



An Amateur Radio publication for the Microwave Enthusiast

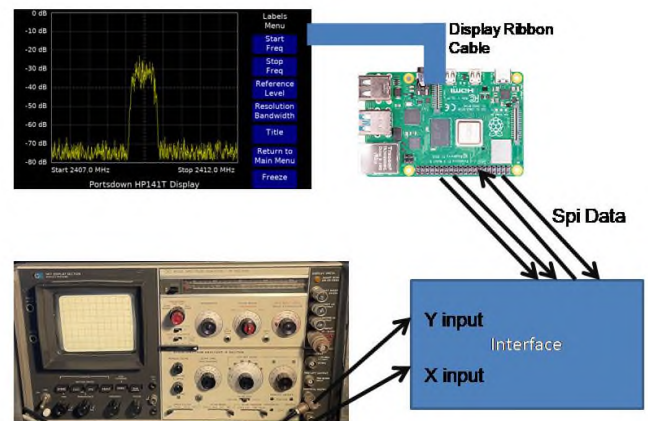
scatterpoint

November / December 2021

Published by the UK Microwave Group

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Dave G8GKQ's Display for 141T Analyser



Dave G4FRE operating on 47GHz DATV

Subscription Information

The following subscription rates apply

UK £600 US \$1200 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

payukug@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, rftd, 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

Reproducing articles from Scatterpoint

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You may not reproduce articles for profit or other commercial purpose. You may not publish Scatterpoint on a website or other document server.

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 Neil G4DBN for more information**

5.7GHz

10GHz

24GHz

47GHz

76GHz

12 Things you should know about Filters – part 2

by Ken, G3YKI

Filter Theory

The internet links to the book Matthaei, et al. Microwave filters, impedance-matching networks, and coupling structures. Did not make it into the published version of last month's notes, so here they are again:

<https://b-ok.cc/book/851200/1c9fc3>

and

<https://archive.org/details/MicrowaveFiltersImpedanceMatchingNetworksAndCouplingStructures/>

7 Materials

The choice of materials for construction of a filter will always take into account the electrical resistance, as this directly affects the losses in the filter.

This table indicates the resistivity of a number of materials, loss being proportional to the resistivity.

Metal	Resistivity (x10 ⁸)	Notes
Silver	1.59	The best conductor. Almost universally used as plating in the manufacture of low loss filters.
Copper	1.68	About 5% worse than silver.
Gold	2.44	If you find a gold plated filter, it was not done to reduce loss compared to silver.
Aluminium	2.82	This is for 99.99% pure metal. Rarely found because it is too soft to be generally useful.
Brass	5 to 6	Many different compositions are possible within the term "brass".
Aluminium Alloys	3 to 6	An online source lists the resistivity of 300 different alloys and states (i.e. whether it has been heat treated or cold worked)
Solder	15 to 20	Tin-lead alloys
Mild Steel	16	Low frequency resistance. It is likely to be much greater at RF because of the effect of magnetic properties on the skin depth.
Stainless steel (316)	75	Useful for dummy loads?
		The skin depth at GHz frequencies is of the order of 1 μm. The surface finish on conductors can therefore affect losses if roughness is on a similar scale, and if plated the plating material will generally be the significant one. So losses may be reduced by polishing the components. (But not if it is silver plated brass and you polish the silver away to nothing!)

8 Inner and outer of coaxial lines

These do not have to be the same material. The ratio of diameters of inner and outer in a coaxial resonator is generally about 3, and both carry the same current. Hence resistance and therefore losses in the inner will typically be three times as much as in the outer if made of the same material. So there is also more to be gained making the inner from a

better conductor. For low loss, it is worth making the inners of copper even if the rest is aluminium. Whatever the materials used, always ensure there is the best possible contact between inner and outer at the short circuit end, as this is where the current is greatest.

9 Coupling

Coupling from the input and output connectors to the resonators, and between resonators can be inductive, capacitive, or even a combination of the two. For amateur purposes it does not really make much practical difference to the end result in terms of filter performance. Capacitive coupling usually means a disc close to the open end of the resonator. Inductive coupling usually means a coupling loop close to the grounded end of the resonator, or a tap on to the resonator. The concept breaks down when the components are not small compared to the wavelength. So in microwave interdigital and combline filters coupling between resonators is always a mixture and is a function of the spacing. Generally there are no specific coupling components between the resonators, but screws or other features can be incorporated to make the coupling easily adjustable to a limited extent.

10 Set up your filter passband while looking at the return loss

OK, if you have a super modern network analyser you can look at two or more parameters at the same time, but if you have a single channel sweeper system put a good load on the output of a filter and measure the return loss. If you can get this as it should be, the through loss will be as intended as well, probably better than you would achieve by looking at it directly. You can check it at the end if you need convincing or want to know the passband loss. This is all based on point 2 above; if the power is not being reflected it is coming out the other end, and it is much easier to see the difference between 20 and 30 dB on the return loss plot than between 0.05 and 0.01dB on the transmission plot.

11 Poles and Zeros

Q. What are these "Poles" I see referred to in discussion of filters? Are they another name for the rods inside the filter?

A. Well no, but in a way yes. The term is used in areas of mathematics such as control systems where an output value is related to an input value and the response can be represented as an equation, the transfer function. It is usually written $H(s)$ to show that it depends on the (complex) frequency, s . A filter is such a system. A value of s for which the transfer function becomes zero is termed a "Zero", and one for which it becomes infinite is termed a "Pole"

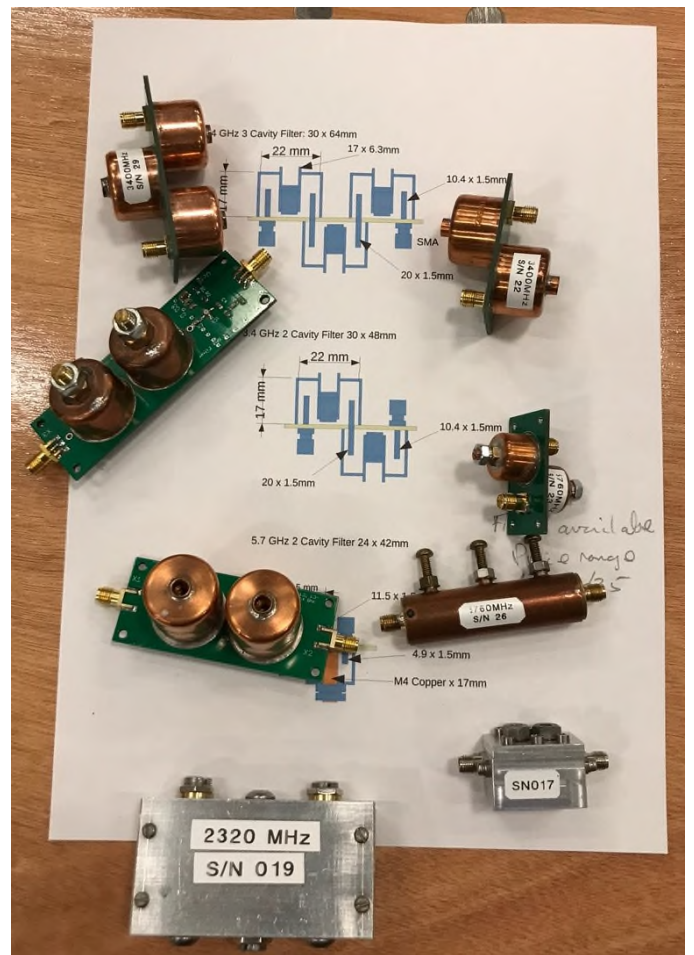
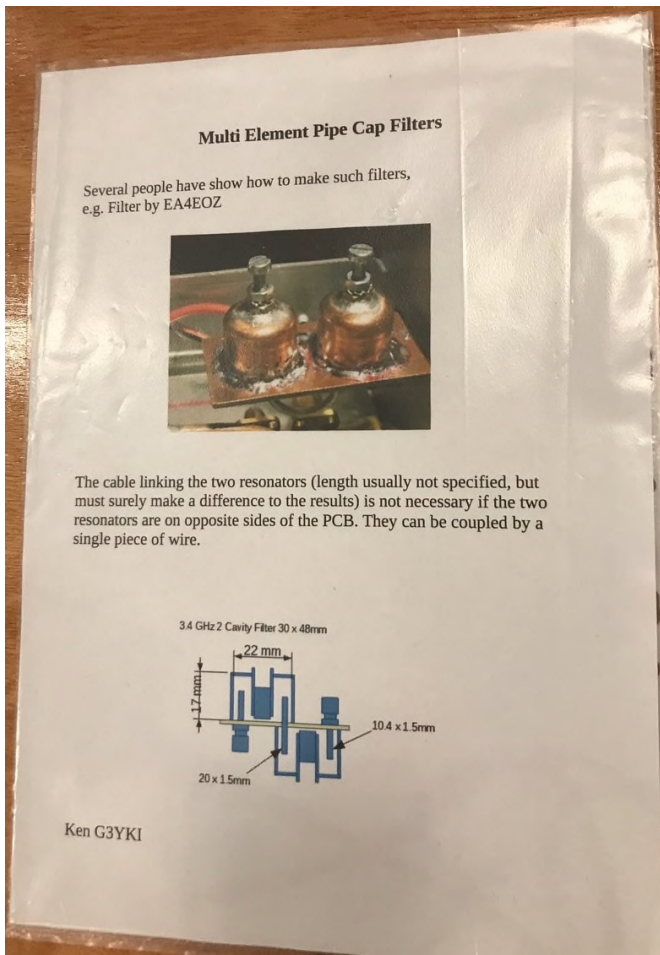
When a filter is analysed mathematically, each resonant circuit in it will give rise to a pole in the transfer function. So "Pole" makes a convenient shorthand and generalised term for the number of elements, resonators, cavities, tuned circuits, coaxial lines, or whatever else you might call them, in a filter.

