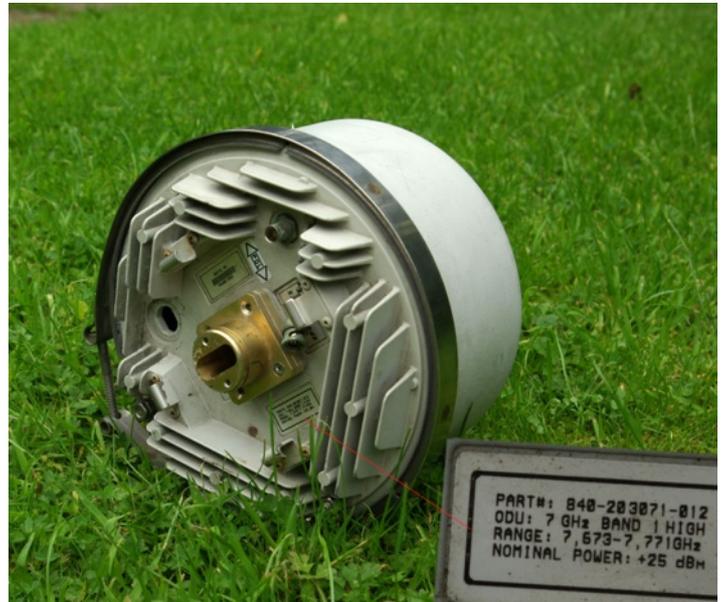




## Surplus Microwave Link Modules and a 5760MHz Beacon

By Andy Talbot G4JNT



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Mike Scott	Chip Bank	G3LYP	

## Editor's corner

Please note the changes to the Committee. We still do not have a Chairman so the role will be shared among the committee members.

John Quarmby G3XDY has taken on the mantle of General Secretary in addition to his Contest Manager role.

Chris Bartram GW4DGU has taken on the role of Regional Rep for Wales enabling Tony GW8ASD to focus on Beacon Coordination.

We also have new committee members: Chris Whitmarsh G0FDZ looking after millimetric interests and Noel Matthews G8GTZ (co-opted last year) for ATV and DATV, linking us with BATC.

73s de Martin G8BHC

## Articles for Scatterpoint

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

Please send them to

[editor@microwavers.org](mailto: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, rtf, 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 your co-operation.

Martin G8BHC

## UK MICROWAVE GROUP 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!

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\* 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!)

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**Activity & Contests**

**Technical**

**Nanowaves (optical)**

**Sales and wants**

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## 76/78GHz VK distance record

I wish to advise on May 13th, Alan - VK3XPD and David - VK3HZ set and subsequently extended the Australian VK National 76/78 GHz Distance Record on both SSB and DIGITAL (WSJT/JT65C) modes.

Our previous SSB Record set in December, 2013 over a 32 km Line of Sight (LOS) path resulted in Signal Reports of 5+9 plus 20. Crushingly strong signals.

On our latest effort - the first QSO's were over a 64 km (40 miles) LOS Path. The SSB Reports were 57/58 and the DIGITAL QSO was (only) -14 dBm both ways. The latter was however a "Bare Mixer" QSO.

These Records were subsequently extended out to 90 km and 127 km later that same day.

On May 15th we further extended these Records out to their current Distance of 139.8 km (87 Miles) over a LOS Path in less than ideal (for 78 GHz) weather conditions. Our SSB Signal Reports were 4+1 bothways and our Digital Reports were -12/-13 dBm.

The achievement of these new Distance Records was however not an easy process. As many of you will be aware - Dish Pointing on 78 GHz is extremely sharp even with small 300mm Dishes. A minor error in "pointing" accuracy means no QSO.

So, to assist us we decided to use 10 GHz FM as a "sighting"; mechanism. This choice of 10 GHz was however problematic because over these short (for 10 GHz) paths there are/were many "reflections";. Even though I had reduced my 10 GHz O/P to about 1 milliwatt we still had "multi-pathing". The solution was to "off point" one end of the 10 GHz link and then optimise for best FM quietening. We will however be using 24 GHz next time because this Band is far less susceptible to "multi pathing".

Both Transverters are DB6NT based, OCXO Locked with a circa 5 kHz Offset between Transverters and LNA's sourced from Tom Williams - WA1MBA. On Tx, these LNA are "reversed"; by a 4 Port Waveguide Switch for a PA function that delivers circa 10 Milliwatts to feed a Cassegrain 300mm dish.

I'm hoping to make a short Presentation on the Hardware used to achieve these QSO's at the forthcoming Microwave Update, October 24/25, 2014 in Rochester NY.

We also concur with the findings of our UK compatriots in that 76/78 GHz is definitely a Line Of Sight proposition. In VK, the lack of accessible high Mountainous terrain means it is also very difficult to find LOS paths >150 km. This fact means the current World Record of 252 km (LOS path) set by Goran and Bob is unlikely to be challenged by VK Amateurs.

Thank you,

**Alan - VK3XPD, David - VK3HZ., Alan Devlin - RETIRED (Formerly Trading as RF RESALE ! Melbourne, Australia - [www.rfresale.com](http://www.rfresale.com))**

From Richard Bown G8JVM

Free Microwave Engineering e-mag. Needs a work email or LinkedIn

<http://free-ebooks.tradepub.com/free-offer/microwave-engineering-europe/meeu?sr=hicat& t=hicat:1035>

## UKμW Group register of potential speakers for microwave talks

Giving presentations to clubs to spread the microwave word is very important to our part of the hobby and I am looking to produce a list of microwavers who would be prepared to do this as and when the occasion arises. If you feel that you might be interested then please read on.

I know that the UKuW group is often approached by clubs asking for someone to give them a talk on an aspect of microwaves, and sometimes it proves difficult to find someone fairly local who could help.

From personal experience of visiting many clubs over many years to give talks, I find that subjects such as microwaves are largely misunderstood and that afterwards people say how glad they are that you came along and explained all about the subject that they previously knew little about. You never know it might just spark an interest in someone who can then be encouraged to join the UKuW group and get involved (just like it did with myself back in the early 70's, after hearing a talk on microwaves by the late Dain Evans G3RPE given at a local club).

To enable our interest in the hobby to be given as wide a spread of publicity as possible it has been proposed to produce a register of folks who would be prepared to give suitable talks. Please note that to do so you do not have to be an 'expert' on microwaves, and it is really enthusiasm that makes all the difference and counts.

The register would be held within the committee so that speaker's contact information is not available to casual surfers on the Internet or web sweepers looking for e-mail addresses, and any enquirer from a radio club can be put in touch with potential speakers. It would then be up to the two parties to make any arrangements necessary.

If a club wishes to find a speaker, then a note on the UKuW group website will direct them to the person responsible on the UKuW committee (probably myself) for keeping the list and they will then try to help them find a speaker. All initial contact will therefore be carried out using e-mail.

Please also note that nobody is under any obligation to agree to give a talk if they do not wish to do so or to travel any distance, and that it would also be polite for clubs to offer to pay speaker's travel expenses if they have travelled a long way.

To start the ball rolling I have shown the suggested info that would be held by the UKuW committee:

-----

Name and callsign:	A N Other G0xxx.....
E-mail address:	me@someisp.uk.....
Home QTH:	NW Kent .....
Primary area covered:	Kent, London (south of Thames), Surrey, Essex (South) .....
Would also consider travelling to:	London (north of Thames), Hampshire, Essex (North), Thames Valley, Sussex
Microwave and allied subjects for talks:	'Introduction to microwaves', 'etc' 'etc'

-----

I am happy to compile the list if you wish to e-mail me with your details.

Thanks and regards

**Chris G0FDZ**

# A simple PIC controller for the G4JNT LMX2541 synthesiser board

by John Worsnop G4BAO

## Introduction

G4JNT's LMX2541 synthesiser boards are described in (1). This board provides the hardware to run G4JNT's PIC code (2) and was made for the UK 432MHz beacon upgrades. It is based on G4JNT's original PIC controller described in (1) but does not have the on board GPS engine. It is designed to be used with an external G3RUH GPSDO (3) or similar unit that provides a serial NMEA stream and a 1pps clock pulse. It is also a useful, with suitable firmware, as a general purpose PIC controller for use with other serially programmed synthesisers.

No description of the PIC code is given, but see G4JNT's website (4) for some example code.

The PCB has a standard Microchip ICSP (in circuit serial programming interface) to allow programming of the chip, and is designed to fit in to a readily available 37 x 74 x 30mm tinplate box [5], if necessary.

## Circuit description

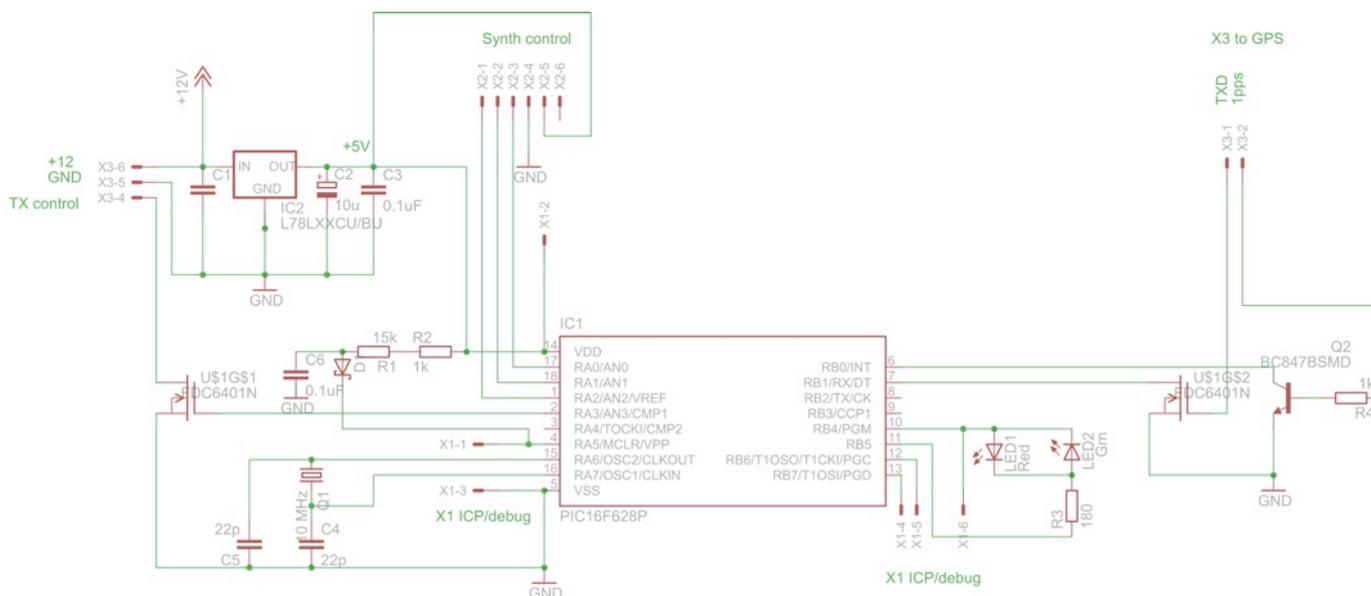


Figure 1 circuit diagram

An 18 pin DIL PIC16F628P Flash programmable PIC, IC1 is used to contain the main program. A regulated 5 V supply is provided by IC2 and associated components. The board has 3 interface ports

### ICSP port X1

X1 provides a standard Microchip ICSP (in circuit serial programming interface) to allow programming of the PIC.

### Synthesiser control interface X2

A standard SPI 3-wire interface connects to the synthesiser board utilising RA0, RA1, and RA2 to provide Data, Clock and Load lines respectively.

