An Amateur Radio publication for the Microwave Enthusiast

scatterpoint

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In This Issue

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Loan Equipment

Don't forget, UKuG has loan kit in the form of portable transceivers available to members for use on the following bands:

5. 7GHz 10GHz 24GHz 76GHz

Contact John G4BAO for more information.

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

https://groups.io/g/Scatterpoint and/or Dropbox. Also, **free access to the Chip Bank**.

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

ukug@microwavers.org

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, OpenOfÞce, 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

Reproducing articles from Scatterpoint

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

www. microwavers. org/proj-support. htm

UKµG Technical support

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, what is more important, 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 Chip Bank – A free service for members

Chipbank Updated October 2017

By Mike Scott, G3LYP

Since the Martlesham Roundtable, I have received a number of donations to the Chipbank. Included are a considerable number of MMICs from G4HUP’s estate including MARs and the Agilent MSA equivalents. We also have a further supply of Kent’s “Funny” MAR-6s (Thanks Kent!).

Paul Nickalls G8AQA donated 48 pcb mounting SMA sockets (through hole) and Paul Entwistle G8AFC, two large bags of BZX85C5v1 and BZX85C11v 1watt Zener diodes.

John, G8ACE, presented me with a large box of reeled components which has added to our range of SM Rs and Cs. If you need a value not listed in the current catalogue, ask as it may now be available.

Finally, as a result of a posting I made on the Reflector just before Martlesham, Bill,N6GHZ, kindly sent me a large collection of microwave components from California. These are mainly diodes, including Gunn and varactor as well as some transistors. These are listed in the July issue on page 5. In many cases Google produced full or abbreviated data sheets, some appear to be specials as I could find no data. The quantity available is listed after the item. If you want any items(s) please use the usual Chipbank order form on the website.

The catalogue is on the UKµG web site at
www. microwavers. org/chipbank. htm

Chairman's thoughts – on the end of year 2017

Picture VK7MO working G3WDG on 24GHz eme

As the year closes it is traditional to look back over the last year and activities within the group. I'm not going to do that….Instead I am going to look forward to 2018 and maybe reflect on a couple of things that might change.

The first thing that I see happening is far more widespread use of digital modes. We made a good start this year with G4BAO's Digifest on Wednesday evenings. This has been extremely interesting and fired the imagination and enthusiasm of many of our fellow microwave enthusiasts.

Apart from the obvious advantages of the weak signal modes like as JT65C and JT4F, when signal levels are too low for the more traditional SSB and CW modes, JT9F fast mode has speeded up QSO times. A minute per over can seem like forever when compared to 15 second overs. The mode is also beneficial when signals are fleeting, such as scatter from non-optimally situated aircraft. But of course it is not a weak signal mode.

We have traditionally (that word again) been used to cranking up the power in order to make the contact. It might be interesting to locate one of the new SG Labs low power 23 or 13cm transverters, with frequency locking, direct to the yagi or dish feed and see what can be achieved with accurately known frequencies and timing (from GPS?).

A similar technique was written up in the old Ham Radio magazine in the USA many years ago. with simple filtered mixer transverters direct at the antenna. Ranges of 160 miles or more were achieved with this technique on 23cm, using CW and under non-lift propagation conditions. With weak signal digital modes and modern hardware, available now, we ought to be able to better that.

This year has seen the rise of the truly microwave capable SDR transceiver. Several of our Group had previously started to develop microwave transverters with some success, but the technology has moved on and low cost SDR transceivers are now available to us all (Lime SDR, Pluto etc).

Many of us currently prefer to stick with traditional transverters and our 'expensive' HF or VHF transceivers as IFs, for good economic reasons. But, I think things are starting to change and the day of the microwave SDR will soon be here. 2018 may be when we start to see of these appear on air for DX'ing and not just for digital TV, as at present.

The SDR approach will enable the development of new digital-based modes that make use of new, wider bandwidth digital modes that are not so practical with transceivers limited by narrow SSB filters.

Maybe we will see microwave transceivers that work simultaneously on two or more amateur microwave bands to exploit fleeting openings that appear in some frequency selective manner?

Again, G4BAO and others have already postulated that easier to access development tools will enable more of us to have a go at developing the applications for such modes, as long as OFCOM allows it, of course!

We have been accused of being ‘behind the curve’ when it comes to modern ‘wireless’ technology. Maybe we have just been waiting for technology to catch up with what we prefer to do? Use our radios to communicate using the full physics of ‘wireless’.

I know what I might like to find in my Christmas stocking this year.

Merry Christmas

73 de Sam, G4DDK
Chairman, UKuG

Silent Key – Brian Pugh G3SMU

Sadly Brian G3SMU recently passed away.
Several tributes were given on the ‘reflector’
‘So sad to report that Brian G3SMU fell silent key on Thursday after being admitted to hospital. Brian was first licensed in 1963 and was active on one band or another (top band to 10 GHz) almost every day until he passed.
Brian's professional broadcast TV and microwave transmission background naturally led to an avid interest in ATV; an opportunity for early retirement in the 90s saw his transition to "professional radio amateur", giving him more time to assist local and DX stations with technical issues. Living in a QTH located 850 feet ASL, on the side of Winter Hill Lancashire, provided a wonderful take off for the higher bands.
As well as ATV Brian was busy on the microwave bands with early wide band systems and later he also implemented "posh" narrow band working too.
More recently Brian's eyesight failed which cruelly prevented him pursuing his passion for all forms of ATV. Local OM G1LWX and 2E0SAF kindly spent many visits implementing HF antenna systems, which rekindled Brian's interest in top band and 40 metres - eliminating QRM was the new challenge. The vertical that Mike and Sean installed all but silenced the local QRM much to Brian's delight.’
RIP Brian - here's hoping for GD DX up there!
73 de Darren
G7LWT

‘It is a sad day to hear the passing of Brian G3SMU, he was always helping somebody - especially when I was setting up my first WBFM ATV gear back in the 80's.
RIP Brian, you will be sadly missed.

Dennis G6YBC

Distribution Change from Yahoo to Groups. Scatterpoint io

Thank you to all who have braved the transition to groups.io. Following the Scatterpoint migration to Groups.io (and a lot of hard work by Bryan/XYL to clean up the members list)...

- The download instructions have been updated at: http://www.microwavers.org/scatterpoint/download.htm
- The membership@microwavers.org address is now aliased to both Bryan's email addresses
- Paypal will now auto cc Bryan's membership address as well as the treasurer (pending further Paypal refinements)
- I have slightly updated the free Under-21 form which was using older info as well
- Membership applications to the old Yahoo Scatterpoint group have been blocked

Previous experience of migration requires some preparation by yourself to ensure this goes smoothly – and this varies depending whether you have ever used Groups.io. See September Scatterpoint.

SCATTERPOINT INTERNET DOWNLOAD:

Scatterpoint is distributed to UKuG members by Groups.io download. This is the most reliable way of getting Scatterpoint each month. What's more, you will have a choice of two formats to download: A4 single pages and A5 booklet editions (both in colour), which look really great when printed out on your colour printer.

Download Site: To join the Group go to: https://groups.io/g/Scatterpoint and click on the button

+Apply for Membership in this Group

Groups.io User-ID / Email Address: Groups.io uses your email address as a user-id.

It is extremely important to set up your account user profile to make your identity/callsign clear, otherwise UKuG reserves the right to reject your group membership if we cannot identify you as a current UKuG member (typically caused by obscure email addresses). The Editor and Membership Secretary will particularly appreciate making their life easier!

Notes:

Do not confuse this group with the UK Microwaves Yahoo Reflector, which nothing to do with UKuG.

The only emails you will receive from the Scatterpoint Group will be the monthly advice to say your new Scatterpoint is ready for download. It will typically remain there for TWO months.

At any one time, there will always be the present month's Scatterpoint and that of the previous month available. Very occasionally, we might send readers a special important message. We are also planning to send membership renewal notices this way as the system lends itself nicely to that. Many thanks for your co-operation.

NB1: Only paid up UKuG members are be able to use this facility so there is no danger of 'freeloaders' or spurious mail affecting you.

NB2: If you joined by being migrated from the former Yahoo Scatterpoint group - it is necessary that you reset and apply a fresh password; and logon to ensure your account profile clearly identifies your name/callsign as per the User-ID note above.

Membership of the new groups.io Scatterpoint group will be managed by the UKuG Membership secretary who will verify if you are a current paid-up member in a similar manner to its Yahoo predecessor. Contact: membership@microwavers.org

Tip: It can be worth adding the scatterpoint@groups.io email address to your contacts in order to 'train' any local spam filter.

From The Editor

Thanks to Murray for the explanation!

We've also launched the UKµG Wiki.

Martin RH G8BHC

SG Labs 2.3GHz transverter – Local Oscillator programming

Mike Stevens G8CUL/M0CUL/F4VRB

The SG Labs 2.3GHz transverter has the capability of providing 4 different Local Oscillator frequencies, selected by internal jumpers. For each channel, transmit and receive frequencies may also be set independently of each other.

