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In This Issue

GMRT 2019

24GHz from Walbury

UK Microwave Group

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

Please send them to

editor@microwavers.org

The CLOSING date is

the FIRST day of the month

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

Please submit your articles in any of the following formats:

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

Spreadsheets: Excel, OpenOffice, Numbers

Images: tiff, png, jpg

Schematics: sch (Eagle preferred)

I can extract text and pictures from pdf files but tables can be a bit of a problem so please send these as separate files in one of the above formats.

Thank you for you co-operation.

Roger G8CUB

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UKμG Project support

The UK Microwave Group is pleased to encourage and support microwave projects such as Beacons, Synthesiser development, etc. Collectively UKuG has a considerable pool of knowledge and experience available, and now we can financially support worthy projects to a modest degree.

Note that this is essentially a small scale grant scheme, based on 'cash-on-results'. We are unable to provide ongoing financial support for running costs – it is important that such issues are understood at the early stages along with site clearances/licensing, etc.

The application form has a number of guidance tips on it – or just ask us if in doubt! In summary:-

- Please apply in advance of your project
- We effectively reimburse costs - cash on results (eg Beacon on air)
- We regret we are unable to support running costs

Application forms below should be submitted to the UKuG Secretary, after which they are reviewed/ agreed by the committee

www.microwavers.org/proj-support.htm

UKμG Technical support

One of the great things about our hobby is the idea that we give our time freely to help and encourage others, and within the UKuG there are a number of people who are prepared to (within sensible limits!) share their knowledge and, what is more important, test equipment. Our friends in America refer to such amateurs as "Elmers" but that term tends to remind me too much of that rather bumbling nemesis of Bugs Bunny, Elmer Fudd, so let's call them Tech Support volunteers.

While this is described as a "service to members" it is not a "right of membership!"

Please understand that you, as a user of this service, must expect to fit in with the timetable and lives of the volunteers. Without a doubt, the best way to make people withdraw the service is to hassle them and complain if they cannot fit in with YOUR timetable!

Please remember that a service like our support people can provide would cost lots of money per hour professionally and it's costing you nothing and will probably include tea and biscuits!

If anyone would like to step forward and volunteer, especially in the regions where we have no representative, please email john@g4bao.com

The current list is available at

www.microwavers.org/tech-support.htm

UKμG Chip Bank – A free service for members

By Mike Scott, G3LYP

Non-members can join the UKμG by following the non-members link on the same page and members will be able to email Mike with requests for components. All will be subject to availability, and a listing of components on the site will not be a guarantee of availability of that component.

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

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

Minimum quantity of small components is 10.

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

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

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

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Loan Equipment

Don't forget, UKuG has loan kit in the form of portable transceivers available to members for use on the following bands: **Contact John G4BAO for more information**

5.7GHz 10GHz 24GHz 47GHz (coming soon) 76GHz

This Month I have been building…….

From Chris G0FDZ

The horn is adjustable in two planes and the system just needs the board to fit into the small die-cast box that has already got the mountings for the GPS unit, the RS232 driver transistor and the D9 socket cut. I have an 3.3 v regulator board to also fit to the box. The D25 cut out is for the connections to the box via the muti-way lead. The box also just needs the UG387 to coupler adapter. On the control unit, the FT817 is only used for the receive IF and the FT817 mic is re-employed as the transmitter mic. I have added an LM386 audio amp for the sidetone and an LED voltage display unit for battery monitoring. Additional 3.5 mm jacks are on the sides of the box for use with other mics or side tone headphones.

The whole idea is to minimise the work required to complete the system when the board arrives

Talking of the 122GHz Project………

Over 50 Built 122GHz Boards ordered from UK Microwave Group members!

The Project has its own group:

The122GProject@groups.io

Don't miss out, you can still order until 30th November.
Prepare for the 122GHz Pile-up in 2020!

https://fundrazr.com/122GHzProject

Those looking for Tin Plate boxes

Alan Melia G3NYK has changed hosting of his website. The link below is correct

https://g3nyk.ham-radio-op.net/componen.htm

The conical horn antenna revisited   Part 1

Barry Chambers, G8AGN

Introduction

Many radio amateurs use pyramidal horns, fed from rectangular waveguide, at 10, 24 and maybe 47GHz, but for higher frequencies the appropriate waveguide and coupling flanges become very expensive and are difficult to obtain. For operation on the higher mm-wave bands, therefore, use is often made of circular waveguide since a wide range of copper and brass small-bore tubing can be obtained inexpensively from model shops. It is possible to feed a pyramidal horn from circular waveguide, but it makes more sense to retain the circular symmetry throughout and to opt for the use of a conical horn instead.

As mentioned in my talk at MMRT in 2017, a simple but effective conical horn antenna for 134GHz may be made from a PME™ stainless steel cake icing nozzle. These are available in a range of types which all have the same standard nozzle dimensions but only differ in the diameter and cross-section of the thread of icing which they produce. So for example, a PME 1.5 nozzle will produce a cylindrical thread of icing with a diameter of 1.5mm and this is determined by the size of the hole drilled in the sharp end of the cone (corresponding to the throat or feed end of a horn antenna). All PME nozzles have an identical base diameter (i.e. the aperture end of a horn antenna) of about 16mm and an identical cone length of 40mm. Computer modelling has shown that these dimensions result in an almost optimum horn design at 134GHz and a predicted gain of around 24dBi.

Because of recent efforts by K6ML, VK3CV and VK2XAX, there is now considerable world-wide interest in operating on the 122GHz band using transceivers based on the *Silicon Radar*™ highly integrated "122GHz system on a chip" approach (for full details, see https://groups.io/g/The122GProject/wiki/home). Hence it is natural to consider what antennas might be suitable for use in this project and the conical horn (or one of its variants) would thus seem to be a suitable candidate both for test antennas (for initial short range tests) and maybe dish feeds (for DX working). In the former case a simple cone based design would be ideal, whereas for the latter case a compound cone such as that due to W2IMU would be more appropriate.

Conical horn antenna design

The full analysis of a conical horn antenna is very involved and requires a high level of mathematical ability. Hence to make this section understandable to the average reader, I have extracted from the professional literature only those equations which will enable you to easily design a conical horn for your particular application.

The cross-sectional geometry of an ideal conical horn is shown in Figure 1.

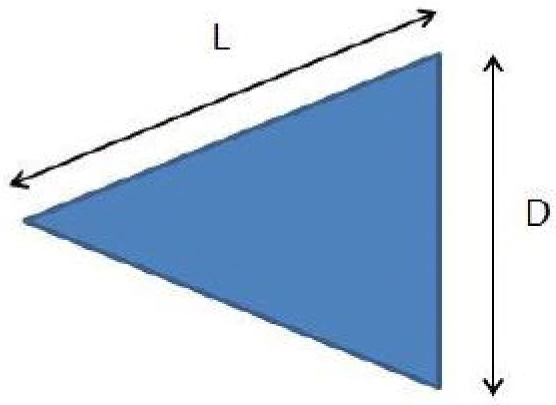


Figure 1

In practice, the horn is fed from a waveguide attached to the sharp point (apex) on the left-hand side of the cone and the aperture (on the right-hand side) has diameter D. In the discussion which follows, it should be noted that the horn slant length L includes the small length l which in a real horn lies inside the feeding waveguide (i.e. the sharp point is truncated by the junction between the cone and the waveguide cylinder). Nevertheless, the position of the apex of the cone is of interest since it represents the approximate phase centre of the antenna. Thus the electromagnetic fields emanating from the phase centre have phase fronts which are circular (in the 2D case shown in Figure 1) or spherical in the actual 3D cone. This creates a problem at the horn aperture since the wave phase front is spherical but the aperture (the interface between the inside of the horn and free-space) is plane (flat), as shown in Figure 2. This results in unwanted field variations in amplitude and phase across the horn aperture and these variations will modify the horn radiation pattern and hence the gain.

Let us start by assuming that there are no amplitude or phase variations across the horn aperture. Then the gain can be estimated from

$$Gain\ (dB) = 20log_{10}\left(\frac{\pi D}{\lambda}\right) \qquad (1)$$

where λ is the wavelength and D is the horn aperture diameter. Because in practice there are amplitude and phase variations across the aperture, then the gain is reduced by a quantity called the Loss factor LF. Hence

$$Gain(dB) = 20log_{10}\left(\frac{\pi D}{\lambda}\right) - LF(dB) \qquad (2)$$

Several, slightly differing, expressions are given in the literature for determining LF but I have chosen the one which seems most appropriate for use when designing horns of moderate length and flare angle. Hence

$$LF(s) \approx 0.75 + 0.66s + 9.4s^2 + 6.8s^3 \qquad (3)$$

where s is the maximum phase variation across the horn aperture, expressed in wavelengths. The quantity s can be obtained from the geometry shown in Figure 2.