12 Symmetry is your friend

If you want to build a bandpass filter, make it as symmetrical as you can. By doing so you reduce the number of variables you are dealing with. A three pole filter with equal coupling to input and output ports and equal coupling between resonators is bound to work correctly even if the bandwidth and passband ripple turn out to be not what you hoped for. If you want to increase the bandwidth of the filter you need to increase the coupling between resonators; for example, put them closer together. If you have too much passband ripple you need to increase the input and output coupling; that is a bigger coupling loop or tap further up the resonators.

Likewise when setting up a bandpass filter, aim for a symmetrical frequency response. That is what you will get when all the resonators are tuned to the same frequency, as they should be.

End of Part 2.



Ken's filters at the Midland Microwave Roundtable

UK Microwave Group Clothing

Get ready for 2022.



Clothing and accessories available on the group website

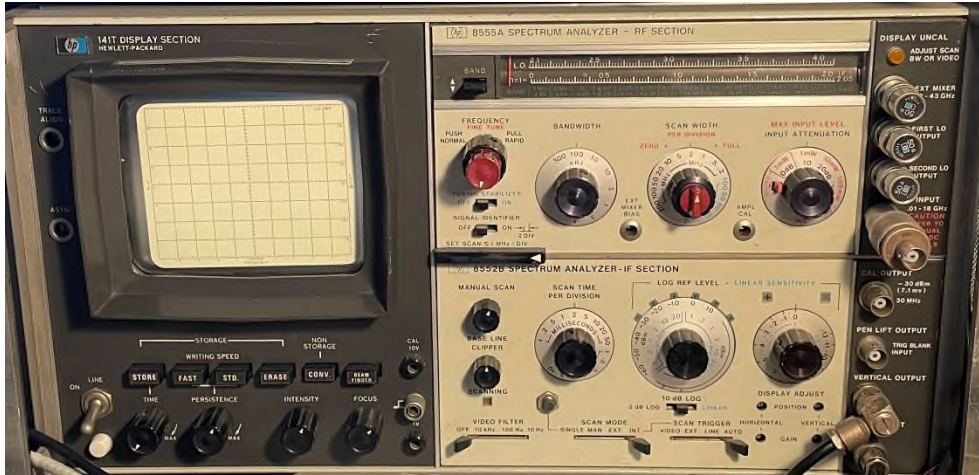
[UKuG Accessories](#)

An Alternative Display for the HP141T Spectrum Analyser

By Dave G8GKQ

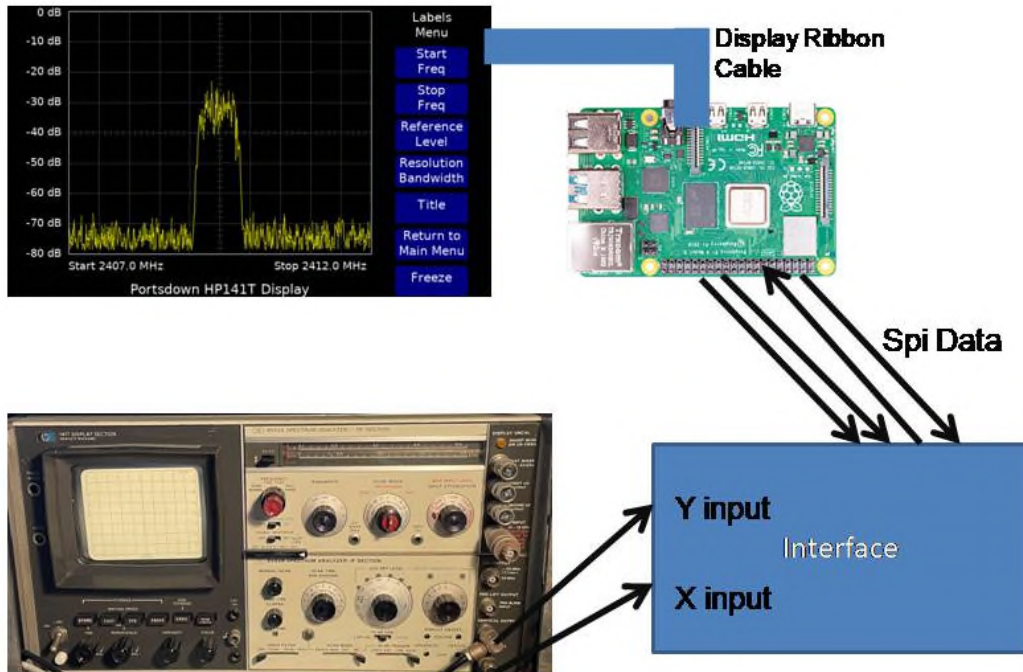
I was lucky enough to be given a non-working HP141T Spectrum Analyser by another Microwave Group member. After some TLC it is now working again and sits centrally on my Test Bench. However, the display (or maybe my eyesight!) is aging and it is not easy to take screenshots for future reference.

I had found a possible alternative display solution published on GitHub https://github.com/schnommus/stm32_hp141_lcd, with some YouTube links, that used an STM32F746G discovery board with an integrated LCD Display. I built this and it worked well as an alternative display, but it did not have any network connectivity to allow the export of screenshots, and I found the software structure difficult to work with.



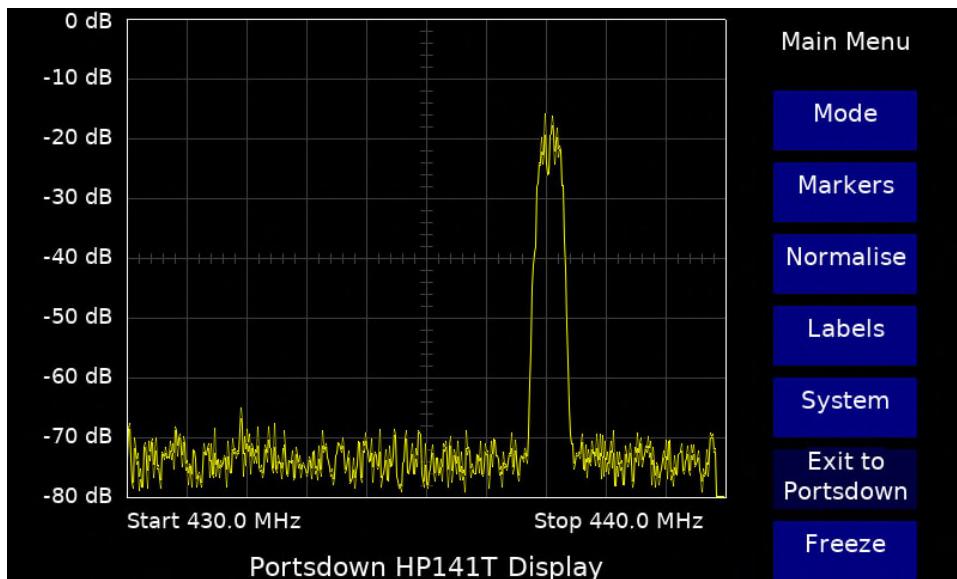
HP141T with "Vertical Output" and "Scan In/Out" Sockets at Bottom Right

I had just started writing software to draw graphics directly (pixel by pixel) on the Portsdown 4 touchscreen and decided to replicate the XY display capability there. I started again from scratch, learning a lot along the way. The first step was to produce an interface that connected to the "Vertical Output" and "Scan In/Out" BNCs on the front of the HP141T and then feed the digital signals to the Raspberry Pi 4 in the Portsdown 4.



Principle of Operation

The software monitors the Scan Output waiting for it to go to the left of the screen and then samples the Vertical Output 500 times as the Scan Output increases. These samples are displayed on the screen almost immediately, erasing the samples from the previous sweep as the update moves from left to right. A typical displayed image can be seen below.

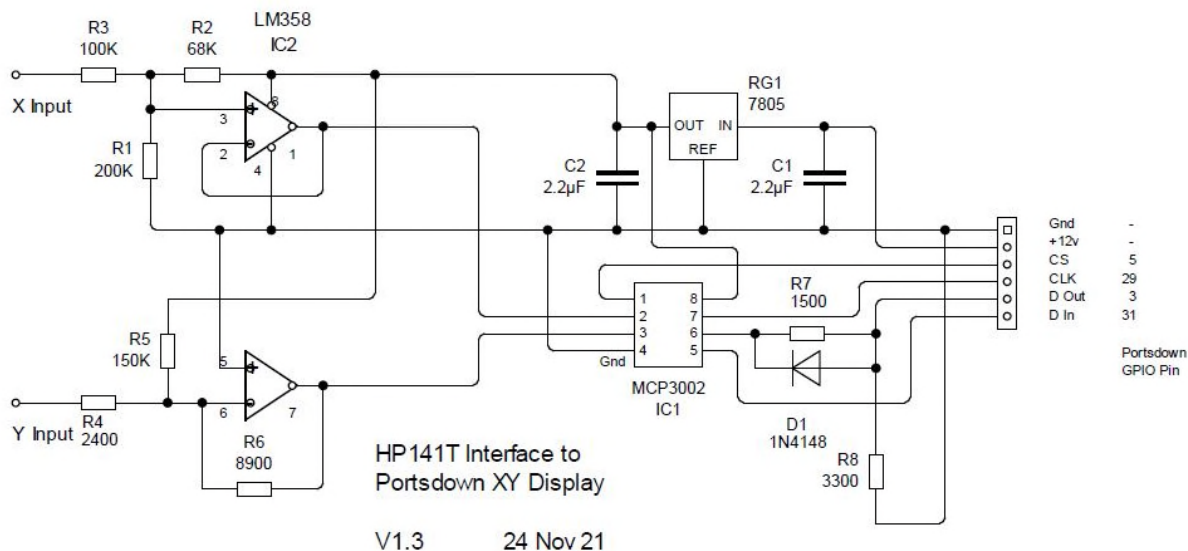


The start and stop frequencies are manually entered, as is the Plot Title. Reference level and resolution bandwidth can also be manually entered and displayed if desired. The displayed images can be captured and stored on the SD Card in the Raspberry Pi for export to a PC.