As delivered, the 4 local frequencies are set as follows –

Channel	Jumper 1	Jumper 2	RX LO (MHz)	RX 2.3 GHz Frequency	TX LO (MHz)	TX 2.3 GHz Frequency
1	OFF	OFF	1870	2302 MHz	1870	2302 MHz
2	ON	OFF	1886	2318 MHz	1886	2318 MHz
3	OFF	ON	1888	2320 MHz	1888	2320 MHz
4	ON	ON	1968	2400 MHz	1968	2400 MHz

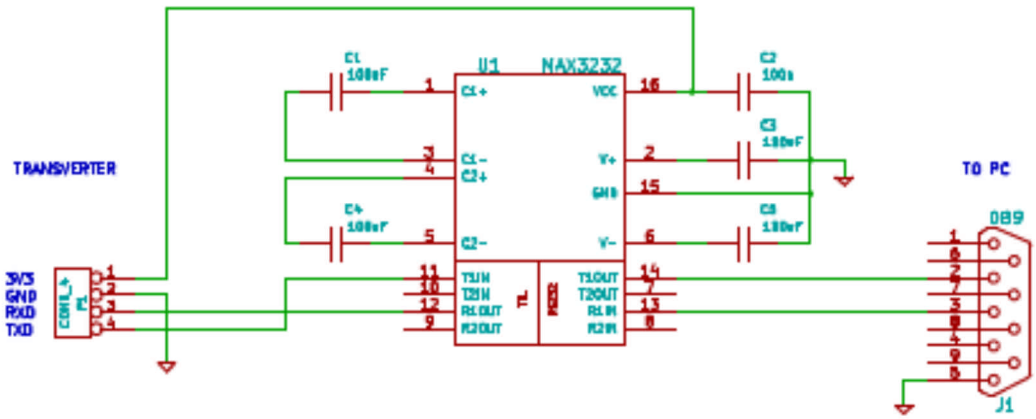
Table 1 As-supplied LO frequencies

All the above are assuming a 432MHz IF.

In the UK we are encouraged to use 2.30 GHz as well as 2.32 GHz, but as delivered, the transverter does not support 2.30 GHz with the use of a 432 MHz IF. It is however supported with a 430 MHz IF (channel 1 above). However, I think this could be a bit confusing when switching between 2.32 and 2.30 GHz as the IF would have to be changed too!

As stated, the 2.3GHz transverter comes delivered with the above frequencies as standard but the local oscillator frequencies can be re-programmed to be anything in the range 1868 – 2200MHz (RX) and 1868 – 2020 MHz (TX). The programming is relatively simple and uses a terminal emulator programme on the PC. Hyperterminal is ideal but isn't supported by Windows 7 and later (but can be copied over from an XP machine!). I use PuTTY which is freely available.

The transverter requires a serial communications link but at 3.3V levels, not ±6V as in true RS232. This can be produced by using the circuit below, or a USB to serial converter. I use a USB to serial converter from FTDI, the TTL-232R-3V3-WE with a simple connector adapter between the converter and transverter. This USB to serial converter is available from many suppliers.



Footnote [1]

The PC serial settings are –

9600 Bits/sec, 8 data bits, no parity, 1 stop bit, no flow control.

With everything connected and the terminal emulator running, switch on the Transverter. The terminal emulator should immediately show the screen below –

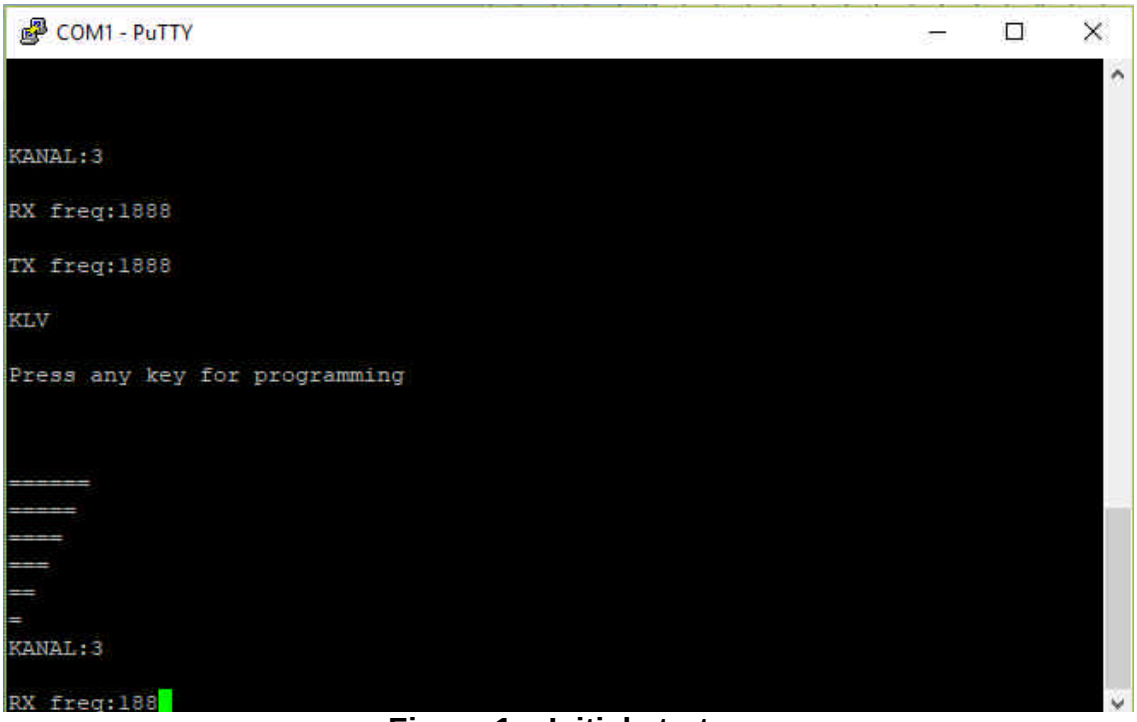


Figure 1 – Initial startup screen

It shows the channel currently set by the jumpers. After the string “Press any key for programming”, 6 lines of ‘=’ characters are displayed with a pause between each

[1] Acknowledgements and thanks to Hristiyan, LZ5HP

line. You have 3 seconds to press any key to switch the transverter to programming mode. Don't worry if you miss it, just switch off and start again!

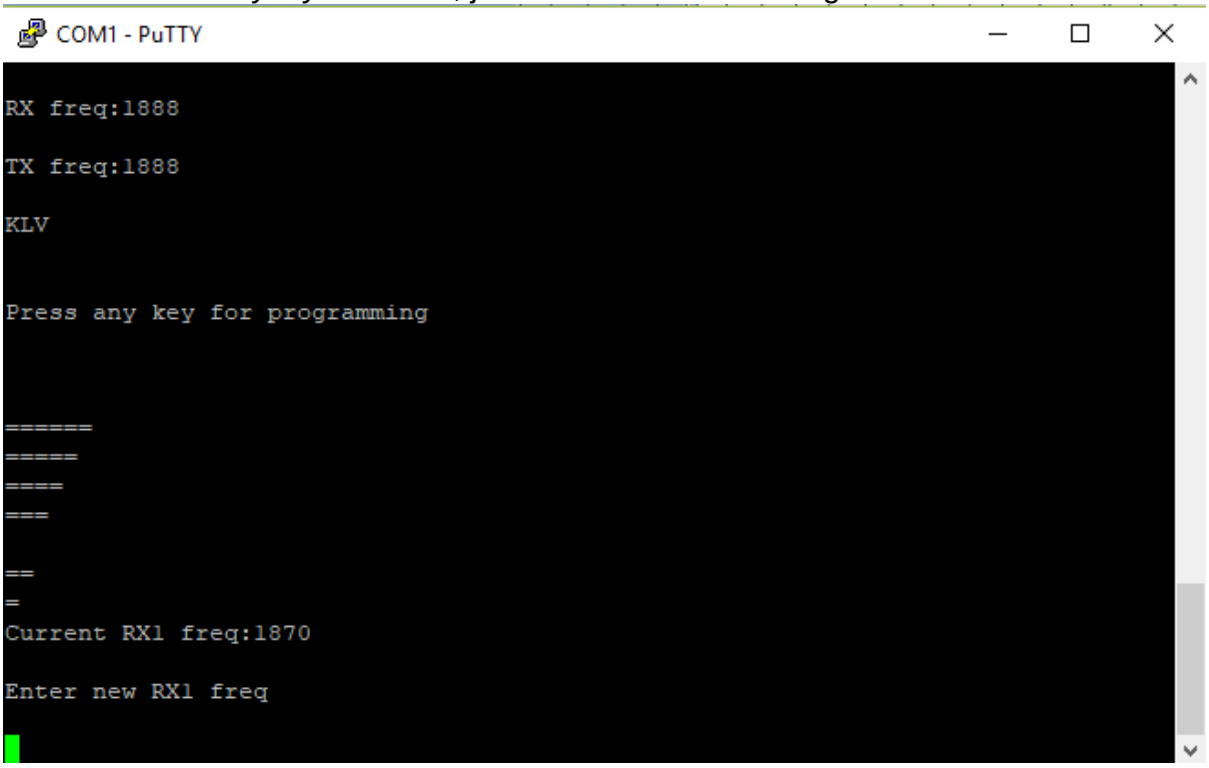


Figure 2 - Entering programming mode

When you have the programming screen showing, the transverter will show the current Local Oscillator frequencies in MHz, in turn, for all 4 channels, each with separate receive and transmit frequencies. Following each frequency, the message "Enter new XXn freq" is shown, where XXn is RX1, TX1, RX2 TX2 etc. Not entering anything at this stage will leave the frequencies at the current value.

