An Amateur Radio publication for the Microwave Enthusiast

# scatterpoint

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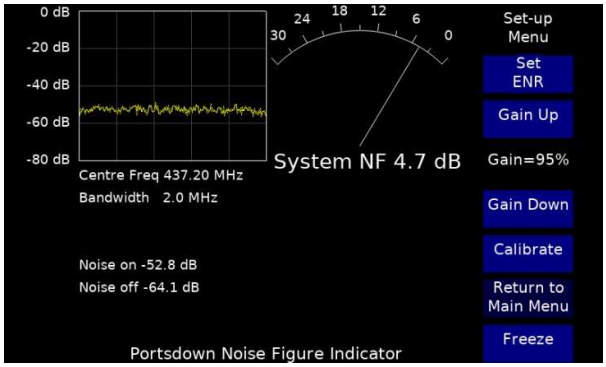
March 2023

In This Issue





Portsdown Noise Meter – Dave G8GKQ


Venus received on 47GHz - José EA4HMJ

UK Microwave Group

## Subscription Information

The following subscription rates apply

UK £6.00 US $9.00 Europe €9.00

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 DropboxAlso, **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@microwaversorg

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**

## Reproducing articles from Scatterpoint

If you plan to reproduce an article exactly as in Scatterpoint then please contact the Editor – otherwise you need to seek permission from the original source/author.

# 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

# UK Microwave Group Contact Information

| | | | |
|---|---|---|---|
| Chairman: | Paul Nickalls G8AQA | chairman@microwavers.org | |
| General Secretary: | John Quarmby G3XDY | secretary@microwavers.org | tel: 01473 717830 |
| Membership Secretary: | Bryan Harber G8DKK | membership@microwavers.org | |
| Treasurer: | David Millard M0GHZ | treasurer@microwavers.org | |
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| Trophies & Awards Manager: | Heather M0HMO | m0hmo@microwavers.org | |

## Assistants

| | | | |
|---|---|---|---|
| Murray Niman | Webmaster | G6JYB | g6jyb@microwavers.org |
| Kent Britain | USA | WA5VJB/G8EMY | wa5vjb@flash.net |
| Mike & Ann Stevens | Trophies | G8CUL/G8NVI | trophies@microwavers.org |
| Noel Matthews | ATV | G8GTZ | noel@noelandsally.net |
| Robin Lucas | Beaconspot | G8APZ | admin@beaconspot.uk |
| Chris Whitmarsh | mmWaves | G0FDZ | chris@g0fdz.com |
| Mike Scott | Chip Bank | G3LYP | g3lyp@btinternet.com |
| Paul Nickalls | Digital | G8AQA | g8aqa@microwavers.org |
| Heather Nickalls | SDR | M0HMO | m0hmo@microwavers.org |
| Neil Smith | Tech Support | G4DBN | neil@g4dbn.uk |
| Barry Lewis | RSGB uWave Manager | G4SJH | barryplewis@btinternet.com |

## UK Regional Reps

| | | | |
|---|---|---|---|
| Martin Hall | Scotland | GM8IEM | martinhall@gorrell.co.uk |
| Gordon Curry | Northern Ireland | GI6ATZ | gi6atz@qsl.net |
| Peter Harston | Wales | GW4JQP | pharston@gmail.com |

## International

| | | | |
|---|---|---|---|
| Kent Britain | USA | WA5VJB/G8EMY | wa5vjb@flash.net |

# 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 76GHz 122GHz**

# Simon G3LQR sk

Photo from Peter G3PHO

Simon, G3LQR, passed away peacefully on March 28th at the age of 88. He was one of the best known microwave and UHF callsigns on both side of the North Sea. Simon was a pioneer in many fields of microwave radio and inspired many others to follow his lead. He had 30 firsts on the bands above 70cm and in 2009 was awarded the G3EEZ trophy.

When he was licenced in 1957 it was as G6LQR/T transmitting studio TV on 70cm. He then passed his CW test and became G3LQR and by about 1975 he was operating on all the microwave bands up to 10GHz, later on adding 24 and 47GHz. His favourite band for dx was 70cm and he made some amazing tropo contacts into the old Soviet Union, up to 2000km.

He started in EME on 432MHz in March 1975 building a 20ft dish from dexion angle and chicken wire which was destroyed in the 1987 hurricane. He then built a succession of large yagi arrays, all home brew of course. In March 1992 he put up a 14ft dish and started on 23cm EME with 100W from a single 7289. He then progressed up the bands to 13cm and finally to 9 and 6cm, the limit for that dish. There have been many tributes to him from the world wide EME community.

His radio interests also included 3cm rain scatter and 70cm aurora, where in both of these he was an early pioneer, plus 4m Es and 28MHz F2.

He was a serious and dedicated home brewer of his equipment, often modified from something he had found at a scrap yard or a rally and was very good at getting the stuff to actually work! Sometimes the enclosures were not that extensive and so it was safest to keep hands in pockets when in his shack!

Simon was a kind, generous and gentle man; he loved nature and was a great photographer in his last years of the butterflies on the farm where he lived.

RIP our old friend.

# UK Microwave Group AGM Minutes 2023

The AGM of the UK Microwave Group took place on 16th April 2023, at the Martlesham Microwave Round Table. 25 members were present, plus 9 others on Zoom.

## Minutes 2022

Minutes 2022 (as published in Scatterpoint Apr/May 2022) – no comments had been received, there were no matters arising.

## Secretary's Report – John Quarmby G3XDY

**Committee members and officers**

Paul G8AQA has volunteered to take on the role of chairman if elected, unfortunately he is not able to be here today. Our continuing thanks go to Murray G6JYB and Barry G4SJH for their work on spectrum issues and Galileo

Thanks also go to the committee members who run the Chipbank (Mike G3LYP), act as beacon co-Ordinator (Denis G0OLX), look after our trophies (Heather M0HOM), edit Scatterpoint (Roger G8CUB) and organise our contests (John G3XDY). Also to Neil G4DBN who has organised several group kit supply projects and provides a lot of mechanical engineering support for members. I would like to thank all our other members who give their time to help run the UKuG.

Chris G0WUS has volunteered to take on some of the contest adjudication for 2023.

**Round Tables in 2022**

A full programme of round tables took place, with events at Martlesham, RAL, Finningley, Crawley, Scotland and the Midlands.

It is expected that the 2023 programme of Round Tables will be similar to last year

Thanks to all the organisers for their hard work in putting the events together.

**Spectrum**

The work on tools for EMF Assessments is now largely complete, with tools for assessing dish antennas available.

All the frequency allocations we have continue to come under some level of threat from commercial applications:

Work on the co-existence of Amateur Radio services with Galileo continues, Barry G4SJH is leading on this in IARU Region 1. Recent work shows that the statistical likelihood of interference is quite low even for a 100W transmitter. Unfortunately we have seen some European countries reducing power limits in advance of any recommendations from the

WARC later this year.

The SDR receiver network project mentioned last year still awaits a volunteer who could lead the development of a group of well sited SDRs to provide a "reverse beacon" network.

5G mobile service rollout continues, and provides some receive filtering challenges on bands such as 2.3GHz and 3.4GHz.

## Treasurer's Report – David Millard M0GHZ

The Secretary presented the Treasurer's report but apologised for an editing error which resulted in slides for the previous year appearing. The correct figures are included in these minutes.

First my apologies for not being present to present the accounts on my 40th wedding anniversary

It's been another stable year for the Group's finances, with net funds increasing by £1378 despite the following new outgoings in addition to our normal operating costs of Zoom, postage, trophies engraving, Paypal fees:

3.4GHz Loan equipment £226

Beacon support

Bell Hill £115

GB3RPE £774

Income is solely from subs, donations and bank interest
Overseas subs have been reduced in line with exchange rates following an action from last year's AGM
Subs are consequently down £114 on the previous year
Interest on our savings accounts is up £12 on last year

UK Microwave Group Accounts

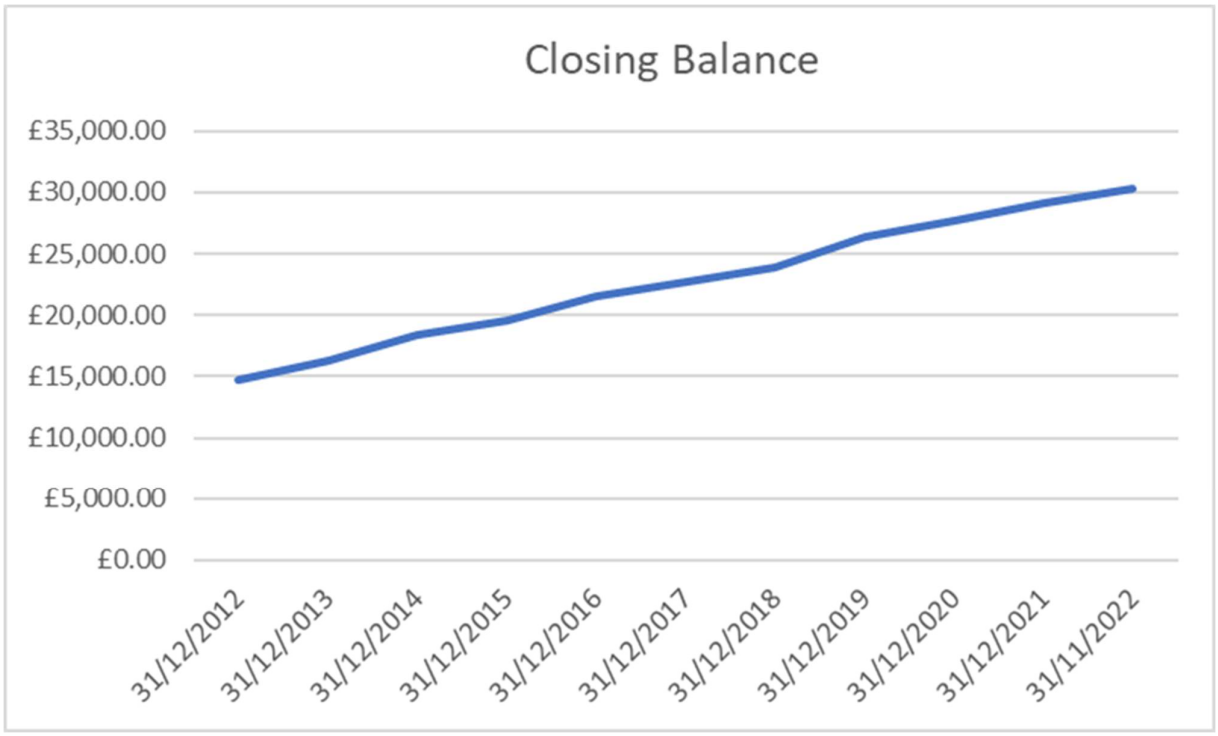
Covering period 01/Jan/2022 to 31/Dec/2022

| Item | Income | Expenditure | Balance | Notes |
|---|---|---|---|---|
| **Opening balances as at 01/01/2022** | | | | |
| Current account | | | £177.10 | |
| Savings account | | | £28,374.05 | |
| Paypal | | | £518.69 | |
| Cash in hand | | | £0.00 | |
| **Opening balance** | | | **£29,069.84** | |
| Chipbank | £0.00 | | | |
| Subscriptions | £3,515.11 | | | |
| Donations | £0.00 | | | |
| Other | £0.00 | | | |
| Interest | £15.05 | | | |
| PayPal fees | | £218.51 | | |
| RSGB Affiliation | | £52.00 | | |
| Websites (inc beaconspot) | | £388.21 | | |
| Beacon Support | | £908.23 | | |
| Trophies | | £249.17 | | |
| Chipbank Expenses | | £44.43 | | |
| Publications | | £0.00 | | |
| Postage | | £0.00 | | |
| Round Table Support | | £29.95 | | |
| Zoom | | £143.88 | | |
| Loan equipment | | £226.74 | | |
| **Sub-totals** | £3,530.16 | £2,261.12 | | |
| **Excess income over expenditure** | | | £1,269.04 | |
| **Closing balance as at 31/12/22** | | | **£30,338.88** | |
| **Represented by** | | | | |
| Current account | | | £539.04 | |
| Savings account | | | £29,489.10 | |
| Paypal | | | £310.74 | |
| Cash | | | £0.00 | |
| | | **Closing balance** | **£30,338.88** | |

