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UKuG

scatterpoint

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In This Issue

JT4 on 122GHz part 2 G8KHU & G1TVL

The Ups and Downs of dish tilting Clive GW4MBS

UK Microwave Group

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The following subscription rates apply.

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

Please send them to

editor@microwavers.org

The CLOSING date is

the FIRST day of the month

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

Please submit your articles in any of the following formats:

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

Spreadsheets: Excel, OpenOffice, Numbers

Images: tiff, png, jpg

Schematics: sch (Eagle preferred)

Please send pictures and tables separately, as they can be a bit of a problem.

Thank you for you co-operation.

Roger G8CUB

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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 (e.g. 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 contact the committee.

The current list is available at

www.microwavers.org/tech-support.htm

UKµG Chip Bank – A free service for members

By Mike Scott, G3LYP

Non-members can join the UKµG 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 components on the site will not be a guarantee of availability of that component.

The service is run as a free benefit to all members of the UK Microwave Group. The service may be withdrawn at the discretion of the committee if abused. Such as reselling of components.

There is an order form on the website with an address label which will make processing the orders slightly easier.

Minimum quantity of small components is 10.

These will be sent out in a small jiffy back using a second class large letter stamp. The group is currently covering this cost.

As many components are from unknown sources. It is suggested values are checked before they are used in construction. The UKµG can have no responsibility in this respect.

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

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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: **Contact Roger G8CUB (roger@valendine.co.uk) for more information. Neil G4DBN looks after the equipment.**

3.4GHz 5.7GHz 10GHz 24GHz 76GHz

JT4 on 122 GHz - and the Continuing Evolution of a Portable System (Part 2)

Dave Fielding G8KHU / Dave Haynes G1TVL

This is the second part of a series of articles based on the presentation we gave at the Midlands Roundtable in November 2024. It has been revised and improved in light of insights and feedback of the attendees at the presentation, so some minor detail is different than originally presented. This article describes the hardware of our implementation, a description of the software will follow in the next part.

From the link budget calculations (see part 1) it was apparent that our best dx using the VK3CV 20 dB horns was going to be of the order 5 to 10 km. We would therefore need to find a set of paths that would enable us to explore a good spread of distances within the range 0 to 10 km – a granularity of 0.5 km would be ideal.

Both of us live in the south of England (Newbury and near Southampton) where the local countryside is gently undulating and often wooded. It soon became obvious that we couldn't identify a series of vehicle accessible points between which we could obtain anything like the LoS path distance granularity we wanted. Our only option was to use footpaths and bridleways to access suitable operating points.

This immediately meant that we needed an integrated system which was easily transported on foot by a single person in a single trip. For various reasons we wanted to keep the VK3CV hardware self-contained, which ruled out a single box solution. A two box solution was therefore our target.

The minimum requirement for the main unit was a JT4 encoder and decoder, a reference oscillator capable of producing FSK, an IF receiver with suitable demodulation capability and a control system - preferably with a reasonable graphical display.

Encoding and decoding JT4

In its standard implementation WSJT-X uses a PC and sound card to interface to an SSB transceiver. In transmit the sound card outputs a series of audio tones which SSB modulation converts to individual frequencies, so outputting FSK. In receive the incoming FSK is SSB demodulated back to baseband resulting in a series of output tones which are passed to the sound card for decoding the main WSJT-X program.

The VK3CV system is based on the TRA120-002 device and the receive path is a conventional LO/Mixer downconverter so, given a suitable SSB demodulator at IF output, the standard PC/soundcard WSJT-X system can be utilised.

However the TRA120 device does not support any amplitude modulation schemes in transmit, thus precluding the use of a standard implementation of WSJT-X. Various ingenious schemes have been proposed to overcome the shortcomings of the TRA120 in this matter, and these have been neatly summarised by Mike K6ML [1] and Barry G8AGN [2].

Apart from the frequency hopping the synthesiser method the schemes all appeared to compromise performance to some degree or other by utilising sidebands to convey the JT4 signal with a significant proportion of the output power remaining in RF outputs which either do not convey information or duplicate it (in some ways analogous to AM vs SSB modulation). Frequency hopping the synthesiser overcomes this issue but requires direct access to the SPI synthesiser bus, which would require substantial modification the VK3CV board and software. We ruled this out as we wanted to preserve the VK3CV board in its original form for compatibility with other stations.

We decided that we would produce a true FSK output by micro-stepping the reference frequency using a DAC; the PLL on the VK3CV board would then track the multiplied reference to produce the required FSK frequencies. For this approach it is necessary that (i) the loop bandwidth of the VK3CV PLL be significantly greater than the highest frequency component of the JT4 symbol/frequency stepping waveform, likewise (ii) the OCXO modulation bandwidth must also significantly exceed this and (iii) that the frequency quantisation due to DAC resolution must be small compared with the decoder frequency tolerance. These requirements are considered in the next section.

Assuming that we could satisfy the above three criteria how were we to generate the JT4 message in a format that can be translated to DAC values? The standard WSJT-X suite of includes several standalone utilities which run from the console (command line). Amongst these is “JT4CODE” which takes a text string formatted as a JT4 message and encodes it. Crucially its output is a text string of 206 tone numbers, which is trivial to convert to a sequence of DAC codes. For example:

Input string: **CQ G1TVL IO90** “

Output string: 2 2 0 1 1 0 2 2 3 3 2 1 1 0 0 1 ………. 3 2 3 1 3 1 2 1 0 1

When running on a PC, WSJT-X GUI calls the program JT9 to decode JT messages. This program can be run standalone via the console taking a .WAV audio file as its input and decoding it to produce a plain text output string.

FSK and the Reference Oscillator

The VK3CV board uses an on-board 10 MHz TCXO both as its reference for the PLL and for clocking the PIC microprocessor. A trivial modification disables the on-board oscillator and enables the use of an external 10 MHz reference source. This change is the only modification strictly required by our implementation.

As a source we chose an OCXO for best stability. Initially we thought that this should be GPS locked, and indeed spent some time investigating this. However once we had the system up and running in FM mode we found that GPS locking was not required with the particular OCXOs we chose (salvaged from ex-military radios), simply setting them against a GPS standard every few weeks was sufficient that we never found more than a kilohertz or so of error between the two of us. Of course this is helped by the short ranges we were operating over ensuring the ambient environment for both stations was well-nigh identical.

The three requirements earlier identified for successful JT4 modulation were then considered. The symbol rate of JT4 is ~ 4Hz i.e. a period of ~250 ms per symbol. If we assume that the rise / fall times of the modulation steps are to be ≤1% of the symbol duration (2.5 ms) then we need an overall frequency response of ≥ 880 Hz.

The first, determination of the PLL loop bandwidth, was a simple exercise using the Analog Devices ADIsimPLL program [3]. This quickly showed that the loop bandwidth is 76.8 kHz and the FM modulation response of the loop is well in excess of 10 kHz. This hugely exceeds the JT4 modulation requirement and so does not present any problems*.

> * Provided that all the frequency components of the modulation are within the modulation bandwidth of the loop then the loop will track the modulation. However with a step input to the loop, such as the transition between symbols, the frequency components of the step may exceed the modulation response, in which case the loop will momentarily lose phase lock resulting in overshoot and ringing causing spectral regrowth (splatter) as lock is regained.
>
> While this is not a practical problem at 122 GHz it is far from good practice and can be eliminated by tailoring the frequency response of the modulation source. A simple low-pass network between the modulation DAC output and the OCXO control input is all that is required.

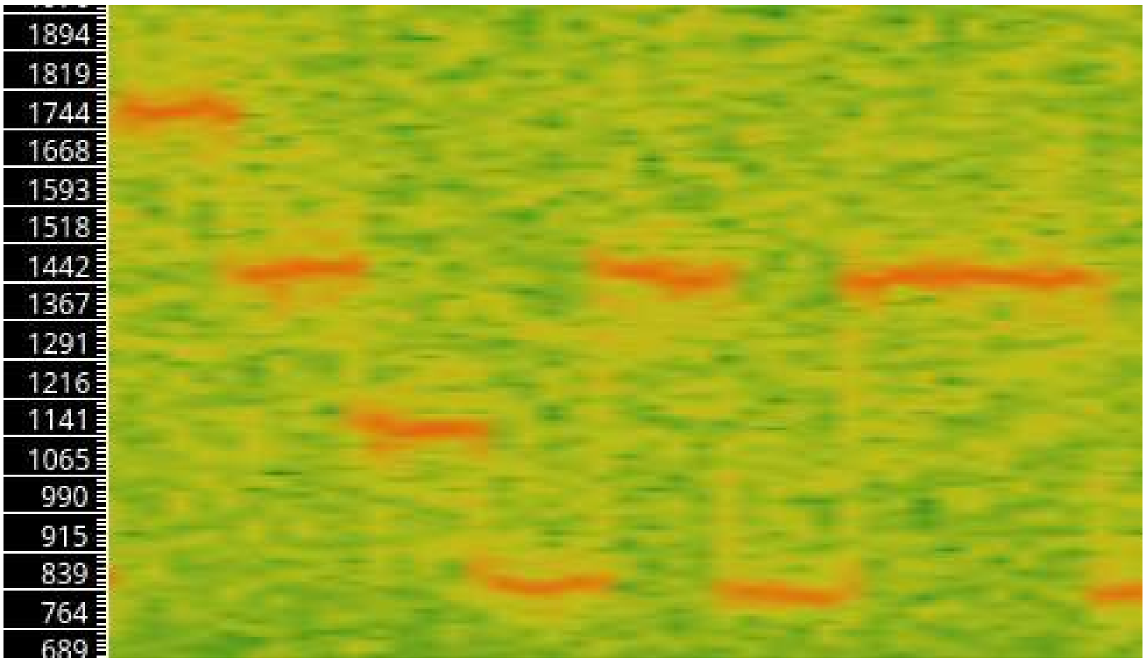
We did not formally determine the modulation response of the OCXO (this remains on our “to do” list), instead we empirically/qualitatively evaluated its suitability by using the OCXO as a reference for the VK3CV board. The OCXO was modulated with a 2 Hz square wave having fast rise and fall times. FM demodulation of the TRA120 VCO divider output showed us the modulation response of the entire system which we determined more than adequately met the requirement.

For simplicity we decided to give the DAC full authority over the tuning range of the OCXO, in order to cover both the tuning and modulation requirements. The overall tuning range of the OCXO we selected was examined and found to be of the order of ± 15 Hz at 10 MHz i.e. ± 1.5 ppm. The tuning characteristic was not completely linear and we calculated that if we used a 16 bit DAC it would give us a step size of ~ 5.4 Hz at the nominal tuning point.

The standard frequency tolerance settings of the JT4 decoder range from 20 Hz to 200 Hz [4]. A modulation granularity of 5.4 Hz / bit seemed rather too coarse when allowing for a non-perfect DAC. An 18 bit DAC was therefore selected (AD5680 [5]) which gives a measured step size of ~ 1.6Hz / bit when the OCXO is correctly tuned. It was felt that this should be a sufficiently fine resolution and so far – at least in our experience of using JT4G with a 200 Hz frequency tolerance setting – this has proven to be the case.

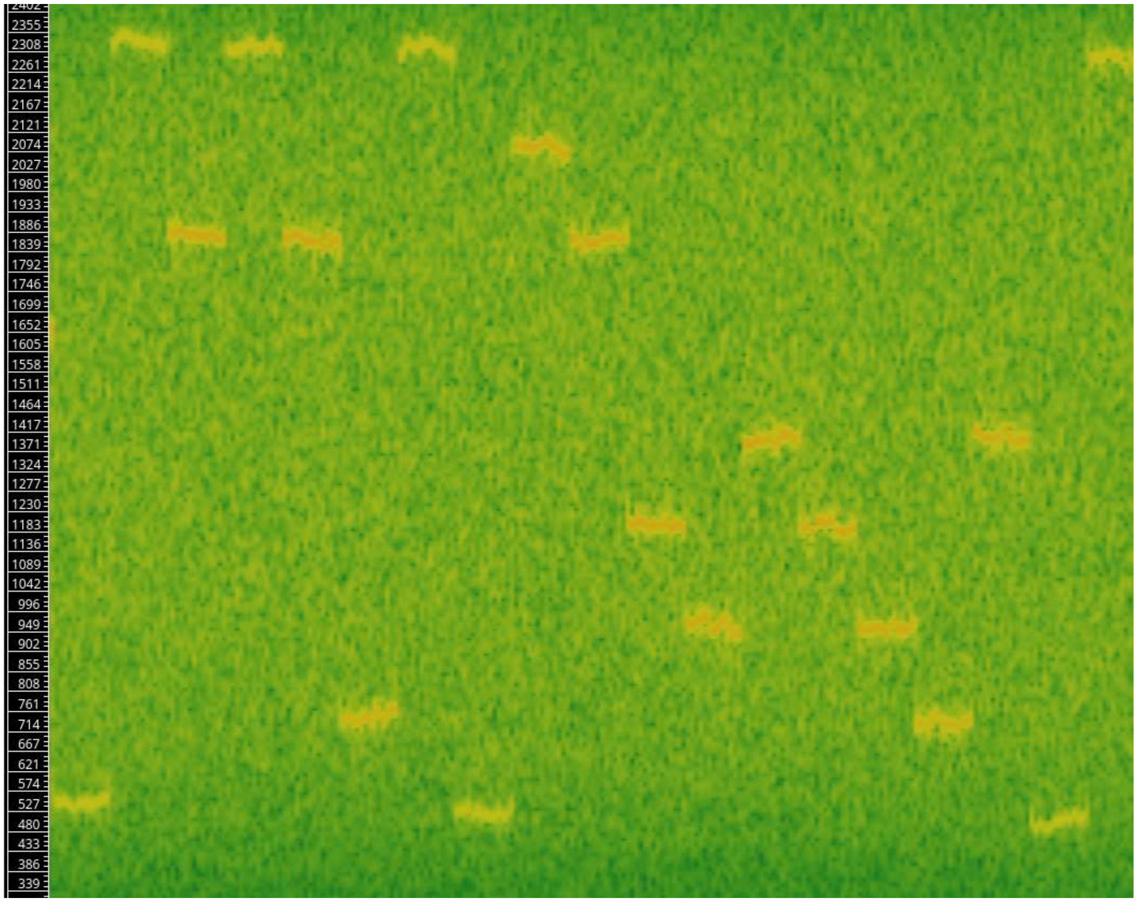
The DAC datasheet gives the settling time of the DAC as 85 us max and the output slew rate as 1.5 V/us – far exceeding the requirement for any of the JT modes, so meeting the criteria identified above.

