An Amateur Radio publication for the Microwave Enthusiast

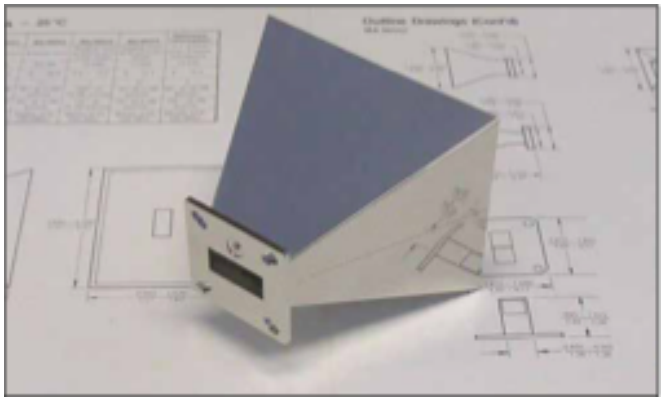
# scatterpoint

April 2018

Published by the UK Microwave Group

## 3D Printed horn antennas

By Gary Hoyland, M1EGI



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| | | | |
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| Roger Ray | Deputy Scatterpoint Editor | G8CUB | |

# WIKI

UKµG wiki - https://wiki.microwavers.org.uk/

## 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/files 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

ukug@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)**

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.

**Martin G8BHC**

## 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.

You may not reproduce articles for profit or other commercial purpose.

You may not publish Scatterpoint on a website or other document server.

# UKµG Project support

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

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

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

- Please apply in advance of your project
- We effectively reimburse costs - cash on results (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 UKuG 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 a component on the site will not be a guarantee of availability of that component.

The service is run as a free benefit to all members and the UK Microwave Group will pick up the cost of packaging and postage, that is, Jiffy bags, small plastic bags for individual component values, and Large letter 2nd class postage, currently 76p.

Minimum quantity of small components supplied is 10.

The service may be withdrawn at the discretion of the committee if abuse such as reselling of components is suspected. We have asked Mike to check with the Chairman (or designated officer) if any individual is making excessive requests, and we will ensure that the service is only available to members.

There is an order form on the website with an address label which will slightly reduce what I have to do in dealing with orders so please could you use it.

Also, as many of the components are from unknown sources, if you have the facility to check the value, particularly unmarked items such as capacitors, do so, and let me know if any items have been mislabelled.

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

# Chairman's thoughts

**Sam Jewell G4DDK**

The AGM on the 14th April at the Martlesham Microwave Round Table returned the existing committee, including yours truly as Group Chairman. I had previously indicated my intentions to stand down and G4BAO had mentioned this in his Radcom GHz Bands column. However I decided against that for the time being. No one had come forward to fill the role and it never looks good when a group are left without a chairperson at the AGM! I will remain until a new chairman is appointed, but not beyond the next AGM.

The General Data Protection Regulations come into force in May and the Group needs to be ready to show we conform to these new regulations. Progress is being made and you will be seeing more about GDPR in Scatterpoint.

One of the highlights of the Martlesham talks was the presentation on SDRs and GNU radio by Heather Lomond. I watched the presentation on the balcony monitor as the presentation room was rather full. It was interesting to see the reaction of the audience. Clearly SDR is something we are going to see a lot more of in the future and the positive reaction of the audience suggests it will be accepted with enthusiasm.

I very much enjoyed the talk on TV by Dave Crump. In fact I have already bought one of the multichannel FPV (first person video) 6cm band receivers and am looking for a suitable LCD monitor.

Likewise the talk on Airscout by John Quarmby and the talk on Digifest by John Worsnop were well attended and much appreciated.

I can't finish without mentioning the excellent entries for the construction contest. It was hard to decide on an overall winner, but once again Mike, G8CUL, had an outstanding entry in his LCD power meter. I hope we will see details in Scatterpoint.

With the visit to the Bawdsey Radar Museum on Saturday afternoon, dinner in the evening and a full Sunday programme of talk, flea market, measurements and construction contest, it was a busy weekend. Next year marks 40 years of MMRT? We'll have to think of something really special!

Maybe our illustrious catering team will be able to produce a 40th anniversary cake to top the programme?

*[It's in hand! It's also the 20th anniversary of UKuG. Ed.]*

**73 de Sam, G4DDK**

# GDPR Interim Statement

1. The Chairman is responsible for GDPR implementation compliance within the Group.
2. Members with be expected to opt-in[1] to allowing the Group to store their name, callsign and e-mail address for the purpose of communicating with members. An opt-in e-mail address will be provided for this purpose. Anyone not opting in will be removed from the contact list within one month of implementation.

   Contact with members will be only by e-mail unless the member gives explicit instructions to use telephone or SMS. This information will be stored with the other details and subject to the same GDPR compliance.
3. This contact list will be for the sole purpose of contact to notify of matters directly related to membership of UKuG, including SP availability. The information will not be disclosed to a third party.
4. The information will be stored on a hard disc or suitable SSD and protected from unauthorised access by firewall and suitable anti key logging protection software.
5. Members will be able to request details of what is stored about them and be able to request that the stored data is either deleted or amended, as appropriate.

1 See page 16 for opt-in request

# Martlesham Microwave Round Table 2018

## Saturday : Visit to Bawdsey Radar Museum

Some of the group who visited Bawdsey Radar Museum.

*Photo by G6JYB*


The refurbished exhibition at Bawdsey Radar Transmitter Block

*Photo by G6JYB*

## Shopping

*Photo by G6JYB*

One for the caption competition?

*Photo by G8BHC*


Mike Scott G3LYP running The Chip Bank

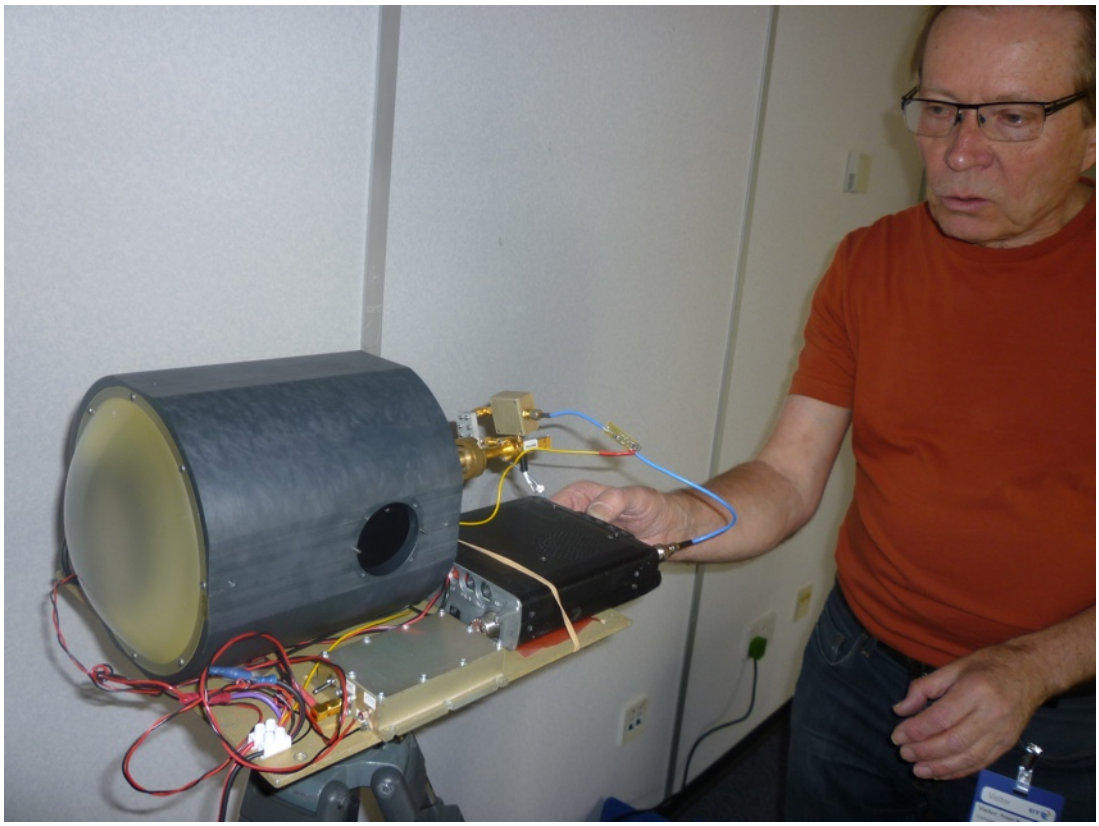
*Photo by G8BHC*


G3NYK checking the competition...

## In the Test Room

*Photo by G6JYB*

## 288GHz



Roger Ray, G8CUB

*Photo by G6JYB*

# Noise Figure Results – MMRT 14-Apr-18

| | | | Tcold = | 295 | | | | |
|---|---|---|---|---|---|---|---|---|
| **Band** | **Callsign** | **System** | **Gain (dB)** | **NF (dB)** | | | | |
| 432 | G3LTF | F5VHX Peamp | 21.82 | 0.37 | | | | |
| | | G3LTF Preamp with SPF5043Z post amp | 43.44 | 0.31 | | | | |
| | | G3LTF preamp nopost amp | 22.87 | 0.31 | | | | |
| 1296 | G4BRK | G4DDK VLNA | 23.27 | 3.11 | | | | |
| 2320 | G3LTF | G4DDK VLNA plus WB5LUA post amp | 42.59 | 0.45 | | | | |
| | G3LTF | G4DDK VLNA no post amp | 24.84 | 0.37 | | | | |
| 3400 | G3LTF | G4DDK VLNA | 26.4 | 0.76 | | | | |
| | G4LDR | G4DDK VLNA | 25.27 | 0.84 | | | | |
| 5760 | G3LTF | G3LTF | 11.43 | 0.80 | | | | |
| | G3LYP | HB receiver | 13.1 | 13.10 | | | | |
| 10368 | G4MVU | DB6NT WG input preamp | 22.06 | 1.52 | | | | |
| | G4MVU | DB6NTB tvtr G4 | 16.2 | 1.73 | | | | |
| | G3LTF | Mod LNB with transitions to N/SMA | 31.8 | 1.40 | | | | |
| 24048 | G0OLX | 24GHz System | 32 | 4.30 | | | | |
| | G8GKQ | 24GHz System | 32.8 | 6.40 | | | | |
| 76GHz | G4LDR | 76GHz System | 37 | ? | | | | |
| | | | | **delta Gain** | **delta NF** | **Cal NF** | | |
| | G3LTF | Noise head plus 10dB pad | 432MHz | 1.01 | -1.05 | 5.45 | | |
| | | | 1296MHz | 0.57 | -0.67 | 5.19 | | |
| | | | 2320MHz | 0.46 | -0.54 | 5.07 | | |
| | | | 3400MHz | 0.31 | -0.17 | 5.03 | | |
| | | | 5760MHz | 1.91 | 0.57 | 5.16 | | |
| | | | 10368MHz | -0.10 | 0.42 | 5.61 | | |
| | | | | **Indicated Gain** | **Indicated NF** | **Delta Gain** | **Delta NF** | **NF Ref.** |
| | G8GKQ | Transverter & Reference Head | 24GHZ | 32.80 | 6.4 | | | |
| | | Paul G8KFW Noise head | 24GHz | 28.12 | 10.94 | 4.68 | 4.54 | 15.3 |
| | | Noel G4GTZ Noise head | 24GHz | 30.73 | 8 | 2.17 | 1.6 | 15.3 |
| | G8ACE | Transverter power measurement | G8ACE | 122255.00 | 2.7 | mW | | |
| | | | | 122400.00 | 3.2 | | | |
| | | | | 122544.00 | 2.04 | | | |
| | | | | 122829.00 | 1.04 | | | |

# UK Microwave Group AGM Minutes 2018

The AGM of the UK Microwave Group took place on 15 April 2018, at the Martlesham Microwave Round Table.

