6.00 US $12.00 Europe €10.00

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

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

You will have to make a quick check with the membership secretary if you have forgotten the renewal date. Please try to renew in good time so that continuity of newsletter issues is maintained.

Put a **renewal date reminder** somewhere prominent in your shack.

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

PLEASE QUOTE YOUR CALLSIGN!

Payment can be made by: PayPal to

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or a cheque (drawn on a UK bank) payable to 'UK Microwave Group' and sent to the membership secretary (or, as a last resort, by cash sent to the Treasurer!)

Articles for Scatterpoint

News, views and articles for this newsletter are always welcome.

Please send them to

editor@microwavers.org

The CLOSING date is the FIRST day of the month

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

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

Text: txt, rtf, rtfd, doc, docx, odt, Pages

Spreadsheets: Excel, OpenOffice, Numbers

Images: tiff, png, jpg

Schematics: sch (Eagle preferred)

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

Thank you for you co-operation.

Martin G8BHC

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UKµG Chip Bank – A free service for members

The catalogue is now on the UKµG web site at www.microwavers.org/?chipbank.htm *Latest Stock Update was end of October – so do take a look!*

Non members can join the UKuG by following the non-members link on the same page and members will be able to email Mike with requests for components. All will be subject to availability, and a listing of a component on the site will not be a guarantee of availability of that component. The service is run as a free benefit to all members and the UK Microwave Group will pick up the cost of packaging and postage.

Minimum quantity of small components supplied is 10. Some people have ordered a single smd resistor!

The service may be withdrawn at the discretion of the committee if abuse such as reselling of components is suspected.

There is an order form on the website with an address label which will slightly reduce what I have to do in dealing with orders so please could you use it. Also, as many of the components are from unknown sources, if you have the facility to check the value, particularly unmarked items such as capacitors, do so, and let me know if any items have been miss-labelled. G4HUP's Inductance/capacitance meter with SM probes is ideal for this (Unsolicited testimonial!!)

Don't forget it is completely free, you don't even have to pay postage!

Mike G3LYP

UKµG Technical support

While many of you will have taken advantage of the "test equipment rooms" that we run at the Round Tables, sometimes that project just cannot wait for the few occasions per year when we hold them. One of the great things about our hobby is the idea that we give our time freely to help and encourage others, and within the UKuG there are a number of people who are prepared to (within sensible limits!) share their knowledge and, more importantly, test equipment. Our friends in America refer to such amateurs as "Elmers" but that term tends to remind me too much of that rather bumbling nemesis of Bugs Bunny, Elmer Fudd, so let's call them Tech Support volunteers.

While this is described as a "service to members" it is not a "right of membership!"

Please understand that you, as a user of this service, must expect to fit in with the timetable and lives of the volunteers. Without a doubt, the best way to make people withdraw the service is to hassle them and complain if they cannot fit in with YOUR timetable!

Please remember that a service like our support people can provide would cost lots of money per hour professionally and it's costing you nothing and will probably include tea and biscuits!

If anyone would like to step forward and volunteer, especially in the regions where we have no representative, please email john@g4bao.com The current list is available at www.microwavers.org/tech-support.htm

UKµG Project support

The UK Microwave Group is pleased to encourage and support microwave projects such as Beacons, Synthesiser development, etc. Collectively UKuG has a considerable pool of knowledge and experience available, and now we can financially support worthy projects to a modest degree.

Note that this is essentially a small scale grant scheme, based on 'cash-on-results'. We are unable to provide ongoing financial support for running costs - it is important that such issues are understood at the early stages along with site clearances/licensing etc

The application form has a number of guidance tips on it - or just ask us if in doubt!. In summary:-

- Please apply in advance of your project
- We effectively reimburse costs - cash on results (eg Beacon on air)
- We regret we are unable to support/running costs

Application forms below should be submitted to the UKuG Secretary, after which they are reviewed/agreed by the committee: http://www.microwavers.org/proj-support.htm

2300 - 2302MHz NoVs now available

You will recall that the central section of the 2.3GHz band (at 2350 – 2390MHz) is being removed from the UK amateur licence due to 'spectrum release' changes, but the RSGB have negotiated access to a new segment at 2300-2302MHz. An NoV for this segment is available to Full Licensees for up to 400W on a secondary basis for UK-mainland use (see below). This makes it potentially suitable for narrowband/EME and similar applications. Applications for NoVs can be made now, but note that the NoV is valid for a period of three years. There are geographic and non-interference requirements which are different from the rest of the 2.3GHz band, so please read the NoV carefully.

It is vitally important that these NoVs are taken up and we can show some good use of them, because the commercial interests are still eyeing our 2320MHz allocation "with envious eyes" (to quote HG Wells) , and should the worse happen and we lose 2320, if we have not bothered to use the new one, we may lose that also. UKµG is looking for ideas from you as to how we can encourage activity in this new segment. Could we for instance add a special rule to the SHF UKAC to give multipliers for QSOs in the new segment? Also, G4BAO is looking for ideas to make existing equipment such as the DB6NT G3 PLL transverter to operate in the new band.

Murray Niman G6JYB
Spectrum Forum Chairman

RSGB News

Microwave enthusiasts who have a Full licence can now apply for a three year NoV to access 2300-2302MHz using up to 400W from a fixed location in the UK.

This new frequency range was negotiated by the Radio Society of Great Britain to partly offset the spectrum changes affecting other parts of the 2.3GHz band.

The NoV can be applied for online from the RSGB website at www.rsgb.org/2300nov.

Ofcom Consultation

Public Sector Spectrum Release (PSSR):

Award of the 2.3 GHz and 3.4 GHz bands

Ofcom is consulting on plans for the future release of new spectrum that could be used to meet the growing demand for mobile broadband services.

Potential bidders are being invited to comment on proposals for Ofcom's auction of spectrum in the 2.3 GHz and 3.4 GHz bands, which is expected to take place in late 2015 or early 2016.

While no specific uses for this spectrum have been prescribed, it is likely to interest the mobile industry, which relies on spectrum to offer internet services to consumers' smartphones and tablets. The 2.3 GHz and 3.4 GHz spectrum bands are frequencies which could be suitable for providing very high data capacity.

Many existing mobile handsets from major manufacturers including the Apple iPhone 5 and 6, HTC Desire and Samsung Galaxy are already compatible with the 2.3 GHz spectrum in other markets.

The 3.4 GHz band is currently being used for 4G wireless broadband in six countries including the UK, Canada and Spain.

The consultation closes on 23 January 2015.

A news release can be viewed here.

The SU-02 “Franco” board challenge

(see October RadCom)

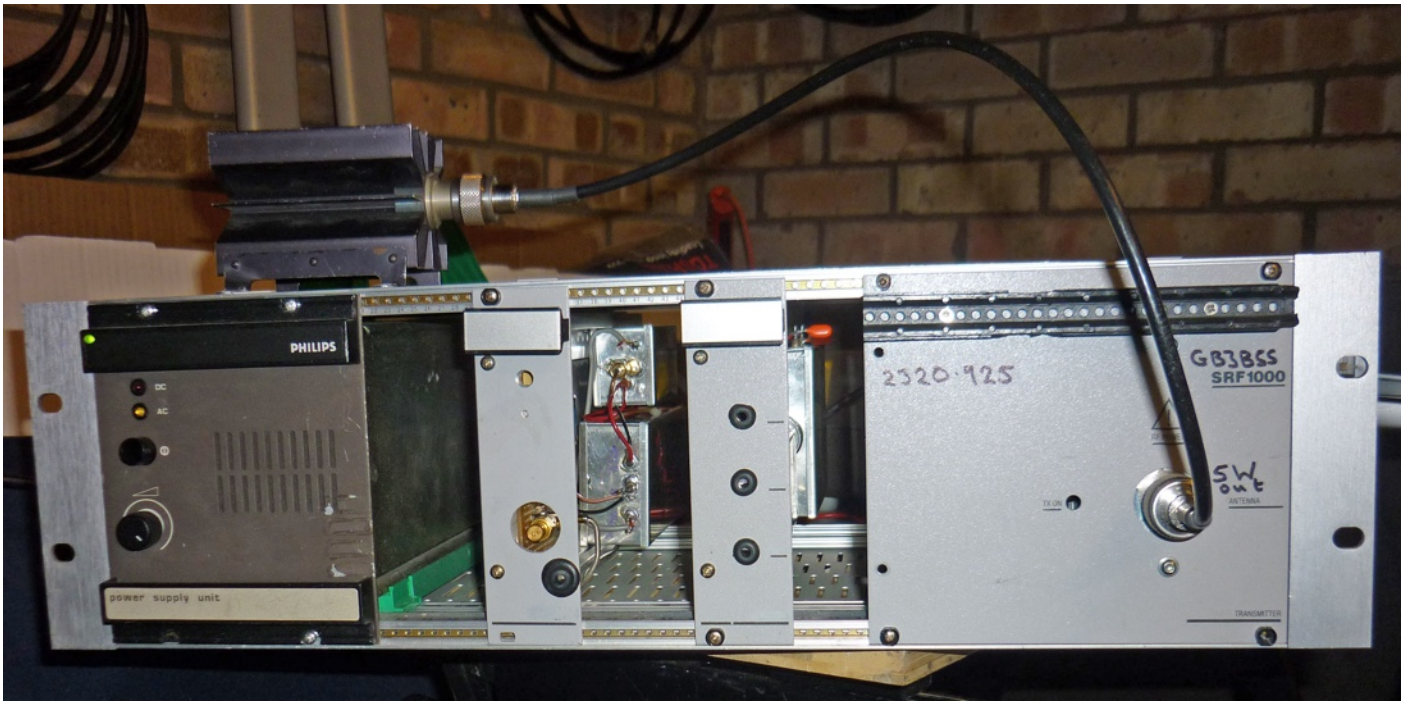
There have been various reports, by me and others, on the use of inexpensive LNBs as 10GHz receivers, but I've bemoaned the lack of a similarly cheap transmitter, so – a challenge –the first person who sends me a design, reproducible prototype, and short write up of an inexpensive 10GHz CW transmitter or transmit converter based mainly on these boards, using a G4JNT synthesiser as source will get it published in my Microwave column of RadCom and Scatterpoint. I'll even award a small prize of either a Merrimac 4 way SMA resistive power splitter, useable up to 1.3GHz or a modified Andrew MRF5S1900HS Power Amplifier Pallet producing around 12 dB gain and 60Watts at 2.3GHz. The basis for a nice 13cm Linear.

John Worsnop G4BAO

GB3BSS BEACON REPAIR

John Worsnop G4BAO

The Stroud 2.3GHz beacon GB3BSS 2320.925 has now got a new Master Crystal Oscillator based on the DF9IC design to replace the faulty Butler Oscillator that was causing the problems. Built on a PCB designed by G3XDY, it is integrated with the existing RDDS so is now like the driver used on GB3MHZ and I'm pleased to say it's working fine.