The spectrograph below shows the JT4 signal taken from a 122 GHz transmission from one VK3CV board to another. The mode used was JT4G with 315 Hz tone spacing.



We have also tried using JT9 in mode JT9H with 222 Hz tone spacing (below). This encoded and received without issue but the received signal would not decode using the JT9 command line utility in our Raspberry Pi implementation. Transferring the saved .WAV file to the same utility running on a PC resulted in a successful decode.

Searching the WSJT forums revealed this to be previously reported behaviour – both for the Pi and some other ARM based systems. It appears the JT9 code has some issues when compiled for these ARM cores. Due to this decoder behaviour we have, to date, not been able to fully trial JT9 in the field.



The frequency jitter visible on the tones in both the plots is inherent to the OCXO (Allen Variation and Phase Noise), the addition of the DAC tuning circuit makes no noticeable contribution to the jitter of a steady tone.

Receiver and Control

The choice of receiver and control microprocessor was simply determined by what was available to us. We each had an unused FUNcube Pro+ dongle and we also had a number of Raspberry Pi Compute 4 modules left over from a commercial contract. We could see no reason not to use these.

The VK3CV board outputs a 2m IF signal which is within the tuning range of the FUNcube. As a significant bonus the FUNcube has a selectable roofing filter covering 130 MHz to 160 MHz which we considered very useful to reject both domestic broadcast transmissions and a significant proportion of commercial and emergency services transmissions. The FUNcube dongle is based on the Elonics E4000 front end tuner device [6]. Within the FUNcube signal processing uses 32 bits but the exported datastream is 16 bit. This represents a significant dynamic range improvement over the cheap RT dongles which are 8 bit devices, however in this application it is doubtful is this offers any real benefit. The RTL-SDR does offer some attractive qualities – more than 10x the sampling rate, and a very considerable cost saving. If we had not already had the FUNcubes we would have seriously considered using it.

The Raspberry Pi Compute Moddule 4 is an industrial version of the familiar Raspberry Pi 4 intended for commercial applications. It does not have the peripheral connectors on-board, neither does it have some of their functionality (e.g. USB hub). As we intended using it as a part of our own main pcb in the system this was not an issue for us - in fact it is a distinct advantage. For the software, the performance of the USB bus is much better defined with only one device connected (and no unwanted USB hub).

Mechanically, the CM4 is generally much easier to design into a ‘product’, excepting the tiny connectors. A high speed PCIe interface is provided on the board for later expansion (e.g. USB3 interfaces, SSD hard drive) but this has not been tested as to date there has been no requirement to use it.

The display is a fairly typical 5” LCD panel with touchscreen capability. The touchscreen was useful in development but for operation all functionality is controlled by soft-keys and the selector control. This keeps the display clear of greasy fingerprints which can drastically impair viewing in daylight and the mechanical buttons don’t stop working because it’s cold or raining, or the operator has gloves on.

The CM4 does not include the simple filter that forms the basic sound output of the Raspberry Pi (though it can be very simply added). Typically sound is provided by an HDMI video monitor, or by a USB soundcard. In this case, neither option is possible, so a simple, low-cost, but high performance, soundcard is implemented on the main PCB, running from the I2S digital audio interface of the CM4. This is based around a TI PCM5102 [7] chosen because it was already supported within the Raspberry Pi default firmware. This is accompanied by a 3W audio power amplifier, and a microphone amplifier for FM operation.

The CM4 also supports a GPS receiver (for position and timing), an environment sensor (for air pressure, temperature and humidity) and a LoRa transceiver (for telemetry between stations). The use of these will be covered in the next part of this article.

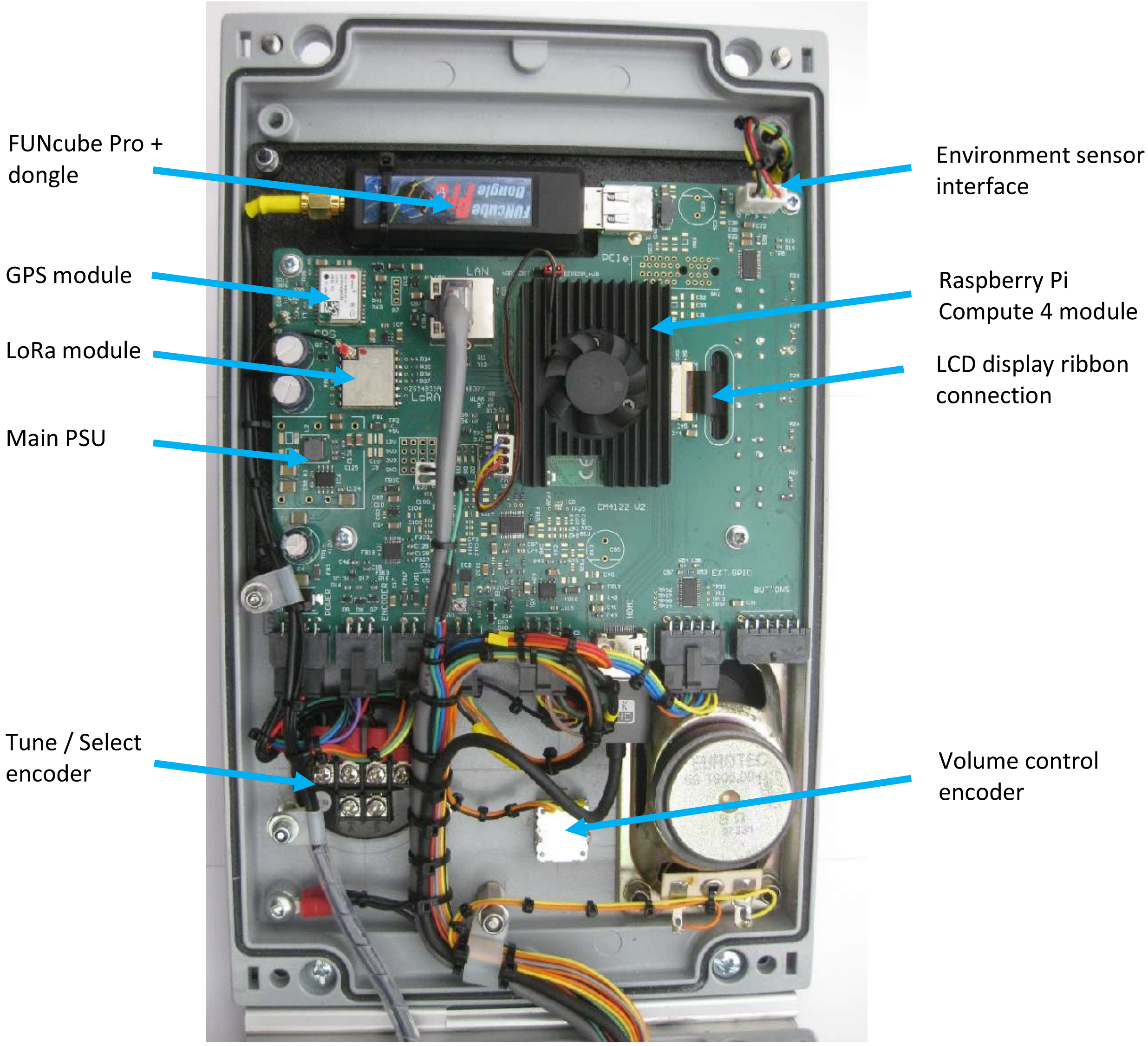
All the hardware was built into a standard sealed die-cast box, obtained cheaply from the usual auction site.

Above Left:
A view of the front panel. At the top left and partially obscured by the flip-up screen cover is a 3D printed square housing for the environment sensor. In the bezel to the left of the screen is a row of 5 push buttons and associated

“active” LEDs. These are soft-keys and their function is shown on the left of the screen, currently the “Select” function is active. At the bottom right the large rotary encoder is the main Tuning / Selector control. To its left is the Rx volume control at the bottom and above is a dual purpose push switch (yellow) – a quick press toggles the Tuning rate between Coarse and Fine, a long press takes a snapshot of the screen as a .PNG file.

Above Right:
An internal view of the base of the box. Across the top are the interface connectors – see below. At middle right is the Reference OCXO PCB, the OCXO is under the 3D printed draught shield. On the left at the bottom are the HDMI output and network connectors.

Above:
The top face of the box showing the Power/Standby switches, Mic & Headphone sockets, status LEDs and VK3CV board channel thumbwheel switch. At the far left is the SMA for the LoRa antenna, to its right is the mixed signal D type umbilical connector (17 discrete signal/power lines + 4 coax connections). To the right of the mixed D connector is the power-pole supply input connector (obscured by the Mic Plug) and then far right under the blue dust cover is the auxiliary 10 MHz reference output.



An internal view of the lid / front panel

References

[1] Post 3506 – part of thread "JT4" – Mike Lavelle K6ML
https://groups.io/g/The122GProject/message/3506

[2] Post 3504 – part of thread "JT4" – Barry Chambers G8AGN
https://groups.io/g/The122GProject/message/35064

[3] Analog Devices - ADIsimPLL a PLL synthesizer design and simulation tool
https://www.analog.com/en/lp/resources/adisimpll.html

[4] WSJT-X User Guide 2.6.1 – J. H. Taylor Jr. K1JT
https://wsjt.sourceforge.io/wsjtx-doc/wsjtx-main-2.6.1.html

[5] Analog Devices – AD5860 5V 18-Bit nanoDAC
https://www.analog.com/media/en/technical-documentation/data-sheets/AD5680.pdf

[6] Elonics E4000 datasheet
https://www.nooelec.com/files/e4000datasheet.pdf

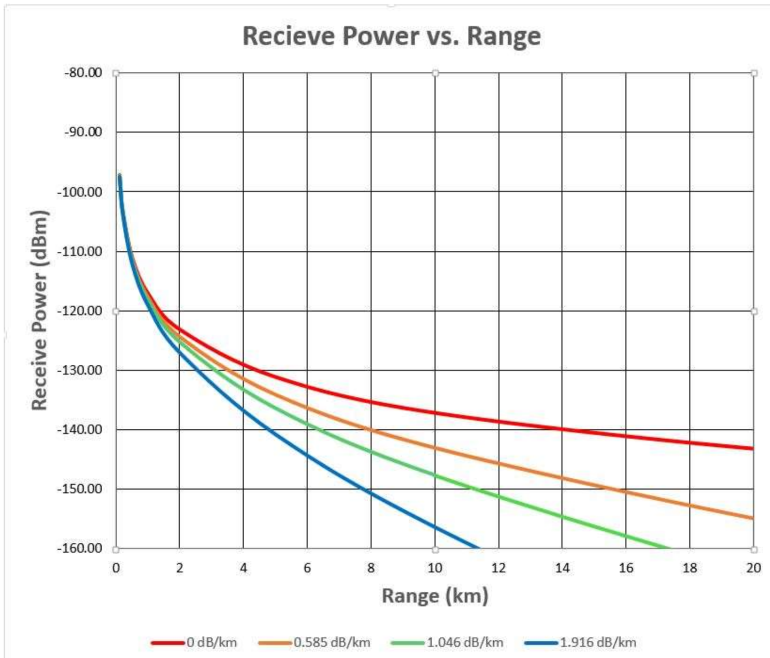
[7] Texas Instruments – PCM5102 Audio Stereo DAC with PCM Interface
https://www.ti.com/lit/ds/symlink/pcm5102.pdf

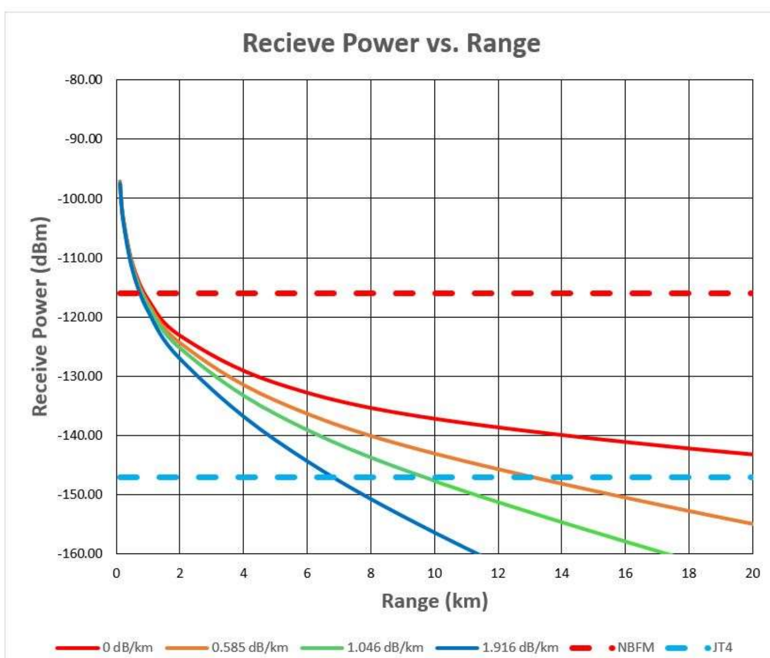
JT4 on 122 GHz - and the Continuing Evolution of a Portable System (Part 1 - Errata)

Dave Fielding G8KHU

As soon as I skimmed through part 1 of this series (Scatterpoint November 2024) a glaring error leapt out at me. The legends for the plots on pages 10 and 12 are incorrect. As published the legends for the plots with atmospheric attenuation included read “0.5 dB/km”, “0.75 dB/km” and “1 dB/km” should read “0.585 dB/km”; “0.75 dB/km” and “1.916 dB/km” respectively. The plots themselves are as they should be.