## Minutes 2017

Minutes 2017 (as published in Scatterpoint April 2017) – no comments received.

## Chairman's Report

Sam Jewell introduced his report by thanking the committee for their efforts during the year, including G3XDY for organising the Skype committee meetings and contests, G4BAO for our sound finances, G8DKK as membership secretary, G8CUL/G8NVI as our trophy managers, G3LYP for the component service, G8BHC for Scatterpoint, G4LDR for activity reports, G4SJH for liaison on microwave spectrum issues, and all our other regional members and co-opts. A particular mention was made of Chris GW4DGU who has provided invaluable technical advice but is now moving to a new QTH in Cornwall, so Peter Harston GW4JQP has taken over the reins as GW representative.

Round Tables were held in 2017 at Martlesham, RAL, Finningley, Crawley, and Burnt Island, and the Laugharne rally Carmarthenshire in early 2018 included a Microwave Symposium with 3 talks. Thanks went to all the speakers and those that entered the project competitions. The group also had its usual presence at the RSGB Convention in October 2017.

On the spectrum front, it was noted that Ofcom have recently auctioned the 40MHz of 2.3GHz spectrum removed from the amateur licence, and at the same time auctioned off rights for 5G systems in 3410 to 3600MHz range. The RSGB Spectrum Forum is attended by committee members G6JYB, G4SJH, and G4BAO, giving us a strong voice on spectrum matters.

The Manchester 24GHz beacon hardware has been transferred to Finningley. Progress on two beacon NoVs has been slower than hoped for. A 23cm slotted waveguide antenna purchased for the GB3NGI beacon but found unsuitable has been donated to the NW DATV Group. Beacon keepers need to focus on getting and keeping beacons on air when licensed.

Beaconspot continues to be the premier source of beacon info for microwaves and VHF, however it appears we may have to change the URL at the point we leave the EU.

More use needs to be made of the UKUG twitter account, committee members can post items @UKGHZ

The General Data Protection Regulations come into force in May 2018, the committee is preparing to meet the requirements. Members may have to re – opt in to continue receiving membership benefits such as Scatterpoint. More details will be published when available.

Loan transverter systems are available for 5.7GHz to 76GHz apart from 47GHz, plans are in place to fill the gap.

The chip bank fulfilled 32 postal requests in 2017. Thanks to all that donated components to the bank. A very big thanks to Mike G3LYP for all his hard work running the chip bank.

Hopefully more radio amateurs will discover the joys of operating on the higher bands as noise continues to pollute HF and increasingly VHF, whilst declining solar activity makes life more difficult on HF.

New techniques will enable us to better exploit the amateur radio microwave spectrum.

## Treasurer's Report – John Worsnop G4BAO

Group funds increased by ~5% for a sub income of £3361

The Group donated £500 to YOTA 2017

The Group donated £1051 to the GB3NGI beacon group.

Of this, the unused antenna was donated to the GB3FT ATV repeater

We supported beaconspot.eu paying the web fees.

Chipbank made £20 from donations this year, justifying its continuation as a free service. Big thanks again to Mike G3LYP for running it!

On next year's accounts we received a donation of £60 from the GB3FT repeater group.

Despite the treasurer's best efforts we still have too much money sitting in the accounts, so no subscription increase is proposed this year.

Thanks to Graham Philips G0KRB for again examining the accounts free of charge.

We are STILL looking for projects to fund, but more importantly **people to carry out such projects**!… put forward your ideas to the Treasurer or at this AGM

Ideas proposed this year

- G3UKV proposes a Midlands 10GHz beacon – The UKuG would financially support this project but a group is needed to come forward to make it happen
- G8GTZ proposes that the Group make a 47GHz loan system and has volunteered to build it.
- G4BAO would like to see second 76 and 24GHz systems so the loanees have a QSO partner.
- Volunteers please step forward with a plan and costings for these ideas to the UKuG Committee.

**UK Microwave Group Accounts** **2017**

**Covering period 01/Jan/2017 to 31/Dec/2017**

| Item | Income | Expenditure | Balance | Notes |
|---|---|---|---|---|
| **Opening C/A+PayPal +Deposit + petty cash balance 01/Jan/16** | | | **21519.30** | |
| Subscriptions | **£3,299.12** | | | |
| Chipbank donations | **£53.45** | | | |
| Interest | **£8.76** | | | |
| PayPal fees | | **£153.18** | | |
| RSGB Afilliation | | **£47.00** | | |
| Websites (inc beaconspot) | | **£142.65** | | |
| Beacon Support | | **£1,152.51** | | |
| Trophies | | **£178.63** | | |
| Chipbank Expenses | | **£33.00** | | |
| Donation to RSGB YOTA 2017 | | **£500.00** | | |
| Loan equipment insurance | | | | |
| **Sub-totals excluding transfers** | **£3,361.33** | **£2,206.97** | | |
| **Closing C/A+PayPal +Deposit + petty cash balance 31st Dec 2017** | | | **£22,673.66** | |

**J C Worsnop G4BAO**
**Treasurer**

## Membership – Bryan Harber G8DKK

**(presented by John Worsnop G4BAO in his absence)**

### 2017/18 Membership Stats

| 2017: | 2018: |
|---|---|
| 479 Members | 518 Members (4/2018) |
| 55 New Members (calendar year 2016) | 74 New members (Calendar 2017) |
| 18 New Members (January to April 2017) | 19 New Members (January to April 2018) |
| Yahoo Scatterpoint | Yahoo Scatterpoint |
| 493 members subscribed | 503 members subscribed |
| 22 pending | 84% members pay by PayPal |

### Scatterpoint Transition to Groups.io

In October 2017 Murray migrated the Yahoo groups/Scatterpoint membership to groups.io/Scatterpoint. Members with more than one ID were removed. Members with bouncing or defunct email addresses were removed. Subsequently, 30 members have requested a change to their groups.io ID

## Election of Officers & Committee

The committee members are all willing to stand again for re-election. No further nominations had been received by the secretary or from the floor at the meeting. The existing officers and committee were therefore re-elected en bloc.

The current committee is now:

| | | |
|---|---|---|
| Chairman | Sam Jewell | G4DDK |
| Treasurer | John Worsnop | G4BAO |
| Secretary | John Quarmby | G3XDY |
| Membership Secretary | Bryan Harber | G8DKK |
| Activity News Column | Neil Underwood | G4LDR |
| Beacon Coordinator | Denis Stanton | G0OLX |
| Web Master | Murray Niman | G6JYB |
| Contests/Awards | John Quarmby | G3XDY |
| 24GHz and Up | Barry Chambers | G8AGN |
| | Graham Murchie | G4FSG |

**Corresponding Members**

| | | |
|---|---|---|
| USA Liaison | Kent Britain | WA5VJB/G8EMY |
| Northern Ireland | Gordon Curry | GI6ATZ |
| Scotland | Martin Hall | GM8IEM |
| Wales | Peter Harston | GW4JQP |
| ATV | Noel Matthews | G8GTZ |
| Beaconspot | Robin Lucas | G8APZ |
| Trophies Manager | Mike & Ann Stevens | G8CUL/G8NVI |
| Scatterpoint Editor | Martin Richmond-Hardy | G8BHC |

## Contests & Awards

The high bands championship (5.7 and 10GHz) showed a good increase in entries, up 60 and 30%.

The Low Band events (1.3/2.3/3.4GHz) showed a 15% drop in overall entries but a 20% increase on 2.3GHz.

The mmwave events continued to be well supported, with 11 entries in the 2017 mm-wave championship, with 7 more entries on 24GHz and two more stations on 47GHz.

No major rule changes have been made for 2018.

G4BAO received the 100 squares award on 1.3GHz (#3), G4NBS reached the 85 squares mark on the same band, and G8PNN achieved 40 squares on 2.3GHz.

Downloadable contest certificates are still work in progress.

### Awards

| | |
|---|---|
| G3BNL: | Not awarded |
| G3EEZ: | Not awarded |
| Fraser Shepherd Award: | To Dave Powis, G4HUP (SK)[1]. |
| G4EAT Memorial Trophy (1.3GHz) | John Lemay G4ZTR |
| G3KEU Trophy (5.7GHz) | Telford & DARS G(P)3ZME/P |
| G3JMB Trophy (10GHz) | Combe Gibberlets M0HNA/P |
| G3RPE Trophy (10GHz) | Telford & DARS G(P)3ZME/P |
| G0RRJ Trophy (24GHz) | Roger Ray G8CUB/P |
| 24GHz Trophy | Neil Underwood G4LDR/P |
| 47GHz Trophy | Keith Winnard GW3TKH/P |
| G3VVB Project Competition Award | Iain Crawford VK5ZD for his 76/134GHz transverter |

1 Received at the RSGB AGM on 21 April by retiring Chairman Graham Murchie G4FSG on behalf of Dave's family.

## Trophies

**Mike Stevens G8CUL/M0CUL/F4VRB**

The G3BNL trophy has not been award for the last 2 years and the G3EEZ trophy not this year either.

These trophies are intended for progress in specific fields:–

- For the G3BNL trophy "For innovation or technical development of microwave equipment or techniques"
- For the G3EEZ trophy "For Contributions to Microwave Communications"

The committee is unaware of notable progress during 2017/2018 in these 2 categories but this may be because we don't know about it rather than there hasn't been any!

It is important therefore that you let someone on the committee know about the work and progress you are making in the microwave field. You never know, in future years *you* could be the recipient of one of these trophies!

G4EAT Memorial Trophy (1.3GHz) being awarded to John Lemay, G4ZTR

*Photo by Mike Stevens G8CUL*

47GHz Trophy being awarded to Keith Winnard, GW3TKH

*Photo by Mike Stevens G8CUL*

## G3VVE Project Competition

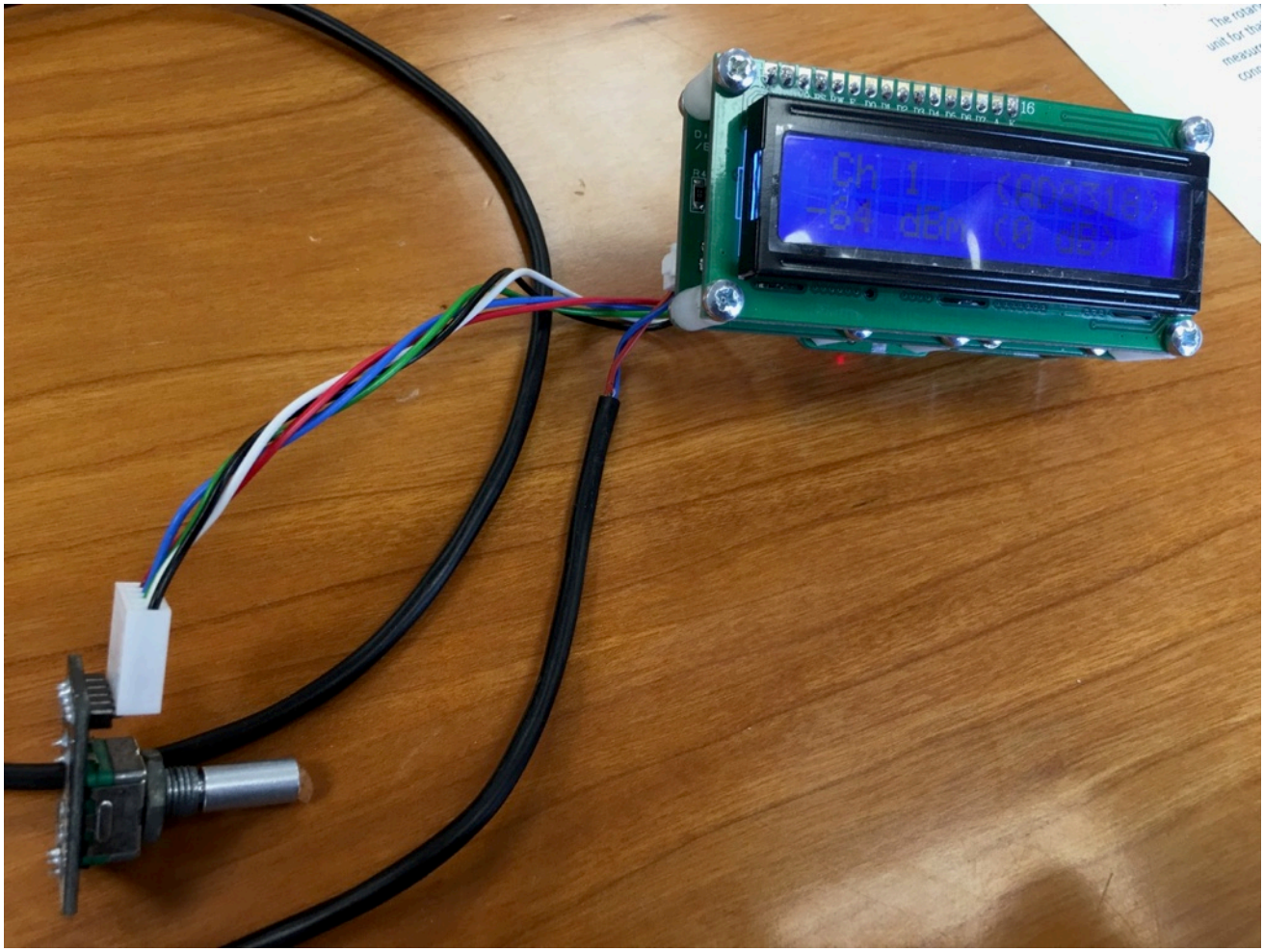
Round 1 of the G3VVE Project Competition was held at the MMRT with a tremendous 11 entries!