If using a sweep generator with the Spectrum Analyser, there is the facility to normalise the display. This involves taking a sweep without the device under test in circuit, measuring the system response, and then connecting the test device and simply displaying the difference. This can cancel out the effect of dips and peaks in the response of the test system.

Interface Circuit

The interface circuit used is very simple with an Op-amp for level and gain shifting, and a 10-bit 2-channel analogue-to-digital (A-D) converter.



The input dual op-amp must be capable of rail-to-rail operation if a single 5v supply is to be used. The LM358 (possibly still available from the UKuG Chip Bank) is suitable. Connection leads to the Raspberry Pi should be short (less than 20 cm) as the spi protocol used for the digital data transmission is only designed for on-PCB use.

Some tweaking of R1 and R2 may be required to ensure that the sweep voltage falls below 150 mV (on the input to the A-D Converter) at the start of the sweep. This is what triggers the start of the data capture. The ramp needs to reach about 3.5v to complete the sweep. The resistors R4 and R6 set the Y gain, and hence the Y calibration. In my prototype (built on veroboard) R6 was a 10K in parallel with a 100K.

The speed of the A-D converter limits the scan speed to about 2 ms per division for correct operation. However, at slower scan speeds, the display offers almost infinite persistence with clean overwrite on subsequent scans.

Software

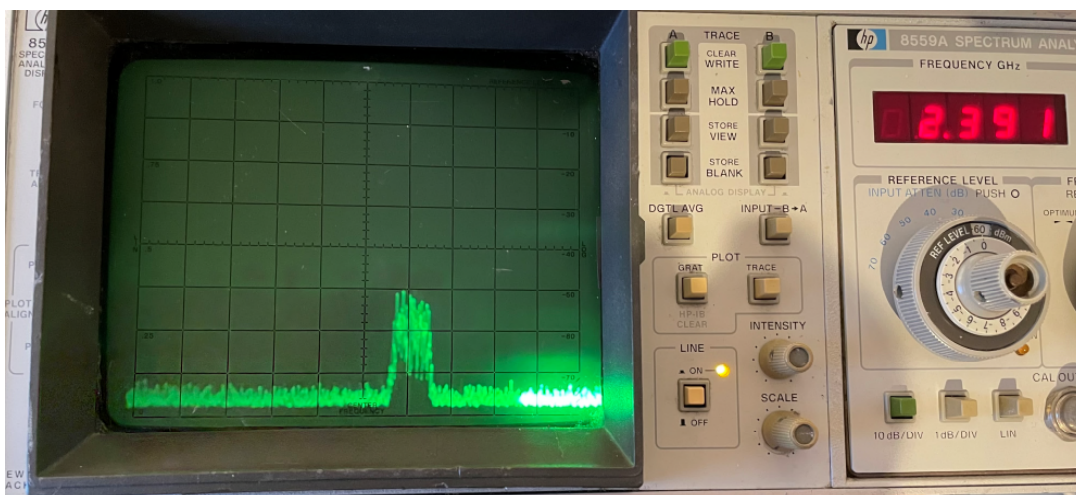
The software is written in C and is included as standard within the Portsdown 4 software build, but could also be used stand-alone. The XY Display can be selected from Menu2, Test Equipment. With additional peripherals, such as a LimeSDR, there are many other Test Equipment functions included in the Portsdown build. The XY Display source code is here https://github.com/davecrump/portsdown4/tree/master/src/power_meter. It is bundled with the display for an AD8318-based power meter which has already been described in CQ-TV 273.

Portsdown 4 and the Langstone Microwave Transceiver

In addition to the interface described above, all that is required to complete this display is a Raspberry Pi 4, a Portsdown SD Card and a Raspberry Pi 7 inch Touchscreen. The hardware build for the Portsdown is described in detail on the BATC Wiki https://wiki.batc.org.uk/Portsdown_4 and programmed SD Cards are available from the BATC Shop.

This is essentially the same hardware as is used for Langstone Microwave Transceiver (with a Pluto, or experimentally, a Lime SDR). So – please don't think of the Portsdown as just an ATV Transceiver; the platform is now the basis for many Microwave-related capabilities.

The input Op-amp circuitry could easily be modified to suit any Spectrum Analyser with X and Y outputs, such as the repaired HP8559A analyser from the Midland round table below.



Setting up a Tripod for Portable Use

Dave G4GLT in collaboration with Pat W5VY

After my last article I was contacted by Pat (W5VY).

Pat commented that he was jealous of all the microwave activity in the UK as he's the only op on 10GHz in Arkansas.

Fortunately he is a member of the North Texas Microwave Society, where he gets a lot of help from experienced veteran ops.

He said that from his limited experience he didn't think that there was much need for elevation control over a few degrees. He had worked a friend over a short 5km path that was completely blocked by elevated land, and they were able to tilt up their dishes to scatter off the tree-tops with 59 signals. For the bulk of his QSO's the spirit level has remained close to centred. He had not tried aircraft or rain scatter yet and agreed that elevation might well be handy depending on conditions. The dish is a 60cm prime focus with a W5LUA dual band feed and Down East Microwave TVTRs for 5 and 10GHz. The small keyer paddle that he bought at Friedrichshafen he finds really handy. He uses a 3 axis camera pan/tilt head to get an elevation control and a Bosch lightweight surveyor's tripod. The camera head will take a 30 pound load and it is a quick connect plate. The camera mount is located at the balance point of the platform. The platform is plywood and is edged with 12mm hardwood reinforcing rails. The vertical mast that supports the dish is a PVC pipe connected to a PVC floor drain at platform level.

I note that Pat is using a 10MHz GPSDO , and like me changed to a different make after problems with getting it to work reliably. The neat arrangement of his interconnecting wiring prompted me to do the same, and I removed all the connections at ground level near the battery.

He has a weight hanging from the top of his tripod. Also, the mast is at the back of the platform, and this is a mod that I have done on my later tripods so that I can easily get all my gear on the platform. I enclose a picture of Pat's set-up below:



The aspects involved regarding setting up a tripod/portable system that a newcomer should consider are as follows:

1. The tripod should be sturdy enough to survive repeated use and the weight of the gear. The threads on the leg adjusters should be in good condition and greased.
2. Rotation of the platform is very useful, and this can either be a rotation directly on the tripod head or the use of a 'lazy Susan' bearing. If rotation is possible, then a locking mechanism is very handy.
3. For windy conditions heavy duty pegs tied to the legs, a weight attached to the centre or heavy theatre weights tied to each leg at ground level are useful.
4. Neat interconnections/fuses around the back of the platform are a good idea.
5. Having a morse key at the front attached to the platform is a great idea as it's hard enough to send CW portable anyway.
6. Having the stub mast near the back of the platform gives more room for the rest of your gear rather than putting it centrally.
7. Do you need the platform to be detachable from the tripod, because with a large dish this makes it easier to pack away in a vehicle and is less cumbersome.
8. Do you want elevation included? If you want to work rain-scatter then this would be recommended.
9. The use of a GPSDO is recommended if you can afford the outlay, and the antenna for this can be anywhere but up in the clear at the top and back of your dish will work well.
10. With the new EMF requirements you could add a PIR sensor so that should the general public come into the exposure zone the gear will not transmit.
11. The fixing of a 360 degree 50mm spirit level to the platform is essential.
12. Whether the equipment on the platform is attached physically is personal preference but if elevation is used attachment may well be necessary and or compensatory adjustment of the angle of the gear, such as Pat has done with his IF rig.
13. Some portable operators use a compass to get their bearings. I can recommend the Silva map-reading compass. If your dish edge profile is perfectly parallel to the edge of the platform, and the platform is perfectly square, then it is easy to line up the dish on a bearing using one side of the platform, to within a degree or so.
14. If you are working on the mm wave frequencies then a telescope attached to the platform can be very helpful.
15. The use of a battery of sufficient amp/hours for a long opening/contest, which can be easily charged. I use a Victron 40amp/hour 12 volt Peak Power Pack that is lithium-ion.
16. Use a low power / long battery life Windows laptop for ON4KST (KST2ME is best version) and maybe take a spare laptop as black screens do sometimes occur.
17. Use a portable wireless 4G router such as the Ryoko Muama, and back up is ideal such as the hotspot on a phone. Even better is to have access to two different networks as they do go down occasionally.

18. The use of the right size of Anderson Powerpole connectors (red/black) for easy setting up and taking down. Always think red to red, black to black. We have all done it!

19. The appropriate use of connectors and coaxial cables.

Use TNC instead of BNC and try to avoid repeated use of SMA's, as they prefer to remain undisturbed. The foil of some coax such as Ultraflex 7 will soon break down with frequent bending.

20. Be prepared for eventualities. Take tools such as spanners, wire stripper, screwdrivers and plastic tape.

Take some spare wired Powerpole connectors and terminal blocks because one day you may need them.