The corrected plots are shown below, my apologies for the confusion.





January Tests

On Sunday 12 Jan 2025 we went out to do some further tests using JT4 on 122 GHz. The forecast was for a cold day with unbroken sunshine, the reality was certainly cold but there was totally unbroken cloud cover with no sun all day. When we arrived at Combe Gibbet there was lots of low lying mist in the valleys – very picturesque but not looking at all good for 122 GHz.

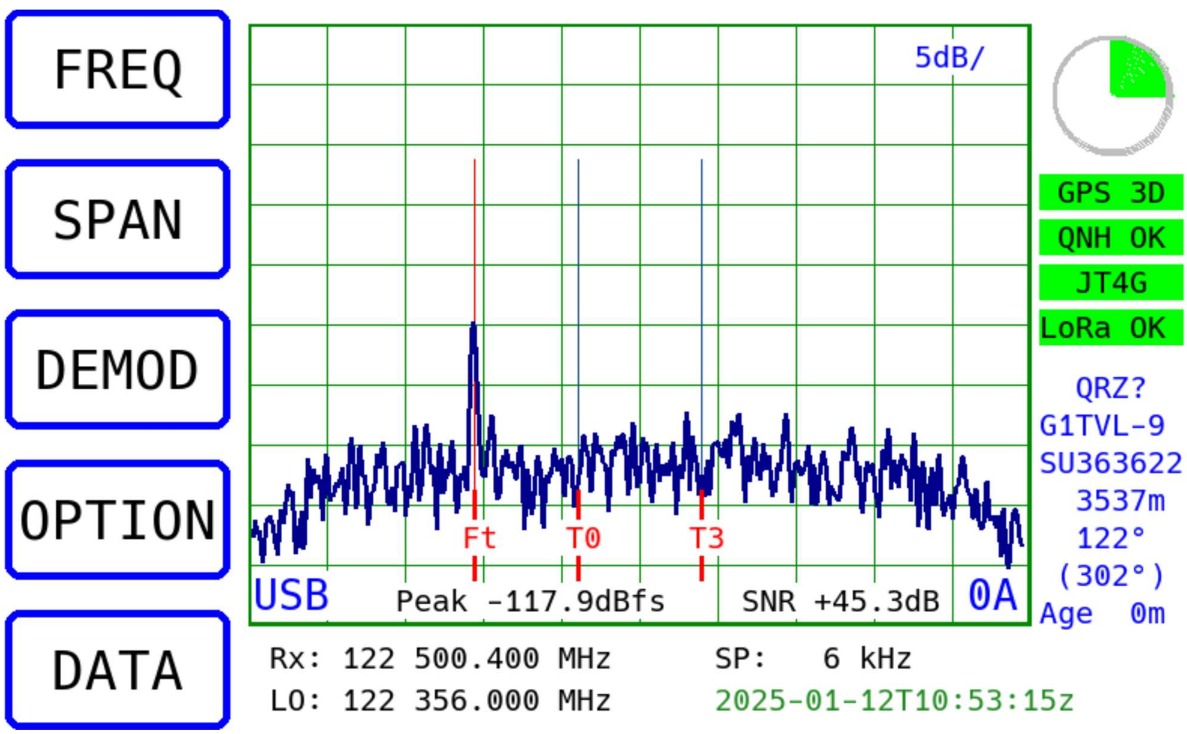
Nevertheless we had clear visibility to the first site we wanted to test which was one we had visited previously at a range of 1.17 km and which had given us very variable signal levels ranging from undetectable to about +7 dB C/N in a 12 Hz BW. This path was IO91GI25NX to IO91GI28NM.

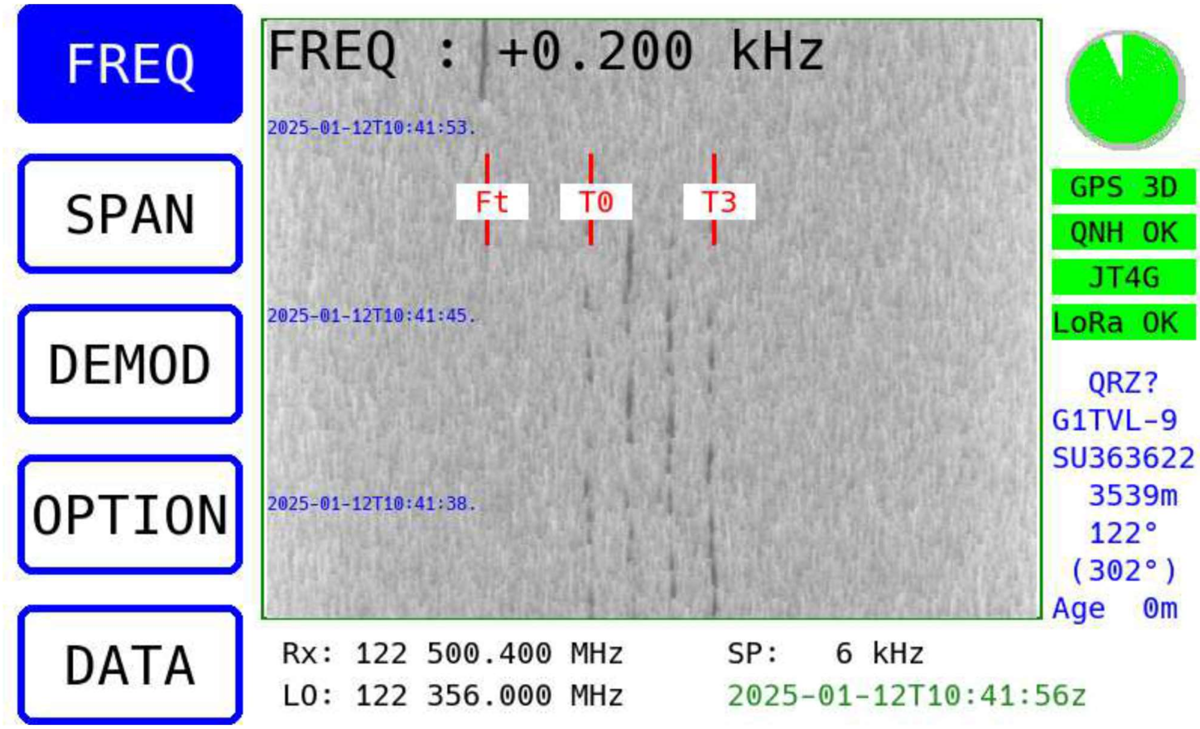
Our system uses the VK3CV boards with VK3CV test horns at both ends. We gave a presentation on this at the UK Midlands Roundtable last November, for those who missed this see our write up in Scatterpoint starting November 2024.

This time we had signals that were in excess of 20 dB C/N, some of the noise was undoubtedly Tx noise so signals were well up on our previous attempt. We sent JT4 in both directions successfully before moving on to our next path.

This path (IO91GI25NX to IO91GI08NG) was 1.57 km and still short of our previous record of 2.2 km. We hadn't tried this path previously but we were fortunate in that the farmer was onsite and he gave us permission to access his land. Again this path gave large signals and we completed a JT4 exchange.

We then tried a path that was significantly longer than our previous best. This was IO91GI25NX to IO91FJ70JC which is 3.54 km. Signals were a good 12 dB C/N and we successfully completed a formal JT4 QSO.



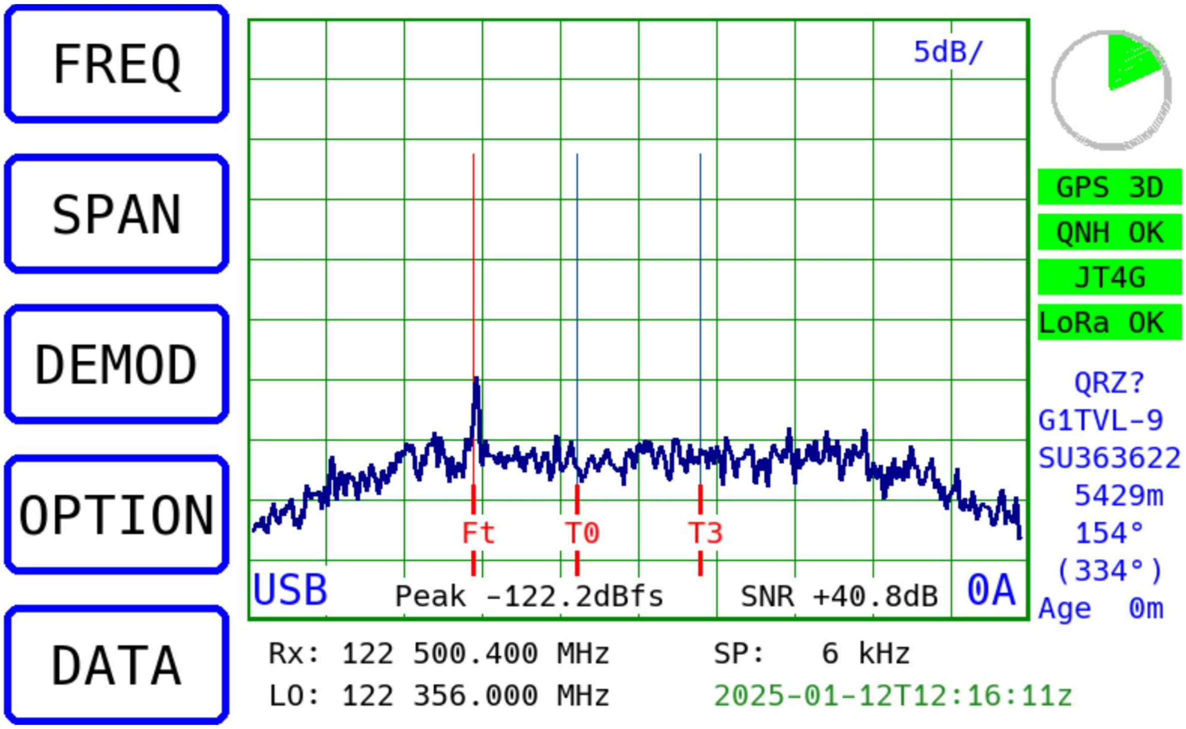


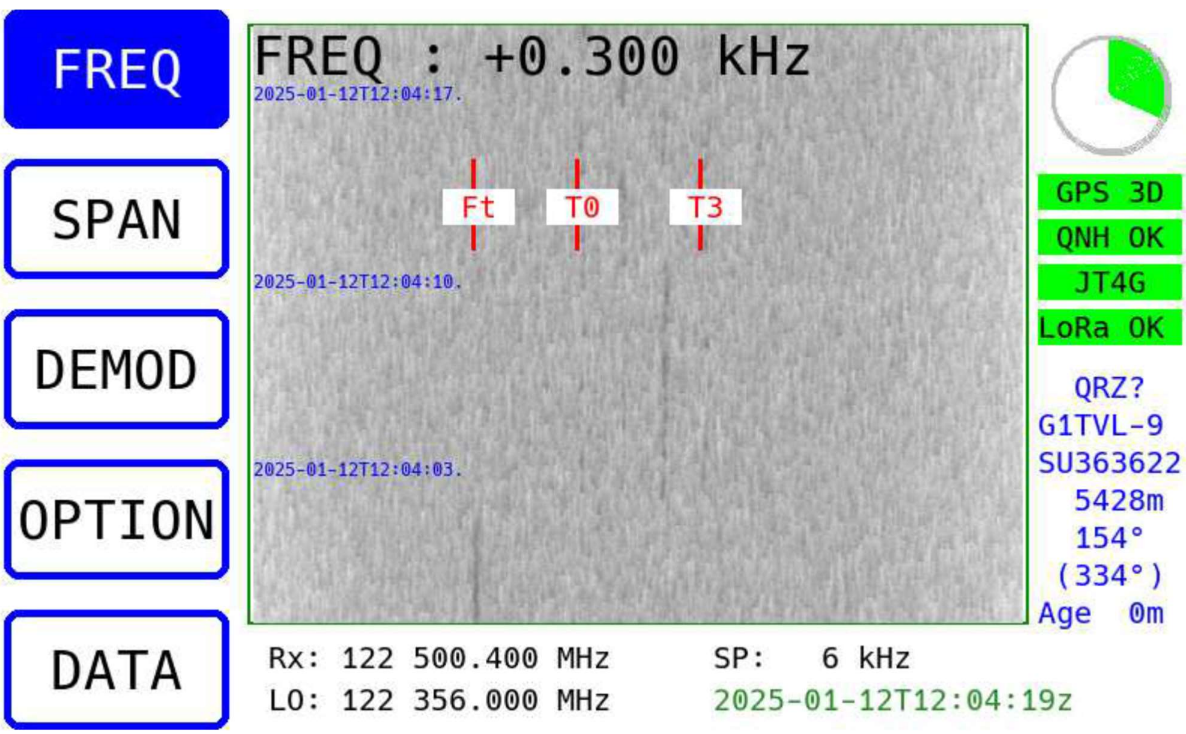
Very encouraged we moved on to a longer path of 5.43 km (IO91GI25NX to IO91FJ86RL). Here we had a C/N of around 7 to 8 dB and once again we managed a complete JT4G QSO. From the system log:

