An Amateur Radio publication for the Microwave Enthusiast

scatterpoint

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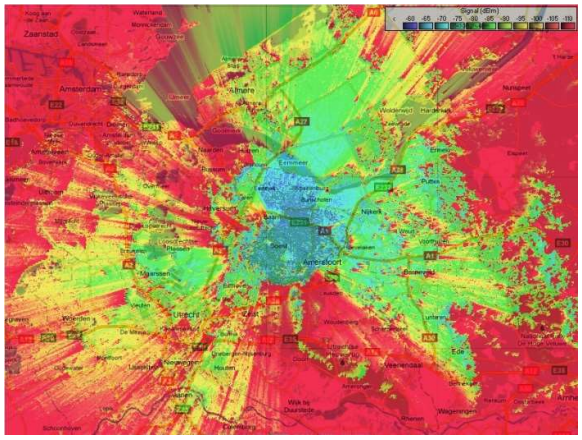
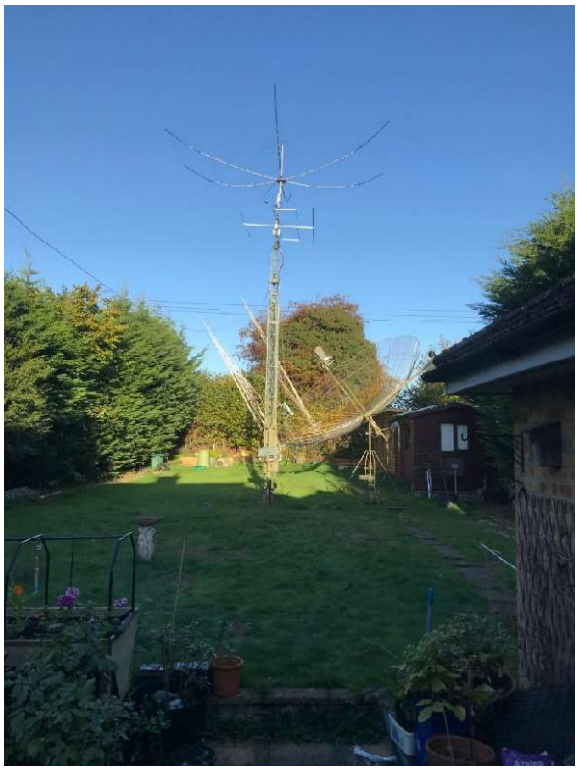


Propagation at 5.76GHz Chris PA3CRX



EME activity from Dave G4RGK

UK Microwave Group

Subscription Information

The following subscription rates apply

UK £6 00 US $12 00 Europe €10 00

This basic sum is for **UKuG membership** For this you receive Scatterpoint for **FREE** by electronic means (now internet only) via

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, 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: Position vacant	General Secretary: John Quarmby G3XDY	Membership Secretary: Bryan Harber G8DKK
email: chairman@microwavers.org	secretary@microwavers.org Suffolk JO02OB Tel: 01473 717830	membership@microwavers.org Hertfordshire IO91VX
Treasurer: David Millard M0GHZ	Scatterpoint Editor: Roger Ray G8CUB	Beacon Coordinator: Denis Stanton G0OLX
email: treasurer@microwavers.org	editor@microwavers.org Wiltshire IO91DK Tel: 07900 261121	beacons@microwavers.org

Scatterpoint Activity news: John G4BAO scatterpoint@microwavers.org
Contests & Awards Manager: G3XDY as above g3xdy@btinternet.com

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 Lomond	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(future)

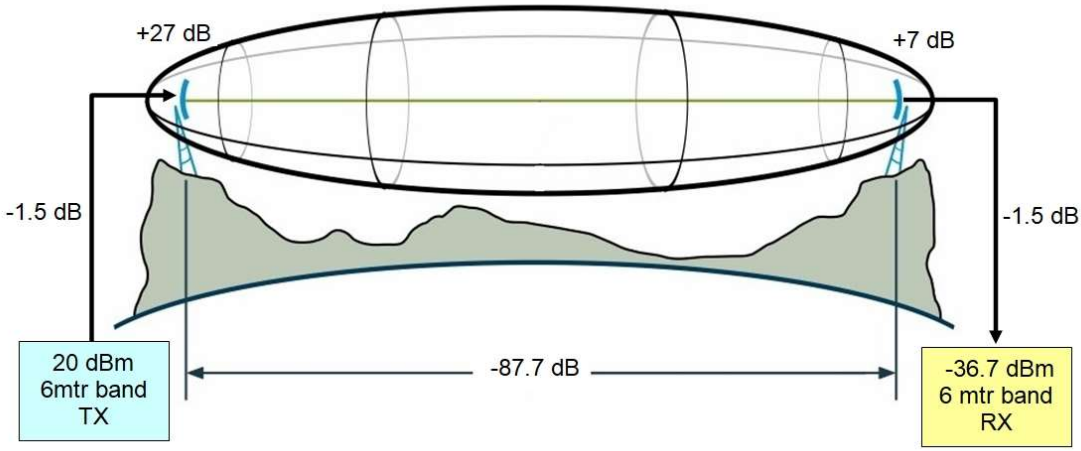
To what extent can contact paths be predicted?

Chris van den Berg PA3CRX

At higher frequencies people quickly think it's only line-of sight contacts - if you can see each other - the contact succeeds, otherwise it doesn't.
This article shows that it is not all that simple and sometimes rather predictable if the signal will arrive with the wanted signal strength at the other station. Mind you, this article focuses on recognisable main issues.

Practical example

A transmitted signal of 100 mW corresponds to 20 dBm. Some signal is lost via the piece of coax (and plugs), for example 1.5 dB. The transmitting antenna has a certain gain, for example 27 dBi. The signal through the air to the other antenna is also attenuated, which we could call 'free space loss'. This depends on the frequency and distance. If we assume a frequency of 5780 MHz and a distance of 100 meters, the 'free space loss' attenuation is 87.7 dB.
So it arrives at the receiving antenna (for example a ring element with a reflecting metal plate) with some 7 dBi gain. Again 1.5 dB is lost in the cable and connectors and the remaining signal arrives at the receiver. The sum looks like this: 20 - 1.5 + 27 - 87.7 + 7 - 1.5 = - 36.7 dBm.



Calculating with dB's and graphical presentation of the Fresnel zone

If the receiver needs a signal of -80 dBm to show a noise-free signal, then there is a considerable surplus of signal, in this case 43.3 dB. This means as more free space loss is allowed, the distance can therefore be increased considerably.
At 14.5 km the free space loss is 131 dB, we then have a signal left of -80 dBm, just what the sensitivity of my six centimetre receiver is to show a visible video image.

With a satellite dish with a gain of 27 dB in the six centimetre band and the opposite station with a poor antenna, a considerable distance can be bridged.

The same applies to repeaters. An omnidirectional antenna with a gain of 13 dBi is already significant.

So if you want to reach such a repeater with 100 mW and you have a line-of-sight, depending on the distance, you can see some additional antenna gain is needed.

With the link budget calculator [ref 5] it is easy to play with the different parameters. For example find out what the distance could be if both stations had a dish with 27 dBi gain.

Unfortunately, RF signals travel (more or less) in a straight line in space. At the horizon, the signal will also go straight ahead, thus effectively limiting the distance. However, regular refraction bends signals often slightly toward Earth ('k factor') allowing them to travel beyond the optical horizon. Temperature and air pressure at different altitudes are responsible for this.

Fresnel zone

Between the transmitting antenna and the receiving antenna, the signal looks like an elongated cigar and is called the Fresnel zone.

The diameter of the Fresnel zone depends on the frequency and the distance. At a higher frequency, the diameter of the Fresnel zone is smaller.
If 60% of that cigar diameter arrives at the receiver, there is only little extra attenuation compared to the unblocked path damping. However, if the Fresnel zone is covered to a larger extent, the losses increase rapidly.

So an example with the horizon. A location has been chosen close to the ground and the antennas can just 'see' each other. Here half of the Fresnel zone (50%) is covered and there is no guarantee that the contact will happen.

One of the antennas (or both) should be placed higher to have the Fresnel zone sufficiently clear. That is also the reason that talkback over a few km between handhelds could be difficult, while a repeater much further away could be used without any problem - after all, the repeater antenna is placed high.

In both cases the antennas 'see' each other, but in one case the Fresnel zone is covered and in the other situation not.

We even noticed that the talkback in the two-meter band was unsuccessful while the contact with the 6 cm equipment was P5. The Fresnel zone for the two-meter band has a much larger diameter than for the six-centimetre band and therefore is more than 60% blocked.

Height differences in the earth's surface

Often, hills form a barricade in the path. It will be clear if a hill is between the transmitter and receiver antenna, the Fresnel zone will be covered by the hill in question and the contact is not possible.

Placing the transmitting or receiving antenna on the hill obviously increases the area to be reached enormously. At both lower and higher frequencies, the Fresnel zone is unobstructed from a large distance, until the next hill or the horizon. Unfortunately, the hills in question are (in the Netherlands) often provided with forests.

Absorption

Besides free space loss, restriction by the earth (horizon) and hills, very little signal remains after going through vegetation.
This effect is stronger at higher frequencies. A well-known effect is that of a bush or tree that grows in front of a satellite dish in a few years. The signal immediately becomes weaker.

A test over only 20 meters with and without a hedge between the antennas made a noise-free signal at 5780 MHz completely disappear. Just one houseplant between the antennas already halves the signal strength.
Of course, the Fresnel zone also reappears here: close to the transmitting and receiving antennas, the cigar is small in diameter and the signal is considerably attenuated.

If the distance is larger, the tree, shrub or houseplant will block a much smaller part of the Fresnel zone, so that the effect will be much less or not even noticed. The effect of trees is even influenced by the species (needle, foliage), season (with leaves more damping) and also the wind strength and direction! If the leaves move in a certain direction, they allow the signal to pass better.

A local station who always receives a repeater on 2387 MHz - some 50 km away - noticed he used a different heading in the winter than during the summer. This effect could be caused by trees.

Reflection

Buildings, bridges, noise barriers, airplanes, even raindrops at higher frequencies are all obstacles that block the signal.

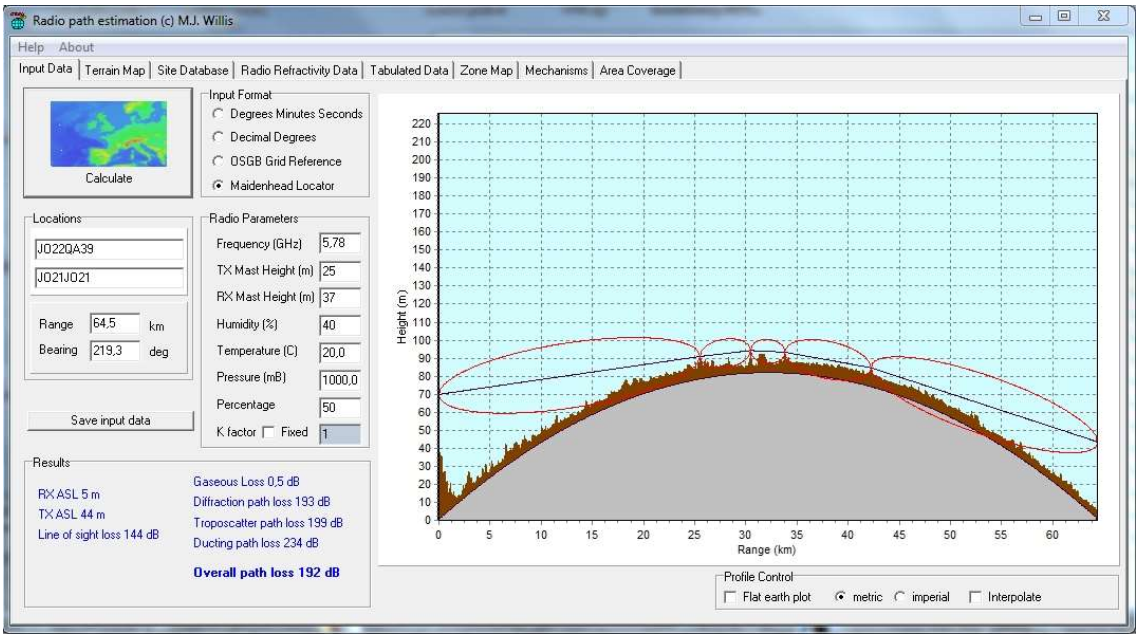
In addition to absorption, a part will also be reflected. Tests on thirteen and nine-centimetres demonstrated that if a direct contact is obstructed, the contact is possible by pointing both antennas at another common (for both) visible high point. The distance may be much larger, but the contact will happen.