When you get to the frequency you want to change, just type in the new frequency in MHz followed by <enter>. This new frequency will then be saved in non-volatile memory for future use. Non-volatile memory means that it won't be forgotten when the transverter is switched off.

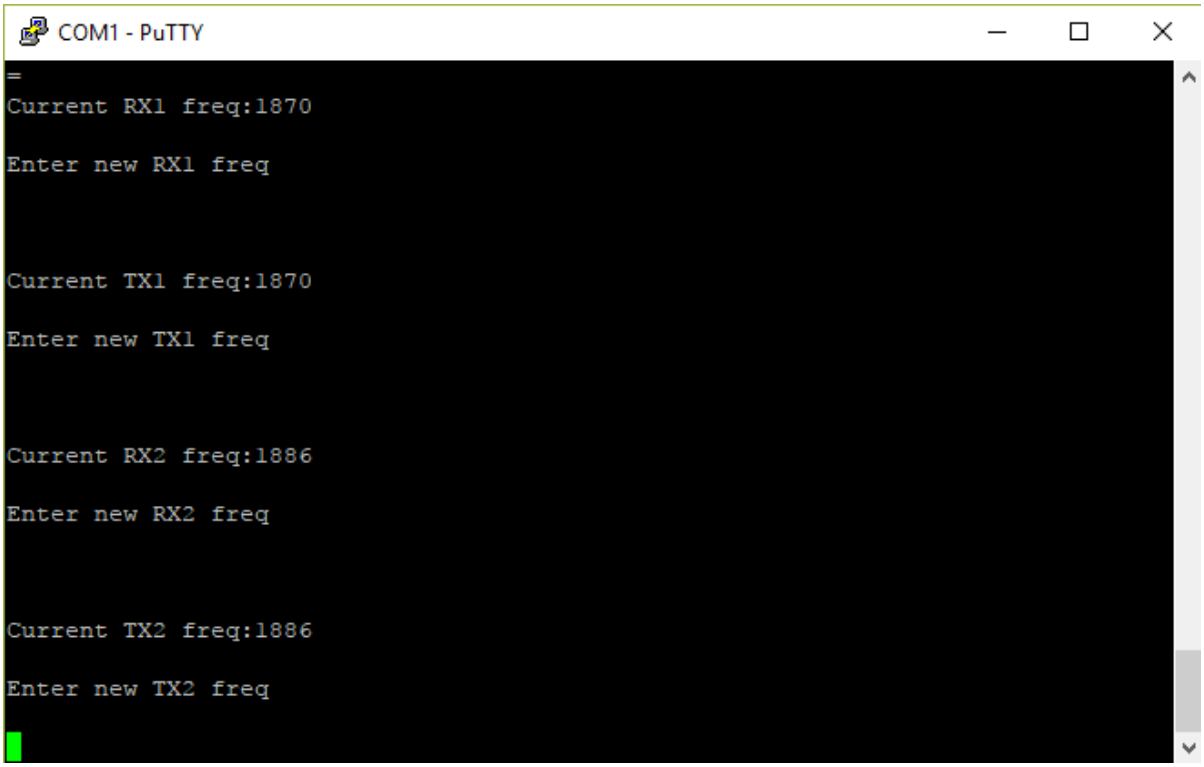
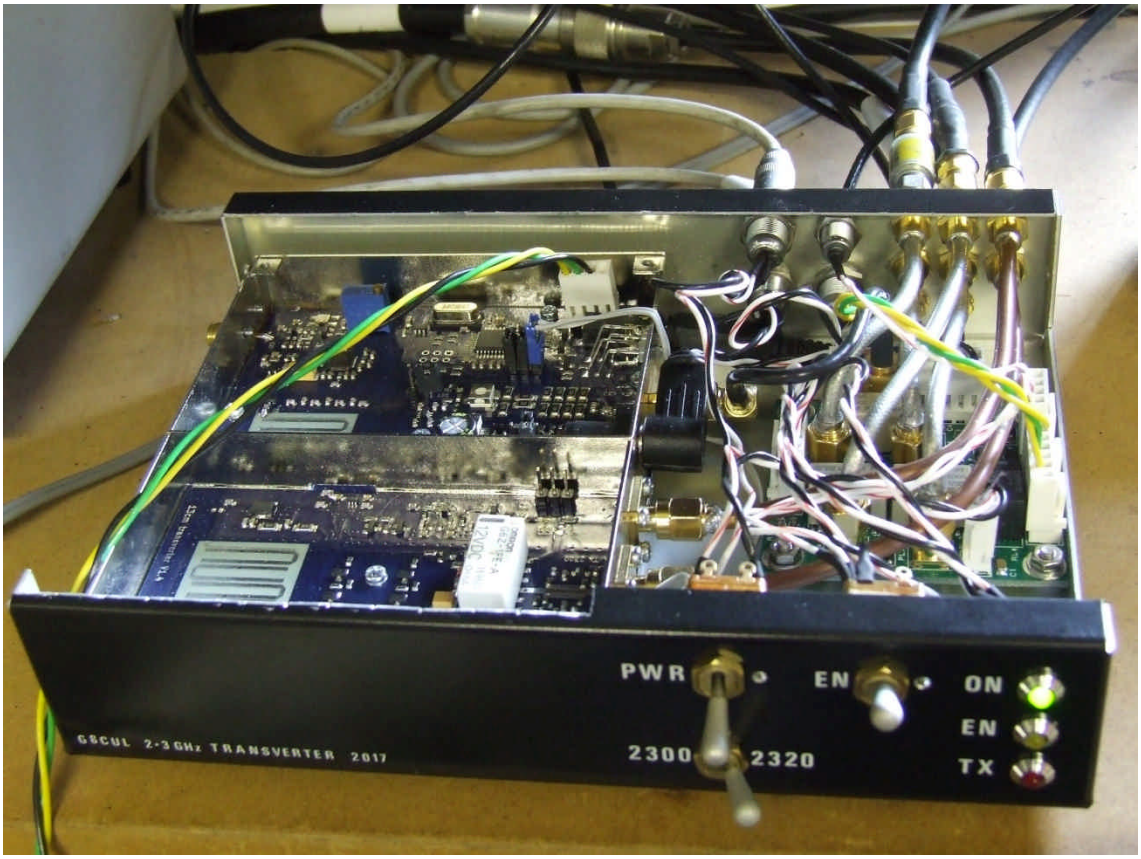


Figure 3 - Channels 1&2, RX &TX frequencies shown

I chose to change channel 4 to cover 2300 MHz so the Local Oscillator frequencies for both receive and transmit were changed to 1868 MHz. This gives 2.32 GHz on channel 3 and 2.30 GHz on channel 4. To give ease of channel selection, the jumper on position 1 was replaced by a header bringing the 2 wires out to a front panel switch.

Testing was carried out by listening to the Martlesham beacon on 2320.830 MHz and with the TPI synthesiser set to 2300.830 MHz. I has some concerns that maybe the power to the transverter would need to be cycled to effect the channel change, but testing shows that it does not! A simple switch change allows a quick swap between 2.32 and 2.30 GHz. Now all I have to do is re-tune the receive filter in the preamp to cover 2300 as well as 2320 MHz!

Below are some pictures of my 2.3 GHz transverter recently installed in its enclosure. I route the 432 MHz and PTT signals into the transverter enclosure and back out again to the 432 MHz preamp and PA. This allows a simple ‘enable’ switch to ‘grab’ the 432 MHz from the driver, switching over the 432 MHz and PTT. This is further complicated by the fact that I run separate receive and transmit coaxes so there are a lot of SMA connectors on the back panel!