These were –

| Callsign | Name | Entry |
|---|---|---|
| PA7JB | John Lambo | 9cm Circular Septum Feedhorn |
| M0HMO/G8AQA | Heather Lomond & Paul Nickalls | Contester SDR Spectrum Analyser |
| G3LYP | Mike Scott | Simple 5.7GHz Receiver |
| WA5VJB | Kent Britain | 6cm Transverter, free running LO |
| WA5VJB | Kent Britain | Pipe cap based Oscillators |
| G4LDR | Neil Underwood | 76GHz Transverter |
| GW3TKH | Keith Winnard | GB3AMU 24GHz Beacon Oscillator |
| G4HIZ | Jeff Easdown | PIC controlled RF Marker Gen |
| G8CUL | Mike Stevens | Multi head Power meter |
| G8HAJ | Graham Sharples | Hellschreiber Beacon |
| G8ACE | John Hazell | 122GHz sub harmonic mixer RX |

The winner, by a very short margin, was Mike Stevens G8CUL with his Multihead Power Meter.

The next round will be held at the RAL roundtable on 17th June.




Low power RF Power Meter by Mike Stevens G8CUL

# Low Power RF Power Meter

**Mike Stevens G8CUL**

This small unit measures RF power in the range of DC to 10GHz over the range -78 to +17 dBm (depending on RF heads fitted). The RF head, display and rotary encoder are all bought from China (at good prices!). The board in the middle reads an analogue voltage from an RF head and converts it to dBm or Watts for display. The rotary encoder is used for configuration such as display units (dBm or Watts), which channel to use, attenuator values etc.

Calibration is achieved by using a calibrated signal generator and connecting a PC running a terminal emulator (hyperterm, Putty etc) and then entering simple commands on the PC.

The calibration and configuration values are subsequently held in non-volatile memory.

Up to 2 different RF heads can be fitted at the same time from the list shown below.

| RF Head | Stated Frequency Range | Upper Frequency Limit within ± 1dB | Typical power measurement range |
|---|---|---|---|
| AD8307 | DC to 500MHz | ~180MHz | -75 to +17 dBm |
| AD8310 | DC to 440MHz | ~140MHz | -78 to +17 dBm |
| AD8317 | 1MHz to 10GHz | ~1.9GHz | -53 to -3 dBm |
| AD8318 | 1MHz to 8GHz | ~1.5GHz | -58 to -1 dBm |

The rotary encoder is used to select which RF head is used on which channel. Once calibrated, the calibration parameters are tied to the RF head not the channel so in theory any of the RF heads can be connected to either measurement channel. Once a particular device is calibrated the calibration is stored in the power meter and will be used for that device, irrespective of the channel it is connected to. In a way, the calibration parameters will 'follow' that particular RF head around, regardless of which channel it is connected to.

The rotary encoder is also used to select which channel is currently in use, the measurement unit for that channel (either dBm or Watts), an attenuator setting in dB (this value is added to the measured reading so the display will indicate the power level at the input of an attenuator connected to the input of the RF head in use) and the device in use on that channel.

From the measurement screen, a short press on the encoder shaft will enter the configuration menu, with further short presses moving through the menu options. While in a configuration screen the rotary encoder is used to move through the options for that screen. A long press (> 2 seconds) will exit the configuration menu back to the measurement screen.

# GDPR – IMPORTANT

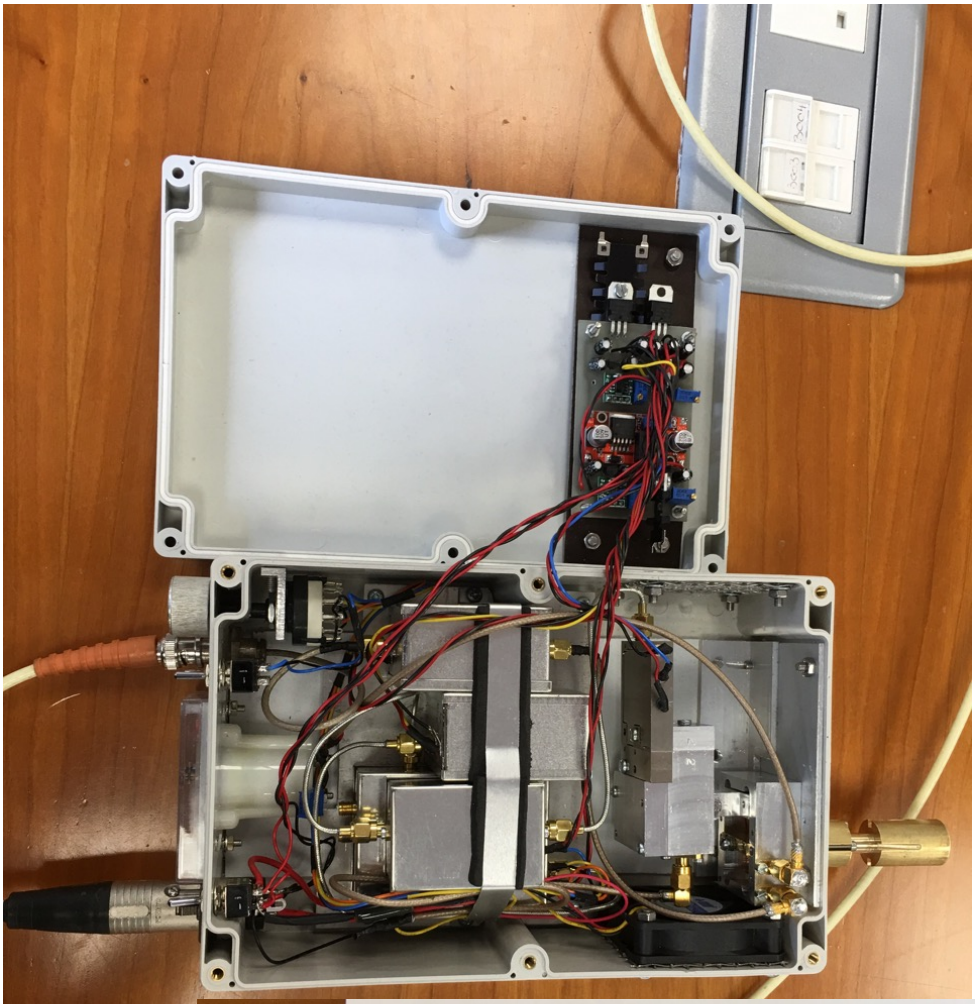
*GDPR[1] requires us to have your approval to store your membership details (name, callsign, email, joining/renewal date).* ***b email me by clicking this link to give (or withdraw) your approval.*** *A simple Yes or No will do – but please include your callsign.*

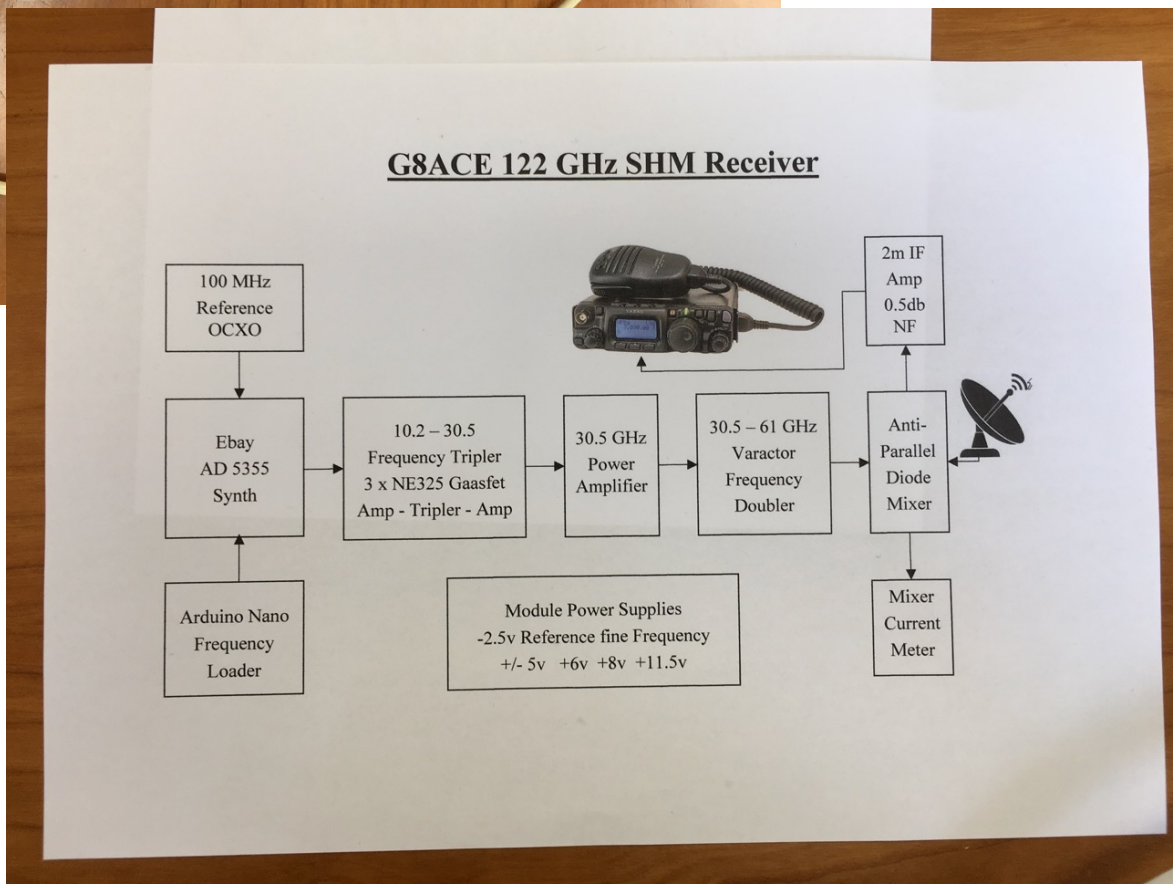
*Thank you to the three people who responded last month!*