During ATV activity weekends several stations leaves the transmitter on for some time, even when the contact is unsuccessful. Then, suddenly, a picture shows up for a very short moment. Therefore several stations even record what they receive so they are able to watch the recording afterwards, frame by frame.

It is likely aircraft are responsible for this event. Aircraft scatter is often used for phone contacts on higher frequencies, over hundreds of km. For ATV such distances are not seen by aircraft scatter. With a rather low plane height, it could just extend the horizon by such reflection. Links below to find out where planes are to investigate in what way they influence your signals.

Diffraction

‘Diffraction’ is an effect that can occur with tall buildings or obstacles such as mountain tops. The signal will bend around (especially sharp) corners.
We experienced that if buildings are on the involved hill (so sharper corners) this really could make the difference. Google 'knife edge diffraction’ for more information.

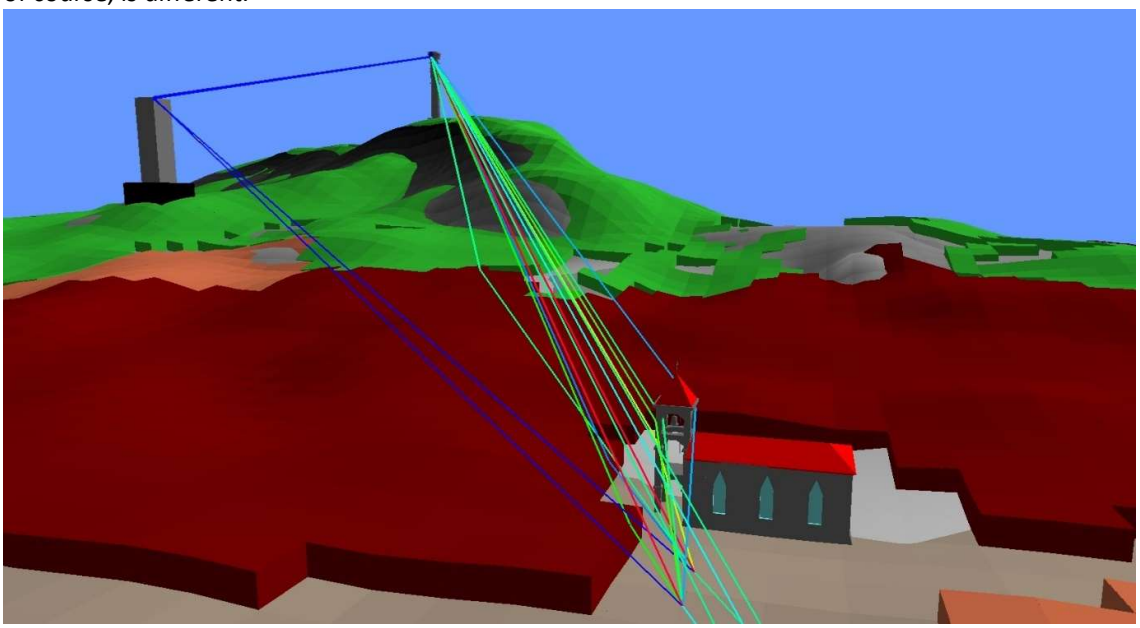


Example of diffraction, showing more Fresnel zones in series, generated by software 'Path Profile'

This will be often accompanied by considerable attenuation, but a signal will indeed pass/around it. (Wet) leaves have sharp edges, as do wind turbines. Elevating the antenna to radiate to treetops (scattering) is certainly beneficial if trees obstruct the signal path. Moving around and elevating the antenna with a portable station even on ground level showed positive results while transmitting between buildings or in a garden blocked by high trees.

Multi-path

The previous image suggests that the signal only travels one way to the other station. The practice, of course, is different.



Example of several paths that the signal will travel

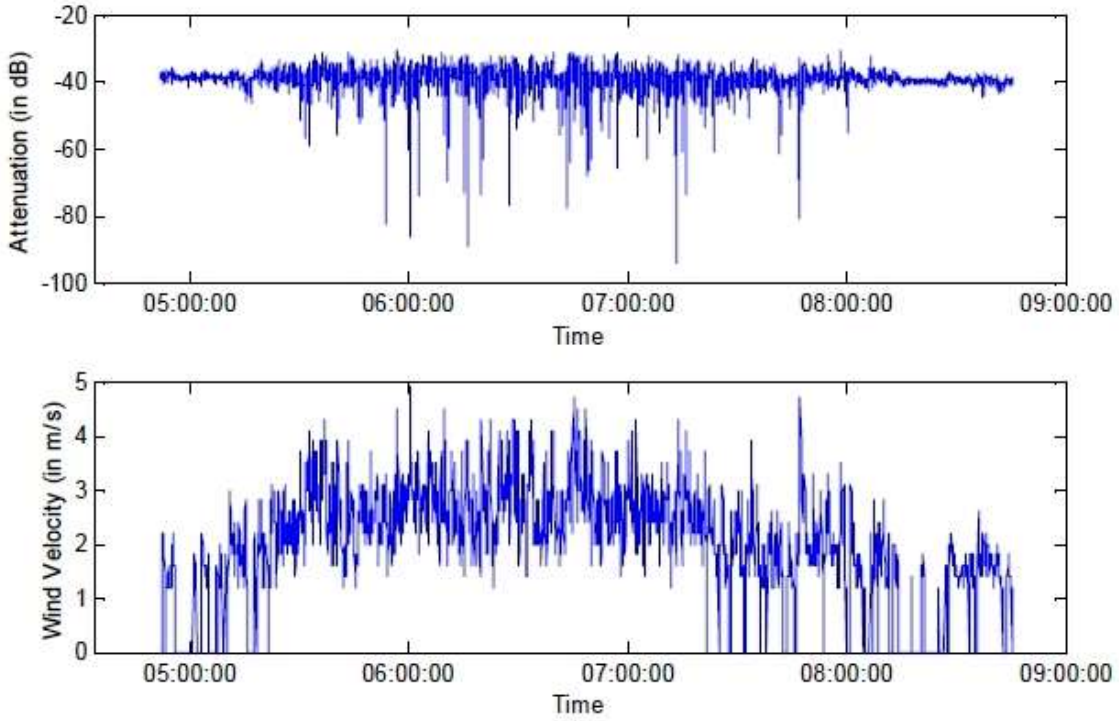
The signal paths mentioned above ensure that the signals arrive at different strengths and different time delays.
Especially with FM ATV signals, these time delays are visible in the image. The signal can therefore be fine in terms of strength, while the image is not really nice, synchronises poorly or with picture distortion etc.

The influence of trees and wind on path damping

An interesting study is about fading of RF signals by vegetation in the frequency bands 2.45, 5.15, 29 and 60 GHz. Two of these bands are very close to amateur bands. Test trails have been set up over a short distance (110 and 63.9 metres), with deciduous and coniferous trees, both with leaves and without.

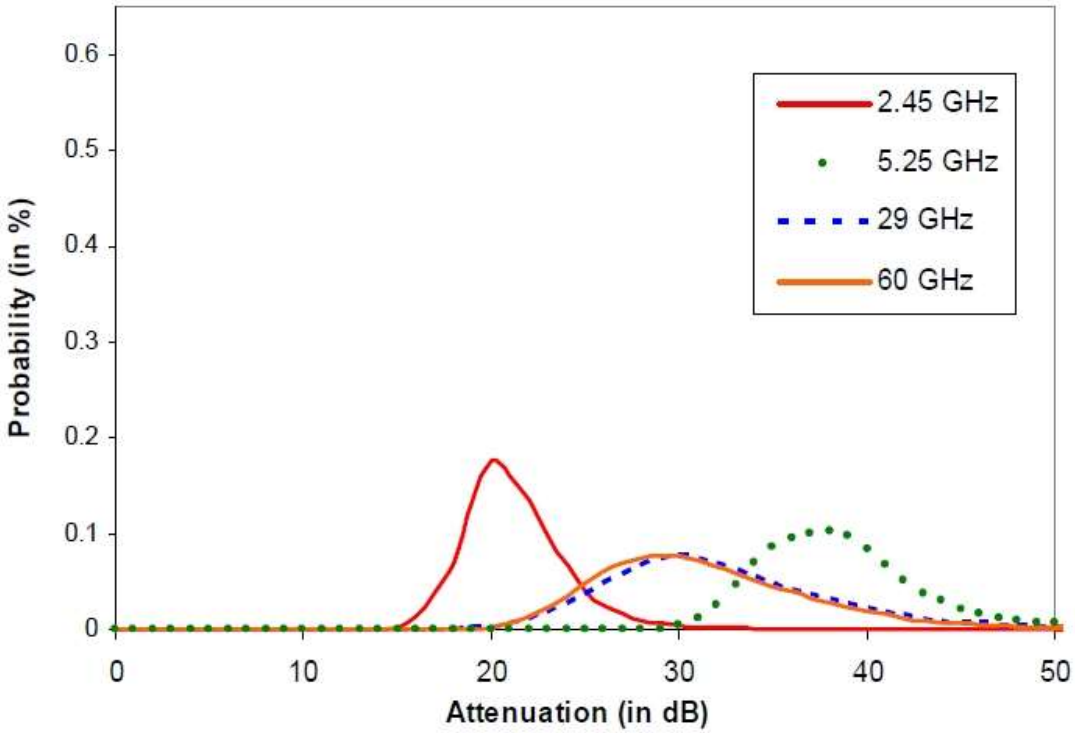
Actually, not much more has been done than to send signals over the path at the various frequencies than to register the signal strength and the wind strength at the same time.

Subsequently, graphs were made and coherence established. The measurements are shown in the following figure.



Signal strength at 5.25GHz in relation to the wind speed

The correlation is clear in these situations - more wind means variation in signal strength, mainly greater attenuation. In addition, the spread has been plotted for the different measured frequencies, showing the effect is different for the different frequencies.



Spread in path losses in leaf-losing trees (deciduous trees)

The spread seen at 5.25 GHz is actually the same as the previous figure. In addition, measurements were made with a spectrum analyser, very close to the carrier wave. The measurements showed that the signal was modulated by the moving leaves. The resulting signals are 30 dB lower than the carrier wave, so whether they cause disturbance in an ATV image will have to be further investigated. Some conclusions in this study:

- It has been shown that the strength of a signal between two and 60 GHz through trees is frequency and wind speed dependent
- That the attenuation is greater if the physical dimensions of the obstacles in the vegetation are the same as the wavelength

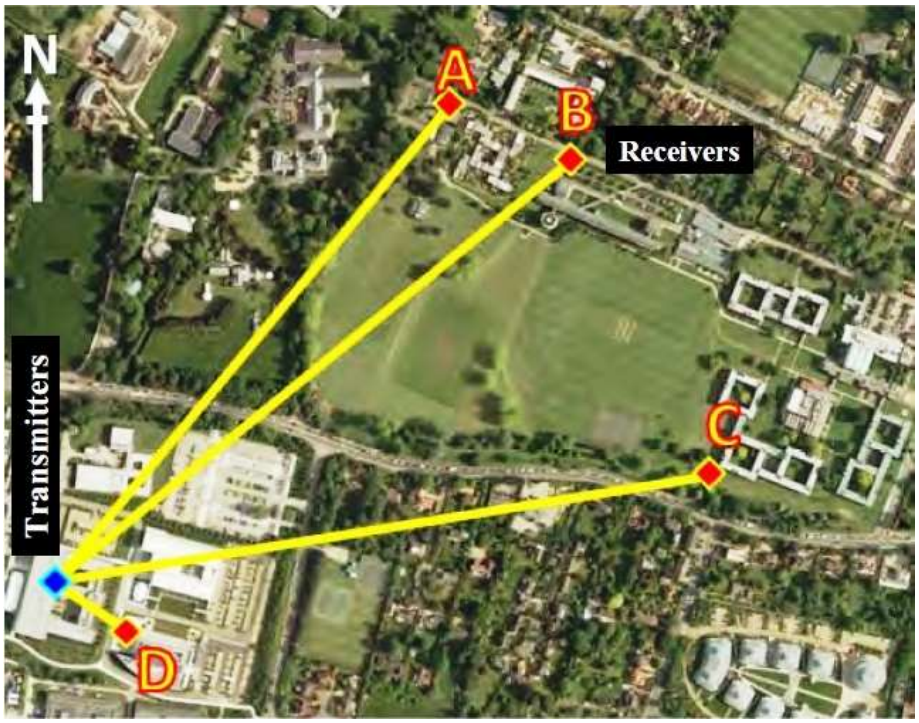
The research itself seems to me to be somewhat limited to substantiate these conclusions.