PWR
EN
ON
EN
TX
G8CUL 2-3GHz TRANSVERTER 2017
2300
2320

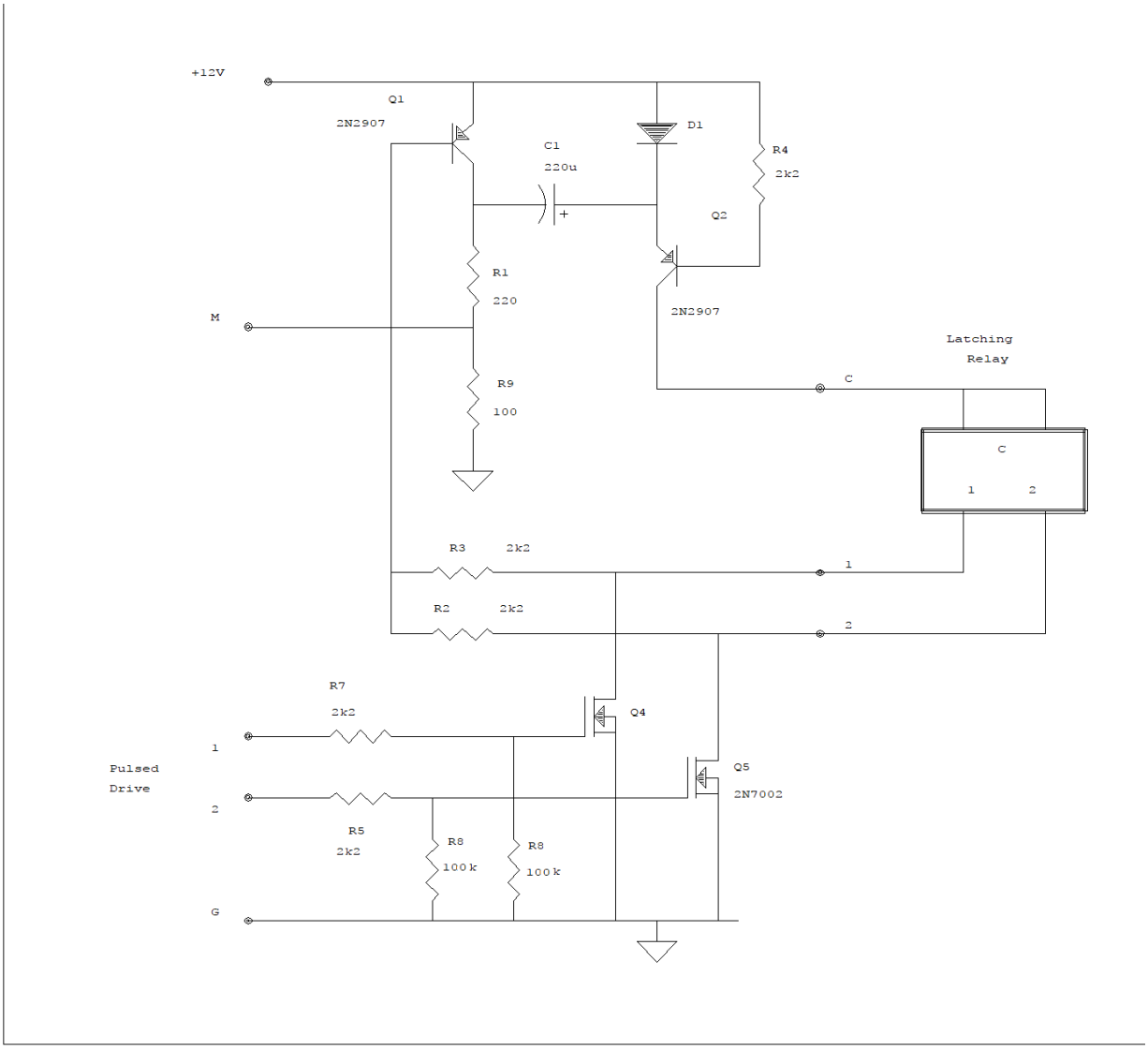

PWR
EN
ON
EN
TX
G8CUL 2-3GHz TRANSVERTER 2017
2300
320

Running 28V Latched Relays from a 12 V Rail

Andy Talbot G4JNT November 2017

A previous design http://www.g4jnt.com/DownLoad/minipulsedrelaydriver.pdf showed how a 28V standard (non-latching) relay can be driven from a 12V supply by providing an initial 'voltage doubling' pulse from a capacitor. Here we carry the concept a stage further to drive dual-coil latching relays using circuitry derived from that design.

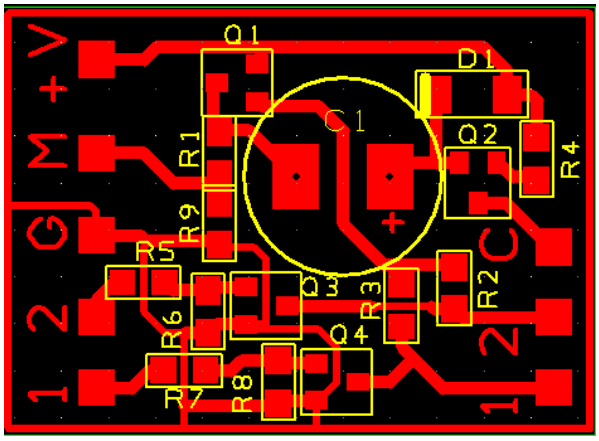
The circuit is shown in Figure 1 below. Q1 and Q2 function in a similar manner to that on the non-latching circuit, although the polarity has been swapped so they run on the high side. The DC holding path has been removed as only the initial pulse is needed – Q2 switches off when C1 has discharged. With no DC path through the relay, an alternative route has to be provided to recharge C1 during the waiting period. This is provided through R1 (and R9, see later).



Q3 and Q4 form the interface from the controller and select which coil is to be activated. A resistive OR function from these via R2 and R3 activates Q1. R6 and R8 are present just to stop the gates floating if left unconnected; R5 and R7 are there more as jumpers on the PCB than for any real function.

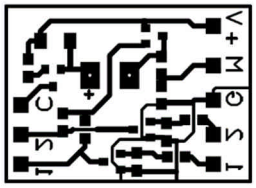
The Logic level drive (to the input terminals labelled '1' and '2') should consist of a pulse of a few tens or 100s of milliseconds, and should not be a continuous level. Whilst a DC level will cause no

damage as the relay itself is powered only via a the capacitor defined pulse drive, it does mean there will be continuous excessive dissipation of around 500mW in R1/R9.
No back-EMF protection diodes should be installed on the relay coils; they are not hard switched-off with the current reducing as C1 charges. Hence no damaging high voltage spikes can be generated.

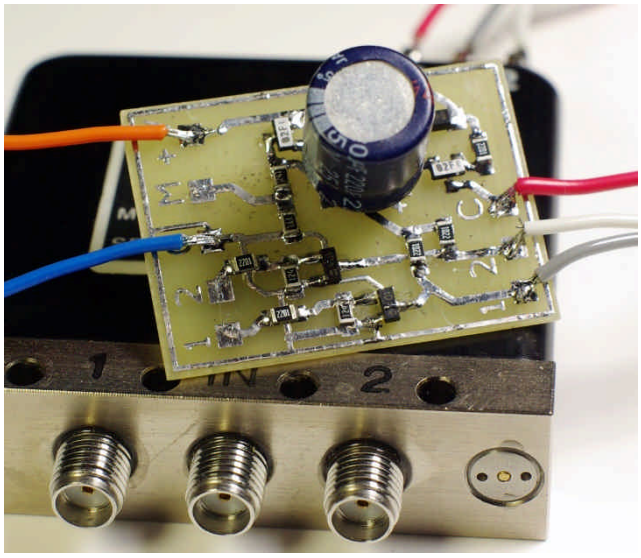


All the components fit easily onto a PCB of 32 x 23mm with the layout shown. This is small enough to attach onto the side of a typical SMA relay, or can be squeezed in somewhere.

Mirror imaged 1:1 PCB layout for home constructors. A higher resolution version in .PDF format can be found at:



http://www.g4jnt.com/DownLoad/LatchedRelayDriver_PCBMirrored.pdf



The board made up and connected to a relatively large relay with a coil resistance of 180Ω. The majority of latched SMA relays are smaller than this with a higher coil resistance, typically in the region of 500Ω. Although rated at 28V, it pulls-in at 15V. In the doubling circuit here it works from a supply as low as 8.5V

C1 Recharge Monitor.
An option that can add increased reliability to a system is to monitor the voltage on C1 during its recharge cycle, after the driving pulse has completed. If switching is done too rapidly, C1 may not recharge sufficiently to pull-in some relays when operating from a lowered supply. Just after transition, the voltage on the C1 negative terminal falls from V_{DD} towards zero as C1 charges. The time is determined by the value of C1 and the value of the charging resistor, and typically should be complete in 200 - 300ms.
The charging resistor is split into two, R1 and R9, to give a potential divider so the voltage on the [M]onitor pad will not exceed 5V. If a microcontroller such as a PIC or Arduino or similar, with A/D inputs, is used for sequence control and pulse generation – for example it may be used to also monitor RF levels or supply current – it is little effort to include an additional A/D channel from this point. Then the control software reads the capacitor voltage, and safely inhibits the sequence until the A/D reading indicates sufficient charge has built up. Belt-and-braces, but worth adding if a spare A/D channel exists.