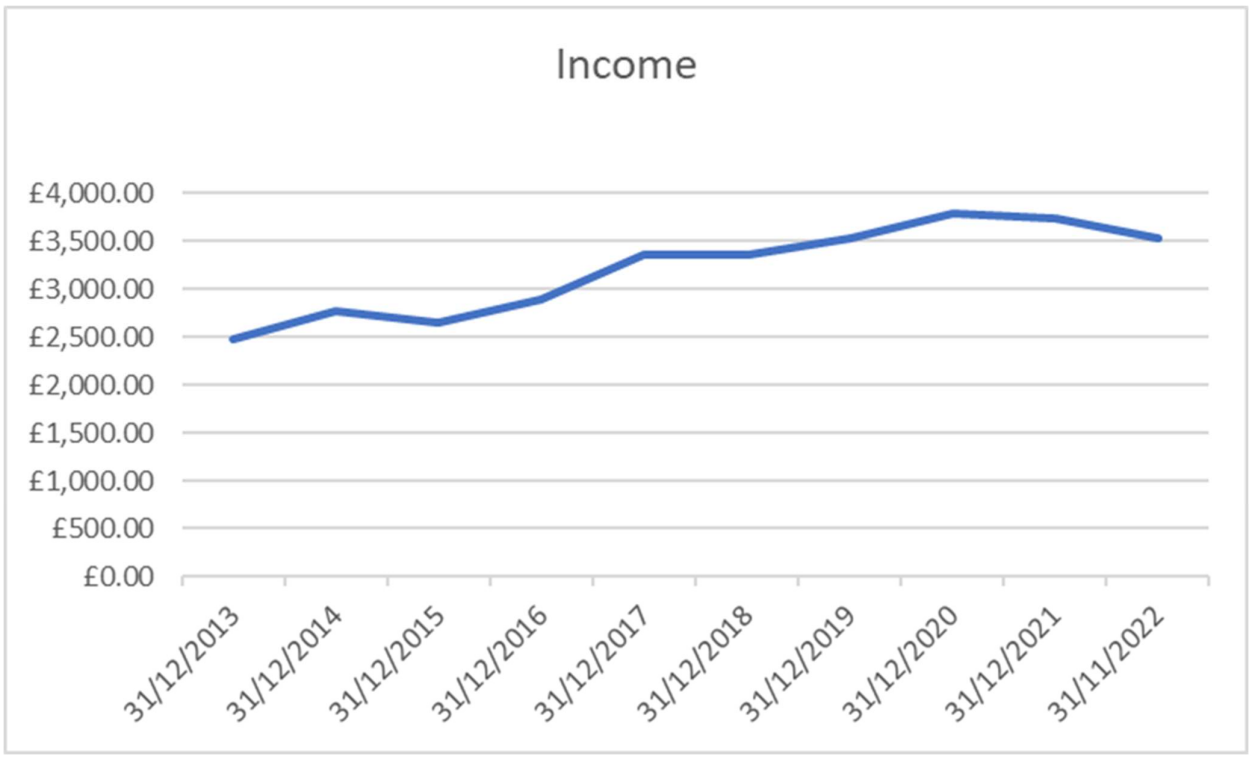
Graham Phillips BSc (Hons) CPFA G0KRB

**D. Millard M0GHZ**
**Treasurer**

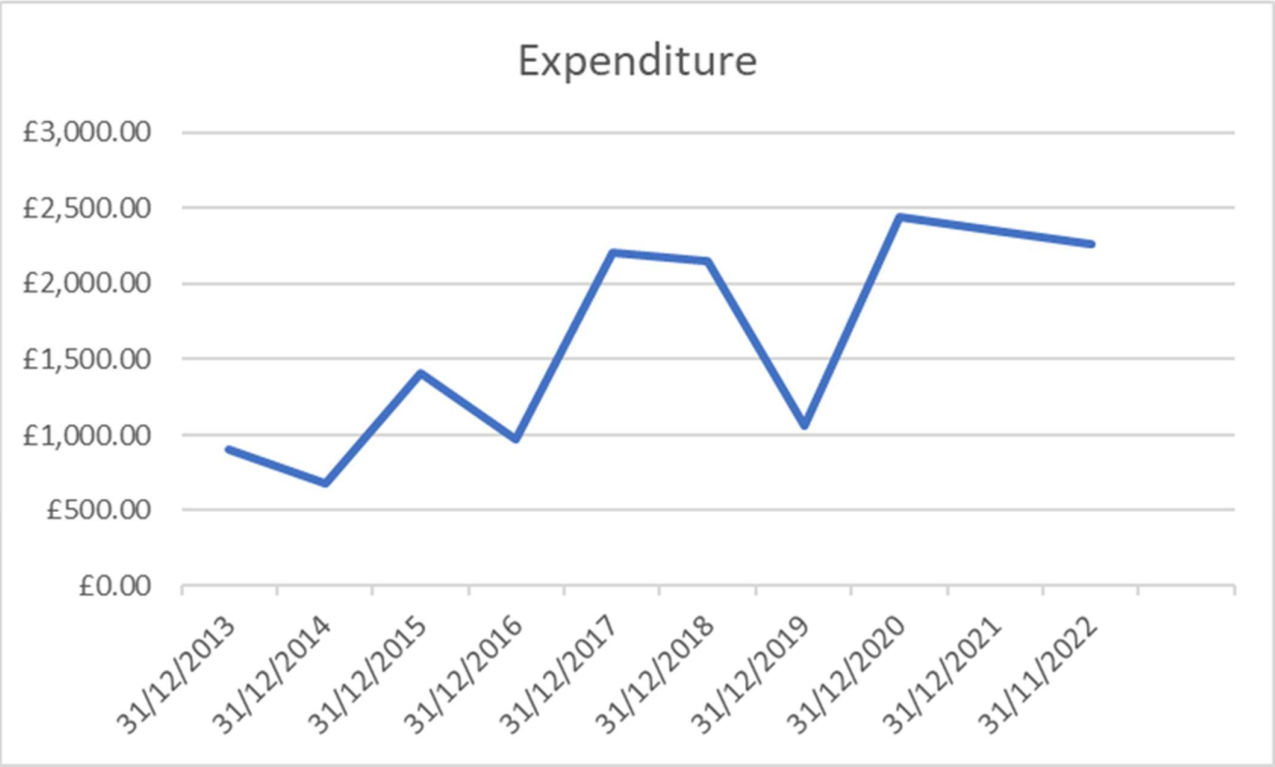
**G. Phillips G0KRB BSc(Hons) CPFA**
**Auditor**




Slowing and expected to drop in 2023




Dropping mainly due to reduced overseas subscription.




Reduced but claims are outstanding for the Goonhilly SDR, circa £1300, and loan equipment maintenance and shipping

There is no requirement to increase the subscription rates which have remained at a very reasonable £6 for many years.
Our balance still increases year on year and we need to increase our expenditure to the benefit of our members.
The committee is looking at funding a further item of loan equipment for QO-100 in 2023.
If you have any suggestions or funding requirements please forward them to the committee.
An asset list is in preparation to identify replacement costs.
Grateful thanks to Graham Philips G0KRB who has again kindly audited the accounts at no cost to the UKuG.

## UKuG Membership – Bryan Harber G8DKK

| 2022 | 2023 |
|---|---|
| 557 Members (4/2021) | 585 Members (4/2021) |
| 65 New Members (January to December 2021) | 88 New Members (January to December 2021) |
| 23 New Members (January to April 2022) | 17 New Members (January to April 2022) |
| During 2021 49 members left the group | During 2021 47 members left the group |
| Groups.io Scatterpoint | Groups.io Scatterpoint |
| 590 members subscribed | 627 members subscribed |
| 4 pending | 0 pending |
| 89% members pay by PayPal | 89% members pay by PayPal |

**Email and Email IDs**

If you change your contact email address please email membership@microwavers.org with your new address
Failure to do so results in membership renewal notifications failing to deliver and can result in cancelled membership

If you change your groups.io email ID the membership secretary is automatically notified by groups.io of a change with the new ID However, if I am unable to associate the new ID with a name/callsign of a member then time is wasted.
I do not assume that a change of email ID in groups.io means a change to your email address for membership notifications
Many members choose to have a different email ID for groups.io

Robin G1YFG queried why the PayPal Subscription service was not being used to automate subscription renewals. Bryan will discuss this with the treasurer.

## Chipbank – Mike Scott G3LYP

A total of 41 requests were fulfilled during calendar 2022, a little up on the previous year.
The only Roundtable attended was Chilton (RAL) when a few items previously requested were delivered.
The Group received a very large donation of sm resistors, capacitors and semiconductors from Andy Wade, G4AJW, and also donations from Paul, M0EYT, and Sam, G4DDK for which many thanks.
Postal service has been rather poor during the year which resulted in longer than usual delivery times ( and one package lost without trace!) From now it is proposed to use first class postage which will mean a cost to the Group of about £1.75 a package, or a total increase of just over £20 in an average year.

## Election of Officers & Committee

Paul Nickalls has been nominated for the role of chairman, no other nominations were received from the meeting so he was declared elected as Chairman. Other members of the committee are willing to stand again. The Secretary requested additional nominations from the floor but none were forthcoming.
The remainder of the committee was elected en bloc:

| | | |
|---|---|---|
| Chairman | Paul Nickalls | G8AQA |
| Treasurer | David Millard | M0GHZ |
| Secretary | John Quarmby | G3XDY |
| Membership Secretary | Bryan Harber | G8DKK |
| Beacon Coordinator | Denis Stanton | G0OLX |
| Web Master | Murray Niman | G6JYB |
| Contests/Awards | John Quarmby | G3XDY |
| 24GHz and Up | Chris Whitmarsh | G0FDZ |
| Technology (Including loan gear) | Neil Smith | G4DBN |

| | | |
|---|---|---|
| Corresponding Members | | |
| USA Liaison | Kent Britain | WA5VJB/G8EMY |
| Northern Ireland | Gordon Curry | GI6ATZ |
| Scotland | Martin Hall | GM8IEM |
| Wales | Peter Harston | GW4JQP |
| ATV | Noel Matthews | G8GTZ |
| Beaconspot | Robin Lucas | G8APZ |
| Trophies Manager | Heather Nickalls | M0HMO |
| Scatterpoint Editor | Roger Ray | G8CUB |
| RSGB Microwave Manager | Barry Lewis | G4SJH |

## Any Other Business

The secretary requested any other business. G4BAO requested clarification about the SDR project, G3XDY explained that a single portal to a network of SDRs was needed, with SDR default frequency, bandwidth and mode set to a common, well known, input frequency. G8APZ commented that a requirements document would be a good starting point for the project.
The AGM was then closed by the Secretary.

# The Portsdown Noise Figure Meter

Dave Crump G8GKQ

The test equipment suite of the Portsdown 2020 and the Portsdown 4 DATV Transceiver now includes a Noise Figure Meter that uses the LimeSDR Mini and a user-provided noise source with a custom switching power supply to provide an indication of the performance of preamps and transverters. Full details of the Portsdown Transceiver can be found here https://wiki.batc.org.uk/The_Portsdown_DATV_transceiver_system .
This Noise Figure Meter was exhibited at the 2023 Martlesham Microwave Round Table.

The ability to measure the noise performance of a receive system is a very useful capability and enables the system to be adjusted for optimum sensitivity. Until recently this has only been possible using expensive professional equipment such as the HP8970 automatic noise figure meter.

**General Principle**

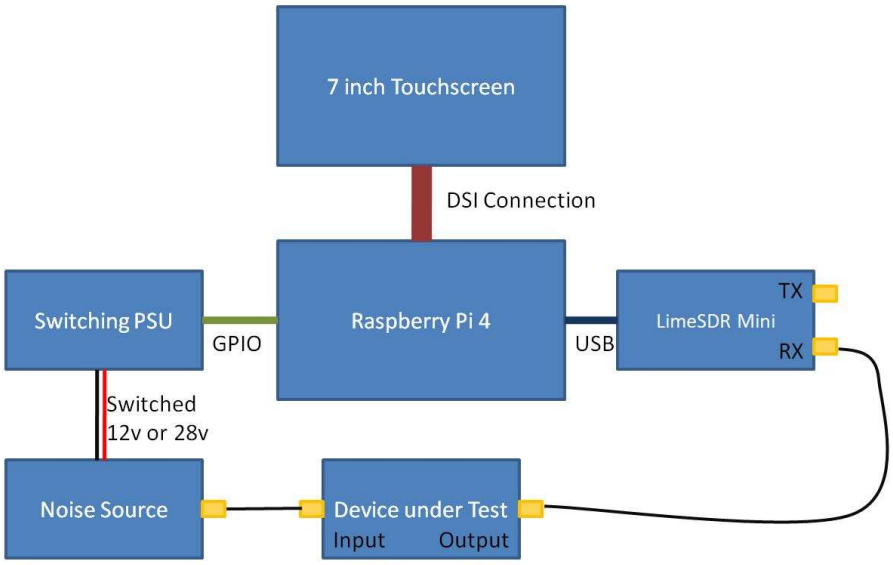
The limiting factor on the performance of many VHF and microwave receivers is the amount of noise generated by the input stage of the receiver. The noise generated by input stage of a receive system can be estimated by making comparisons between the receiver output level (at IF or RF) with a dummy load at a known temperature connected to the input, and its output when connected a calibrated source of low-level noise.