For example, it would have been nice if a second path (without vegetation) had been performed as a reference measurement at the same time as the measurement. Also the conclusion about the relationship between the dimensions of the leaves/needles in relation to the wavelength - if that relationship is really there, it must also be easy to determine with more measurements, other trees, if the leaves are still emerging (and are therefore smaller) etc.

What is also noticeable is that with more wind, not only more weakening occurs, but sometimes also less. It is therefore easy to explain that contacts that fail when there is no wind, suddenly succeed when the wind starts to blow [ref 3].

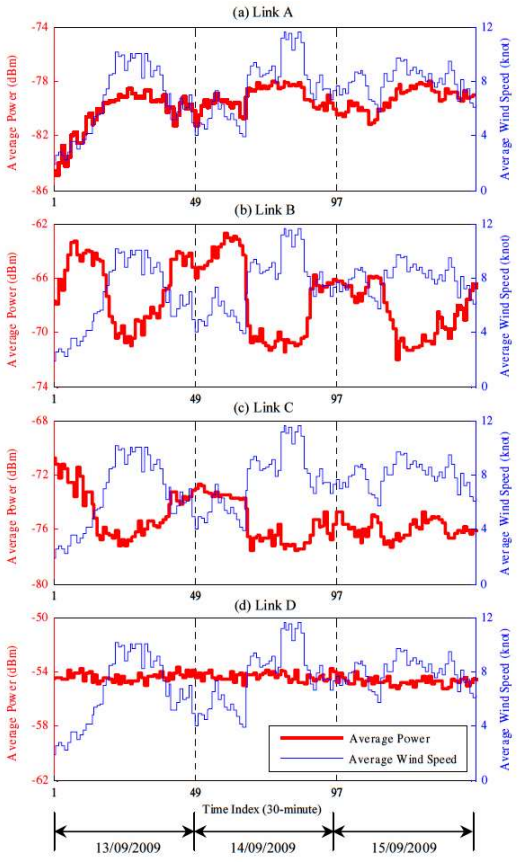
Another study continues with vegetation and the wind: it even includes the wind direction. Here too, long-term measurements were performed in a typical urban area with vegetation.

One transmitter at 5.8 GHz and three receivers. The paths are about 600 meters and the vegetation is at different distances from the receivers. There is also a line of sight over 100 meters away.



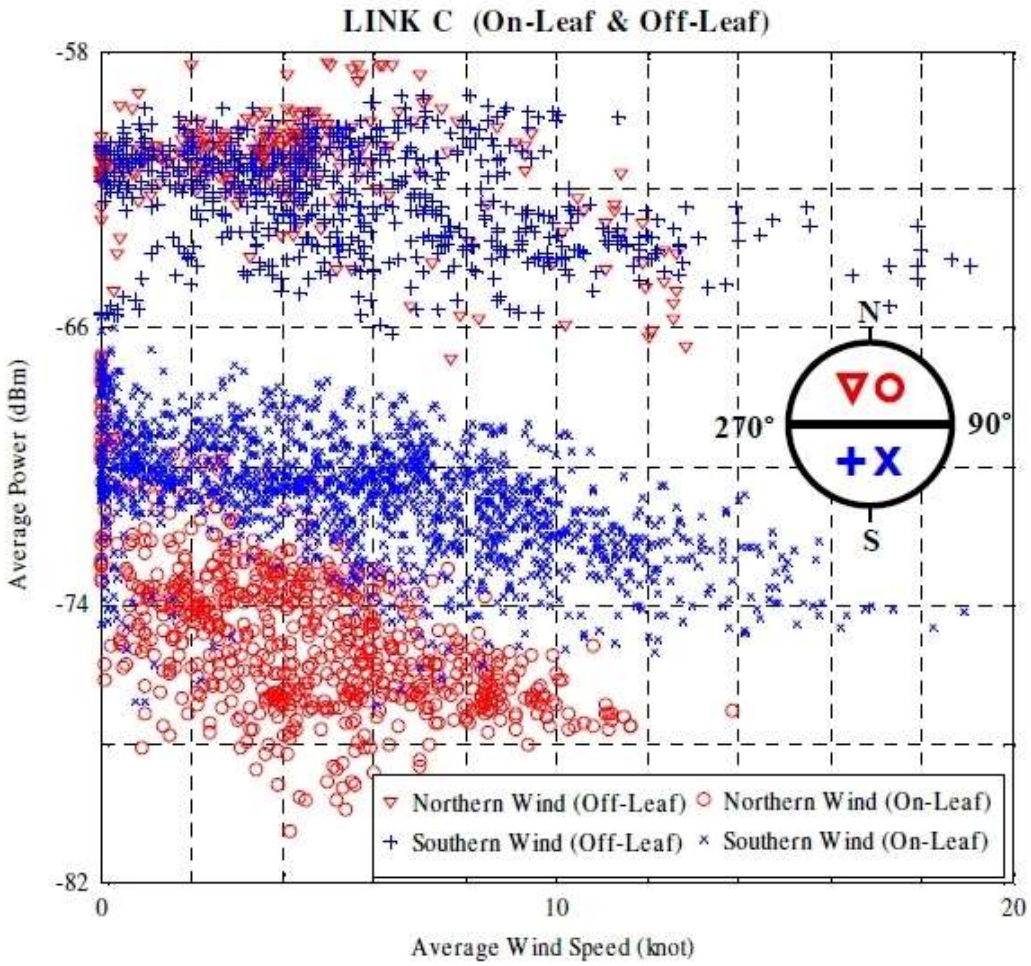
The four paths in Cambridge, three of which are through leafy trees

While the visual contact showed virtually no fluctuation in signal strength, two paths resulted in less signal as the wind strength increased, with one path the opposite (more wind is more signal).



Average signal strength in relation to wind speed (trees in leaf), paths A to D
Trees without leaves give less damping and the wind direction then plays almost no role. Which means that the leaves (and the direction in which they move) really cause the damping. The correlation between these parameters is very interesting to look at.

Correlation between average signal strength, average wind speed and average wind direction of path C (with and without leaves)



The effect and tipping point are different for the different wind directions. It is also clearly recognised in this research that the received signals arrive at the receivers via different paths.

- Diffraction at the top of the vegetation
- Ground reflection under the vegetation
- Reflection between the vegetation itself

The different paths have different lengths, so that the phases of the signals amplify or attenuate each other when received. Link to this study below.

Rain, snow, humidity, especially at real high frequencies, also influence the received signal.

It's definitely interesting to study the local situation (at home?) and can be carried out yourself with relatively simple equipment. Especially when we use already software to receive DATV stations, it should be possible to record the signal strength over a longer time period to monitor a path.
One could also consider experiments to, for example, examine the effects of using different polarisations.

Software

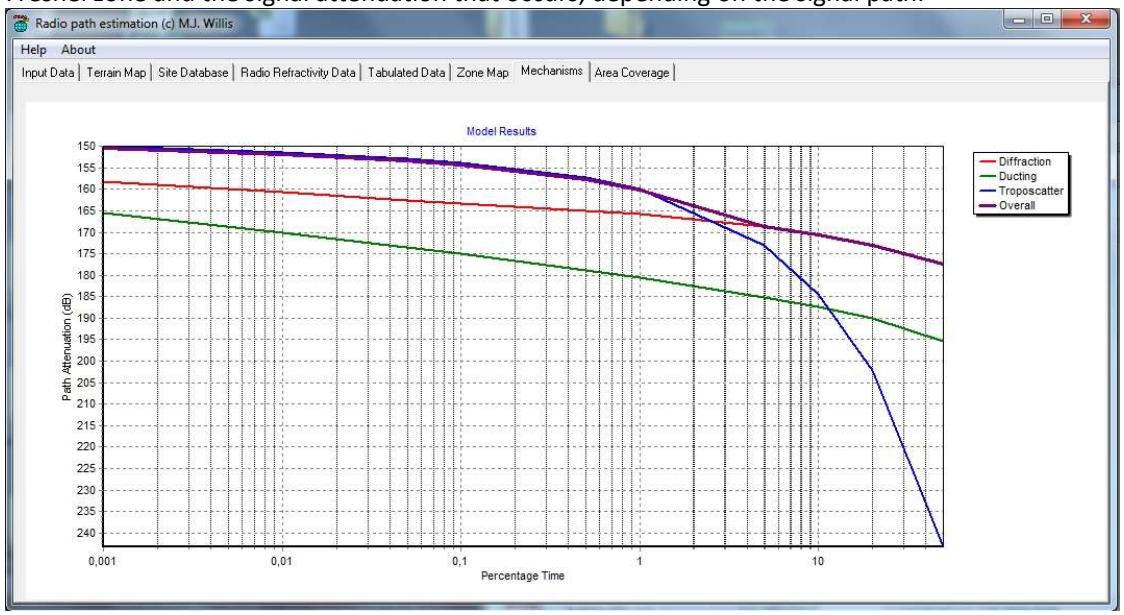
An easy-to-use calculation tool is available on the Internet for free space loss -the RF link budget calculator [ref 5]. Fill out data and it will show how much signal is left on the receiving side. However, the Fresnel zone is not taken into account here.

Another calculation tool is available for the Fresnel zone. The Fresnel Zone calculator [ref 6] neatly indicates whether the horizon is in the way at a chosen distance.

A (known) obstacle can also be entered, height and distance. If the sensitivity of the receiver is known, it can be seen how much signal is left. To find out which obstacles there are, an elevation map should be consulted.

There is also software that combine several things, such as those used to determine locations of cell-phone masts: Link Wizzart [ref 7].
The limitation of various programs is that not all frequencies can be selected, the curvature of the earth, buildings and forests are not taken into account. Nice to play with, but certainly useless for longer distances.

There are nicer software programs with many possibilities that, among other things, use (inconvenient to retrieve) data from NASA: Path Profile [ref 8].
The frequency can be chosen, the location on the transmitting and receiving side (in coordinates or QRA locator system), mast height and refraction. The result is shown graphically, the obstacles in the land, curvature of the earth, Fresnel zone and the signal attenuation that occurs, depending on the signal path.

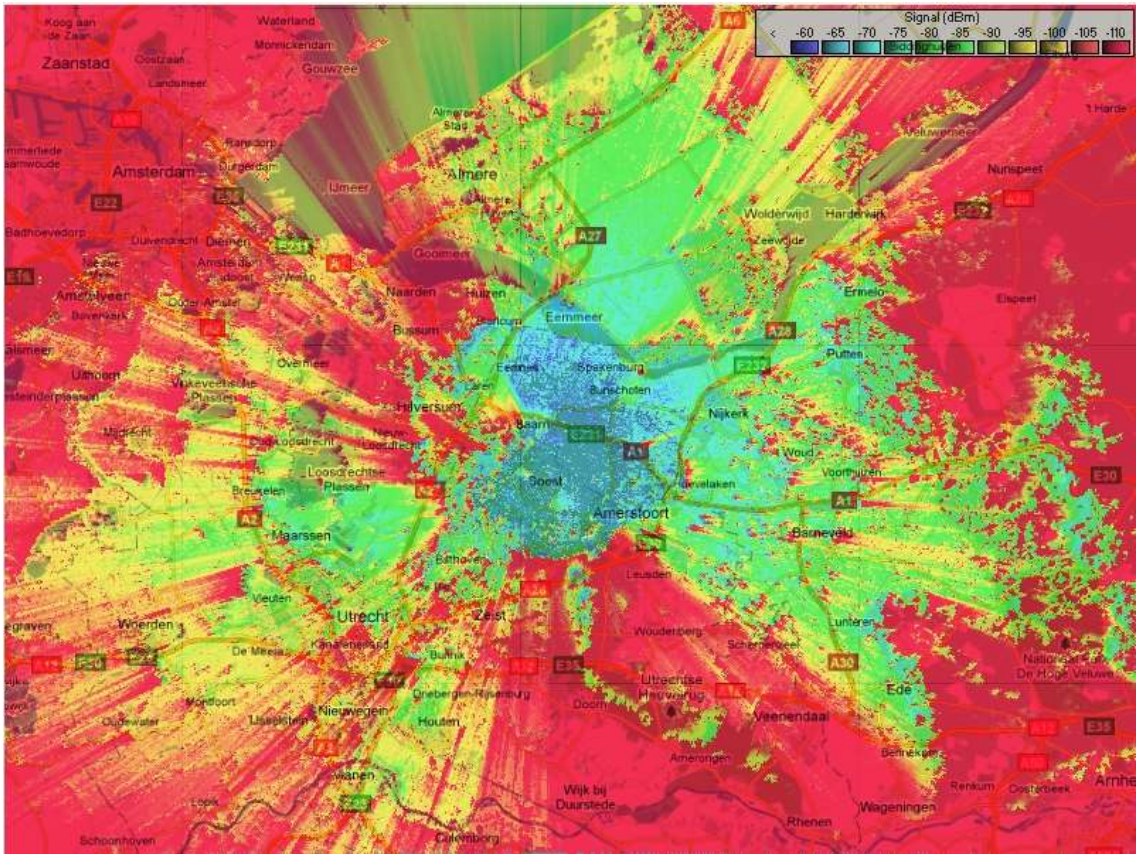


Prediction of propagation used

It is also possible to generate a coverage plot from a certain location (and mast height). This shown on the map (Google Earth) where the signals are weaker in which direction, for example caused by the landscape. In this way it is easy to see whether a location is suitable or less suitable.
What is unfortunately missing in this program is the buildings and vegetation, so that these unpredictable element remains.