**73 Martin G8BHC**

[1] See Page 5

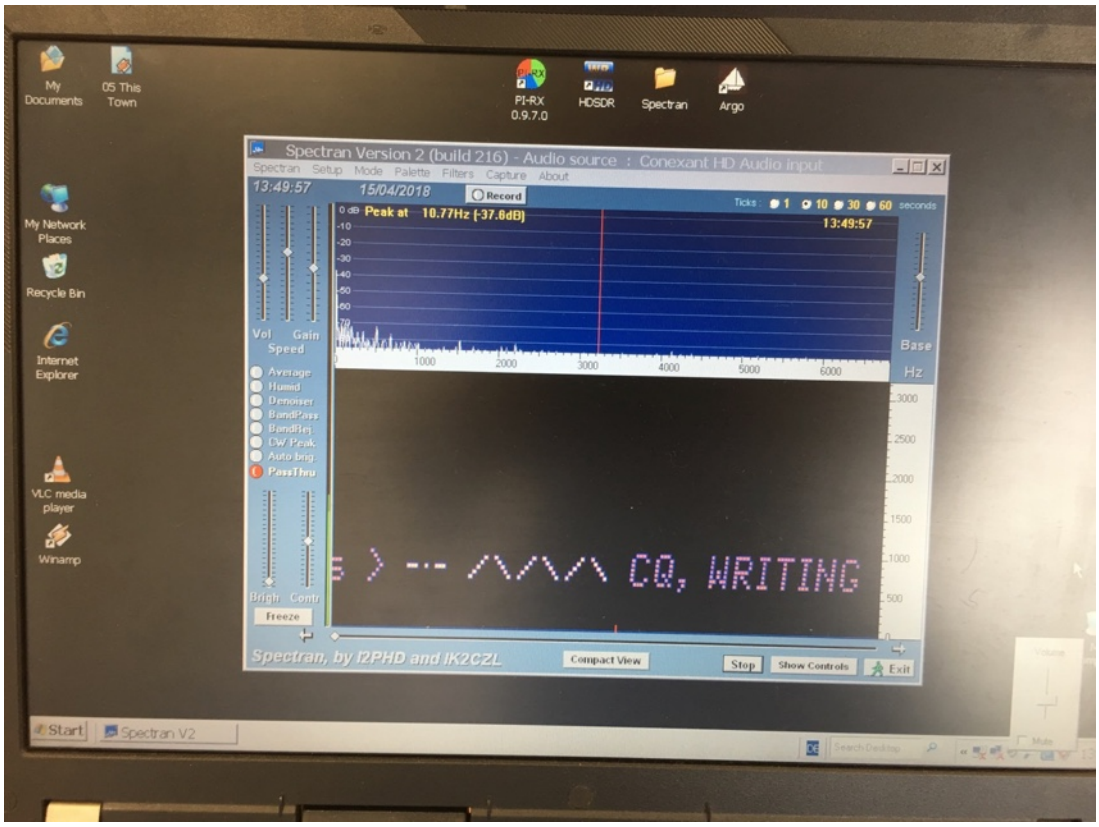
# Some of the other Construction Competition Entries






3.4GHz Septum dish feed for EME
by John Lambo PA7JB


A simple 5.7GHz Receiver
by Mike Scott G3LYP




Hellschreiber Beacon Software Project by Graham G8HAJ
Writing direct to a waterfall beacon + RS232 text input

A handy microwave signal generator by Jeff Easdown G4HIZ

See article on page 20.

# A Handy Signal Generator for 10GHz (and other frequencies)

**Jeff Easdown G4HIZ**

One of the factors not often appreciated about the ADF4351 is the harmonic content of the RF output. Essentially, it tries to be a square-wave, although when you get to the higher frequencies, the harmonics are starting to tail-off a bit. The clone evaluation boards available online which use FR4 (fibreglass) substrates don't help the higher frequencies.

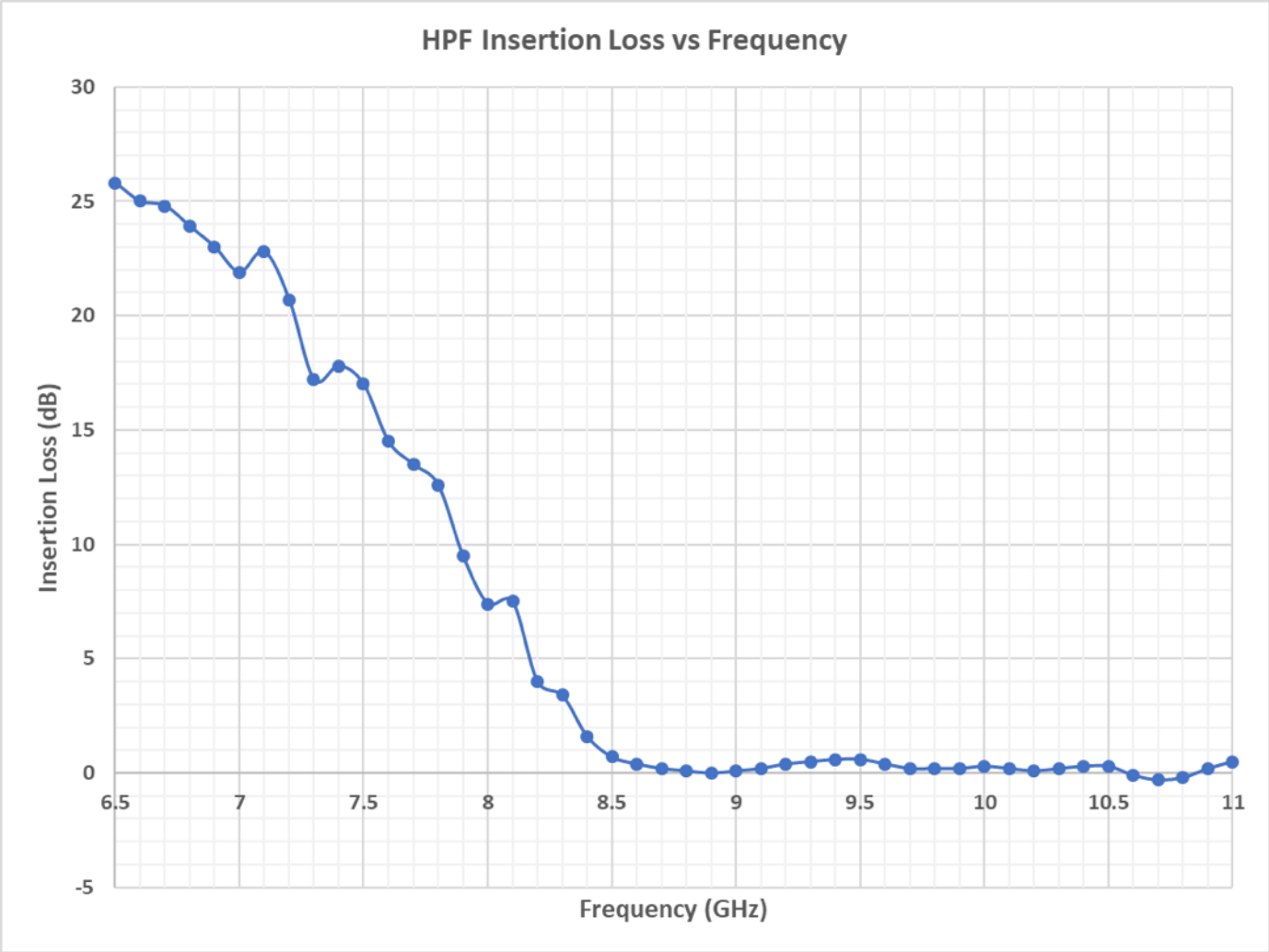
In order to see what I could get at 10GHz, I looked at the third harmonic output of a suitable carrier. The levels that I found were as below:

| | |
|---|---|
| Fundamental frequency (3456.03333MHz) | 4dBm |
| 2nd harmonic (6912.06666MHz) | -28dBm |
| 3rd harmonic (10368.1MHz) | -26dBm |
| Higher harmonics not seen. | |

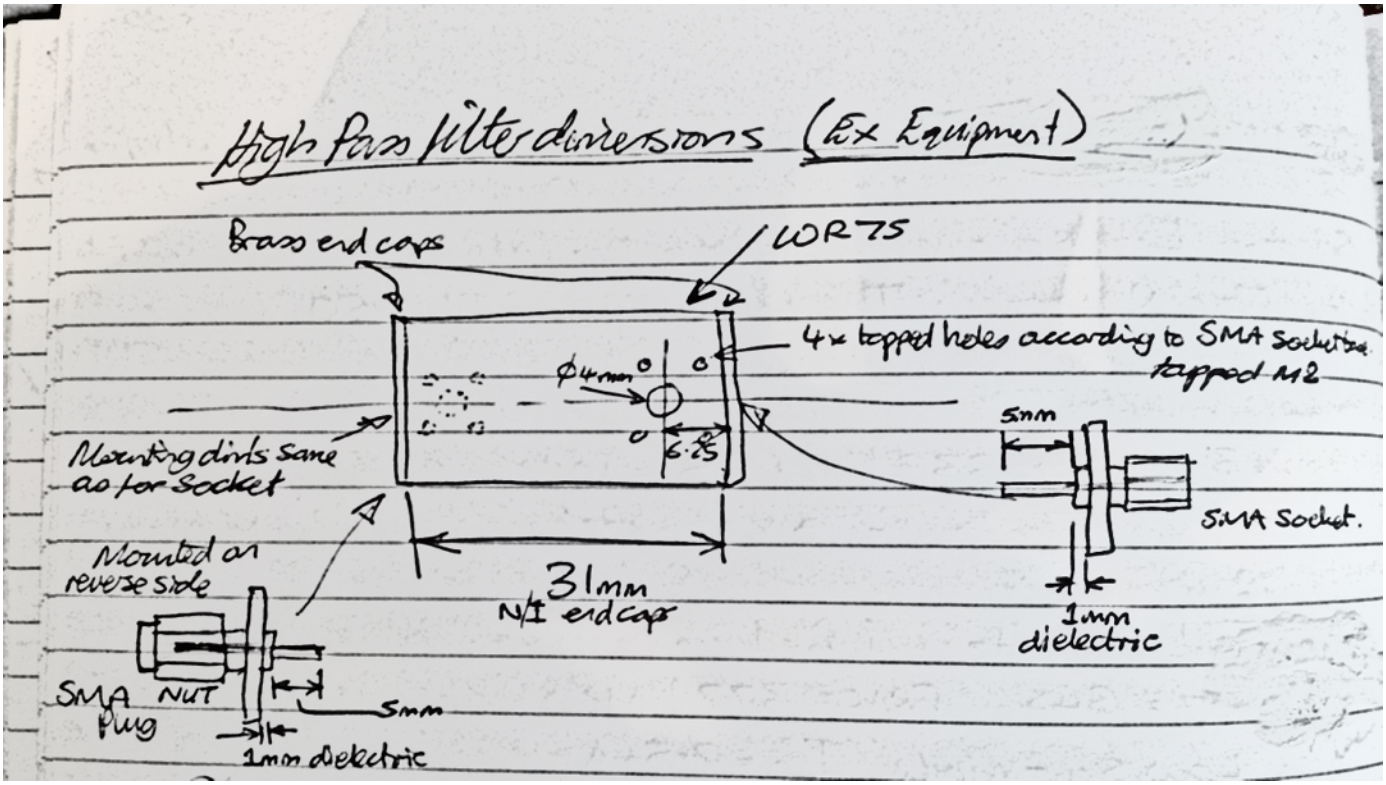
I thought that I may try to increase the 10GHz output a little and placed a dual (back to back) Schottky diode across the RF output of the board, type BAT54S. The effect of this was to change the levels to: fundamental 0dBm, 2nd harmonic -22dBm, 3rd harmonic -24dBm. I decided to keep this arrangement due to the slight increase at 10GHz, which for a marker source can be considered as very high in any case.

To see what the harmonic content was for a lower frequency, the board was programmed to produce 100MHz output and significant harmonics could be seen to more than 8GHz !

Returning to 10GHz, the next thought was, can a High Pass Filter help clean up the output a bit? I had available a very nice (and simple) ex-equipment HPF made from a short section of WR75, with input/output coupling via SMAs. The measured frequency response of the filter was as below.