This is often referred to as the “Y Factor” method and is used by most professional Noise Figure meters and is the method used in the Portsdown. A noise source provides this function, it behaves as a dummy load when off and generates a known level of additional noise when on. In this implementation, it is switched on and off at about 10 Hz. The noise level at the output of the preamp/transverter is measured during the on and the off periods, is then averaged and then the noise contribution of the receiver itself can be calculated.

The noise contribution from amateur preamps and transverters is normally stated as a logarithmic "Noise Figure" measured in dB, which relates to the difference compared to an ideal, noise free receiver. Noise figures of around 2 dB are acceptable for VHF receivers (where there is a lot of atmospheric noise) whereas good microwave receivers typically achieve between 1 and 2 dB, with EME receivers achieving about 0.5 dB.

Lower noise figures are desirable for moonbounce and satellite use where the background noise is much lower. Lower noise figures may also be stated as a noise temperature and there is a direct relationship between the two. This Wiki page provides a full explanation: https://en.wikipedia.org/wiki/Noise_temperature.

## Equipment Required




*Portsdown Noise Figure Meter Block Diagram*

To measure noise figure using the Portsdown 4, a Lime SDR Mini, a calibrated noise source and a matching switched power supply are required.

Note - The software also works with a LimeSDR Mini V2, LimeSDR USB or a LimeNET Micro (although accessing the noise source switching signal from the DIMM connector of the Raspberry Pi 3 compute module on the LimeNET Micro is a challenge – ask me for details). The Pluto SDR is not supported.

## Noise Sources

A noise source (or noise head) does exactly what it says – it generates a known level of noise when supplied with a specified voltage. To measure Noise Figure, this voltage (and hence the excess level of noise) is switched on and off controlled by the Noise Figure meter.

All noise heads have an "Excess Noise Ratio" (ENR) which is a measure of the level of noise that they produce. Professional units will have a calibration chart or table stating how this ENR varies with frequency. Typical ENR values are 5 or 15 dB.

The accuracy of the noise figure meter is limited by the accuracy of the noise source ENR calibration. However, an uncalibrated noise source can still provide a very valuable alignment aid.

*A Typical Commercial Noise Head with Calibration Chart*

Second-hand noise heads (such as the HP346B) are available on eBay for £200 or more, depending on their condition and currency of calibration. Alternatively, Kevin G3AAF sells some suitable substitutes for under £100 - contact him directly

Many of the noise sources sold on eBay are designed to produce high levels of noise across a broad bandwidth to allow the alignment of filters using a spectrum analyser. These produce far too much noise for use with a Noise Figure meter and are totally unsuitable. Look for stated ENR figures of 25 dB or below.

If you do not have a calibrated HP or similar noise source, they can be homebuilt, but calibration is a problem. This webpage has an easy to build design (but note it requires -9v switched supply) complete with expected ENR charts and a PCB design which is available to order from OSH Park
http://www.janbob.com/electron/Noise/NoiseGen1.htm

Even if you have no access to a calibrated noise source, it is well worth home-constructing one; you can still use the indications from this Noise Figure meter to align your receiver for optimum sensitivity, which will usually correspond to the minimum noise figure.

## Noise Source Power Supply

A switched power supply is required to turn the noise source on and off when commanded to by the Noise Figure meter. Many professional noise sources (as used by HP) require a 28v supply in their "on" state. Check what your noise source requires before connecting it to the supply described below.

The noise source supply switching must be synchronised with the noise detector in the Portsdown. The switching signal is taken from pin 26 of the Raspberry Pi GPIO port where a logic level (3.3v/0v) is used to turn the noise source on and off. This logic level controls the higher DC voltage required to drive the noise source.

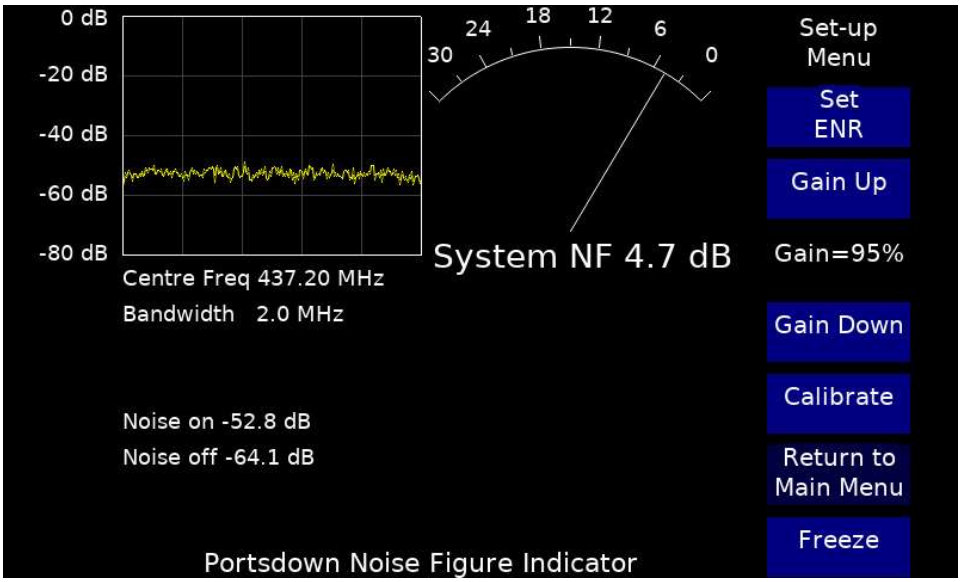
A suitable design by Dave, G8GKQ is described on the BATC Wiki. Mike, G0MJW has produced a PCB which is available in the BATC member's shop.

## Preparing for a Measurement

Once you have assembled all the required modules, connect your LimeSDR to the Portsdown by USB. Note - the LimeSDR Mini should have gateware V1.30 or the LimeDVB gateware loaded.

Connect your switched power supply to pin 26 of the Raspberry Pi GPIO and connect the noise source. Then connect the output of the noise source directly to the LimeSDR Mini receive port.

From Menu 2, select Test Equipment, NF Meter. After the levels have settled (which may take 10 seconds or so) you should see the screen below.




*Noise Figure Meter Start-up Screen*

## Setup Menu

The first screen shown is the Set-up Menu. If all is working correctly, you should see 2 flickering lines on the small spectrum window. The lower line is the detected noise with the noise source off, and the upper line is the detected noise with the noise source on.

You will need to visit other menus to prepare for your measurement.

## Setting the Measurement Frequency

Press "Return to Main menu", "Freq and Bandwidth" and then "Centre Freq". Set your desired measurement frequency. Alternatively, you can use one of the presets (146.5, 437, 748, 1255 or 2409). The entered frequency should be the signal frequency if you are testing a preamp, but the IF frequency if you are testing a transverter (see below for some of the complications that this introduces).

**Measurement Bandwidth**

It is suggested that the measurement bandwidth is left at the default of 2 MHz (as was standard on the early HP Noise Figure meters) but it can be adjusted down to 500 kHz and up to 20 MHz at this point.

**ENR**

Then select "Set-up Menu" again to enter the ENR of your noise source. Touch the ENR button and enter the exact ENR for your noise source at the selected signal frequency (read from its calibration chart). Note that if measuring a transverter you may have to change this value later.

**Lime Gain**

Next, the gain of the LimeSDR needs to be adjusted so that it is operating in its linear region. Use the "Gain Up" and "Gain Down" buttons to adjust the "Noise Off" level shown at the bottom left of the screen to between -65 dB and -55 dB. If set too low, the indication will change colour and a message advising an increase in Lime Gain will be displayed. If the gain is set too high, there is a risk that high gain preamps may overload the system when tested, leading to inaccurate readings.

The Meter will now display the Noise Figure of your LimeSDR. This is very dependent on screening and digital noise pickup, but should be in the range of 5 dB to 10 dB between 146 and 1255 MHz.

**Making a Simple Measurement**

If you now insert your preamp or transverter (the Device Under Test) between the noise source and the LimeSDR, you should see the "System" NF improve (hopefully) and you can make adjustments to your device to optimise its performance.

What is displayed on the NF Meter is the noise figure of the complete measuring system comprising of your device and the LimeSDR. This means that if your device has low gain, the LimeSDR might introduce a contribution to the total measured noise figure. However, this mode enables quick and easy optimisation, and is very useful for general bench testing.

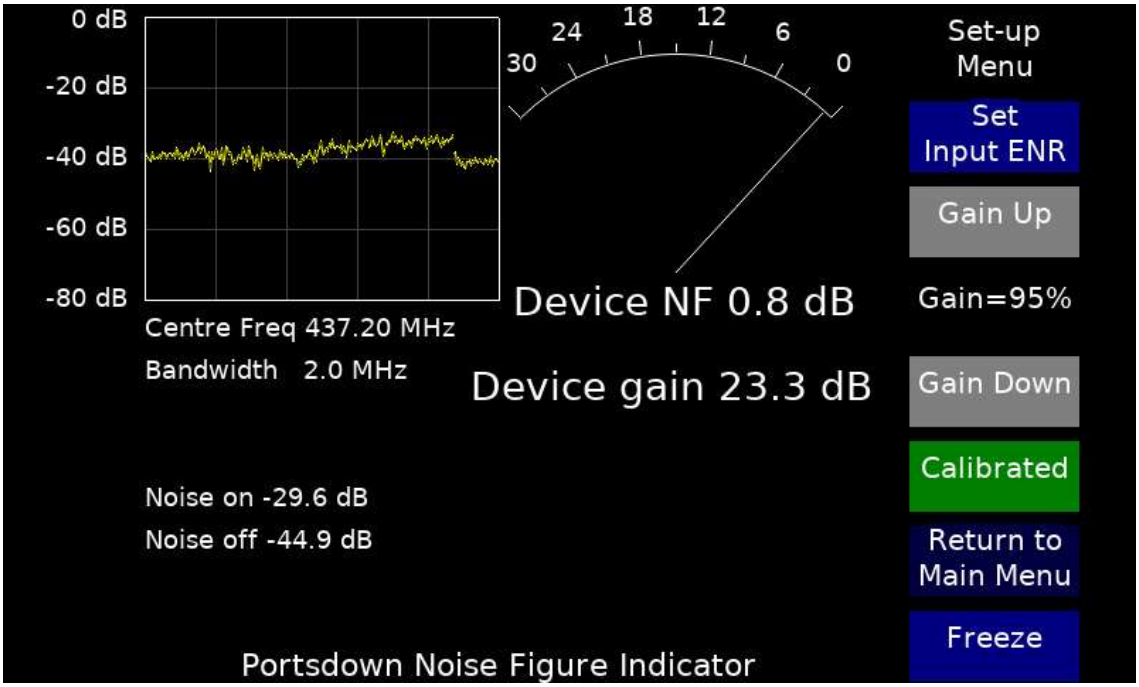
**Measuring Gain and NF of a Preamp**

By calibrating the noise levels of the LimeSDR, it is then possible to calculate the Gain and NF of a preamp and exclude the NF contribution of the LimeSDR Mini. This procedure only works for one frequency and one Lime Gain setting, and needs to be repeated if frequency, Lime Gain or Bandwidth are altered.

Note that this calibration procedure is not the same as calibrating the LimeSDR; it is calibrating the noise response of the LimeSDR.

To perform the calibration, connect the noise head directly to the LimeSDR, and set the frequency, bandwidth and gain as specified above. Then, in the Set-up Menu, press "Calibrate". The system will average a number of readings and then display the "Device" noise figure and gain, which

should be around zero.  Now put your preamp in circuit, and the meter will display the preamp (the "Device") noise figure and gain as shown below.




*Measuring the NF and Gain of a Preamp*

Once calibrated, the Lime Gain buttons are locked (as adjusting them would invalidate the calibration).  To adjust the Lime Gain, press the "Calibrated" button again to come out of Calibrated mode.