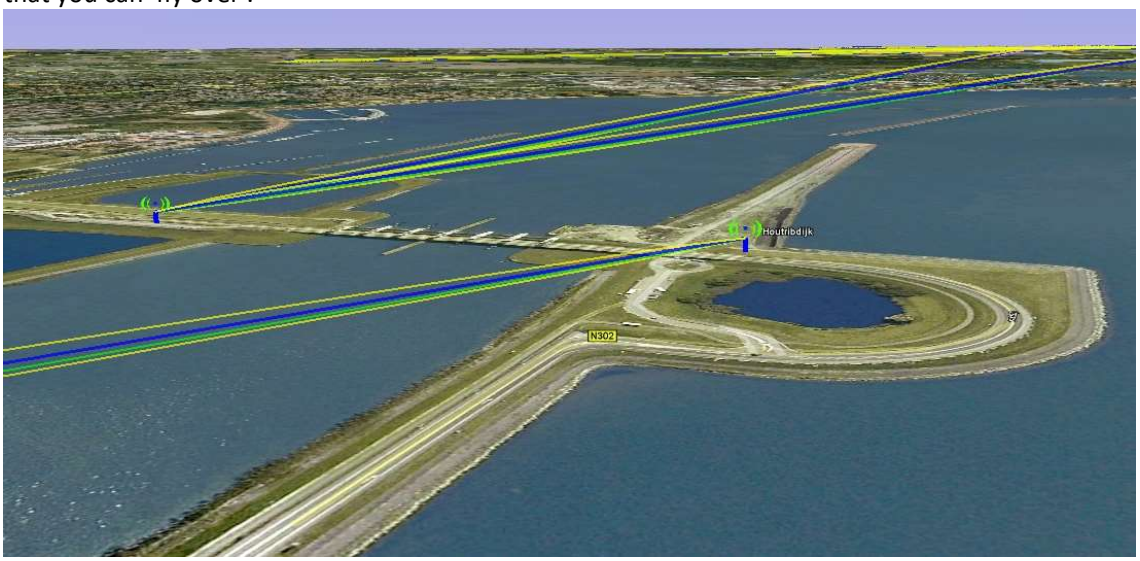
An even nicer program is available for this: Radio Mobile [ref 9].
In that program extra data can be imported that includes vegetation and buildings. However, the use of this program is not easy and certainly not easy to explain in this article.

Basically, equipment must be predefined, stations must be created (co-ordinates) after which a network must be created between the stations and the equipment. The height of the antenna (above ground level) must also be specified. After that, a lot of information is generated, like the coverage. Terrain, buildings and vegetation are downloaded from the NASA database.



Plot of what's left of 100mW at 5780MHz in an antenna of 13dB gain.

When displaying the path, for example, colours indicate whether the signal is above or below the reception level, of course everything can be defined yourself.
The various paths can also be displayed simultaneously on Google Earth, which gives a nice graphical representation that you can 'fly over'.



Google Earth view

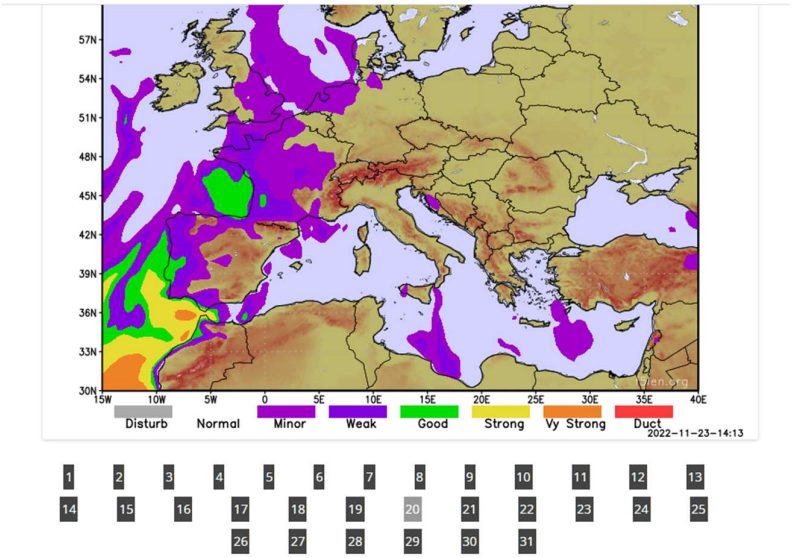
Professionals versus radio amateurs

Professionals want to be able to predict contacts, there must be a certain guarantee that a certain signal strength is available in 100% of the cases.
That's what most software is for and amateurs do not have that requirement.

Use is made of the poorly predictable effects in order to make the contact that is otherwise not possible, if necessary only for a very short time.
Of course, there is also the chance contacts that should be successful will not succeed.

Tropo forecast

Just like with weather forecasts, there are also 'tropo forecasts' [ref 12]. Every click on the map adds six hours, nice to see if the propagation is going into the wanted direction.



However, as with the weather forecast, there is no guarantee whatsoever.

Tropo scatter

Photo of Hoek van Holland tropo scatter station that is no longer in use

A combination of the mentioned methods is often used for longer distances. Both stations are at a distance that a connection is not possible, but they have a common area of air where they can point the antennas to. By making enough power and using antennas with a high gain, predictable connections can be made.

More?

It has also been reported that spinning wind turbines made it possible to see a repeater that normally could not be seen. Strange, when the blades are not moving they could also act as a reflecting or diffracting point. What does the spinning add, what cause this effect?

So keep experimenting, try to understand why sometimes it works and sometimes it doesn't.
It's still an interesting hobby.

Links:

1. Wind and trees study: www.pi6ats.nl/Trees%20and%20801_11.pdf
2. Wind and speed study: www.pi6ats.nl/wind%20speed%20effect.pdf
3. Aircraft scatter, Airscout: http://www.airscout.eu/
4. Just see where planes are: https://www.flightradar24.com/
5. RF link budget calculator: http://www.afar.net/rf-link-budget-calculator/
6. Fresnel Zone calculator: http://www.afar.net/fresnel-zone-calculator/
7. Link Wizzart: http://www.big-vienna.com/LinkWizard/
8. Path Profile: http://www.mike-willis.com/software.html
9. Radio Mobile: http://www.g3tvu.co.uk/Radio_Mobile.htm
10. Radio Mobile handy additional explanation: http://radiomobile.pe1mew.nl/
11. On-line version of Radio mobile (limited functions and possibilities): https://www.ve2dbe.com/rmonline_s.asp
12. Tropo Forecast: http://www.dxinfocentre.com/tropo_nwe.html#day3
13. Another Tropo Forecast http://tropo.f5len.org/forecasts-for-europe/

Editors comment.
Very many thanks to Chris PA3CRX, and to BATC for allowing the article to be reproduced in Scatterpoint.
The original article was published in CQ-TV the BATC magazine No. 277 – Autumn 2022.

'Tilt-O-Matic'

by Gareth Evans G4XAT

Members may well have noticed that I like designing and building things, lots of things….it was on this basis that Noel G8GTZ asked me to give thought to designing an easy to construct pan and tilt mechanism for the ubiquitous yellow / orange surveyor's tripod, the sort that crop up around £35 on the well-known auction site. (I paid £30 for one and collected, then £25+£10 delivered for a second).

(picture from Noel G8GTZ)

The 'TOM' (as it has become known) has been designed to be built without access to extensive workshop facilities and is entirely DIY-able, other than the 3-D printed parts (the .stl files are on the wiki). It can be adapted to suit what you have available and to suit your dish/gear mounting requirements. 'Clip-on' top tables, each with band specific transverters for instance can be quickly exchanged as required.

After 'kicking the idea around in my head for a while', I started by looking at 'Lazy Susan' bearings, as used by others and published in the Scatterpoint uwave journal. I designed it around 12mm plywood as it's cheap, lightweight and easy to work with basic tools and of adequate rigidity. The hinge was some cheap Screwfix piano hinge (I had lots) and the tilt mechanism was a cam/lever with a simple wingnut locking system. The first prototype was exhibited at CAT21. However, the 'Lazy Susan' had far too much slack in it (price-point product) adequate perhaps for spinning around your hors'd'ouvres in its intended application but not this, especially when added to the 'less than quality' piano hinge(non-Steinway) proved that it was not going to be a very good solution. So a bit more thinking went on. This led to wondering what sort of bearing WOULD be adequate and I recalled the last differential I rebuilt (Mazda RX 8 change of final drive ratio for the V8 conversion I did) that had large taper-roller bearings in it. A quick browse of the Simply Bearings website (https://simplybearings.co.uk/shop/) led to some large bearings at surprisingly low prices, so after some tripod measuring, one was ordered. Meanwhile I was busy with my CAD package and worked the 3-D printer making trial parts. Should any of you have ever installed taper roller bearings, you may be familiar with the term 'pre-load'. Basically, you tighten up the bearing until it takes a certain torque to turn it. Seems a strange thing to do, but it works without detriment to the bearing. I surmised that the 'damping' feel provided by many camera tripods

could be replicated by two means. At a base level, the friction between the smooth bearing outer case and the 3-D printed retainer fitted to the TOM base plate. Some different sizes were tried to get the 'feel' right and to still hold the bearing assembly in when dismantled – you don't want to drop a precision bearing into the inevitable mud/sand etc! The assembly was then retained on the tripod by a 12mm threaded rod and a captive nut, (aided by a centralising ring) fitted and tightened by a hand-wheel. By tightening the 12mm retaining rod, increased pre-load can be placed on the bearing and the damping increases. A simple 'screw-down' brake was provided, attached under one of the tripod leg bolts. Personally I have not found it necessary yet, even with a big dish mounted. However, when the base plate was turned, the clamping screw also tightened/loosened depending on the direction turned. This was solved by adding a second smaller 'thrust' bearing, allowing free rotation. In the engineering world, side loading a ball-race would be frowned on (although I recall that Triumph motorcycles used them on their swinging arm). For our low rotation speed (1 rpm per month) I chose the cheapest sealed unit that would do the job.

With the slack and damping sorted I turned to the actual tilt mechanism. These days quality piano hinges don't exist at budget prices and precision hinges are fairly rare or expensive. Fortunately, some mid-size brass hinges from Screwfix proved adequate and by mounting them at each end of the tilt axis the effect of any hinge slack is minimised. Negative angles (or positive depending which way you look) are accommodated by small plastic wedges mounted under one faces of the hinge. If you have a wood plane you could add a suitable bevelled edge yourself, but it's not a common (and rarely sharp) tool these days.