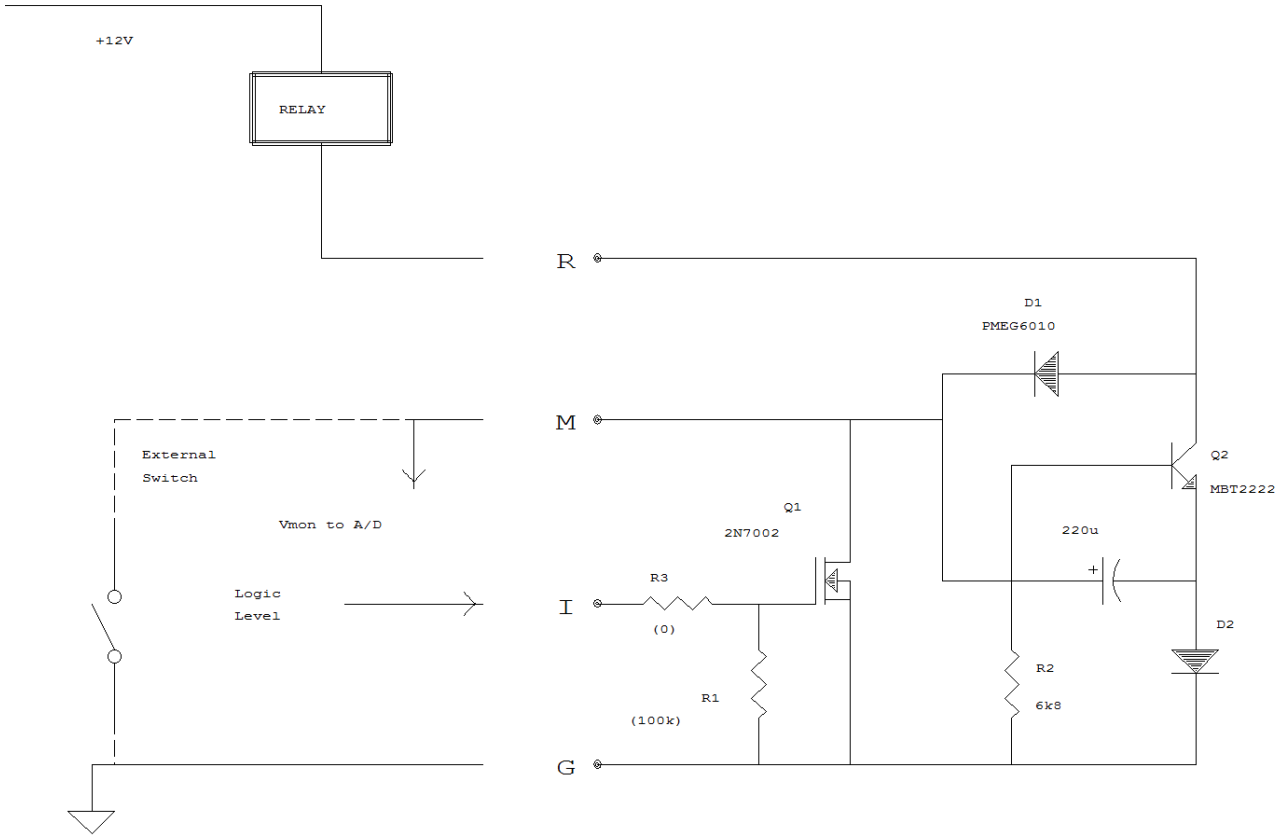
Miniaturised Pulsed Relay Driver for 28V Microwave Relays

Andy Talbot G4JNT November 2017

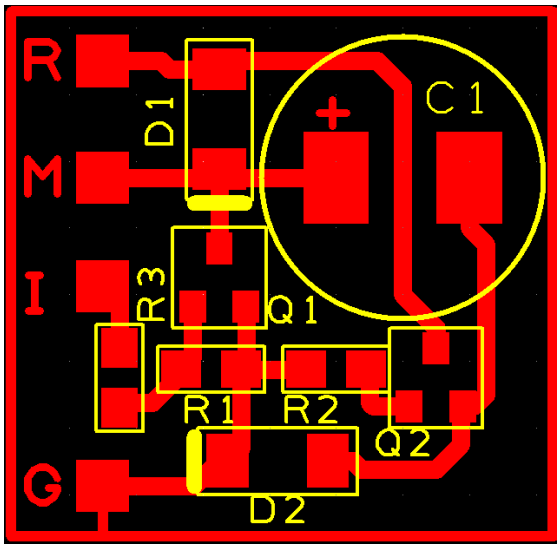
Circuit arrangements abound for driving relays with 28V coils from a nominal 12V supply. The Nov/December 2017 QEX [page 12] has a whole article dedicated to the subject, written by Joseph Haas, KE0FF. A minimum component-count solution is to give the relay an initial kick from a capacitor of a few 100uF that has been pre-charged from the supply voltage, and connected in series with the supply to the relay. This delivers an initial pulse of about twice that of the supply rail to start the pull in process. Once the relay coil has started its travel, a lower holding voltage, the nominal 12V supply, is more than adequate to hold it on. This is described fully in KE0FF's article.

One of the neatest arrangements I've seen is that on GM3SEK's website https://gm3sek.com/ that can be connected in series with the relay, (the circuitry doesn't need the +V supply going to the board) and provides its kick using what amounts to a [minus] -12V pulse on the bottom of the relay coil. It "…seems to have originated from K1KP and K6XX"'

Ian's designs are targeted at big chunky VHF high power relays so he uses appropriately rated components. For lower power microwave use, smaller components can be used, for example a 2N7002 MOSFET for the main switch and MBT2222 type for the auxiliary dump switch. Figure 1 below shows my implementation.

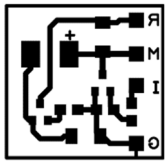


External connection nomenclature : [R]elay, [M]onitor [I]nput, [G]round. R1 is there to stop the input floating if left unconnected. R3 - just in case it may be needed. (It costs nothing to provide PCB pads and link them if unwanted but more effort to cut tracks and add them later). The value of R2 is not critical, D1 and D2 were just what I had available.



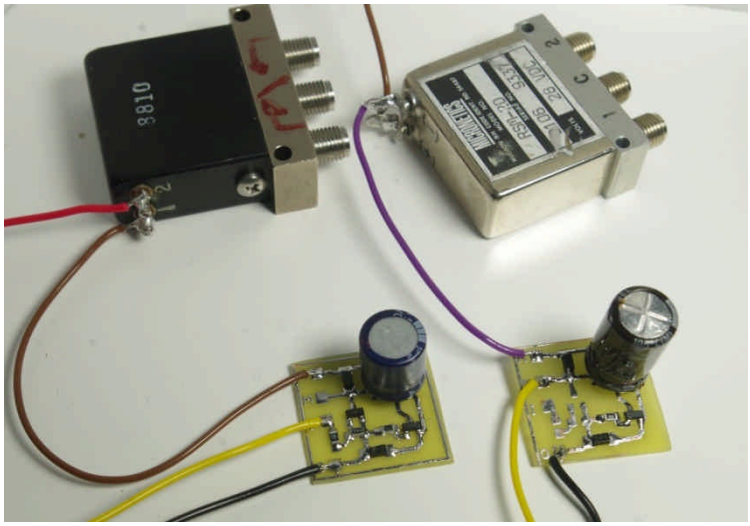
The design has the option for logic level drive (+5V Tx / 0V Rx) to the 'I' terminal or an external switch that may already be available can be connected to the 'M' terminal.

All the components fit easily onto a PCB of about 21mm square, with the layout shown. This is small enough to glue onto the side of a typical Transco type SMA relay, or can be squeezed in somewhere.



Mirror imaged 1:1 PCB layout for home constructors. A higher resolution version in .PDF format can be found at.

http://www.g4jnt.com/DownLoad/PulsedRelayDriverPCB_Mirrored.pdf



Two boards made up and connected to their respective relays. The one on the left is a Dynatech relay with a coil resistance of 180Ω. Although rated at 28V, it appears to pull-in at 14V and drops out at around 7V. In the doubling circuit here it works from a supply as low as 9V

The one on the right, configured for an external switch (Q1 etc. missing) is a Micronetics relay with a coil resistance of 180Ω which, although also rated for 28V, appears to pull in at the ridiculously low value of 9V and drop out around 5V. It pulls-in here from a supply as low as 6.5V.

C1 Recharge Monitor.

As a nice touch that can add higher reliability to a system, the voltage on C1 can be monitored during its recharge cycle, just after the transition from Tx to Rx. If Tx/Rx switching is done too rapidly, C1 may not recharge enough to pull-in some relays when operating from a lowered supply. Just after the Tx to Rx transition, the voltage on the M pad rises from about 0.7V towards the supply as C1 charges. The time is determined by the value of C1 and the relay coil resistance, and typically should be complete in 100 to 300ms.

If a microcontroller such as a PIC or Arduino etc with A/D inputs is already in use for Tx/Rx sequence control – for example it also monitors RF levels or supply current – it is little effort to include an additional A/D channel from this point. Then the control software reads the capacitor voltage, and safely inhibits the sequence to Tx until the voltage is sufficient. Belt-and-braces, but worth adding if a spare A/D channel exists.

A look at the phase noise performance of a range of synthesisers and references

Part 1. Roger Ray G8CUB

The move away from the traditional crystal oscillator / multiplier, to frequency synthesisers, has not been all beneficial. The improvement in getting directly to the required LO frequency, and stability when a good reference is used, has been offset by poorer, and often much poorer noise performance. Now a range of very good synthesiser chips have become available, from the likes of Analog Devices and others.

Although these chips are capable of good performance, to obtain excellent performance requires great attention to detail. The good news is that low cost boards and complete units are available on ebay. There is a whole range of synthesisers with maximum frequencies of 4.4, 6.8 & 13.6GHz. The higher frequency units being particularly attractive to multiplying up for the millimetre bands. If, and that's a big if, the noise performance is good enough.