Prompted by Pat's query about how I achieved elevation with my set-up, I have now built elevation onto the latest tripod (as well as detachability and rotation). The platform is a standard 300 x 300mm.

Using a linear actuator for elevation on a portable tripod seemed overkill to me so I have used a mechanical approach that enables elevation of minus 1 degree to plus 15 degrees. The use of thick stainless steel Screwfix fire door hinges (1) gave the spacing to enable the minus 1 degree setting. Where necessary countersunk bolts are used to enable the close proximity of the two 6mm aluminium platforms. One advantage of 6mm aluminium plate is that the holes for the M6 countersunk bolts for the two hinges can be tapped to give a neater finish. The pictures show the basic structure of the elevation mechanism and also the lower detachable platform that will be attached to the top of the bearing (see previous article). A stub mast will be attached to the high side of the uppermost platform. The angles on the reading scale were calculated, having found the exact point of intersection of the two plates when at an acute angle to each other. The offset crank handle was bought online from Good Hand UK (2), and its square hole fitted the square section of an M10 coach bolt. It may not be obvious but I have inclined the rotating handle thread 20 degrees away from the perpendicular to get it out of the way of the tripod. The angular gauge also has a stop on it to prevent any further movement of the top platform.

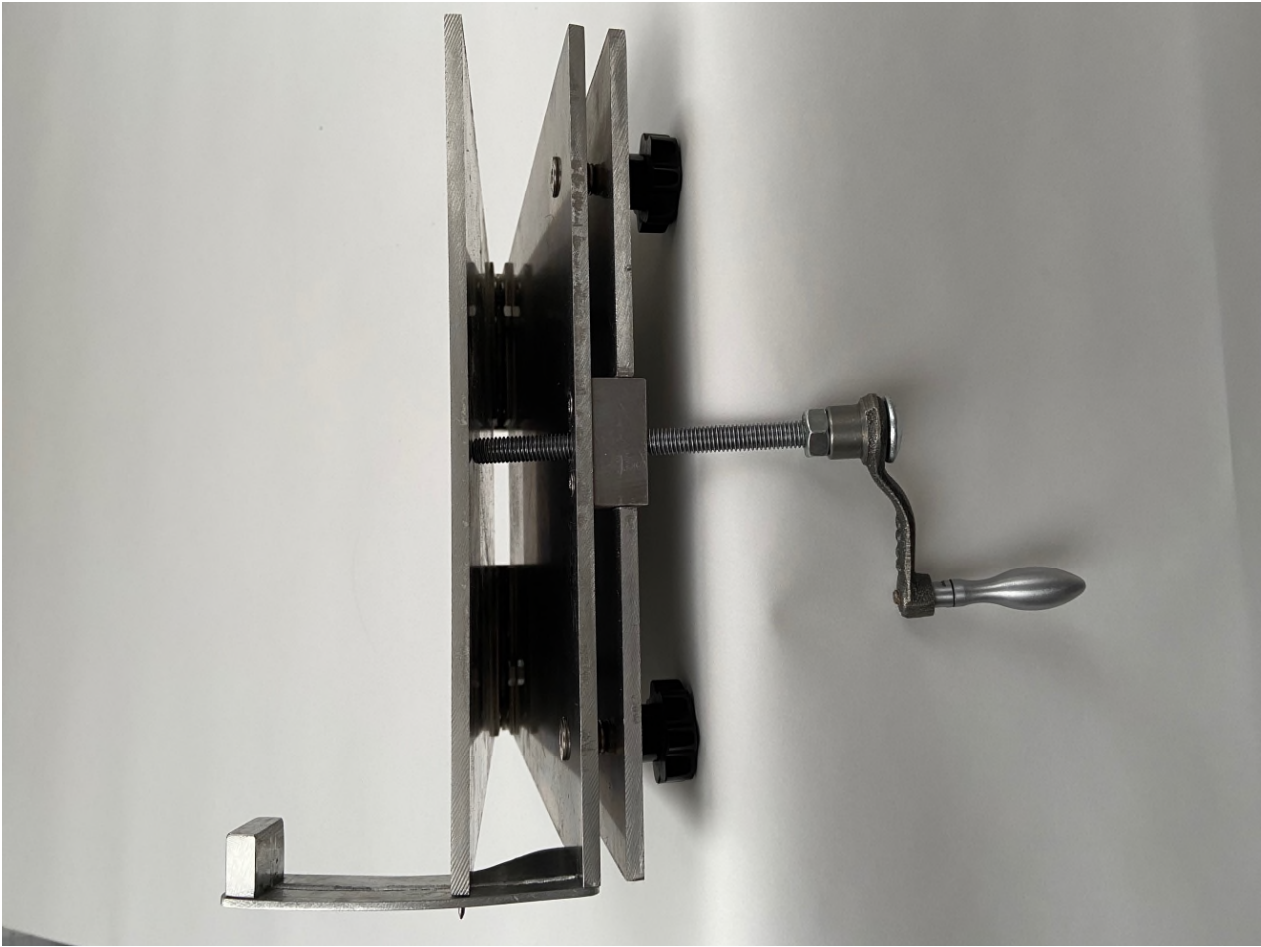
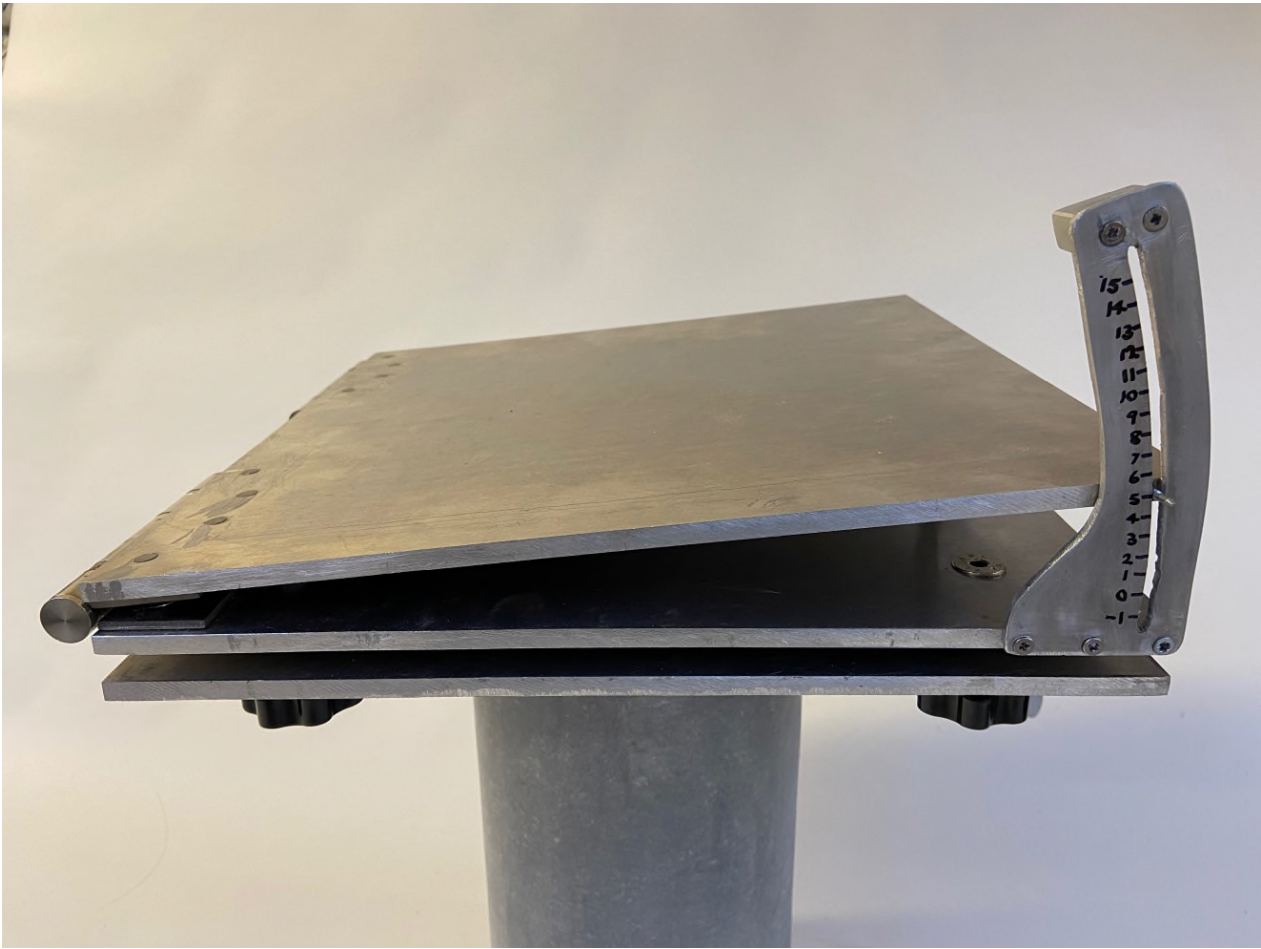
The tapped block of aluminium for the M10 handle thread is 46 x 22 x 20mm, and is secured by two countersunk screws tapped into the block. A rectangle needs to be cut out of the side of the bottom plate to allow the tapped block to fit in. The gauge was marked using an Edding 370 fine black permanent marker. M3 countersunk bolts are tapped into the platform to secure the gauge, and an M2.5 thread was filed to a point and tapped into the plate for the pointer.

I hope that this is helpful and certainly hope that you enjoy your portable operating, even if it is perishing outside!

Written by Dave G4GLT in collaboration with Pat W5VY.

(1) Smith and Locke SS Fire Door hinge 76 x 51mm (Screwfix)

(2) Offset crank handle with revolving handle K0684.206X10 L1=63 S=10 H=20 from Good Hand UK.