Using this filter, the output levels were: fundamental -58dBm, 2nd harmonic -39dBm, 3rd harmonic -26dBm. It was decided that this was a useful addition. See below for a sketch of the HPF construction.




HPF construction.

The next thing to consider was the on-board frequency reference. I decided to change this for a high stability 10MHz TCXO with frequency adjustment capability. This would help to get a reliable and calibratable output frequency. The unit chosen was the IQD LFTVXO009912 (obtained from Farnell), with a claimed stability of +/- 0.5ppm, which can be used as a drop-in replacement for the original. After a 2 to 3 minute warm-up, the drift at 10GHz was hardly noticeable. To calibrate the frequency, I generated a 3456MHz output and measured the frequency using a Rubidium locked counter and adjusted the reference accordingly.

The other thing that I considered was the PLL loop filter, having designed a number of PLLs. Bearing in mind that the original AD evaluation board was probably designed to suit a particular requirement, I modified the filter such that a wider range of loop operating conditions could be tried by altering the Phase Detector output current. This current was programmable over a wide range for the ADF4351 and directly influences the loop bandwidth. Now, messing about with surface mount resistors and capacitors is not everybody's idea of fun and it was not strictly necessary, but it did provide a useful degree of extra tweaking capability. By adjusting the loop bandwidth, it was possible to reduce the impact of spurs (unwanted spurious outputs), whilst maintaining the best possible Phase Noise.

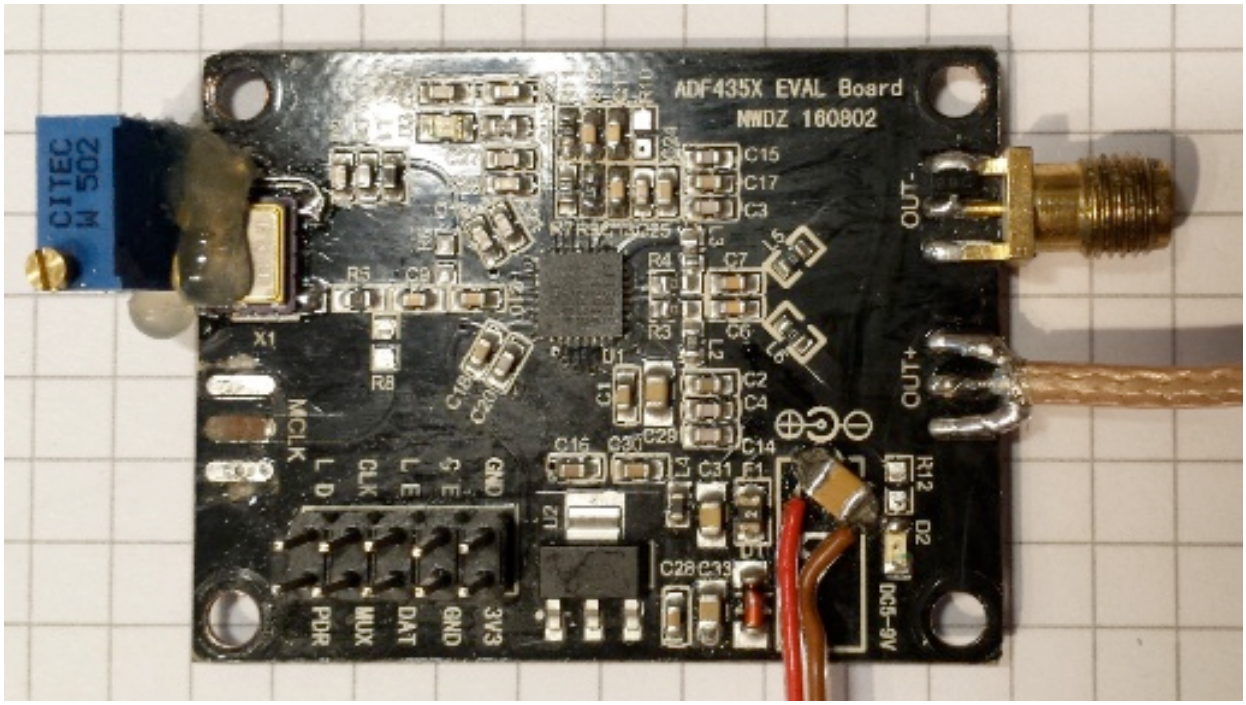
Having mentioned the word spurs, it is worth pointing out that the ADF4351 has two fundamental operating PLL modes: Integer-N and Fractional-N. In simple terms, a Fractional-N PLL changes the frequency divider value part way through a division, resulting in a fractional division. This has the useful attribute of allowing smaller frequency steps to be obtained than the Phase Detector input frequency, whereas for an Integer-N PLL, steps are limited to this frequency. For example, a 1MHz phase detector frequency would allow 1MHz steps in an integer-N PLL, but 244Hz steps for a Fractional-N PLL such as the ADF4351. Great, you may say, but the downside is that a Fractional-N PLL can produce intrusive frequency spurs. A trick can be employed to try and reduce the spur amplitudes (Low Spur Mode) but this is not completely effective and can significantly increase the Phase Noise near the carrier.

It can be seen that there is plenty of scope for experimentation with Fractional/Integer-N PLLs, to trade-off the purity of the output versus the frequency steps. In this case, the decision was made to use as large a step as possible, with the possibility of smaller steps with degraded spur performance if required.

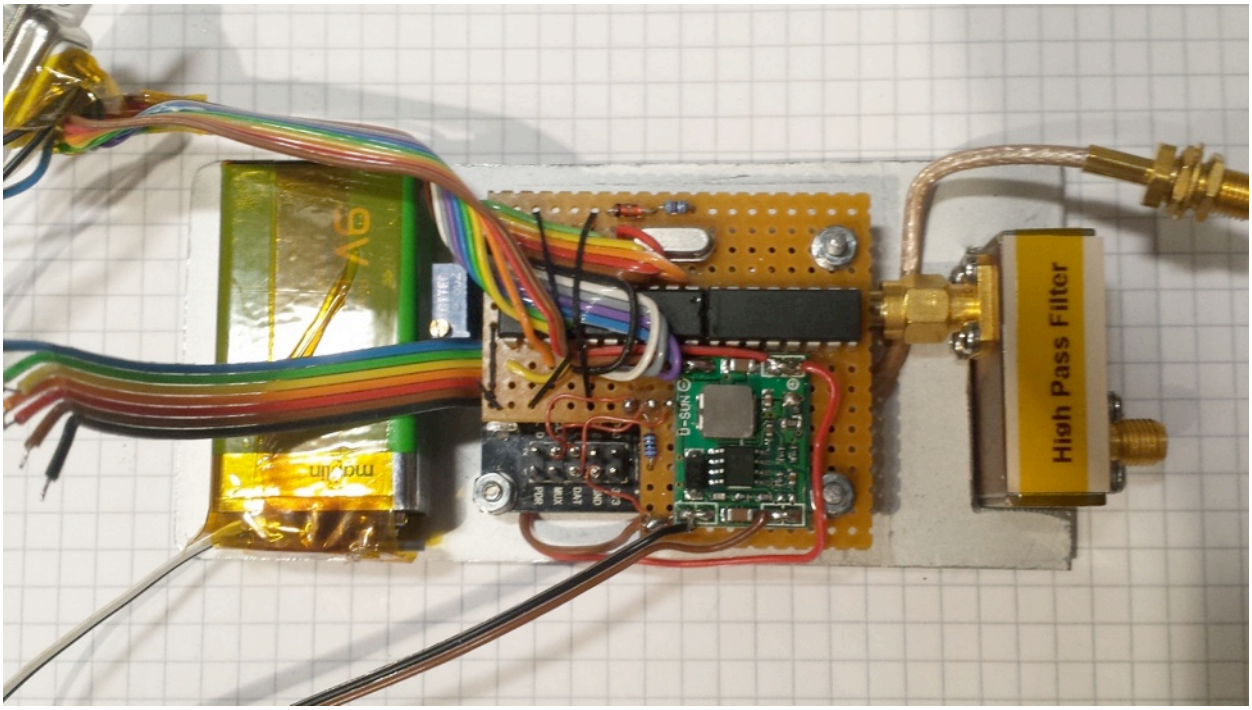
In the end, as happens with many projects of this type, it grew quickly ! So from a requirement for a simple marker at 10GHz, it developed into a full-blown signal generator covering roughly 35MHz to 13.2GHz. The

basic ADF4351 board was incorporated into a small case with a PIC16F690 microcontroller, which had In-Circuit Serial Programming brought out to a connector, thus allowing the PIC to be reprogrammed at any time. An on-board rechargeable NiMH battery was used together with a small DC/DC converter to reduce the effective current demand of the synthesiser (around 120mA) as presented to the battery (down to about 60mA, including PIC). A switch allows the selection of pre-set frequencies covering 70MHz to 10GHz. In addition, an RS232 interface was provided for future remote-control development. And lastly, all available spare port pins of the PIC were brought out via a connector to allow simple interfacing of control/display, with the aim to produce variability of frequency. For RF output, one output of the board was used for fundamental output, whereas the other was fed via the HPF and used according to the filter characteristic, mainly for 10GHz.

Some photos of the unit development and results can be seen below.



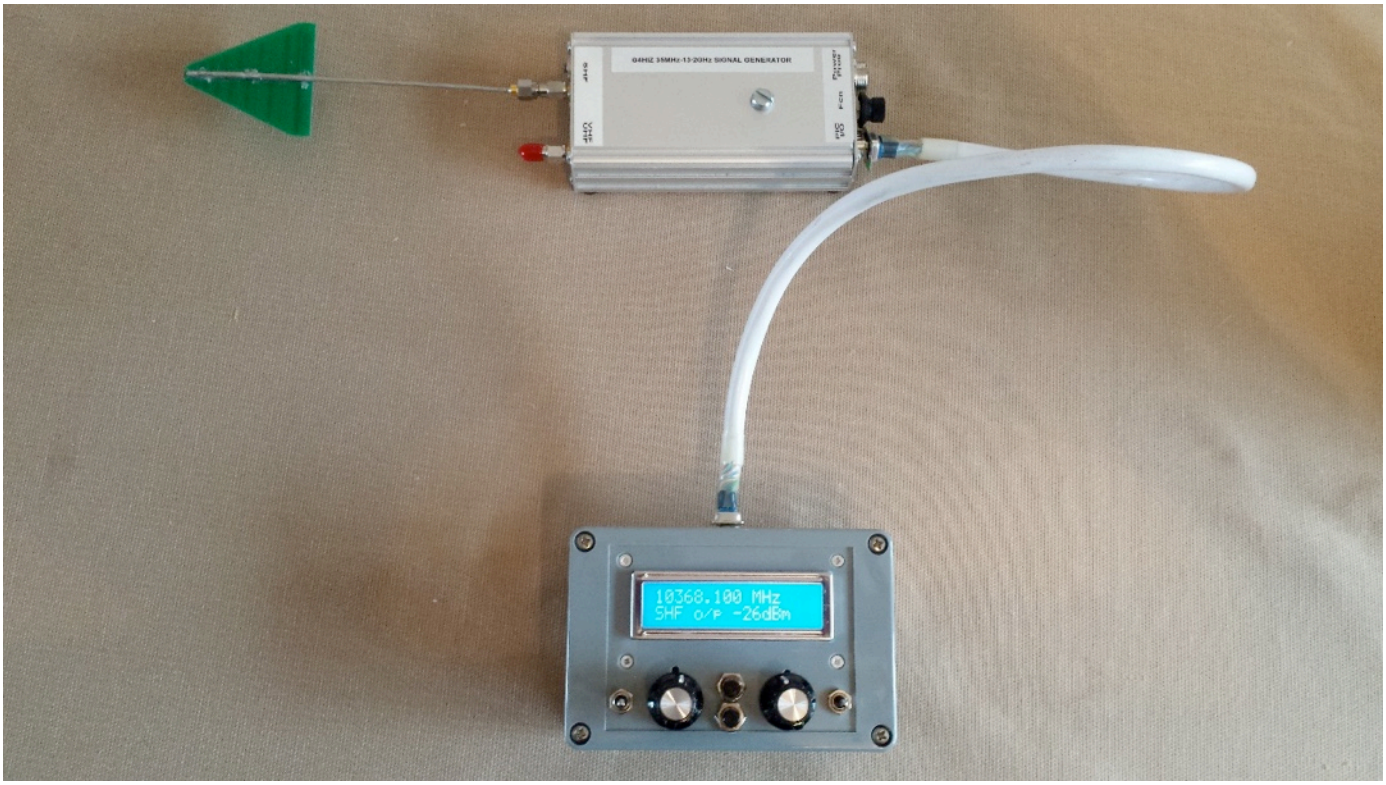

ADF4351 evaluation board as used, with modifications.