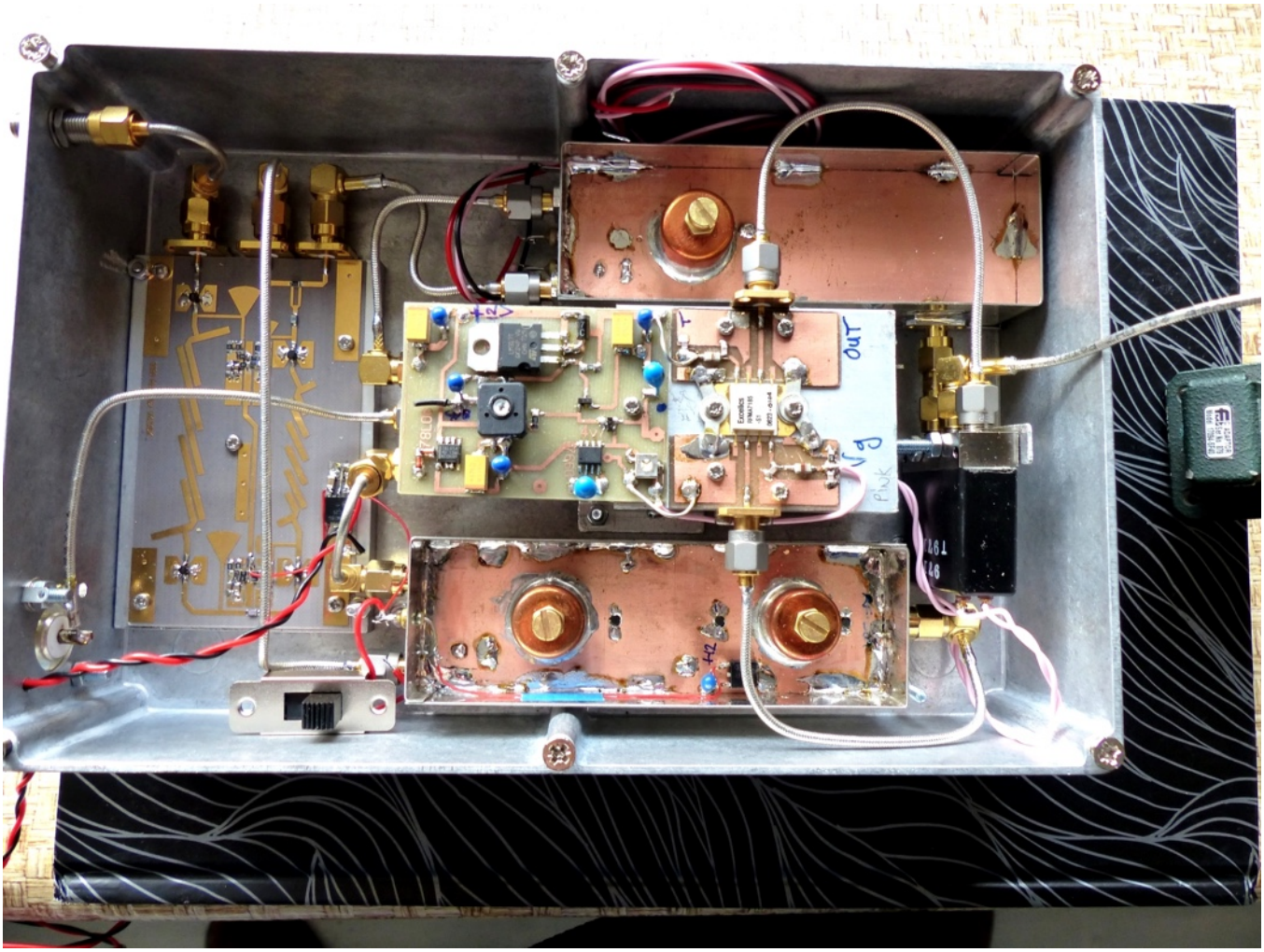


Picture of GB3BSS on soak in my garage

A 10 GHz Transverter

Geoff Pike GI0GDP

This was originally intended as single board transverter with an external local oscillator (L.O.), however as things don't always work out the way you intend it then became separate modules and an external L.O. Perhaps with hindsight it was better this way as it makes it much easier to test and de-bug should there be any problems!.



The L.O. unit consists of :-

1. 10 MHz Trimble Reference oscillator
2. 1.656 GHz Synthesizer
3. Power supplies including 28 V for the relays

The Synthesizer was obtained from Graham VK3XDK Agile PLL, the ADF4351 microwave synthesizer from Wayne ZL2BKC would also do the job and which one you would use depends on your personal choice. I did find it convenient to put the edge coupled filter multiplier in the transverter box.

The Transverter unit consists of:-

1. Rx converter
2. Tx converter
3. X6 Multiplier
4. Microwave SMA relays
5. 1 Watt PA
6. Attenuators as needed to adjust the drive level

Local Oscillator

For a 432 MHz IF (Ft-790r) we need a local oscillator at 9.936 GHz.

In my case this is derived from the synthesizer at 1.656 GHz and an edge coupled filter multiplier (X6) from VK3XDK. I had looked at Puff to see how this was done but for once in my life I decided to let someone else do it and get on with the rest of the transverter.

The synthesizer uses dip switches to set the frequency and there is space on board to add an ERA-2 mmic to buffer and increase the driver level to the X6 multiplier.

The synthesizer is only available ready built but you build the X6 multiplier, which is very easy to do. It also works very well, providing two outputs for the separate Tx and Rx mixers.

The Trimble 10 MHz sources came from Ebay and produce more than enough drive to lock the synthesizer.

Be aware that when cold the oven takes> 2A and then settles to less than 1/2A.

Power Supplies

Really this is done to suit the individual but +5,-5,12v and 28v are needed, choose the best way that suits you.

Transverter

This is the bit I built and it was a journey. The original concept of a single ended diode mixer and Eisch cylindrical filters (same as DB6NT) was a complete disaster.

I thought I had left something out or that there was a break in the pcb . I couldn't get a mixed signal out of the filter.

On investigation the losses in the diode mixer and filter where >30 dB. Then looking further the losses in each part was assessed .

I decided to abandon the concept, very similar to DB6NT but not using GaAs Fets. I had originally planned using ERA-1s and Rogers 4350B pcb as I had it (the following will almost certainly work on 0.8mm double sided FR4 with reduced but useable performance).

Rx Converter

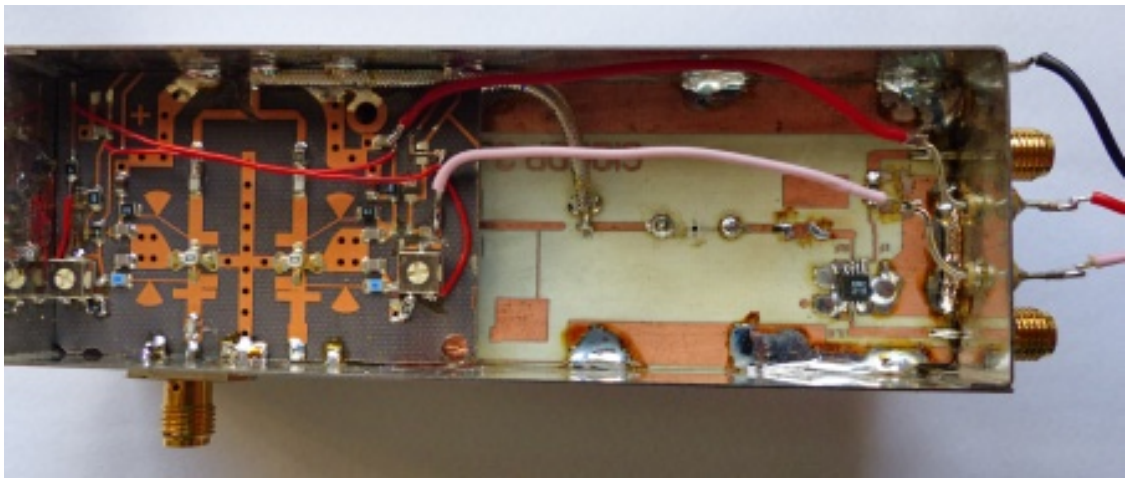
The current approach uses the two stage pre-amp from an SU-02 board from www.rf-microwave.com in Italy and a diode mixer from Hittite. The filter is a pipe cap filter. At this point I should mention that the 15mm pipe cap filters were also an issue. I ended up with 1 mm diameter pins 4mm above the pcb and 8 mm apart for a compromise between bandwidth and insertion losses. I have come round to thinking that these filters may work better in and 100 or 200 ohm termination rather than a 50 ohm environment, something to test later.

The measured conversion gain was -1 dB, however I'am sure that is +- 3dB. Anyway it's consistent with the gain of the pre-amp and the losses in the filter and mixer.

It's possible that a NLB-310 could be added after the filter and before the mixer to increase the overall conversion gain if needed.

The receiver can be a bit lively so you will need to make a trip to Lakeland and buy some microwave plate warmers. You get 3 for about £12, and – surprise, surprise – they don't half absorb microwaves and prevent oscillations in pcbs in tin boxes with lids fitted. The name on the box is "Waveware microwave cookware", Microwave Plate Warmers.

When switching from tx/rx I plan to just switch the +5v line to the Rx and leave the -5v bias on all the time.



Tx Converter

This uses the same Hittite mixer HMC219 from E-Bay or perhaps a Mini-Circuits SIM-14+ available from RF Microwave Italy at ~£14. I haven't yet tried this mixer but the pining seems to be the same.

This is more expensive than a single diode mixer but is easier to get working, the Ebay mixer is much cheaper.

This is followed by a pipe cap filter and 3 stages of NLB-310 and a pipe cap filter just before the last stage.

I built three of these and they all had different outputs, I think this is due to the flagging conversion loss in the 9 GHz specified mixer.

Tuning the pipe cap filters is somewhat tedious and the peak is very easy to miss. You need to take a bit of time and develop a technique of locking the nut and then turning the screw against almost akin to stripping the thread.

The worst output was 0dBm and the best 7dBm. The worst will still drive the PA to 300 mW at 10.368 GHz.

It's more than likely that some stubs or snow-flaking of the lines near the mmic inputs and outputs would improve matters, it's strange that RFMD don't seem to supply S-parameters for these devices. This would allow some degree of simulation to see where the best place to position the stubs .

Like the receive converter the pcb was made from Rogers 4350B and soldered into a tin box 37x30x110 available from Alan G3NYK.

I didn't always solder all the way around the pcb ground plane but with hindsight it is better if you do as I made some poor spot solder joints on the rx pcb and had a conversion loss of -30 dB.

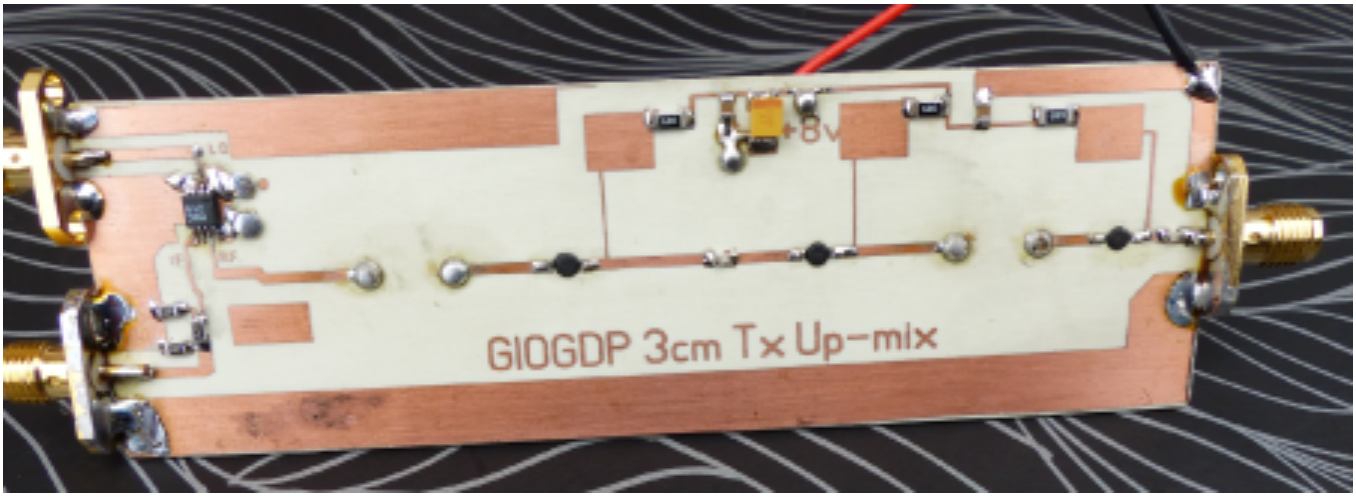
The mixers used really needed a LO power of 13 dBm for minimum loss, I reckon I was some 3 dB down on this and this reflects the lower than 1 watt output that was achieved from the PA which needed around 3 mW for full output.

I decided to leave it this way however if the LO was switched between TX and Rx from a single output from the X6 multiplier then the drive level to the mixer would have been 3dB higher.

The MMICs are all biased for approx 50 mA and the gains from them at 10 GHz was about 9dB, older designs using GaAs Fets would probably achieve 5-6 dB more gain than the mmics but not as easy to use.

Although the Tx converter uses two pipe cape filters and the RF is 432 MHz away from the L.O. suppression of the L.O. was at best -35 dBc. This is a poor result and better could be achieved with different pin configuration in the pipe cap but of course with increased loss.

A filter from Chris Bartram would be a good thing to get and this would greatly improve these figures.



X6 Multiplier

This was built from a kit from VK3XDK and worked very well. It produces in my example approx two 9dBm outputs for the mixers when driven at about 4dBm at 1.656 GHz from the synthesizer.

More output would be available with stubs as suggested in the associated paper work with the kit.

As this uses edge coupled filters there was no tuning needed and like wise free from going off tune over time.

The SMA relays were obtained from Ebay and the one used for switching the 432 MHz IF was a waste and I plan to remove it later.