122GHz QSO report – November 28th 2021

Noel Matthews G8GTZ

Whilst others were sitting in their warm shack working CQWW CW, Dave G1EHF and I ventured out on a cold and frosty morning to attempt a longer path on 122GHz using the VK3CV boards (our current best DX was 17km).

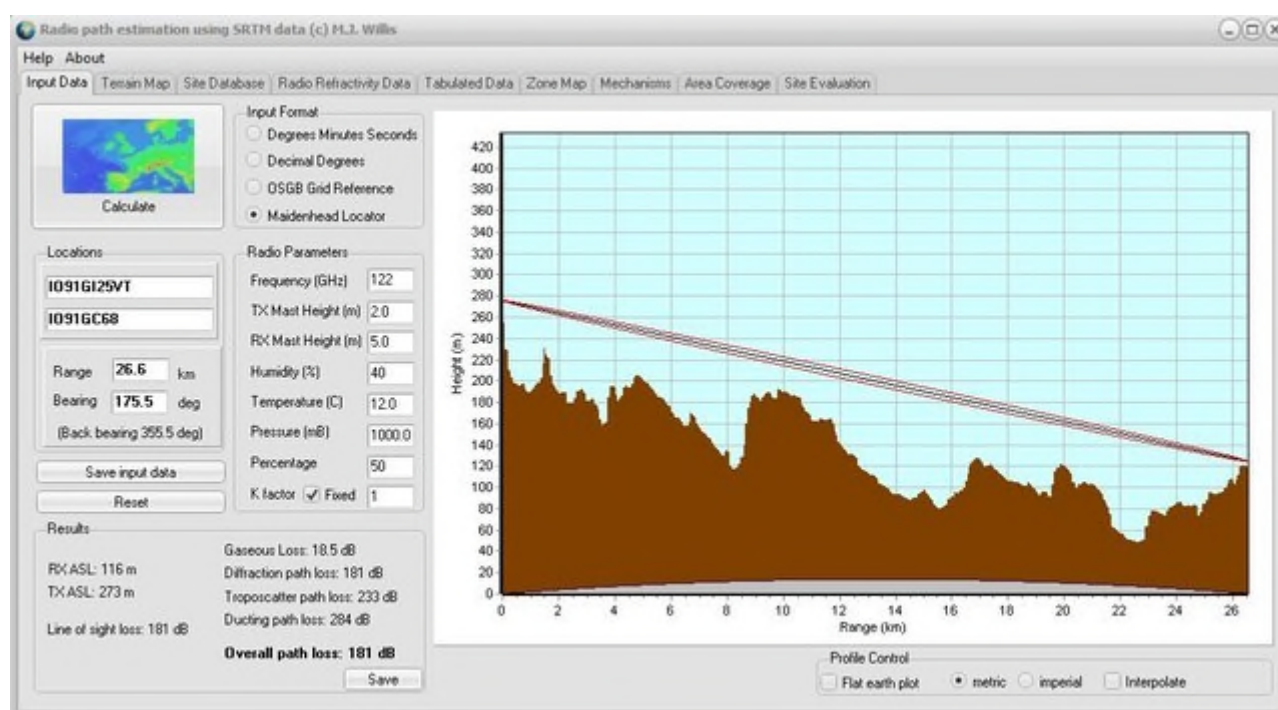
We knew to really improve on 17km we would have to choose a cold dry day with a low dew point. If you do not have a G8AGN weather box this site is very useful to calculate dew point from temperature and relative humidity <https://www.calculator.net/dew-point-calculator.html>

This site enables look up of historic dew point and other parameter records which is useful after the event to see exactly what conditions were during a contact.

<https://meteologix.com/uk/observations/wiltshire/dewpoint/20211128-1000z.html> -

After several false starts, including the day of storm Arwen, Sunday morning looked suitable - the weather was cold but dry, air temp was 1 degree (it felt much colder) and dew point -3 degrees . For comparison, the dew point yesterday on a typical grey winter's day was +9 degrees.

The 26.6km path was from Coombe Gibbet IO91GI25 to a small local hill near Stockbridge IO91GC68. The sites are well known by southern microwaves and provide a good line of sight path over a reasonable distance.



The output from the VK3CV units are estimated to be in the range -10 to -6 dBm and signals were about 14 dB SNR and just readable on FM.

Recordings from both ends and pictures are available on

Twitter: <https://twitter.com/G8GTZ/status/1464954101582729217>

The biggest problem making the contact was initial dish alignment as Stockbridge is not on the horizon from Coombe Gibbet so difficult to get an initial alignment to acquire the signal – we solved this by running a high power Phlat light optical beacon and using this to align the 122GHz rifle sight. The Optical beacon is in the large wooden box on the tripod along the 18" Edmund dish.



G1EHF was using a 47GHz Pasolink sub reflector dish and I was using the Edmund 18" optical dish with a sub-reflector which I have spent many happy (non-scientific) hours optimising and trying different designs. See separate article in Scatterpoint for more details.

The systems are clearly working well as we have signal in hand and will be hoping to improve the distance during the next cold snap. As CW is a bit of a problem for both operators (no lectures please!) we are now investigating running WSJT or other weak signal modes.

Using the Edmund 18" optical dish on 122GHz

Noel Matthews G8GTZ

As mentioned in the 122GHz QSO report, with the help of Gareth G4XAT and Dave G1EHF, I have spent many happy hours trying to optimise a feed for the Edmund 18" optical dish which is available at a reasonable price from the manufacturer's website.

My 122 GHz QSOs to date have been made with the VK3CV transverter and a variety of dishes and feeds with the best DX being 17km made using a Nera 38GHz dish. However during last winter I built up my 47GHz system and so that dish was no longer available for 122GHz!

Early in 2020, David G1EHF and I noticed that Edmunds were offer a discount on the optical dishes and so purchased a pair – the challenge was then how to feed them. After a couple of false starts and the need to get "on the air" last summer, I had some ideas based on commercial dishes but being mechanically inept, I challenged Gareth to make up some parts to mount the dish and feed!



Test setup

These notes describe my unscientific experiments which did result in Gareth doing a proper design which is described in a separate article.

All the ideas were tested over a short near field test range using an Elcom synth block running at 11,126.66 MHz driving an HSM8101 diode which generates a low level signal on 122GHz – see

https://wiki.microwavers.org.uk/Microwave_signal_source

I used the 20dB horn supplied with VK3CV transverter as a reference receive antenna and airspy / SDR sharp (with AGC turned off) was used to measure the approximate received signal strengths.

Idea 1 – sub reflector feed with brass waveguide

I started with a 2mm i/d brass tube feeding a sub reflector mounted in front of the end of the tube with disappointing results. Whilst it did seem to have gain over the horn on the test range, on air tests failed over a 12km path, largely I think due to the use of brass tubing which has a loss of 1dB per inch and the size and shape of the sub reflector.



Idea 2 – Direct PCB feed

Comments were being made on the 122 iogroup that it may be possible to directly mount the PCB at the focus point of the dish – one advantage of this approach is that it would losses in the Tx / Rx cavity combiner but the Tx and Rx focal point would be different.

Gareth G4XAT made a mount to hold the PCB directly at the feed point but this was difficult to focus and gave poor results and so was never tried in the field.



Idea 3 – sub reflector fed by 20 dB horn

The current best solution is 50mm aerosol can bottom fed by the VK3CV 20 dB horn. It was initially mounted on the 3D printed frame which was designed to hold the PCB using double-sided tape.

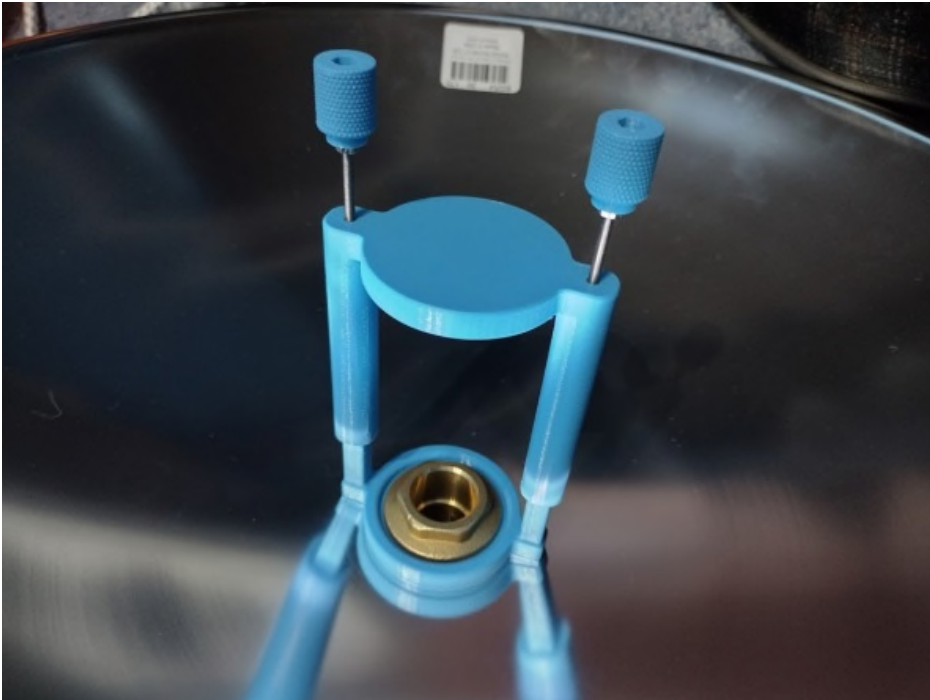
This was the feed used for the 26.5km QSO with Dave G1EHF in late November.