**Measuring a Transverter or Receive Converter**

When measuring the NF of a transverter, the Noise Figure Meter measurement frequency should be the IF frequency (e.g. 144 or 432 MHz).

However, the ENR entered once the transverter is in place should be the ENR of the at the signal frequency (for example 10 GHz), not the IF frequency.

**Measuring True Transverter Gain and NF**

It is possible to provide a good indication of the transverter gain and noise figure, however the procedure is much more complex.  First, the NF Meter should be calibrated at the IF frequency using the ENR of the noise source at the IF frequency.  Once the instrument calibration is complete, then the transverter can be put into circuit with an appropriate noise source for its input frequency. The "Set Input ENR" button should then be pressed, and the second ENR value for the input frequency (e.g. 10 GHz) entered.  The NF Meter and Gain will then indicate Transverter NF and Transverter gain to show that it is calculating using the 2 ENRs, one at IF and one at signal frequency.

Great care needs to be taken, by using IF filtering, to ensure that no local oscillator signals are presented to the LimeSDR receiver, and that only one sideband of the first mixer is being measured.  A good image filter (after the first RF preamplifier in the transverter) is essential.

**Meter Scale**

The "analogue" meter has 5 scale settings: a wide 30 to 0 dB, narrower 30 to 20 dB, 20 to 10 dB and 10 to 0 dB, and a narrow 5 to 0 dB. You can move between these scales by touching the right or left side of the meter face. Note that the meter reads lower noise figure (better) to the right, and higher noise figure to the left. This is the convention followed on older analogue Noise Figure meters.

**Sources of Error**

It is very difficult to perform accurate Noise Figure measurements; assuming none of the errors listed below are present, the Portsdown Noise Figure meter should indicate within 1 dB of the correct value. To get the best accuracy, attempt to minimise the following sources of error:

1. **Noise Source ENR Accuracy**. Errors in the stated ENR of the Noise Source will directly affect the NF reading. If using a home-built noise source, try to compare it with a more-recently calibrated noise source at specified frequencies. Microwave round tables are often good events to do such comparisons.

2. **Noise Source reflection Coefficient Variation**. Many noise sources change their reflection coefficient (SWR) between the on and off states. The change in input matching can cause GasFET preamplifiers to appear to have much better NF than they actually have. This error can be minimised by using high quality attenuators between the noise source and the preamp; the attenuation value of the attenuator subtracts directly from the ENR to produce the new ENR. So if you have a 15 dB ENR noise source, always use an additional 10 dB attenuator (and hence enter 5 dB ENR) if trying to measure low NFs.

3. **SDR non-linearity**. The SDR needs to be operating in its linear region for accurate measurements. This is why the Lime Gain needs to be adjusted before measuring, and if a preamp or transverter has particularly high gain (over 30 dB) it is recommended to put an attenuator in-circuit after the preamp to prevent overdriving the LimeSDR.

4. **Interference in the passband**. Interfering signals within the Noise Figure meter passband should be visible on the spectrum display. These can cause inaccurate readings; if they are spurii from the LimeSDR, a small frequency change can often put them out of the passband. Note that the DC spike (in the centre of the bandviewer display) is rejected by the measurement software and is not a problem whatever its amplitude.

5. **Connectors and Cables**. The noise figure indication has a resolution of 0.1 dB. Any loose connections or lossy cables will cause the indicated noise figure to increase or vary, so use the best quality possible and make sure that connectors are properly tightened.

6. **Temperature**. Noise sources are calibrated at a constant temperature (generally 290 degrees Kelvin which is 17 degrees Centigrade). Higher test bench temperatures will cause very small inaccuracies which are only significant for moonbounce and Satellite applications.

7. **LimeSDR Digital RF Noise**. The LimeSDR receiver suffers from a lot of digital noise, both from the on-board circuitry and from noise conducted along the USB cable.


*LimeSDR Mini in an ESA Case* Each sample will vary, but I took the following measurements of the Noise Figure of some LimeSDRs. The LimeSDR Mini in an "ESA" metal case was particularly bad; I did optimise another LimeSDR Mini by putting it in a larger sealed metal enclosure and selectively grounding parts of the device. The LimeNET Micro and LimeSDR USB measurements were also taken after some optimisation.

| Test Freq MHz | LimeSDR Mini (no case) | LimeSDR Mini (ESA Case) | LimeSDR Mini (optimised) | LimeNET Micro | LimeSDR USB |
|---|---|---|---|---|---|
| **146** | 5.5 dB | 11.0 dB | 6.0 dB | 8.5 dB | 13.5 dB |
| **437** | 5.5 dB | 11.0 dB | 5.0 dB | 8.5 dB | 10.0 dB |
| **1255** | 9.0 dB | 15.0 dB | 8.5 dB | 10 dB | 8.5 dB |
| **2395** | 19 dB | > 25 dB | 9.0 dB | 18 dB | 19 dB |
| **3405** | 22 dB | > 25 dB | 19.5 dB | 25 dB | 16 dB |

*Basic LimeSDR Noise Figure Measurements*

## Conclusion

Measuring Noise Figure is a complex process; do not expect to get perfect results first time. Play with the test set-up and the device under test, adding attenuators in both the input and output to check that they affect the results in the manner that you would expect them to.

To learn more, read the 2 HP Application Notes referenced below; the software was designed based on the principles and formulae in those notes.

The main usage of the meter should be to optimise your equipment, and provide a benchmark for your optimisation from day-to-day. If you want to know the absolute Noise Figure of your receiver, then take it to a Microwave Round Table where someone might have access to recently calibrated Noise Figure measuring equipment costing many thousands of pounds.

Improving the Noise Figure of your system can be as rewarding as tweaking for maximum power output; it is well worth the effort!

## References

Agilent Application Note 57-1: Fundamentals of RF and Microwave Noise Figure Measurements
https://web.stanford.edu/class/ee133/appnotes/5952-8255E.pdf

Agilent Application Note 57-2: Noise Figure Measurement Accuracy – The Y-Factor Method
https://g8fek.com/uploads/9/4/4/3/94435411/an57-2_5952-3706e_hp_nf_measurement_primer.pdf

# Starting out on 10GHz

Ben 2E0TXQ / M7TXR

Some of you may recall that right at the start of 2021 I expressed an interest in getting on 10GHz as a foundation licence holder, it being a band I was licenced to use but not exactly 'readily available. My first post from 6th January is here
https://groups.io/g/UKMicrowaves/message/65527

I thought it was good to update everyone on my journey so far as it's just over a year now

Immediately following my post I was contacted by Neil G4DBN with an offer to borrow one of the UKuG 10GHz loan kits. This was amazing, just the offer I couldn't refuse! Just a few days later the previous loanee Stuart G1GSM kindly met me in an M1 service station and passed the kit on. A quick familiarisation over coming days meant I was able to make my first fore onto the 3cm band in the January UKAC SHF contest 2 weeks later, using my existing 817 for IF. Only two QSOs in the log but I was hooked!

Also following that initial post I was contacted by Steve G1MPW, offering to let me have his 10GHz /p kit based around a DB6NT G2 transverter and matching 1w PA. The generosity and kindness shown to me by Steve and other experienced microwavers is incredible. As a newcomer, I couldn't ask for a warmer welcome. I collected everything from Steve in June and I've been gradually building my own mast head box (effectively re-boxing the great work Steve had done) over the last few months, with liberal helpings of advice from this reflector along the way.

I've continued in the UKAC with the UKuG loan kit whilst putting my own kit together and was please to get a certificate as highest placed foundation station for 2022, albeit I was the only foundation station hi hi

I've now obtained my intermediate licence and gained other bands. I'm now QRV on 9cm, 13cm and 23cm, utilising SG Labs transverters. I hope to be QRV on 6cm soon too.

So what could have been a passing idea of trying a band has somewhat snowballed. All of that due in great part due to the generosity of time, advice and kit by individuals, the UKuG and my friends within my contesting group. Thank you all for your support so far!

--

73
Ben
2E0TXQ / M7TXR

# Beacon and SDR News

**PI7ALK Beacons**

Just to update you; yesterday we (Rob PA1EMT and myself) have been to the beacon site and we put 23, 6 and 3 cm back on the air. So every beacon is operational now.
The beacons on 9, 6 and 3 cm are also PI4 modulated .

73, Hans PH0V

**Wessex Web SDR**

Martin G8JNJ with assistance from Roger G8CUB and Noel G8GTZ, has added 10GHz to the Wessex WebSDR located at Eggardon Hill in Dorset IO80QR, 240m asl.

The antenna is slotted waveguide Omni at 13m AGL, feeding an Octagon LNB with an external stability reference (not GPS locked).

http://wessex.hopto.org:8070

GB3SCX at nearby Bell Hill is pretty strong, with other beacons popping up out of the noise, from time to time.
Other SDRs on site, cover 8M, 6M, 4M, 2M & 70cm.
A 24GHz SDR, and a 76GHz beacon are planned for later in the year.

Dave

# RAL MICROWAVE ROUND TABLE 2023


Harwell ARS are pleased to announce that they will be hosting the RAL Microwave Roundtable on Sunday 18th June 2023 at Chilton Village Hall (just off the A34).

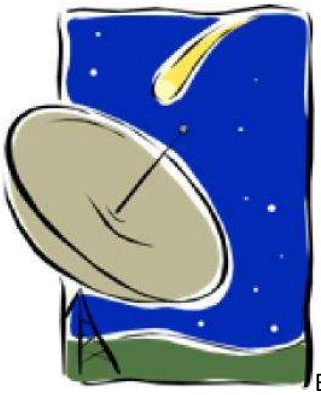
The location is Chilton Village Hall, Chilton, Oxfordshire, OX11 0SR from 10am - 4pm and there is ample parking. Click for directions to Chilton Village Hall (Google)

Please register your interest by emailing the secretary using the button below, including your name and whether you would like a sandwich lunch or not (to help with catering).

## The Technical Talks

- John, G4BAO - Moving up to 24GHz EME. (So you think 24GHz is just "3cm and a bit"? Three years and counting - Pitfalls and issues on the rocky road to my first 24GHz EME QSO)
- Andy, G4JNT - GB3SCS Beacon (How to use and abuse direct up-conversion)

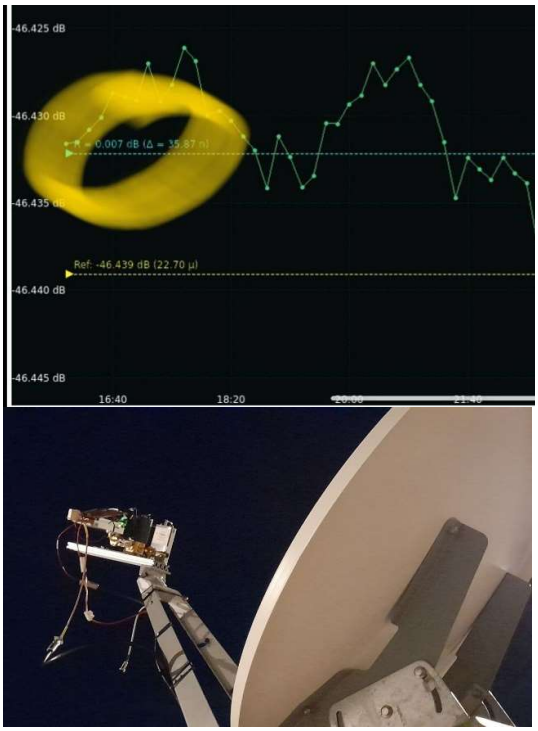
# Activity News March & Early April 2023



By John G4BAO

***Please send your activity news to:*** [scatterpoint@microwavers.org](mailto:scatterpoint@microwavers.org)

## From Iban EB3FRN and Jose EA4HMJ




Hot news of the month is that on April 7th Iban, EB3FRN and José, EA3HMJ, achieved what is probably the first detection by citizen scientists of the thermal noise from planet Venus. It was at 47GHz using José`s Kathrein CAS120 1.2m offset dish. They have written a small brief that will be featured in the June RadCom GHz Bands column and a further detailed report will be forthcoming.
The detection was done from both stations, which are using a Kathrein 120cm dish and our 47GHz lna. Both have a performance of 11.5dB from the Sun and 1.5dB from the Moon. About the Venus detection, the backend was an Airspy SDR at 10MHz of BW and 10secs of integration, with a S/N from 0.004 to 0.010dB in the different tests.

As Venus will be closer this Summer we hope to repeat the tests with better signals. Also pending is to detect Jupiter.