## GPS interface X3

The 1PPS signal from the GPSDO is buffered by Q2 and fed to RB0 of the PIC. The NMEA signal from the TXD line of the GPS receiver is buffered by one half of the dual FET UIG2 and fed to RB1. Should A1A keying or other TX control be required by the beacon, an optional ON/OFF keying output is derived from RA5 and buffered by the other half of the dual FET U1G1. This is not implemented in the 432MHz beacons.

## Construction

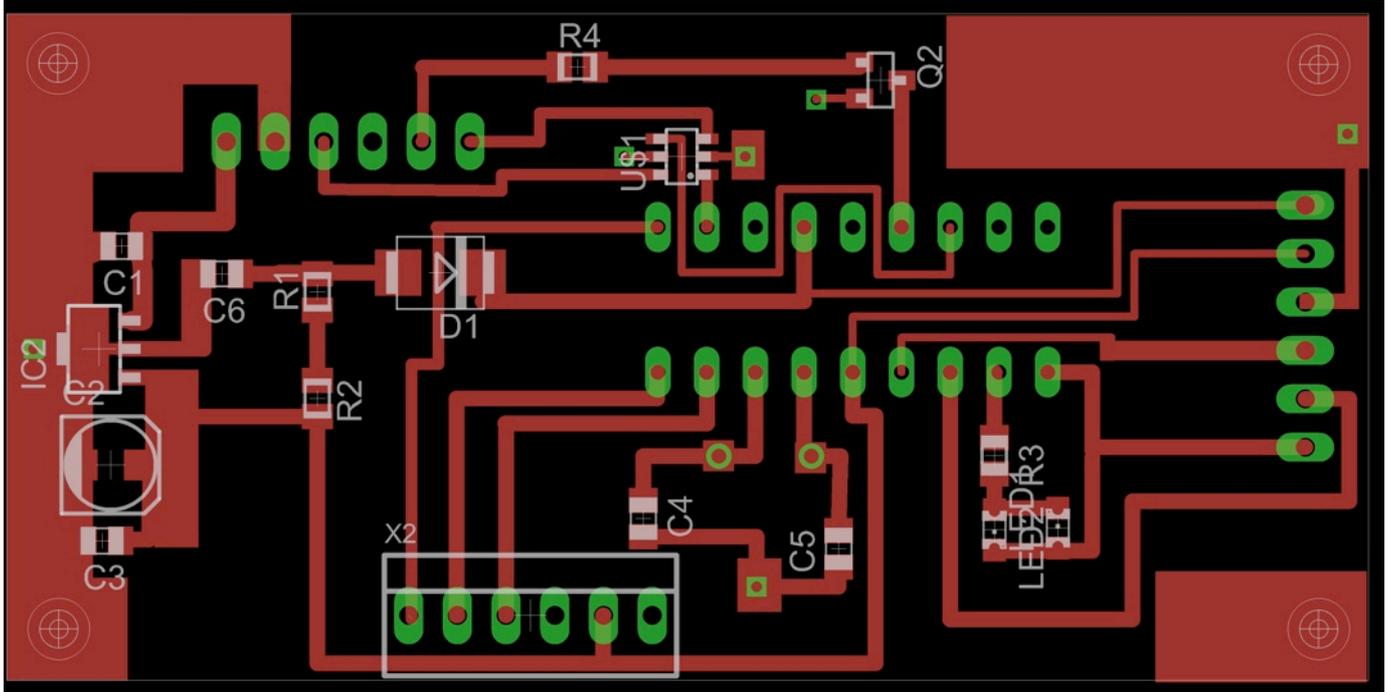


Figure 2 PCB layout (component side)

The controller is built on standard FR4 PCB material with the 10MHz crystal, connectors and the PIC on the ground plane side. All the other components are surface mounted on the component side.

Component list is on page 8.

## References

- 1 The G4JNT LMX2541 Fractional-N synthesiser development PCB [g4jnt.com/LMX2541\\_Synth\\_Module.pdf](http://g4jnt.com/LMX2541_Synth_Module.pdf)
- 2 Some example PIC code from G4JNT [g4jnt.com/LMX2541\\_WSJT\\_Routines.zip](http://g4jnt.com/LMX2541_WSJT_Routines.zip)
- 3 The G3RUH GPSDO [www.jrmiller.demon.co.uk/projects/ministd/frqstd.htm](http://www.jrmiller.demon.co.uk/projects/ministd/frqstd.htm)
- 4 G4JNT's Website [g4jnt.com](http://g4jnt.com)
- 5 Tinplate boxes can be obtained from Alan Melia G3NYK alan.melia [at] btinternet.com

**Table 1 - Component list**

Component	Value	Type
R1	15k	SMD 0805
R3	>180R (to suit LEDs)	SMD 0805
R2, R4	1k	SMD 0805
C1	330nF	805
C2	10 $\mu$ F 16V	SMD electrolytic
C4,C5	22pF	ceramic 0805
C3, C6	100nF	ceramic 0805
IC1	16F628P	18 pin DIL PIC
IC2	78L05	SMD 5V 100mA regulator
U\$1	FDC6401N	Dual N channel MOSFET
Q1	10MHz Crystal	
Q2	BC847 or similar	NPN transistor SMD
LED 1	Red LED	SMD 0805
LED 2	Green LED	SMD 0805
D1	Schottky diode	SMD
X1 to 3	6 pin Berg pin headers	

## For sale: 26.5GHz Frequency Counter

I was wondering if any of your members would be interested in making me a fair offer my “no longer required” frequency counter.



**HP/Agilent 5343A Microwave Frequency Counter, 26.5GHz**

Item condition: **Used**

Price: **US \$995.00**

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4 watchers

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100% positive  
Feedback

Best offer available

It's a 26.5GHz model and has an SMA connector on the front instead of the 'N' type shown in the photo.

**Kind Regards, Keith Howell G4YKE 07732 615809**

# Surplus Microwave Link Modules and a 5760MHz Beacon

Andy Talbot G4JNT

A while ago Paul M0EYT handed over several surplus microwave links units that he had acquired as scrap, with the comment "... could I look at them and see if there was anything worth salvaging inside...". There were three basic module types, operating in the 7GHz, 11GHz and 18GHz bands. Photo 1 shows the type of unit under discussion here, enclosed in a cylindrical housing of similar size to a saucepan with a waveguide antenna connection exiting it on the front panel with some heatsink flanges. There is also an N-Type connector on the casing which had been removed before that photo was taken.

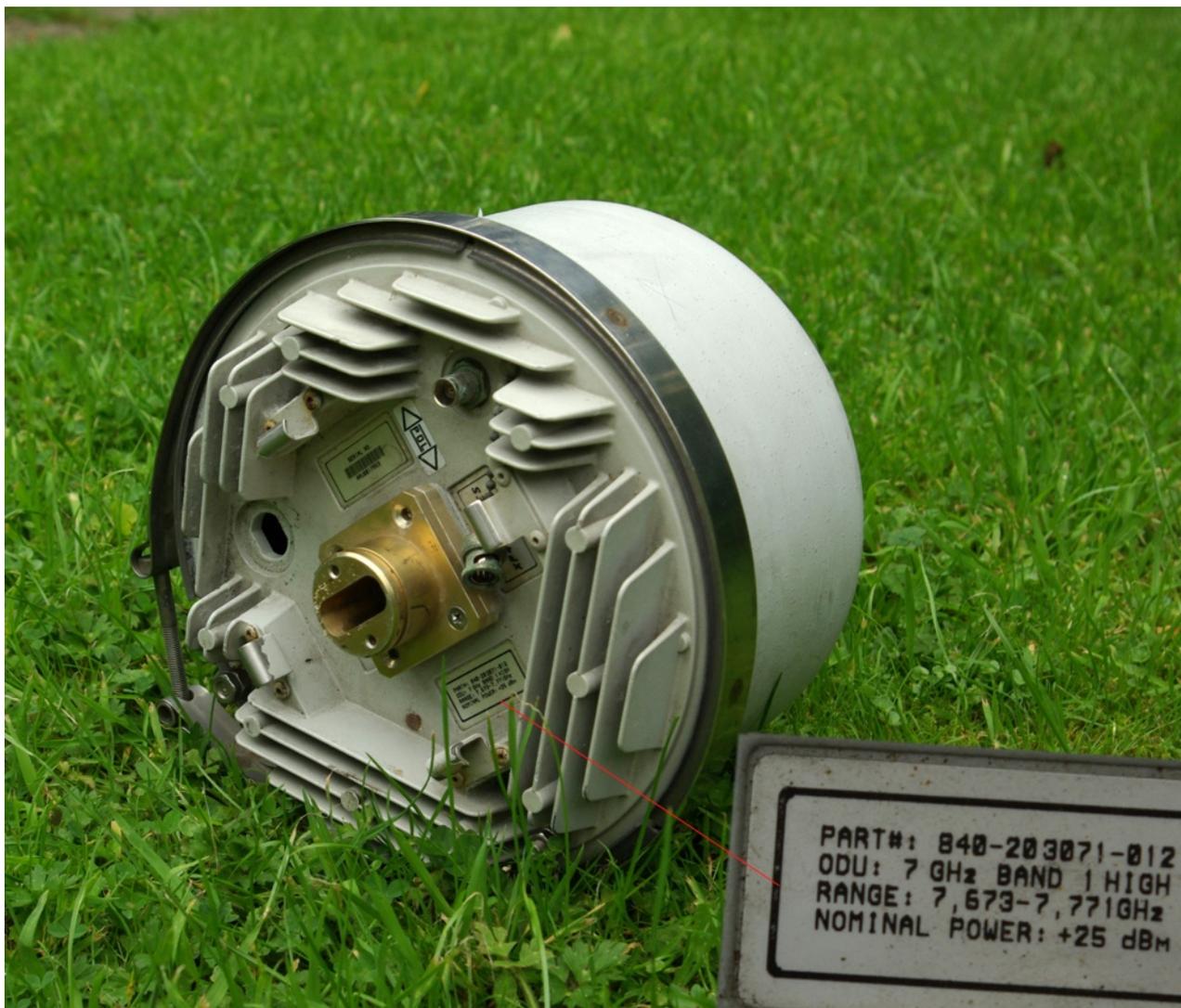


Photo 1 One of the 7GHz links occasionally seen on the surplus stands. The Identification plate is shown enlarged. The internal RF module is suitable for making a 5.76GHz beacon transmitter.

I wasn't expecting much useful stuff inside. The units were built circa 1998 with component technology of that era, so there was unlikely to be any exciting semiconductors inside. However, surplus modules are an excellent source of some of the more expensive bits like SMT tantalum capacitors and inductors. Even in these days of virtually free components, some types still cost more than a few tens of pennies to buy new. Also VCOs and TCXOs covering

useful frequency bands can sometimes also be recovered, and these are always pricey things to buy, especially if you just want to keep a junk box well stocked.

All units were much as expected, and the few useful components were removed. I did find some AD9850 Direct Digital Synthesizer chips; a bit dated, but useful to have in the junk box as a general purpose low-to-HF frequency source. The RF side of surplus modules is rarely of use to us – at least directly. The frequency coverage is rarely close to amateur bands and although the filters with their shiny metal hardware may look nice, cannot usually be tuned to anything useful.

However, there was one exception. I took a look at the low band link unit, labelled as covering around 7.6GHz and pondered... Assuming the first IF were to be somewhere in the 1GHz region, and the IF components suggested it was around this sort of value, then wasn't the local oscillator going to be around 6GHz? Perhaps that could be retuned to something useful and might be worth investigating.