Sub reflectors

I have done further tests with different aerosol can bottoms and a 3D printed design based on the G3PHO sub reflector calculator, but have not had time to document the results or reach any firm conclusions other than they all seem to be within 2 -3 db of each other.

Final design!



Based on the success of the boded sub reflector holder, a design with 2 legs coming off the centre boss to give accurate placement of the sub-reflector with adjustable focus has been designed by G4XAT and is described in another article.

This design should enable accurate adjustment of the reflector and easy experimentation of different reflector designs, hopefully resulting in a few more dB gain!

122GHz Cassegrain mount

Gareth G4XAT

This article describes the parts required and assembly of a cassegrain sub reflector mount for the edmunds optical dish. The 3D print files will be made available in the files area of the 122GHz io group.

Parts required

Screwfix #36982 Flomastea Compression tank connector £3.99 (Plastic alternatives may not need any machinework e.g. #220HR at £2.37 or #11877 at £3.87 for a pack of 5! Untried by me personally).

3mm SS (doesn't have to be stainless) Threaded rod 150mm x2 e.g. eBay

<https://www.ebay.co.uk/itm/193855058944?var=494077891586> doesn't have to be stainless

10 3mm nuts and 4 3mm washers

Bottom of Hycote Double strength acrylic aerosol or similar – refer to forum posts as people try different bases. (cheaper solutions MWEY include Sure aerosol anti-perspirant and Alloy soft drinks can bases).

3-D Printed parts:

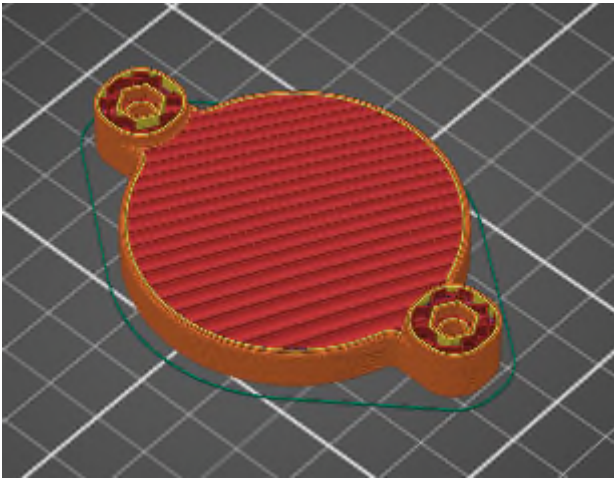
Two knurled nut holders for adjustment

1 Dish inner side 'Thrust' washer

1 Dish front mount

1 Cassegrain front mount

(Print time at 0.2mm layer height around 5 hours, note the Cassegrain mount needs a pause inserting in the .stl/print file at the top of the trapped HEX nuts layer, where you insert two 3mm nuts – easy to do if you screw them onto a long screw so you have something to align/push them in with.



Note that the brass (and maybe plastic) tank connector has an internal shoulder that may not benefit the flow of microwave energy from the horn (if used). Where possible this is removed either by drilling through with a 22mm drill or by the use of a boring bar. An obvious alternative is to use a plastic equivalent where the shoulder may not matter. The supplied rubber sealing washer goes on the back of the dish. The 'thrust' washer curved face goes against the front dish face – you may wish to put a small cloth/cardboard gasket between the plastic and the dish. The reverse profile of the thrust washer is a very simple match to the actual dish shape.

A variety of Cassegrain reflectors can be tried – just look at the underside of small/medium size aerosols – I found that the base of a Hycote Double Acrylic concentrated aerosol paint gave good results, but furniture polish and deodorant cans are similar. Fizzy drinks cans may also work. It's a case of 'select on test'.

Assembly.

1. Check both ends of the threaded rods are correctly finished – file until a nut screws on easily if not.
2. Screw both rods into the Cassegrain mount from the outer end until about 25mm is proud both ends of the mount.
3. Fit one 3mm nut to the 25mm protruding thread at the away from dish end, followed by a 3mm washer.



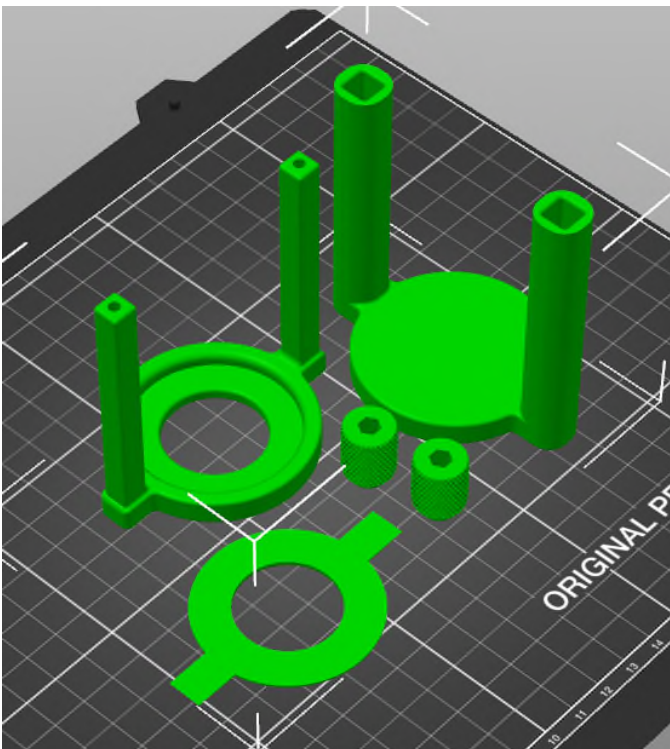
4. Note the knurled nut fitting has a blanking layer at the bottom of the hexagonal recess that will require clearing with a 3mm drill. This is deliberate feature as it helps with filament support.
5. Engage a second 3mm nut above the knurled fitting and then screw the bottom nut progressively until TIGHT – it will take a while to pull the internal nut down inside until it seats. This forms the drive to the adjustment so needs to be a tight grip on the knurled part.
6. Repeat for the second threaded rod.
7. Slide the dish side unit over the threaded rods and fully into the Cassegrain mount.



8. Fit a washer and then two nuts to the bottom of the rod, then LOCK them together with the bottom nut flush with the end of the rod. The washer and nuts should then JUST fit into the recesses at the base of each column. At this stage try and get the protrusion of the rods equal so the two sides adjust parallel. There are small markings every 5mm up each leg to assist with equal adjustment.

9. Assemble the unit with the tank side of the coupling in the dish mount recess, followed by the thrust washer, then the dish, then rubber washer, any dish mount you have and finally the retaining nut. Match the lugs on the thrust washer with the lugs on the dish mount. Tighten the back nut as required. You can now adjust both threaded rods equally to move the reflector face in/out as required. There are small markings every 5mm up each leg to assist with equal adjustment. You can get close by sighting across the dish face and lining up the reflector face. Then adjust each knurled nut the same amount. Final tweaking needs to be done in use for the ultimate in optimisation.

Not for commercial use or for sale. E. & O. E. Gareth Evans G4XAT g4xat@ntlworld.com



Scatterpoint activity report

Activity News: November/December 2021



By John G4BAO

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

From Phil G8MLA

Yes, there is life above 10GHz East of the Greenwich meridian! Around the October contest I got together with Jenny, G0VQH, Dave G6GZH and Bernie G4HJW to have QSOs on 122GHz.

Testing started in Jenny's garden. Photo 1 below shows Bernie and Dave setting up





Photo2 shows G4HJW operating from The Newmarket Heath area



Photo 3 shows Dave G6GZH setting up

No great DX but it's a start and we are hoping to be joined next time by John G4BAO and Simon G7SOZ who have equipment

From Dave G4FRE

The photo shows me operating portable on December 4 in 30mph wind gusts. From the Malverns IO82TB, I worked Noel G8GTZ on Titterstone Clee IO82QJ. We made it easily on 47GHz DATV but the wind made it impossible to keep my 76GHz dish pointing at him, so we didn't complete!



From John G4BAO

Very little activity to report this month, been too busy setting up my new 1.2m EME dish and 24GHz plug-in. I copied the DL0SHF beacon in its QRO mode, so am now working on improving the RX to receive the 4.5-Watt beacon. Charlie G3WDG is ahead of me on this, having already copied it with his 1.2m dish. He noted "you have to pick your day" At 24GHz it needs a combination of low temperature and humidity, high Moon elevation to reduce slant path losses, low libration Doppler spreading, and of course choosing a day close to Moon Perigee to reduce the free space loss to a minimum.

With my new 1.5dB preamp I can now see 0.6dB Moon noise on 24GHz stacking up exactly with the VK3UM calculator.

I did have one 10GHz Q65E EME QSO with IK0HWJ in JN61HM.

From Dave G4GLT

10 GHz propagation in December 2021.

A new beacon has been heard at my portable location (IO8DO).

The Brittany beacon, F5ZVW, is at IN88AI and has a very distinctive chirpy

keying (can be heard on Beaconsport). I find it very useful as I know now whether this end of the path to ED1ZBE is open. The beacon feeds into a horn aimed at 75 degrees.

On 16th December I was hearing the F5ZWM beacon strongly from JN05VE around 2200hrs.

At 2215hrs I had a cw QSO with Dom F6DRO in JN03TU. Dom mentioned later on the ON4KST site that he had built the F5ZWM beacon. There is no doubt that for me hearing this beacon is a pre-requisite to a QSO with him, as this was the course of events last time I contacted him in 2019.