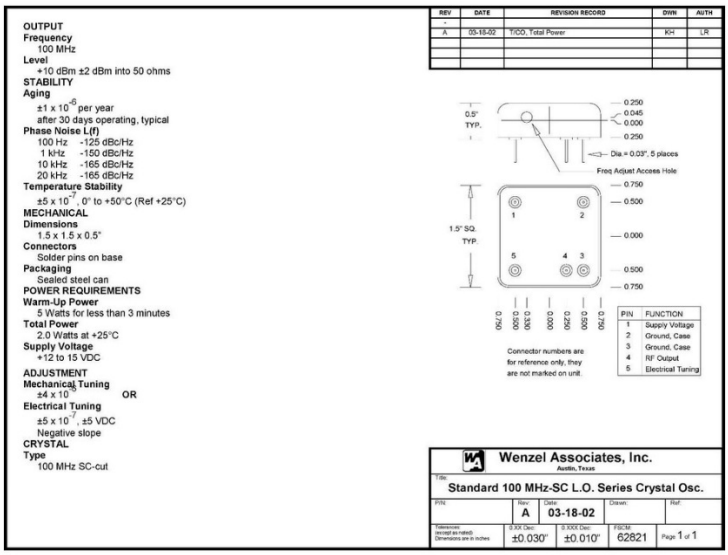
One of the big problems with wideband synthesisers is the gain of the VCO (sensitivity). If for example the VCO covers 6GHz with 6V, then the gain is 1000MHz / volt. So just 10uV of noise on the control line will FM modulate the VCO 10kHz. Thus ultra-low noise voltage regulators are required. This together with non-optimal layout and grounding, is where many of the low cost ebay synthesisers fall down.

The other problem is the accuracy, stability and noise performance of the reference. To obtain the best noise performance from the synthesiser, requires the use of high frequency references. The on-board references are not good enough for the higher microwave bands, or digital modes on the lower bands. The use of high performance external references is a way forward. Although some of the on board oscillators are on 'odd' frequencies. A good low phase noise reference should give the performance that we require inside the loop bandwidth of the synthesiser. This is often the only region we are really interested in. However when the noise is already on the control line, rather than within the oscillator, the best reference in the world, is not going to give the required noise performance.

It is intended to look at a number of commercially available synthesisers, and reference oscillators, and compare their noise performance. At one end of the cost range being a £15 ebay board, with an ERA 16GHz crowd funded signal generator at the other end at $750 (when available). Somewhere in the middle being the ZL 14G from ZL2BKC, and the Kuhne 13.6GHz synthesiser. For the higher bands in particular what is required is a replacement for the much used Elcom synthesisers, which have become scarce. Preferably with the option of external reference and more frequency setting versatility, and lower noise.

For the really high bands above 76GHz, good phase noise of the LO becomes difficult to obtain. We are fighting against the increase of noise with multiplication of 20 log n. Where n is the multiple in

frequency. Thus without any additional noise contribution, noise at 10GHz will be 60dB higher than 10MHz, and at 100GHz will be 80dB higher.
If starting at 10MHz an ultra-low noise reference is required. Talking with Brian Justin WA3ZMS, who holds many of the American firsts and records for the millimetre bands. He said he purchased two 10MHz references to his specification very early on, at an equivalent cost of a quality HF transceiver and linear!
A number of manufacturers make low phase noise reference oscillators. Wenzel in particular make some superb units, but at a cost.
Recently a small quantity of Wenzel 100MHz units appeared on ebay from Israel. The noise performance is very good, using an SC cut crystal. Stability is not as good as a 10MHz oscillator, but may well be good enough for many applications. For ultra-stability, phase locking to 10MHz with a low loop bandwidth, may be required.



OUTPUT
Frequency
100 MHz
Level
+10 dBm ±2 dBm into 50 ohms
STABILITY
Aging
$\pm 1 \times 10^{-6}$ per year
after 30 days operating, typical
Phase Noise L(f)
100 Hz -125 dBc/Hz
1 kHz -150 dBc/Hz
10 kHz -165 dBc/Hz
20 kHz -165 dBc/Hz
Temperature Stability
$\pm 5 \times 10^{-7}$, 0° to +50°C (Ref +25°C)
MECHANICAL
Dimensions
1.5 x 1.5 x 0.5"
Connectors
Solder pins on base
Packaging
Sealed steel can
POWER REQUIREMENTS
Warm-Up Power
5 Watts for less than 3 minutes
Total Power
2.0 Watts at +25°C
Supply Voltage
+12 to 15 VDC
ADJUSTMENT
Mechanical Tuning
$\pm 4 \times 10^{-6}$ OR
Electrical Tuning
$\pm 5 \times 10^{-7}$; ±5 VDC
Negative slope
CRYSTAL
Type
100 MHz SC-cut

REV	DATE	REVISION RECORD	DWN	AUTH
-				
A	05-18-02	T/CO, Total Power	KH	LR

0.5" TYP.
0.250
0.045
0.000
0.250
Dia = 0.03", 5 places
Freq Adjust Access Hole
1.5" SQ. TYP.
0.750
0.500
0.000
0.500
0.750
1 2 5 4 3
0.750 0.500 0.330 0.000 0.220 0.500 0.750

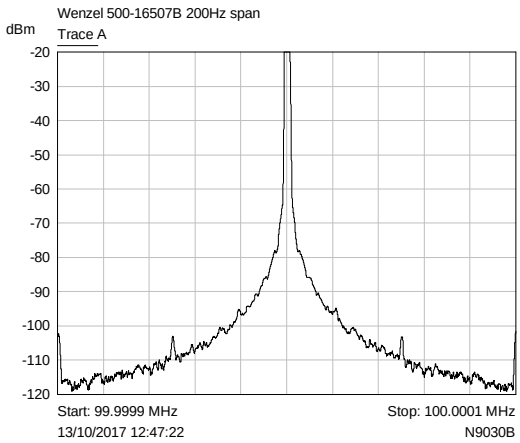
PIN	FUNCTION
1	Supply Voltage
2	Ground, Case
3	Ground, Case
4	RF Output
5	Electrical Tuning

Connector numbers are for reference only, they are not marked on unit.

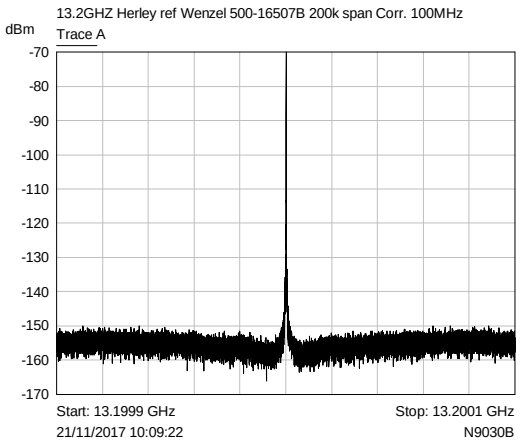
Wenzel Associates, Inc.
Austin, Texas
Standard 100 MHz-SC L.O. Series Crystal Osc.
A 03-18-02
±0.030" ±0.010" 62821 Page 1 of 1

Specification as shown with the crystal as advertised.
The 500-16507B supplied, had electrical tuning which I suspect is 0 to -5V. On frequency is approx. -2.0V. As minimal current is required, a 6 or 9V battery and 3.3V regulator, could supply this. LF and RF decoupling of the tuning pin is required.
To get stability a regulated supply is required. Specification is 12 – 15V, although measurement by John G8ACE suggest operation down to 9V (although phase noise has not been verified at this voltage). Thus a low drop 10V regulator could be the answer for portable operation from 12V.

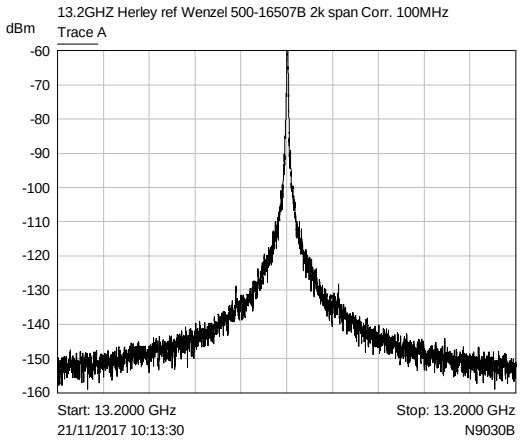
My measurements on the Wenzel 100MHz unit, were measured on a Keysight PXA Analyser. This was in no way good enough at 100MHz to measure the noise greater than 1 kHz out. Measurements at a wider span were measured using a Herley 13.2GHz DRO based PLL, locked to the 100MHz reference. This had a loop bandwidth of around 300kHz. Measurements were then scaled to 100MHz by subtracting 42.4dB.



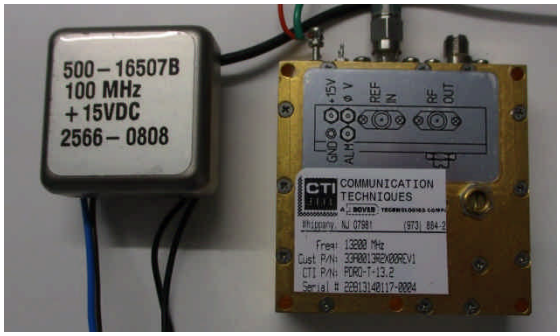
Measured directly at 100MHz Noise in dBc/Hz 200Hz span. Spurs at 50/100Hz are pickup on the bench. Ignoring those noise measured is circa -120 dBc/Hz +/- 100Hz. Equivalent noise at 10MHz would be -140dBc/Hz.