1 Watt PA

This is the Excellics RFMA 7185-S1 high power mmic available from RF microwave Italy and was described in VHF Comms by Franco himself, I found the two I built only needed milliwatts to produce 1 Watt plus, they also work at reduced power on 5.7 GHz. I suppose some tabs might help here.

During the course of connecting up the various modules I did use some 90 degree entry SMA connectors. This is not recommended. You will get better results with normal straight entry SMAs but I admit it doesn't look as good.

Drive Levels

Although the Tx up mixer has provision for an onboard attenuator I ended up using a mixture of 3 dB on the pcb and a 20 dB SMA attenuator. This is likely to be removed and replaced with a 3 GHz variety rather than waste the 12 GHz units used at present. For the Hittite mixers I used I drove them with about 3-5 dBm at 432 MHz, compressed but useable.

It may be worth trying different mixers and Mini Circuits have some useful types e.g. SIM-14+ again available from Franco Rota.

The 28 v supply was from Ebay and works well and the rest of the supplies were derived from the 12v line with the -5v from

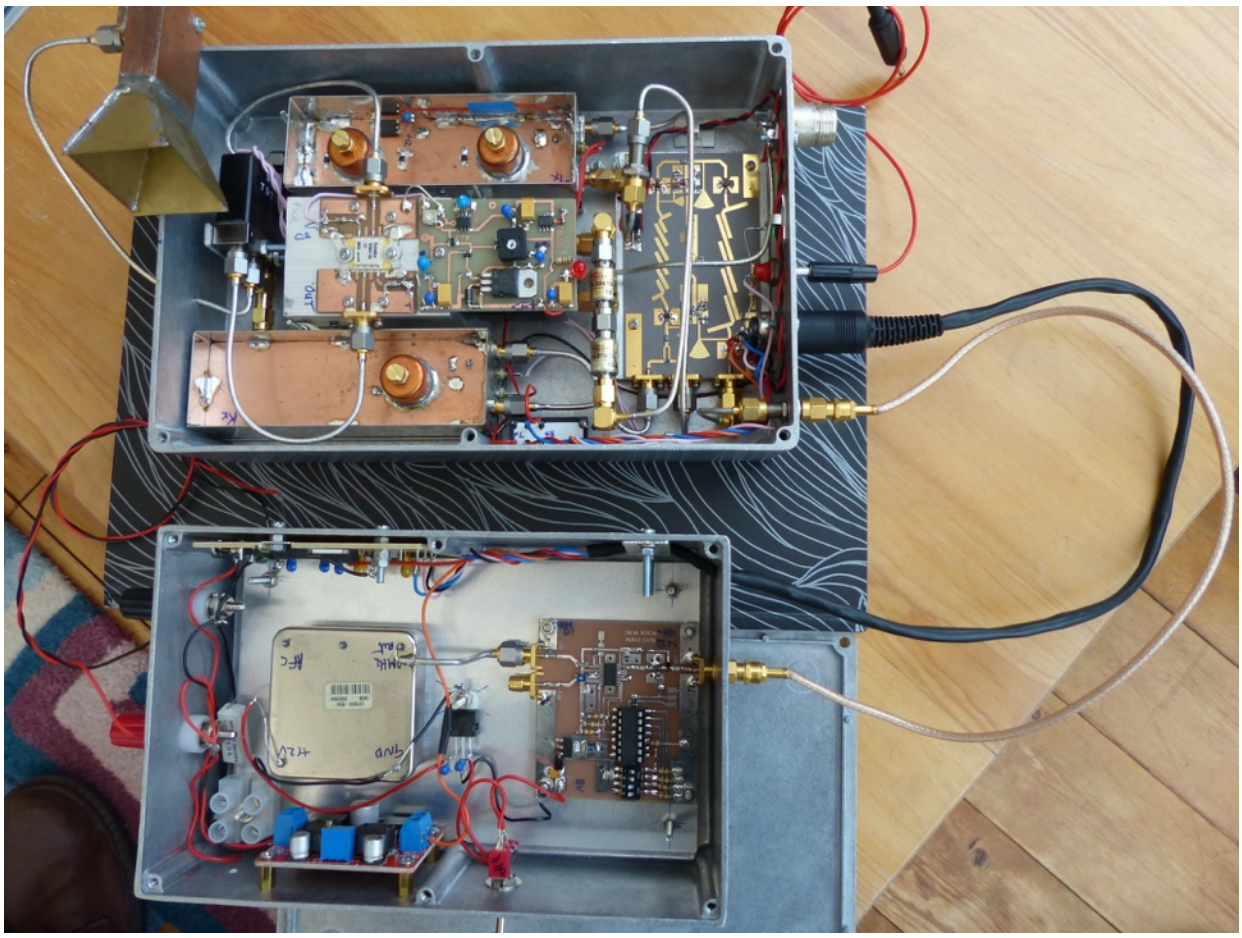
an ICL7660 inverter being fed from +5v.

When the lid of the transverter die cast box was closed down the whole unit took off producing >1 watt with no drive, anyway a 2" square piece of microwave absorbing material as mentioned previously was positioned directly above the Excellics MMIC and peace was restored.

The final 2 piece unit is shown below with a 5 pin umbilical connecting the synthesiser unit to transverter, also an SMA connection for the L.O. and the PPT direct to a relay already fitted inside the FT-790R.

I would recommend soldering whatever pcbs you use all the way around the tin box enclosures, I have at times used "spot" soldering and it can be quite lossy at times.

Geoff Pike GI0GDP



How to record slowly changing data easily using a Data Logger USB

By André Jamet F9HX

It is often useful, and sometimes required, to record slowly changing data to be able to study it at leisure after its appearance. This is true, not only in a laboratory, but also for domestic applications and amateur radio.

Recordable data

There are strip paper recorders and electronic models. The price of the latter is generally rather high and dissuasive for the average amateur. **Data Logger USB** brings a simple, effective solution at a reduced cost. They are small devices used with a Windows™-based PC by connecting them on a USB port to initialize and, after recording, read.

Voltage, electric current, electric power, electric resistance, temperature, humidity, acoustic pressure, vibrations, etc., are data the variations of which have to be known when the conditions of use of a device change.

Data-Logger USB

Some distributors have Data-Logger USB for:

- Voltage 0 to 30 VDC, > with an external attenuator.
- Current 4 - 20 mA direct > with external shunt.
- Temperature - 10 + 50 °C internal sensor.
- Temperature with outside thermoelectric couple K 200 + on 1350 °C.
- Temperature and humidity -35 to +80 °C 0 to 100% RH.
- Vibrations 3 axes ± 18 g.
- Sound pressure 30 in 130 dB.
- CO2
- and even microphone spies!

The recording contains the start and end dates as well as duration.

User manual

Load the software supplied with the device. Plug the recorder into an available USB port in your PC. Follow the indications to enter the required, typical data of recorder, name, choice of units (for example °C or K), puts sampling rate into recording (1 second to 12 hours), high alarms and low, date and time of sampling period.

When set up is complete, the Data-Logger should be removed from the USB port to begin recording. We can stop the recording by replacing the recorder in the USB port and then to read the record. This one can be copied to preserve it in the PC and will be erased in the memory of the Data-Logger when we shall make a new recording.

Recording of temperatures

I chose a model with external thermocouple for its universality (figure 1): Data-Logger USB EL-USB – TC

Unfortunately, it is delivered with a large-dimension sensor probe which does not allow recording on small objects. It was necessary for me to acquire a K probe provided with a very small sensor to make measurements on electronic components (figure 2)

Recordings on a domestic device were made first of all to master the use of the recorder. Figure 3 shows the changes of the internal temperature of a refrigerator. The opening of the door for 30 seconds causes an immediate increase in the air temperature. Very fortunately, the thermal capacity of food ensures it doesn't change temperature quickly. We can observe this by pricking the probe in a cheese or a block of butter

For an application relevant to hams [*the radio kind. Ed*], the small K probe was placed against the case of the final transistor of the 15W 10GHz SSPA described by F6BVA. It is attached with silver glue (figure 4).

! Figure1. Temperature recorder

Figure 2. Small bead probe

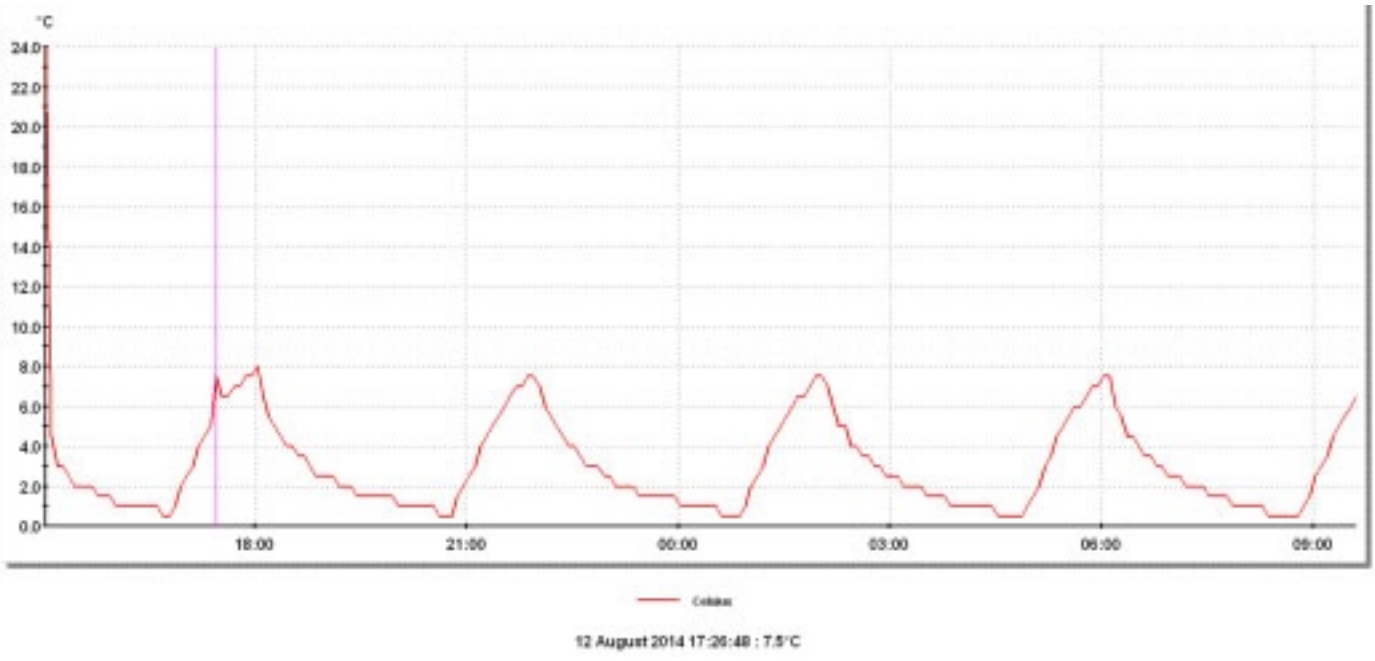


Figure 3. Refrigerator ambient temperature.
Red vertical mark: open door for 30 seconds