## From John G4BAO

Finally, some six months from receiving it last October, I now have a new MKU10G5 10GHz transverter for my EME system with firmware that works to specification!
As I mentioned here in the February column after much bug hunting and documentation by me, Kuhne's technical team have come good and, fingers crossed, all seems OK with the latest v1.4 firmware.

I haven't yet had my first QSO with JA using its 10450MHz facility but did manage a few of the "usual suspects" on Q65 digimode during the 10GHz section of the Italian EME contest weekend. They were, OZ1LPR, OK2AQ, OK1CA, DK4RC, (Initial #36) and IW2FZR, plus another new one IZ4BFA (initial #35) the weekend before.

Terrestrially, in a brief foray for half an hour in frankly dire conditions in the February SHF UKAC I worked G4CLA 99km, G3XDY 72km, G0WUS/P 89km and G4ODA 60km, all on CW.

## From Kevin ZB2GI

Operating on QO-100 from the GARS club at Coaling Island, My SSB log included GB3RS, demonstrating Amateur Radio to visitors at Bletchley Park. Plus 28 other DXCCs
My setup is TX: Yaesu FT817, DX Patrol up-converter and power amplifier connected to POTY mounted on a 60cm dish.
RX: LNB with TXCO fed via a basis tee, connected to an RTL_SDR dongle running on SDR Console with the Beacon lock Feature activated

## From Denis G0OLX

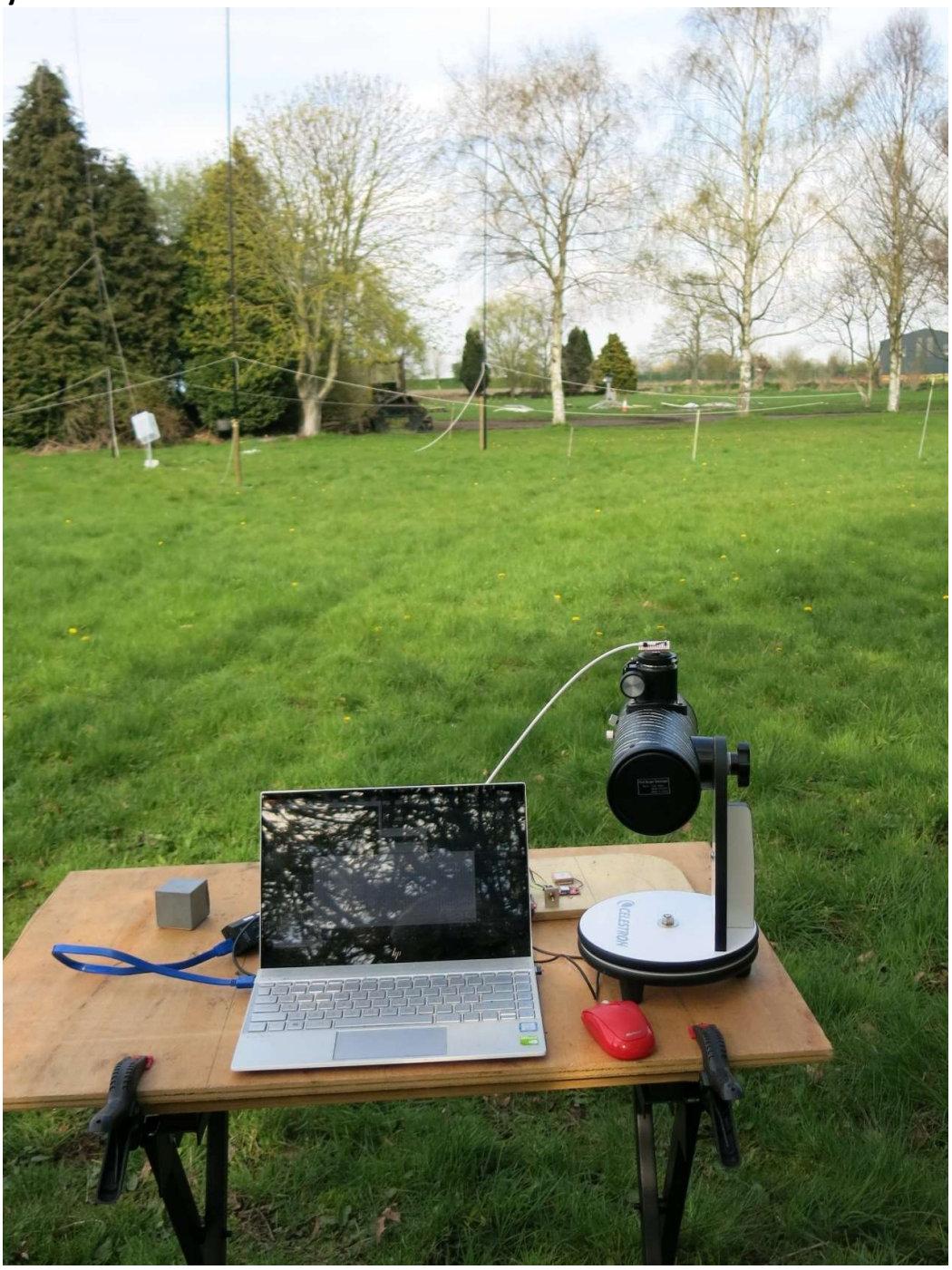
I managed at last to work VK7ZBX on 10GHz EME after trying for at least 5 months. Having decoded Richard several times during that period with no copy of my signals in Tasmania. We exchanged a Q65 60D -18 dB. from Richard and my signals at -24
This was a first for both of us, myself being the first G station Richard had made it to and likewise my first VK station. It was also my second continent.
I was able to track the moon manually by having a second receiver listening to DL0SHF, being switched out on my transmit period. We also used Zello I believe for the first time on EME as talk back but stand to be corrected!

## From Peter G3LTF

I have been active on EME in the first two microwave contests of 2023 organised by Dubus-REF. On 3.4GHz on 6/7 March I worked, using CW, OH2DG, KL6M, WA6PY, 9A5AA, K2UYH, VE6BGT, OK1KIR, ES5PC, G4CCH, OK1CA, DF3RU, PA3DZL, SP3XBO, DB6NT, and then PA3DZL and DF3RU again, using SSB. System is a 6m HB dish on a polar mount with 90W at fed and HB G4DDK VLNA.
In the next leg, 2.3GHz on 23rd March I worked on CW, UA5Y, OH1LRY, OK1KKD, DB6NT, DF3RU, IK3COJ, DL4DTU, and K2UYH cross band to 2304. Unfortunately, my 280W PA failed and it took pretty much all of Sunday 24th to fix it. However, there was evening activity in the following 3 days and I worked 3 new stations who had just got active on the band, DL6SH, IW2FZR and ON4BCB plus a QSO with PA0PLYand G4CCH and an SSB contact with PA3DZL.
Signals on 13cm tend to be pretty strong, it's the best EME band, with a 3m dish and 100W pretty much everyone is workable on CW.

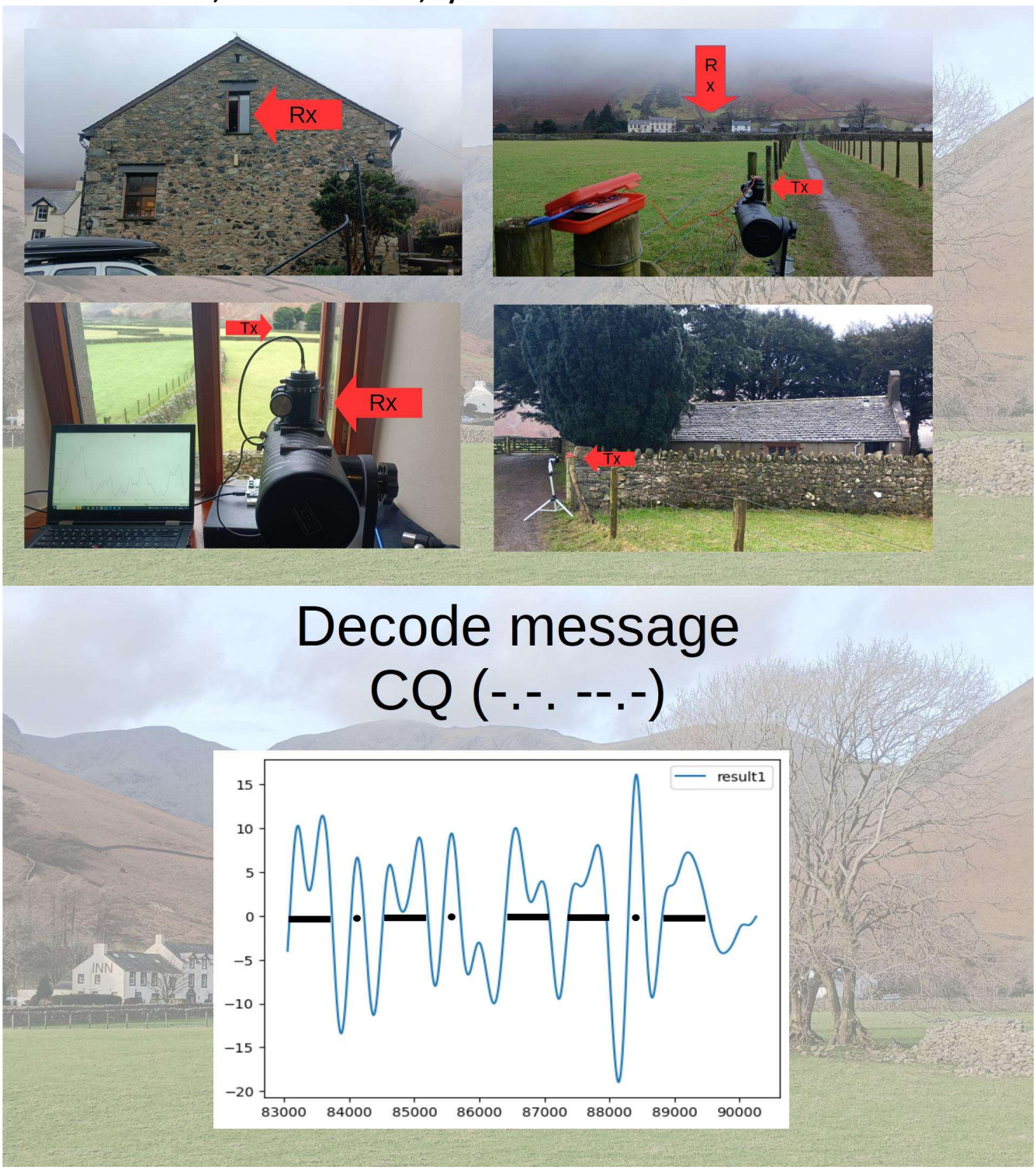
# More 30THz experiments

## From Barry G8AGN



With the kind assistance of Kevin G3AAF and the Finningley ARS I was allowed to use the club's facilities to do more 30THz tests operating with the Tx at low power and over a dx of 125m.
Barry I'm sure will be happy for anyone to look at his data from the tests and he says that apparently the recovered message is garbled in places, but all the transmitted data can be found by looking at the whole file. Barry has not yet had time to process the 125m high power data or the 75m and 103m data but would expect this to be error free except when people inadvertently walked into the LOS!

**From Remi M0LRH, Hieronim M7HBL, Tymek M7TBL**




Please look at the video from another 30THz experiment a few weeks ago (February 2023). We installed a small heater in the eyepiece of the astronomical telescope (transmitter) and a pyroelectric sensor in the other astronomical telescope (receiver).

The weather was very poor (rainy and foggy), which suggests there is potential to achieve a much longer distance with 30THz. Distance was 186m, Power = 800mW
https://www.youtube.com/watch?v=Juw5stisc3w

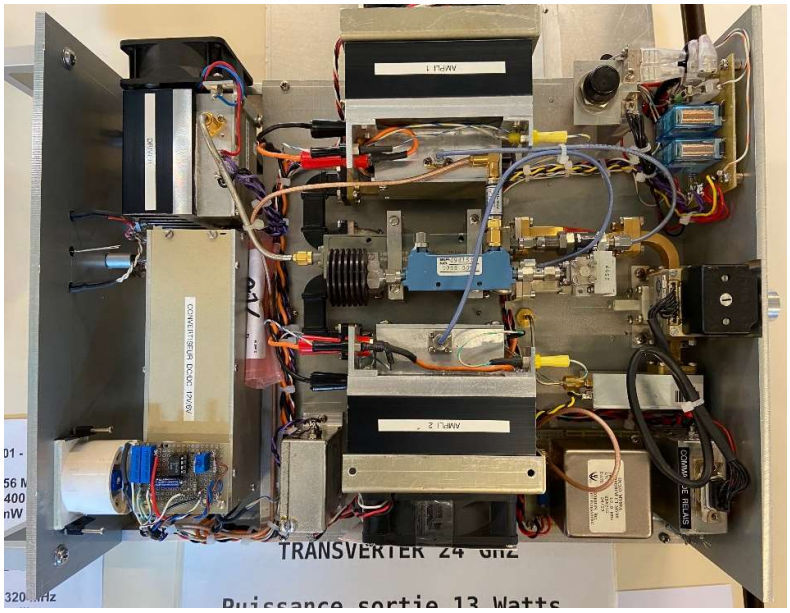
# A Visit to the Seigy 2023 VHF/UHF/Microwave Event.