On 21st December, G4CBW heard the ED1ZBE beacon at a distance of 1095km with a report of 519. G4CBW is at IO83UB (Stoke on Trent) .Watch out for this ODX to be extended, as at times the beacon is peaking 599 here in the south west (21/12/2021 at 2046hours).

During the extensive tropo opening on 22nd December the large area of stable high pressure was located mainly over the northern two thirds of France, Belgium and the Netherlands.

The beacons heard delineating the edges of the propagation (as heard from IO80DO) were GB3FNY (and all the southern beacons including GB3PKT), PI7ALK, ON0EME, LX1DB , HB9BBD, HB9G, F5ZWM, ED1ZBE, F1ZUQ and F5ZVV. I had QSO's with G4BAO, ON4IY, F6DKW, F1RJ, and F8DLS; the last three being near Paris. Signal strengths were strong with PA3GCO being 599 plus 20dB, and the furthest heard : HB9BBD (982km) at 599 for hours on end. My current set up is 5watts to a 60cm dish. I am working on improving this portable set up to 8 watts to an 85cm dish, with rotation, mechanical elevation and easy detachability from the tripod.

Dave G4GLT. 23/12/2021.

From Noel G8GTZ

At the end of November, while others were sitting in their warm shack working CQWW CW, Noel G8GTZ and Dave G1EHF ventured out to attempt a longer path on 122GHz using the VK3CV boards and extended their best DX to 27km. The path was from Coombe Gibbet (IO91GI25) to near Stockbridge (IO91GC68), air temp was 1 degree and dew point -3 degrees. Signals were about 14 dB SNR and just readable on FM. Videos and pictures are available on Twitter (7)

G1EHF was using a 47GHz Pasolink sub reflector dish and Noel was using an Edmunds 18" optical dish with a sub-reflector consisting of a 50mm aerosol can bottom placed at the focal point, which is at the dish rim, fed by the VK3CV 20 dB horn.

See separate full 122GHz report by Noel.

Contests

November 2021 Lowband Contest Results

Conditions were about average for this final session, with similar activity levels to 2020. Aircraft scatter provided some DX, but there were few contacts made outside the UK.

On 1296MHz The Combe Gibberlets, M0HNA/P took top spot, and also had joint best DX with their contact with GM4JTJ, third placed G3TCT sharing the 617km DX distance. John G4ZTR was runner up on this band.

M0HNA/P also won the 2300MHz band, but it was a close-run battle with Mike G8CUL. Both leading stations made 174km QSOs as their best DX.

John G4ZTR was the leader on 2320MHz, with Mike G8CUL in second place. Best DX was from G4ZTR to GM4JTJ at 569km.

David M0GHZ ran out as winner on 3400MHz, with M0HNA/P in the runner up spot. Best DX was 246km from M0GHZ to G3XDY.

The overall winner was
Congratulations to them and to the following winners and runners up.

1296MHz M0HNA/P, G4ZTR, G3SQQ(Low Power)

2300MHz M0HNA/P, G8CUL, G3YJR (Low Power)

2320MHz G4ZTR, G8CUL, G3YJR (Low Power)

3400MHz M0GHZ, M0HNA/P

John G3XDY

UKuG Contest Manager

1296MHz Contest November 2021

Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX kms
1	M0HNA/P	IO91RF	30	6341	GM4JTJ	617
2	G4ZTR	JO01KW	19	4592	GM4JTJ	569
3	G3TCT	IO81QC	20	4323	GM4JTJ	617
4	G0HIK/P	IO84KD	19	4205	G3XDY	371
5	G8CUL	IO91JO	21	4166	GM4JTJ	568
6	M0GHZ	IO81VK	20	3948	GM4JTJ	580
7	GW4JQP	IO71KR	13	3589	G3XDY	437
8	G3SQQ	IO93JC	18	3049	GM4JTJ	403
9	G3UKV	IO82RR	12	2160	GM4JTJ	436
10	G8AIM	IO92FH	11	1622	GM4JTJ	487
11	G4TJC/P	IO83XG	13	1529	GM4JTJ	377
12	G3YJR	IO93FJ	8	1367	GM4JTJ	367
13	G6GVI	IO83SN	8	1178	M0HNA/P	291
14	PE1EWR	JO11SL	4	1014	G8CUL	329
15	GM8IEM	IO78HF	1	245	GM4JTJ	245
16	GW7HJN	IO71XS	2	104	GW4JQP	75
17	GM4DIJ	IO85IW	1	92	GM4JTJ	92

2300MHz

Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX kms
1	M0HNA/P	IO91RF	3	390	G4ODA	174
2	G8CUL	IO91JO	3	387	G3XDY	174
3	G3YJR	IO93FJ	1	118	G4ODA	118

2320MHz

Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX kms
1	G4ZTR	JO01KW	11	2012	GM4JTJ	569
2	G8CUL	IO91JO	10	1649	GM4JTJ	568
3	G3SQQ	IO93JC	9	1601	GM4JTJ	403
4	M0GHZ	IO81VK	10	1532	G3XDY	246
5	M0HNA/P	IO91RF	10	1488	G4ALY	271
6	G3UKV	IO82RR	5	779	M0HNA/P	216
7	PE1EWR	JO11SL	3	694	G8CUL	329
8	G8AIM	IO92FH	5	493	G4ZTR	171
9	G3YJR	IO93FJ	2	158	G4ODA	118
10	GM4DIJ	IO85IW	0	0		0

3400MHz

Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX kms
1	M0GHZ	IO81VK	7	1037	G3XDY	246
2	M0HNA/P	IO91RF	7	892	G3UKV	216
3	G4ZTR	JO01KW	6	808	M0GHZ	220
4	G8CUL	IO91JO	8	776	G3XDY	174
5	G8AIM	IO92FH	4	410	G4ZTR	171
6	G3UKV	IO82RR	1	216	M0HNA/P	216
7	G4KNZ	IO91PJ	1	42	G8CUL	42

Low Band Championship 2021

Entry levels dropped back from last year's lockdown high of 47 to 38 this year, more in line with the previous year.

Conditions have been generally flat, although aircraft scatter has improved with more planes in the air. The best session was (as last year) in April.

1.3GHz

The Combe Gibberlets were able to get out portable for all but the first session and proved invincible on this band, so the G4EAT Memorial Trophy is awarded to M0HNA/P. Runner up is last year's winner, John, G4ZTR. John G3SQQ takes the award for leading low power entrant.

2.30GHz

M0HNA(/P) were able to be on for four sessions this year and took maximum points, but were given a run for their money by Mike G8CUL as runner-up.

2.32GHz

G4ZTR repeated his win over M0HNA/P as last year, but the outcome was not decided until the last session, with some tight competition for the runner up position.

3.4GHz

John G4ZTR also wins this band, the first full year he has been active on 9cm. He won the first four sessions. David M0GHZ drops to the runner up position with one session win.

Congratulations to the winners and runners up mentioned above.

73

John G3XDY

UKuG Contest Manager

2021 Lowband Contest Overall Results

Best three count to
the total

1.3 GHz

Pos	Call	07/03/2021	11/04/2021	02/05/2021	06/06/2021	14/11/2021
1	M0HNA/P	0	1,000	1,000	1,000	1,000
2	G4ZTR	1,000	775	633	643	724
3	G7LRQ	0	815	837	397	0
4	G3TCT	372	565	579	0	681
5	M0GHZ	561	262	544	332	622
6	G8CUL	0	650	0	251	656
7	G0HIK/P	0	291	271	0	663
8	G3SQQ	307	401	307	283	480
9	GW4JQP	0	226	151	190	565
10	G4LDR	336	244	365	140	0
11	GM4BYF	0	379	274	176	0
12	G4BRK	0	511	0	314	0

13	G4BXD	269	173	135	179	0
14	G3UKV	0	269	0	0	340
15	G16ATZ	0	559	0	0	0
16	G8AIM	98	142		127	255
17	G1PPA/P	0	206	0	313	0
18	G3YJR	0	279	0	0	215
19	G6GVI	39	54	97	149	185
20	G3TCU	418	0	0	0	0
21	G4KUX	0	0	0	404	0
22	PE1EWR	0	188	0	0	159
23	G4GFI	0	184	144	0	0
23	GM8IEM	49	75	161	87	38
25	GD1MIP	0	269	0	0	0
26	G4TJC/P	0	0	0	0	241
27	G4KZY	0	149	0	0	0
28	M0AFJ/P	0	138	0	0	0
29	GM4DIJ(/P)	0	13	2	71	14
30	G0LGS	95	0	0	0	0
31	G0NZI	0	0	0	46	0
32	G4GUG	0	0	45	0	0
33	G1JPV	41	0	0	0	0
34	GW7HJN	0	0	0	0	16
35	G8EOP	0	11	0	0	0
36	G3WJG	0	0	0	8	0

2.30 GHz

Pos	Call	11/04/2021	02/05/2021	06/06/2021	14/11/2021
1	M0HNA/P	1,000	1,000	1,000	1,000
2	G8CUL	992	0	860	992
3	G3YJR	302	0	0	302
4	G1DFL/P	0	42	0	0

2.32 GHz

Pos	Call	07/03/2021	11/04/2021	02/05/2021	06/06/2021	14/11/2021
1	G4ZTR	0	1,000	802	909	1000
2	M0HNA/P	0	775	956	1,000	739
3	G7LRQ	0	897	1,000	817	0
4	M0GHZ	1,000	744	856	416	761
5	G3SQQ	727	681	544	747	795
6	G8CUL	0	799	0	610	819
7	G4LDR	616	353	758	317	0
8	G4BRK	0	926	0	794	0