So just the tilting mechanism to deal with then…..the cam idea needed 'return springs' (more parts, more making needed) and although very quick to adjust, was unwieldly and cumbersome in use. A chat with my son Josh (an accomplished Mechanical Engineer) simplified my proposed design by pointing out that I only needed movement in one axis, negating something like a Rose joint (£'s). I chose some 6mm threaded rod as the drive mechanism, so with a 1mm pitch, a whole turn would only move one end of the table 1mm. How that would translate into degrees relates to the table size and geometry, but you can work that out if you want. No need, it works fine without – just peak up that 'S' meter!

By printing small clamping blocks that made 6mm nuts either ***captive and fixed*** or ***captive but able to rotate***, the two fixings were then pivoted on some short pieces of 3.2mm alloy welding rod pressed into 3-D printed 'Plummer (pillow) blocks'. You may need to buy a 3.3mm drill to provide the correct fit or the friction on both assembly and in-use will be too great.

Where possible, captive nuts are used to simplify assembly as we only have two hands. Any slack in the mechanism can be adjusted to zero any backlash in the adjustment mechanism. The Wiki assembly information provides more detail on how to achieve this.

Quick clamping methods have been considered, to allow quick change of 'transverter boards'. Consider big 'croc-clips' from Wilko, toggle clamps or even bicycle saddle post QR units.
It's really up to you to adapt as you wish or what you have available. In use, I have found very little that I would change to the point that I built a second unit with no changes other than the actual axis of rotation. Thanks to my two beta testers, Noel G8GTZ and Dave G4FRE whose feedback has been valuable.
Why 'Tilt-O-Matic'? As a fan of Heath Robinson (whose wonderful drawings would rarely work) to Wallace and Gromit (whose ideas work with various degrees of success) to Wiley Coyote (a main shareholder in ACME Products) I am, I'm afraid, a fan of 'names that imply their function'…..
Adapt to your own needs, modify, improve and do please send me a picture of your own 'TOM'.

First published in the CQ-TV magazine, issue 276.

Build information exists on the BATC Wiki here https://wiki.batc.org.uk/Tilt-O-Matic
along with the required .stl 3-D print files.

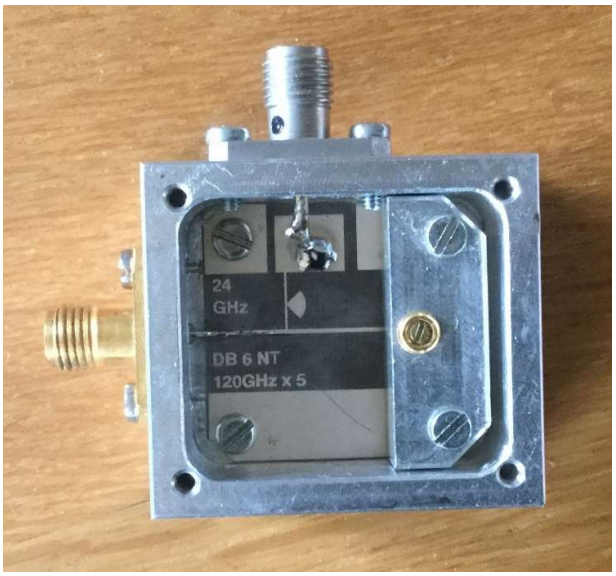
Getting started with Waveguide on the Millimetre Bands-part 2

Roger G8CUB

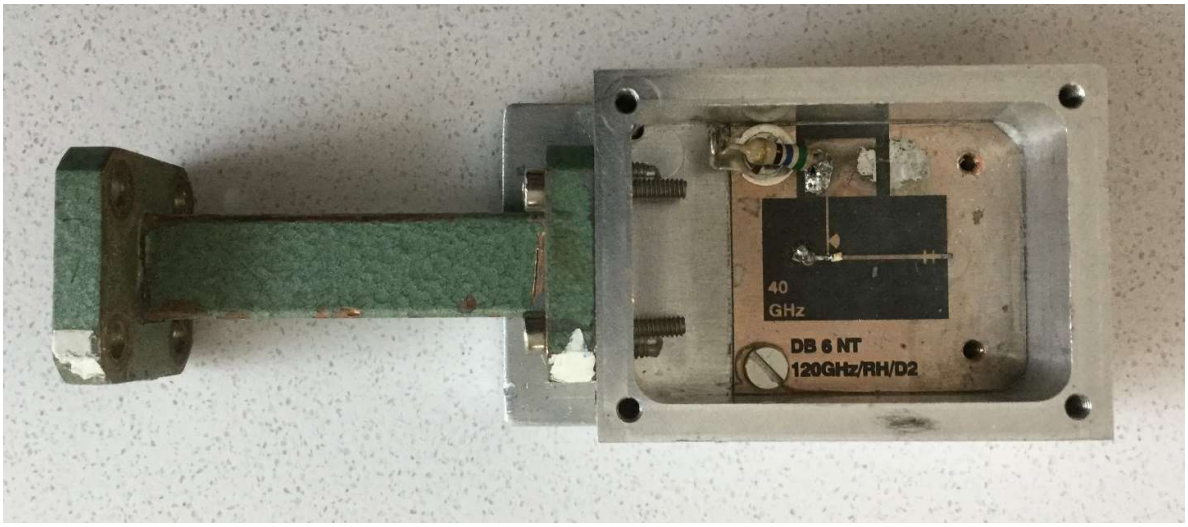
To continue from last month. I will further the emphasis on using waveguide cut-off to ensure that you are on the right frequency.

A time that I was caught out, was when I had a sudden breakthrough testing on 241GHz. Previous tests with the mixer that I had, together with a source that was x24. Gave a range of about 1 metre. The source producing around 10mW at 80Ghz, was then tripled. The last stage was a diode multiplier on a board from DL2AM (Kuhne purchase), in an aluminium block also from Philipp.
My great idea was to use a block I had bought for 76GHz, and use concentric brass tubes, to narrow the diameter down to less than 1mm. The Tektronix mixer on the receive side, still responded at 80GHz.
All looked good. I could increase the frequency 1kHz, the received signal increased 24kHz. That must be correct then? NO. I later found that the 80GHz was being transmitted, and the mixer waveguide let in 80GHz, and tripled in the mixer! Looking carefully at the source, there was a 90 degree segment where the tubes were not touching. That was all that was needed.
After that, I used a block drilled for the frequency of use!

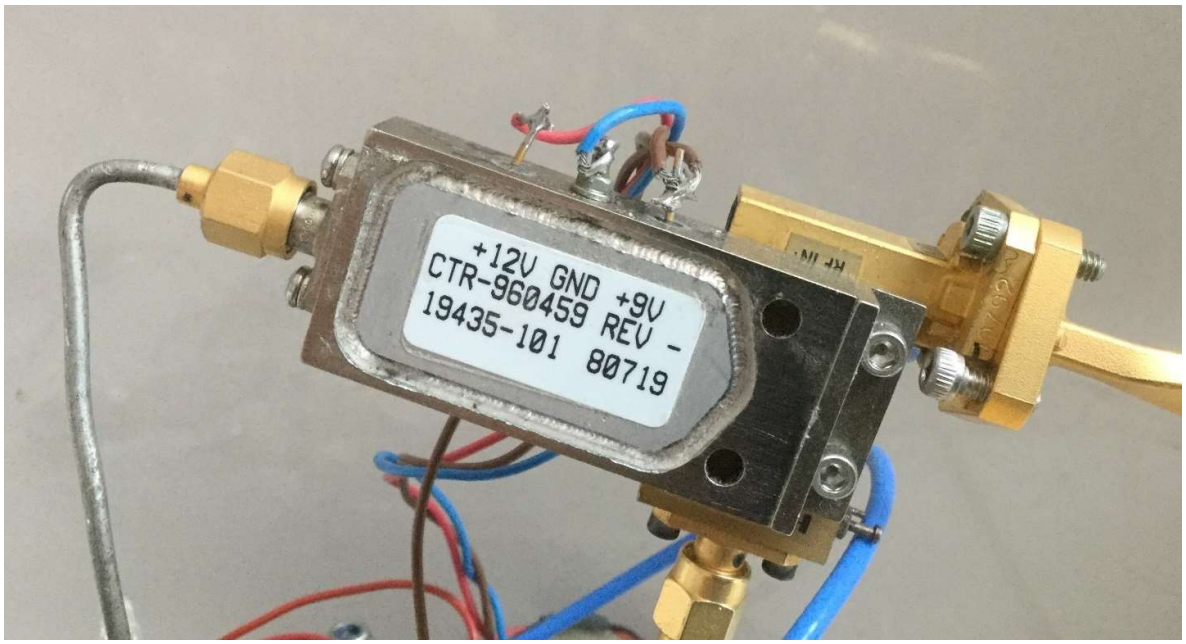
My journey into millimetres, was perhaps odd. Going from 24GHz to 134GHz, then down to 76GHz, and eventually 47GHz.
Experience at 76GHz, initially was not great. An earlier miscomprehension. Getting power at 38GHz was easy with available multipliers that worked x3 or x4. A single diode mixer, produced lots of IF noise at 432MHz. Mixing on transmit produced around 200uW. Testing with John G4EAT sk, we struggled to complete a QSO at 5km, with signals just outside the noise. The breakthrough came by changing from a single diode, to a back-to-back anti-parallel diode. The great IF noise, was replaced by much lower noise, and then signals could be heard. We had turned the mixer into a sub-harmonic mixer, with lower loss, and much lower noise figure. With a sub-harmonic mixer, LO injection is at half frequency. That makes the LO chain a lot easier, with performance close to that of a fundamental mixer .



The normal route to the higher bands, has been to use the pcb's from Kuhne. Either with a do it yourself block, or a ready machined one from Philipp DI2AM. Unfortunately the pcb's have mostly disappeared from the Kuhne site.



Now would be a good time, to check the junk box, and make the unused board available to others!
Of course there is now an easier route to 122GHz with the VK built units. With the combined 122 / 134 GHz units not too far away.



Going back to 76GHz. There are a number of active multipliers that work 36-40GHz. Often they will work x3 or x4. Output typically +15 to +21dBm. The nice signal at 38GHz can then be doubled to 76GHz. Here is one of my favourite ways of doing so. A WR-28 (26-40GHz) mixer being driven on it's RF port. Output on the LO port is around 0dBm (1mW). Note the waveguide is offset. This is on purpose to achieve maximum output.

If using a single diode as a multiplier or mixer, the bias resistor is critical and needs to be adjust for maximum output in the case of a multiplier, or best S/N for the mixer. An inline uA meter shows the bias current. Bias resistor is usually a few tens of ohms to a couple of k. A varactor multiplier such as an MA46H146 usually needs 10-150k.

One word of warning. Keep the leads to the meter and pot well insulated! It is easy to forget the other end connects to an expensive diode! I destroyed a millimetre mixer that way that cost £££.

To be continued…….

Scottish Microwave Round Table 2022

GMRT 2022 Report The 10th Scottish Microwave Round Table (GMRT) was held on Saturday 22nd October in its usual venue of the Museum of Communication (MOC) in Burntisland. Despite issues with public transport, road diversions, the increasing age of the attendees and lingering fears of Covid, there was a good turn-out, with 36 attendees. On arrival, after a friendly reception at the door by Peter Dick GM4DTH, the sound of voices from within indicated that everyone was already renewing old acquaintances, having much to discuss since the previous GMRT 3 years earlier. New faces were also being made to feel at home as they were associated with names and call-signs. Attendees were spread amongst two areas, those in the conference room where refreshments were available right from the start, and those who had migrated downstairs to the area where bits and pieces of microwave equipment and components were piled up on tables for sale or swap, and where the test and measurement facilities provided by Brian Flynn GM8BJF, David Stockton GM4ZNX, and David Nugent were already in operation. These activities continued throughout the day in the breaks between presentations. Formal proceedings started at 10:30 AM when Colin Wright GM4HWO opened the event on behalf of the organisers, with a welcome to the venue by Professor Tom Stevenson from the MOC who gave the customary safety announcements. Martin Hall GM8IEM, the UK Microwave Group (UKuG) Scottish representative, then welcomed the participants and acted as chair for the morning session. Roger Blackwell GM4PMK started the presentations with his talk entitled “EME from the Hebrides – an update 10 years on” – on the 10th anniversary of the talk he gave to the GMRT in 2012. Roger is based on Mull, in an exposed location, where high winds, driving rain and salt spray have to be combatted to keep his station operational. He described improvements to weather proofing for the 23cm preamplifier at the feed, as well as the successful installation of a weatherproof metal Asgard shelter close to the dish to house the Power Amplifiers. Tracking has also been improved. Since his last talk Roger has installed a 9cm system based on an SG Labs transverter and Ionica PA boards, which he described. Unlike the permanent feed for 23cm the feed for the 9cm system is only installed when operational. Roger presented his results to date on 23cm and 9cm EME. After a short break Brian Howie GM4DIJ gave a talk on “OpenEMS for Microwaves”, which is a free and open electromagnetic field solver using the FDTD method. He described how it can be used with a Matlab or Octave scripting interface for modelling various antenna structures, running the software on his laptop to carry out a demonstration analysis of simple antennas such as a dipole, and presenting the results of more complex antenna structures, which would have taken too long to analyse during a live presentation.
As usual we were asked to vacate the conference room while lunch was being set out and re-assembled in the museum where the entries for the GM4LBV Projects Trophy were displayed, and where Ian White GM3SEK and David Stockton GM4ZNX judged the entries. Once judging was finished, we returned to the conference room for a superb buffet lunch provided by the MOC volunteers which was greatly enjoyed by the attendees. John Cooke GM8OTI, took over as chair for the afternoon session. Speaking in the after-lunch slot isn’t easy, but Malcolm Hamilton GM3TAL was up to the task in his light-hearted but nevertheless informative talk on “Microwaves – theory and practice or five different ways to cook eggs”. In this amusing and entertaining talk Malcolm covered everything the radio amateur might want to know about microwave ovens. His demonstrations using a microwave oven certainly kept everyone awake!