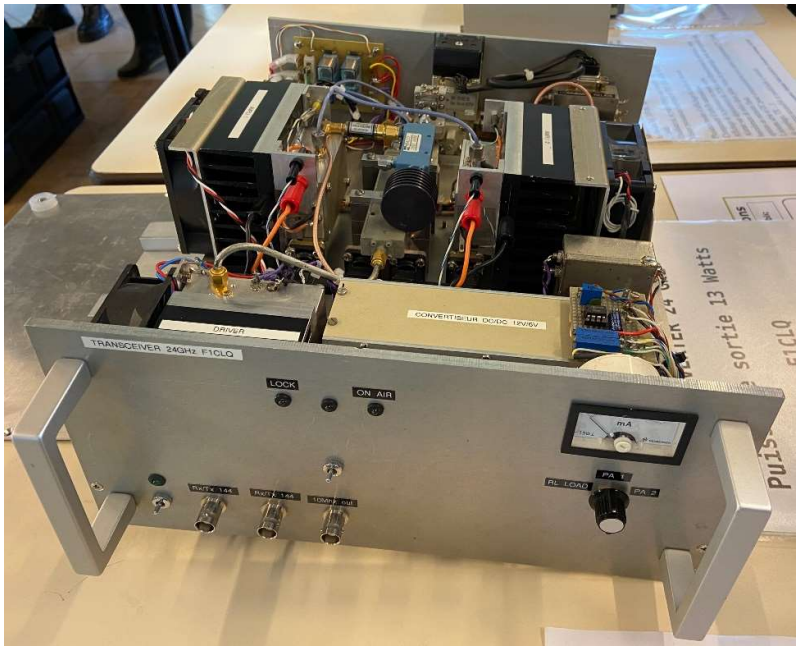
David Newman G4GLT

I travelled with my partner to what will be the last of these events at Seigy which occurred on 1/4/2023. Next year it will be held at a place nearer to the Massif Central. After several years of Covid causing this event to be cancelled, there was a definite feeling of reunion. It was certainly a challenge to get there without a car and involved three trains (including Eurostar) and a bus, which was very cheap. I was made very welcome indeed and was very pleased to meet up with F6DRO, F5CKV, F5AYE, F1GHB, F5BUU, F6DKW, F5HRY, ON7FLY, ON4KHG, ON5TA and F1BJD, F5BLC and many others. A report on this event would be lacking without a mention of Ralph, G4ALY, and how greatly missed he was by many there, as he used to be a regular attendee. Many asked me to send him their best wishes and hoped that his health improves.

On entry to the event I was given a complimentary bottle of Touraine wine, as was everybody. There was plenty of camaraderie. We stayed at St. Aignan which is a beautiful historic town on the Cher.

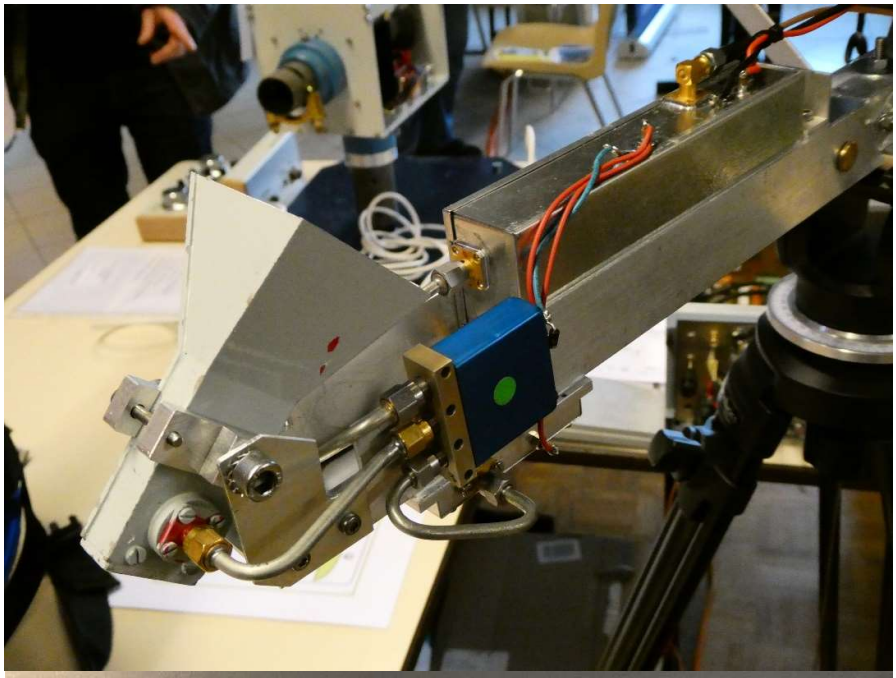
There were outdoor events and also the sale of radio gear, and this time I managed to restrain myself. Part of the Seigy events is a construction competition. I was particularly interested in a 13 watt transverter for 24GHz, which was beautifully built by F1CLQ. Getting all the modules in the right place is an art in itself. You can see this for yourself in the photo below:



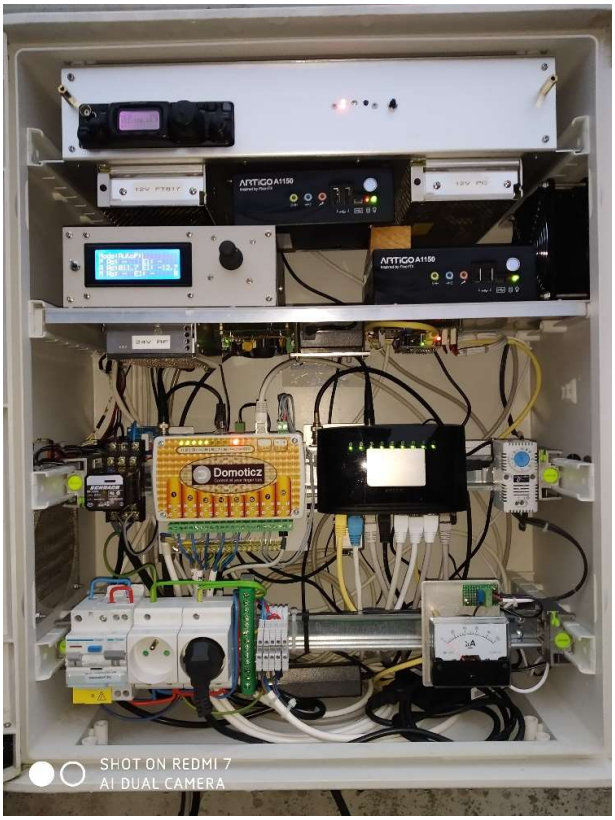
I was impressed by a completely homebrew tripod by F5BLC in wood and metal based on a German design. He mounts an Edmund optics 60cm dish on it for 122GHz using a Mark 2 Australian TX/RX board that does not require any physical movement on TX/RX. This tripod has azimuth marked on its circumference and is workmanship at its best.

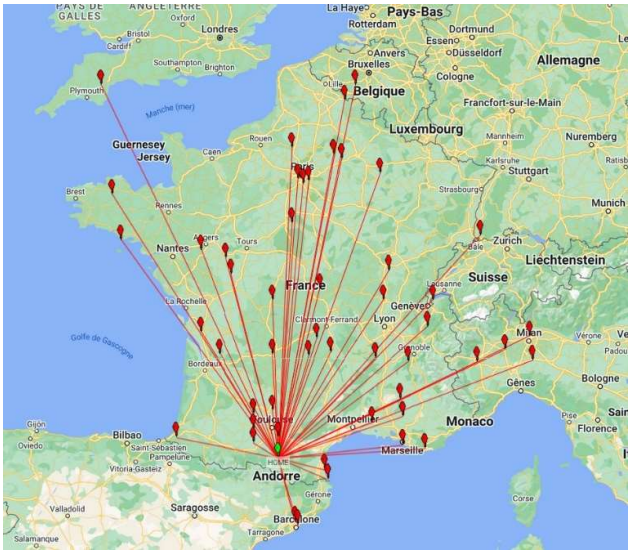
I was also very impressed with the complete 10GHz backpack station by F5AYE weighing 8Kg with 1.5watts to a 51cm dish, F5BVA transverter and an FT817 IF rig. Jean Paul states that often there are great sites for microwaves that have no road access, and this design is his answer to this. The battery is a lightweight Bosch 12volt 3 Ah. He is hoping soon to try this gear on the high peaks of the Jura mountains at 1700mASL. He also comments that from 27/5/2023 to 9/6/2023 he will be in the centre of France, presumably on the Massif Central, trying to work stations on 10ghz by tropo or rain-scatter. Jean Paul lives near the Swiss border and is the beacon keeper for the HB9G beacon. You can see that the transverter/amplifier is attached to the feed arm. He takes a box with him to fill with stones from on site and suspends this below the Amazon Basics tripod. The tripod appears to have elevation on it which is ideal for rain-scatter.
Very neat indeed. See opposite:




YAESU

I attended a very interesting presentation by Jean Claude (F5BUU) and Frederic (F4BXL) about the remote-controlled 10GHz station that they have set up at Prat d'Albis at 1200mASL, about 5km south of Foix, in the Ariège department, which is in the foothills of the Pyrenees about 25km north of the border with Andorra. When Jean Claude and I were both hearing the F5ZBA beacon in central France, last October, and went on to have an ssb QSO on 10GHz, little did I realise that I was working a remote station. I imagined him on the top of a mountain with his portable gear. Frederic took care of the computer aspects including making sure that the internet link was good enough. Jean-Claude reused some Inmarsat equipment which was inside a large white radome (Saturn B Mk2). Inside the radome a dish is located that has both azimuth and elevation controlled separately, as you can see in the picture below. The map below also shows the stations worked via this remote system and their results are very impressive




My thanks to Jean Claude (F5BUU) and Jean Luc (F1BJD) for the use of their photos, and also to everyone who made me feel so welcome.
Dave (G4GLT). 8th April 2023.

# UKuG MICROWAVE CONTESTS

## March 2023 Lowband Contest Results

Entry levels and activity were lower this year than in 2022. Conditions were uninspiring too. Unusually no-one won on more than one band apart from John G3SQQ in the low power section.

A new callsign appears at the top of the 1296MHz results, with G3DCT/P (Ops G0HIK and M0KPW) from IO84. Mike G8CUL takes the runner up slot this time. John G3SQQ wins the Low Power section. G3DCT/P worked DF0MU in JO32 at 737km for the best DX in this event. Conditions were flat with aircraft scatter providing DX contacts.

2300MHz saw a single entry from G8CUL, who just worked G3XDY on this band.

On 2320MHz David M0GHZ was the winner with a comfortable margin over runner up M0HNA/P. The only entry in the low power section was from John G3SQQ. Best DX was between G8CUL and PI4GN at 571km.

John G4ZTR was the winner on 3400MHz with a commanding lead over runner up M0HNA/P, despite fewer QSOs. David M0GHZ was the sole entry in the low power section on this band.