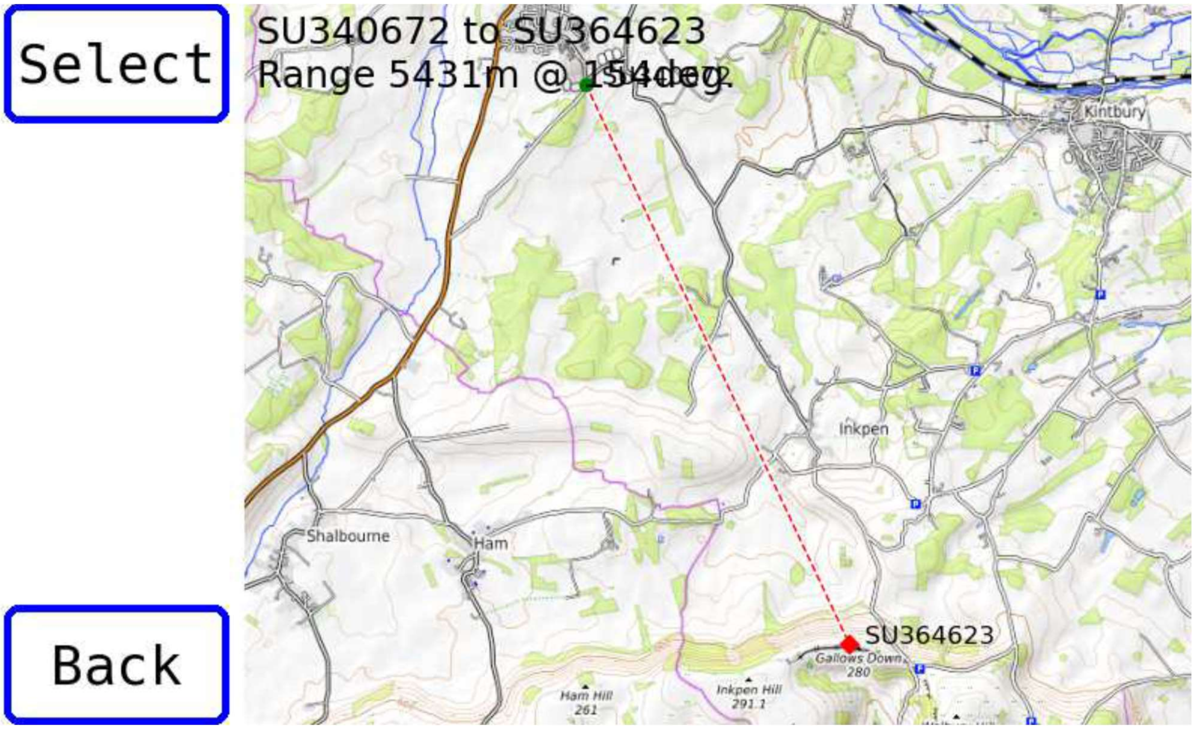
Message Summary
Tx @ 1214 - G1TVL G8KHU 73
Rx @ 1213 - G8KHU G1TVL 73
Tx @ 1210 - G1TVL G8KHU -16
Rx @ 1209 - G8KHU G1TVL -16
Tx @ 1206 - G1TVL G8KHU IO91
Rx @ 1205 - G8KHU G1TVL IO91
Tx @ 1202 - CQ G8KHU IO91

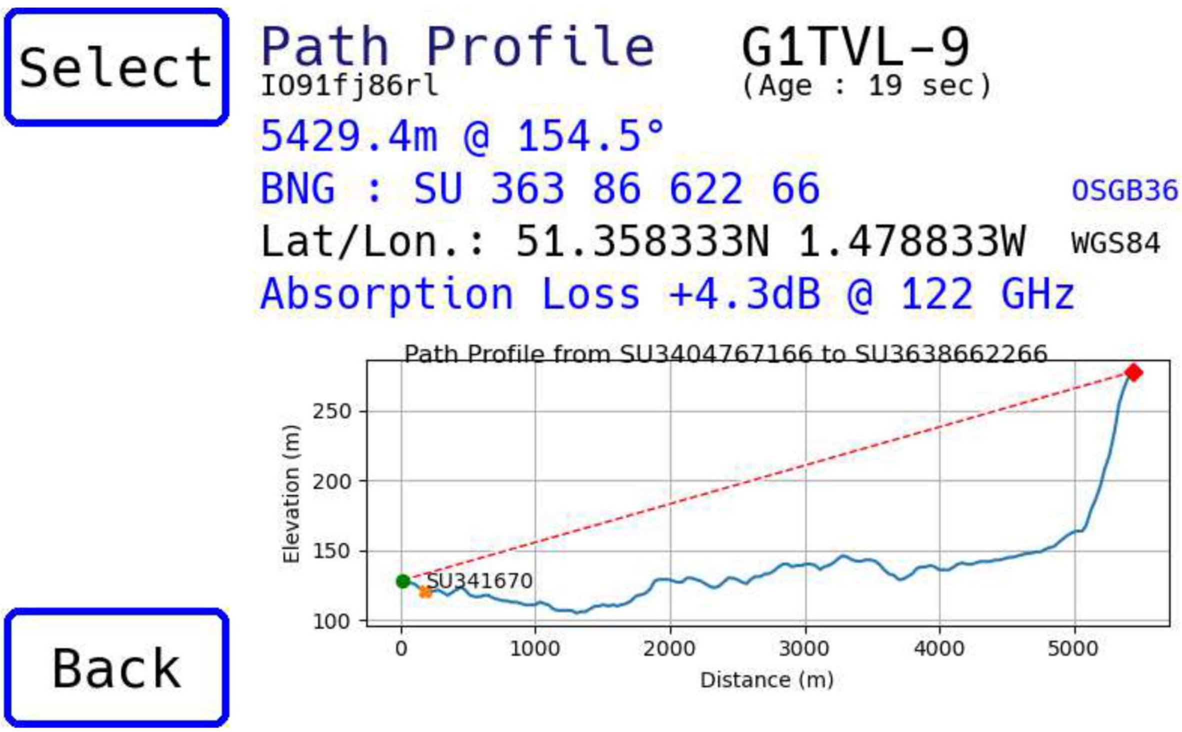
Screenshots for the QSO are on the following pages. It is worth noting that our measured temperature is significantly higher than the real temperature. Our measured temperature was 9°C but the reality was that the temperature never got higher than 4°C. The error is due to inadequate thermal isolation between the temperature sensor and the equipment box. This also effects the RH measurement.

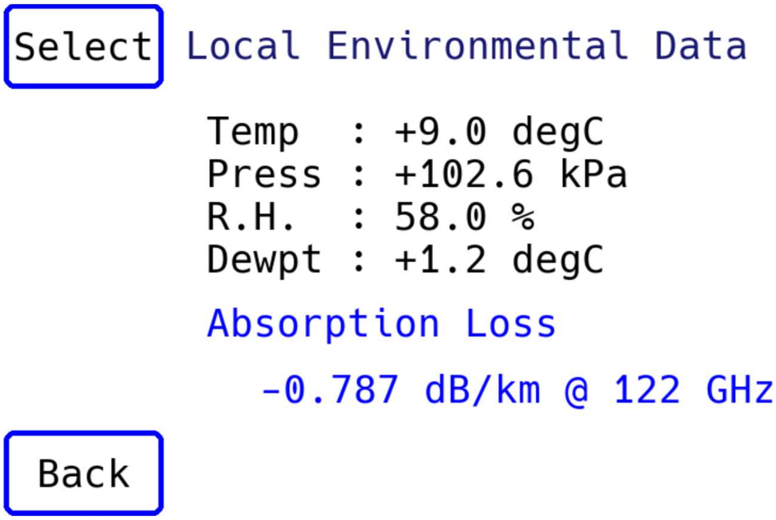
Data from Middle Wallop airfield (15 – 20 miles south) was temperature 3.0°C, dew point 2.0°C, RH 93.1 % and atmospheric pressure 103.9 kPa. These values give an absorption of around 0.85 dB/km rather than our system indication of 0.787 dB/km. Resolving this is on our to-do list.


FREQ
SPAN
DEMOD
OPTION
DATA
5dB/
Ft
T0
T3
USB
Peak -122.2dBfs
SNR +40.8dB
0A
GPS 3D
QNH OK
JT4G
LoRa OK
QRZ?
G1TVL-9
SU363622
5429m
154°
(334°)
Age 0m
Rx: 122 500.400 MHz
LO: 122 356.000 MHz
SP: 6 kHz
2025-01-12T12:16:11z


FREQ
SPAN
DEMOD
OPTION
DATA
FREQ : +0.300 kHz
2025-01-12T12:04:17.
Ft
T0
T3
2025-01-12T12:04:10.
2025-01-12T12:04:03.
GPS 3D
QNH OK
JT4G
LoRa OK
QRZ?
G1TVL-9
SU363622
5428m
154°
(334°)
Age 0m
Rx: 122 500.400 MHz
LO: 122 356.000 MHz
SP: 6 kHz
2025-01-12T12:04:19z

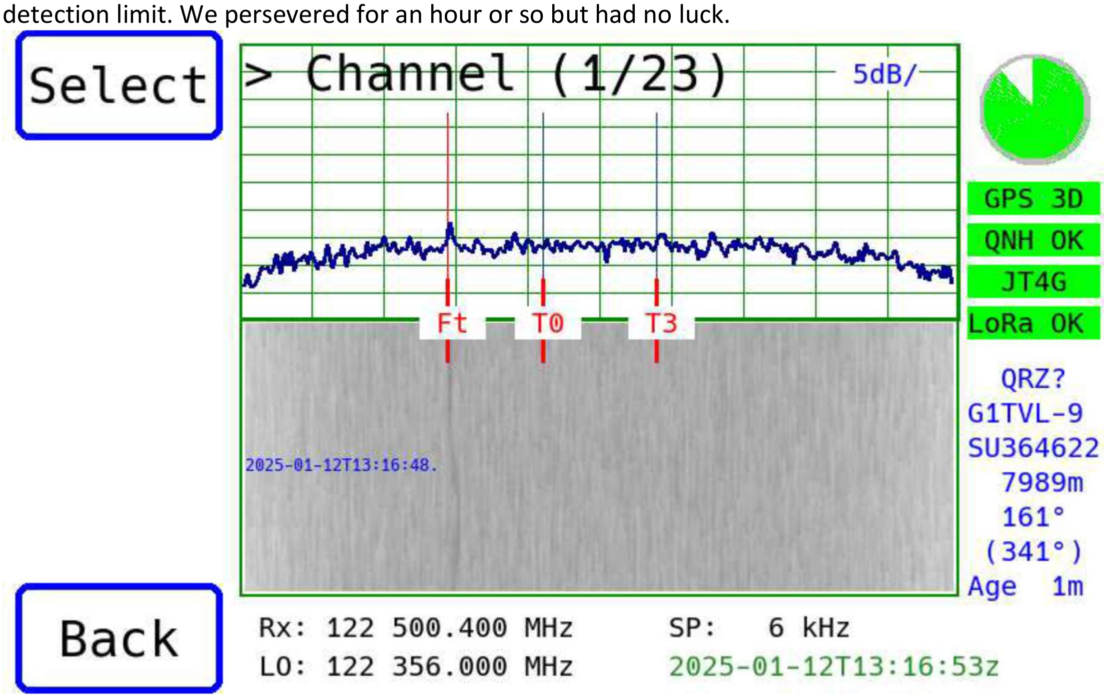

Select
Back
SU340672 to SU364623
Range 5431m @ 154deg.
Kintbury
Inkpen
Shalbourne
Ham
SU364623
Gallows Down
280
Ham Hill
261
Inkpen Hill
291.1


Select
Back
Path Profile
G1TVL-9
IO91fj86rl
(Age : 19 sec)
5429.4m @ 154.5°
BNG : SU 363 86 622 66
OSGB36
Lat/Lon.: 51.358333N 1.478833W
WGS84
Absorption Loss +4.3dB @ 122 GHz
Path Profile from SU3404767166 to SU3638662266
Elevation (m)
Distance (m)
SU341670
250
200
150
100
0
1000
2000
3000
4000
5000



As it was still early afternoon it seemed that there was time to try a couple of further paths. We had two sites mapped, one giving a range of 6.80 km and one of 7.99 km. Normally we would have tried the 6.8 km site first but purely by chance the direct road to that site was closed and the diversion went via the 7.99 km site. We therefore tried this site next.