Another short break followed whilst the next presentation was being set up by Peter Bates, GM4BYF, for his talk on "122GHz Operations and Experiences. Pete was one of 5 amateurs based in Scotland who ordered 122GHz kits from VK2XAX (the others are Mark GM4ISM, Brian GM8BJF, Andy MM0FMF, and Chris GM4YLN). This kit uses the TRA120 chip incorporated in a board developed by VK3CV in conjunction with VK3ZBJ. Pete described the background to the project, the equipment itself, improvements he made and the tests that he had been involved with, which included the first GM to GM and GM to G QSOs on this band. The finale to his talk was a live demonstration and the opportunity for a member of the audience to conduct a first 122 GHz 2-way QSO. Norman Stewart GM1CNH jumped at the chance and worked the speaker Pete along the length of the room. Immediately following Pete's talk we had the conclusion of the construction competition and award of the coveted GM4LBV Projects Trophy. Ian White GM3SEK and David Stockton GM4ZNX gave a review of each of the diverse selection of entries, all of which had great merit making it difficult to select the winner.

However, Mark Hughes GM4ISM's entry of a user-friendly display and control panel for the VK3CV/VK3ZBJ/VK2XAX 122GHz kit was judged to most closely meet the award criteria. The interface on the kit itself is not very easy to use, and Mark's solution is likely to encourage more amateurs to experiment with this system. The other entries were a 3.4GHz filter submitted by Jon Joyce GM4JTJ constructed using simple hand tools (and no pipe caps); the 2.3GHz entry by Jack Hood GM4COX was a complete masthead transmitter, PA and control unit (not a complete station). As in

previous years the museum volunteers had kept us well supplied with tea, coffee, biscuits, and scones throughout the day, as well as providing the splendid buffet lunch. John thanked them for their contribution to what was viewed as a very successful event, and the volunteers were given gifts in appreciation to a round of applause from the audience. During the day those present provided updates to the Directory of Scottish Microwave Activity, which also includes stations in nearby areas that can be reasonably worked from GM. This is intended as a reference for those considering who they might be able to work on the microwave bands (especially when upgrading their stations), and the latest issue will be made available via the UKuG, gm13 group, and GMDX Digest.

The leisurely programme of talks at the GMRT gives plenty of time to chat, though it never seems enough, and once again some participants were still going strong when they had to be ushered out at 1700 so the doors could be closed. Many attendees (and some spouses and partners) moved on to the Kingswood Hotel in the evening for further chat and an excellent meal, followed by a delightful musical performance by the Microwave Band comprising Nadine White MM0WNW, Ian White GM3SEK and John Cooke GM8OTI. After the musical interlude an auction of items was undertaken, and thanks go to those who made the donations. The proceeds from the auction, other donations, and a small surplus from the door takings raised £193 which has been donated to the MOC to support their activities. Technical discussions and social chit-chat continued well into the evening. Thanks go to the organising committee of Roger Blackwell GM4PMK, John Cooke GM8OTI, Brian Flynn GM8BJF, David Stockton GM4ZNX, Colin Wright GM4HWO, Ian White GM3SEK, Peter Dick GM4DTH, Andy Sinclair MM0FMF and Alan Masson GM3PSP. Prepared by Martin Hall GM8IEM, with contributions from the organising team. 06-Nov-22.

Midlands Round Table – Saturday 3rd December 2022

This year's event will take place on the **Saturday** and follow much the same format as previous events. The day will follow a relaxed schedule with talks aimed primarily at UKuG, BATC and AMSAT interests and other innovative areas of amateur radio.

Test and Fix

Test equipment will be available for noise, power and spectral measurements. There will be soldering facilities including hot air systems for work on SMD. The 'Portsdown clinic' will help people get things working.

Goodies!

There will be tables provided free of charge for the junk sale and for any free stuff you wish to give away. A sack truck will be on hand so don't be shy! The BATC shop will be open for business, offering PCBs and hard to find components.

Demonstration Station

Throughout the day there will be a QO100 ground station setup to demonstrate the use of this satellite and for on-air testing of receiver and transmitter components.

Location and Times

The event is being held at Eaton Manor, Eaton-under-Heywood, Church Stretton, Shropshire. SY6 7DH.

The event venue will be open from 9:00 am, proceedings will start at 10:00 am.

Details of location and estate plan can be found here:

https://www.eatonmanor.co.uk/location/how-to-find-us/

Further Info

https://www.eatonmanor.co.uk/midlands-microwave-round-table-event/

Food and Drink

There is an admission charge of **£15 per head** to cover the venue hire, lighting and heating. Admission includes a two course sit down lunch (vegetarian option available on request at time of booking), all day teas and coffees etc. **This must be paid in advance** but will be refunded if you have to isolate due to covid.

Accommodation

This year two houses have been reserved for those wishing to make a weekend of the event. These will be available from 4pm on Friday with latest check-out by 10am on Monday morning. For details of the heavily discounted accommodation rate and availability please telephone Paul G8AQA on: 01694 771441.

Payment

Payment for day admission and accommodation is by the same means.

Preferred payment method is by bank transfer to:

Paul Nickalls 20-53-22 53708810

PayPal paulnick@btinternet.com Please use friends and family to avoid fees.

(Cash may also be accepted in grubby brown envelopes by arrangement)

Day 2 – Sunday 4th December (optional)

There is no formal activity planned for Sunday and depends on the mood of the masses (few intrepid souls). Previously we have operated from the Long Mynd and the Brown Clee (the highest point in Shropshire). At this time of year a lot will depend on the weather. There is no scheduled activity planned for that day, so please indicate if you have a band of interest that you wish to air so that reciprocal stations can be organised if possible.

The venue will also be available at no additional cost for continued construction, fault finding and further chat while finishing the last of the biscuits and mince pies. Tea and coffee will be available, but no food is being served, pub lunch anyone…?

Contact

If you have any questions or requests, please ask.

Paul Nickalls G8AQA
Holy Mill
Longville
Much Wenlock
TF13 6ED
01694 771 441

On-site contact

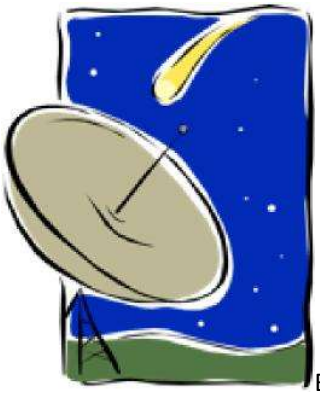
John Cariss G7ACD 07816 643925

Editors Comments

This month I have include the excellent article from Chris PA3CRX. Many thanks to him and BATC.
Great to see that the Scottish RT went well.
I look forward to seeing many of you at the Midlands Round Table on 3rd December.

Roger G8CUB

Activity News: October 2022


By John G4BAO

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

From Peter G3LTF

As I was unable to be QRV in the first leg of the 23cm EME contest, so I set myself a target of 60 stations on 23cm CW in the second, and I was pleased to pass that with a total of 69 including 4 initials. In addition, I heard the following stations working others (louder than me!) but never found a CQ to reply to. VE4SA, SM7FWZ, XE1XA, DL7APV. I need to change feeds to go on 70cm, but the moon times made that hard to do without giving up a lot of 23cm time as I no longer do feed changes at night. 6m dish 350W

From John G4BAO

Been a bit of a "24GHz" month here on the Fen Edge. I finally worked my 5th locator square to qualify for the first European 24GHz UKuG 5-square award, certificate #2 for the band. Certificate #1 went to Dave WW2R (GW4FRE) for his operations in Texas. To get that elusive IO91 square, in the October 24GHz contest, I worked Pete G1DFL/P three times from locations in North Hertfordshire around the point where JO01, JO02, IO91 and IO92 meet. The contact with Pete was particularly weak and difficult but was completed via CW over a 33km path. Whilst he was on "my side" of the ridge at Barkway, signals were 59+ both ways, but the QSO to Buckland was heavily obstructed by the terrain as Pete's location in IO91XX was 20m or so behind the chalk ridge with lots of trees. G1DFL's equipment consisted of an IC-9700 70cm IF with a converted Nortel ODU, 30cm PF dish at 2m on a tripod and just 250mW!I was running 2Watts to a 60cm dish at 9m AGL.

This month I built a 24GHz WebSDR and the plan is to site it on the Essex coast in the Spring, looking out over the North Sea and directed at the three Netherlands beacons PI7ALK, PI7RTD and PE9GHZ. I am currently in talks with Tony G0MBA and the Martello Tower group who run the GB3PKT beacons about a spring installation. The hardware and "OpenWebRX" software on a Raspberry Pi with an RTL-SDR is complete and has been on test from my QTH using my home transverter and dish. At the time of writing (November 2022) It's running irregularly, pointed at either GB3CAM or GB3MHZ depending on conditions.

URL when it's on is 24ghzwebsdr.ddns.net:8073.

From Neil G4DBN

This month I've been doing experiments with a professionally-3D-printed graded-index Mikaelian cylinder lens on 24 and 47 GHz and visiting the USA to do some research and interviews for an upcoming YouTube video. I brought home some graded index dielrod lenses I designed that the kind folks in New England printed for me while I filmed the process. I've also been doing FDTD simulations of a Pickett-Potter feedhorn for an f/d 0.5 dish with an oval iris match to rectangular waveguide and making a new mount for one of the UKuG 24 GHz loan kits.

As for operating, there's either been rain in the wrong places or too much rain or too little rain an no tropo. I machined a few parts for 122 GHz systems, but the Day Job and US trip swallowed up what little radio playtime I had spare. Very nice to have a 10 GHz RS contact with Clive GW4MBS in IO71XW over a lot of mountains after the SHF UKAC.