200kHz span measured at 13.2GHz and scaled to 100MHz



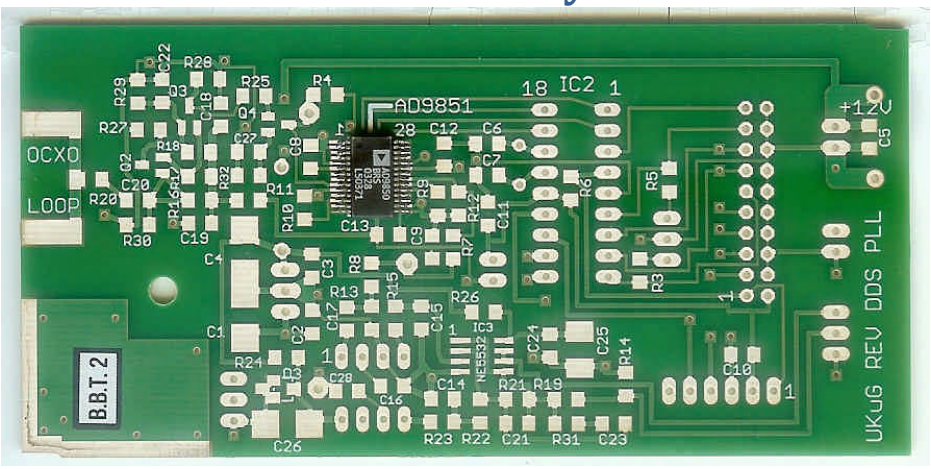
2kHz span measured at 13.2GHz and scaled to 100MHz



The Wenzel 100MHz used as reference for the Herley DRO. Supply on both 12.0V.

As good things can disappear quickly on the auction site, I purchased a few. So, I have available for purchase at cost, five units @ £35.00 each, delivered.
For once I am not making them available on a first-come basis.
Rather with limited quantity, on the most worthy use first.
If interested please email me directly mailto:g8cub@yahoo.co.uk

Reverse DDS Last time buy



John G8ACE has kindly sourced and kitted these useful kits for many years now, they have been built into many microwave beacons around the world and used to lock microwave local oscillator systems to precision references. In addition to generating FSK they are in use generating JT4 modes for suitably GPS equipped beacons. I use an RDDS with suitable switching to lock all my microwave local oscillators. When I heard that John was becoming too busy to supply more kits but had some material still in stock, I thought that as a service to the microwave community I would see that the remaining materials were offered as a last opportunity to buy. To this end I have put together part kits consisting of the PCB with the AD9850 already fitted, thanks to Ronny SM7FWZ. The part kit also includes all semiconductors and the tin plate box. All other materials are either “junk box” items or could be sourced from the UKuG Chip bank. These last remaining part kits are offered at cost + postage as a LAST TIME BUY on a first come first served basis at a price of £35.00. Place your order with me Brian G4NNS but don't send money until I confirm that a kit is available and allocated to you. The numbers are very limited.

More information at :- http://myweb.tiscali.co.uk/g4nns/RevDDS.html but no more full kits are available.

73 Brian G4NNS

PS attached picture shows the PCB with AD9850 fitted as will be supplied in the part kits.

Contest Results

John G3XDY, UKuG Contest Manager

October Contests

24GHz Contest October 22nd

Bad weather resulted in a limited turn out for this event, with just four stations active. G1EHF/P and G8CUB/P both roved to two sites for this event.
Congratulations go to the joint winners Dave G1EHF/P and Barry G4SJH/P.

Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX km
1=	G1EHF/P	IO91KF	2	82	G4SJH/P	41
1=	G4SJH/P	IO91RF	2	82	G1EHF/P	41
3	G8CUB/P	JO01GR	2	66	G0FDZ/P	33

mm-wave Contest Championship 2017 final positions

Last year's winner G8CUB/P repeated his strong performance on 24GHz and 76GHz but was pushed into third place in closely fought contest on 47GHz. Congratulations go to Roger as winner on 24GHz and 76GHz. Roger will also receive the G0RRJ Memorial Trophy.
On 24GHz the runner up is Neil G4LDR/P.
47GHz sees Keith GW3TKH/P take the leading position, with runner up Neil G4LDR/P close behind. The leading three scores were very close.
Keith GW3TKH/P is runner up on 76GHz, entering two sessions out of the four.
The poor weather conditions for the last event in October resulted in no entries on the 47GHz and 76GHz bands, and a low turnout on 24GHz.
The dates of this year's events were altered following feedback last year, but the vagaries of the British weather conspired against entrants again this year.
John G3XDY

Final positions after four events, the best three count to the total

24GHz

Pos	Callsign	21/05/2017	18/06/2017	17/09/2017	22/10/2017	TOTAL
1	G8CUB/P	0	987	1000	805	2792
2	G4LDR/P	747	1000	536	0	2283
3	GW3TKH/P	544	639	710	0	1893
4	GW4HQX/P	0	881	913	0	1794
5	G3ZME/P	1000	3	623	0	1626
6=	G1EHF/P	0	0	0	1000	1000
6=	G4SJH/P	0	0	0	1000	1000
8	M/VK4OE/P	0	0	379	0	379
9	G1DFL/P	0	0	277	0	277
10=	G4FVP/P	0	0	100	0	100
10=	M0DTS/P	0	0	100	0	100

47GHz

Pos	Callsign	21/05/2017	18/06/2017	17/09/2017	22/10/2017	TOTAL
1	GW3TKH/P	1000	863	768	0	2631
2	G4LDR/P	790	1000	781	0	2571
3	G8CUB/P	656	873	1000	0	2529
5	GW4HQX/P	0	863	768	0	1631
4	M/VK4OE/P	0	0	590	0	590

76GHz

Pos	Callsign	21/05/2017	18/06/2017	17/09/2017	22/10/2017	TOTAL
1	G8CUB/P	1000	1000	769	0	2769
2	GW3TKH/P	762	0	1000	0	1762
3	G4LDR/P	475	116	463	0	1054
4	GW4HQX/P	0	0	616	0	616

The rules and calendar for the 2018 series of UK Microwave Group contests will be published in early January 2018. Feedback and suggestions on the rules and dates of the events are very welcome prior to the end of December 2017 - please email to me at g3xdy@btinternet.com

73

John G3XDY, UKuG Awards Manager

80m UK Microwavers net

Tuesdays 08:30 local on 3626 kHz (+/- QRM)

73 Martyn Vincent G3UKV

This month I 'ave been mostly.....

From Chris Whitmarsh G0FDZ

....building my new CW transmitter for 122 & 134 GHz, which uses the new DB6NT LO as the heart of the frequency generator. The transmitter will be used with the existing 122 & 134 mixer systems that will now be mainly used for reception only.

Scottish Microwave Round Table

Report by Martin Hall GM8IEM and Brian Flynn GM8BJF

The seventh Scottish Microwave Round Table (GMRT) was held on Saturday 3 November 2017 at the Museum of Communication (MOC), Burntisland. Over 40 participants attended the event during the day.

The MOC was buzzing with life soon after the doors opened at 9:30 AM – while the stalls were being set up there was lots of friendly chat over welcome cups of coffee. In fact, the museum staff kept us well supplied with tea, coffee, biscuits and scones (plain and jam!) throughout the day, as well as providing a splendid buffet lunch. Test and measurement facilities were set up by Brian Flynn GM8BJF and David Stockton GM4ZNX. They were in the museum display area as usual, along with the tables occupied by traders. As in previous years, plenty of time was allocated in the programme for catching up on the "craic".

The "formal" proceedings started at 10:30 AM with a welcome to the venue by Professor Tom Stevenson from the MOC. The morning session was chaired by Martin Hall GM8IEM, UK Microwave Group (UKuG) GM representative, who asked those present to update the Directory of Scottish Microwave Activity (including stations from nearby areas) as a reference for those considering who they might be able to work on the microwave bands (especially when upgrading their stations).

The programme opened with a talk by Mark Hughes GM4ISM entitled "A 10 GHz Home Station", in which he systematically described all the options open to a home station and the practical considerations and pros/cons associated with each. This prompted a stimulating question and answer session in which the experiences of those present were shared, and this continued though the break that followed.

Due to a cancelled flight, the talk by Geoff Pike GI0GDP was moved to the last session of the day, so a change in the programme was necessary. Andy Sinclair MM0FMF stepped in next and gave a lively and well-illustrated presentation on “13cm SOTA”, supported by Jack Hood GM4COX. He described the activity of a group of stations which had been prompted by last year’s talk on 13cm by John Worsnop G4BAO. They had gone ahead with a bulk order for the SG Labs transverter at a discount price, and followed it up by supporting each other getting going on the band. This intrepid band of activists has set up a group on groups.io primarily to publicise their SOTA expeditions, although it also covers 13cm activity more generally in Scotland and neighbouring areas – details at https://groups.io/g/gm13

Whilst lunch was being set up in the conference room, attendees assembled in the museum where the entries for the GM4LBV Projects Trophy were displayed. The usual excellent buffet lunch (included in the entrance fee) was provided by the MOC staff.