On this path we had a C/N of around 5 to 6 dB. The JT4G detection threshold is -17 dB S/N in a 2.5 kHz bandwidth, this equates to just over 6 dB in a 12 Hz bandwidth which is the effective resolution bandwidth used by our spectrum and waterfall displays. The signal was therefore right at the detection limit. We persevered for an hour or so but had no luck.



I relocated to the site for the 6.8 km path but unfortunately propagation conditions were declining, on this path we once again had a 5 to 6 dB C/N despite having reduced the range. Also QSB was starting to occur. We managed to get a single one way message from this site but conditions deteriorated further with the QSB increasing. After a while we decided to call it a day as the C/N was only 5 dB or so best case and the QSB was taking it to negative values.

In retrospect we should have tried the 6.8 km path first as conditions earlier were noticeably better and we feel that there should have been a realistic chance of a 2 way contact, 20/20 hindsight is a wonderful thing.

Overall though it was a very good day and we have increased our horn to horn dx from 2.2 km to 5.4 km with a full 2 way JT4 QSO. If we get an appropriate cold, dry and sunny day we are pretty confident that we can increase this to the 6.8 km and with luck even to 7.9 km.

Dave G8KHU / Dave G1TVL

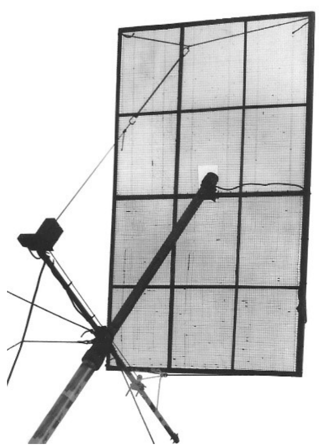
The Ups and Downs of Tilting a Dish

Clive GW4MBS

Operators using a dish on tripod whether that is on top of a hill or from an upper bedroom at home have direct control of the dish elevation. Those of us who operate from home or in my case portable with a mast to see over local obstructions need to be able to alter the elevation of the dish to achieve maximum performance by remotely controlling the elevation.

I have heard it said that this a burdensome complication and all that is needed is to assess the elevation to the horizon and away you go. The problem is that many of us have horizons of differing heights in various directions, in my valley in one direction I have to elevate to 25°. If you are lucky enough to live where you have uniformly distant horizons there is still value in being able to adjust the tilt of the dish. Being able to do so can give reassurance that you are indeed at the optimum setting, and it gives you the ability to optimise on scatter from rain clouds where you may even find more than one good elevation point. The ability to elevate to the Sun to check for an increase in noise is a valuable reassurance that your receiver is working, particularly if like me it is normal not to hear any beacons on any microwave band.

When I had a Fly Swatter antenna, I controlled the angle of the reflector with a windscreen wiper motor that drove cords via pulleys and an aircraft Desynn indicator to display the elevation achieved. (The reflector comprised ½ inch chicken mesh with 288 horizontal copper wires.)



This was rather too complicated as these days I have 3 dishes at home and 3 dishes when portable that all need controlling in a more compact and refined way.

The only suitable motor I could find to do the job was the “SuperJack” actuator.

From a small motor a linear movement is achieved via a threaded collar engaging a long rotating threaded shaft. A reed switch gives pulses to an electronic counter that gives a linear relationship between the extension of the motor and degrees of elevation.

A graph can be drawn to the get a direct reading of elevation. In calibrating the graph, you should allow for the fact that with an offset dish the beam of RF will be about 10° above the angle of the feed support arm. It needs careful planning to arrange the dish so that the feed arm can be tilted to at least -10°, I say at least because I want the dish to beam to the foreground in order to listen to ground noise.

I like to see ground noise on the waterfall to confirm receiver sensitivity and by elevating I can let the dish see the horizon appear as the ground noise fades away. I find a rapid elevation makes the change an obvious demarcation on the screen.

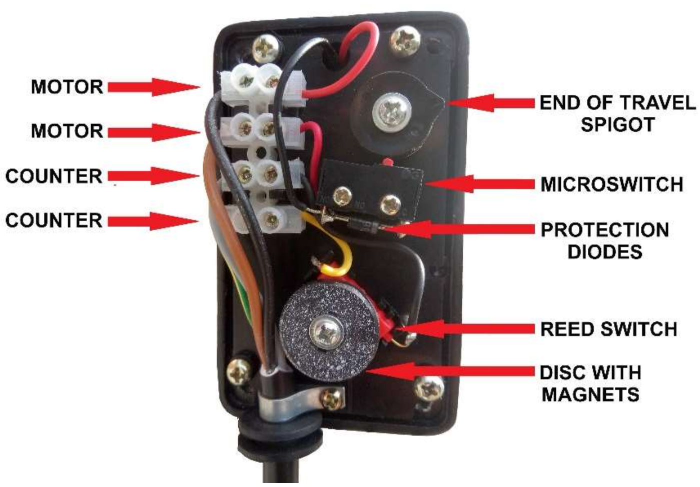
Rather than take detailed measurements to make up drawings, I find it far easier to bolt what I can together and see if it will work or not. The important thing is to ensure that with maximum declination that the dish or the feed do not impinge on the mast.

There are several considerations that are all interdependent. The larger the dish the longer that the actuator should be, this is a 1m dish with a 12-in actuator. The 12-in refers to the length of travel of the shaft and not the overall length of the actuator which is shown here in its retracted state. A robust pivot point in the dish support must be chosen bearing in mind that the further from the axis of rotation the less the range of the dish elevation although the actuator does not have to work so hard pushing up a load further from the rotational axis.

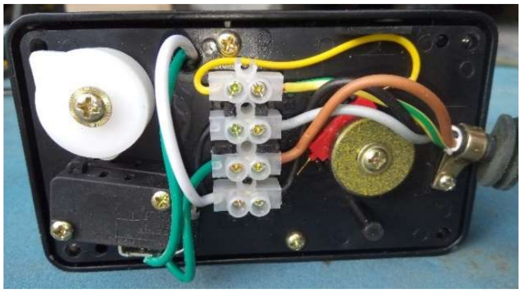
It is necessary for the actuator to push obliquely at least slightly upwards not just for reasons of mechanical advantage but to provide water drainage from the motor control box that must be mounted with the motor uppermost. An extension piece needs to extend downwards to support the floating ball pivot in the actuator clamp. This support must be rigid and of sufficient length to give the actuator optimum leverage over the expected range of elevation.

All these factors can be assessed by a preliminary mock-up with the actuator extended and retracted. On several set-ups I have had to change the proposed layout or even get a longer actuator. But before installing the actuator even as a mock-up it is important to run it on the bench to ensure that it is working properly. Before doing so you need to engage say a screwdriver in the eyelet at the end of the actuator to stop the barrel turning. Otherwise, you will lose the relationship of turns that trigger the microswitch to turn the motor off at full extension and withdrawal. It is also worthwhile wiring a buzzer or ohmmeter to the counter terminals to ensure the reed switch is sending a series of pulses.

Care needs to be taken removing the screws from the plastic cover to access the motor connections. Strangely some of the screws seem to be M4 thread and some are self-tappers, the number of each and their positions vary. So, I now identify each screw with its original hole, otherwise a screw may jam or not bind to the thread. The other difficulty with this box is that there is very little room for the connecting wires when you try to attach the lid.



Furthermore, it is a struggle to clamp the control cable without it impeding the movement of the rotating disc. Some models have a different layout, although there is better access to the terminal block the cable wires can easily foul the rotating disc especially if the cable has been tugged.

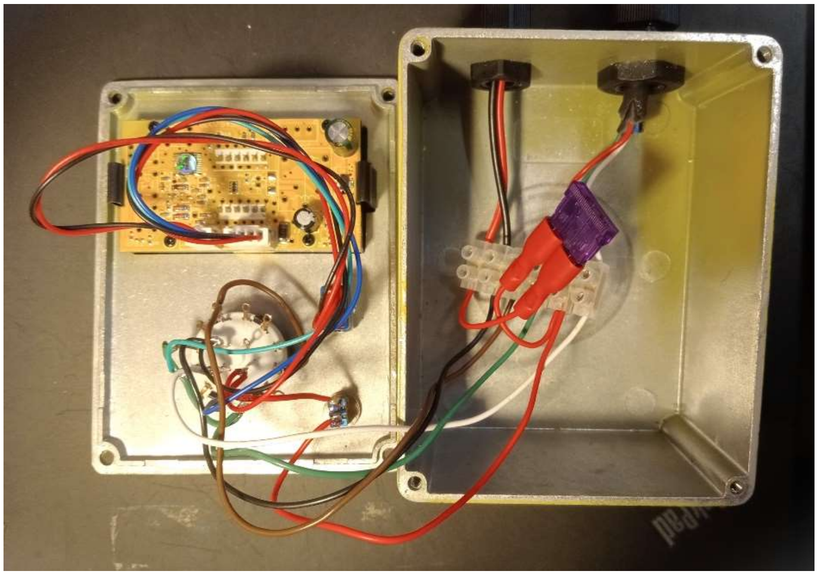


This disc contains 4 magnets that trigger the closure of the reed switch which is wired to the terminal board. Obviously as a switch the wires have no polarity, pulses indicating the direction of travel of the actuator are determined within the counter control box. The polarity of the supply to the motor obviously effects the direction of travel of the actuator and can only be determined by trial and error, but again this can be easily changed in the control box. The design voltage of the motors is 36v, but they will work quite happily on 13.5v with the benefit of reduced speed. At home I run my control units from a 30v variable power supply, which is helpful for getting a quick elevation to look for suitable clouds then back down again for finer tuning at a lower voltage.

The base of the motor box has an inner lip to discourage water ingress, but this is not very effective and acknowledged by the provision of a rectangular drainage hole.

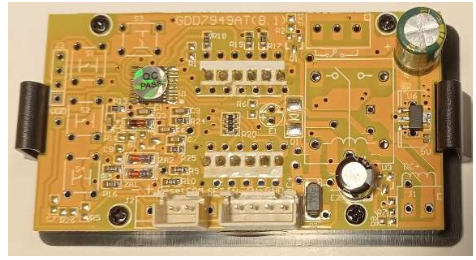
Note the damage to the cover on the right by having to forcibly extract a self-taping screw that must have originated from one of the other screw holes. This mixture of self-tappers and M4 threads seems an extraordinary arrangement in a manufactured product.

The control unit contains the digital counter, the up or down switching, a zero reset button and a fuse.



There are many counters available for online purchase. I often find that my previous seller is no longer trading but a replacement source can still be found. Just search for "**LED 4-Digital 0 - 9999 Up / Down Digital Counter**" blue seems most popular at the moment but if you prefer just insert red or green in your search.

Sellers state that it is unbranded and don't give much information, but these are the details:

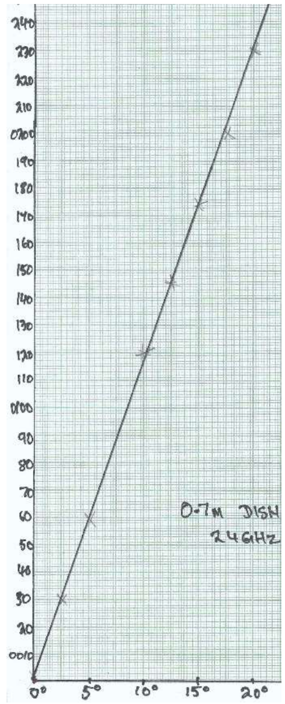


It comes with wired plugs and sensible instructions. Although in the layout diagram the up and down controls are drawn as push buttons, I found it more convenient to wire these into a 3-way 3-pole rotary switch which not only tells the counter to count up or down but also switches the appropriate polarity of supply to the motor. If the motor does not move in the intended direction just reverse the motor supply wires to the rotary switch. It works within the DC range of 4.5v–35v which is ideal for use with the actuator.

The zero reset button is a push-to-make type which needs to be used from time to time. It would be tempting to calibrate the system by putting a spirit level on the dish feed arm then zero setting the counter. The problem is that declining the dish the counter cannot read below 0000 i.e. a negative angle. I set up my dishes so that minimum extension of the actuator where it switches off is at a place very close to the dish support mechanism touching the mast, I then zero the counter. I elevate the dish to a point where the feed arm is horizontal, this is easy because I have a small spirit level fixed on each dish arm mounted on the side of the arm so that the bubble can be viewed from the underside.

I then make a note of the reading and tilt the dish up at key elevations of say 10° intervals recording the counter reading until the actuator is fully extended. All sorts of inclinometer may be used but I find this digital version is very useful during calibration and assessing a likely elevation needed in a particular direction.

It is a simple matter to plot a graph giving the true elevation against the counter reading. This is more straight forward with a prime focus dish, but with an off-set dish a deduction needs to be made for the offset of the beam. With all my off-set dishes I have to deduct 10° from the angle of the feed arm to get the true elevation of the beam.