### A 5760MHz Beacon Source

So, a deeper look at the RF block – a nice solid silver plated heavy lump of metal with dozens of tiny screws holding the top and bottom panels on. Unfortunately, I didn't take any photographs before dismantling, and only took one of its innards. Photo 2 shows the RF chambers, and it is quite clear what is in there. A packaged VCO drives a series of amplifiers including a very delicate looking MMIC package with bonded wires. If you intend using these bits, **take very great care with the MMICs** – they have very fine gold wires and damage to them is irrecoverable unless you happen to have access to a wire bonder. There is clearly a frequency multiplier stage somewhere in there with a buffer amp, an LO splitter, then more LO filtering feeding Tx and Rx integrated mixers. Other comb-line filters provide image filtering for Rx and Tx chains then a MMIC PA block on the Tx side, and a simple two packaged-device LNA on Rx. Fortunately, the RF chain is made up of several individual PCB modules just bolted in with their microstrips connected by jumpers. It is presumably done this way to be able to cover different frequency bands by dropping in the appropriate filter blocks. I removed one of the LO filters, that on the TX side feed in the mixer and measured its response.

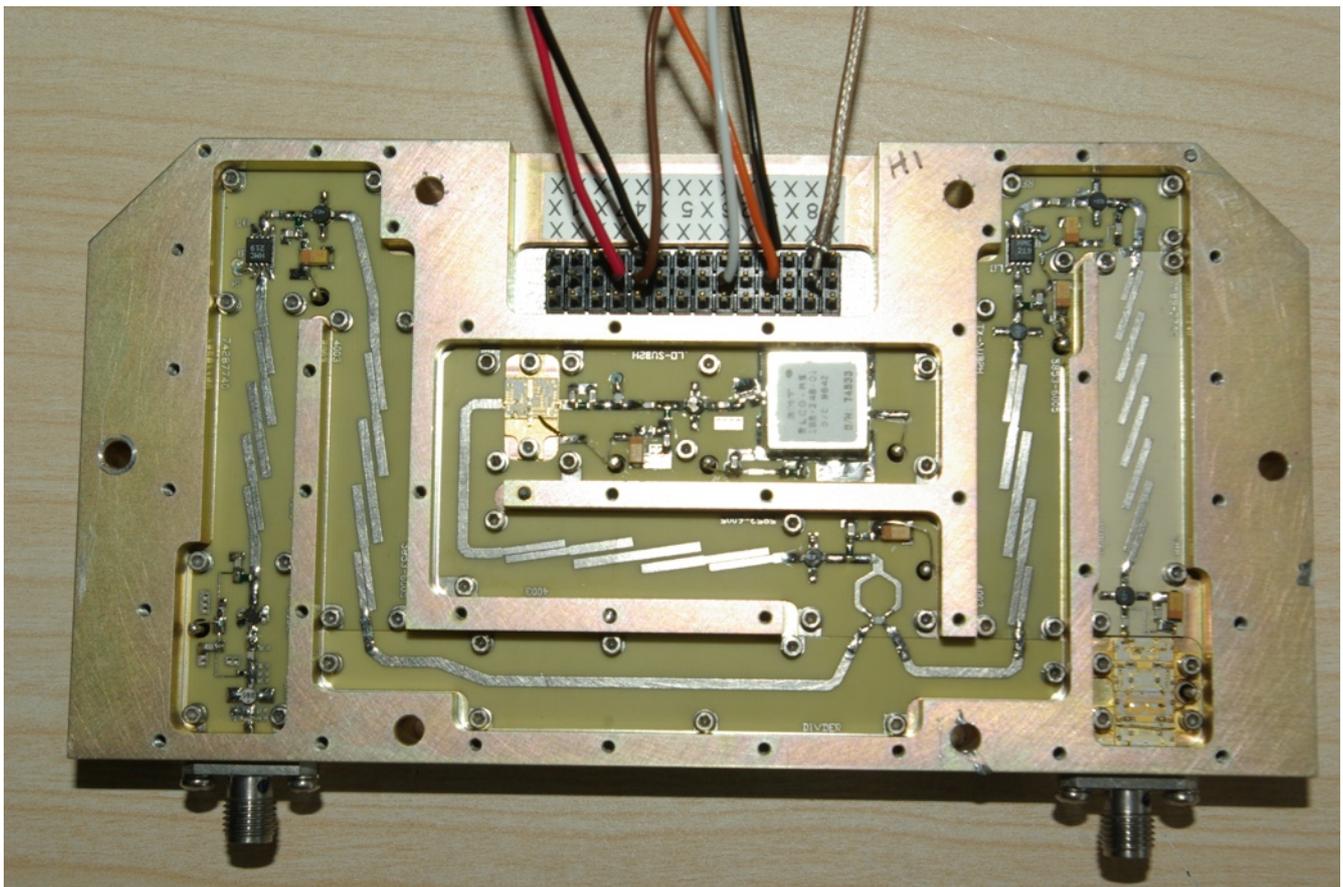


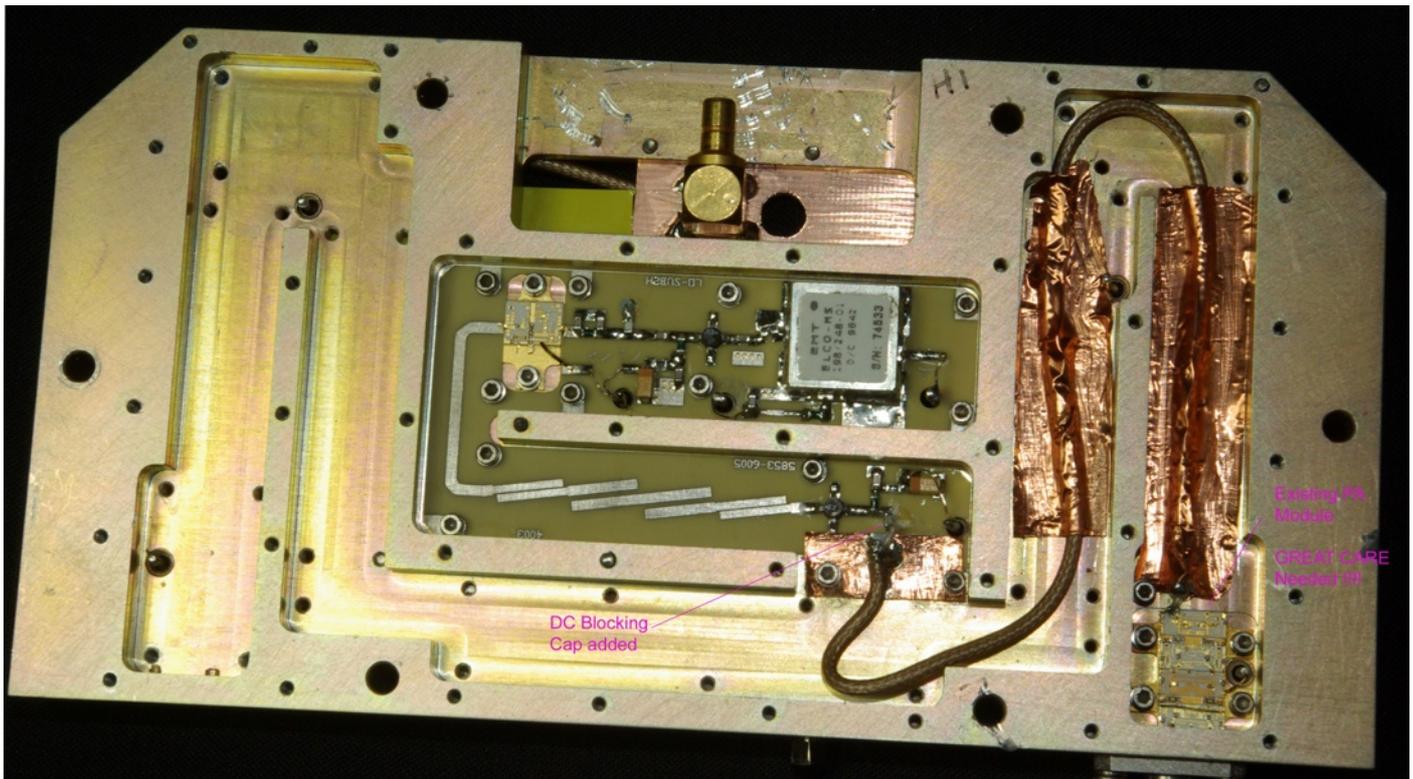
Photo 2: Underside of the RF module before any modifications. Wires added to the multiway connector were for initial testing.

Encouraging! It passed 5.3 to 6.2GHz so could be useful on the 5760 band. That filter was placed in the junk box for later. Now to take a look at the unit as a whole. A very helpful label on the lid showed the connections to the multiway connector and even described the pins. Unfortunately I took no photos, but the active pins were labelled:

**+12.6V, +5V, +6.2V, OSC Vt, and OSC/2 as well as I<sub>f</sub>out and I<sub>f</sub>in**

All the RF stages were fed via feed-throughs from the underside, and most of them were supplied with 5V. The PA MMIC, bottom left in Photo 1 was fed from the pin labelled +6.2V and the oscillator module from the 12V one. All pretty straightforward. A sample of the VCO was fed through to the underside and went into a divide by two chip (I do wish I'd taken a photo of the underside before ripping it all out) to supply the output reference signal to the pin labelled OSC/2. So... connected up just 5V and 12V supplies, a spectrum analyser to the OSC/2 pin, a variable voltage to the OSC Vt pin and looked to see what came out. An output tuneable over the range around 880MHz to 1GHz was the result, meaning the VCO ran at 17500 MHz to 2GHz, and after the tripler would be delivering 5.3 to 6.2GHz – which I'd already suspected from the LO filter response. Very useful! The LO chain could make a useful beacon source for 5.76GHz using an external synthesizer to lock the VCO. There was no useful synthesizer chip to extract elsewhere in the link modules, although the original synthesizer components were found on one of the other PCBs. Having been made in 1998, synthesizer technology of that era was orders of magnitude worse than that it is now, so the ancient devices weren't even worth considering.

On the underside the feed through links to the PCB were unsoldered, as well as the connections passing the two IFs and the VCO pick-off signals. That board along with the multiway connectors were discarded, leaving an almost empty underside set of chambers, with only the feed through capacitors and 1.9GHz VCO signal for later use. Returning to the top side, most of the PCB modules carrying the Rx and Tx chains with their filters were removed, leaving only the VCO, tripler, its MMIC and output filter. The last PCB carrying the filter was removed and cut just after the ERA-2 buffer amplifier following the common LO filter, but before the splitter, to give a convenient take off point for a 5.76GHz signal. An additional capacitor, (taken from one of the receiver chain PCBs) had to be added to the output of the buffer amplifier stage to block the DC on the ERA-2 output port. The modified PCB filter was then replaced and the input link on the microstrip reconnected.