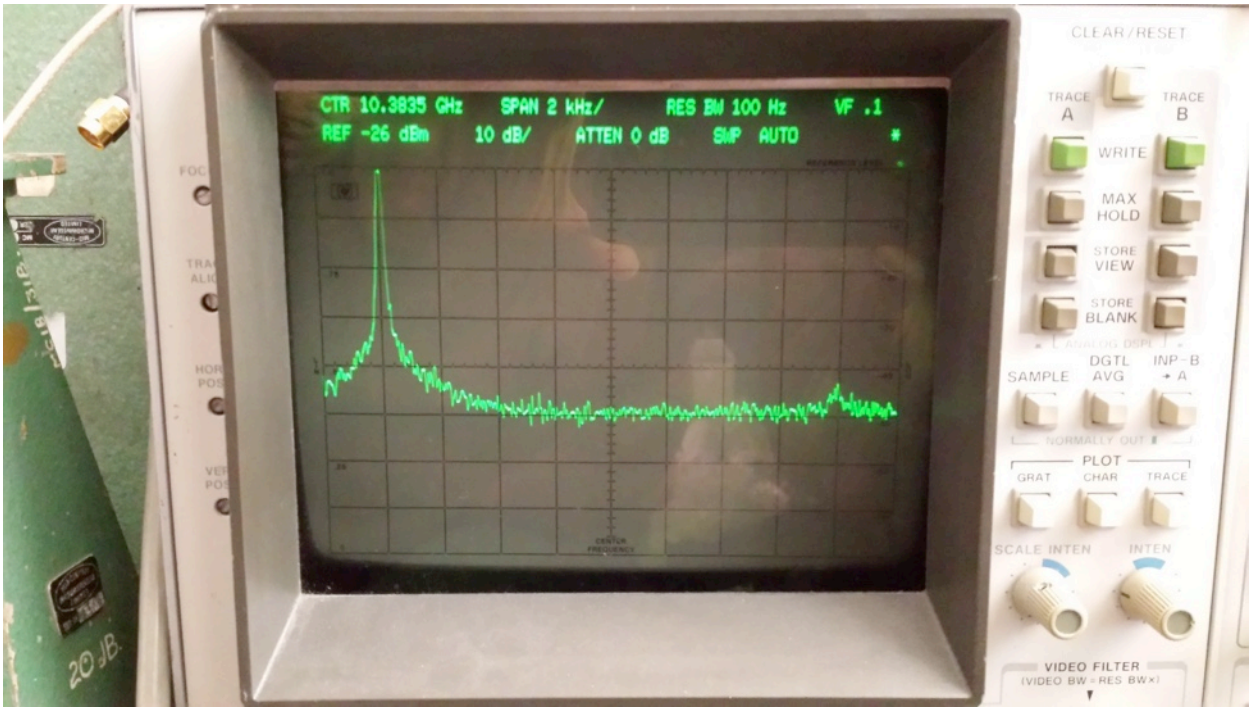

Prior to final integration.


Completed Signal Generator, rear end view.

In use in hand-held mode, using a WA5VJB 2-11GHz antenna for 10GHz output.




In use with control/display unit attached.




Typical 10GHz output (using a Fractional-N PLL). The bump on the right is a smoothed spur.

Finally, the pot for frequency reference adjustment was panel mounted. The SMA connector has the BAT54S mounted directly onto it. The coax connection for the other RF output did not seem to unduly affect the output levels.

## Conclusion

The completed Signal Generator provided useful outputs for markers at amateur band frequencies from 70MHz to 10GHz. It also provided a useful test-bed for experimentation with Fractional/Integer-N PLL synthesisers.

# 3D Printed horn antennas

**Gary Whittaker, M1EGI – from CQ-TV 259 – Spring 2018**

At the beginning of 2017 I started at a new place of work, and within a very short space of time I had soon made friends with a colleague (Dave Fox) who had an interest in 3D printing and was also looking into injection moulding and CNC, this turned out to be a great two-way relationship as I don't have those facilities, and he required help with the electronics side of things... perfect!

Initially my thoughts were to getting some slotted waveguides machined, as I didn't really have a use for 3D printing at the time.

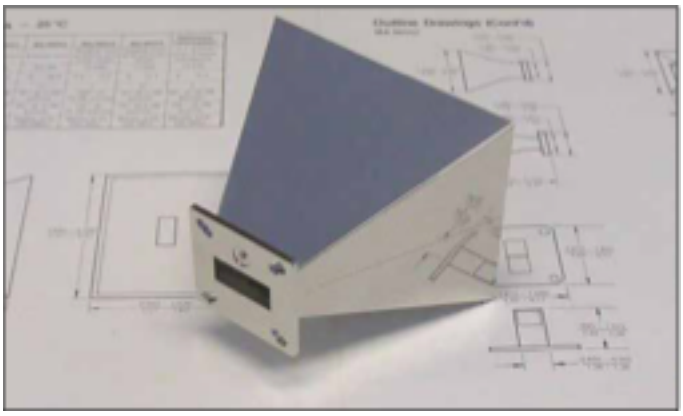
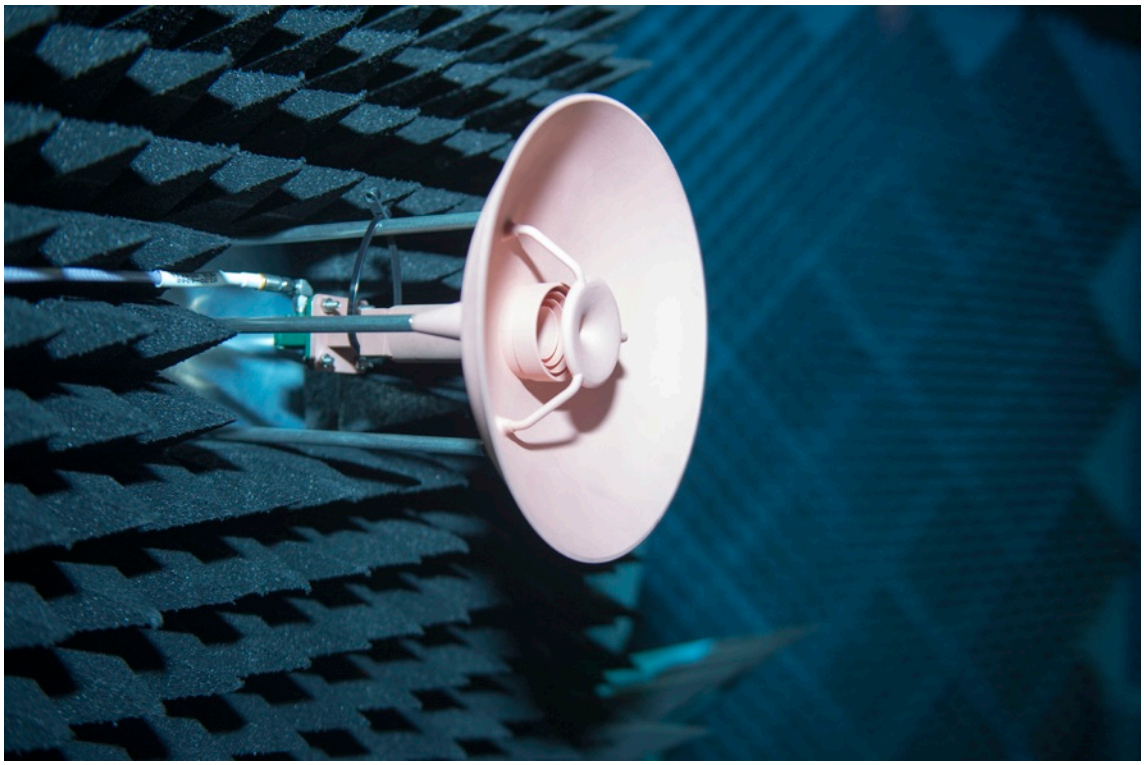


Figure 1: 17dbi metallised ABS 10GHz horn

But then, one day it struck me that I had bought several X-band horns which are moulded ABS plastic! These have a base plating of copper and finished in bright nickel plating with a quoted gain of 17dBi.

This got me thinking, wouldn't it be great if we could use 3D printing as a method to produce horns for 10GHz and 24GHz or even higher! Anything which could help the bands become more accessible the better.

So the next question has 3D printing antennas been done before? A quick internet search resulted in an article about the European Space Agency 3D printing a Cassegrain dish with integrated corrugated feed horn as a "single piece of polymer" and then copper plated



http://www.esa.int/spaceinimages/Images/2016/03/3D-printed_antenna .

Well if it's a good enough process for space, then it should be adequate enough for amateur radio use!

So now my thoughts turned to having to create a design/file suitable for the 3D printing process. After a quick look around at free CAD software, I decided to use the cloud based "TinkerCAD"[1] which seemed ideal as I found it very easy to use with a short learning curve.

Initially I started to design a conical horn for 10GHz as this was easiest to design with my lack of experience of the CAD software, then I realised that having to create a waveguide transition might be getting a little ahead of my new found skills...

It was at this stage I had remembered about online repository for other peoples 3D creations/designs and had a look around.Within a very short space of time I had not only found a suitable design with a file to download, but it also had a neat "customizer" function whereby the designer (rdklein) had entered formulas from

http://www.ece.mcmaster.ca/faculty/nikolova/antenna_ dload/current_lectures/L18_Horns.pdf

and you can simply select waveguide for the band of interest along with waveguide & horn length.

After creating a small selection of horns for 10 & 24GHz with even a unit that might be of use on 47GHz with WG20 flange, the files were downloaded and handed to Dave for printing. Over the following week I was handed several horns in various materials all with impressive results!

Now it was time to think about the next step, which is effectively going from a plastic model to a metalised part that could be pushed into service.After a short chat to Dave explaining the theory of operation and how it needed to be conductive, we discussed what filaments were available which are conductive.These all seemed to be relatively high resistance when compared to copper, for example – this is when Dave pointed out that filament is available with up to 80% copper loaded – worth a go...

At the time when Dave ordered a sample length of the copper-loaded filament to test with, only 40% loaded were available, unfortunately. Better than nothing for the experiment...

The result was a horn which certainly weighed more; it felt more robust in the hand, after a quick test with a Ohm meter showed open circuit. So time to read up to see if the 80% variant would be conductive, the results indicated that this too reads open circuit to an Ohm meter.

Over this short period of time I had been taking these samples to the radio club (Finningley) and discussing the progress with Kevin G3AAF, who kindly offered to conduct some basic tests on the 24GHz horns to see if they showed any sign of being functional – none of them did.

By the time the microwave roundtable had come around, Kevin had fitted some self adhesive copper strips to see if that would make it perform and the results were poor.

After getting the horns on the antenna test range at the roundtable, it confirmed that these indeed were not performing very well as antennas. Kevin, Martin G7CKX and I had a discussion about this and Martin made a suggestion of trying conductive nickel paint to see if this would be the key to get them working.