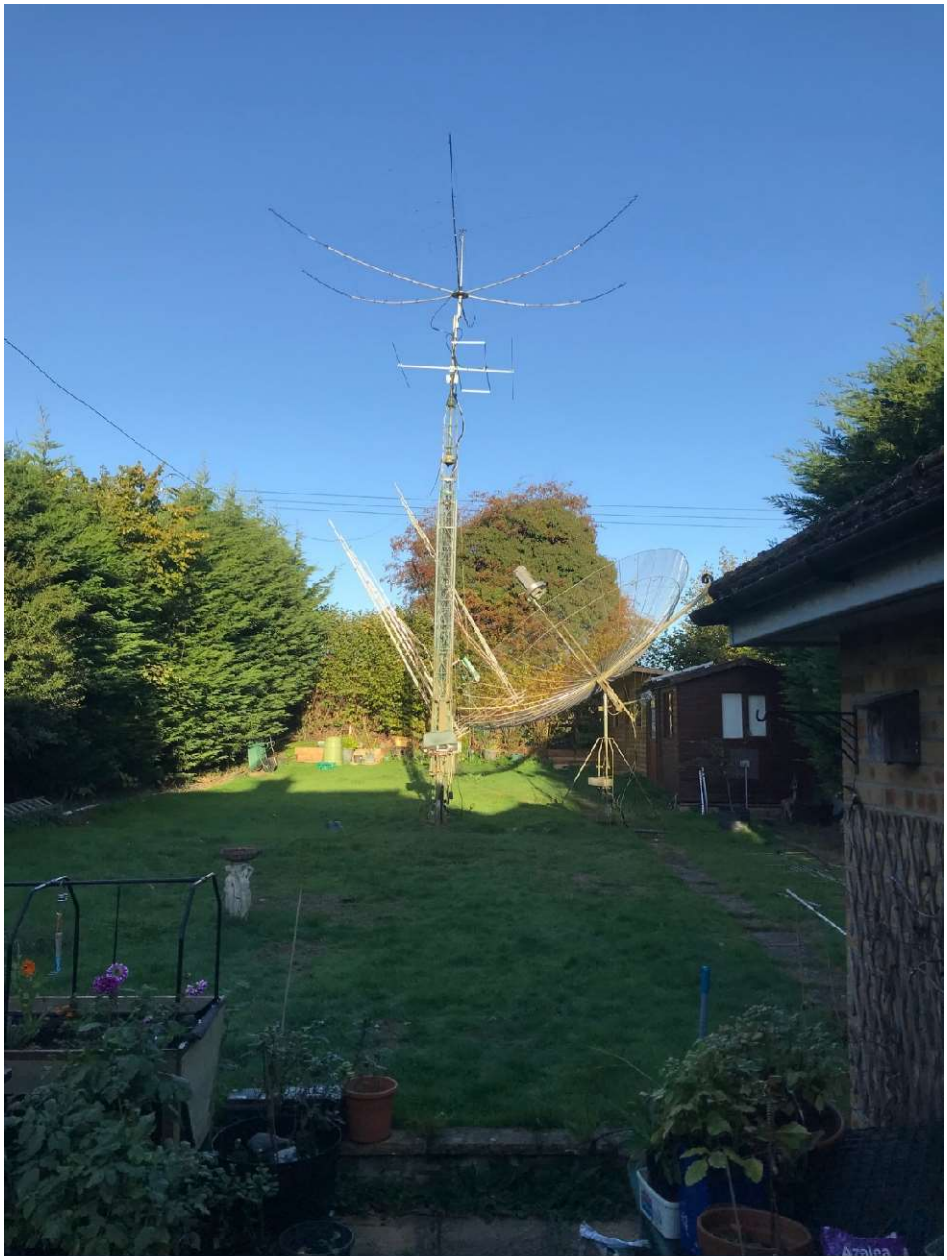
From Clive GW4MBS

After a 35-year gap I'm assembling bits to get back on 24GHz. My main 24GHz activity will be from home where I already constantly monitor the Dorset microwave beacons on three bands already. I am interested in seeing under what conditions I may hear something on 24GHz. My QTH is not ideal for the band, so am also planning "sunny day portable use," contests and looking forward to seeing what can be achieved on 24GHz while attending military vehicle shows around the country. I currently take 10GHz with me and has fun exploring new paths from different locations.

From Keith G4ODA

This month, on 24GHz I worked Pete G1DFL/P who was at Therfield IO92XA at 82km, but my ODX on the day was a QSO with Steve G1PPA/P at Mavis Enderby JO03AE. Steve was trying out the 2W UKuG loan kit.

From Dave G4RGK



A report on my activity over the last couple of months. The first microwave weekend was given over to trying get a simple RX system going on 10 GHz, I found a 1.2m prime focus solid dish at a local flea market for £15. It was missing feed arms and mounting brackets, so I set about fabrication these parts and mounting a Octagon LNB. I mounted this in the middle of the 70cm array. after a lot of fiddling around making up a bias tee, I eventually got it all running using a SDRplay 2 and HDsdr

software. The first check was to find the QO100 signal, sure enough it was there with a big signal. Looking for the DL0SHF beacon however proved difficult using the array az/el drives. The backlash that on acceptable on 432 becomes a serious issue on 10 GHz. I was eventually able to get a solid decode from the EME beacon, but although I could see weak traces from contest stations, I was unable to decode them due to the backlash and frequency drift. In the second ARRL microwave EME weekend I decided to try and get the 13cm station running again. It hasn't been used for over a year, so a lot of time was lost finding leads etc. Anyhow I finally got it all running with good echoes. But it was soon clear that the advancing vegetation was going to severely restrict my activity. Activity on 13cm seemed down on previous years and it is always a battle keeping the dish on the Moon. On the first day I only wkd G3LTF on CW and that was struggle so I started a problem with cables, the next day signals seemed stronger and OK1CA was an easy QSO 579/559. The rest of the QSOs were on Digital modes with UA5Y, PA3DZL and OK1KIR. The photo shows my "antenna farm."

From Phil G0JBA

24GHz tropo propagation was going well on Sunday 13th of November. As well as working G4BAO and seeing my own signal via his 24GHz WebSDR, I copied the GB3CAM and GB3PKT beacons (the latter at 599) and worked ON/PA0MHE several times on 24GHz SSB at 139km. Best QSO was at 1635hrs when he gave me 58 and he was 57 with me. Home to home location. I copied GB3MHZ on 24GHz for the first time, despite it being on a horn antenna facing West. I am due South of the beacon so that is pretty amazing. This is the first time I have ever heard GB3MHz on 24GHz and it may be reflecting off something, but it was on the expected heading.
Below is a link to a YouTube video of my reception on 24GHz of the ON0HVL beacon at my QTH near Sandwich.

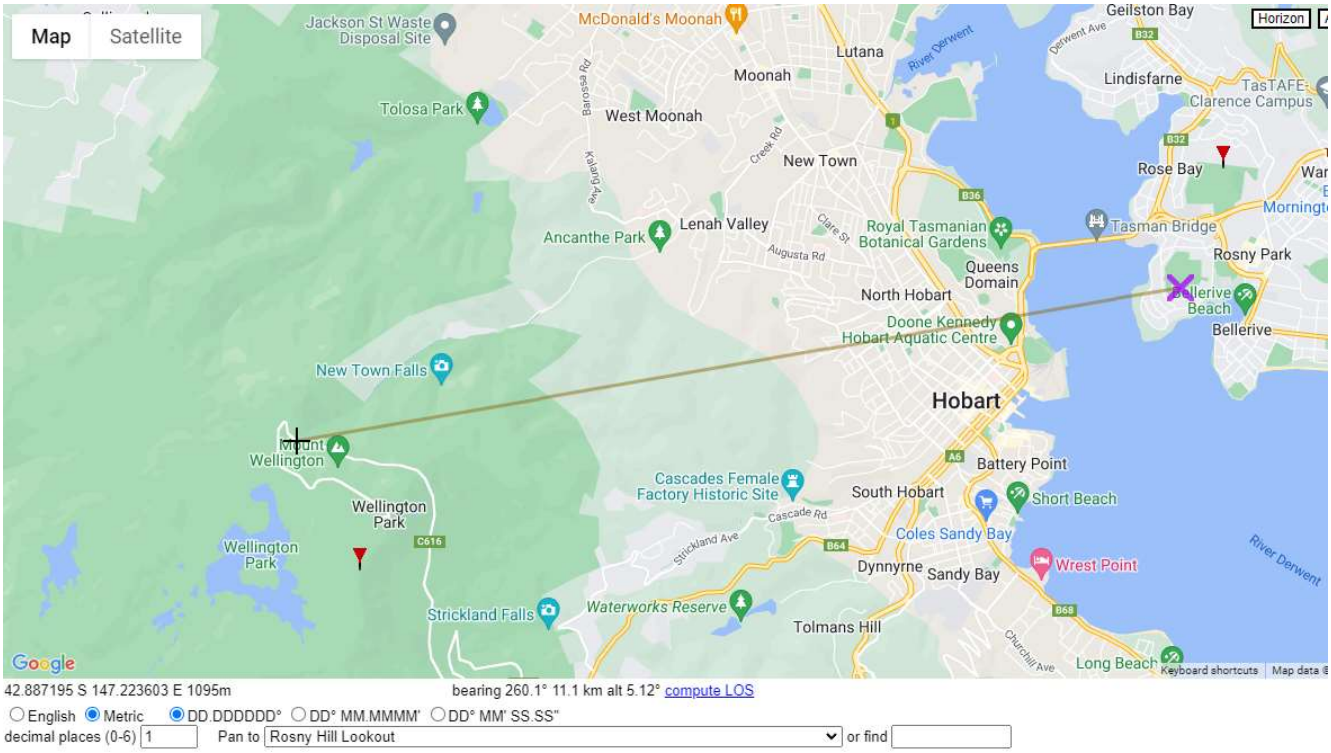
https://t.co/ZgFdggb0rZ

ON0HVL is 123km from me and located on a Church tower beaming 45-70Deg. I have seen photos of the beacon site and the beacon is the other side of a lot of stonework to my direction.

Microwaves from around the World

From Iain VK5ZD

On 31st October Dave, VK5KK and I , travelled to Hobart to attend the Tasmanian Ham Radio Conference and Expo on the following weekend. While in Tasmania, we made the first ever VK7 contacts on 47GHz, 76GHz, 122GHZ and 134GHz. I was on Rosny Hill Lookout (QE37QD31) and Dave was on Mt Wellington (QE37OC67). The distance was not great (just over 11km) but now there's something for the locals to try and beat. The photos show my equipment and the path we used.



42.887195 S 147.223603 E 1095m bearing 260.1° 11.1 km alt 5.12° compute LOS

English Metric DD.DDDDDD° DD° MM.MMMM' DD° MM' SS.SS" decimal places (0-6) 1 Pan to Rosny Hill Lookout or find

From Peter VA3ELE

Now that's it's getting colder out there and the dewpoint is dropping, it's time to get the 24 and up gear out of storage and have some fun.

Hugh VA3TO has been out near Aylmer in EN92MV, and we decided to give it a shot on 24 and 47GHz since there was a bit of snow between us. We easily found each other on 24GHz without even using 10GHz to line up first. It literally took just a couple seconds, I guess it nice to have stable and frequency referenced rigs on both ends. Once we completed on 24GHz, we switched over to 47GHz and instantly found each other's dashes. It's not a super huge distance, but it's just a beginning to the season and there was barely any snow between us, just a lot of wind hihi. Our previous best was 117km using 85mw on my end and Hugh was using 89mw. Now, I'm using a 60cm dish with 1watt and Hugh uses a 30cm dish with 1watt.