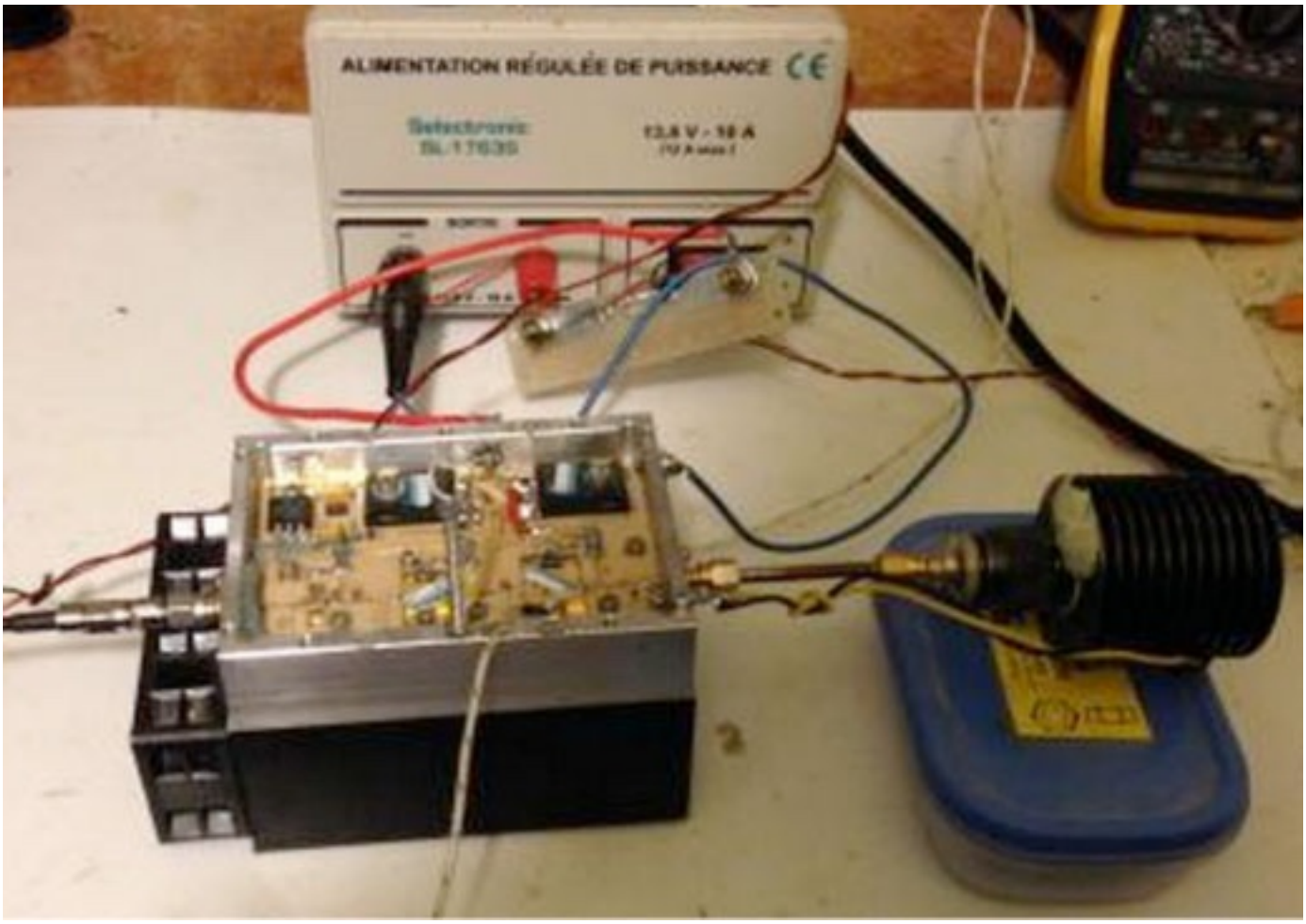


Figure 4. Temperature record of the final power transistor case

Figure 5 shows the change of temperature during a TX / RX sequence; cooling fans were in action only during the TX state.

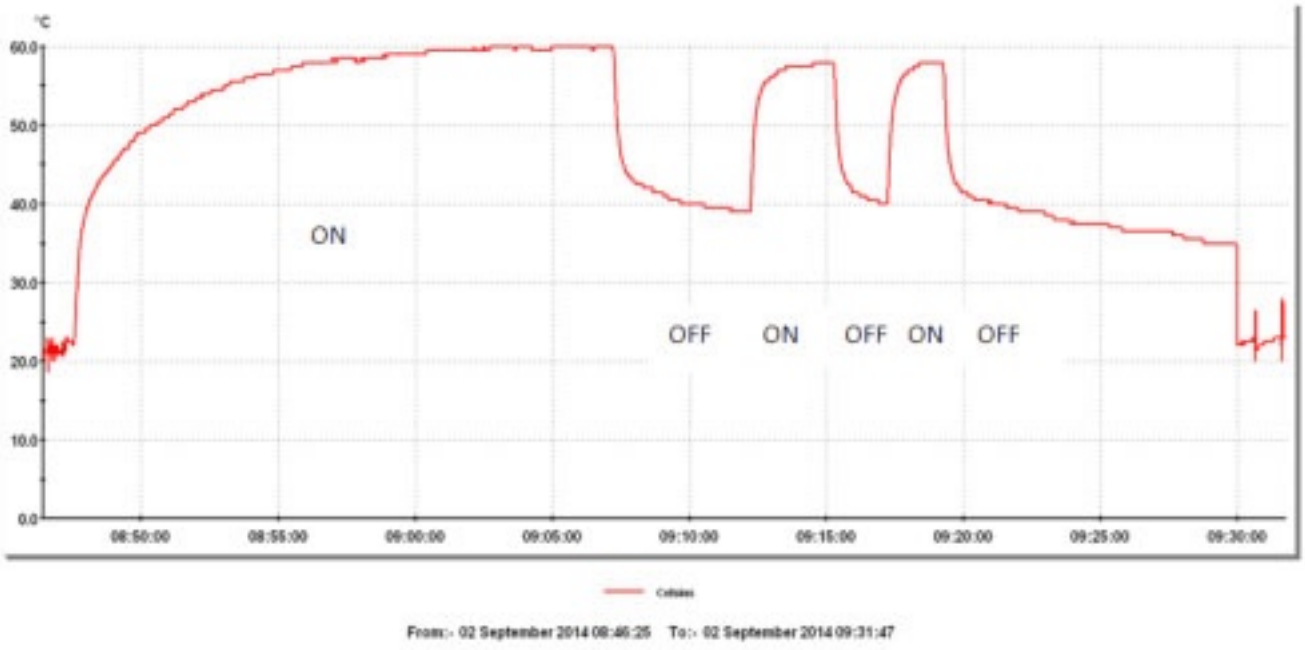


Figure 5. Temperature changes of the transistor case

Other uses for a Data-Logger USB EL-USB TC

By using a recorder designed for a voltage, it is enough to have a sensor delivering sufficient voltage to be able to record any variable parameter. We can also record current by means of a shunt of appropriate value.

We can, therefore, use a model not designed for the measurement of voltages. The module intended for the recording of temperature has, however, to receive a voltage in the range delivered by a thermocouple K (figure 6):

- 200 °C - 6 mV + 1350 °C + 54 mV

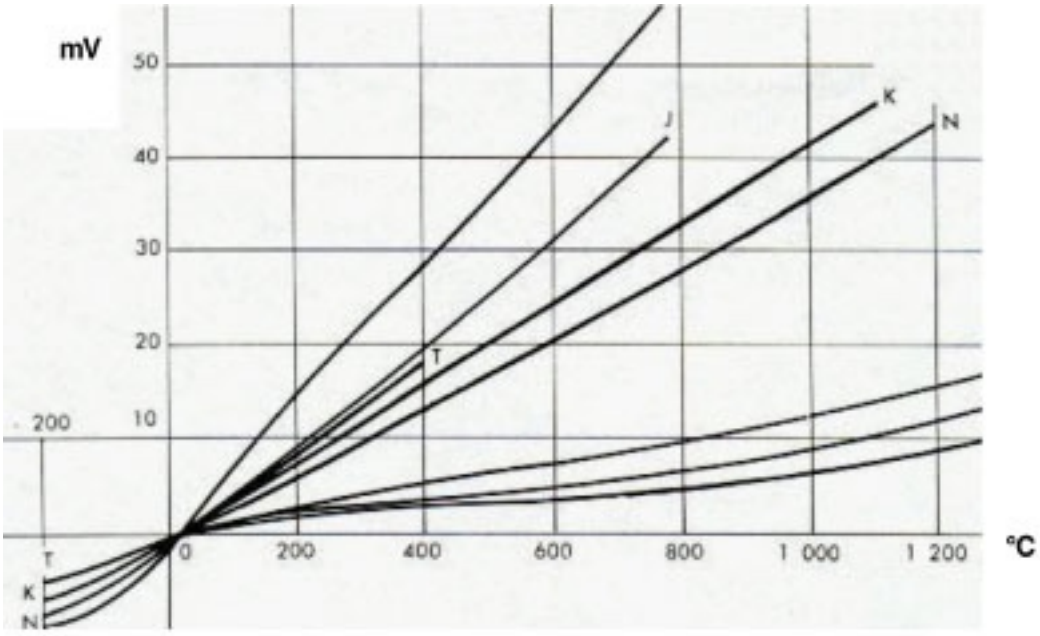


Figure 6. Thermocouple voltages versus temperature

It is suitable for a classic shunt 50 mV. To measure higher voltages, it is necessary to insert an attenuator to reducing the signal to ≤ 50mV. For example, for a voltage of the order of 10 volts, we would insert a rudimentary divisor 1000Ω/2.2Ω. The input resistance of the voltmeter so constituted is rather low, but acceptable for many applications.

Figure 7 shows the voltage of a 1 Ah Ni-MH accumulator of 7 elements during its discharge by a 50Ω resistor. It was stopped before the voltage quickly falls.

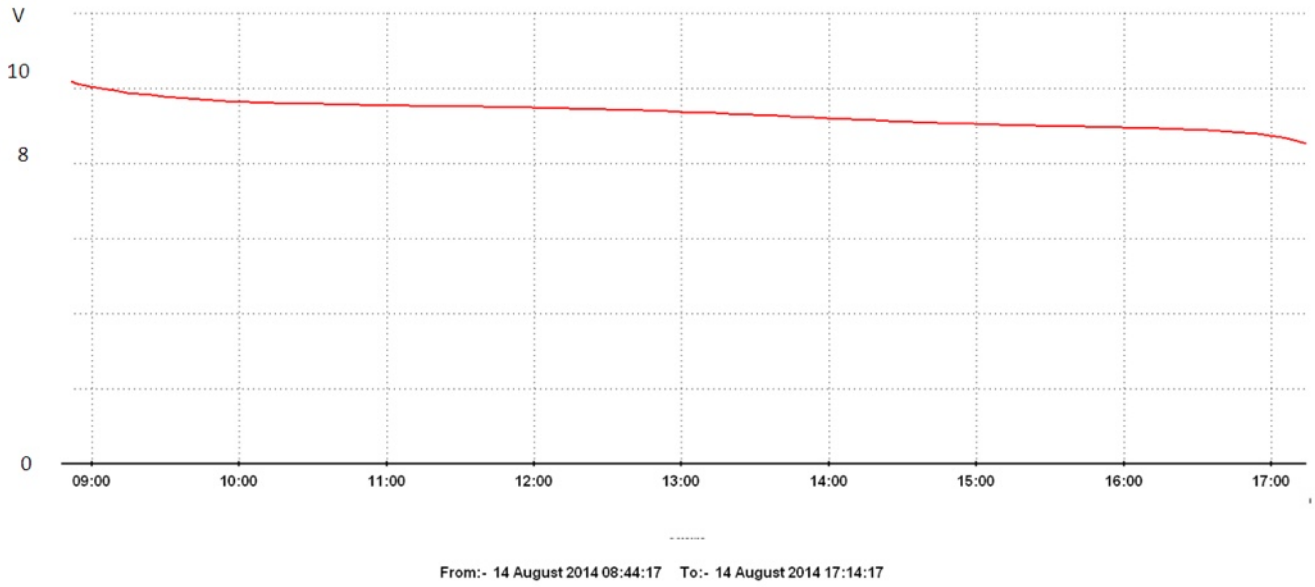


Figure 7. Accumulator discharge

We can also know the variation of the QRK of a station during a period of time. The S meter voltage is applied to a divider delivering an adequate voltage. Figure 8 shows the QRK variations of the 10MHz US station WWV. The S meter needle wags under the effect of fast and deep QSB and a slight tendency to increase the average QRK towards the end of the recording.