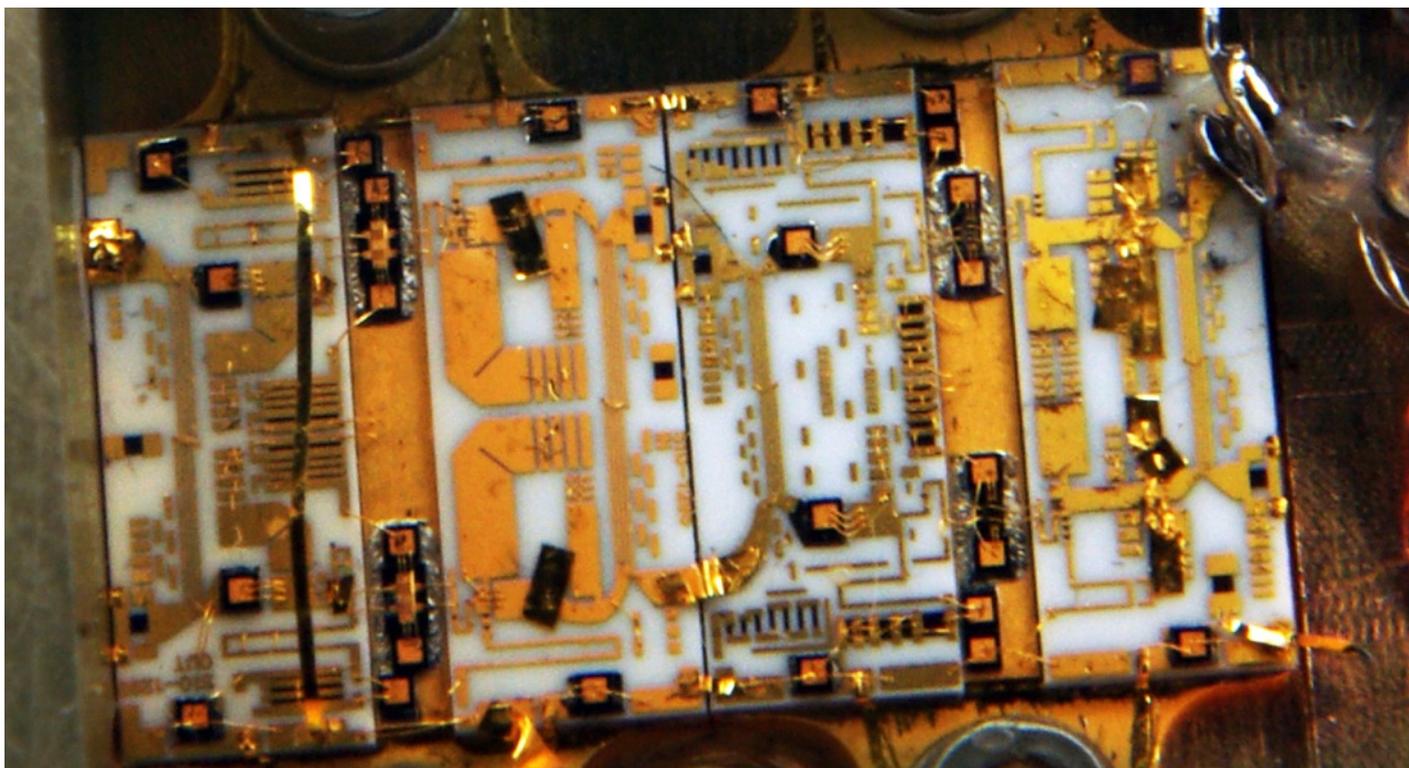
**Photo 3: View of the modified RF side showing only the modules needed for the 5.76GHz source.**

Photo 3 shows the remaining RF hardware and connections for the 5.76GHz take off from the modified PCB after the buffer stage. A signal level of around +4dBm was available at the output of the ERA modamp, so useful as a low power beacon or LO signal.

Although I had no real hopes at this stage of being able to use the link units PA module – after all it was designed for operation at 7GHz - some sixth sense said leave it in and don't damage it. So thoughts wandered to the PA itself and what it might be capable of. Some testing was needed.

## Power Amplifier Module

Connecting an input to this was going to be really tricky. A fine gold wire had been bonded from an input pad on the MMIC module to the output track on the microstrip filter – this of course no longer existed, but the pad was just about large enough to solder to. There was also a convenient ground pad next door to the tiny input pad. However, being constructed on a ceramic substrate meant it had good heat conductivity so soldering wasn't going to be easy. It was all very small, and the knowledge that just one broken gold bond wire would make it useless didn't help! However, the pads were no smaller than those I'm quite happy working with on TSSOP ICs, so onwards and upwards.



**Photo 4: PA Module shown in close-up. The delicate connection to the input pad is made using a stress-relieving loop of thin silver plated wire – shown top right.**

It proved virtually impossible to achieve a good connection to the grounding pad of the MMIC for the braid of an input coax. Any heat applied was just sucked away and it wouldn't take solder at all, so another way was going to be needed. I used the thinnest flexible PTFE wire I had in the junk box – stuff about 1.2mm diameter, and made a longish run (several wavelengths) taped down using copper tape to the base of the old empty Tx RF chambers. This is shown in Photo 3. The idea being that capacitive coupling from braid to ground over several wavelengths would act as a decent choke / decoupling so a true ground connection at the PA wouldn't be necessary. By keeping all the original output circuitry and its SMA connector with proper grounding, there would hopefully be no opportunity for common ground impedance that would cause it to go unstable. The inner of the coax went via a stress relieving loop of 0.2mm silver plated wire to the input pad – which fortunately was small enough to be able to properly raise to soldering temperature. This can be seen at the top right of Photo 4 which shows the PA module in close-up.

Initially the input coax went to a flying SMA connector so RF could be applied from a signal generator. The PA MMIC was powered from 5V (6.2V was the original application, but I was playing safe). After powering everything up, more than 250mW out at 7GHz was seen when the input level was wound up to a few milliwatts, and sweeping the signal generator from 5 to 8GHz showed a few dB of gain ripple but did suggest the PA was good for frequencies way outside the range the link was specified for. At 5.76GHz it was delivering 300mW, and that was with only the 5V supply. It wasn't worth trying a higher voltage. The PA appeared to compress with about 0dBm input,

so it looked ideal for a direct connection to the output buffer of the comb-line filter. The chopped PCB at the filter did not have a convenient grounding hole or pad, so some copper tape was stuck on between two grounding posts further afield and the braid of the coax soldered to that. All a bit Heath-Robinson but hopefully the long run of several wavelengths of coax kept close to the groundplane and covered with copper tape would make it OK. The fact the unit was in a proper milled box offering good isolation between stages also contributed to ability of the poor / bodged grounding of this link to not cause problems.

Tuning the VCO approximately to the wanted frequency, powered everything up and there was a nice clean 300mW of 5.76GHz on the output socket from the free-running VCO.

## Stabilising the Source

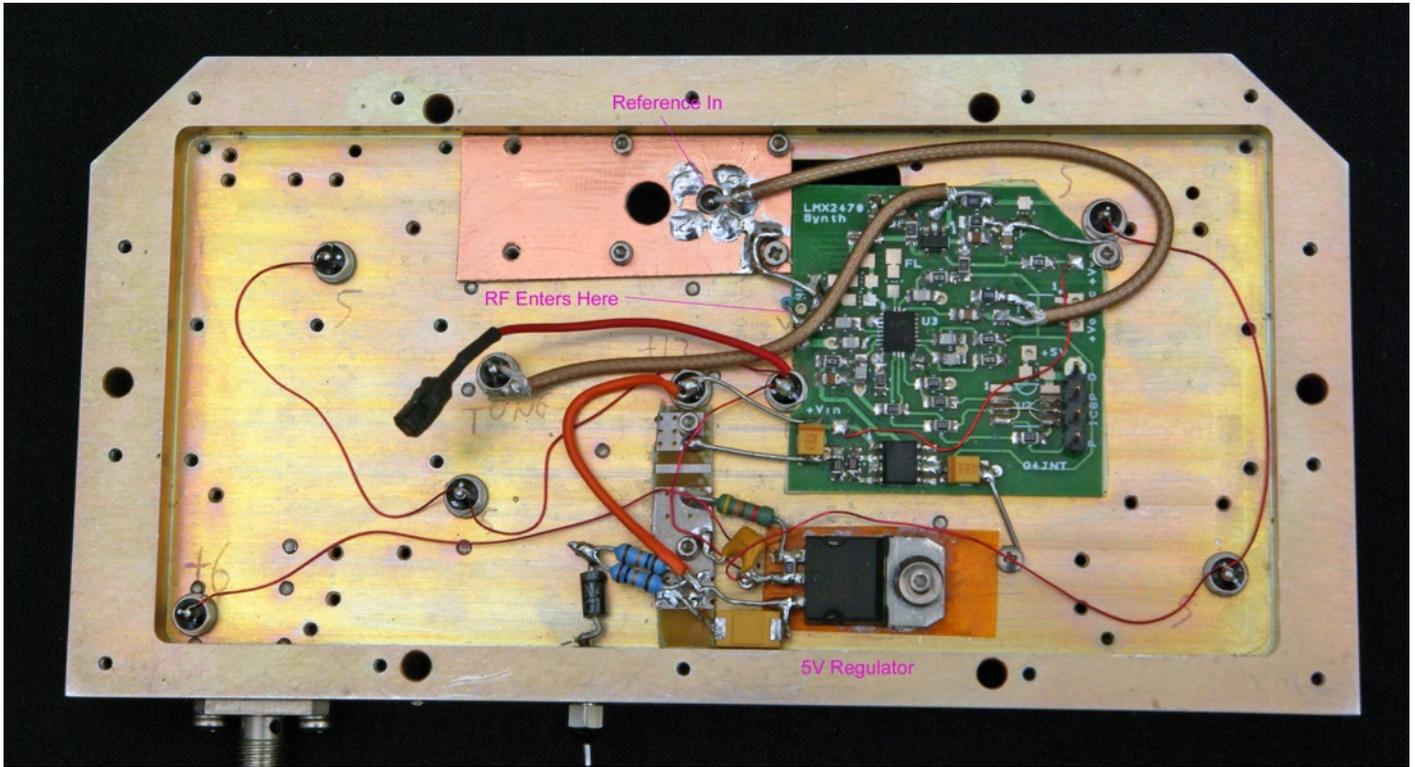


Photo 5: Top Side of the modified TF Module, showing the somewhat hacked LMX2470 Synthesizer PCB, voltage regulator and frequency reference input.

The VCO delivers the wanted final frequency of 5.76GHz, with about 2.9V tuning voltage. This was good news, as it meant a synthesizer running from 5V would do the trick and wouldn't need a high voltage output buffer. I had originally intended using an LMX2541 Fractional-N synth module since I still have plenty of these PCBs and a handful of chips, as well as many made up. The device is useable with an external VCO, although I had never tried it in this mode before. However, on looking in the box of synth bits, I spotted a spare LMX2470 module [1] – a device without an internal VCO and good to somewhat over 2GHz input frequency. With a bit of PCB hacking, it could just about be shoehorned into the underside of the milled metal box, with the RF input pad adjacent to the drop through input from the VCO. Photo 5 shows the setup. An LM317 5V regulator and SMC socket for a 10MHz reference input for the synth completed the setup.

On initially powering up, the spectrum was awful. Although the synth was nominally locked, the tone sounded terrible and there was a broad spectrum of phase noise several MHz wide around the carrier so something was very wrong. My LMX2470 module includes a LM6211 high speed op-amp in the PLL filter which, ironically, does mean high tuning voltages are possible, although not needed here.. The output of this opamp was driving the VCO tuning input via a feed through capacitor of 1.5nF. Opamps don't like driving capacitive loads – they go unstable. Adding a 150 ohm resistor on its output killed off the instability, and also added a third pole to the PLL loop filter. The result was a decent-enough clean and stable 5.76GHz carrier.