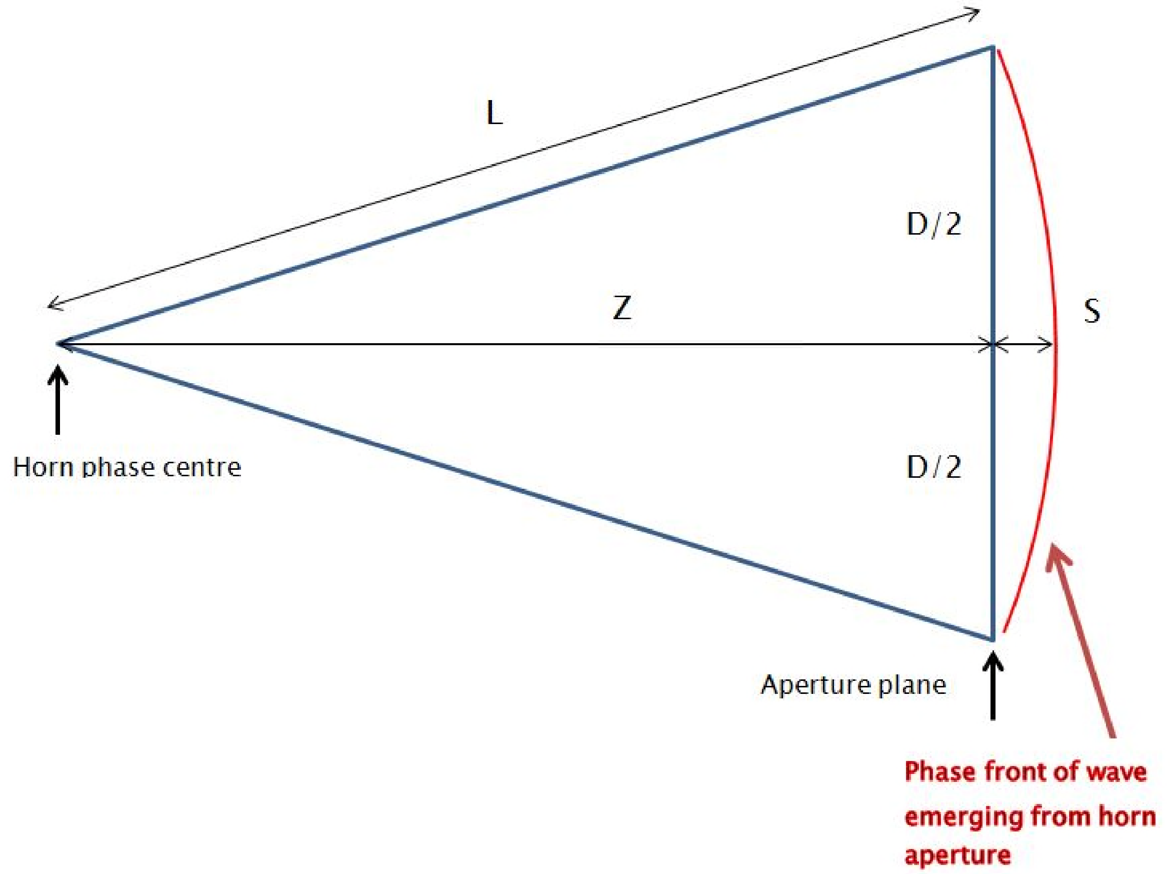


Figure 2

Hence

$$s \approx \frac{D^2}{8L\lambda} \qquad (4)$$

where D is the aperture diameter, L is the horn slant length and λ is the wavelength.
The variation of the Loss Factor LF(s) with s is shown in Figure 3

Figure 3

It should be noted that LF(s) is not equal to 0 when the phase error s = 0; this is because LF(s) accounts for both amplitude and phase error terms.

Before using the design data given above in an example, it is necessary to explore what is meant by a "good" horn design. This is because there are two routes to obtaining such an antenna and they result in horns with markedly different overall dimensions.

Let us start by assuming we want an antenna with an aperture size A. Then a horn which is designed for "maximum gain" will be very long and with a very small flare angle. This will result in a very small phase variation across the aperture and so s and the Loss Factor LF(s) will be very small. Let us assume that this antenna has a resulting gain G_1.

The second route to a conical horn design is to maximise the gain for a given slant length. Such a design is normally called an "optimum" horn and it can be realised by making the horn diameter D satisfy equation (5).

$$D = \sqrt{3L\lambda} \qquad (5)$$

This corresponds to s, the maximum aperture phase error, being equal to $\frac{3\lambda}{8}$ and from Figure 3, the Loss Factor LF(s) being about 2.7dB. Hence with this design of horn the predicted gain G_2 is about 2.7dB less than that for an extremely long "maximum gain" design but the resulting physical horn size is much more manageable. Of course, an "optimum" horn can be made with a gain of G_1, but its aperture will be bigger than that for the "maximum gain" horn.

To conclude Part 1 of this article let us look at the "21 dB" test horn which VK3CV has proposed for use with his 122GHz transceiver. Basically it is a conical horn with aperture diameter D = 23mm and an axial length Z from the aperture plane to the horn apex of 49mm. Hence using Pythagoras' Theorem we can calculate the horn slant length L. This is not the actual slant length since it includes the short length l which is "hidden" inside the feed waveguide, as mentioned earlier.

So, $L^2 = \left(\frac{D}{2}\right)^2 + Z^2 = 132.25 + 2401$ and $L = 50.33\,mm$

At a frequency of 122.5GHz, $\lambda = 2.447\,mm$

From Equation (4), s, the maximum phase deviation across the horn aperture, is 0.536λ. Then using Equation (3), the Loss Factor LF(s) is $4.86dB$.

The antenna gain in the absence of any aperture amplitude and phase variations is calculated using Equation (1) and gives a value of $29.4dB$. Hence the actual predicted gain of the conical horn is equal to $29.4 - 4.9 = 24.5dB$.

This value of 24.5dB is in excellent agreement with that of 24.4dB as given by VK3CV's CST modelling.

Several comments about this result are in order.

(a) As the predicted gain is over 3dB higher than VK3CV's description of the horn as a "21dB" one, why the discrepancy?

A possible answer is that the models I and VK3CV have used neglect a number of factors; these could include impedance discontinuities at the horn aperture and the junction between the horn apex and the feeding waveguide. The feed waveguide may be carrying more than one waveguide mode. Also the geometries of the real and modelled horns may be different because of non-zero horn wall thickness. In addition, diffraction effects and edge currents at the horn aperture may have been neglected. Finally the real horn is constructed from Aluminium which has a finite conductivity and surfaces will have roughness which will increase the effective surface area of the internal horn surfaces and so add loss.

(b) The calculated value of s for this horn is 0.536λ which is somewhat greater than the value of 0.375λ for an “optimum” horn which maximises the gain for a given slant length L. Given that the horn diameter D is limited to 25mm by the use of a standard size of Aluminium bar stock, more gain could thus be realised with this aperture size by simply increasing the axial length z (see Figure 2). Whether in practice this is worth the cost of the extra material is for the reader to decide.

In Part 2 of this article I will explore the computer modelling of both simple and compound conical horns (such as the W2IMU design) and VK3CV’s Chaparral dish feed using the free-to-download **openEMS** software package which is available at http://openems.de/start/ .

The conical horn revisited

Part 2 – modelling using openEMS

Barry Chambers, G8AGN

Introduction

In Part 1 of this article, a simple procedure for designing conical horn antennas having optimal characteristics was discussed and this was illustrated by designing a horn for the 122GHz band; in Part 2, the emphasis will be on using a computer to simulate more realistic models for several horn-related antennas with the aim of better quantifying properties such as gain and radiation pattern.

Because these variations on the simple horn have more complicated geometries, it is not possible to derive simple design procedures for them and so computer modelling must be used to simulate solutions to Maxwell’s equations for each case. This, although tedious and requiring the use of a fast computer with a substantial amount of RAM (ideally an i7 processor and 16GB of RAM), enables us to get a better estimate of an antenna’s performance since almost all the limitations of the simple model discussed in Part 1 can now be addressed.

Professional software for analysing microwave antennas is very expensive and not usually available to the average radio amateur but there is one suitable software package which is free to download and use; this is openEMS, which is available at http://openems.de/start/ . It can be run under Windows or Linux but requires Octave as the “front-end”; this is also free to download and use and is available at (https://www.gnu.org/software/octave/).

In order to make the best use of openEMS, it is helpful to have some appreciation of how it works; a good starting point is to look at the openEMS tutorial examples, one of which is for the conical horn. Because the latter has rotational symmetry about its axis, it is not necessary to describe the whole 3D geometry of the horn but merely its cross-section as a series of co-ordinates in x and z (corresponding to the horn radial and axial directions). The software then rotates this cross-section to give the 3D structure. To simulate a solution of Maxwell’s equations for the latter, it is first represented by a large number of small cubes or “cells”, one of which is shown in Figure 1.