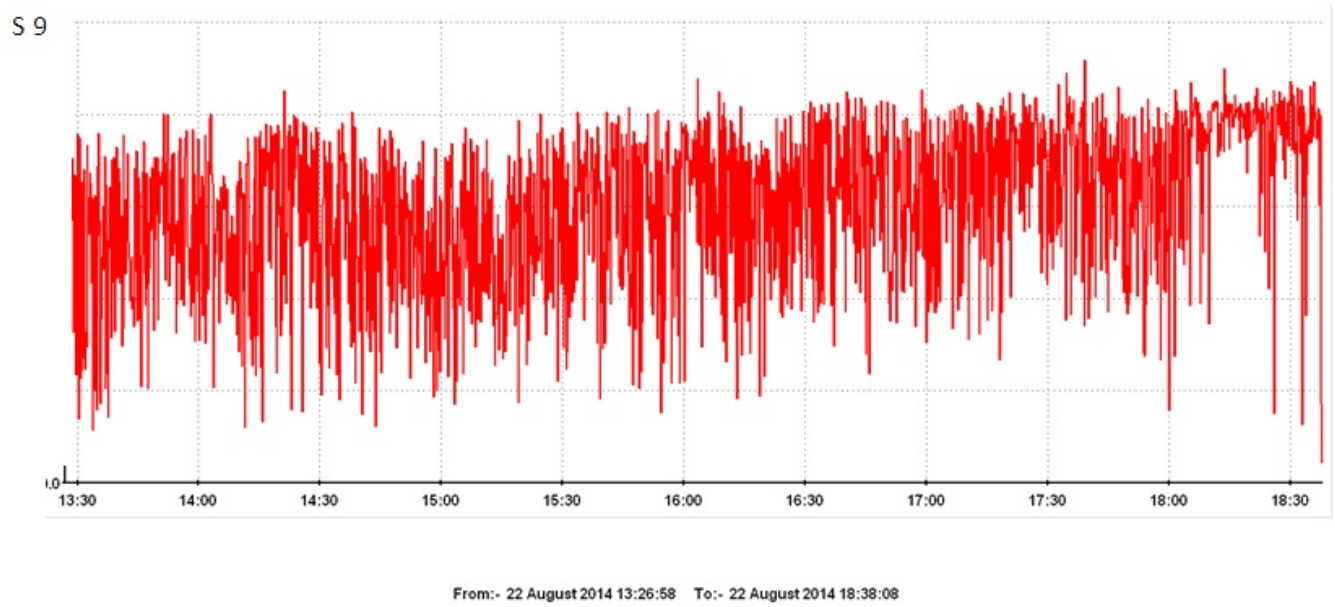


Figure 8. Reception of the US station WWV on 10 MHz

Conclusion

The use of such recorders is very easy and they can be very useful. It is a little bit risky to use a device designed for temperature in another application. The price is accessible (~ 80 €) and should allow you to acquire the models suited to your different needs.

Reg2 PROGRAMMING bug

Andy Talbot G4JNT

Anyone who uses this prog to calculate values for programming the LMX25411 for WSJT modes USING Reg2 PROGRAMMING : There is (was) a bug in the software on my website. If you specified an RF multiplication other than 1, the values generated for Reg2 programming didn't take this into account.

If you used 'standard' Reg0 programming to generate the tones then it gave the right answers. Or if you used Reg2 programming with no RF multiplication.

As we now know from experience, altering Reg0 (the Fract register) on that chip causes an auto VCO recal and consequential short glitches every time the frequency is changed, so all the latest WSJT beacon software for that chip now uses Reg2 (the Denom register) to alter the tone frequency.

The latest version on my website

http://www.g4jnt.com/LMX2541Support.zip is now corrected.

No one has reported this problem, so I'm guessing no one has yet tried the Reg2 version on anything that has RF multiplication.

It came to light here a couple of days ago as I was programming a chip for IscatA on 10GHz

If (and only if) you use Setup.exe to do a complete install it, then copy the latest LMX2541_Prog.exe on top of the one the Setup generates. I can't be bothered doing a complete rebuild of the install files. Existing users, just overwrite .exe

Andy G4JNT

The GM3WOJ 3cm Personal Beacon Story

Brian Flynn, GM8BJF

Back last winter I visited my friend and near neighbour Briain Wilson, GM8PKL, who lives near to me and also happens to have a very good view from his from living-room and patio to the north over the City of Edinburgh and beyond. He told me that on very clear winter days he could see snow covered peaks which he thought were in the Cairngorms which are at a distance of around 140km away. A few weeks later I was visiting Chris Tran GM3WOJ (a well known HF DXer/contester) who lives near Tain in Ross and Cormarty and he happened to remark that from his patio he could see Ben Macdui on a clear day. I began to realise that these summits were probably LoS from both ends of the path between my home location in Edinburgh (IO85JV) and Chris's location (IO77WS). I suggested that it would be interesting to try a 3cm microwave contact scattering signals over the peaks between the two locations. In the back of my mind was the thought that both locations could be done with more than the usual comfort of portable operation, and as we could probably run about 20 watts at each end of the path it should work. A bit of path profiling confirmed that in fact both ends were in fact LoS to these peaks and it was likely that a signal could be scattered over them on 10GHz.

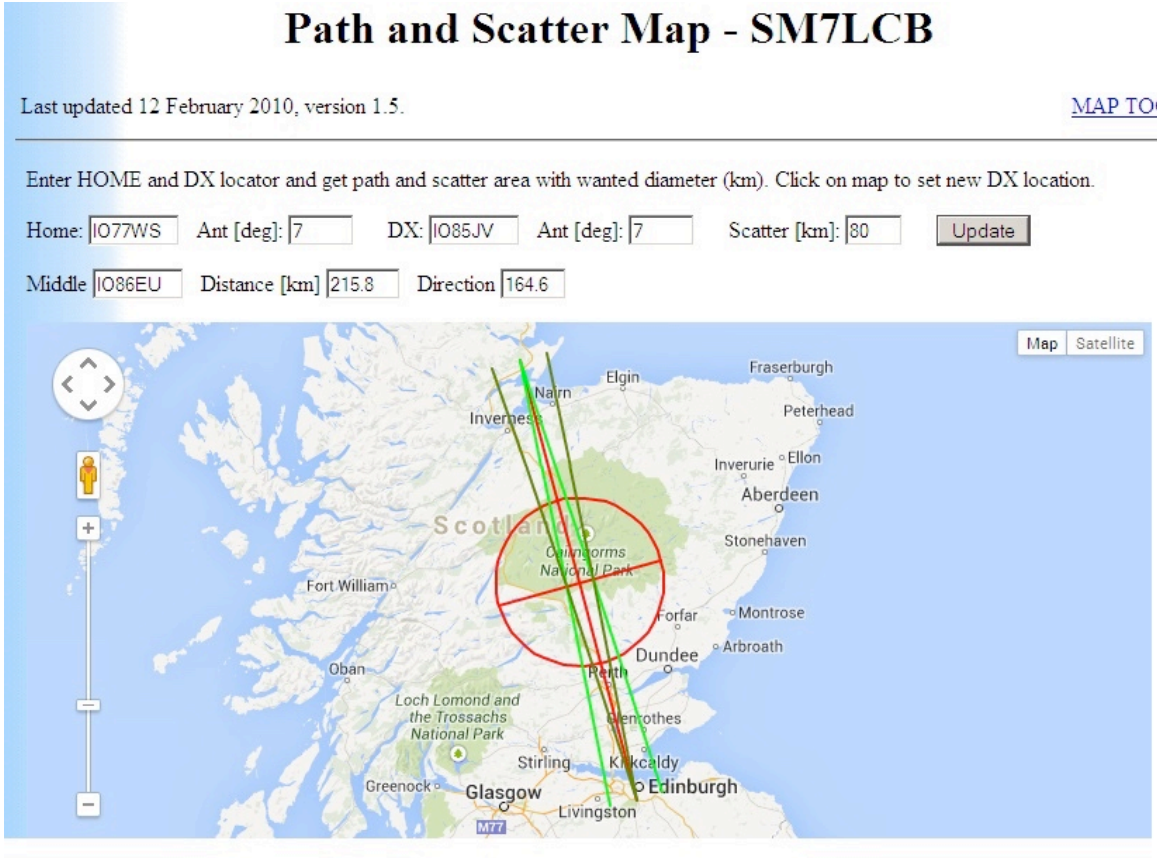


Figure 1. Path between GM3WOJ and Edinburgh

At this point Chris suggested that we could do one better and he would be very happy to host a 3cm personal beacon on either his house or one of his towers provided I built it and set it up. He was happy to keep an eye on it and mind it. I jumped at this and said I was very happy to provide the necessary hardware.

Over the winter of 2013/14 I assembled the necessary bits and pieces. The exciter I used one of Andy JNT's LMX2541 frac-N synthesiser PCBs programmed by a PIC microcontroller to do the keying as per Andy's recipe. The JT4G keying is timed from GPS. The frequency reference is a well-aged 10 MHz OCXO. It was felt that the extra complications of GPS frequency locking were probably not worth the effort from experience of running the 23 cm beacon GB3EDN

This generated a signal on 3456 MHz which is tripled in frequency (With a bit of recycled Sat TV PCB) to drive a modified QUALCOMM Omnitrak PA (courtesy of Chris Towns, G(M)8BKE). The output is a few hundreds of mW which is fed to a small 35cm BSB dish (remember those?). This gives a beam width of around 7 degrees which from IO77WS gives good coverage of a lot of the UK southwards. The all important housing is from a surplus DMC 22 GHz link unit which had already yielded lots of useful stuff for 24GHz.

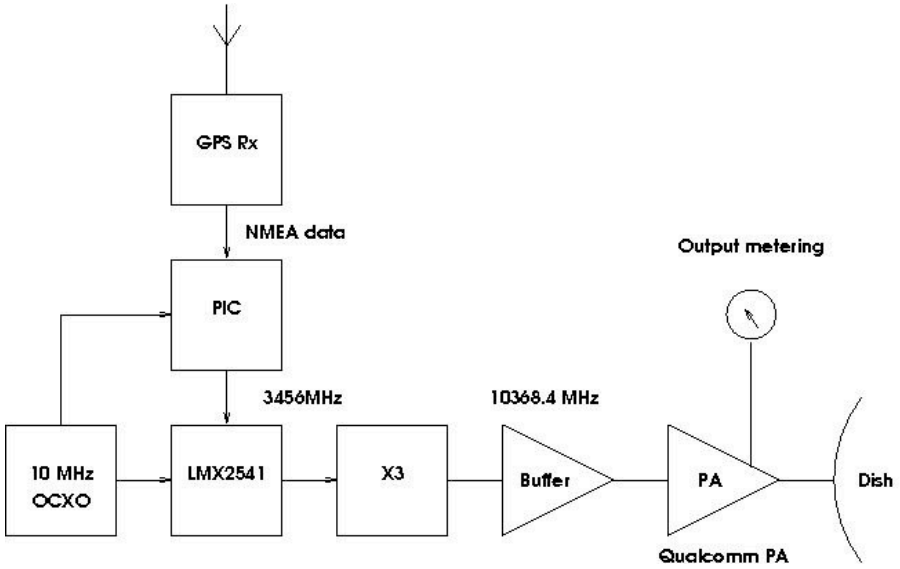


Figure 2: Block Diagram of hardware.

After an initial trip to Chris,GM3WOJ's in mid May to reconnoitre and get some measurements to fix the beacon to one of his smaller tower s(at 11m AGL) I got all the hardware together and tested to my satisfaction. This tower was chosen as it had a clear view south and was not obstructed by trees. It all had to be pretty rugged and weather-proof as I did not want to be driving up and down the A9 to effect repairs. In mid June I returned and between us we installed the beacon. Remarkably all went to plan and we had it on the air within that day. Monitoring the signal locally all sounded good but it remained to be seen if it would get past the mountains to the south which incidentally are the highest in the UK second only to Ben Nevis. An interesting problem was ensuring that the dish was actually pointing in the correct direction when the tower was elevated as there was no received signal to pan it on.

Figure 3.The beacon hardware with builder.

The next day I set off south down the A9 heading home to Edinburgh. I had a Horn antenna fixed to the car as all the best microwave geeks have and monitored it going south. The signal was good on backscatter from the Black Isle but largely disappeared in the vicinity of Inverness. Further down the A9 just before Aviemore where the

Cairngorms are in good view from the road it returned and at reasonable strength which was reassuring. I drove up to the Ski slope at Cairngorm and it was not audible LoS as the area is shielded by the direction of the glen. Pointing the antenna at any of the peaks in the vicinity however gave a reassuringly good signal. After that I headed south back on the A9 home with no more signals. It worked with back-scatter but it remained to be seen if forward scatter would work. The next day I was keen to see if it was audible in Edinburgh and I pointed a small (40cm) sat TV dish with a modified LNB as a pre-amp out of my shack window to the north. After a bit of waving it about in the right general direction I was amazed to find the signal was clearly audible at 216 km with an 1800 m obstructed path. The signal is always audible after fixing the antenna to a bracket on the roof. I monitor the received signal in Edinburgh continuously using a SAT-TV LNB based receiver which is GPS locked so that I can check the Tx frequency of the beacon. The audio from this receiver is streamed onto the internet and is at http://gm8bjf.no-ip.org:5700 and click on "MCU".

The stream is generated on a Raspberry Pi computer using Darkice and Icecast is the web-server programme. These programmes are open-source and intended for internet "radio" stations.

The vital statistics of the beacon are:

Callsign	GM3WOJ
Location	IO77WS62
Mode(s)	JT4G + FSK
Frequency	10368.400 MHz
Reference	TCXO (Usually within 200Hz of nominal carrier frequency)
Power	700 mW
Antenna	35 cm off-set parabola (Ex BSB dish)
Beamwidth	7 degrees
Beam heading	~165 degrees
JT4G timing	GPS

To date the best DX spot is from G4KUX in Co Durham, but with rain-scatter I would expect that it may get further. A fuller version of this article is available at http://myweb.tiscali.co.uk/gm8bjf/index.html

Postscript: Needless to say we have not had that QSO yet but we still have plans! That's the trouble with beacons!