9	G8AIM	279	295	0	0	245
10	G3UKV	0	419	0	0	387
11	PE1EWR	0	61	0	0	344
12	G3YJR	0	89	0	0	78
13	G0HIK/P	0	152	0	0	0
14	G3WJG	0	0	0	120	0
15	GM4DIJ(/P)	0	43	11	57	0
16	G8EOP	0	62	0	0	0
17	G0FCU/P	0	0	0	53	0
18	GM8IEM	0	45	0	0	0
19	GM4BYF	0	35	2	0	0
20	G1DFL/P	0	0	9	0	0
21	G0NZI	0	0	0	6	0

3.4 GHz

Pos	Call	07/03/2021	11/04/2021	02/05/2021	06/06/2021	14/11/2021
1	G4ZTR	1,000	1,000	1,000	1,000	779
2	M0GHZ	0	780	686	635	1000
3	M0HNA/P	0	826	725	716	860
4	G8CUL	0	606	0	318	748
5	G4LDR	529	481	539	309	0
6	G4BXD	388	386	509	611	0
7	G8AIM	367	375	0	205	395
8	G4BRK	0	518	0	461	0
9	G3UKV	0	562	0	0	208
10	G1PPA/P	0	515	0	0	0
11	G1DFL/P	0	230	21	0	0
12	G4BAO	224	0	0	0	0
13	G0HIK/P	0	211	0	0	0
14	G4KNZ	0	0	0	0	40

Feedback Request for rules and calendar for 2022

Your input needed

"As is usual at this time, feedback on this year's rules and calendar are welcome. For 2022 the only significant change under consideration is to make the dates of the mm-wave events more flexible so that entrants can choose at short notice weekends with favourable weather and low humidity. Please address comments to me at g3xdy@btinternet.com by 7th January. I aim to publish the rules and calendar for 2022 early in January."

Editors Comments

This a combined November / December edition. In that way I can start cleanly in 2022 with a January edition.

Visiting the excellently organised Midlands Round Table, was a real treat in November. Many thanks to Paul G8AQA, Heather M0HNO, John G7ACD and Nicky of Eaton Manor Estate, for hosting the event, and all others involved.

Thank you to the contributors this month.

Best Wishes for 2022.

Help Required

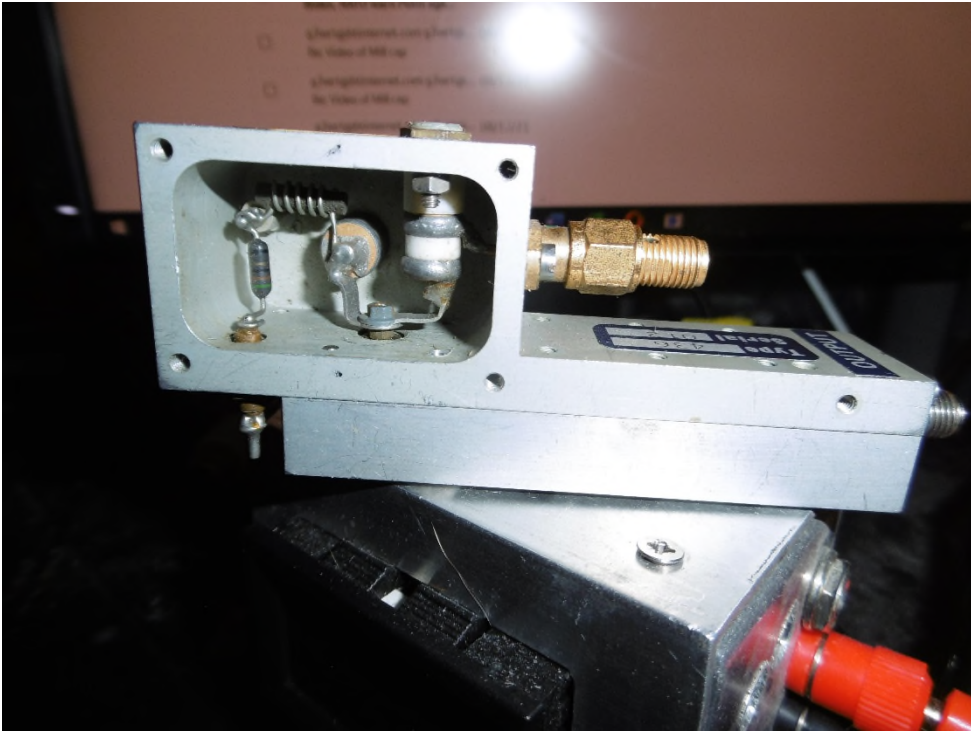
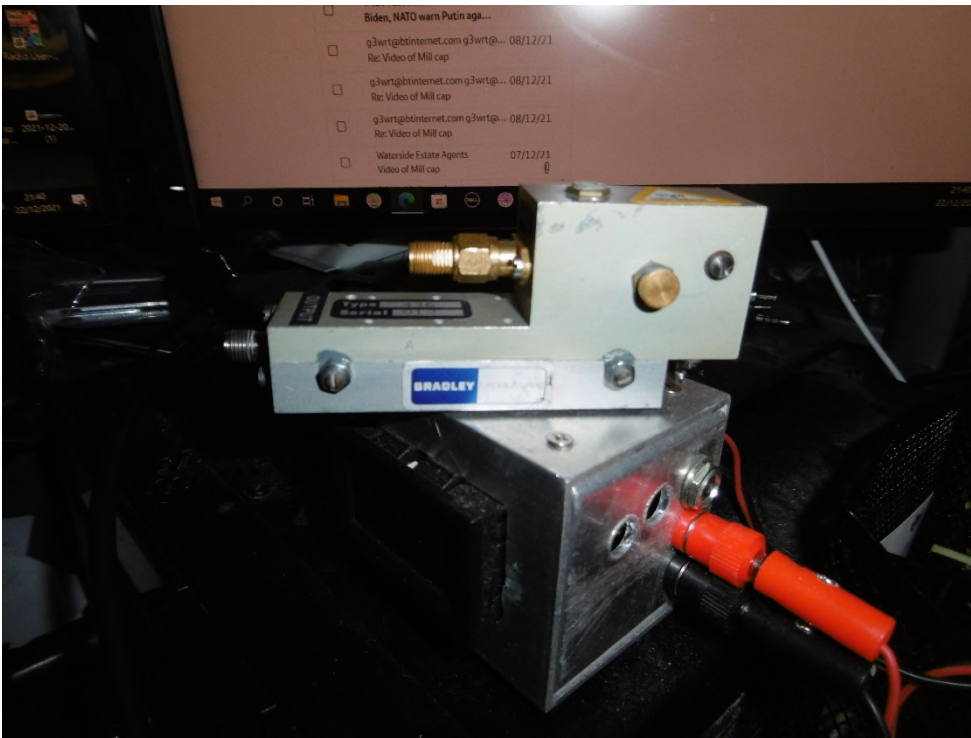
By Ian G3WRT

Any Info on Bradley Microwave?

I am almost sure Bradley microwave are and were UK based. I strongly suspect they were bought out by a military group again probably UK based. This one is a type 436 (10GHz) passive multiplier I also remember around 1970 buying a 10GHz PLL source from Bradley (smaller than the usual other suspects. It just seems like they have been wiped from history and I am sure someone out there knows the sketch and may have data.

Varactor multiplier pictured.





Beacon News

Reported earlier in December

GB3USK is off air due to lack of sunshine. I will try to restart it once the sun comes out!

73

Graham

G3TCT

Unfortunately due to site issues the Farnham 2.3GHz beacon GB3FNM has been turned off. Hopefully this is a temporary situation but the beacon may need to be relocated and installed in a new location. 73 G4SJH obo the GB3FNM team.

By [Barry Lewis](#) ·

Midlands Round Table - Sunday 5th December 2021



Organiser Paul, snapping up last minute bargains



I used to have one just like that.....



An excellent lunch left everyone ready for the afternoon talks.



An example of a Portdown working as a Noise Figure meter. As described by Dave G8GKQ in his test equipment talk.



QO100 beautifully engineered dish belonging to John G7ACD in use throughout.



QO-100 Operation desk

Talks included:

10 & 24GHz eme dish feeds by Brian G4NNS, including his 50MHz Radio Meteor Beacon project.

Backyard 144MHz eme by Peter G4URT. Using digital modes.

Test equipment based on the Portsdown by Dave G8GKQ

Some of the equipment originally belonging to Ian G4MLY sk, was available to visitors.

22GHz HP Analysers went to Bernie G4HWA and Dave G8GKQ (the later needing a display repair).

A beautiful 3.5GHz Advantest R4131D went to Ken G3YKI who is contributing to this issue. A number of LNB's with external reference, will hopefully find use on QO100 etc.

Roger G8CUB

Committee Vacancies

Volunteers are sort for the following positions within the Group:

Trophies Manager
PR Manager

The position of Chairman will be elected at the next AGM.

UKuG MICROWAVE CONTEST CALENDAR 2022

2022 Contest Calendar

Available January 2022

EVENTS 2022

For the latest information please see: <https://microwavers.org>

2022		
February 12	Tagung Dorsten Cancelled	www.ghz-tagung.de
February 13-18	European Microwave Week, London, Excel - rescheduled 2021 event	www.eumweek.com
March 26	CJ-2022 Seigy	cj.r-e-f.org
April 23	RSGB AGM	rsgb/agm
May 20-22	Hamvention, Dayton	www.hamvention.org
June 24-26	Ham Radio, Friedrichshafen	www.hamradio-friedrichshafen.de
August 12-14	EME 2022, Prague - rescheduled 2021 event	www.em2020.cz
September 25-30	European Microwave Week, Milan, Italy	www.eumweek.com

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73 Martyn Vincent G3UKV