The actuators have 4 magnets embedded in the rotating disc, each magnet passing the reed switch sends one pulse to the counter. With a supply of 13.5v in 10 seconds the counter will have received 50 pulses. At the point when the desired elevation has been reached, the reed switch may be closed or open, when the dish is moved again the counting starts again but over time a cumulative error builds up. So at least once a week I tilt each dish down to the lowest level and check that the counter reads 0000, very often it might read something like 0008 so the reset button gets pressed. Obviously the more frequently there is shuffling around to optimise a signal the sooner will be the error build up. For this reason, it is best to plot only a few points on the graph too many will build up a cumulative error. I found it most convenient to take counter readings against actual elevation settings in multiples of 5° or 10° rather than the other way around and having to plot fractions of a degree.

I have used many of these counters, but I did make the mistake of buying something that I thought was similar. But the way it should interact with the actuator was not so intuitive, and with only the supply connected only one digit displayed and then a smell of burning then nothing. I can't see that I did anything wrong, but I will avoid this type in the future:

It is a good idea to regularly exercise the actuator to avoid rust building up of the internal thread and that the nylon collar can freely move. The thread is greased on assembly, and it is important to ensure this gets regularly distributed.

Otherwise, the thread on the nylon will become stripped so that the actuator can no longer move, or the dish just collapses to its lowest declination.

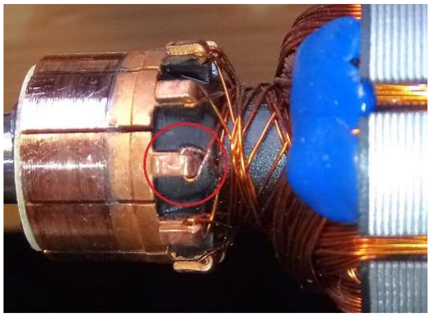
As a precaution against moisture creeping into the actuator, I now enclose the motor section in a plastic box. I have provided drain holes in the most dependant edge of the box.

The box gives a good degree of protection for the motor which will otherwise rust up with time. After a while with my first actuator the motor failed for this reason, I found that the armature had severely rusted and could not rotate. I was able to clean it and get it to work again and installed in a plastic box and has given no further trouble. If you do decide to dismantle the motor take care not to disturb the alignment of the plastic discs that rotate against each other on a spindle that triggers the limit switches in each direction.

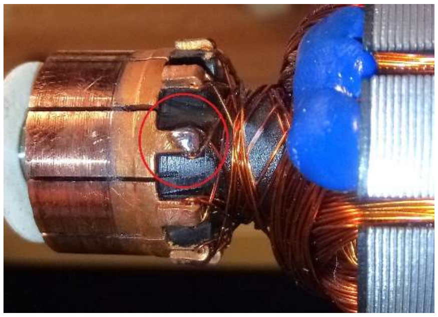
I only use a protective box for home based installations where the whole actuator might be soaked in water for months on end. I don't bother giving this protection for my portable dishes as exposure to rain will be short lived and they will have every opportunity to dry out later.

I had an unusual fault on a new actuator, having tested it on the bench in the usual way, I installed it on the mast but after a day it had failed to move at all. I removed it and tested it on the bench, and it worked perfectly, so back it went onto the mast where it promptly failed again! Back again, on the bench it worked correctly but I suspected that if I sent it to the supplier, they would find that it worked and return it to me at my expense and I would be no further forward. Yet if I dismantled it and whatever the fault, it might be looked on as a fault that I had caused.

So, I decided to dismantle the motor, but I could see no obvious fault. But investigation with an ohmmeter revealed that although the armature winding was intact, one segment of the commutator was receiving no voltage. This was due to poor crimping of the wire grasping terminal failing to penetrate the enamel of the copper wire.



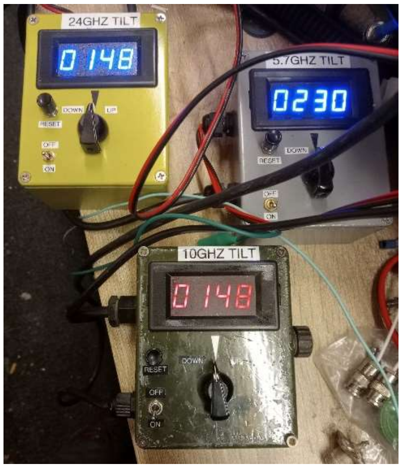
Although I scraped the varnish off as best I could, I was unable to create a reliable connection, so it was soldered.



The actuator has performed faultlessly ever since. My portable dishes use 6-inch actuators but for the home dishes I use 12-inch actuators. This larger size is also available in a high resolution version which has 8 magnets rather the 4 magnets in standard models. There are also heavy duty versions available in 18-inch, 24-inch and 36-inch, but remember the length quoted is the travel length of the shaft not of the actuator itself.

Unfortunately, the 6-inch version has been discontinued. I contacted the main importer* who indicated that some smaller actuators “mini-jacks” were made in sizes 6-inch, 8-inch and 10-inch and they might be stocking the 8-inch version in the coming year.

With several dishes I found it helpful to paint the controllers in differing colours as it was easy to get confused. Particularly when two dishes of different sizes often end up with a similar count displayed.



I did briefly play with mercury tilt switches so I could define when the feed arm was horizontal, but I could not get a reliable and repeatable indication. They had worked well on the ‘fly swatter’ but there they were used to define the limits of travel rather than give a precise indication.

From there I entered another blind alley, when I started playing with remote reading inclinometers. At first, they offered great promise with a 0.1° readout in the shack connected to a sensor on the dish via an Ethernet cable.

I was so impressed that I bought another set and installed it on my 10GHz portable dish. Out portable it offered the promise of defining a horizontal setting for the dish arm although I might not be parked on level ground. In such a location rotating the mast the horizontal reading would change, and this identified. Unfortunately, even on an apparently calm day there was sufficient movement on the 5m mast as to cause the sensing mechanism to never settle. So, I abandoned that and resorted to a spirit level on the dish arm that could be calibrated before pumping up the mast and to be on the safe side I carry a small monocular to observe the bubble aloft.

Back home I carried on with the inclinometer as my 9m Hilomast is rarely extended as in a valley mast height makes no discernible difference other than when I need to clear my barn roof. But even when retracted the display would sometimes behave erratically and need resetting by removing the battery. Whether this was due to RFI or me having to use an albeit screened cable that exceeded the recommended length of 5m I don’t know. But it was extremely annoying to have something unreliable as a measuring instrument. I replaced the home set up with the redundant portable kit, but this proved just as unreliable.

It is very important to ensure that the dish support bracket at the point of rotation is well greased, not slack nor too firm that would make the actuator work unnecessarily hard, bearing in mind that most of us will be burdening the dish support arm with the weight of the rig itself.

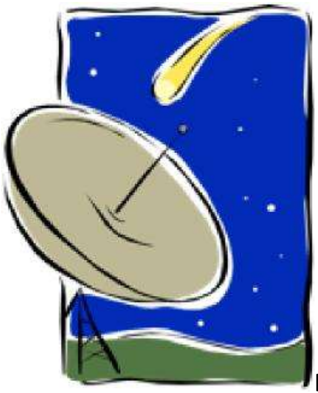
As always it is important to have an installation examined by the resident Health and Safety Inspector, and yes, he advised that the spirit level be moved to the side of the arm to permit easier observation!

*Satellite Super Store https://www.satellitesuperstore.co.uk/motors.htm

Editors Comments

I thank the contributors this month. It is good to have a couple of lengthy articles.
I have been asked about access to some of my previous articles and talks. After a gap of three years, my webpage has been updated rfdesign.co.uk
I look forward to seeing many of you at the Ridgeway Round Table. Hopefully we will get some nice cold and dry days for some millimetre tests in the next month or so. The first contest of the year, is the 122GHz contest on 2nd February.

Roger G8CUB

By John G4BAO

Please send your activity news to: scatterpoint@microwavers.org

From John G4BAO

Not too much activity above a GHz over the Christmas period from here, but the 10th of December brought my ODX for the period of 1328km with SM0DJW (JO88WW) at -13, -11 on 1.3GHz FT8. Christmas Day and Boxing Day saw some more good conditions that I chose to mainly ignore for obvious reasons, so apart from a few more 1.3GHz FT8 QSOs, namely SM7GEP (JO77IP) -13, -13 at 1098km, DF5VAE (JO64RK) -16 -26 at 910km F6DBI (IN88IJ) -03 -07 at 497km and OZ2ND (JO46) -18 +01 at ~741km I had a quiet Christmas.

From F4CKV/p in JN16NL

On December 27th around 9:30 a.m. at the portable QTH, well placed in the sun above a sea of fog, HB9G was "end stop" on 5.7 and 10 GHz and 59 on 24GHz. I worked Maurice F6DKW on 10GHz, and a test at 24 GHz was limited to a few snippets of CW but no contact through a thick layer of fog. Beacons copied on the 22nd included the 10GHz F1ZAP and 5.7GZz F1ZAO, GB3SCC IO80UU 59 on 5.7GHz. Only Dave, G4GLT benefited from this beautiful tropo. He was 59+20 on 5.7GHz and 55 on 10GHz QRB 676 km. Nothing towards the north, but ON4UCL a little further east came out of the noise 529 at best, not a single Belgian station to trey with.
I then made a successful test on 5.7GHz with Rudi OE5VRL, 529 via aircraft scatter, QRB 878km. I also heard hm briefly on 10GHz thanks by the same mode.

Overall, in 2024 I made 52 QSOs with 22 different calls - 4 DXCCs - 20 locators - 18 departments - ODX tropo SP6GWB (1094 kms). My first tropo QSO SP.
On 10 GHz during I made 195 QSOs -70 different calls - 10 DXCCs - 39 locators - 30 departments - ODX OE5VRL (868 kms). Operating conditions: 10GHz: Solectra DB6NT G1, 250mw, PF 48cm.
On 24 GHz during 2024 I made 24 QSOs - 9 different calls - 1 DXCC - 5 locators - 5 departments - ODX Tropo F6DPH (290 kms) - ODX RS F6DKW (264kms) and heard F1FIH/p via RS QRB: 313 kms
Operating conditions on 24GHz: IC-705, DB6NT, 315mw (26dBm), PF 48cm.
On 47 GHz since the year 2023 I made 8 QSOs - 1 single call - 1 DXCC - 1 locators - 1 departments - ODX Tropo F1MNQ/p (107 kms).
Operating conditions on 47GHz
47GHz: IC-705, DB6NT, 31.6mW (15dBm), PF 28cm.
On 76 GHZ since the year 2023 I made 1 QSO - 1 single call - 1 DXCC - 1 locators - 1 departments - ODX Tropo F1MNQ/p (10 kms).
Operating conditions on 76GHz: IC-705, DB6NT, 0.31mW (-5 dBm), PF 28cm.
Look at my Youtube channel at https://www.youtube.com/channel/UCURgAXEMRqraq1ViZZpYQ9g

From Dick PA2DW

The IARU is now looking into the best way to adapt the 1.3GHz band plan. Given the outcome of WRC23 - see attached PPT for more information - we have to face the fact that more and more administrations will - possibly soon – no longer allow high-power operations under 1298 MHz.
Therefore, in order to be prepared, I am collecting helpful information from within our EME-community on following subjects:

1. There will be technical consequences when moving up to 1298-1300 and we would like to know all the possibilities and limitations. Most of our current equipment will work flawlessly in the new bandwidth. But if not, then we think Moon-net is the place to share technical information and help to each other. So please share your thoughts and solutions with us regarding consequences for any part of your station (Radio, PA, LNA etc.) that might need adaptation.

2. There are regulatory or environmental limits to operate in the 1298-1300 range in some regions. We know that Italy is one of them and Malta suffers radar above 1300 MHz, but is there more that we don't know yet?

3. Other authorities are very progressive in moving the QRO/EME operations to above 1298, like Finland. But what is the current situation in your own region? And do you know if there are negotiations being planned/executed with the authorities?

4. Some authorities have been limiting the power even well in advance to the outcome of WRC23, like Austria. Others still agree on 750W or even more. In Holland we are facing a very stable limit of 120W since many years ago… But what is the situation in your region?

5. And finally, is there any reason not to identify 1298.000-1298.150 in the band plan as a "centre of Moonbounce activity" otherwise what would you prefer, above 1298?

Please send information numbered in the same sequence as above to PA2DW: qtc@kpnmail.nl

From Neil G4DBN

I've been machining some bespoke gold-plated 76 GHz feed horns with integral waveguide flanges for a European op who's doing EME experiments on the band. Receive only for now. I've made some new Cassegrain reflectors and one-piece dual-mode feed horns for 47 GHz with integral oval iris sections, but so far I've only tested them across the garden using two Kuhne transverters.

From Murray G6JYB

GB3CMS (nr Chelmsford Essex) has completed a lengthy major rebuild (fingers crossed!) It is on a roof top - but not a tall hill, so would appreciate reports. It is nominally GPS locked on 10368.960 - CW keying only (using a Kuhne MKU LO 8-13 synth/beacon unit, Bodnar reference and PA)

From John G0API

The GB3CMS beacon is not the strongest of 10GHz signals, but I made my first spot of the recently returned beacon. Slowly fading into the noise now but firmly in my directional database and in a good direction for monitoring long term .
No other Easterly beacons detectable, so I hope this bodes well for when we get any enhancements. Many thanks to Murray G6JYB and anyone else involved.