The afternoon session was chaired by Brian Flynn GM8BJF, the first talk being given by David Anderson GM6BIG about the development of “A High Quality 10 GHz Beacon”, designed to operate near an operational amateur station without causing interference due to phase noise and spurious emissions. This focussed on the architecture of a system using the ADS9852 DDS chip, and the techniques needed to clean up the noise and spurious signals. The spectrum displays showed clearly the benefits that were obtained by taking straightforward measures such as separating and regulating the different power supplies for each functional block, screening, filtering etc. It led to an interesting discussion in the Q&A session which covered the need for care in designing power supply earth returns.

During the break which followed, the judging of the entries for the GM4LBV Projects Trophy took place by John Worsnop G4BAO and Andy Sinclair MM0FMF As usual there was great difficulty in selecting the best project, and after much deliberation the judges chose the 13cm signal analyser by Kevin Avery G3AAF as the winner. Kevin will be expected to write up the entry for "Scatterpoint", and it will be taken forward to next year's UK Microwave Group G3VVB Projects Trophy competition. Microwavers in GM and nearby areas please remember to submit something next year: built, modified, hardware or software.

Brian Flynn GM8BJF then led a discussion about the future of GMRT events, and there was strong support for the next event to take place in November 2018 – with a request that the date be announced early so it could take priority in everyone’s diary. There was also discussion of the future of the GB3EDN Edinburgh 23cm beacon. Brian also advised those present that the organising committee would be issuing a call for papers for the 2018 event, and requested anyone prepared to give a talk to get in touch with him as soon as possible.

A big round of applause greeted the final speaker Geoff Pike GI0GDP, who arrived hotfoot from the airport just in time to fit in his talk before the end of the day. In this he examined various “Replacement LO Options for the DB6NT G2 Transverters”, based on his own experiences, describing the ease or difficulty of implementation, and performance. This prompted more sharing of experiences by those present in the Q&Q session which followed.

Brian Flynn GM8BJF made the closing remarks, and the museum staff were thanked and applauded for their support and each was awarded a gift. The organising committee were also thanked for their hard work in making this event yet another success, with more loud hand-clapping

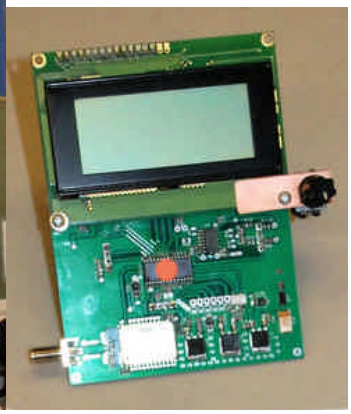
Many attendees (and some YL/XYLs) moved on to the Kingswood Hotel in the evening for further chat and an excellent meal, followed by an auction of microwave related publications and some very interesting bits and pieces which raised money for MOC funds. This was followed by musical entertainment provided by the "Microwave Band" , this year consisting of Ian White GM3SEK, Nadine White MM0WNW and John Cooke GM8OTI.

The "organising committee" (Roger Blackwell GM4PMK, John Cooke GM8OTI, Brian Flynn GM8BJF, 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, Alan Masson GM3PSP and Pete Bates GM4BYF for local support.

09-Nov-17 Prepared by Martin Hall GM8IEM and Brian Flynn GM8BJF.

Martin GM8IEM with speakers Mark GM4ISM, Geoff GI0GDP, Andy MM0FMF and David GM6BIG

John G4BAO presents the trophy to Kevin Avery G3AAF. The trophy goes south of the border this year!



G3AAF 13cm source & analyser

Activity News : October 2017

By Neil Underwood G4LDR

Please send your activity news to:

scatterpoint@microwavers org

Introduction

October seems to have been relatively quiet despite the RSGB/IARU UHF to microwave contest and a couple of openings as reported by John G3XDY. I am aware that on several Wednesday evenings recently there have been tests using various digital modes on the microwave bands; it would be good if someone could summarise what has been achieved and send a report to Scatterpoint.

Band Reports

From John, G3XDY, JO02.

A summary of recent activity is attached below. A new homebrew 13cm transverter had its first real airing in the October UHF Contest, it has capability for 2300MHz as well as 2320MHz, with the LO locked to a 10MHz reference, and drives a modified Lucent iPAM amplifier, which produces about 300W on 2300MHz and 250W on 2320MHz.

There have been two good tropo openings in October as well as the UHF Contest at the start of the month.

QSO worked by G3XDY on 23 cm.
From 01/09/2017 to 01/11/2017 Distance over: 700 Km.

DATE	TIME	CALLSIGN	LOCATOR	QRB
31/10/2017	21:56	EA2XR	IN83KI	1020
14/10/2017	22:15	EA2TZ	IN83WE	1017
14/10/2017	21:46	OE5VRL/5	JN78DK	1012
14/10/2017	21:09	EA2AWD	IN93CI	993
14/10/2017	21:02	F6AJW	IN93EK	982
14/10/2017	19:10	F1MOZ	IN93RS	931
14/10/2017	19:04	F5ICN	JNØ3BF	985
08/10/2017	08:29	DM7A	JO6ØLK	836
07/10/2017	20:23	DF4IAO	JN48WM	730
07/10/2017	19:25	DFØYY	JO62GD	773
07/10/2017	16:36	OK2A	JO6ØJJ	826
07/10/2017	15:03	DR5T	JN47KW	714

QSO worked by G3XDY on 13 cm.
From 01/09/2017 to 01/11/2017 Distance over: 500 Km.

DATE	TIME	CALLSIGN	LOCATOR	QRB
01/11/2017	09:42	F6APE	IN97PI	541
31/10/2017	20:23	F5EAN	JNØ6CP	606
14/10/2017	22:00	OE5VRL/5	JN78DK	1012
14/10/2017	21:11	F6AJW	IN93EK	982
14/10/2017	19:16	F1MOZ	IN93RS	931
07/10/2017	21:55	DL3IAE	JN49DG	587
07/10/2017	19:59	DL3IAS	JN49EJ	585
07/10/2017	18:14	DLØGTH	JO5ØJP	683
07/10/2017	17:58	DJ5AR	JN49CV	546
07/10/2017	14:42	DR9A	JN48EQ	631

QSO worked by G3XDY on 9 cm.
From 01/09/2017 to 01/11/2017 Distance over: 500 Km.

DATE	TIME	CALLSIGN	LOCATOR	QRB
14/10/2017	21:48	OE5VRL/5	JN78DK	1012
07/10/2017	22:02	DL3IAE	JN49DG	587

QSO worked by G3XDY on 6 cm.
From 01/09/2017 to 01/11/2017 Distance over: 400 Km.

DATE	TIME	CALLSIGN	LOCATOR	QRB
01/11/2017	09:35	F6APE	IN97PI	541
14/10/2017	21:55	OE5VRL/5	JN78DK	1012
14/10/2017	21:40	F6AJW	IN93EK	982
08/10/2017	13:25	DLØGTH	JO5ØJP	683
08/10/2017	12:15	DR9A	JN48EQ	631
07/10/2017	22:07	DL3IAE	JN49DG	587
07/10/2017	14:35	DFØMU	JO32PC	415

QSO worked by G3XDY on 10 GHz
From 01/09/2017 to 01/11/2017 Distance over: 400 Km.

DATE	TIME	CALLSIGN	LOCATOR	QRB
01/11/2017	09:32	F6APE	IN97PI	541
14/10/2017	21:59	OE5VRL/5	JN78DK	1012
14/10/2017	21:29	F6AJW	IN93EK	982
07/10/2017	14:40	DFØMU	JO32PC	415

.....and finally

The deadline for activity reports to be included in the next issue is Friday 1st December 2017.

Events calendar

2017

Oct 26 Ð 29	Microwave Update, Santa Clara, California	www.microwaveupdate.org
Nov 4	Scottish Round Table	www.gmroundtable.org.uk/

2018

January 13	Heelweg	www.pamicrowaves.nl/
February 9–11	Hamcation, Orlando, Florida	www.hamcation.com/
February 17	Tagung Dorsten	www.ghz-tagung.de/
April 7	CJ-2018, Seigy	http://cj.r-e-f.org/
April 14-15	Martelsham	
April 21	RSGB AGM	www.rsgb.org/agm
May 18–20	Hamvention, Dayton	www.hamvention.org/
June 1–3	Ham Radio, Friedrichshafen	www.hamradio-friedrichshafen.de/
July 7–8	Finningley RT	www.g0ghk.com/
August 17–19	EME2018, Egmond aan Zee,NL	www.eme2018.nl
Sept 7–9	63.UKW Tagung Weinheim	www.ukw-tagung.de/
Sept 23–28	European Microwave Week, Madrid	www.eumweek.com/

2019

May 17–19	Hamvention, Dayton	www.hamvention.org/
TBA	Ham Radio, Friedrichshafen	www.hamradio-friedrichshafen.de/
Sept 15–20	European Microwave Week, Utrecht	www.eumweek.com/

NB Some of the 2018/19 event links may not be working/updated yet.

EME 2018: Booking

The website http://eme2018.nl/ is online. Booking now open mailto:info@eme2018.nl to register interest and for updates.

There's also a Facebook page:

https://www.facebook.com/EME2018/

73!
Jan PA3FXB (team PI9CAM) team EME 2018

Editor's note

Martin G8BHC should be back from his Antipodean adventures to complete the editor's duties of the next edition, hopefully! I look forward to seeing a few of you at Heelweg (low cost flights available Stansted to Eindhoven).

73 de Roger G8CUB