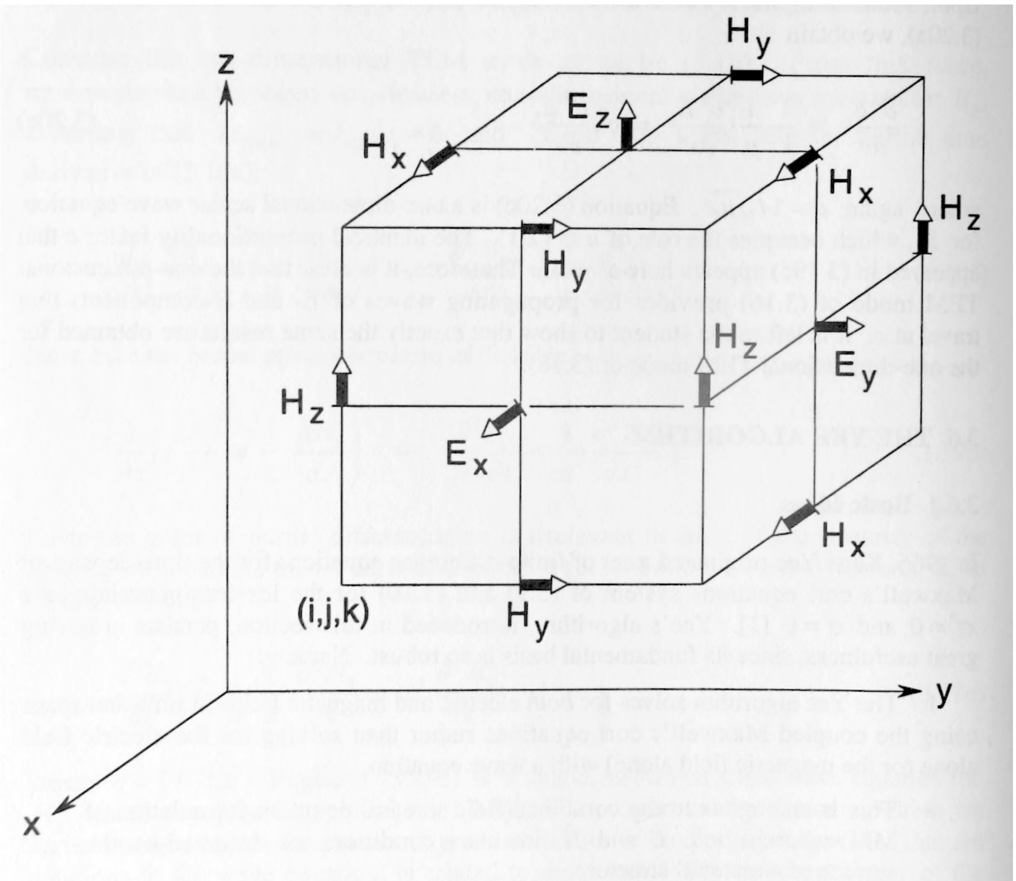


Figure 1

Each cell contains information about the tiny volume of space which it occupies. The information includes the values of the x, y and z components of the interlinked electric (E) and magnetic (H) fields at a particular instant in time and whether the cell is made from free-space, a conductor or a dielectric. Because an antenna is an open structure (i.e. it radiates), the model must also include a large number of cells which surround the antenna and represent the free-space region where the radiation field exists. In theory, this external volume should be infinite but since our computer memory is finite, it has to be terminated by "absorbing" boundaries which prevent radiated waves from the antenna being reflected back towards it and so giving rise to unwanted wave interference effects.

Having built up a model of the antenna, it now needs to be provided with a source of energy at the feed point (inside the circular waveguide in this case). This source sets up the dominant TE11 waveguide mode whose E and H field components are then allowed to change with time. The simulation follows what happens to these fields as they propagate through the antenna structure and out into free space. This process takes some time to settle down to a steady state since there will be positions within the horn (such as the transitions between the feed waveguide and the horn apex and at the horn aperture) where there will be reflections due to impedance discontinuities and so waves will "slosh" backwards and forwards inside the horn. The computer simulation proceeds one time step at a time, with a time increment which is typically about 0.1 pS (10^{-13} second). At each time step, the values of the E and H fields in each cell in the model are updated sequentially (since E gives rise to a new H which in the next time step gives rise to a new E and so on). Once a steady state has been reached, the E and H field components (each described in amplitude and phase) in the vicinity of the antenna aperture will be known and these constitute the antenna's "near-field". To obtain the radiation pattern and gain, however, the antenna's "far-field" needs to be determined and this can be done using a mathematical procedure called a "near-field to far-field transformation". If required, the simulation can also provide estimates of the antenna 3dB beamwidth and input impedance match.

The technique described above for numerically solving Maxwell's equations is known as Finite Difference Time Domain (FDTD) and one of its most crucial requirements for success is that the size of the "cells" used to model the antenna geometry must be very small. In the examples discussed below, a cell width of λ/30 has been used. This implies a very large number of cells even for an antenna of modest size; hence the need for lots of computer RAM and long run times (10-200 million cells, 0.5-3 hours).

<u>Results from openEMS simulations</u>

(a) <u>Original VK3CV "21dB" horn for 122GHz</u>

The dimensions of this horn were taken from
https://groups.io/g/The122GProject/files/CadMechanicalFiles/Test%20Horn%20-%20page%201%20of%202.pdf

The openEMS 3D model of the horn is shown in Figure 2.The model contains about 140 million cells and required about 2.5 hours of computer time to simulate.

The resulting estimated horn gain was 22.2dBi, as compared with the value of 24.5dBi which was obtained with the simple horn model discussed in Part 1 of this article. This latest value would seem to back up VK3CV's measured gain value of "about 21dBi".

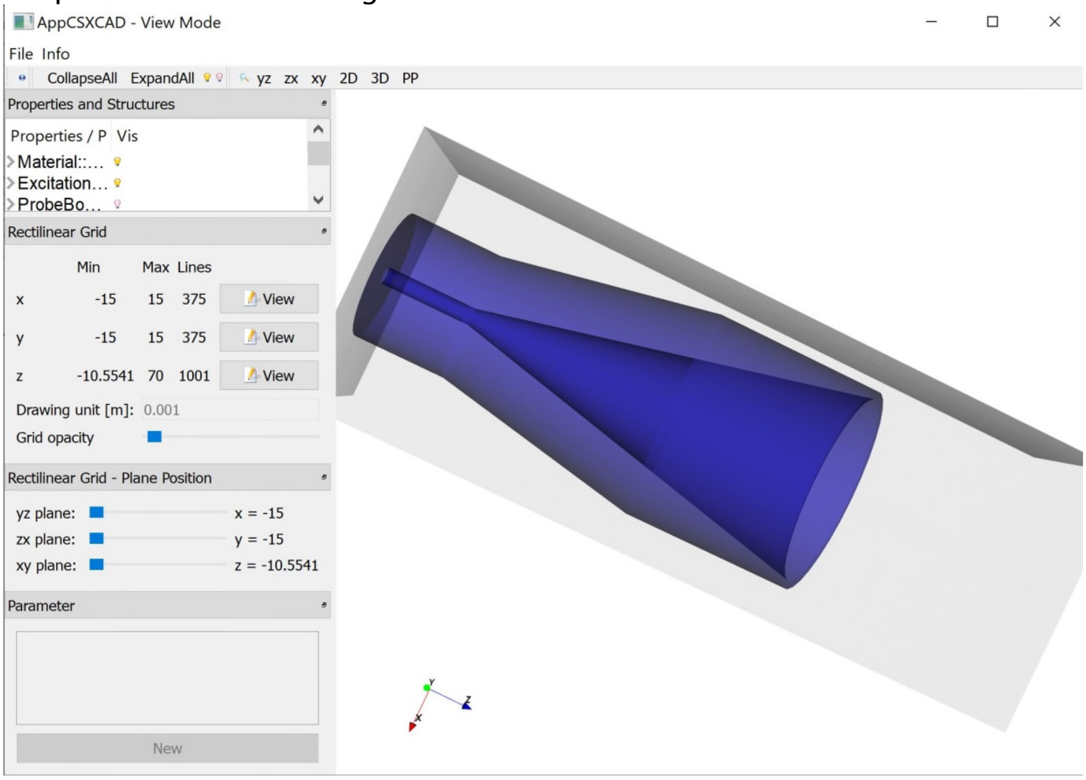


Figure 2

The horn far-field radiation pattern is shown in Figure3.