John G3XDY
UKuG Contest Manager

### 1296MHz Low Band March 2023

| Pos | Callsign | Locator | QSOs | Score | ODX Call | ODX Kms |
|---|---|---|---|---|---|---|
| 1 | G3DCT/P | IO84JE | 16 | 4883 | DF0MU | 737 |
| 2 | G8CUL | IO91JO | 17 | 4749 | DF0MU | 587 |
| 3 | M0GHZ | IO81VK | 17 | 4263 | PI4GN | 641 |
| 4 | G4ZTR | JO01KW | 13 | 3968 | DK5EZ | 437 |
| 5 | GW4JQP | IO71KR | 13 | 2591 | G3XDY | 437 |
| 6 | G3SQQ | IO93JC | 12 | 1985 | GM4DIJ/P | 313 |
| 7 | G6GVI | IO83SN | 11 | 1670 | G3XDY | 298 |
| 8 | G3UKV | IO82RR | 11 | 1567 | GM4DIJ/P | 285 |
| 9 | GM4DIJ/P | IO74MU | 4 | 1247 | G3XDY | 513 |
| 10 | G3YJR | IO93FJ | 8 | 1131 | G3XDY | 238 |

### 2300MHz Low Band March 2023

| Pos | Callsign | Locator | QSOs | Score | ODX Call | ODX Kms |
|---|---|---|---|---|---|---|
| 1 | G8CUL | IO91JO | 1 | 174 | G3XDY | 174 |

### 2320MHz Low Band March 2023

| Pos | Callsign | Locator | QSOs | Score | ODX Call | ODX Kms |
|---|---|---|---|---|---|---|
| 1 | M0GHZ | IO81VK | 11 | 2395 | OP5Y/P | 546 |
| 2 | M0HNA/P | IO91GI | 11 | 1945 | ON4CJQ/P | 445 |
| 3 | G8CUL | IO91JO | 8 | 1547 | PI4GN | 571 |
| 4 | G4ZTR | JO01KW | 6 | 1435 | PI4GN | 424 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | G3DCT/P | IO84JE | 4 | 1138 | M0HNA/P | 337 |
| 6 | G3SQQ | IO93JC | 6 | 1027 | G3XDY | 201 |
| 7 | G4LDR | IO91EC | 5 | 569 | G3XDY | 223 |
| 8 | G3UKV | IO82RR | 3 | 415 | M0HNA/P | 170 |

## 3400MHz Low Band March 2023

| Pos | Callsign | Locator | QSOs | Score | ODX Call | ODX Kms |
|---|---|---|---|---|---|---|
| 1 | G4ZTR | JO01KW | 8 | 1743 | PI4GN | 424 |
| 2 | M0HNA/P | IO91GI | 11 | 1099 | G3XDY | 200 |
| 3 | G4LDR | IO91EC | 10 | 1028 | G3XDY | 223 |
| 4 | M0GHZ | IO81VK | 10 | 1003 | G3XDY | 246 |
| 5 | G8CUL | IO91JO | 9 | 933 | G3XDY | 174 |
| 6 | GW3TKH/P | IO81LS | 7 | 915 | G4ZTR | 270 |
| 7 | G3UKV | IO82RR | 6 | 831 | M0HNA/P | 170 |
| 8 | GW4HQX/P | IO81LS | 6 | 803 | G4ZTR | 270 |
| 9 | G1DFL/P | IO91OQ | 6 | 471 | G4ZTR | 118 |

## April 2023 Lowband Contest Results

Entries were up on 1296MHz compared with March, but down on 3400MHz. Participation on 2300MHz is still low.

John G4ZTR (JO01) won the 1296MHz section with some good DX in the log, with G3DCT/P (IO84) as runner up. Best DX was worked by Nick G4KUX at 712km, with F6DKW (JN18) providing best DX for half a dozen stations. John G3SQQ takes the top low power station slot.

There were two entries on 2300MHz, M0HNA/P (Op G4SJH) was the winner, unfortunately a logging error cost G4LDR his points. G3XDY was the best DX worked at 200km.

On 2320MHz the two-man team of M0KPW and G0HIK operating G3DCT/P were leaders, with G4ZTR as runner up. Best DX was the contact between G4ZTR and GM4DIJ/P at 505km. John G3SQQ is leading low power station on this band too.

David M0GHZ takes the both the overall top slot on 3400MHz and the low power crown, with M0HNA/P (Op G1EHF) as runner up. The best DX worked was the QSO from M0GHZ to G3XDY at 246km.

Thanks go to Keith G4ODA for his checklogs.

John G3XDY
UKuG Contest Manager

## 1296MHz Contest April 2023

| Pos | Callsign | Locator | QSOs | Score | ODX Call | ODX Kms |
|---|---|---|---|---|---|---|
| 1 | G4ZTR | JO01KW | 27 | 7369 | EI2FG | 605 |
| 2 | G3DCT/P | IO84JE | 25 | 6832 | F6DKW | 710 |
| 3 | G4KUX | IO94BP | 21 | 6347 | F6DKW | 712 |
| 4 | GI6ATZ | IO74AJ | 17 | 5444 | G3XDY | 543 |
| 5 | M0GHZ | IO81VK | 25 | 4989 | F6DKW | 433 |
| 6 | GW4JQP | IO71KR | 23 | 4968 | G3XDY | 437 |
| 7 | G7LRQ | IO91TQ | 24 | 4912 | EI2FG | 522 |
| 8 | GM4DIJ/P | IO74MU | 14 | 4416 | G3XDY | 513 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9 | M0HNA/P | IO91GI | 26 | 4248 | F6DKW | 389 |
| 10 | G8SEI | IO92FO | 22 | 3994 | F6DKW | 502 |
| 11 | G3SQQ | IO93JC | 22 | 3902 | GI6ATZ | 344 |
| 12 | G8DOH | IO92FA | 24 | 3743 | F6DKW | 449 |
| 13 | G4EPA | IO92KI | 23 | 3286 | EI2FG | 468 |
| 14 | G4LDR | IO91EC | 17 | 3252 | G4KUX | 395 |
| 15 | EI8KN | IO62IE | 7 | 2914 | G3XDY | 581 |
| 16 | G3UKV | IO82RR | 13 | 2171 | GI6ATZ | 292 |
| 17 | G6GVI | IO83SN | 12 | 2027 | G3XDY | 298 |
| 18 | G8AIM | IO92FH | 15 | 1630 | G4KUX | 261 |
| 19 | G4GFI | IO91VH | 11 | 1535 | G3DCT/P | 379 |
| 20 | GM8IEM | IO78HF | 3 | 1258 | G4KUX | 453 |
| 21 | G4CSD | IO91KG | 10 | 1202 | G3DCT/P | 354 |
| 22 | G8TZJ | IO84OA | 2 | 244 | GI6ATZ | 211 |

## 2300MHz Contest April 2023

| Pos | Callsign | Locator | QSOs | Score | ODX Call | ODX Kms |
|---|---|---|---|---|---|---|
| 1 | M0HNA/P | IO91GI | 3 | 413 | G3XDY | 200 |
| 2 | G4LDR | IO91EC | 0 | 0 | | 0 |

## 2320MHz Contest April 2023

| Pos | Callsign | Locator | QSOs | Score | ODX Call | ODX Kms |
|---|---|---|---|---|---|---|
| 1 | G3DCT/P | IO84JE | 11 | 3025 | G3XDY | 378 |
| 2 | G4ZTR | JO01KW | 13 | 2718 | GM4DIJ/P | 505 |
| 3 | M0HNA/P | IO91GI | 14 | 1928 | G3DCT/P | 337 |
| 4 | G3SQQ | IO93JC | 12 | 1854 | G4LDR | 225 |
| 5 | M0GHZ | IO81VK | 12 | 1784 | G3DCT/P | 314 |
| 6 | G7LRQ | IO91TQ | 12 | 1665 | G3DCT/P | 337 |
| 7 | G3UKV | IO82RR | 8 | 1551 | GM4DIJ/P | 285 |
| 8 | G4BRK | IO91HP | 12 | 1484 | G3DCT/P | 309 |
| 9 | G4LDR | IO91EC | 9 | 1251 | G3SQQ | 225 |
| 10 | G8SEI | IO92FO | 7 | 983 | G3XDY | 197 |
| 11 | GM4DIJ/P | IO74MU | 4 | 950 | G4ZTR | 505 |
| 12 | G8AIM | IO92FH | 7 | 843 | G3DCT/P | 237 |

## 3400MHz Contest April 2023

| Pos | Callsign | Locator | QSOs | Score | ODX Call | ODX Kms |
|---|---|---|---|---|---|---|
| 1 | M0GHZ | IO81VK | 8 | 996 | G3XDY | 246 |
| 2 | M0HNA/P | IO91GI | 8 | 808 | G3XDY | 200 |
| 3 | G4ZTR | JO01KW | 5 | 733 | M0GHZ | 220 |
| 4 | G4LDR | IO91EC | 5 | 607 | G4ODA | 212 |
| 5 | G4BRK | IO91HP | 4 | 311 | G4ODA | 152 |

## 2023 Lowband Contest Overall Results

After two sessions, best three count to final score

### 1.3 GHz

| Pos | Call | 05/03/2023 | 02/04/2023 | Total |
|---|---|---|---|---|
| 1 | G3DCT/P | 1000 | 927 | 1,927 |
| 2 | G4ZTR | 813 | 1000 | 1,813 |
| 3 | M0GHZ | 873 | 677 | 1,550 |
| 4 | GW4JQP | 531 | 674 | 1,205 |
| 5 | G8CUL | 973 | 0 | 973 |
| 6 | G3SQQ | 407 | 530 | 937 |
| 7 | G4KUX | | 861 | 861 |
| 8 | GM4DIJ/P | 255 | 599 | 854 |
| 9 | GI6ATZ | | 739 | 739 |
| 10 | G7LRQ | | 667 | 667 |
| 11 | G6GVI | 342 | 275 | 617 |
| 12 | G3UKV | 321 | 295 | 616 |
| 13 | M0HNA/P | | 576 | 576 |
| 14 | G8SEI | | 542 | 542 |
| 15 | G8DOH | | 508 | 508 |
| 16 | G4EPA | | 446 | 446 |
| 17 | G4LDR | | 441 | 441 |
| 18 | EI8KN | | 395 | 395 |
| 19 | G3YJR | 232 | 0 | 232 |
| 20 | G8AIM | | 221 | 221 |
| 21 | G4GFI | | 208 | 208 |
| 22 | GM8IEM | | 171 | 171 |
| 23 | G4CSD | | 163 | 163 |
| 24 | G8TZJ | | 33 | 33 |

### 2.30 GHz

| Pos | Call | 05/03/2023 | 02/04/2023 | Total |
|---|---|---|---|---|
| 1 | G8CUL | 1000 | 0 | 1,000 |
| 2 | M0HNA/P | 0 | 1000 | 1,000 |
| 3 | G4LDR | 0 | 0 | 0 |

### 2.32 GHz

| Pos | Call | 05/03/2023 | 02/04/2023 | Total |
|---|---|---|---|---|
| 1 | M0GHZ | 1000 | 590 | 1,590 |
| 2 | G4ZTR | 599 | 899 | 1,498 |
| 3 | G3DCT/P | 475 | 1000 | 1,475 |

| | | | | |
|---|---|---|---|---|
| 4 | M0HNA/P | 812 | 637 | 1,449 |
| 5 | G3SQQ | 429 | 613 | 1,042 |
| 6 | G3UKV | 173 | 513 | 686 |
| 7 | G4LDR | 238 | 414 | 652 |
| 8 | G8CUL | 646 | 0 | 646 |
| 9 | G7LRQ | 0 | 550 | 550 |
| 10 | G4BRK | 0 | 491 | 491 |
| 11 | G8SEI | 0 | 325 | 325 |
| 12 | GM4DIJ/P | 0 | 314 | 314 |
| 13 | G8AIM | 0 | 279 | 279 |

## 3.4 GHz

| Pos | Call | 05/03/2023 | 02/04/2023 | Total |
|---|---|---|---|---|
| 1 | G4ZTR | 1000 | 736 | 1,736 |
| 2 | M0GHZ | 575 | 1000 | 1,575 |
| 3 | M0HNA/P | 631 | 811 | 1,442 |
| 4 | G4LDR | 590 | 609 | 1,199 |
| 5 | G8CUL | 535 | 0 | 535 |
| 6 | GW3TKH/P | 525 | 0 | 525 |
| 7 | G3UKV | 477 | 0 | 477 |
| 8 | GW4HQX/P | 461 | 0 | 461 |
| 9 | G4BRK | 0 | 312 | 312 |
| 10 | G1DFL/P | 270 | 0 | 270 |