Later on at the same event, I happened to get chatting to Barry G8AGN about the project and he filled me with confidence that not only was it worth pursuing, but he felt that this approach could yield results on 47GHz and maybe even 76GHz bands if a suitable low resistance coating could be applied.

## Results from FRT-17 test range:

- 17dbi metallised ABS 10GHz horn (Fig1) – 17.4dbi
- 3D printed 10GHz horn (RHS of Fig3) – 8.7dbi
- 3D printed 24GHz small horn (Fig3) – 7.8dbi
- 3D printed 24GHz large horn (Fig3) – 9.3dbi

Figure 3 : 3D printed horns

1 https://www.tinkercad.com

Spurred on by the conversations I had at FRT17, I set about investigating 3D printing in 100% metal using a process is called “direct laser metal sintering” and after narrowing down a short-list of companies I submitted the relevant files to receive a quote for 3 prototypes.The cost was over £2000! Not amateur friendly, Needless to say I didn’t pursue this further.

Shortly after the roundtable,Rob M0DTSTweeted (18/7/18) a picture of a 3D printed lens inspired by what he had seen at Finningley!

The 3D print had around the same gain (~36db) as a Flann lens at 134GHz!!!Very exciting times...

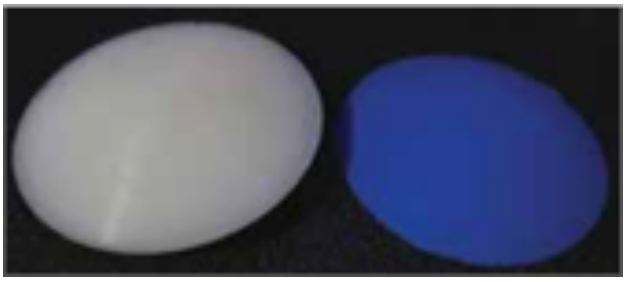


Fig. 4 taken from Rob’s tweet,
Flann lens on the left, 3D print to the right.

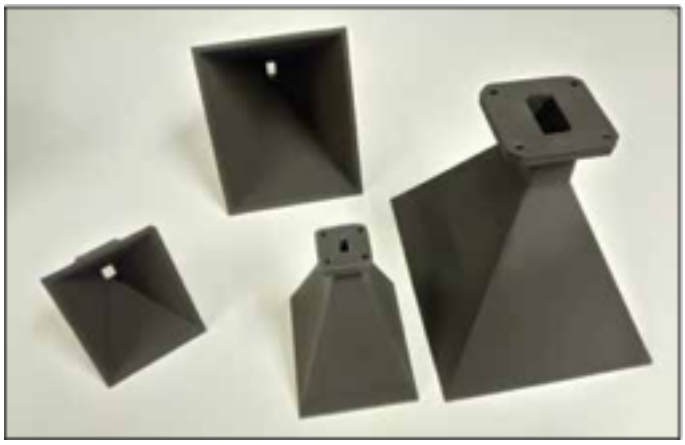


Figure 5

The next step was spraying a small selection of the prints with nickel conductive paint (TBA ECP 552) the results can be seen in Fig. 5, these would have to wait till CAT17 to see if any improvements would be seen.

Around this time I became aware via my Twitter feed of a fellow amateur in America (N4IP@ibelings) was also experimenting with 3D printing horns,“Tested it to be within 0.2 dB of the $1000 Narda die cast aluminium version” Pieter has used both nickel conductive paint along with silver coated copper conductive paint.

One of Pieter’s tweets stated “nickel vs silver didn’t show any difference at 10GHz for me, but did at 24GHz. but, not a lot. Would use again.”

This all sounds very promising!

So after presenting the same three samples to the test range at CAT-17, which had now been sprayed with the nickel paint, all three now showed signs of gain!

- 3D printed 10GHz horn (RHS of Fig3) – 16.5dBi (very close results to Fig. 1)
- 3D printed 24GHz small horn (Fig3) – 13.3dBi
- 3D printed 24GHz large horn (Fig3) – 14.8dBi

As you can see from the results, this is now showing to have some real potential!

### Discussions at the antenna test range – CAT17

Whilst at CAT17, I was talking with Malcolm G0UHY, who mentioned he had a copy of QEX (Sep/Oct 2016) which had an article about 3D printed horn antennas. Malcolm kindly offered to lend me the magazine which made for an interesting read, again the evidence points towards this having real potential for low volume production of antennas.

## Conclusion

Whilst my results weren't quite as expected, the evidence is that 3D printing could have some real potential!

After some discussion recently with Dave about this project, the next step should be to copy the dimensions of both a 10 and 24GHz horn antenna I have in my collection, get a copy printed, and then set about doing a side-by-side comparison.

The reason for this is that I have not checked the dimensions for the horns generated by Thingiverse! By creating identical copies of existing horns it should be easier to compare performance between metal and 3D printed metallised horns.

It would be great to have readily available horns off the shelf for 10-47GHz

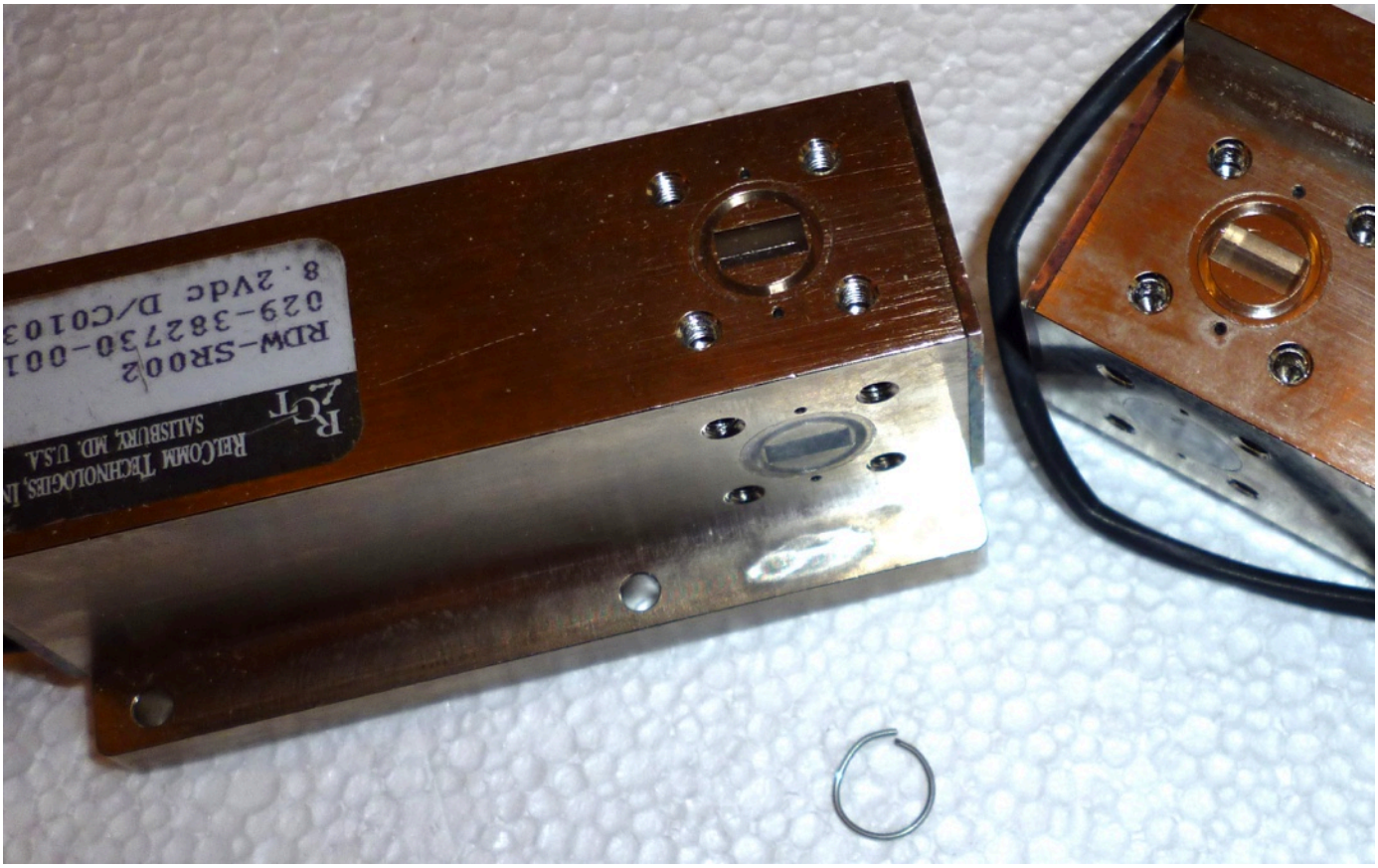

## Wanted

Toshiba BA2074C or BA2075C 24GHz PA module or anything similar or useable.

Please contact Gus G3ZEZ at gus.kestrel84@talktalk.net or 01255 425965.

# Bodging WG22/WR28 switches for 24GHz

**Kent Britain G8EMY/W5**




These RelCom waveguide WG22/WR28 switches have been popular since they first hit the surplus market a few years ago. But there have been issues with high loss at 24 and 47 GHz. A few sweeps on my 8510 and I could see the notch around 24 GHz. The units are spec'd for 26-40 GHz, so 24 and 47 are outside their design range.

Well, the 24 GHz loss is sort of a notch and about the only resonate structure is the choke ring. Putting a wire ring in the choke ring and moving it's resonate frequency greatly reducing 24 GHz losses. We haven't tested this at 47 GHz as yet, but it would be harmonically related to 24 GHz. It might also be possible to fill the ring with Silicon rubber and move the resonate frequency down. My thanks to AA5C and W5LUA for their help. Experiments continue.

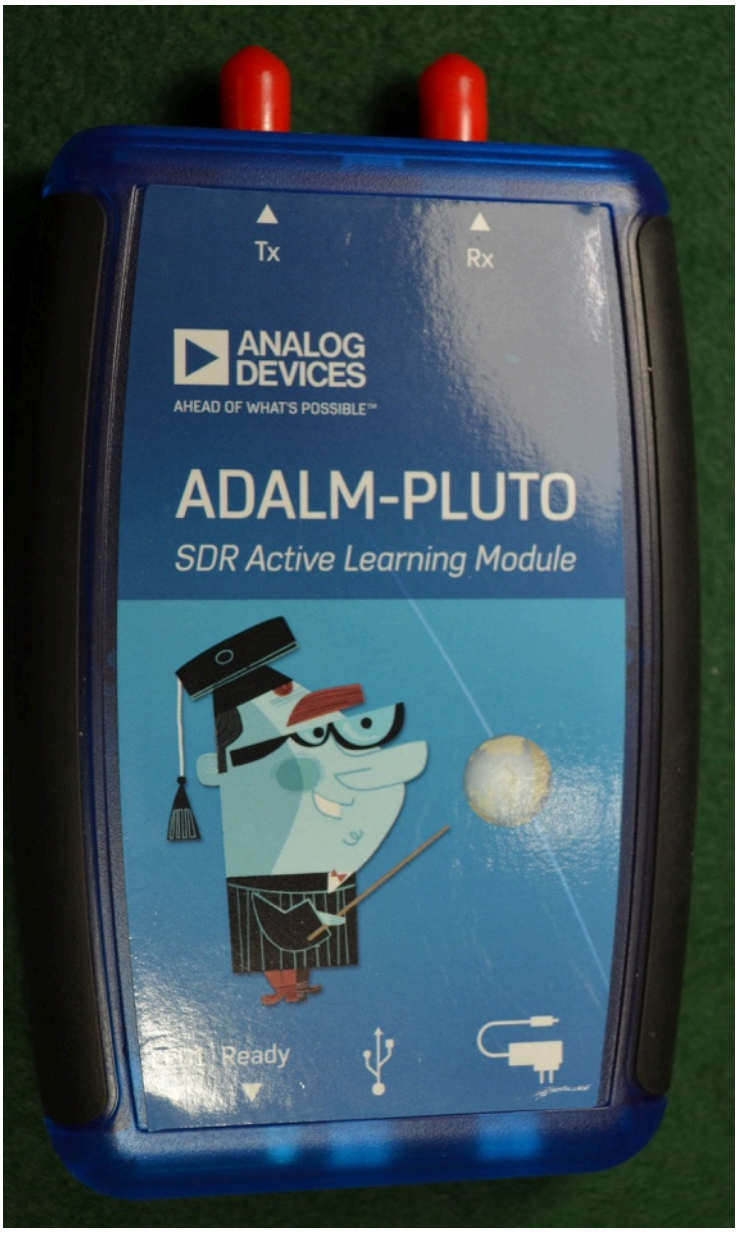
**Footnote from G4BAO**

The Wiki reference [1] describes how the choke flange works.