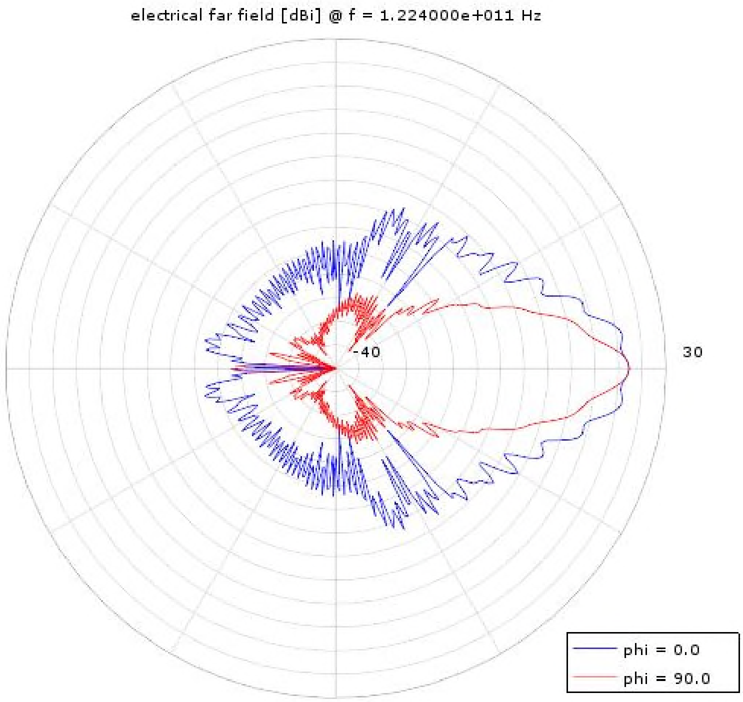


Figure 3

<u>(b) Modified VK3CV horn</u>

As discussed in Part 1 of this article, the axial length of the original horn is too short to make full use of the available antenna aperture. Hence the axial length of the horn flare section was increased by 20mm. The resulting estimated gain from openEMS was about 25.1dBi, an increase over the original design of 2.9dBi. The far-field radiation pattern for this horn is shown in Figure 4.

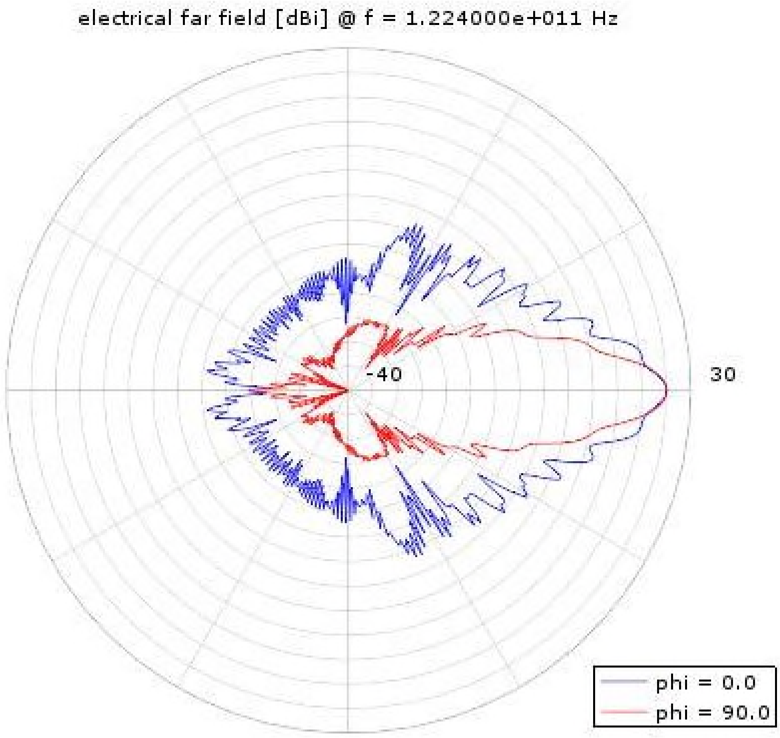


Figure 4

The new radiation pattern is similar to that for the original VK3CV horn but the gain is higher and the beamwidth is smaller as expected.

(c) VK3CV Chaparral dish feed

The dimensions for this horn were taken from https://groups.io/g/The122GProject/files/CadMechanicalFiles/CP%20feed%20horn%20-%20page%201%20of%203.pdf .

The openEMS 3D model of the horn is shown in Figure 5.The model contains about 18 million cells and required about 27 minutes of computer time to simulate.

The resulting estimated gain was 10.5dBi as compared with VK3CV's CST result of 9.5dBi.

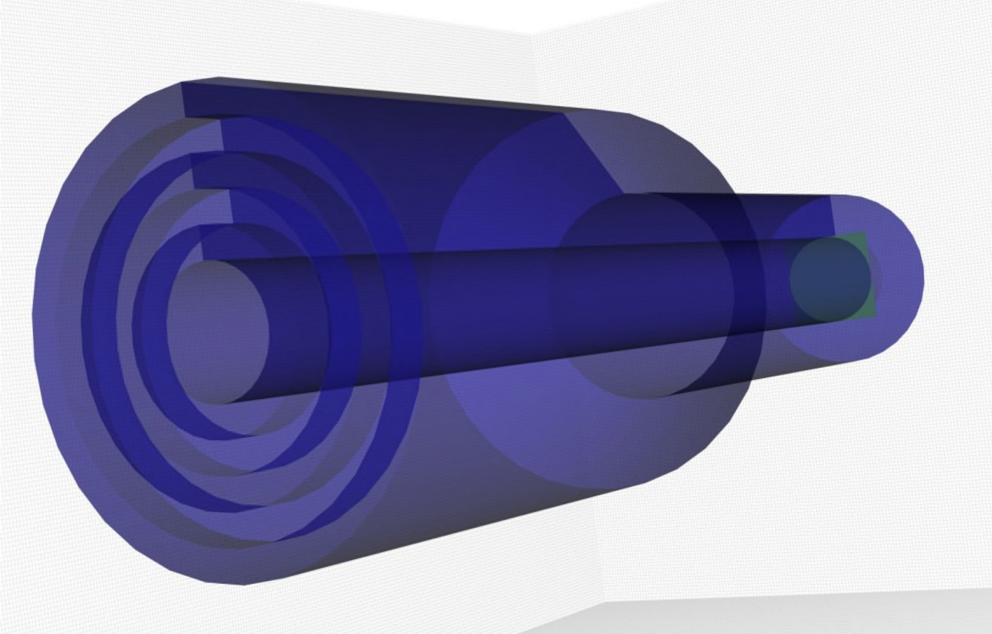


Figure 5

The far-field radiation pattern is shown in Figure 6 and is very similar to VK3CV's CST result

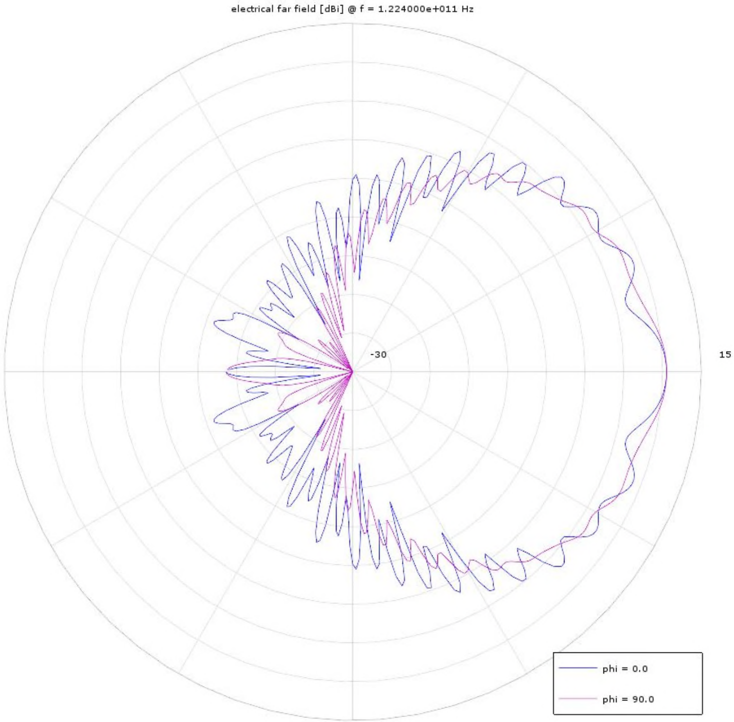


Figure 6

(d) W2IMU Dual mode horn feed

The basic geometry of this horn is shown in Figure 7, which is taken from W1GHZ's *Antenna Handbook* at http://www.w1ghz.org/antbook/ch6_5-1.pdf

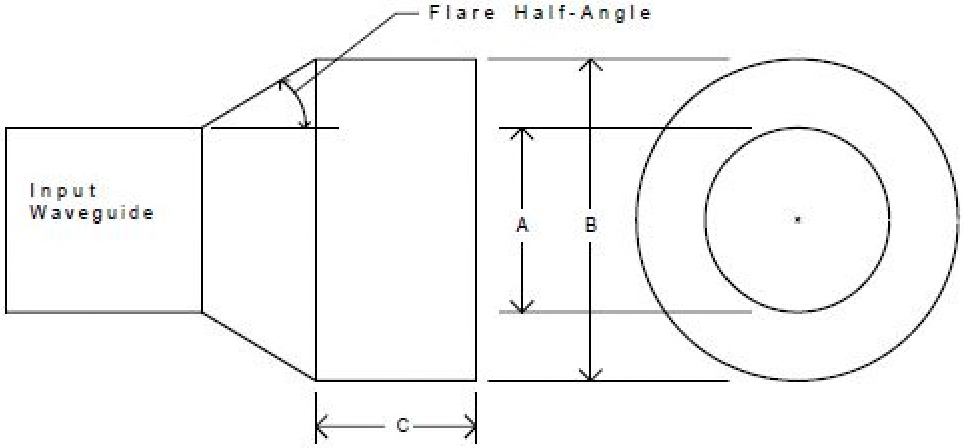


Figure 7

Assuming a frequency of 122.4GHz and a dish f/D of 0.6, the following values for the internal horn dimensions were obtained from equations listed in the Antenna Handbook (see above link). Hence

A = 2mm, B = 3.45mm, C = 4.51mm, flare half-angle = 31.6 degrees, Z (axial length of flare section) = 1.18mm.