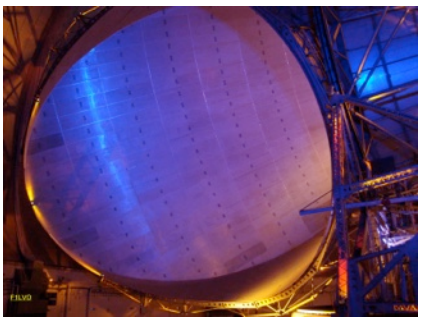
Acknowledgements:

- Chris Towns G8BKE – Donation of PA
- Susan Kivlin – Soldering of LMX2541 to PCB
- David Anderson GM6BIG – Donation of OCXO
- Chris Tran GM3WOJ – The location.
- Andy Talbot G4JNT - for doing the hard work sorting out the JT4G coding.

Brian Flynn, GM8BJF

EME 2014 Conference Report

The 16th International EME (moon bounce) Conference was held in Brittany, France on August 24-26, 2014. The meeting was held at Pleumeur-Bodou, the site of the 64 meter wide radome, housing the immense 340 ton antenna that captured the first live television signals broadcast from the US via Telstar satellite to France on July 10th of 1962. More than 100 EME enthusiasts and their spouses participated in this three-day event. Starting with a tour of the rose granite rocky coast, attendees had visits to the Telecommunications Museum and the giant microwave antenna in the radome. www.cite-telecoms.com/



The conference had more than 23 presentations over two days with topics in all fields related to moon bounce activity and frequencies as high as 77GHz.

Speakers from countries all over the world contributed their experience, technical achievements and research..

Joe K1JT

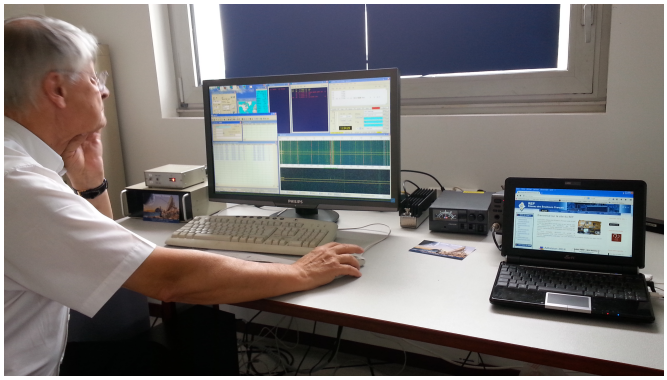
The LX-ON group

The OK beer team !

Workshops and demonstrations were interlaced with the program and included operation of the 144MHz digital EME station, the 5.7GHz CW/SSB EME station, and reception of the 10GHz EME beacon with a small 50cm dish, preamp and down-converter.

PB8 and 144MHz EME setup

Hans PA0EHG



Lucien F1TE operating 144 WSJT EME

The attendees and spouses enjoyed meals together for each of the 3 days, which facilitated a great exchange of technical knowledge and camaraderie .

Pause bar

Bag Pipes at Gala dinner

Lottery during Gala dinner

The group of French amateurs and others who organized this conference spent the past 2 years ensuring a great result for all attendees.

Corine

logistic staff

F2CT Corine F1TE P. Droniou K1JT

Organizing committee :

- Chairman Andre Gilloire, ORPB Chairman
- Co-chair Lucien Serrano F1TE, REF Chaiman
- Co-chair Guy Gervais F2CT,
- Members : Franck Tonna F5SE, Sylvain Meyer F6DBI, , Lucien Mace F3ME, Herve Sizun, Philippe Dupuis, Pierre-Francois Monet F5BQP,
- Logistic staff
- Corine Guillard F2CT XYL
- Catherine Berger
- Philippe Dupuis , treasurer
- Michel Dontenwille F1GVU City of Telecom friends society Chairman

EME 2014 Proceeding including CDrom with extras are still available at www.EME2014.fr

Venezia, Italy will host the next EME Conference in 2016

Photo by Alex Hanoko https://www.flickr.com/photos/alex_hanoko/ Reproduced here under Creative Commons licence

GM Microwave Round Table 2014

The fourth Scottish Microwave Round Table (GMRT) was held on Saturday 1 November 2014, at the Museum of Communication (MOC), Burntisland.

Participants started to arrive even before "doors open" at 9.30am, keen to see the traders' tables and deposit odd lengths of cable, connectors and preamplifiers for test with the measurement facilities run by Brian Flynn GM8BJF and David Stockton GM4ZNX with Dave Nugent.

Attendees were welcomed to the meeting for the formal programme at 10.30am by John Cooke GM8OTI, UK Microwave Group (UKuG) GM representative, and Prof. Tom Stevenson who outlined the MOC facilities which included a plentiful supply of tea, coffee and biscuits throughout the day.

The first talk was given by Pete Bates GM4BYF on simple measurements at microwave frequencies. Pete gave us demonstrations of the use of the SDR# software with a USB dongle as spectrum analyser for use with several simple devices he had constructed.

After a short break Andy Sinclair MM0FMF described the new UKuG / SOTA (Summits on the Air) microwave awards. A number of people are already making contacts towards these awards.

This was followed by two reports on the setting up of personal beacons by Alan Dimmick GM0USI (the GM4CXM beacon on 10368.947MHz) and Brian Flynn GM8BJF (the GM3WOJ beacon on 10368.400MHz).

An addition to the programme was Ed Murphy GM3SBC who gave a short outline of a new software defined radio system for 1.6MHz to 1296MHz that he has been working on.

An excellent (as always) buffet lunch was provided by the MOC staff (included in the entrance fee), and the Museum "store" was opened over lunchtime for visitors to eye the amazing collection of communications equipment that cannot all be put on show.

The afternoon session was chaired by Andy Sinclair MM0FMF, the first talk being given by David Anderson GM6BIG who gave a fascinating account of the history, development and future of the GB3CSB beacon cluster.

After another break, the final talk was by the RSGB Chairman Graham Murchie G4FSG who spoke on "The RSGB and Microwaves". He gave an interesting update on current changes to the bands as well as other current RSGB and Ofcom-related matters, and some interesting open discussion followed.

The formal part of the meeting concluded with the award of the GM4LBV trophy for the GM Construction Competition, judged by Graham Murchie G4FSG and Ian White GM3SEK. As last year there were only two entries, this time from from GM8BJF and Chris Bartram GW4DGU. The trophy (a waveguide to croc clip transition) was won by Brian Flynn GM8BJF. Brian has been told in no uncertain terms that this year he must definitely write up the entry for "Scatterpoint"; it will be taken forward to next year's UK Microwave Group G3VVB Projects Trophy competition. GM microwavers please remember to submit something next year, to avoid a repeat of the Lothians RS monopoly! Built, modified, hardware or software.

In the evening, many attendees (and some YL/XYLs) moved on to the Kingswood Hotel for an excellent meal, followed by an auction of microwave related publications and some interesting bits and pieces which together with other donations raised over £220 for MOC funds. This was followed by musical entertainment provided by Chris Bartram GW4DGU, Ian White GM3SEK, Nadine White MM0WNW and John Cooke GM8OTI.

The "organising committee" (Pete Bates GM4BYF, Roger Blackwell GM4PMK, John Cooke GM8OTI, Brian Flynn GM8BJF, Ray James GM4CXM, David Stockton GM4ZNX, Ian White GM3SEK and Colin Wright GM4HWO) thanks the MOC Staff for all their efforts before and during the event, and Lothians RS members Peter Dick GM4DTH, Andy Sinclair MM0FMF and Alan Masson GM3PSP for local support.

John GM8OTI

Activity News : October

By Bob Price G8DTF

Please send your activity news to:

scatterpoint@microwavers.org

Introduction

Quite a short report this month as I have only had a few reports. This month I have been able to use my rebuilt transverter for 13cm.

There seemed to be good activity with quite a number of new callsigns on for the SHF UKAC.

Beacons

From John G3XDY JO02

22/10/14

The EA2TZ beacon from IN93 was heard (just identifiable) on its new improved antenna

23/10/14

Beacons heard on 23cm, but no QSOs made:

FX3UHX	IN78
F5ZBT	IN94
EA2TZ	IN93 up to 559

27/10/14

Beacons heard on 6 and 3cm:

5.7GHz

F1ZBD	JN07
F5ZBE	JN18
HB9G	JN36

10GHz

F5ZBA	JN07
F5ZBB	JN18
DB0JK	JO30

28/10/14

Beacons noted (several more heard):

1.3GHz

SK1UHG	JO97	1234km building through the morning to peak 579
SK6MHI	JO57	

2.3GHz

DB0YI	JO42
DB0AJA	JN59
OZ5SHF	JO45
DB0VC	JO54

3.4GHz

DB0AJA	JN59
OZ5SHF	JO45

5.7GHz

DB0AJA	JN59
OZ5SHF	JO45 (16kHz wide due to loss of frequency locking)
OZ7IGY	JO55

10GHz

DB0VC	JO54
OZ5SHF	JO45
DB0MMO	JN49
DB0ANU	JN59
DB0FGB	JO50

30/10/14

Beacons heard included:

1.3GHz

F1ZBC	JN06

2.3GHz

F1ZUM	JN07
F5ZMF	JN06

5.7GHz

F1ZBD	JN07

10GHz

F1ZAI	JN07

31/10/14

Beacons heard included:

2.3GHz

F5ZMF	JN06
DB0VC	JO54

5.7GHz

F5ZBE	JN18

10GHz

F5ZBB	JN18
ON0GHZ	JO20
ON5JEF	JO20

October IARU UHF Contest

From John G3XDY JO02

October has been a busy month with the big European contest at the start and some good troposcatter at the end.

Flat conditions, but aircraft scatter working as usual. DL0GTH was heard on 10GHz, but we didn't manage to complete the QSO.

1.3GHz QSOs>600km

Limited to about 2 hours due to masthead preamp failure (the first preamp failure in 35+ years on 23cm!)

DF4IAO	JN48
DK6AS	JO52
DK2AN	JO51
DF6IY	JN48
DF0GEB	JO51

2.3GHz QSOs>500km

DL0GTH	JO50
DR9A	JN48
DC6UW	JO44

3.4GHz QSOs>400km

DK1VC	JO31
DF0MU	JO32
DL0GTH	JO50

5.7GHz QSOs>300km

DF0MU	JO32
F5REF	JN19
PI4GN	JO33
PA0BAT	JO31
DK0PU	JO31
DL0GTH	JO50

10GHz QSOs>300km

PE1MMP	JO21
DF0MU	JO32
F5REF	JN19
PI4GN	JO33
PA0BAT	JO31
DJ5BV	JO30
DF0HS/P	JO31
DK0PU	JO31
PA0WMX	JO21
F6DKW	JN18
DC6UW	JO44
G4KUX	IO94

October 23cm UKAC

From John G3XDY JO02

QSOs>600km

All by aircraft scatter

OZ3Z	JO45
OZ9KY	JO45
OZ9ZZ	JO46
SK7MW	JO65
DL0VV	JO64
OZ1FF	JO45
DF9IC	JN48

From Bob G8DTF IO83

I had a go again at the 1.3GHz UKAC with my 2W and 44 element Yagi. It was a bit of a struggle with a number of stations. I worked 11 locals in IO83, 3 stations in IO92 (G8OHM, G4KIY and G3ZUD), 3 in IO91 (G4BRK, G3TCU/P and G8CUL), 2 in IO81 (G3VKV and M0GHZ). I also worked G4NBS in JO02 and Ray GM4CXM in IO75.

October SHF UKAC

From Bob G8DTF IO83

I am back on 13cm now with just over 20W to a 62 element Yagi and a mended preamp. It was interesting to see local activity now at very good levels. There were 6 Bolton Wireless Club members on 13cm for the SHF UKAC including Richard G4HGI and John G8PEF/P. I also worked a couple of new stations in IO93 (G8BUN and M0ORO).

Other stations in IO83 worked were G1SWH, G4MVU, G8UVR, GW8ASD and G4JLG/P. In IO93 I worked G8BUN, M0ORO and G8SFI/P. Also worked were G3VKV and G4WLC/P in IO81, G0MJW and G4BRK in IO91, G8OHM in IO92, GM4CXM in IO75 and G4NBS in JO02.