From Jan PA0PLY

Member of PI9RD team, Dwingeloo Radio Telescope/ new callsign for PI9CAM)

A team of amateurs have used the historic Dwingeloo radio telescope to receive signals from the Voyager 1 spacecraft. Only a few telescopes in the world have received these signals, which are very faint due to the distance of Voyager 1: almost 25 billion kilometres, more than four times the distance to Pluto.

Voyager 1 was launched in 1977 to visit the outer planets in the Solar system. After its primary mission ended, it was sent on a journey out of the Solar system. It is currently the most distant and fastest human-made object, traveling in interstellar space. Its radio signals, traveling at the speed of light, currently need 23 hours to reach Earth. The Radio telescope was built in 1956, by what is now ASTRON, Netherlands Institute for Radio Astronomy. Today the telescope is a national monument, used by amateurs (CAMRAS).

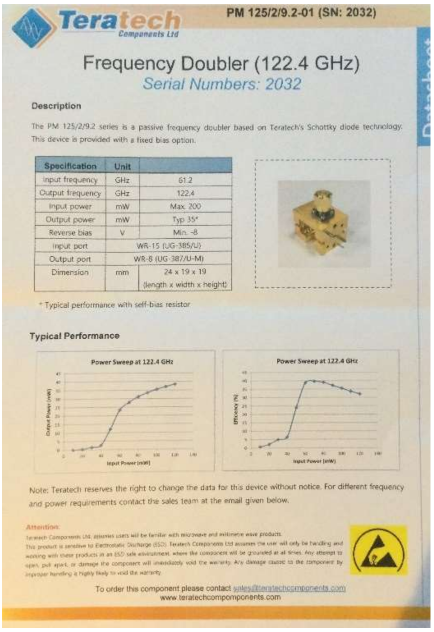
Since the Dwingeloo telescope was designed for observing at lower frequencies than the 8.4GHz telemetry transmitted by Voyager 1, a new antenna had to be mounted. At these higher frequencies, the mesh of the dish is less reflective, making it extra challenging to receive faint signals.

In October this year, Voyager 1 turned off one of its two transmitters. The NASA JPL flight team has been able to recover the spacecraft, which is now operating nominally again. To find the very weak carrier signal in the noise, the team used orbital predictions of Voyager 1 to correct for the Doppler shift in frequency caused by motion of Earth and Voyager 1. By doing so, the signal could be seen live in the telescope observation room (picture 1 in our BLOG). Later analysis confirmed that the Doppler shift corresponds to that of Voyager 1 (picture 2).

NASA uses dishes in the Deep-Space Network (DSN) to communicate with Voyager 1. These dishes, located around the globe in Goldstone, Canberra and Madrid, are optimized for these higher frequencies and have a diameter of 70m, much larger than the 25m Dwingeloo Telescope.

High resolution photos and measurements are available in our blog
https://www.camras.nl/en/blog/2024/dwingeloo-telescope-receives-signals-from-voyager-1/

122GHz Frequency Doubler update



Teratech Components Ltd

PM 125/2/9.2-01 (SN: 2032)

Datasheet

Frequency Doubler (122.4 GHz)

Serial Numbers: 2032

Description

The PM 125/2/9.2 series is a passive frequency doubler based on Teratech's Schottky diode technology. This device is provided with a fixed bias option.

Specification	Unit	
Input frequency	GHz	61.2
Output frequency	GHz	122.4
Input power	mW	Max. 200
Output power	mW	Typ 35*
Reverse bias	V	Min. -8
Input port	WR-15 (UG-385/U)	
Output port	WR-8 (UG-387/U-M)	
Dimension	mm	24 x 19 x 19 (length x width x height)

* Typical performance with self-bias resistor

Typical Performance

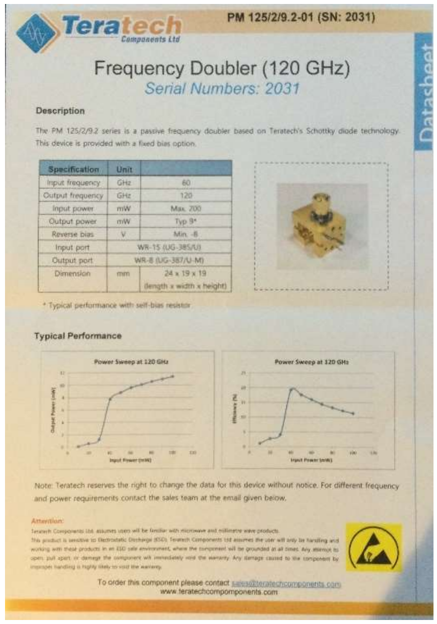
Power Sweep at 122.4 GHz — Output Power (mW) vs Input Power (mW)

Power Sweep at 122.4 GHz — Efficiency (%) vs Input Power (mW)

Note: Teratech reserves the right to change the data for this device without notice. For different frequency and power requirements contact the sales team at the email given below.

Attention:
Teratech Components Ltd. assumes users will be familiar with microwave and millimetre wave products.
This product is sensitive to Electrostatic Discharge (ESD). Teratech Components Ltd assumes the user will only be handling and working with these products in an ESD safe environment, where the component will be grounded at all times. Any attempt to open, pull apart, or damage the component will immediately void the warranty. Any damage caused to the component by improper handling is highly likely to void the warranty.

To order this component please contact sales@teratechcomponents.com
www.teratechcompomponents.com



Teratech Components Ltd

PM 125/2/9.2-01 (SN: 2031)

Datasheet

Frequency Doubler (120 GHz)

Serial Numbers: 2031

Description

The PM 125/2/9.2 series is a passive frequency doubler based on Teratech's Schottky diode technology. This device is provided with a fixed bias option.

Specification	Unit	
Input frequency	GHz	60
Output frequency	GHz	120
Input power	mW	Max. 200
Output power	mW	Typ 9*
Reverse bias	V	Min. -8
Input port	WR-15 (UG-385/U)	
Output port	WR-8 (UG-387/U-M)	
Dimension	mm	24 x 19 x 19 (length x width x height)

* Typical performance with self-bias resistor

Typical Performance

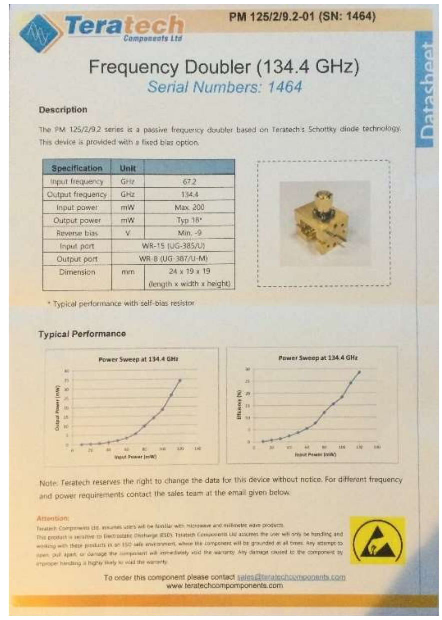
Power Sweep at 120 GHz — Output Power (mW) vs Input Power (mW)

Power Sweep at 120 GHz — Efficiency (%) vs Input Power (mW)

Note: Teratech reserves the right to change the data for this device without notice. For different frequency and power requirements contact the sales team at the email given below.

Attention:
Teratech Components Ltd. assumes users will be familiar with microwave and millimetre wave products.
This product is sensitive to Electrostatic Discharge (ESD). Teratech Components Ltd assumes the user will only be handling and working with these products in an ESD safe environment, where the component will be grounded at all times. Any attempt to open, pull apart, or damage the component will immediately void the warranty. Any damage caused to the component by improper handling is highly likely to void the warranty.

To order this component please contact sales@teratechcomponents.com
www.teratechcompomponents.com



Teratech Components Ltd

PM 125/2/9.2-01 (SN: 1464)

Datasheet

Frequency Doubler (134.4 GHz)

Serial Numbers: 1464

Description

The PM 125/2/9.2 series is a passive frequency doubler based on Teratech's Schottky diode technology. This device is provided with a fixed bias option.

Specification	Unit	
Input frequency	GHz	67.2
Output frequency	GHz	134.4
Input power	mW	Max. 200
Output power	mW	Typ 18*
Reverse bias	V	Min. -9
Input port	WR-15 (UG-385/U)	
Output port	WR-8 (UG-387/U-M)	
Dimension	mm	24 x 19 x 19 (length x width x height)

* Typical performance with self-bias resistor

Typical Performance

Power Sweep at 134.4 GHz — Output Power (mW) vs Input Power (mW)

Power Sweep at 134.4 GHz — Efficiency (%) vs Input Power (mW)

Note: Teratech reserves the right to change the data for this device without notice. For different frequency and power requirements contact the sales team at the email given below.

Attention:
Teratech Components Ltd. assumes users will be familiar with microwave and millimetre wave products.
This product is sensitive to Electrostatic Discharge (ESD). Teratech Components Ltd assumes the user will only be handling and working with these products in an ESD safe environment, where the component will be grounded at all times. Any attempt to open, pull apart, or damage the component will immediately void the warranty. Any damage caused to the component by improper handling is highly likely to void the warranty.

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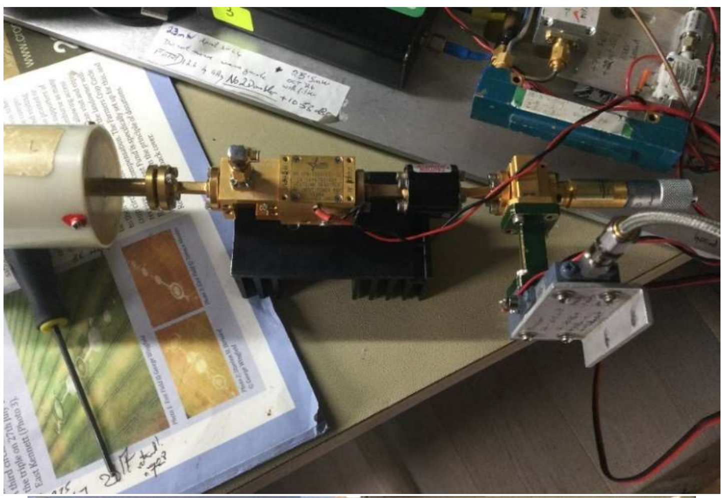
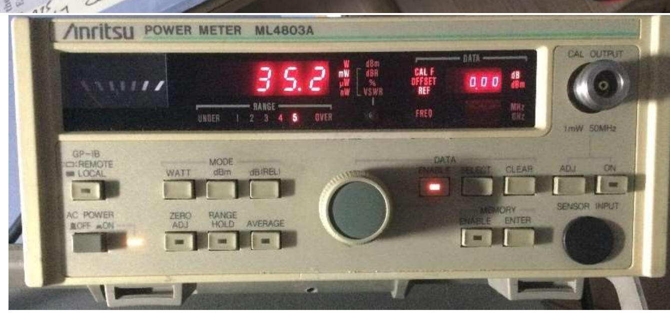
www.teratechcompomponents.com





With the doublers just having arrived from Teratech Components. I made a quick measurement on my existing 122GHz TX. They had been supplied with a self-bias resistor as requested.

Drive was +19.4dBm. Output 35mW as shown on the power meter. This is using a 75-110GHz head. However this has been shown to be within 0.5dB of a calibrated power meter. The results from Teratech above, show that the doubler will work at 134.4GHz with enough drive. Using the 50-66GHz amp, I only had +16dBm drive. This gave around 3.5mW out. But the potential to use 122 & 134 is great. To get the most output at 134, bias will be required. The interest at 120GHz is to drive a sub-harmonic mixer for 241GHz, requiring +9dBm. Note that the data sheets are for three different doublers, though results are likely to be fairly consistent.

Roger G8CUB

Microwave Meetings 2025

Ridgeway Round Table

Saturday 1st February

The Ridgeway Roundtable is a new event in the annual calendar of gatherings for radio amateurs interested in the microwave bands from 1.3GHz to 241GHz and above.
This meeting takes a new format, with fewer talks and focusses on 'show and tell' of equipment and operating modes, together with an opportunity to purchase a few goodies from a small selection of sellers.
Radio amateurs of all experience and skill-level are welcome, from complete beginners with a passing interest, to those with years of knowledge in building and operating equipment. It will be a chance for all to exchange ideas, gain knowledge and examine some typical equipment setups. Hopefully we will be able to demonstrate some of the equipment in operation.
We are also planning to have a few items of test equipment available for you to use or for you to be guided by others.

Proposed programme

- 10am: Doors open
- 10am to 11am: Registration, 'Show and Tell' and trading
- 11am to 11.30am: Welcome and talk by Barry G4SJH (RSGB Microwave Manager) on our bands in the spotlight
- 11.30am to 12.30pm: Talk and demonstration by Dave G8HKU and Dave G1TVL on some of the problems encountered with getting JT4 going on the 122GHz band (this is a follow-up to the MRT talk in 2024)
- 12.30pm: Lunch break and time for a chat
- 12.30pm to 3pm: 'Show and Tell' and trading continues
- 3pm: Close

Test Equipment

- Noise figure 1.3 – 76GHz
- Spectrum Analysis to 50GHz
- Swept response to 26GHz
- RF Power to 47GHz

Please add your name and callsign to the list, in the first room on the left.