## Final Beacon Source

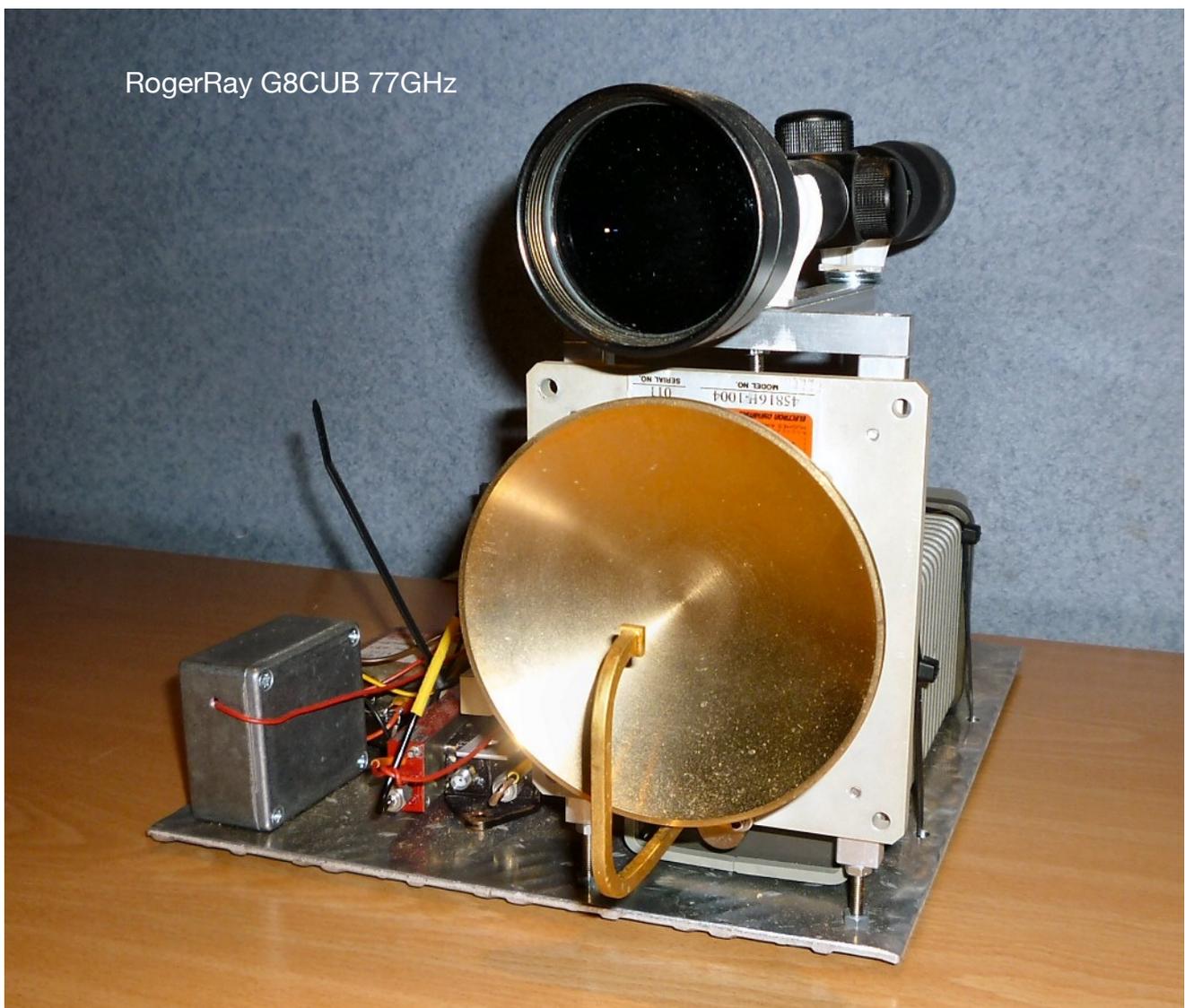
And that's just about it. With the addition of a reference input and a controller for the LMX2470 synthesizer chip you can have a complete 300mW stand-alone 5760MHz beacon. I have any number of suitable controller boards, adaptable to several types of synth chip, so one with a small GPS module for timing was bolted on to make a complete module suitable for WSJT modes beaoning.

Alternative synthesizer topologies will no-doubt also work, and it may be more convenient to leave in the original divide by 2 stage and use the 900MHz output for locking. Its your choice !

## Reference

[1] LMX2470 Fractional-N Synthesizer. [http://www.g4jnt.com/LMX2470\\_DevModule.pdf](http://www.g4jnt.com/LMX2470_DevModule.pdf) and <http://www.g4jnt.com/LMX2541Support.zip> Supplies of the PCB for this device have sold out and I will not be ordering any more. However the LMX2470 chip is available from RS Components for the grand sum of £3.14. Alternatively, the LMX2541 device, for which a few PCBs are still currently available can be used with its internal VCO disabled.

## Construction Competition at MMRT



# Some thoughts on very small dish 10GHz EME

Chris Bartram GW4DGU

Small dish 10GHz EME is now a reality, bringing opportunities for intercontinental DX on 3cm to relatively modest stations. Microwave EME is no longer just the province of those with significant technical or financial resources.

So what do I mean by modest? For the purpose of this note, I'm exploring the practicalities of making EME contacts with a typical 10W, 1m dish station using contemporary modulation schemes, particularly JT4 and JT65. Although I've been active on 10GHz 'off-the-Moon' quite successfully in the past on CW (and have been able to reliably copy my SSB echoes ...) with 50W and a good 2.4m offset dish, I'm likely to use a smaller system for a while after my planned move, both while I develop a better mount/positioner for my 'big' dish to make operation on the higher frequency bands practicable, and to acclimatise my new neighbours to the presence of antennas ... A ground-mounted 1m dish also seems to fit into the Welsh planner's (and presumably those of other parts of the UK) ideas of 'permitted development'.

It would be good to encourage other people to involve themselves in similar projects. For far too long, EME has been seen as an activity which only the most technically gifted or affluent radio amateurs could indulge in. It isn't. EME is just another propagation mechanism which anyone who has built a good 10GHz system can use.

These notes aren't a rigorous analysis; see (1, 2) for more detailed treatments of the 'interesting' aspects of 10GHz EME. These notes are being written to share some of my thoughts, to get people thinking, and hopefully, to persuade them into doing something; it's not a complete handholding 'how-to' guide, though.

## Path Losses

The EME path at 10GHz is pretty well understood. At 10GHz, the path loss at perigee (when the Earth and Moon are at their closest) between isotropic antennas, is about 288dB, so discounting signal spreading effects, with a 1m dish (~38dBi) on receive and transmit, and 10W (+40dBm) at the feed, the received signal power expected at the antenna feed in an echo test would be:

$$\begin{aligned} \text{Prx} &= \text{P(tx)} + \text{Ga(tx)} - \text{L(p)} + \text{Ga(rx)} \\ &= 40 + 38 - 288 + 38 \\ &= -172\text{dBm} \end{aligned}$$

This is a small signal by any standard, but what receive sensitivity can we achieve? I'll assume a 2.5kHz bandwidth, as that fits-in with the WSJT EME reporting scheme.

A receiver with a noise figure of 1dB (which is relatively easily achievable at 10GHz) equates with a noise temperature of ~75K. To that we need to add the noise temperature of the dish, which for a properly fed satellite TV dish will be about 30K, the losses due to T/R switching (20K) and the noise stemming from thermal radiation from the Moon, which for a 1m antenna can be estimated as about 10K. Add these all together, and the overall receiver noise temperature can be estimated as 135K.

$$\text{Pn} = \text{kTB}$$

where:

$$\text{k} = \text{Boltzmann's constant (1.38e-23)}$$

$$\text{T} = \text{noise temperature (T)}$$

$$\text{B} = \text{bandwidth (Hz)}$$

$$\text{Pn} = 1.38 \cdot 10^{-23} \cdot 135 \cdot 2500$$

$$= 4.66 \cdot 10^{-18}\text{W}$$

$$= -173.3 \text{ dBw}$$

$$= -143.3\text{dBm}$$

The difference between the received signal level and the receiver noise floor gives a signal level, in the WSJT reporting format, of -28.7dB, tantalisingly close to, if not at, the levels at which decodes are possible in the absence of libration induced spectral spreading. If the system can be improved by a better receive noise figure, say 0.7dB, and the switching losses effectively eliminated by using a waveguide switch, the signal level will improve by nearly 2dB, making 1m-to-1m dish EME QSOs between 10W stations possible, if the path geometry is right.

As a sanity check, I've compared my calculations against results from the VK3UM EME planner (3), and they pretty much concur.

It seems certain that a reasonably optimised 1m dish/10W station could detect its own echoes, and make a fair number of initial QSOs with larger stations via EME on 10GHz. With some planning and luck, it should be possible to work another 1m/10W system.

## Getting On

Many EME projects have failed due to an excess of ambition: starting small with equipment you are already comfortable with is much more likely to produce results than an attempt to put a big system on the air from a standing start.

One of the reasons for the growth of EME activity on 144MHz in recent years is that the coming of the JT modulation schemes has made initial EME QSOs possible for stations with what would have previously have been seen as modest tropo/MS capability. With a few EME contacts in the log, it's amazing to see the way in which stations seem to develop! The same can be true of 10GHz.

## Steering the dish.

So, what's the catch? I guess that the most difficult part of the process for most people is finding and tracking the moon with microwave antenna beamwidths. Unless you have a willing slave who is willing to sit by the dish and to track the Moon by hand, you'll need some form of electro-mechanical help.

With a big dish, Moon noise provides a useful way of confirming that the antenna is pointing in the right direction. But even with a very good receiver the cold sky/Moon noise that you'll see with a 1m antenna will be small, perhaps 0.5dB. In practice, it becomes rather important to get the tracking right. Fortunately, a 1m dish has a 1dB beamwidth of about  $\pm 1^\circ$  which implies a required pointing accuracy of maybe  $0.5^\circ$ . With care, it's not too difficult to track the Moon by dead-reckoning.

The EME mainstream tends to use azimuth - elevation tracking, largely because big commercial dishes tend to be made that way, and I'll be going down that route with my new system for just that reason. However, there's an advantage, if you need, or want, to build something from scratch, to using a polar mount (4). G3LTF has used a polar mount (also known as an equatorial mount) for his 50 years of moonbouncing. By far the majority of astronomical telescopes and motorised satellite TVRO dishes are mounted that way. One of the chief advantages of that approach is that it's only really necessary to drive the Right Ascension axis continuously. The slow changes to the Declination setting ( $< 2^\circ/\text{day}$  for the Moon) can easily be made manually. The disadvantage is that it's not really possible to use the mount for terrestrial communications – unless you live at one of the poles!

The use of a polar mount can save a lot of computation. Figures for Right Ascension and

Declination of the Moon are given in any ephemeris, including that of WSJT, and classically the Nautical Almanac (aka 'The Naughty Book' to those who were taught astronavigation by the same Ancient Mariner as 'dgu.)

Adapting a computer controlled telescope mount such as those sold by Optical Vision (5) would probably work, but I'm not sure how well they would survive with even a 1m dish as a load.

Luckily, the satellite television industry has probably come to our rescue by providing low-cost hardware for a small dish polar mount. Dish motors, such as the 'Icecrypt Satellite Motor', available from CPC (6) for £38 (+VAT), or its heavier-duty cousins from specialist satellite suppliers (7), should make a usable basis for a polar mount. It's possible to hack the DiSEqC control system, (didn't Sam,G4DDK, go into that a few years ago?) but that's possibly a bit of overkill. The positioner seems to use a simple DC motor. An alternative might be to buy a low-cost DiSEqC controller (8) and hack it. It wouldn't be difficult to design a PWM controller to move the dish at  $\sim 15^\circ/\text{hour}$ . The 'satellite motors' seem to use some form of turns counting on the motor to provide positional feedback, but I haven't yet investigated further. For years, astronomical telescopes, with very much smaller beamwidths than my 2.4m dish at 24GHz, were successfully tracked open-loop without angular feedback: a simple DC motor and a rheostat determining the rate. The existence of a high-powered amateur EME beacon (DL0SHF, 10.368.025 MHz+/- doppler) also simplifies things a little.