Other October Activity

From John G3XDY JO02

19/10/14

DL3YEE JO50LX worked on 1.3 and 3.4GHz by aircraft scatter, along with DL1HTT (JO61) on 1.3GHz.

27/10/14

Some nice tropo, and new squares from F1NYN/P. Despite good signals from him on 6cm, we failed to hear each other on 3cm.

1.3GHz QSOs>600km

DB6NT	JO50
DK2AN	JO51
DL3YEE	JO50
DL7QY	JN59
F1NYN/P	JN06

2.3GHz QSOs>500km

DB6NT	JO50	
DL3YEE	JO50	
F1NYN/P	JN06	New square

3.4GHz QSOs>400km

DB6NT	JO50
DB5KN	JO31
DL3IAS	JN49

5.7GHz QSOs>300km

DB6NT	JO50	
DB5KN	JO31	
F1NYN/P	JN06	New square

10GHz QSOs>300km

DB6NT	JO50
DK1VC	JO31

28/10/14

Another excellent day for tropo, but activity levels were low unfortunately and the UKAC started after the tropo had virtually dropped out.

1.3GHz QSOs>600km

OK1MAC	JN79

2.3GHz QSOs>500km

OK1MAC	JN79
OZ1FF	JO45
SM6AFV	JO67
DC6UW	JO44

5.7GHz QSOs>300km

SM6AFV	JO67
PA0BAT	JO31

10GHz QSOs>300km

OZ1LPR	JO44
OZ7Z	JO44
DL7QY	JN59
SM6AFV	JO67
PA0BAT	JO31
DF0MU	JO32
DC6UW	JO44

30/10/14

Conditions were back towards France again, but on the edge of the conditions.

F6CBC in IN94 worked on 1.3 and 2.3GHz

31/10/14

The last day of the tropo, but the best DX of the day was by aircraft scatter!

F5AYE/P JN14SC (Mt Aigoual) worked by aircraft scatter on SSB at 903km on 1.3GHz for a new square.

From Alan GM0USI/P IO77

Just some info on my trip to Skye - the WX was fantastic the whole week so was out quite a lot walking etc... on Mon 13 Oct and Wed 15th Oct I had some time to try some 3cm test at IO77aa in the south of the island about 40min from the holiday cottage.

For the first time I believe from Skye, Tony G4CBW was audible on both days on troposcatter albeit weakly over the 501km path...I could almost read his cw - but with real difficulty.

This where digital modes came into their own completing on ISCAT A, JT4G and JT65c over a short period - as well as a quick SSB AS QSO.

On the Wednesday we tried again with very similar results. I also tried with John G4BAO on ISCAT A, but to no avail. A CW test with G4KUX gave 2 bursts of CW, but no qso.

Being a fairly recent convert to digital modes on 10GHz I can thoroughly recommend them as being very efficient with aircraft scatter and weak troposcatter.

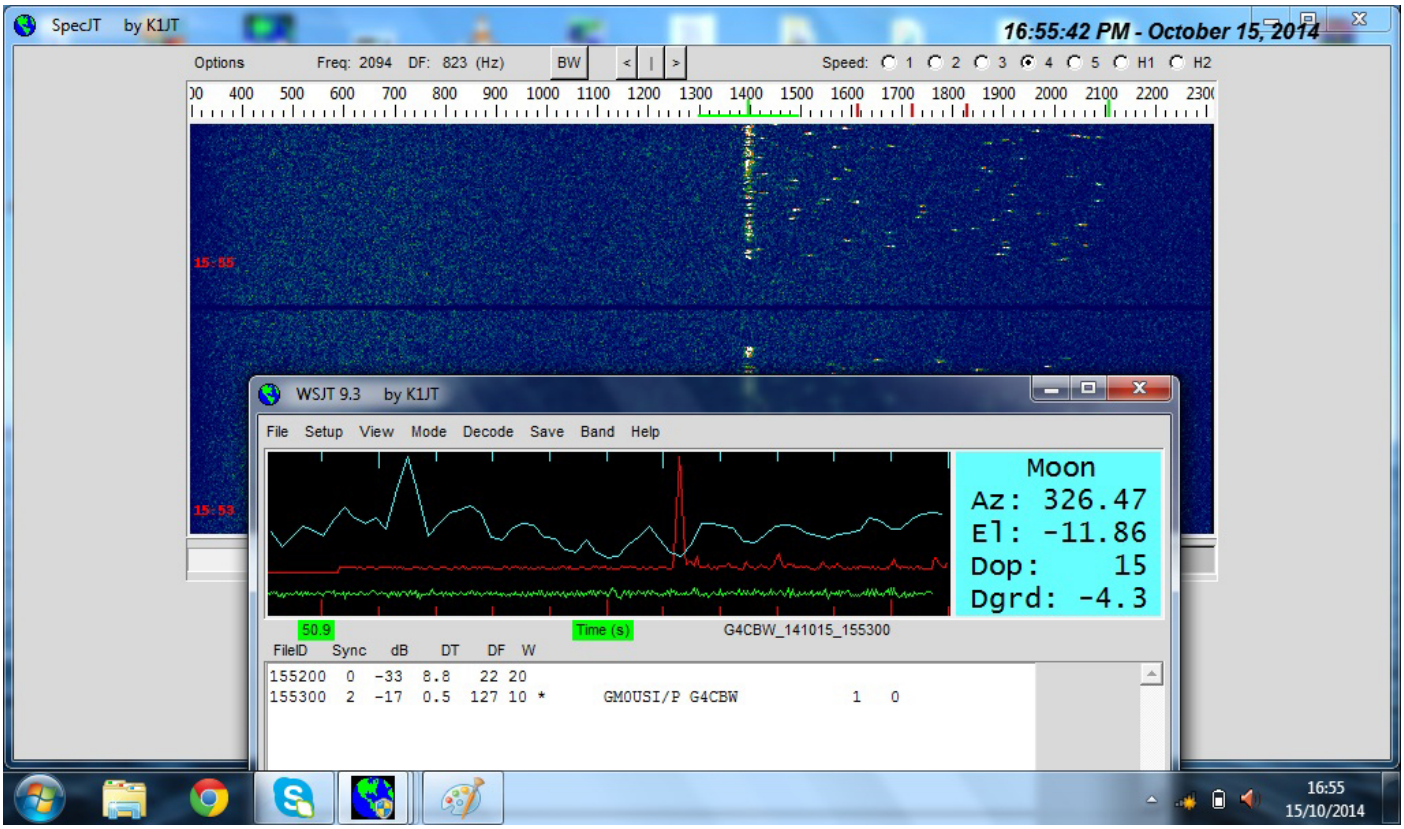
Some screen grabs and pics are on pages 25–27. The high ground across the loch was only 9 miles away. Also,the shot of the dish has 2 planes which were used for aircraft reflection.

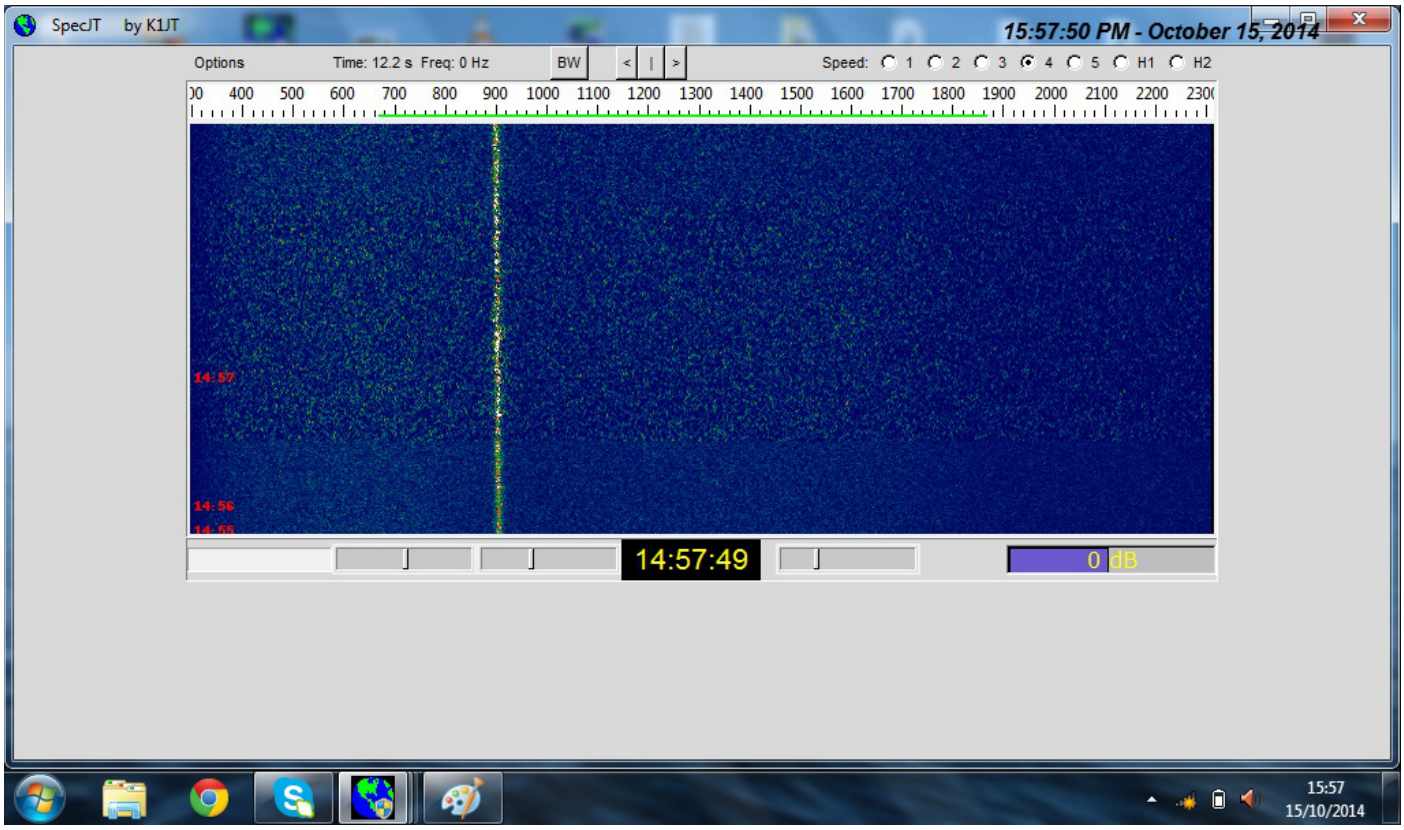
...and finally

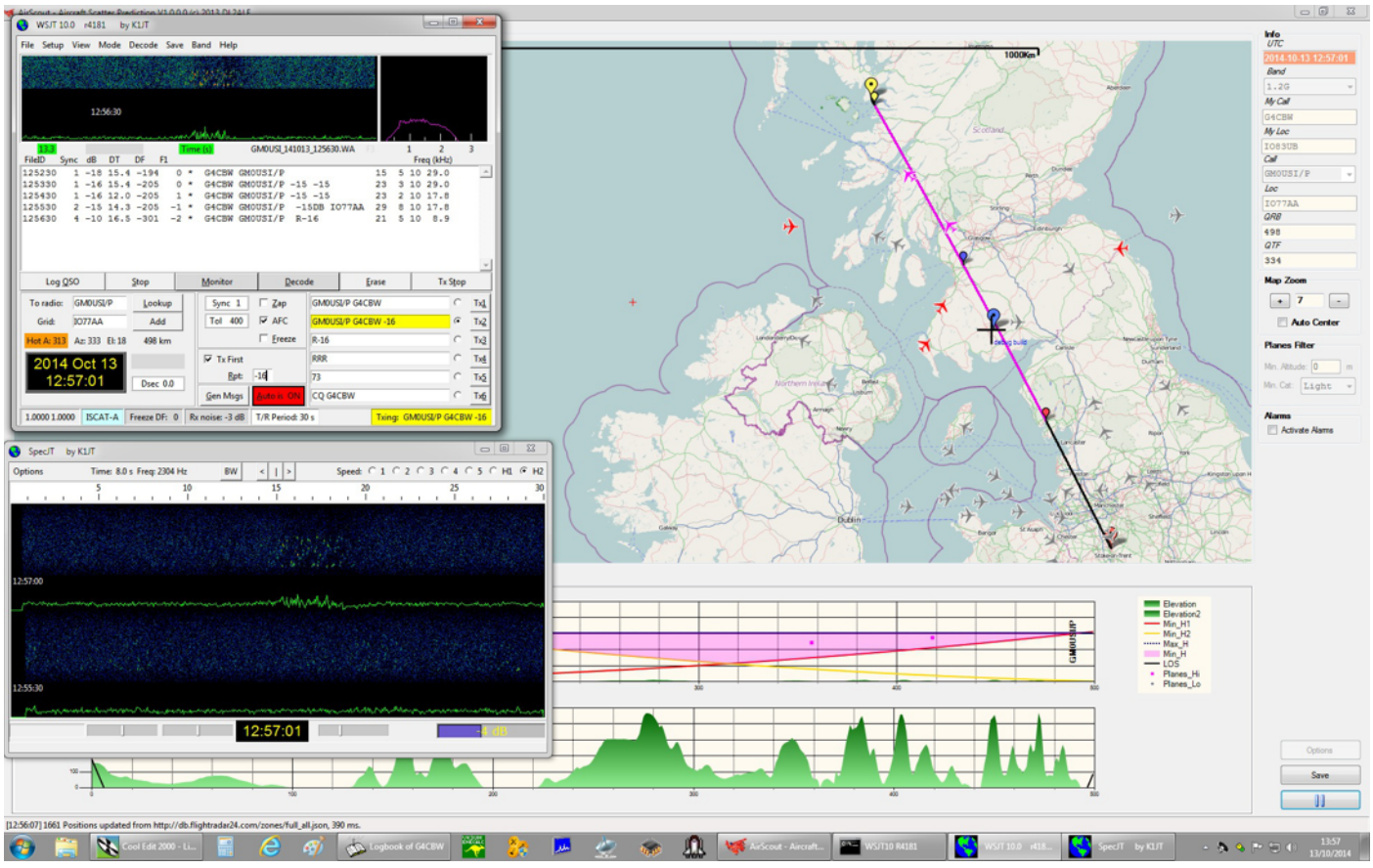
I want to encourage you get on the air as often as possible and report your activity to clearly document use of the amateur microwave bands. This means not just DX and EME, but also local activity with ATV, low power or WB equipment.