Here's the video from my side of the QSO in FN03DM

https://youtu.be/E3v3ojRYOpw

24GHz/47GHz/76GHz Contest October 2022 and mm-wave Championship

This year saw record entry levels for this final session of the mm-wave Championship, with respectable conditions as well, so some good scores were achieved.
On 24GHz there was a close battle at the top with Keith GW3TKH/P emerging just ahead of Roger G8CUB/P who used three sites as a rover to good effect. Best DX was between G3UKV/P and co-sited G4SJH/P and G1EHF/P at 147km, although logging errors resulted in loss of points in one direction for some of these contacts.
47GHz sees Roger G8CUB/P take the rostrum by a substantial margin using his roving to good effect. The best DX was Roger's contacts with co-sited runners up GW3TKH/P and GW4HQX/P at 101km.
On 76GHz G8CUB/P also recorded a clear win with the joint team of GW3TKH/P and GW4HQX/P the runners up, and also the best DX worked at 94km. The 101km path they worked on 47GHz would only work one way on 76GHz.
This was the last event in the mm-wave Championship for 2022. Compared with 2021, entries were up this year.
On 24GHz Martyn G3UKV/P was the winner, with Roger G8CUB/P in second place. Both won one session and were runners up in another.
Roger G8CUB/P came out in the lead on 47GHz, with one win and two second places, but with only a small margin over Neil G4LDR/P who won two sessions.
Roger G8CUB/P repeats his winning ways on 76GHz with two session wins. Runner up was John G8ACE/P with one win and one runners up slot.
Congratulations to all the winners and runners up. Martyn G3UKV/P will receive the G0RRJ Memorial Trophy for 24GHz, and the 47GHz Trophy will go to Roger G8CUB/P.
John G3XDY
UKuG Contest Manager

24GHz Contest October 2022

Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX Kms
1	GW3TKH/P	IO81KR73	7	672	G1EHF/P	121
2	G8CUB/P	IO91DL56	9	666	G3UKV/P	126
3	G4SJH/P	IO91GI44	10	577	G3UKV/P	147
4	G3UKV/P	IO82QL83	5	518	G1EHF/P	147
5	G1EHF/P	IO91GI44	10	487	GW3TKH/P	121
6	GW4HQX/P	IO81KR73	4	373	G1EHF/P	121
7	G4LDR/P	IO81WG22	7	357	GW3TKH/P	84
8	G8GTZ/P	IO91JG26	7	243	G8CUB/P	55
9	G1DFL/P	IO92XA03	4	183	G4ODA	83
10	G8ACE/P	IO91GC68	5	139	G8GTZ/P	36
11=	G1PPA/P	JO03AE03	1	48	G4ODA	48
11=	G4ODA	IO92WS81	1	48	G1PPA/P	48
13	G4BAO	JO02CG33	1	34	G1DFL/P	34

47GHz Contest October 2022

Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX Kms
1	G8CUB/P	IO91DL56	6	458	GW3TKH/P	101
2=	GW3TKH/P	IO81KR73	3	279	G8CUB/P	101
2=	GW4HQX/P	IO81KR73	3	279	G8CUB/P	101
4	G4LDR/P	IO81WG22	2	168	GW3TKH/P	84
5	G1EHF/P	IO91GI44	4	111	G8GTZ/P	43
6	G8GTZ/P	IO91JG26	3	86	G1EHF/P	43
7	G8ACE/P	IO91GC68	3	77	G8CUB/P	27

76GHz Contest October 2022

Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX Kms
1	G8CUB/P	IO91DL56	5	315	GW3TKH/P	94
2=	GW3TKH/P	IO81KR73	2	144	G8CUB/P	94
2=	GW4HQX/P	IO81KR73	2	144	G8CUB/P	94
4	G8ACE/P	IO91GC68	1	27	G8CUB/P	27
5	G8GTZ/P	IO91JG26	1	24	G8ACE/P	24

24/47/76GHz Championship Tables 2022

Final Positions after four events, best three count to the final total

24GHz

Pos	Callsign	15/05/2022	10/07/2022	11/09/2022	16/10/2022	TOTAL
1	G3UKV/P	529	1000	971	770	2741
2	G8CUB/P	235	341	1000	991	2332
3	G4SJH/P	659	341	0	858	1858
4	GW3TKH/P	0	0	427	1000	1427
5	G4LDR(/P)	152	154	657	531	1342
6	G1EHF/P	0	392	0	724	1116
7	G(W)4FRE/P	1000	0	0	0	1000
8	G8ACE(/P)	145	154	431	206	791
9	GW4HQX/P	0	0	215	555	770
10	G1DFL/P	281	0	0	272	553
11	G0JBA	0	0	507	0	507
12	G8GTZ/P	0	0	0	361	361
13=	G1PPA/P	0	0	0	71	71
13=	G4ODA	0	0	0	71	71
15	G4BAO	0	0	0	50	50

47GHz

Pos	Callsign	15/05/2022	10/07/2022	11/09/2022	16/10/2022	TOTAL
1	G8CUB/P	597	712	666	1000	2378
2	G4LDR/P	0	1000	1000	366	2366
3	G8ACE/P	314	1000	0	168	1482
4	G(W)4FRE/P	1000	0	0	0	1000
5	G1EHF/P	0	700	0	242	942
6	G1DFL/P	6	712	0	0	718
7=	GW3TKH/P	0	0	0	609	609
7=	GW4HQX/P	0	0	0	609	609
9	G8GTZ/P	0	0	0	187	187

76GHz

Pos	Callsign	15/05/2022	10/07/2022	11/09/2022	16/10/2022	TOTAL
1	G8CUB/P	38	1000	19	1000	2038
2	G8ACE/P	1000	490	0	85	1575
3	G4LDR/P	0	490	1000	0	1490
4=	GW3TKH/P	0	0	0	457	457
4=	GW4HQX/P	0	0	0	457	457
6	G8GTZ/P	0	0	0	76	76
7	G1DFL/P	38	18	0	0	56

UKuG MICROWAVE CONTEST CALENDAR 2023

Dates, 2023 Time UTC Contest name

To be published early 2023

Wanted

GB3ZZ - Lime mini wanted.
GB3ZZ, the Bristol ATV repeater, is building a new Portsdown transmitter for lower symbol rate transmission. Does anyone have a Lime mini that they would be prepared to sell us for this project?
Shaun G8VPG.
g8vpg@aol.com
Tel. 01225 873 098.

HP 415x SWR Meter with good scale.
Paul Nickalls G8AQA
paulnick@btinternet.com
Tel. 01694 771 441

For Sale

G4DDK Anglian '3' Low noise 2M transverter, supplied built by G4DDK himself. Brand new unused.

28-30MHz I.F. £100.

G4DDK design SUFFOLK 2M transverter. Transmit and Receive PCB's, both populated, untested.£15. Manual available online (VHF/UHF DX Book).

FDK Multi 750E, Expander 430 and PS750 mains PSU.

2M and 70cms multimode transceiver, SSB,FM,CW. CTCSS board, Currently GRP 'F'.

Complete 2M and 70cms station with own PSU, mic and manual/diagrams £100.

Carriage/Insurance extra or collect. Photos available, Contact Carl G3XGK (SK G4RLS sale OBO family) email carl.langley@talktalk.net

MICROWAVE CONTESTS - 2022

Month	Contest name	Certificates	Date 2022	Time GMT	Notes
Jan	1.3GHz Activity Contest	*Arranged by RSGB*	18-Jan	2000 - 2230	RSGB Contest
Jan	2.3GHz+ Activity Contest	*Arranged by RSGB*	25-Jan	1930 - 2230	RSGB Contest
Feb	1.3GHz Activity Contest	*Arranged by RSGB*	15-Feb	2000 - 2230	RSGB Contest
Feb	2.3GHz+ Activity Contest	*Arranged by RSGB*	22-Feb	1930 - 2230	RSGB Contest
Mar	Low Band 1296/2300/2320/3400MHz	F, P,L	6-Mar	1000 - 1600	First 4 hours coincide with IARU event
Mar	1.3GHz Activity Contest	*Arranged by RSGB*	15-Mar	2000 - 2230	RSGB Contest
Mar	2.3GHz+ Activity Contest	*Arranged by RSGB*	22-Mar	1930 - 2230	RSGB Contest
Apr	Low Band 1296/2300/2320/3400MHz	F, P,L	10-Apr	1000 - 1600	
Apr	1.3GHz Activity Contest	*Arranged by RSGB*	19-Apr	1900 - 2130	RSGB Contest
Apr	2.3GHz+ Activity Contest	*Arranged by RSGB*	26-Apr	1830 - 2130	RSGB Contest
May	REF/DUBUS EME 1.2GHz	*Arranged by REF/DUBUS*	7-May to 8-May	0000 - 2400	REF/DUBUS EME 1.2GHz
May	*432MHz & up*	*Arranged by RSGB*	*7-May to 8-May*	*1400 -1400*	RSGB Contest
May	*10GHz Trophy*	*Arranged by RSGB*	*8-May*	*0800 - 1400*	Sunday, to coincide with IARU
May	Low Band 1296/2300/2320/3400MHz	F, P,L	8-May	0800 - 1400	Aligned with IARU event
May	24GHz/47/76GHz		15-May	0900-1700	
May	1.3GHz Activity Contest	*Arranged by RSGB*	17-May	1900 - 2130	RSGB Contest
May	2.3GHz+ Activity Contest	*Arranged by RSGB*	24-May	1830 - 2130	RSGB Contest
May	REF/DUBUS EME 10GHz & Up	*Arranged by REF/DUBUS*	28-May to 29-May	0000 - 2400	REF/DUBUS EME 10GHz & up
May	5.7GHz/10GHz	F, P,L	29-May	0600-1800	
Jun	REF/DUBUS EME 2.3GHz	*Arranged by REF/DUBUS*	4-Jun to 5-Jun	0000 - 2400	REF/DUBUS EME 2.3GHz
Jun	Low Band 1296/2300/2320/3400MHz	F, P,L	5-Jun	1000 - 1600	Aligned with some Eu events
Jun	1.3GHz Activity Contest	*Arranged by RSGB*	14-Jun	1900 - 2130	RSGB Contest
Jun	2.3GHz+ Activity Contest	*Arranged by RSGB*	21-Jun	1830 - 2130	RSGB Contest
Jun	5.7GHz/10GHz	F, P,L	26-Jun	0600-1800	
Jul	REF/DUBUS EME 5.7GHz	*Arranged by REF/DUBUS*	2-Jul to 3-Jul	0000 - 2400	REF/DUBUS EME 5.7GHz
Jul	VHF NFD (1.3GHz)	*Arranged by RSGB*	2-Jul to 3-Jul	1400 - 1400	RSGB Contest
Jul	24GHz/47/76GHz		10-Jul	0900-1700	
Jul	1.3GHz Activity Contest	*Arranged by RSGB*	19-Jul	1900 - 2130	RSGB Contest
Jul	2.3GHz+ Activity Contest	*Arranged by RSGB*	26-Jul	1830 - 2130	RSGB Contest
Jul	REF/DUBUS EME 3.4GHz	*Arranged by REF/DUBUS*	30-Jul to 31-Jul	0000 - 2400	REF/DUBUS EME 3.4GHz
Jul	5.7GHz/10GHz	F, P,L	31-Jul	0600-1800	
Aug	1.3GHz Activity Contest	*Arranged by RSGB*	16-Aug	1900 - 2130	RSGB Contest
Aug	2.3GHz+ Activity Contest	*Arranged by RSGB*	23-Aug	1830 - 2130	RSGB Contest
Aug	5.7GHz/10GHz	F, P,L	28-Aug	0600-1800	
Sep	24GHz/47/76GHz		11-Sep	0900-1700	
Sep	ARRL Microwave EME	*Arranged by ARRL*	17-Sep to 18-Sep	0000 - 2359	ARRL EME 2.3GHz & Up
Sep	1.3GHz Activity Contest	*Arranged by RSGB*	20-Sep	1900 - 2130	RSGB Contest
Sep	5.7GHz/10GHz	F, P,L	25-Sep	0600-1800	
Sep	2.3GHz+ Activity Contest	*Arranged by RSGB*	27-Sep	1830 - 2130	RSGB Contest
Oct	*432MHz & up*	*Arranged by RSGB*	*1-Oct to 2-Oct*	*1400 - 1400*	IARU/RSGB Contest
Oct	*1.3 & 2.3GHz Trophies*	*Arranged by RSGB*	*1-Oct*	*1400 - 2200*	RSGB Contest
Oct	ARRL EME 50-1296MHz	*Arranged by ARRL*	15-Oct to 16-Oct	0000 - 2359	ARRL EME Contest
Oct	24GHz/47/76GHz		16-Oct	0900-1700	
Oct	1.3GHz Activity Contest	*Arranged by RSGB*	18-Oct	1900 - 2130	RSGB Contest
Oct	2.3GHz+ Activity Contest	*Arranged by RSGB*	25-Oct	1830 - 2130	RSGB Contest
Nov	ARRL EME 50-1296MHz	*Arranged by ARRL*	12-Nov to 13-Nov	0000 - 2359	ARRL EME Contest
Nov	Low Band 1296/2300/2320/3400MHz	F, P,L	13-Nov	1000 - 1400	
Nov	1.3GHz Activity Contest	*Arranged by RSGB*	15-Nov	2000 - 2230	RSGB Contest
Nov	2.3GHz+ Activity Contest	*Arranged by RSGB*	22-Nov	1930 - 2230	RSGB Contest
Dec	1.3GHz Activity Contest	*Arranged by RSGB*	20-Dec	2000 - 2230	RSGB Contest

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

Main changes from 2021 calendar

122GHz+ events removed (no fixed dates in 2022)

EVENTS 2022/3

2022		
December 3	Midlands Roundtable	Eaton Manor SY6 7DH
2023		
January 14	Heelweg Microwave Meeting	info@pamicrowaves.nl
February tba	Tagung Dorsten	www.ghz-tagung.de
April 1	CJ-2023, Seigy	cj.r-e-f.org
April 14-15	Microwave Update, Windsor CT, USA	microwaveupdate.org

80m UK Microwavers net

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

73 Martyn Vincent G3UKV