## The System

Many current 'tropo' systems have adequate performance to exploit WSJT effectively for 10GHz EME. Very good frequency stability and accuracy are needed. This probably means locking to a GPS-steered oscillator or a Rb source, but isn't that pretty standard now? Software exists to control transceiver tuning dynamically, eliminating the need to chase the doppler shift, however some people have successfully tracked JT signals on 10GHz manually. Coaxial relays are likely to introduce significant losses in microwave EME systems, so a waveguide based antenna switch, feed, and preamp start to make a lot of sense. Choose a preamp design where the input match is performed in the waveguide, and not like one well known commercial design, where a microstripline amplifier simply sits between a pair of MS-WG transitions and masquerades as a 'waveguide preamp'! Small losses ahead of the preamp can make surprisingly big inroads into overall receiver sensitivity with a small dish, as the background noise

temperature with a small dish forms only a small part of the overall receiver noise temperature. As the Moon begins to fill the antenna beamwidth, its thermal radiation at ~210K reduces the need for a very low noise temperature.

Moon noise makes a good metric for receiver system performance. I finally managed to achieve about 1.8dB with my 2.4m dish (where, as the Moon filled about a quarter of the solid angle of the beamwidth, the Moon noise component was about 50K) and my old coax-based front-end. I've seen claims of >2dB from a similar dish. My own projection of what could be achieved with a fully optimised system, based on losses and errors I knew I could eliminate, was about 2.3dB.

A major problem is making the measurement, particularly when the Moon noise is only about 0.5dB above system noise. I use an old 'total power receiver', built in the 1980s as part of a noise figure measuring system. This is basically a broadband noise receiver operating at about 30MHz, consisting of a strip of tuned dual-gate mosfet amplifiers, with a square-law detector which looks at the output of a downconverter from my 432MHz IF. The TPRx integrates the Moon noise over 1MHz, and the detected signal is then passed through a low-pass filter with a bandwidth of about 100Hz, resulting in a good, flicker-free indication on a high-quality analogue meter.

If I didn't have the old TPRx, I'd almost certainly take the approach used by Martin, G8FEK, in his commercial noise measuring kit, (9) and linearly downconvert the noise to baseband where it can be measured by a true-RMS detector or suitable software in a PC. Some modern SDR receivers, such as the SDR-IQ running under Spectravue also have a noise measurement, sometimes called a 'continuum' mode. There are also 'proper' instruments, such as some power meters and spectrum analysers, which can also be used, although that requires some care.

Sun noise – which is probably more familiar - is not altogether reliable, unless you factor-in the solar flux at the time of the measurement, and even then it can be misleading.

## Doppler

You and your QSO partner and the Moon are in constant relative motion. So doppler shift is inevitable. In order to counter this it's necessary to compensate. This (just!) can be done by hand, but it's not too difficult to calculate the frequency offsets to a few Hz, and use that information to tune your receiver. Software to do this for a number of common transceivers exists courtesy of VK1XX (10).

## Dish Feeds

To get good performance from a small dish, you need to think carefully about the feed. Its pattern needs to be matched to the dish f/D ratio: if the feed has too wide a pattern, the dish will be 'overilluminated' and significant energy will be collected (reflected or dissipated) beyond from the dish surface. On receive, in particular, this will mean that part of the energy entering the feed will be at local ambient temperature, and will lead to an excess noise temperature. If the feed has too narrow a pattern, the whole reflecting area of the dish will not be used effectively, and gain will suffer. This is inevitably a compromise: usually the solution chosen is to select (or to design) a feed which will have a response around 10dB down at the dish edges, and is why many feedhorn designs are specified at their -10dB beamwidth. It's easier, and more efficient to feed a large f/D dish than a deeper dish with a small f/D: hence the widespread use of offset dishes with f/D ~ 0.7 for satellite TV reception.

Don't confuse the feedhorn design with other features, such as a means of establishing circular polarisation. As an example the so-called 'septum feed' is effectively a piece of open waveguide, and is only a useful feed for deeper dishes. It's worth a careful read of the online W1GHZ microwave antenna book (11). While simple pyramidal horns are fine for tropo, the noise temperature of the horn-dish system will probably be a bit high. For standard TV offset dishes with f/D ~ 0.7 effective feeds include the designs of W2IMU. Some versions of the latter, when made with plumbing fittings may not work properly. I used the W2IMU 1.8WL aperture dual-mode horn on my 0.8 f/D, 2.4m dish quite effectively, before moving-on to a Skobelev-based feed: another form of dual-mode structure. You should also look at the designs of RA3AQ who has taken Skobelev's work further.

If you are using waveguide at 10GHz, you're not forced to use WG16/WR90! That stems from the days of easy availability of surplus components for 9GHz radar, and from military projects. Nowadays WG17/WR75 from 12/14GHz earth station systems seems to be more available from various surplus sources. While it has very slightly larger losses at 10.4GHz (due to operation closer to its cut-off wavelength) it is entirely usable. It's also smaller and lighter than WG16!

## Polarisation

Unlike the lower-frequency microwave bands, the vast majority of active 10GHz operators use linear polarisation. In order to circumvent spatial polarisation changes, European stations use local vertical polarisation, North Americans, horizontal, and

antipodeans, vertical. As there is some spread of polarisation due to the way in which signals are reflected from the Moon, small differences in linear polarisation result in very small differences in received signal. I suggest that, at least initially, any new 10GHz EME system employs that convention. Of the relatively small proportion of stations currently using CP on 10GHz, most have sufficient reserves of system performance to work small linearly polarised stations.

CP has been a 'hot topic' amongst 10GHz EME'ers for well over a decade! If you read the classic W2IMU EME notes, he has details of a CP antenna for 10GHz. There are a number of reasons why CP hasn't really caught-on at 10GHz, apart from inertia. One of the chief of these has been that, until relatively recently, good, reproducible, recipes for achieving circularity without introducing too much loss have been few and far between. Another reason is simply that the current linear polarisation protocol works very well indeed.

## PAs

I used a Mikom 10W SSPA, which now forms part of my tropo system, to make my first CW EME QSOs on 3cm with my 'big' dish.

10GHz power amplifiers are very expensive - if you buy, or even make, modern SSPAs. However, surplus TWTAs still turn-up, but seem to be ignored by many microwavers. Why? Suitable 20W units - with very high quality power supplies - have been almost ignored at recent roundtables. I can understand the concerns regarding high voltages, but with military/avionic/telecom power supplies this shouldn't be a problem, although, of course, a modicum of care is re

I replaced my SSPA with a 50W TWTA and a switching power supply of my own design - which cost about £80 in components to make. Modern TWTs, run at the manufacturer's design voltages, and properly cooled, are highly reliable devices, and used in amateur service should last several lifetimes!

## Summary

If you don't have ambitions to have a close relationship with a 3m+ dish, small dish 10GHz EME is easier than you might think. Don't just sit there thinking that you could never do it! In the immortal words of Mrs. Doyle ... (12) 'G'wan, g'wan, g'wan, g'wan' You'll enjoy it!

## Links

- 1 [home.planet.nl/~alphe078/whatis.htm](http://home.planet.nl/~alphe078/whatis.htm)
- 2 [www.physics.princeton.edu/pulsar/K1JT/small\\_station\\_eme.pdf](http://www.physics.princeton.edu/pulsar/K1JT/small_station_eme.pdf)
- 3 [www.vk3um.com](http://www.vk3um.com)
- 4 [www.satsig.net/polmount.htm](http://www.satsig.net/polmount.htm)
- 5 [www.opticalvision.co.uk](http://www.opticalvision.co.uk)
- 6 [cpc.farnell.com](http://cpc.farnell.com)
- 7 [www.systemsat.co.uk/satellite-motor.html](http://www.systemsat.co.uk/satellite-motor.html)
- 8 [www.cardman.com/diseqc.html](http://www.cardman.com/diseqc.html)
- 9 [www.rfdesignuk.com/](http://www.rfdesignuk.com/)
- 10 [www.vk3hz.net/microwave/doppler141.zip](http://www.vk3hz.net/microwave/doppler141.zip)
- 11 [www.qsl.net/n1bwt/contents.htm](http://www.qsl.net/n1bwt/contents.htm)
- 12 'Father Ted' Channel 4 TV, and countless repeats.

## ESWR 22 June

### East Suffolk Wireless Rally

UK $\mu$ G stand was inside the main building.

Join us here for breakfast on the last Saturday every month.

VLF – nanowaves

Aerial Photo by John Gee G4BAV



# Dubus EME Contest

Dave Dibley G4RGK

G4RGK was active in the Dubus 23cm CW EME contest, May 31/ June 1st. Contrary to popular belief CW EME is alive and well. For once local weather conditions were good, activity was excellent from Europe but not so good from North America. Due to prior commitments I was unable to operate both Saturday and Sunday evening. So a fair amount of time was lost. Attempts at optimising the station and a lot of work with a chain saw have paid off with much better echoes and a much wider, clearer window for EME. Here is the log with reports removed. All qso's unassisted random CW.

31/05:- 08:13 HB9CW; 08:38 I1NDP; 09:00 VK3UM; 09:18 IZ1BPN; 09:30 UA3PTW; 09:38 PI9CAM; 10:01 OE5JFL;

10:18 UA4HTS; 10:21 SP7DCS; 10:36 OK2DL; 10:45 F6CGJ; 10:51 RA3AUB; 11:21 ES5PC; 11:26 UA3PTW

11:34 JA6AHB; 11:40 OH2DG; 11:46 DJ8FR; 11:50 G3LTF; 11:55 SP6JLW; 12:10 DL3EBJ; 12:36 LZ2US

12:50 OK1CA; 12:51 OK1KIR ; 13:24 OH1LRY; 13:30 OK1CS; 13:40 IK3COJ; 14:00 NC1I; 14:34 S53MM

14:50 RA3EC; 15:38 SM7FWZ; 16:29 K2UYH; 16:55 F5SE/P; 16:59 W6YX; 17:20 N4PZ; 17:30 DF3RU

17:36 VE6TA; 19:40 OZ4MM; 01/06:- 11:03 DL0SHF; 11:20 LX1DB; 11:37 OK2ULQ; 13:20 IK5VLS; 14:04 OZ6OL

15:35 PA3FXB; 15:40 S59DCD; 16:04 I5MPK; 16:28 W4OP; 19:02 PA0BAT. A total of 46 x 42 mults for a score of 193000 points. A further 20 stations were heard, but were unable to work for various reasons.

Station details: 4.6m, 0.4 f/D Stressed Dish mounted on wheels. 230w solid state PA. G4DDK preamp.

Around 15 dB Sun noise (SF=140)



## UKμG Chip Bank – A free service for members

The catalogue is now on the UKμG web site.  
See [www.microwavers.org/?chipbank.htm](http://www.microwavers.org/?chipbank.htm)

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](mailto:john@g4bao.com)

The current list is available at [www.microwavers.org/tech-support.htm](http://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>



# Activity News : June

By Bob Price G8DTF

**Please send your activity news to:**

[scatterpoint@microwavers.org](mailto:scatterpoint@microwavers.org)

## Introduction

This month we have the usual reports from the month's contests. There was the May 432MHz-248GHz, the Microwave Group Low Band Contest, the 23cm and SHF UKAC. There is some feedback on the change in contest times for the 13cm contest. There are also reports on Alan GM0USI's expedition to Mull.