The horn was assumed to be machined from a piece of ¼" (6.35mm) diameter Aluminium bar stock and so for convenience B was changed to 3.5mm (a standard drill size), C to 4.7mm and Z to 1.24mm. The horn flare angle was ±31.2° and the wall thickness at the aperture was assumed to be 1.25mm. From the W1GHZ equations, these modified values are suggested for an f/D of 0.61but this value is not critical. At 122.4GHz, the aperture diameter B is about 1.43 wavelengths across.

The openEMS model for this horn is shown in Figure 8. It was represented by just over 9 million cells and so took only about 18minutes of computer time for solution. The estimated gain was 12.8dBi.

The polar far-field plot is shown in Figure 9 and it can be seen that the E and H plane patterns are similar which indicates that the required TE11 and TM11 waveguide modes are being excited correctly in the horn phasing section (section C in Figure 7).

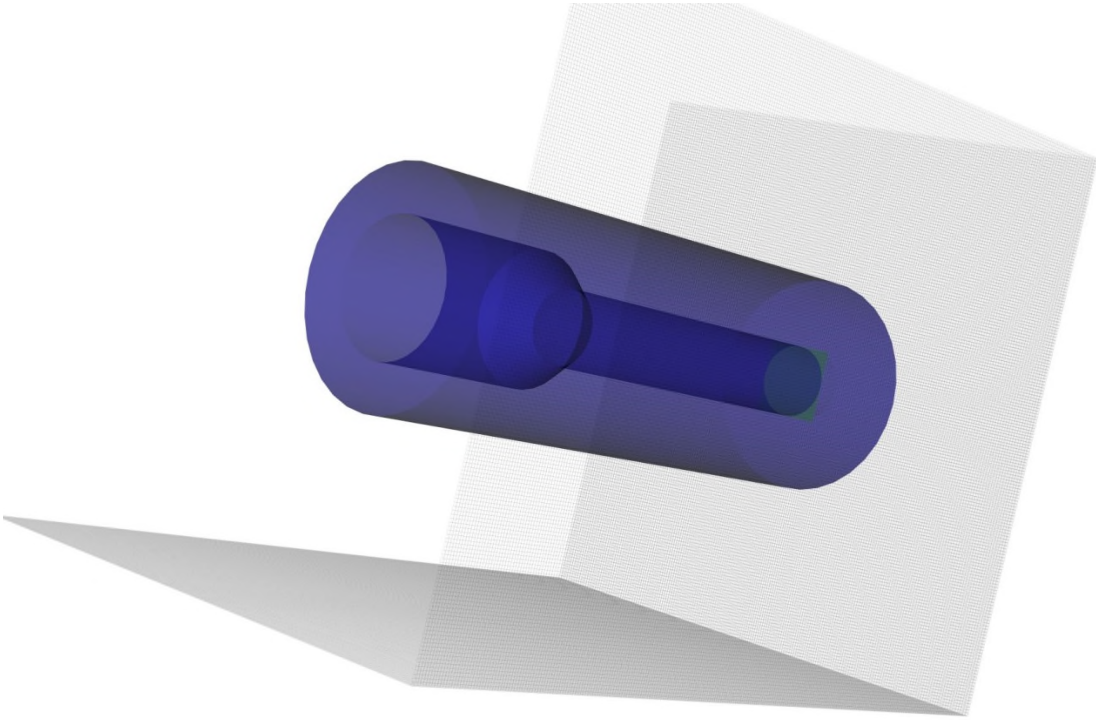


Figure 8

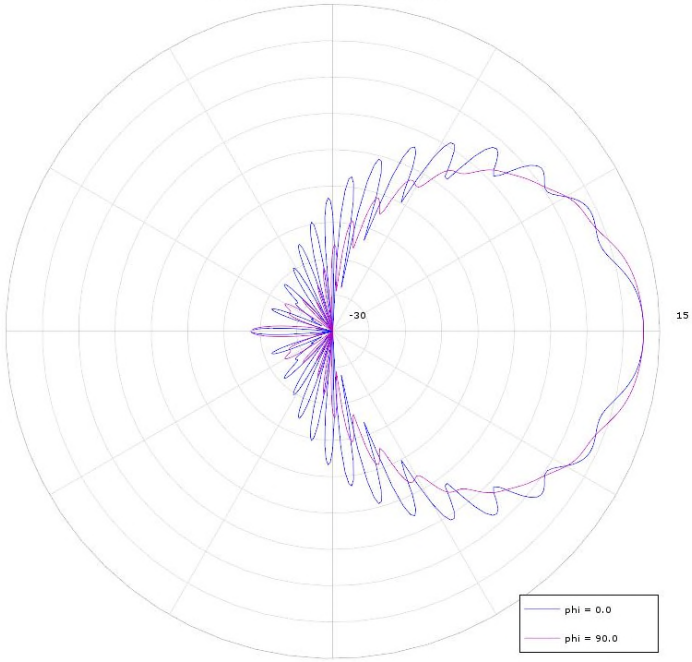


Figure 9

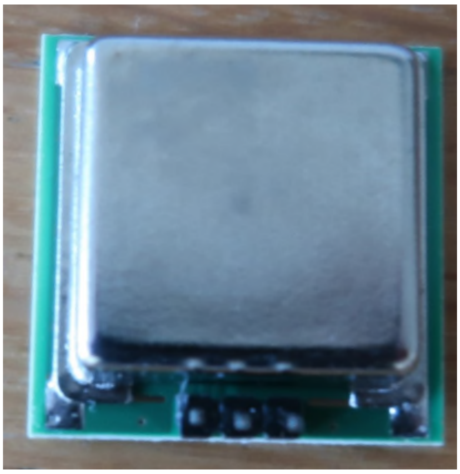
<u>Concluding comments</u>

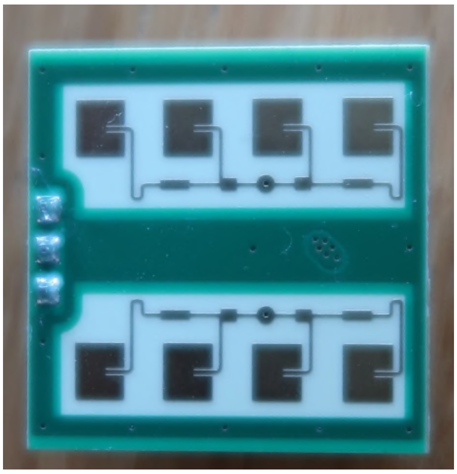
(a) The results shown above confirm that openEMS, if used properly, can enable the radio amateur to obtain useful information about a range of mm-wave antennas. As the example files which form a part of the down-load for the openEMS package show, the software can also be used to model a wide range of other antenna types and over other frequency ranges as desired. It can also be used to model items such as waveguides, microstrip lines, cavities and lenses.

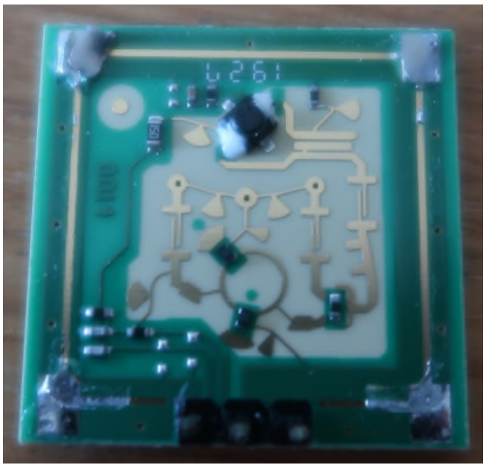
(b) A question which will arise at this point is whether openEMS can be used to model both a horn feed and its associated dish? If one has enough CPU power and RAM, the answer is yes. The openEMS forum has details on how to do this at http://openems.de/forum/viewtopic.php?f=3&t=769 but I have not tried this yet.

A 24GHz Check Source?

These Radar Modules are available on ebay for less than £4.
The CDM324 is spec'd 24.125-24.250GHz 16dBm
Mine was lower in frequency than 24.048GHz, and could be persuaded to sweep through the band by putting it close to a piece of metal. It was happiest on a 5.5V supply. Of course I played with the supply etc. until I blew it up.
Still broken I have 2 quad 24GHz patch antennas, and a couple of mm-wave diode to play with.