Please send your reports to Scatterpoint@ukmicrowavers.org, remember the deadline is the 1st of the month.

73 Bob Price G8DTF


SpecJT by K1JT
16:55:42 PM - October 15, 2014
Options
Freq: 2094 DF: 823 (Hz)
BW
Speed: 1 2 3 4 5 H1 H2
WSJT 9.3 by K1JT
File Setup View Mode Decode Save Band Help
Moon
Az: 326.47
El: -11.86
Dop: 15
Dgrd: -4.3
50.9
Time (s)
G4CBW_141015_155300
FileID Sync dB DT DF W
155200 0 -33 8.8 22 20
155300 2 -17 0.5 127 10 * GM0USI/P G4CBW 1 0
16:55
15/10/2014


SpecJT by K1JT
15:57:50 PM - October 15, 2014
Options
Time: 12.2 s Freq: 0 Hz
BW
Speed: 1 2 3 4 5 H1 H2
14:57:49
0 dB
15:57
15/10/2014


WSJT 10.0 r4181 by K1JT
2014 Oct 13
12:57:01
SpecJT by K1JT
12:57:01

Contests

John G3XDY, UKuG Contest Manager

Contest results are also published online - please follow the link from the UKuG Contests Page at:

www.microwavers.org/?contesting.htm

September 5.7GHz Contest 2014

Entry levels recovered for this event, and activity was at the highest level of the series, with the winner Ian G8KQW/P making 15 contacts. Runner up in this session was Telford & DARS G3ZME/P.

In the overall championship, G8KQW/P consolidated his winning position, having finished with wins in four sessions out of five. The overall runner up was Telford & DARS G3ZME/P with three runners up slots. Both stations will receive certificates, as will G4LDR as leading fixed station.

Congratulations go to Ian G8KQW/P as winner of the G3KEU Trophy.

September 10GHz Contest 2014

The number of entrants came back up again this month, and many commented on the excellent activity levels. Conditions were unexceptional with no reported rain scatter.

Once again Ian G8KQW/P took the honours, this time from Dunkery Beacon on the South Downs, with an impressive total of 34 contacts, opening a substantial lead over runner up Nick G4KUX in Co Durham.

In the overall Championship table G4KUX is confirmed as the winner of the Open section, with G8KQW/P as runner-up. The restricted section is won by Nick G4WLC/P , with close neighbour Stewart G0LGS/P as runner up. Coincidentally the winners of both sections won three sessions to gain maximum points, and the runners up both won the other two sessions and were third in another scoring session.

Congratulations to all the winners and runners up, who will receive certificates, as will Dave G4RGK as the highest placed fixed station in the restricted section, and Colin G4EML/P as leading radio talkback only station. G4KUX will receive the G3RPE Memorial Cup, and G4WLC/P the G3JMB Memorial Trophy.

September 24GHz Contest 2014

Entry numbers remained low again this month. Roger G8CUB/P is once again at the top of the list, having made 3 QSOs.

In the overall table G8CUB/P takes the overall honours with two session wins, with Telford & District ARS G3ZME/P in runners up slot with one session win. Both will receive certificates, as will G4BAO as leading fixed station. Congratulations particularly to G8CUB/P , who will receive the G0RRJ Memorial Cup.

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John G3XDY, UKuG Contest Manager

UKuG Microwave Contest Calendar 2014

Dates	Time UTC	Contest name	Low Band#	Certificates
23 -Nov	1000 - 1400	Low band 1.3/2.3/3.4GHz	5	F, P,L,R

Key:

F	Fixed / home station
P	Portable
L	Low-power (<10W on 1.3-3.4GHz, <1W on 5.7/10GHz)
R	Radio Talkback only

Contest results

5.7GHz Contest September 2014						
Pos	**Callsign**	**Locator**	**QSOs**	**Score**	**ODX Call**	**ODX km**
1	G8KQW/P	IO90WV	15	3081	F1BZG	366
2	G3ZME/P	IO82QL	12	1892	G4ALY	248
3	GW4HQX/P	IO81KR	8	1187	G4EAT	259
4	G4LDR	IO91EC	8	1146	G3LRP	279
5	M0HNA/P	IO91GI	7	732	G4BEL	156
6	G8CUB/P	IO92XA	3	222	G8KQW/P	126

10GHz Contest September 2014							
Pos	**Callsign**	**Locator**	**QSOs**	**Score**	**ODX Call**	**ODX Kms**	**Power**
1	G8KQW/P	IO90WV	34	6315	F9OE/P	449	20
2	G4KUX	IO94BP	18	4896	G1IKV/P	443	8
3	G4BAO	JO02CG	20	3781	F6DZK	419	7
4	G4WLC/P	IO81WU	20	2738	F6DWG/P	402	1
5	G3ZME/P	IO82QL	17	2705	G4DDK	272	8
6	M0HNA/P	IO91GI	18	2503	G3LRP	251	0.8
7	G4LDR	IO91EC	17	2497	G4KUX	395	25
8	G0LGS/P	IO81XW	19	2382	G4KUX	302	1
9	GW3TKH/P	IO81KR	13	2111	F6DWG/P	448	10
10	G1MPW/P	JO00BU	12	1728	G4CBW	297	1
11	GW4HQX/P	IO81KR	12	1663	G4EAT	259	150mW
12	G8CUB/P	IO92XA	10	1316	F6DWG/P	327	5
13	G4EML/P	IO90SV	12	1259	G4ALY	269	2.5
14	G6ZAC/P	IO90SV	11	1172	G4ALY	269	2.5
15	G0PEB/P	IO90JO	7	770	G3XDY	234	200mW
16	G3YJR	IO93FJ	2	167	G4KUX	141	0.2

24GHz Contest September 2014						
Pos	**Callsign**	**Locator**	**QSOs**	**Score**	**ODX Call**	**ODX km**
1	G8CUB/P	IO92XA	3	155	G0FDZ/P	83
2	G3ZME/P	IO82QL	1	60	GW4DGU/P	60
3	G4BAO	JO02CG	2	44	G8CUB/P	33
4	G4LDR	IO91EC	1	16	G4NNS	16

5.7/10/24GHz Championship Tables

Final positions after five events, the best three count to overall total

5.7GHz

Pos	Callsign	5/25/14	6/29/14	7/27/14	8/31/14	9/28/14	**TOTAL**
1	G8KQW/P	0	1000	1000	1000	1000	3000
2	G(T)3ZME/P	0	977	894	0	614	2485
3	G8CUB/P	1000	879	0	480	72	2359
4	G4LDR	0	309	710	509	372	1591
5	GW4HQX/P	0	562	0	397	385	1344
6	G8ACE/P	0	803	380	0	0	1183
7	G4BRK	0	805	0	0	0	805
8	G3VKV	0	272	127	0	0	399
9	M0HNA/P	0	0	0	0	238	238

10GHz Open

Pos	Callsign	5/25/14	6/29/14	7/27/14	8/31/14	9/28/14	TOTAL
1	G4KUX	1000	1000	1000	843	775	3000
2	G8KQW/P	0	826	530	1000	1000	2826
3	G4BAO	611	0	591	638	599	1848
4	G4LDR	0	420	629	730	395	1779
5	GW3TKH/P	0	199	853	509	334	1696
6	G8CUB/P	789	0	0	605	208	1602
7	G(T)3ZME/P	552	393	609	0	428	1589
8	M0DTS/P	0	950	0	0	0	950
9	G8ACE/P	0	587	276	0	0	863
10	G4EML/P	250	129	0	339	199	788
11	G6ZAC/P	250	108	0	339	186	775
12	G4BRK	0	459	0	0	0	459
13	G3VKV	0	172	166	111	0	449
14	GM0USI/P	0	0	235	0	0	235
15	G3PHO	0	177	0	0	0	177
16	G8AIM	0	0	123	0	0	123
17	GM4BYF/P	0	0	64	0	0	64

10GHz Restricted

Pos	Callsign	5/25/14	6/29/14	7/27/14	8/31/14	9/28/14	TOTAL
1	G4WLC/P	883	1000	0	1000	1000	3000
2	G0LGS/P	1000	554	1000	781	870	2870
3	M0HNA/P	0	938	0	0	914	1852
4	GW4HQX/P	288	344	0	639	607	1590
5	G0PEB/P	0	351	379	305	281	1035
6	G1MPW/P	0	386	0	0	631	1017
7	G4RGK	0	448	0	0	0	448
8	G3YKI			285	0	0	285
9	G4GSB/P	0	159	0	0	0	159
10	GM8OTI/P	0	129	26	0	0	155
11	GW4NOS/P			115	0	0	115
12	G3YJR	0	0	0	0	61	61

24GHz

Pos	Callsign	5/25/14	6/29/14	7/27/14	8/31/14	9/28/14	TOTAL
1	G8CUB/P	0	0	125	1000	1000	2125
2	G3ZME/P	1000	0	525	0	387	1912
3	GW3TKH/P	0	847	1000	0	0	1847
4	G8KQW/P	0	1000	475	0	0	1475
5	G3PHO/P	1000	0	0	0	0	1000
6	G4BAO	93	0	69	611	284	988
7	G8ACE/P	0	424	0	0	0	424
8	G4LDR	0	0	0	0	103	103

Events calendar

2015

Jan 17	Heelweg Microwave, Westendorp Netherlands	www.pamicrowaves.nl/website/
Feb 21	Tagung Dorsten	http://www.ghz-tagung.de/
Apr 11	CJ-2015, Seigy	cj.ref-union.org/
April 25 – 26	Martlesham Round Table	mmrt.homedns.org/
May 15 – 17	Hamvention, Dayton	www.hamvention.org/
June 26 – 28	Ham Radio, Friedrichshafen	www.hamradio-friedrichshafen.de/
July 11 – 12	Finningley Round Table	www.g0ghk.co.uk/
July tbc	Amsat-UK Colloquium, Holiday Inn, Guildford, Surrey	
Sept 6 – 11	European Microwave Week, Paris	www.eumweek.com/
Sept 11 – 13	60.UKW Tagung Weinheim	http://www.ukw-tagung.de/
Sept 25 – 26	National Hamfest	http://www.nationalhamfest.org.uk/
Oct 9–11	RSGB Convention	http://rsgb.org/convention/
Oct tbc	Microwave Update, San Diego	http://www.microwaveupdate.org/

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May 20 – 22	Hamvention, Dayton	http://www.hamvention.org/
Jun 24 – 26	Ham Radio, Friedrichshafen	www.hamradio-friedrichshafen.de/
Oct 3 – 7	European Microwave Week, London	http://www.eumweek.com/
Oct 7–9	RSGB Convention	http://rsgb.org/convention/