## May 432MHz-248GHz Contest

**From Bob G8DTF IO83**

I managed to get on for a little while during the contest.

### 23cm

I worked G8OHM (IO92), G4BRK (IO91), G4HGI and GW8ASD both in IO83, GM4JR in IO85 and the best DX of the day was M0HNA/P in IO91 at 287km.

### 13cm

Activity seemed a bit low, but I worked G8OHM (IO92), G4BRK (IO91), GW8ASD (IO83) and again best DX was M0HNA/P in IO91 at 287km.

## May Low Bands Contest

**From Dave G1EHF IO91**

Here's a report from our activity in the May Low Band contest:

"The 'Combe Gibberlets' entered the May Low Band contest using their new callsign M0HNA/P, from a site to the East of Guildford in IO91RF. Weather conditions were fine, not too hot and with little wind, whilst radio conditions seemed quite average on all bands. Activity however was reasonable: 40 worked on 23cm with best DX GM4CXM at 582km; 20 worked on 13cm with best DX PI4GN at 547km and 7 worked on 9cm with best DX PI4Z at 309k. The 23cm station was operated from G3TCU's new mobile shack, constructed in the back of an old people carrier donated by a benevolent colleague!"

I've attached a couple of photo's from the day. The antennas are 9, 13, 23cm left to right.

The 'Combe Gibberlets' line-up





'Combe Gibberlets'  
MOHNA/P 23cm  
Operator G3TCU

## May 23cm UKAC

### From Eddie G0EHV/P IO84

The UKAC on 20th was best described as “Average” although the QSB was quite a problem at times. The best of my 38 QSOs was G3TCU/P.

KST was “misbehaving” again but a good few QSOs were due to direct CQs or S&P.

Chatting to G4KUX after the contest - he said it was raining at his QTH, it was foggy at my portable site. Just after signing, down came torrential rain resulting in the worst soaking I've had in a long time, the drive home was very uncomfortable!

Also at take down I found the cause of intermittent RX/TX – a loose N plug on the antenna tail, the joy of /P operating.

### From Bob G8DTF IO83

The 23cm UKAC was reasonably busy. I worked 10 in IO83, 3 in IO82, 3 in IO91, 2 in IO81, and one each in IO90, IO75, IO92, IO93 and JO02. Best DX was G0PEB/P in IO90 at 336km, not bad with 2W SSB.

## May SHF UKAC

### From Eddie G0EHV/P IO84

No activity from me this month, as going portable for a late start and finish is not really a practical proposition here. Setup/takedown and travel etc., take over 4 hours. I'll be back in August but may venture out with

my 3cms system in the mean time, it needs checking over as it's not been fired up for about a year!

### From Ross G6GVI (for Bolton Wireless Club) IO83

For the May UKAC session, Mark M0UFC got out his passport and travelled “over the border” into IO93 square. He'd found a site with stunning views over the Pennine Moors (where the gorgeous sunset directly over Winter Hill brought out several local photographers). This would extend our range up to 40km and give the potential of a new Locator Square (and a Multiplier too) on these bands. Meanwhile, Dave G4JLG and Ross G6GVI met up at their usual roadside site on the Southern side of Winter Hill, whilst Dan 2E0NNX operated from his 10th-floor balcony in the centre of Bolton.

Despite the forecast of a very wet evening it actually stayed dry up to sunset, but it was cold and breezy on the hills: Dave and Ross needed their gloves on and Mark was struggling to keep his 60cm dish pointed against the wind.

Using 70cm FM for co-ordination and talk-back between the sites, we kicked off at 8pm with Dave working first Mark and then Dan on 6cm in short order. Our kit consists of AirWave video senders converted for WBFM voice, with flat-panel phased-patch array antennas. The main challenge with this kit is picking out our voices from the heterodyne tones of all the other video and Wi-Fi links in this shared band!

Then whilst Dave and Dan made a QSO on 9cm SSB (using our home-made transverters adapted from AirSpan data-link units), Ross and Mark set up their 3cm WBFM stations. These use old Solfan Gunn-diode heads and PW EXE dishes on transmit, alongside converted satellite LNBS and tuners on receive. Following last month's unsuccessful attempts, Mark had improved the performance of his LNB, and alongside the guys, his steadying hand on the receiving dish turned the critical adjustments into strongly peaked signals. Dan doesn't have any dishes on his balcony, just a 16dB horn on his Gunn-diode and simply hand-holds his LNB on receive: the compensation for lower antenna gain is reduced directivity, so the pointing is much less critical. And Dan found that it was easy to work up to Winter Hill via a reflection off Bolton Town Hall, rather than trying to get his antennas into the awkward position they would need to point directly to the North-West.

Dave was trying out the latest version of his MS Access logging system (now with a multi-band capability designed for these SHF events), and whilst he was working Mark and Dan on 3cm, Ross was able to nip in and work them both on 6cm himself, and then have a 9cm QSO with Dan too. Then the final challenge was for Mark to try a QSO with Dan on 3cm. After painstaking adjustments of dishes and frequencies, the QSO was completed as Ross and Dave packed away and set off home.

Ross got home soon after 9:30 and turned on his 13cm station for a sked with Dan, who'd borrowed the Club's transverter. There seemed to be some problem with the antenna, as signals were very weak over this 1km path, but the QSO was completed – could this be the first-ever for an Intermediate Licensee on this band?

So the results of another busy night were:

M0UFC/P: 6 QSOs on 6 & 3cm;  
G4JLG/P: 5 QSOs on 6, 9 & 3cm;  
G6GVI/P: 5 QSOs on 6, 9 & 3cm and then 3 more on 13cm from home;  
2E0NNX: 8 QSOs on 6, 9, 3 & 13cm

*– and the first station to enter logs in all nine bands of the 2014 UKACs!*

#### **From Bob G8DTF IO83**

Conditions on 13cm were dire. They seemed particularly bad to the North and to the South. I failed with a number of stations who are usually easy QSOs. I worked 3 in IO83, and one each in IO93 and IO92. I finished early for supper otherwise, a hypo would have happened. The late finish is not working for me either.

## **Other activity**

### **From Alan GM0USI/P IO66**

Here is some info on the very quick overnight trip to The Isle of Mull to visit Roger GM4PMK.

I had planned a quick trip to IO66 for a little while now – I only had a small window between work, but the WX looked great so travelled up from Glasgow via the Corran and Lochaline ferries to the island. I arrived at Roger's QTH in Pennyghael about 1530 on Tues 27th May – I had decided to operate 3 and 6cm from Uisken Beach (IO66vg39sn) after a good look at some maps - take off is good till you hit Jura 20 miles distant. The good thing about the location, is that even though it is a horseshoe type bay – it faces the right direction from IO85 round to IO65 going over some very low lying islands in the bay – [one was higher and had to be avoided]. The great thing was you could drive right onto the beach....it can be busy with tourists all wanting to know what you were doing. The down side was the phone signal or apparent lack – it appeared some Vodafone and O2 might be possible from Islay - it took a while to find a spot quite far from the car to make a call or text. Once that happened all went smoothly with the loud growl of scatter from Mark GM4ISM QRO station - I have not been anywhere in Scotland as yet that I haven't managed to hear him [IO78 later in year might be a bit more of a challenge hi] I was pleased Roger PMK came along to witness 10GHz from his local patch - we certainly hadn't thought over the next 30min he would be sitting down rag chewing to Tony G4CBW in IO83UB at around 430km – I knew there was some RS about as Mark GM4ISM was very scattered and the GB3NGI beacon quite loud with RS on a more westerly than normal heading. Tony on the other hand had virtually no distortion on his signal, but was audible over perhaps 5 or more degrees - peaking to S7 around just after 1730 local. Brian GM8BJF also came on from a roadside location near Tarbrax IO85FS – running about 1w - he was easy copy again with some RS - at this point Mark ISM called in at huge strength - well over S9 much less distortion too. We tried 6cm with Bryan GM4BJF and Tony G4CBW – signals levels were similar, but I think the RS conditions were changing - changing back to 10GHz G4CBW signals had gone down to around S4. If the phone signal had been easier I would have been phoning others to try a QSO. The next day I returned as Geoff GI0GDP had emailed to ask for a sked at 12 noon – he was travelling to Ballycastle IO65UF – exactly due south just missing the cliff at the southern part of the bay, Geoff was a super signal – pretty easy path going over Islay and Colonsay to reach me – I was not so strong with – which seemed quite odd – another test with Tony G4CBW

who was much weaker around 539 with me right on the noise... Conditions had changed a lot since the day before – I will be checking my amplifier though! The GB3NGI beacon was a nice steady tropo signal though.

A thoroughly enjoyable trip – the WX was fantastic with no wind at all – many thanks to Roger and his XYL for their hospitality – longer and maybe other bands next time!

Will definitely be in touch again – I am QRV as usual last week in June from Isle of Cumbrae IO75MS and no doubt a few other spots over the summer.

**From Tony G4CBW IO83**

Just a few notes on my recent activity during May. I have been QRT for a while on 3, 6 & 9cm, upgrading the rotator with hi-res sensors, accuracy was 1.0 degree, now 0.1 degree. Happily, I am back on with 3cm and 6cm, but 9cm is still awaiting reinstallation. The past week has been great fun playing aircraft



scatter on 23cm with Martin GM8IEM in IO78HF. We arranged three skeds for the week, the first on Tuesday 27th May at 8 AM, starting with JT4G data, which was successful. The second sked booked was for Wednesday 29, using ISCAT-B, which took some time to complete due to the lack of suitable aircraft, but was eventually successful. The final sked was booked for Thursday 30th May on SSB. I was a bit concerned about this, thinking we could be shouting down a microphone for some time, but that was not the case as the QSO took barely a minute to complete with a reflection off the very first aircraft to enter our common volume, reports were 51/53. We then followed this up a little later using a second aircraft to enter our common volume with reports of 55/57. Two QSOs completed within minutes using the initial reflection off each aircraft. As final note to these QSOs, I would like to mention the super application of AirScout by DL2ALF, this is a brilliant application and a joy to use, making Aircraft Scatter a breeze. Highly recommended, thank you DL2ALF.

Also during the last week in May was of course Alan GM0USI, with the able help of Roger GM4PMK, mini expedition to MULL with 3cm & 6cm, Locator: IO66VG39VP. My first contact with team MULL was on 3cm early evening of 27th May, working Alan and then Roger at an amazing signal strength of 57/56, easy chat strength! The WX was fine at both ends, but looking back on the QSO it was realised that there was rain on the path so at the very least it was RS assisted, but I for one could not tell that on the received audio quality. A little later we tried on 6cm, which was successful, but conditions had by then changed such that signals were unstable with a lot of QSB.

Last, but certainly not least for the month of May, was a fine QSO with Geoff G10GDP/P on 3cm. Geoff had gone portable to work Team Mull on Wednesday 28th, located close to Ballycastle, sited for a good view to MULL. That particular location was not suitable for a test to me so Geoff very kindly took to the road, heading SE from Ballycastle on the A2 until he located a suitable pull-in with a take-off to 130 degrees. The actual location was between Cushendun and Cushendall, approximate locator IO65XC. Geoff setup his 1 Watt to a Sky dish system and started transmitting. I immediately found Geoff's signal and two-way SSB qso was completed in minutes at 41/51 reports. Path length was approximately 338 km, but what is interesting is that the route goes through the high part of the Isle-Of-Man, which lies close to the centre of the path, hence represents a formidable obstacle.

### ...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, but also local activity with low power or WB equipment.

Please send your reports to [Scatterpoint@ukmicrowavers.org](mailto:Scatterpoint@ukmicrowavers.org), remember the deadline is the 1st of the month.