Activity News: October 2019

By John G4BAO

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

Scatterpoint activity report

Plenty of GHz Bands activity from me this month, covering mid-October to mid-November.
Mainly EME operation in the ARRL GHz contests, but for the first time I'm including the highlights of my QO-100 QSOs, now I have the system fully up and running. On the QO-100 narrowband transponder I run 5 Watts from an all-SDR system using the excellent SDR-Radio software from Simon G4ELI. On transmit, I use a Lime SDR with a high gain PA bodged together from junk box parts, and on receive an LNB locked to a Leo Bodnar GPSDO, the antenna is a 1.2m offset dish with a POTY dual band patch feed built to G0MJW's design. The whole station is operated remotely from my workshop over Ethernet. I use TightVNC to remote the desktop and Voicemeeter VBAN Audio streaming. PTT control to the PA is via a USB relay controlled by Simon's software.

Here's my log highlights.

1.3GHz EME - new initials, SM6CKU, KA1GT and KL6M

19/10/2019	SM6CKU	JO67	JT65
20/10/2019	KA1GT	FN54	JT65
20/10/2019	PA3FXB	JO33	JT65
20/10/2019	ON4QQ	JO2Ø	JT65
20/10/2019	OK2DL	JN79	JT65
20/10/2019	OK1CA	JO7Ø	CW
20/10/2019	UA3PTW	KO93	CW
20/10/2019	G4CCH	IO93	CW
20/10/2019	G3LTF	IO91	CW
20/10/2019	OZ4MM	JO55	CW
20/10/2019	OE5JFL	JN68	CW
20/10/2019	KL6M	BP51	CW
20/10/2019	SP6JLW	JO8Ø	CW

3.4GHz EME

22/10/2019	PY2BS	GG66	JT65
23/10/2019	OK1DFC	JN79	JT65
23/10/2019	K2UYH	FN20	JT65

5.7GHz EME - new initials, SM6CKU, PA0BAT and OK1DFC

24/10/2019	SM6CKU	JO67	QRA64
24/10/2019	PAØBAT	JO31	QRA64
24/10/2019	OH2DG	KP3Ø	QRA64
24/10/2019	OK1DFC	JN79	QRA64
24/10/2019	K2UYH	FN2Ø	QRA64

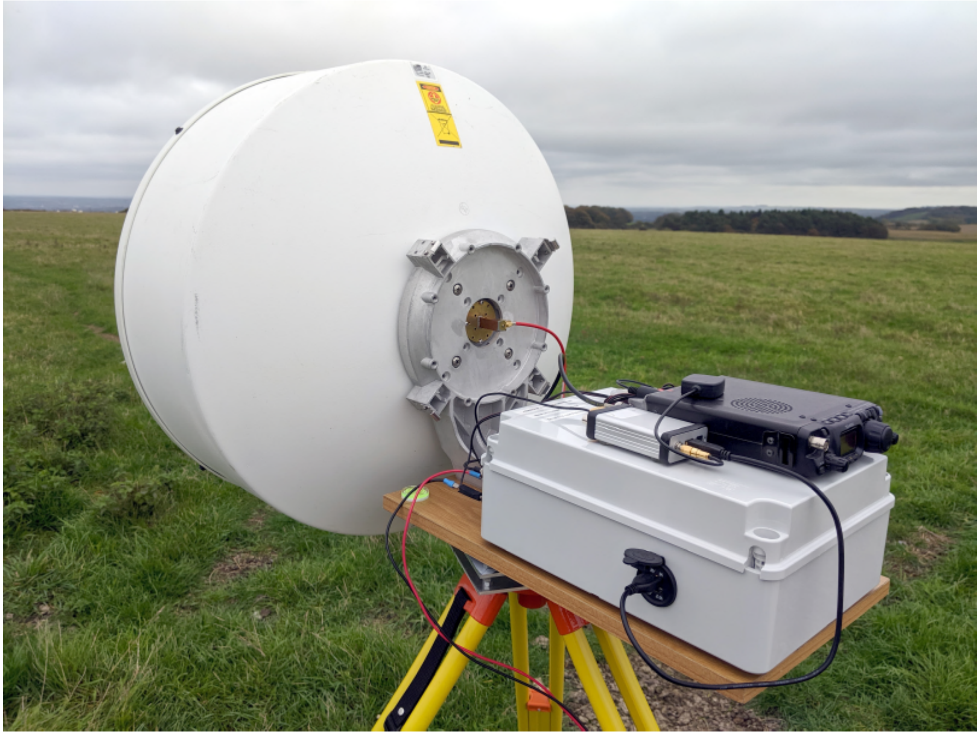
24/10/2019 UA3PTW KO93 QRA64

QO-100 Satellite all on SSB

04/11/2019 VU2LBW MK82
04/11/2019 IW1GAL JN44
04/11/2019 DL8BDR JO43
05/11/2019 4X1TI KM71
05/11/2019 G4DPZ IO82

From Dave, G1EHF

Barry G4SJH/P and myself G1EHF/P ventured to Walbury Hill for the final 24GHz session on 20th October. Barry was operating the loan kit and I had my usual setup, plus an experimental system using one of the 18GHz dishes kindly donated by Bill G4CUE. The 18GHz dish is 60cm with a circular feed, to which I had simply attached a WR42 transition and was running a modest 15mW. Being an entirely separate setup I operated the experimental kit under our contest group call M0HNA/P. Our best DX was GW3TKH/P, worked on all three systems over a slightly obstructed path at 122km. This was satisfying as conditions were generally poor, with low cloud and mist.



From Phil G0JBA

I had my first QSO on 24GHz with G8CUB/P JO01GR81 Danbury from my QTH JO01PG63 71.3km with 52 reports each way, at 1051hrs today 20th Oct.
My QTH Nr Sandwich Kent is 32m ASL and dish antenna at 15m agl. TS790e as the I.F. Radio 144MHz. Talkback 144MHz is icom756 pro iii and Kuhne Pro 144 Transverter 25W 9ele PowAbeam ant.

Phil's 24GHz setup on trial before the contest

Contests

24GHz/47GHz/76GHz Contest October 2019 and mm-wave Championship

The last event of the mm-wave series saw by far the best entry level of the year on 24GHz, with 12 stations submitting logs. Pete G4HQX/P undertook a marathon roving expedition, operating from four sites, which helped Keith GW3TKH/P to amass the best winning score this year. Pete took the runners up slot for his efforts. No entries were received for 47 or 76GHz on this occasion.

This was the last event in the mm-wave series for 2019, so the overall results can now be determined taking the best three sessions operated by each entrant.

On 24GHz Telford & District Amateur Radio Society G3ZME/P take the honours, with Neil G4LDR/P as close runner up.

47GHz sees Roger G8CUB/P in first place with Neil G4LDR/P again as runner up, and these positions are also replicated on 76GHz.

Congratulations to all the winners and runners up. Telford & DARS G3ZME/P will receive the G0RRJ Memorial Trophy for 24GHz, and the 47GHz Trophy goes to Roger G8CUB/P.

John G3XDY
UKuG Contest Manager

24GHz Contest October 2019

Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX Kms
1	GW3TKH/P	IO81LS19	9	766	G1EHF/P	122
2	G4HQX/P	IO81UR40	7	460	G3ZME/P	88
3	G1EHF/P	IO91GI44	6	419	GW3TKH/P	122
4	G4SJH/P	IO91GI44	5	385	GW3TKH/P	122
5	G3ZME/P	IO82QL83	5	375	GW3TKH/P	83
6	G4FRE/P	IO81XW91	5	371	GW3TKH/P	75
7	G4LDR/P	IO80WP01	4	370	G1EHF/P	94
8	M0HNA/P	IO91GI44	4	333	GW3TKH/P	122
9	G1DFL/P	IO91LO78	3	129	G1EHF/P	43
10	G8CUB/P	JO01GR81	2	106	G0JBA	72
11	G0JBA	JO01PG63	1	72	G8CUB/P	72
12	G8ACE	IO91IB05	1	34	G1EHF/P	34

mmWave 24/47/76GHz Championship 2019

24GHz

Pos	Callsign	19/05/2019	23/06/2019	15/09/2019	20/10/2019	**TOTAL**
1	G3ZME/P	888	993	568	490	2449
2	G4LDR/P	1000	786	621	483	2407
3	GW3TKH/P	555	0	699	1000	2254
4	G4SJH/P	0	1000	371	503	1874
5	G(W)4HQX/P	555	0	699	601	1855
6	G8CUB/P	650	194	1000	138	1844
7	G1EHF/P	161	385	0	547	1093
8	G4FRE/P	0	0	0	484	484
9	M0HNA/P	0	0	0	435	435
10	G1DFL/P	0	0	157	168	325
11	G8ACE/P	0	177	0	44	221
12	G0JBA	0	0	0	94	94

47GHz

Pos	Callsign	19/05/2019	23/06/2019	15/09/2019	20/10/2019	TOTAL
1	G8CUB/P	1000	1000	0	0	2000
2	G4LDR/P	555	672	0	0	1227
3	G8ACE/P	0	914	0	0	914
4	GW3TKH/P	849	0	0	0	849
5	GW4HQX/P	431	0	0	0	431

76GHz

Pos	Callsign	19/05/2019	23/06/2019	15/09/2019	20/10/2019	TOTAL
1	G8CUB/P	1000	983	1000	0	2983
2	G4LDR/P	138	1000	1000	0	2138
3	G8ACE/P	0	610	0	0	610
4=	GW3TKH/P	431	0	0	0	431
4=	GW4HQX/P	431	0	0	0	431

The rules and calendar for the 2020 UKuG Contests will be set in late December 2019, so now is your opportunity to make suggestions for changes or improvements. No significant changes to the 2019 rules or calendar are planned for next year, subject to your feedback.