## Overall

| Pos | Call | 1296MHz | 2300MHz | 2320MHz | 3400MHz | Total |
|---|---|---|---|---|---|---|
| 1 | G4ZTR | 1813 | 0 | 1498 | 1736 | 5047 |
| 2 | M0GHZ | 1550 | 0 | 1590 | 1575 | 4715 |
| 3 | M0HNA/P | 576 | 1000 | 1449 | 1442 | 4467 |
| 4 | G3DCT/P | 1927 | 0 | 1475 | 0 | 3402 |
| 5 | G8CUL | 973 | 1000 | 646 | 535 | 3154 |
| 6 | G4LDR | 441 | 0 | 652 | 1199 | 2292 |
| 7 | G3SQQ | 937 | 0 | 1042 | 0 | 1979 |
| 8 | G3UKV | 616 | 0 | 686 | 477 | 1779 |
| 9 | G7LRQ | 667 | 0 | 550 | 0 | 1217 |
| 10 | GW4JQP | 1205 | 0 | 0 | 0 | 1205 |
| 11 | GM4DIJ/P | 854 | 0 | 314 | 0 | 1168 |
| 12 | G8SEI | 542 | 0 | 325 | 0 | 867 |
| 13 | G4KUX | 861 | 0 | 0 | 0 | 861 |
| 14 | G4BRK | 0 | 0 | 491 | 312 | 803 |
| 15 | GI6ATZ | 739 | 0 | 0 | 0 | 739 |
| 16 | G6GVI | 617 | 0 | 0 | 0 | 617 |
| 17 | GW3TKH/P | 0 | 0 | 0 | 525 | 525 |
| 18 | G8DOH | 508 | 0 | 0 | 0 | 508 |
| 19 | G8AIM | 221 | 0 | 279 | 0 | 500 |
| 20 | GW4HQX/P | 0 | 0 | 0 | 461 | 461 |
| 21 | G4EPA | 446 | 0 | 0 | 0 | 446 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 22 | EI8KN | 395 | 0 | 0 | 0 | 395 |
| 23 | G1DFL/P | 0 | 0 | 0 | 270 | 270 |
| 24 | G3YJR | 232 | 0 | 0 | 0 | 232 |
| 25 | G4GFI | 208 | 0 | 0 | 0 | 208 |
| 26 | GM8IEM | 171 | 0 | 0 | 0 | 171 |
| 27 | G4CSD | 163 | 0 | 0 | 0 | 163 |
| 28 | G8TZJ | 33 | 0 | 0 | 0 | 33 |

# UKuG MICROWAVE CONTESTS – 2023

## UKuG MICROWAVE CONTEST CALENDAR 2023

| Dates, 2023 | Time UTC | Contest name |
|---|---|---|
| 7-May | 0800 - 1400 | 3rd Low band 1.3/2.3/3.4GHz |
| 14-May | 0900 – 1700 | 1st 24GHz Contest |
| 14-May | 0900 – 1700 | 1st 47GHz Contest |
| 14-May | 0900 – 1700 | 1st 76GHz Contest |
| 28-May | 0600 - 1800 | 1st 5.7GHz Contest |
| 28-May | 0600 - 1800 | 1st 10GHz Contest |
| 4-Jun | 1000 - 1600 | 4th Low band 1.3/2.3/3.4GHz |
| 25-Jun | 0600 - 1800 | 2nd 5.7GHz Contest |
| 25-Jun | 0600 - 1800 | 2nd 10GHz Contest |
| 9-Jul | 0900 – 1700 | 2nd 24GHz Contest |
| 9-Jul | 0900 – 1700 | 2nd 47GHz Contest |
| 9-Jul | 0900 – 1700 | 2nd 76GHz Contest |
| 30 -Jul | 0600 - 1800 | 3rd 5.7GHz Contest |
| 30 -Jul | 0600 - 1800 | 3rd 10GHz Contest |
| 27-Aug | 0600 - 1800 | 4th 5.7GHz Contest |
| 27-Aug | 0600 - 1800 | 4th 10GHz Contest |
| 10-Sep | 0900 - 1700 | 3rd 24GHz Contest & 24GHz Trophy |
| 10-Sep | 0900 - 1700 | 3rd 47GHz Contest |
| 10-Sep | 0900 - 1700 | 3rd 76GHz Contest |
| 24 -Sep | 0600 - 1800 | 5th 5.7GHz Contest |
| 24 -Sep | 0600 - 1800 | 5th 10GHz Contest |
| 15 -Oct | 0900 - 1700 | 4th 24GHz Contest |
| 15 -Oct | 0900 - 1700 | 4th 47GHz Contest |
| 15 -Oct | 0900 - 1700 | 4th 76GHz Contest |
| 12 -Nov | 1000 - 1400 | 5th Low band 1.3/2.3/3.4GHz |

# UKuG MICROWAVE CONTEST CALENDAR 2023

| Month | Contest name | Certificates | Date 2023 | Time GMT | Notes |
|---|---|---|---|---|---|
| Jan | 1.3GHz Activity Contest | *Arranged by RSGB* | 17-Jan | 2000 - 2230 | RSGB Contest |
| Jan | 2.3GHz+ Activity Contest | *Arranged by RSGB* | 24-Jan | 1930 - 2230 | RSGB Contest |
| Feb | 1.3GHz Activity Contest | *Arranged by RSGB* | 21-Feb | 2000 - 2230 | RSGB Contest |
| Feb | 2.3GHz+ Activity Contest | *Arranged by RSGB* | 28-Feb | 1930 - 2230 | RSGB Contest |
| Mar | REF/DUBUS EME 3.4GHz | *Arranged by REF/DUBUS* | 4-Mar to 5-Mar | 0000 - 2400 | REF/DUBUS EME 3.4GHz |
| Mar | Low Band 1296/2300/2320/3400MHz | F, P,L | 5-Mar | 1000 - 1600 | First 4 hours coincide with IARU |
| Mar | 1.3GHz Activity Contest | *Arranged by RSGB* | 21-Mar | 2000 - 2230 | RSGB Contest |
| Mar | 2.3GHz+ Activity Contest | *Arranged by RSGB* | 28-Mar | 1930 - 2230 | RSGB Contest |
| Jun | REF/DUBUS EME 2.3GHz | *Arranged by REF/DUBUS* | 25-Mar to 26-Mar | 0000 - 2400 | REF/DUBUS EME 2.3GHz |
| Apr | Low Band 1296/2300/2320/3400MHz | F, P,L | 2-Apr | 1000 - 1600 | |
| Apr | 1.3GHz Activity Contest | *Arranged by RSGB* | 18-Apr | 1900 - 2130 | RSGB Contest |
| Apr | REF/DUBUS EME 1.2GHz | *Arranged by REF/DUBUS* | 22-Apr to 23-Apr | 0000 - 2400 | REF/DUBUS EME 1.2GHz |
| Apr | 2.3GHz+ Activity Contest | *Arranged by RSGB* | 25-Apr | 1830 - 2130 | RSGB Contest |
| May | *432MHz & up* | *Arranged by RSGB* | 6-May to 7-May | 1400 -1400 | RSGB Contest |
| May | *10GHz Trophy* | *Arranged by RSGB* | 7-May | 0800 - 1400 | Sunday, to coincide with IARU |
| May | Low Band 1296/2300/2320/3400MHz | F, P,L | 7-May | 0800 - 1400 | Aligned with IARU event |
| May | 24GHz/47/76GHz | | 14-May | 0900-1700 | |
| May | 1.3GHz Activity Contest | *Arranged by RSGB* | 16-May | 1900 - 2130 | RSGB Contest |
| May | REF/DUBUS EME 10GHz & Up | *Arranged by REF/DUBUS* | 20-May to 21-May | 0000 - 2400 | REF/DUBUS EME 10GHz & up |
| May | 2.3GHz+ Activity Contest | *Arranged by RSGB* | 23-May | 1830 - 2130 | RSGB Contest |
| May | 5.7GHz/10GHz | F, P,L | 28-May | 0600-1800 | |
| Jun | Low Band 1296/2300/2320/3400MHz | F, P,L | 4-Jun | 1000 - 1600 | Aligned with some Eu events |
| Jun | 1.3GHz Activity Contest | *Arranged by RSGB* | 20-Jun | 1900 - 2130 | RSGB Contest |
| Jun | 5.7GHz/10GHz | F, P,L | 25-Jun | 0600-1800 | |
| Jun | 2.3GHz+ Activity Contest | *Arranged by RSGB* | 27-Jun | 1830 - 2130 | RSGB Contest |
| Jul | VHF NFD (1.3GHz) | *Arranged by RSGB* | 1-Jul to 2-Jul | 1400 - 1400 | RSGB Contest |
| Jul | 24GHz/47/76GHz | | 9-Jul | 0900-1700 | |
| Jul | REF/DUBUS EME 5.7GHz | *Arranged by REF/DUBUS* | 15-Jul to 16-Jul | 0000 - 2400 | REF/DUBUS EME 5.7GHz |
| Jul | 1.3GHz Activity Contest | *Arranged by RSGB* | 18-Jul | 1900 - 2130 | RSGB Contest |
| Jul | 2.3GHz+ Activity Contest | *Arranged by RSGB* | 25-Jul | 1830 - 2130 | RSGB Contest |
| Jul | 5.7GHz/10GHz | F, P,L | 30-Jul | 0600-1800 | |
| Aug | ARRL Microwave EME | *Arranged by ARRL* | 12-Aug to 13-Aug | 0000 - 2359 | ARRL EME 2.3GHz & Up |
| Aug | 1.3GHz Activity Contest | *Arranged by RSGB* | 15-Aug | 1900 - 2130 | RSGB Contest |
| Aug | 2.3GHz+ Activity Contest | *Arranged by RSGB* | 22-Aug | 1830 - 2130 | RSGB Contest |
| Aug | 5.7GHz/10GHz | F, P,L | 27-Aug | 0600-1800 | |
| Sep | ARRL Microwave EME | *Arranged by ARRL* | 9-Sep to 10-Sep | 0000 - 2359 | ARRL EME 2.3GHz & Up |
| Sep | 24GHz/47/76GHz | | 10-Sep | 0900-1700 | |
| Sep | 1.3GHz Activity Contest | *Arranged by RSGB* | 19-Sep | 1900 - 2130 | RSGB Contest |
| Sep | 5.7GHz/10GHz | F, P,L | 24-Sep | 0600-1800 | |
| Sep | 2.3GHz+ Activity Contest | *Arranged by RSGB* | 26-Sep | 1830 - 2130 | RSGB Contest |
| Oct | *432MHz & up* | *Arranged by RSGB* | 7-Oct to 8-Oct | 1400 - 1400 | IARU/RSGB Contest |
| Oct | *1.3 & 2.3GHz Trophies* | *Arranged by RSGB* | 7-Oct | 1400 - 2200 | RSGB Contest |
| Oct | 24GHz/47/76GHz | | 15-Oct | 0900-1700 | |
| Oct | 1.3GHz Activity Contest | *Arranged by RSGB* | 17-Oct | 1900 - 2130 | RSGB Contest |
| Oct | 2.3GHz+ Activity Contest | *Arranged by RSGB* | 24-Oct | 1830 - 2130 | RSGB Contest |
| Oct | ARRL EME 50-1296MHz | *Arranged by ARRL* | 28-Oct to 29-Oct | 0000 - 2359 | ARRL EME Contest |
| Nov | Low Band 1296/2300/2320/3400MHz | F, P,L | 12-Nov | 1000 - 1400 | |
| Nov | 1.3GHz Activity Contest | *Arranged by RSGB* | 21-Nov | 2000 - 2230 | RSGB Contest |
| Nov | ARRL EME 50-1296MHz | *Arranged by ARRL* | 25-Nov to 26-Nov | 0000 - 2359 | ARRL EME Contest |
| Nov | 2.3GHz+ Activity Contest | *Arranged by RSGB* | 28-Nov | 1930 - 2230 | RSGB Contest |
| Dec | 1.3GHz Activity Contest | *Arranged by RSGB* | 19-Dec | 2000 - 2230 | RSGB Contest |

# EVENTS 2023

| | | |
|---|---|---|
| May 19-21 | Hamvention Dayton | www.hamvention.org |
| June 18 | RAL Microwave Roundtable | www.g3pia.net |
| June 23-25 | Ham Radio, Friedrichshafen | www.hamradio-friedrichshafen.de |
| July 8/9 | Finningley Roundtable | g0ghk.com |
| August 6 | BATC Convention, Midlands Air Museum, Coventry | www.batc.org.uk |
| September 8-10 | 68.UKW Tagung Weinheim, Germany | www.ukw-tagung.de |
| September 17-22 | European Microwave week, Berlin | www.eumweek.com |
| November11 | Scottish Round Table | www.gmroundtable.org.uk |
| December 2 | Midlands Roundtable, Eaton Manor, SY6 7DH | |

## 80m UK Microwavers net

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

**73 Martyn Vincent G3UKV**