73

Bob G8DTF

## Journées d'Activité

Robin G8APZ

Here are the dates for 2014 provided by Jean-Paul F5AYE (JN36dh).

All are Sat/Sun weekends apart from the scatter tests via Mont Blanc.

### 1296 GHz and up

21/22 June

13th July morning - F6BSJ  
Memorial JA - Scatter tests via Mont Blanc, (Last year a scatter contact of 600 km was made...)

26/27 July

30/31 August

27/28 September

25/26 October

73  
Robin, G8APZ

The latest [EME calendar](#) is available from DL7APV's website

# Contests

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

[www.microwavers.org/?contesting.htm](http://www.microwavers.org/?contesting.htm)

## May 2014 Lowband Contest Results

Entry levels remained the same as last month for this session, the comparable event in 2013 was in October, and numbers have improved since then.

The coincidence with an IARU Region 1 coordinated date and the RSGB UHF event increased activity and also provided some continental DX for many entrants. Conditions were unexceptional judged by the comments received.

M0HNA/P had a substantial lead on 1.3GHz over G4BRK, who was runner up. G8OHM worked the best DX with DK2MN in JO32, unfortunately one entrant lost their best DX contact with PI4GN through logging the square as IO33 not JO33.

The 2.3GHz band was also led by M0HNA/P, with G8OHM as runner up. G8OHM also worked the best DX on this band, again with DK2MN. Unusually there were more entries on 2.3GHz than on 1.3GHz this time.

M0HNA/P completed a clean sweep of the top positions on 3.4GHz, but scores were much more evenly spread on this band. G3UKV was the runner up. No continentals were worked on 3.4GHz this time, with all entrants ending up with best DX in the 200km range.

The overall winner was the "Combe Gibberlets" group consisting of G3TCU, G3TCT, G4SJH, and G1EHF who achieved the maximum score of 3000 points. Overall runner up and leading fixed station is Neil Whiting G4BRK who was the runner up on 1.3GHz.

Certificates go to the overall Winner M0HNA/P and Runner-up G4BRK and to the following winners:

**1.3GHz** M0HNA/P, G4BRK, GW3TKH/P (Low Power), GM3HAM/P (Radio Talkback)

**2.3GHz** M0HNA/P, G8DTF, G4WLC/P (Low Power), GM4BYF/P (Radio Talkback)

**3.4GHz** M0HNA/P, G3UKV

73

John G3XDY,  
UKuG Contest Manager

Low Band Championship 2014					
After three events, the best three events count towards the total					
Overall					
Pos	Callsign	3/2/14	4/13/14	5/4/14	TOTAL
1	M0HNA/P	0	2692	3000	5692
2	G4BRK	2113	1602	1777	5492
3	G4LDR	1833	2245	1083	5161
4	G3UKV	1788	0	1208	2996
5	G4NBS	1879	0	0	1879
6	G4BAO	1456	0	0	1456
7	G8OHM	0	0	1302	1302
8	G8DTF	0	1233	0	1233
9	GW3TKH/P	0	766	444	1210
10	G4WLC/P	521	0	299	820
11	G4KIY	0	697	0	697
12	G0RUZ	0	537	0	537
13	G3TCT	527	0	0	527
14	G4DZU	154	0	0	154
15	GM3HAM/P&GM4BYF/P	0	0	131	131
16	GM8IEM	0	90	0	90
1.3GHz					
Pos	Callsign	3/2/14	4/13/14	5/4/14	TOTAL
1	M0HNA/P	0	1000	1000	2000
2	G4BRK	816	498	575	1889
3	G4LDR	439	436	150	1025
4	G4NBS	1000	0	0	1000
5	G4BAO	685	0	0	685
6	G8OHM	0	0	577	577
7	G0RUZ	0	537	0	537
8	G3TCT	527	0	0	527
9	G3UKV	320	0	152	472
10	GW3TKH/P	0	227	183	410
11	G4KIY	0	305	0	305
12	G8DTF	0	267	0	267
13	G4DZU	154	0	0	154
14	GM8IEM	0	90	0	90
15	GM3HAM/P	0	0	67	67
2.3GHz					
Pos	Callsign	3/2/14	4/13/14	5/4/14	TOTAL
1	G4BRK	1000	776	575	2351
2	G4LDR	986	809	232	2027
3	M0HNA/P	0	1000	1000	2000
4	G4WLC/P	521	592	299	1412
5	G3UKV	468	0	830	1298
6	G8DTF	0	966	0	966
7	G4NBS	879	0	0	879
8	GW3TKH/P	0	539	261	800
9	G4BAO	771	0	0	771
10	G8OHM	0	0	725	725
11	G4KIY	0	392	0	392
12	GM4BYF/P	0	0	64	64
3.4GHz					
Pos	Callsign	3/2/14	4/13/14	5/4/14	TOTAL
1	G4LDR	408	1000	701	2109
2	G3UKV	1000	0	830	1830
3	M0HNA/P	0	692	1000	1692
4	G4BRK	297	328	597	1222

<b>May 2014 Low Band Contest Results</b>					
<b>Overall</b>					
<b>Pos</b>	<b>Callsign</b>	<b>1.3GHz</b>	<b>2.3GHz</b>	<b>3.4GHz</b>	<b>Total</b>
1	M0HNA/P	1000	1000	1000	3000
2	G4BRK	605	575	597	1777
3	G8OHM	577	725	0	1302
4	G3UKV	152	226	830	1208
5	G4LDR	150	232	701	1083
6	GW3TKH/P	183	261	0	444
7	G4WLC/P	0	299	0	299
8	GM3HAM/P&GM4BYF/P	67	64	0	131
<b>1.3GHz</b>					
<b>Pos</b>	<b>Callsign</b>	<b>Locator</b>	<b>QSOs</b>	<b>Best DX</b>	<b>Points</b>
1	M0HNA/P	IO91RF	40	GM4CXM 582km	9950
2	G4BRK	IO91HP	25	DK2MN 597km	6016
3	G8OHM	IO92AJ	21	DK2MN 614km	5745
4	GW3TKH/P	IO81LS	10	M1CRO/P 299km	1818
5	G3UKV	IO82RR	11	GM3HAM/P 263km	1508
6	G4LDR	IO91EC	8	PA6NL 410km	1491
7	GM3HAM/P	IO74WV	2	G4BRK 405km	668
<b>2.3GHz</b>					
<b>Pos</b>	<b>Callsign</b>	<b>Locator</b>	<b>QSOs</b>	<b>Best DX</b>	<b>Points</b>
1	M0HNA/P	IO91RF	20	PI4GN 547km	4126
2	G8OHM	IO92AJ	13	DK2MN 614km	2992
3	G4BRK	IO91HP	14	PA0S 403km	2374
4	G4WLC/P	IO81WU	12	G4KCT 243km	1233
5	GW3TKH/P	IO81LS	7	G4BEL 226km	1076
6	G4LDR	IO91EC	5	PA6NL 410km	959
7	G3UKV	IO82RR	8	GM4BYF/P 263km	932
8	GM4BYF/P	IO74WV	1	G3UKV 263km	263
<b>3.4GHz</b>					
<b>Pos</b>	<b>Callsign</b>	<b>Locator</b>	<b>QSOs</b>	<b>Best DX</b>	<b>Points</b>
1	M0HNA/P	IO91RF	6	G3UKV 216km	786
2	G3UKV	IO82RR	4	M0HNA/P 216km	652
3	G4LDR	IO91EC	4	M1CRO/P 219km	551
4	G4BRK	IO91HP	4	M1CRO/P 186km	469

## UKuG Microwave Contest Calendar 2014

Dates	Time UTC	Contest name	Low Band#	Certificates
29-Jun	0600 - 1800	2nd 5.7GHz Contest		F, P,L,R
29-Jun	0600 - 1800	2nd 10GHz Contest		F, P,L,R
29-Jun	0600 - 1800	2nd 24GHz Contest		F, P,R
20-Jul	0900 - 1700	24GHz Trophy / 47 / 76-1000 GHz		
27-Jul	0600 - 1800	3rd 5.7GHz Contest		F, P,L,R
27-Jul	0600 - 1800	3rd 10GHz Contest		F, P,L,R
27-Jul	0600 - 1800	3rd 24GHz Contest		F, P,R
3-Aug	0900 - 1700	Microwave Field Day		F, P,L
31-Aug	0600 - 1800	4th 5.7GHz Contest		F, P,L,R
31-Aug	0600 - 1800	4th 10GHz Contest		F, P,L,R
31-Aug	0600 - 1800	4th 24GHz Contest		F, P,R
28-Sep	0600 - 1800	5th 5.7GHz Contest		F, P,L,R
28-Sep	0600 - 1800	5th 10GHz Contest		F, P,L,R
28-Sep	0600 - 1800	5th 24GHz Contest		F, P,R
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

## Events calendar

### 2014

Jun 22	RAL Roundtable	<a href="http://www.ntay.com/hars/RAL2014.html">www.ntay.com/hars/RAL2014.html</a>
Jun 27-29	Ham Radio, Friedrichshafen	<a href="http://www.hamradio-friedrichshafen.de/">www.hamradio-friedrichshafen.de/</a>
July 1	Scatterpoint 10th Anniversary	<a href="http://www.scatterpoint.org/">www.scatterpoint.org/</a>
July 12-13	Finningley Round Table	<a href="http://www.g0ghk.co.uk/">www.g0ghk.co.uk/</a>
July 12-13	Gippsland Technical Conference, VIC 3842 Australia	<a href="http://www.vk3bez.org/gippstech.html">www.vk3bez.org/gippstech.html</a>
July 25-27	AMSAT Colloquium, Holiday Inn, Guildford	<a href="http://www.amsat-uk.org/colloquium/">www.amsat-uk.org/colloquium/</a>
July 23 – Aug 3	Commonwealth Games, Glasgow	<a href="http://www.glasgow2014.com/">www.glasgow2014.com/</a>
August 23 – 26	EME2014, Pleumeur-Bodou near Lannion	<a href="http://www.eme2014.fr">www.eme2014.fr</a>
Sept 6-7	European Conference on Amateur RA, Bad Münstereifel- Eschweiler, Germany	
Sept 12-14	59.UKW Tagung, Weinheim [ <i>note date correction</i> ]	<a href="http://www.ukw-tagung.de/">www.ukw-tagung.de/</a>
September 21	Crawley Round Table	
Sept 26-27	National Hamfest	<a href="http://www.nationalhamfest.org.uk/">www.nationalhamfest.org.uk/</a>
Oct 6-9	European Microwave Week, Rome	<a href="http://www.eumweek.com/">www.eumweek.com/</a>
Oct 10-12	RSGB Convention	<a href="http://www.rsgb.org/rsgbconvention/">www.rsgb.org/rsgbconvention/</a>
Oct 18-19	Microwave Update, Rochester, New York	<a href="http://www.microwaveupdate.org/">www.microwaveupdate.org/</a>
Nov 1	Scottish Round Table	<a href="http://www.gmroundtable.org.uk/">www.gmroundtable.org.uk/</a>

### 2015

Apr 11	CJ-2015, Seigy	<a href="http://cj.ref-union.org/">cj.ref-union.org/</a>
April 25 – 26	Martlesham Round Table	<a href="http://mmrt.homedns.org/">mmrt.homedns.org/</a>
May 15 – 17	Hamvention, Dayton	<a href="http://www.hamvention.org/">www.hamvention.org/</a>
Sep 28 – Oct 2	European Microwave Week, Paris	<a href="http://www.eumweek.com/">www.eumweek.com/</a>