The Ridgeway RT is being held at a location convenient for the A34:

Chilton Village Hall, Chilton, Didcot, Oxfordshire, OX11 0SH

https://temp-tntdyedoigtcbfjkdtpz.webadorsite.com

To understand the number of people attending the Ridgeway RT, we would appreciate that people register beforehand. This will allow us to estimate seating arrangements and catering needs. We do not anticipate excessive demand but numbers may have to be limited.

To avoid overloading the carpark. Please share transport where possible.

To register, please send an email to ridgewayrt@btinternet.com stating your name, callsign (if applicable) and whether you are likely to purchase a lunchtime bacon butty. If a number of you are travelling together, one email with multiple details is sufficient. Thanks!

November Low Band Contest

Conditions were generally described as poor, but activity as seen by the leading stations on 1.3GHz was reasonable for the time of year, although not too good on the higher bands.
Congratulations to the band winners and runners-up.

1296MHz Results November Low Band Contest

Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX kms
1	M0HNA/P	IO91RF	38	9134	DF2VJ	572
2	G8CUL	IO91JO	33	7079	DG1KDD	569
3	G7LRQ	IO91TQ	24	5983	DG1KDD	512
4	GD8EXI	IO74PC	13	5299	F6DKW	762
5	G3TCT	IO81QC	20	4321	F6DKW	433
6	G4ZTR	JO01KW	14	3787	F6DBI	493
7	G3SQQ	IO93JC	17	3779	ON4MU	460
8	M0GHZ	IO81VK	17	3445	PA0WMX	567
9	EI8KN	IO62IE	8	2850	G7LRQ	478
10	GW4JQP	IO71KR	10	2499	G3XDY	437
11	G0HIK	IO84JE	7	2243	G3XDY	378
12	G4LDR	IO91EC	12	2028	EI8KN	410
13	G6GVI	IO83SN	10	1998	G3XDY	298
14	G4GFI	IO91VH	7	1108	G7RAU	383
15	PE1EWR	JO11SL	4	1055	G8CUL	329
16	G4CSD	IO91KG	6	847	GD8EXI	397
17	G0NZI	IO92GM	5	618	G4LDR	158
18	G8AIM	IO92FH	3	280	M0HNA/P	139
19	G3WUN	IO91MS	3	262	G3XDY	153

2300MHz Results November Low Band Contest

Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX kms
1	G4LDR	IO91EC	3	363	G3XDY	223
2	G8CUL	IO91JO	3	300	G3XDY	174
3	M0HNA/P	IO91RF	3	293	G3XDY	153

2320MHz Results November Low Band Contest

Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX kms
1	G3SQQ	IO93JC	6	1173	G4LDR	225
2	G8CUL	IO91JO	7	947	PE1EWR	329
3	G7LRQ	IO91TQ	7	908	PE1EWR	272
4	M0HNA/P	IO91RF	8	866	G3SQQ	214
5	M0GHZ	IO81VK	6	820	G3XDY	246
6	PE1EWR	JO11SL	3	775	G8CUL	329
7	G4LDR	IO91EC	6	752	G3SQQ	225
8	G8AIM	IO92FH	3	280	M0HNA/P	139

3400MHz Results November Low Band Contest

Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX kms
1	M0GHZ	IO81VK	6	1039	GD8EXI	341
2	M0HNA/P	IO91RF	7	778	G4ODA	174
3	G4LDR	IO91EC	6	739	G3XDY	223
4	G7LRQ	IO91TQ	6	590	M0GHZ	130
5	G8CUL	IO91JO	5	509	G3XDY	174
6	G8AIM	IO92FH	2	197	M0HNA/P	139

Low Band Championship 2024

Thirty six stations took part in the 2024 Low Band Championship. Congratulations go to the Combe Gibberlets M0HNA/P who emerged as the overall champions with a commanding lead over runner up Mike G8CUL. They did not have it all their own way on every band though, as David M0GHZ took the leading place on 3.4GHz, and Anthony G7LRQ the top spot on 2.32GHz. Thanks to all participants and we hope to see you again for the 2025 series.

Microwave Contest Results Low Band Championship 2024

Pos	Call	2.3 GHz	1.3 GHz	3.4 GHz	2.32 GHz	Total
1	M0HNA/P	3000	2997	2748	2725	11470
2	G8CUL	2515	1956	1781	2099	8351
3	G4LDR	2324	957	2179	1473	6933
4	M0GHZ		1196	2916	2480	6592
5	G7LRQ		2119	1374	2774	6267
6	G3SQQ		1180		2364	3544
7	G4ZTR		2761			2761
8	G4BRK		648	468	607	1723
9	G3DCT/P		846	779		1625
10	G8AIM		110	980	428	1518
11	PE1EWR		409		874	1283
12	G3TCU		1000			1000
13	GW4JQP		875			875
14	G4KZY/P		253		414	667
15	GM4JTJ		625			625
16	G3TCT		623			623
17	EI8KN		615			615
18	GD8EXI		580			580
19	G3SGC				526	526
20	G0WZV		495			495
21	G6GVI		483			483
22	GM4DIJ/P		178	250	0	428
23	G1YFG		19		281	300
24	GM4BYF		284			284
25	G0HIK		245			245
26	G4CSD		194			194
27	F4VRB		187			187
28	G8HGN		133			133
29	G4GFI		121			121
30	G4XYW		69			69
30	G0FEH/P				69	69
32	G0NZI		67			67
33	G4RGK/P		26		22	48
34	MW0PJE/P		31			31
35	G3WUN		28			28
36	G0DJA		18			18

UKuG MICROWAVE CONTEST CALENDAR 2025

Month	Contest name	Organiser	Date 2025	Time GMT	Notes
Jan	1.3GHz Activity Contest	*Arranged by RSGB*	21-Jan	2000 - 2230	RSGB Contest
Jan	2.3GHz+ Activity Contest	*Arranged by RSGB*	28-Jan	1930 - 2230	RSGB Contest
Feb	122GHz Contest	UKuG	2-Feb	0600 - 1800	
Feb	1.3GHz Activity Contest	*Arranged by RSGB*	18-Feb	2000 - 2230	RSGB Contest
Feb	2.3GHz+ Activity Contest	*Arranged by RSGB*	25-Feb	1930 - 2230	RSGB Contest
Mar	Low Band 1296/2300/2320/3400MHz	UKuG	2-Mar	1000 - 1600	First 4 hours coincide with IARU event
Mar	REF/DUBUS EME 2.3GHz	*Arranged by REF/DUBUS*	8-Mar	0000 - 2400	REF/DUBUS EME 2.3GHz
Mar	1.3GHz Activity Contest	*Arranged by RSGB*	18-Mar	2000 - 2230	RSGB Contest
Mar	2.3GHz+ Activity Contest	*Arranged by RSGB*	25-Mar	1930 - 2230	RSGB Contest
Apr	REF/DUBUS EME 1.2GHz	*Arranged by REF/DUBUS*	5-Apr to 6-Apr	0000 - 2400	REF/DUBUS EME 1.2GHz
Apr	Low Band 1296/2300/2320/3400MHz	UKuG	6-Apr	0900 - 1500	
Apr	1.3GHz Activity Contest	*Arranged by RSGB*	15-Apr	1900 - 2130	RSGB Contest
Apr	2.3GHz+ Activity Contest	*Arranged by RSGB*	22-Apr	1830 - 2130	RSGB Contest
May	REF/DUBUS EME 3.4GHz	*Arranged by REF/DUBUS*	3-May	0000 - 2400	REF/DUBUS EME 3.4GHz
May	*432MHz & up*	*Arranged by RSGB*	3-May to 4-May	1400 -1400	RSGB Contest
May	*10GHz Trophy*	*Arranged by RSGB*	4-May	0800 - 1400	Sunday, to coincide with IARU
May	Low Band 1296/2300/2320/3400MHz	UKuG	4-May	0800 - 1400	Aligned with IARU event
May	24GHz/47/76GHz	UKuG	11-May	0900-1700	
May	1.3GHz Activity Contest	*Arranged by RSGB*	20-May	1900 - 2130	RSGB Contest
May	5.7GHz/10GHz	UKuG	25-May	0600-1800	
May	2.3GHz+ Activity Contest	*Arranged by RSGB*	27-May	1830 - 2130	RSGB Contest
Jun	Low Band 1296/2300/2320/3400MHz	UKuG	8-Jun	0900 - 1500	Aligned with some Eu events
Jun	1.3GHz Activity Contest	*Arranged by RSGB*	17-Jun	1900 - 2130	RSGB Contest
Jun	REF/DUBUS EME 24GHz	*Arranged by REF/DUBUS*	21-Jun	0000 - 2400	REF/DUBUS EME 24GHz
Jun	REF/DUBUS EME 10GHz	*Arranged by REF/DUBUS*	22-Jun	0000 - 2400	REF/DUBUS EME 10GHz
Jun	2.3GHz+ Activity Contest	*Arranged by RSGB*	24-Jun	1830 - 2130	RSGB Contest
Jun	5.7GHz/10GHz	UKuG	29-Jun	0600-1800	
Jul	VHF NFD (1.3GHz)	*Arranged by RSGB*	5-Jul to 6-Jul	1400 - 1400	RSGB Contest
Jul	24GHz/47/76GHz	UKuG	13-Jul	0900-1700	
Jul	1.3GHz Activity Contest	*Arranged by RSGB*	15-Jul	1900 - 2130	RSGB Contest
Jul	REF/DUBUS EME 5.7GHz	*Arranged by REF/DUBUS*	19-Jul	0000 - 2400	REF/DUBUS EME 5.7GHz
Jul	2.3GHz+ Activity Contest	*Arranged by RSGB*	22-Jul	1830 - 2130	RSGB Contest
Jul	5.7GHz/10GHz	UKuG	27-Jul	0600-1800	
Aug	ARRL Microwave EME	*Arranged by ARRL*	16-Aug to 17-Aug	0000 - 2359	ARRL EME 2.3GHz & Up
Aug	24GHz Trophy Contest	UKuG	17-Aug	0900 - 1700	New event
Aug	1.3GHz Activity Contest	*Arranged by RSGB*	19-Aug	1900 - 2130	RSGB Contest
Aug	5.7GHz/10GHz	UKuG	24-Aug	0600-1800	
Aug	2.3GHz+ Activity Contest	*Arranged by RSGB*	26-Aug	1830 - 2130	RSGB Contest
Sep	ARRL Microwave EME	*Arranged by ARRL*	13-Sep to 14-Sep	0000 - 2359	ARRL EME 2.3GHz & Up
Sep	24GHz/47/76GHz	UKuG	14-Sep	0900-1700	
Sep	1.3GHz Activity Contest	*Arranged by RSGB*	16-Sep	1900 - 2130	RSGB Contest
Sep	2.3GHz+ Activity Contest	*Arranged by RSGB*	23-Sep	1830 - 2130	RSGB Contest
Sep	5.7GHz/10GHz	UKuG	28-Sep	0600-1800	
Oct	*432MHz & up*	*Arranged by RSGB*	4-Oct to 5-Oct	1400 - 1400	IARU/RSGB Contest
Oct	*1.3 & 2.3GHz Trophies*	*Arranged by RSGB*	4-Oct	1400 - 2200	RSGB Contest
Oct	24GHz/47/76GHz	UKuG	5-Oct	0900-1700	
Oct	ARRL EME 50-1296MHz	*Arranged by ARRL*	11-Oct to 12-Oct	0000 - 2359	ARRL EME Contest
Oct	1.3GHz Activity Contest	*Arranged by RSGB*	21-Oct	1900 - 2130	RSGB Contest
Oct	2.3GHz+ Activity Contest	*Arranged by RSGB*	28-Oct	1830 - 2130	RSGB Contest
Nov	ARRL EME 50-1296MHz	*Arranged by ARRL*	8-Nov to 9-Nov	0000 - 2359	ARRL EME Contest
Nov	Low Band 1296/2300/2320/3400MHz	UKuG	9-Nov	1000 - 1400	
Nov	1.3GHz Activity Contest	*Arranged by RSGB*	18-Nov	2000 - 2230	RSGB Contest
Nov	2.3GHz+ Activity Contest	*Arranged by RSGB*	25-Nov	1930 - 2230	RSGB Contest
Dec	1.3GHz Activity Contest	*Arranged by RSGB*	16-Dec	2000 - 2230	RSGB Contest

Sections		
	F	Fixed / home station
	P	Portable
	L	Low-power <10W 1.3/2.3/3.4GHz, <1W 5.7/10GHz)

Updated for 2025

EVENTS 2025

January 13	Heelweg, Westendorp, Netherlands	www.pamicrowaves.nl
February 1	Ridgeway Roundtable, Chilton village	https://temp-tntdyedoigtcbfjkdtpz.webadorsite.com
February 15	Tagung, Dorsen, Germany	www.ghz-tagung.de
March 7-9	MicroMeet Madrid. Spain	www.micromeet.es
April 24-26	IARU-R1 Interim meeting / Centenary, Paris	conf.iaru-r1.org
April tbd	Martlesham Roundtable/AGM Ipswich	
September 12-14	70.UKW Tagung, Weinheim	www.ukw-tagung.de
September 21-26	European Microwave Week, Utrecht, Netherlands	www.euweek.com

EVENTS 2026

May 28-31	EME Conference 2026 Tenerife, Canary Islands	http://eme2026.moonbounce.info/
October 4-9	European Microwave Week London	www.eumweek.com