Contact John if you have any suggestions: g3xdy@btinternet.com

Scottish Microwave Round Table

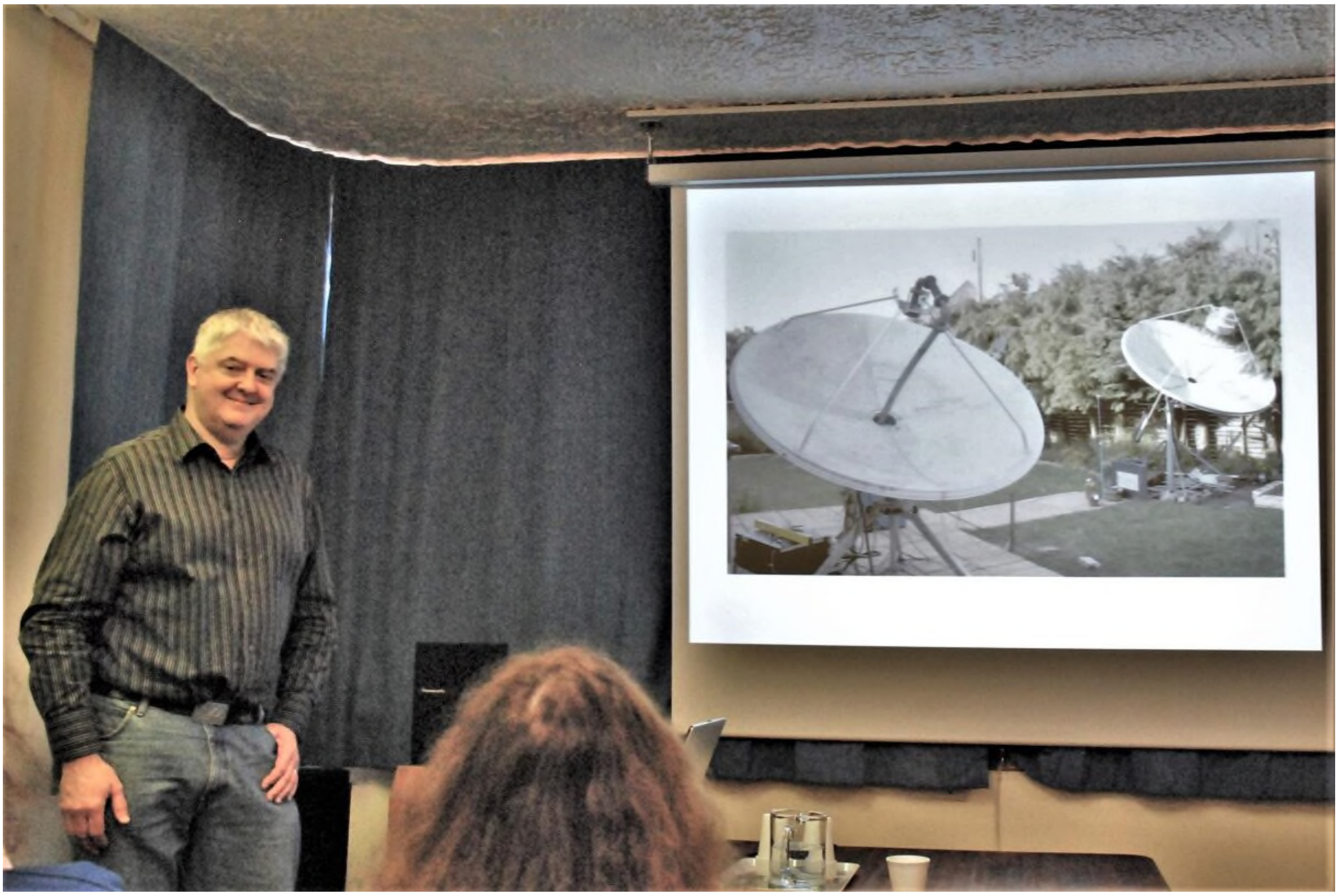
GMRT 2019 Report

The Scottish Microwave Round Table (GMRT) is now well established, and for the 9th year running was held on Saturday 2nd November at its usual venue, the Museum of Communication (MOC) in Burntisland. A record-breaking 53 amateurs attended.

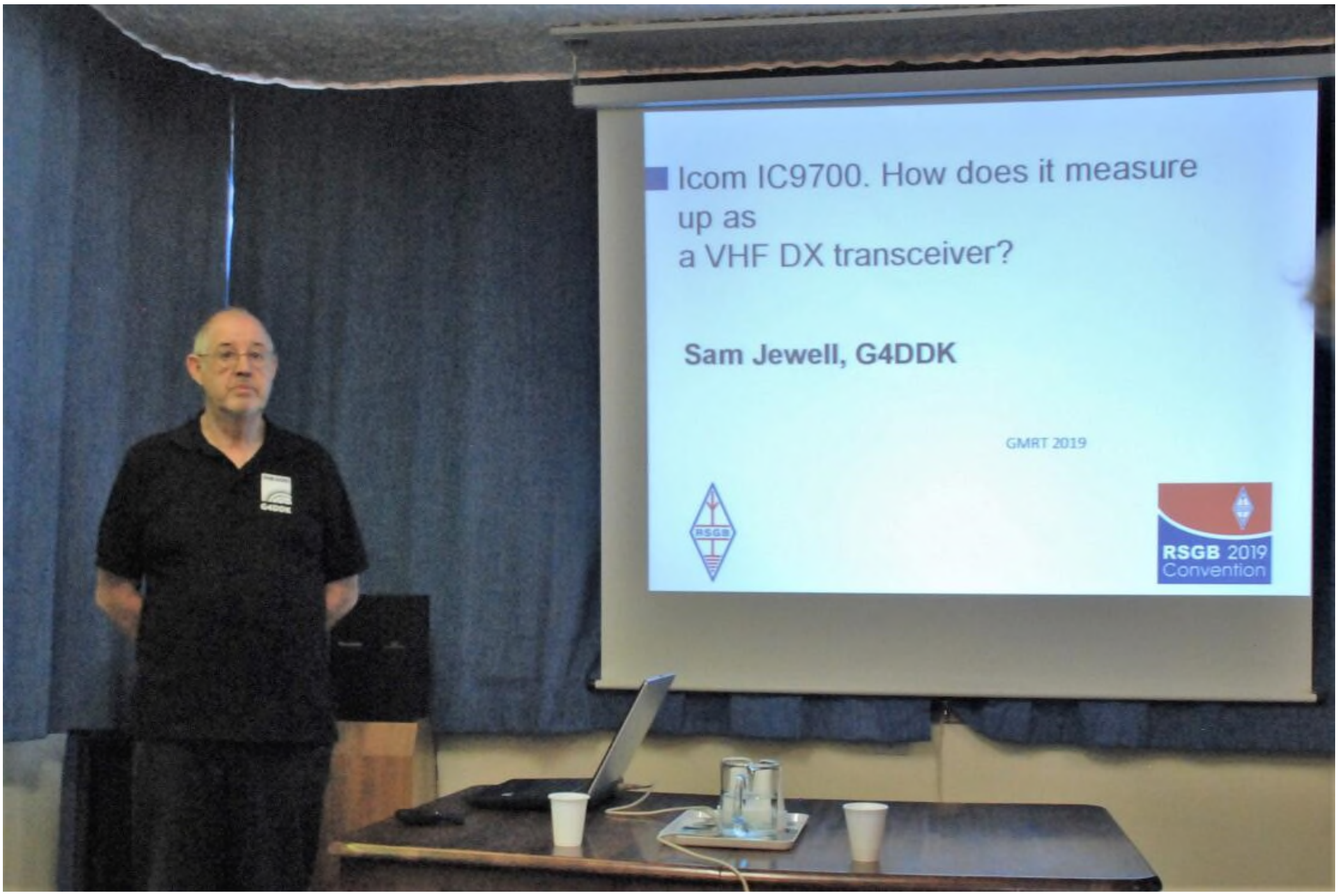
Ten minutes before the official door opening time of 9:30 AM the organisers had everything set up and some attendees were already inside, enjoying welcoming cups of tea and coffee, eagerly looking at the piles of microwave equipment, modules and bits and pieces on the market stalls. The volume of voices steadily increased with more arrivals as old acquaintances were renewed and new faces were associated with names and call-signs.

Right from the start the participants also made good use of the test and measurement facilities provided by Brian Flynn GM8BJF and David Stockton GM4ZNX, and this continued throughout the day in the breaks between presentations.

The proceedings started at 10:30 AM with a welcome to the venue by Professor Tom Stevenson from the MOC. Martin Hall GM8IEM, the UK Microwave Group (UKuG) Scottish representative, then welcomed the participants and acted as chair for the morning session.



Mark Hughes GM4ISM started the presentations with his talk entitled “Microwave EME”, reminding us that Earth-Moon-Earth (“moonbounce”) is good for those who are surrounded by hills or living in remote locations and for whom terrestrial QSOs aren’t easy – for EME you just need to be able to see the sky. The concept of EME seems rather esoteric, yet many well-equipped terrestrial stations have the capability for working worldwide DX on the microwave bands. In a fascinating presentation, Mark guided us through the opportunities and challenges of microwave EME, describing the issues to be tackled and providing practical solutions, covering path loss, equipment requirements, polarisation, Faraday rotation, antenna feeds, Doppler shifts, and best operating times.

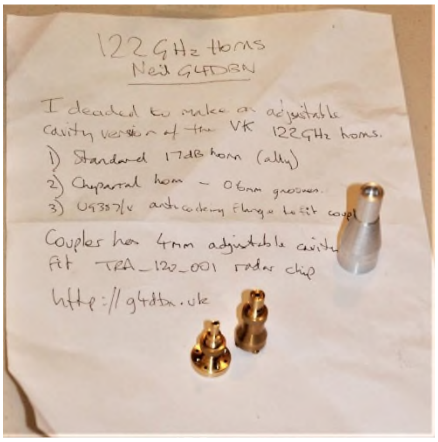


After a short break Sam Jewell G4DDK gave his eagerly anticipated talk on the "Icom IC9700: How does it measure up as a VHF DX Transceiver". This was listened to attentively, since many participants either already own or were thinking of purchasing this transceiver, both for use to drive a transverter and directly on the 144, 432 and 1296 MHz bands. Sam gave a very clear and simple explanation of the architecture and characteristics of the transceiver that are not only important when chasing DX and contesting, but also the implications for other nearby stations. The characteristics described were supported by measurements carried out by Sam and other amateurs. Of particular note was that Sam recommends the injection of a 49.152 MHz signal from a low phase noise reference-locked source to over-ride the internal oscillator to address the radio's frequency stability issues on 1296 MHz when used with weak signal digital modes. These are commercially available either as a kit or complete.

Whilst lunch was being set up in the conference room, attendees assembled in the museum where the entries for the GM4LBV Projects Trophy were displayed. We have come to expect a superb buffet lunch (included in the entrance fee) provided by the MOC volunteers and weren't disappointed! Their efforts are very much appreciated by the attendees.

Andy Sinclair MM0FMF took over as chair for the afternoon session, which started with a talk by Martin Hall GM8IEM in which he described the architecture and system design aspects associated with "Constructing a 13cm (home) station around the Kuhne MKU23 G4 transverter". Martin has made several attempts to build kit for operation on 13cm over the last 40 years, but these were never completed, since "life got in the way". Prompted by talks given at recent GMRTs by John G4BAO, Andy MM0FMF and Jack GM4COX he decided to make a big push to get on the air as quickly as possible with a station based around the MKU23. Martin described his objectives, the architecture of the system, the practical issues addressed whilst designing and building the system (including the use of simple home-built test gear), and the future upgrade path now the system is operating. He also presented his QSOs to date on 13cm from his remote location in IO78HF and gave an update on his 23cm station count.

Another short break followed whilst the next presentation was being set up. The Hayling Project is named in memory of Mike Walters G3JVL and is intended to provide an advanced low cost SDR-based microwave transceiver in the same way that the very successful BATC Portsdown Project has delivered a low cost system for ATV, resulting in a doubling of the membership of the BATC. Heather Lomond M0HMO discussed various radio hardware, processor and software options for this project in her talk entitled “SDRs and Software for (Portable) Microwave Operation” and opened up a discussion in which she asked the audience for alternative ideas for achieving the project objectives. This provided a lively discussion and several useful suggestions for Heather to develop further.



During the afternoon break Roger Blackwell GM4PMK and David Stockton GM4ZNX judged the entries for the GM4LBV Projects Trophy, and the trophy was now presented to the winner Neil Smith G4DBN for his beautifully built 22db conical feed horn and waveguide flange to dish feed horn for 122GHz. The other entries were a microwave signal marker by Tom Melvin GM8MJV, an ADF5355 microwave signal generator covering 54 MHz to 13.6 GHz by Brian Flynn GM8BJF, and a second entry by Neil G4DBN of a QO-100 dish feed (2.4GHz circular patch and dielectric lens to 22mm ID copper waveguide feed to 10GHz LNB mount).

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 a splendid buffet lunch. Andy thanked them thanked for their efforts, and each was awarded a gift to a round of applause from the appreciative audience.

Finally, and looking forward to next year, Andy confirmed that the next GMRT would be held on **Saturday 7 November 2020** - put the date in your diaries now! Anyone willing to make a presentation next year, please contact one of the organisers with details of your proposal.

During the course of the day those present provided updates to the Directory of Scottish Microwave Activity, which also includes stations in nearby areas that can reasonable 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.

Time to chat is an important feature of the leisurely programme of the GMRTs, and as in previous years plenty of time was allocated for this purpose between presentations. However, as usual, it never seems enough, and some participants were still going strong when they had to be ushered out at 1700 so the doors could be closed.

Roger Blackwell GM4PMK running the auction to bring in additional funds for the Museum of Communication.

Many attendees (and some YL/XYLs) moved on to the Kingswood Hotel in the evening for further chat and an excellent meal, followed by an auction of microwave related publications and hardware conducted by Roger GM4PMK which raised £165 for the MOC. Thanks go to those who donated the items for auction – Dubus UK, Dubus Verlag, David GM6BIG, Sam G4DDK, and Brian GM4BJF. 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 08-Nov-19, reviewed by the organising committee.

The date of the next event has been set for 7th November 2020 so those interested in attending can get it into their diaries.
www.gmroundtable.org.uk/

Midland Round Table and ATV Event

Details about the Midlands RT and ATV event for 2019. For those who are new to this it is a small (ish) friendly group of radio enthusiasts all getting together to discuss/make/test/learn/assist all things radio, microwave and ATV.

The Event is on the weekend of 14th/15th December 2019 at Eaton Manor, Shropshire.
https://www.eatonmanor.co.uk/

10am to 5pm on the Saturday, then out on the hills (or indoors if the weather is bad) for operating/testing on the Sunday. If there is sufficient interest we will arrange a table for dinner on the Friday and/or Saturday evenings. Please let us know if you are coming so we can arrange food and tables for dinner: heather@myorangedragon.com 07802 548 938.

As before, the emphasis will be on making, debugging and testing Microwave (and all things radio) projects. There will be a couple of talks during the day and tables set aside for bring and buy but the main focus will be on the large array of test and assembly equipment and, most importantly, lots of expertise on hand to help get your projects up and running. As well as the usual Spectrum Analysers, Power Meters and so on, we will also have SMD rework/assembly facilities, High Altitude Balloon testing, Antenna Testing, DATV systems and a full QO100 SSB and DATV station.

We have reserved one of the Estate's Holiday Cottages to provide accommodation for visitors to the event. All rooms are en-suite, available as double/twin (and possibly triple) beds and will cost £110 per room, for the weekend (Friday and Saturday nights). There may be an option on the Sunday night as well. Guests can arrive from 5pm on Friday and we will be ready to kick stuff off on the Friday evening is people want to start doing things as soon as they arrive. Please contact Eaton Manor on 01694 724 814 to book a room.

The Event itself will cost £10 per person, this covers refreshments and a full cooked lunch on Saturday (which has been superb for the past events we have held) and access to Brown Clee on the Sunday.
Heather

Coming up in January

UKuG MICROWAVE CONTEST CALENDAR 2019

Dates, 2019	Time UTC	Contest name	Certificates
17 -Nov	1000 - 1400	5th Low band 1.3/2.3/3.4GHz	F, P,L
Key:	F	Fixed / home station	
	P	Portable	
	L	Low-power (<10W on 1.3-3.4GHz, <1W on 5.7/10GHz)	

Events calendar

2019

Oct 28-Nov 22	ITU WRC-19, Sharm el-Sheikh	http://rsgb.org/wrc-19
Dec 14-15	Midlands Round Table, Eaton Manor	www.eatonmanor.co.uk

2020

January 11	Heelweg	http://www.pamicrowaves.nl/
February 15	Tagung Dorsten	www.ghz-tagung.de/
April 14	CJ-2020, Seigy	http://cj.r-e-f.org
May 1-17	Hamvention, Dayton	www.hamvention.org/
June 26-28	Ham Radio Friedrichshafen	http://www.hamradio-friedrichshafen.de/
August 20-23	EME 2020 Prague	www.eme2020.cz
September 13-18	European Microwave Week, Utrecht	www.eumweek.com/
October 5-18	Microwave Update, Sterling, Virginia	www.microwaveupdate.org
October 10-16	IARU-R1 General Conference, Novi Sad	www.iaru2020.org
November 7	Scottish Round Table	www.gmroundtable.org.uk/

80m UK Microwavers net

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

73 Martyn Vincent G3UKV