1. https://en.m.wikipedia.org/wiki/Waveguide_flange

# ADALM-PLUTO

**Charles Brain G4GUO**




The ADALM-PLUTO is a low cost Software Defined Radio (SDR) manufactured by Analog Devices. It is aimed at students and self learners. Currently it is being sold on special offer for $99 from the likes of Digikey. The first batch of radios sold out in less than 4 days. More are being manufactured.

Out of the box it covers a frequency range from 325 MHz to 3.8 GHz. With a slight software modification that frequency range can be extended to 48 MHz to 6 GHz on transmit and 70 MHz to 6 GHz on receive. The extended range is not guaranteed though.

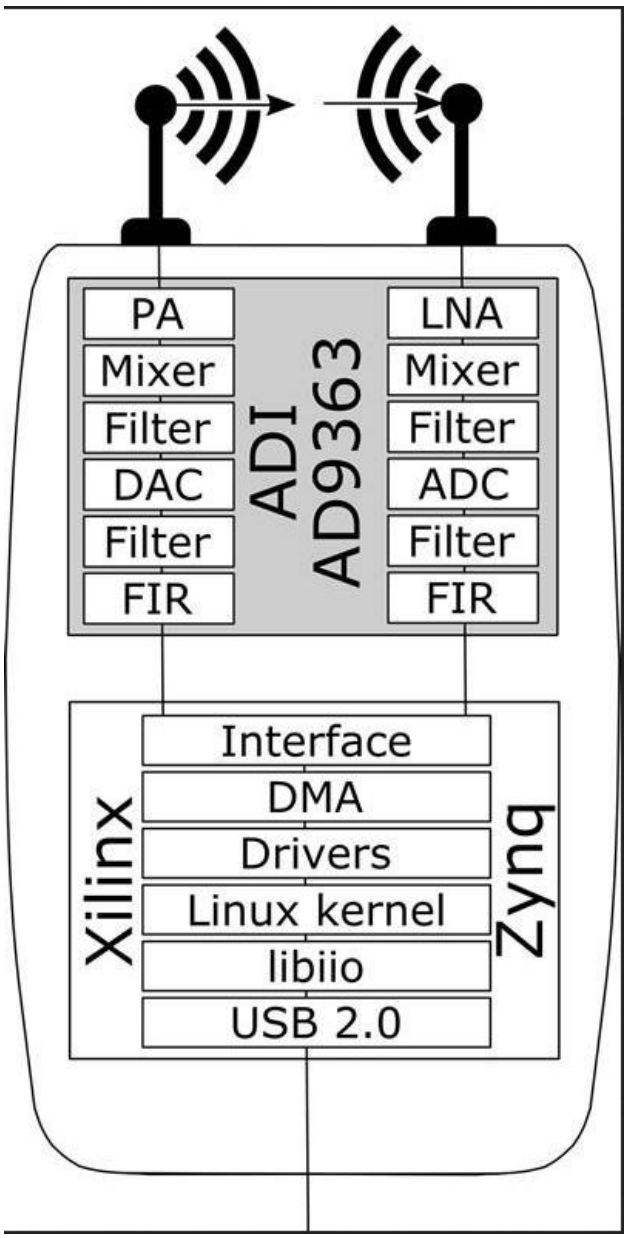
The device consists of an AD9363 integrated transceiver which is the economy version of a range of chips collectively referred to by Analog Devices as the RadioVerse.  As well as the transceiver chip there is also a Xilinx Zynq chip Z-7010. The Zynq consists of dual ARM Cortex A9 cores (although only one core is used in this design) and 28K of programmable ARTIX-7 FPGA logic. The interface to the PC uses a Microchip USB3320C-EZK  USB2 PHY. See illustration 1 for an overview of the Pluto. The Pluto itself runs kernel version 4.6.0. Although it is a Linux device you don't need to understand Linux to use it.

Libiio is the interface Analog Devices chose to use to talk to the Pluto. IIO stands for Industrial Input Output. After the drivers have been installed the Pluto when plugged in provides a number of interfaces to the host. It provides a network connection and a USB device as well as a file system. The interface that DATV-Express uses is the network connection which has a default address of 192.168.2.1.

Currently the main issue with the Pluto is that it only seems to handle 4 Million samples per second, the USB2 interface is capable of over twice that rate, more about that later. Currently the Windows Express program only uses the transmit path.

Looking at the transmit path, the DATV-Express software outputs IQ data at the symbol rate these symbols make their way to the FIR filter block in illustration 1, this Finite Impulse Response filter (FIR) interpolates the symbols by 4 and also gives them the classic Root Raised Cosine (RRC) filter shape.  So for every symbol that goes into the filter 4 filtered samples come out. The filter is 128 taps in size. The next block in the transmit chain is called in the illustration a Filter, this is in fact 3 halfband filters. Halfband filters are special filters that magically set every other coefficient in the filter to zero. The zero coefficients have no effect on the output signal so don't have to be implemented. This makes the filters very efficient for their size. In fact there is nothing magical about the filters it just happens that when set it to half the bandwidth every other coefficient becomes zero. These filters also interpolate the samples further. The aim is to interpolate the samples up to around 320 Million samples per second which is the rate the DAC operates at.

Illustration 1




Fortunately for us libiio works out the required interpolation rates to get the DAC sample rate into the correct range. The DAC is driven by a 715 MHz – 1430 MHz PLL which is divided to achieve the actual DAC clock.

The DAC itself is only 12 bits in precision, the lack of precision causes rounding errors which appears as noise in the output of the DAC. This noise is spread almost evenly across the entire bandwidth of the DAC. If we now use an analogue filter after the DAC we reduce the bandwidth of the signal and therefore the amount of noise in the wanted bandwidth. So all this interpolation means our DAC performs as if it had many more bits of precision. The analogue filter is the block in the illustration that appears just before the mixer. The analogue filter also removes the aliasing of the baseband signal that appears around the sample rate. The DAC is effectively a mixer it is mixing the baseband signal with a series of harmonics of the sampling frequency and that is the reason an anti alias filter is needed. Outside of the AD9363 in the FPGA fabric of the Zynq device is another optional x8 interpolation, this allows a minimum symbol rate of 65K. The AD9363 itself only allows rates down to  521 K.

A similar operation applies to the receive side but the interpolation is replaced by decimation.

We have now covered the digital portion of the chip next for the analogue. The output of the DACs go to programmable low pass filter then to an IQ mixer. The output of the mixer then goes to the PA. Analog Devices quote an output of around 7 dBm. I have not been able to get more than 1 dBm out of the device.

The design is based on the direct conversion principal and that causes a number of issues. The big advantage is that the design is simple and because there are no intermediate mixing stages the burden of filtering is reduced. All components are not perfect and in our case this can produce Local Oscillator (LO) leakage through the mixer and both phase and gain errors in the IQ channels. The leakage can be due to both a DC offset in the mixer/ DAC or lack of isolation in the mixer itself. This appears as a carrier in the centre of the transmit band.  The gain and phase errors will appear as poor suppression of the unwanted side-band. Analog Devices mitigate these problems by carrying out a calibration routine. At device start-up baseband errors are reduced through base band calibration, this is a one off operation. There is a further RF calibration that also runs. In auto mode the RF calibration will run every-time the AD9363 changes in frequency by more than 100 MHz.

Now that we have covered the basics of the Pluto we can go on to describe what the DATV-Express Windows application brings to the party. The program is basically the same for both the Express hardware and the Pluto. To support the Pluto I had to add support for the iio interface I also had to add a module to create and download the RRC FIR filter into the AD9363. I also had to add code to generate a DVB-S IQ stream, fortunately I already had DVB-T modulator code in the program and all the routines I needed were already in that code. I also added a hardware abstraction layer so the program could support many different radios in the future. As well as the support for Pluto it also now supports a FMCOMMS4 card and Zedboard, Zedboard is a Zynq 7020 development board and the FMCOMMS4 board is a development board from Analog devices that contains the big brother of the AD9363 the AD9364. This combination of boards supports a Gigabit Ethernet interface so will work at higher symbol rates than the Pluto will. However it currently does not have the x8 interpolation filter that the Pluto has so will not work at low symbol rates.

As a point of interest the Pluto software is built upon the now discontinued Avnet PicoZed SDR.

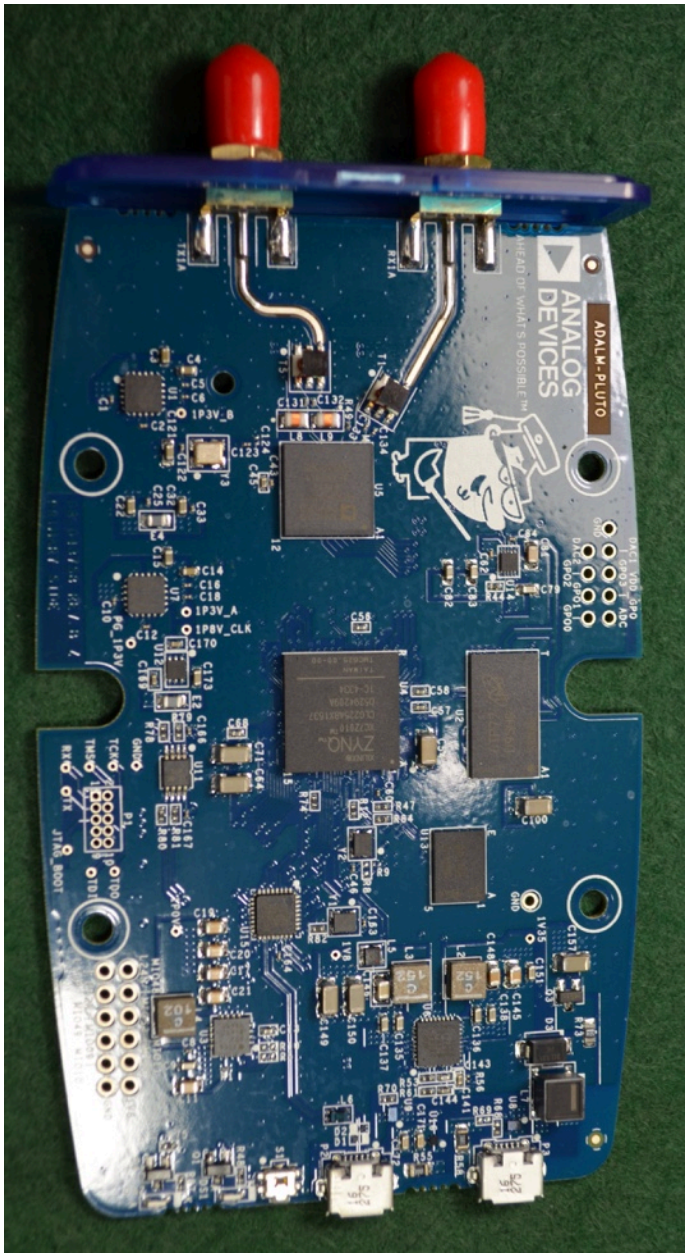
While the USB2 interface of the Pluto is limited to just over 4 MS/s of transfer with no samples dropped it is possible to see 56 MHz of spectrum with device once the frequency modification has been done. The samples are not continuous but that is not needed for a waterfall display.

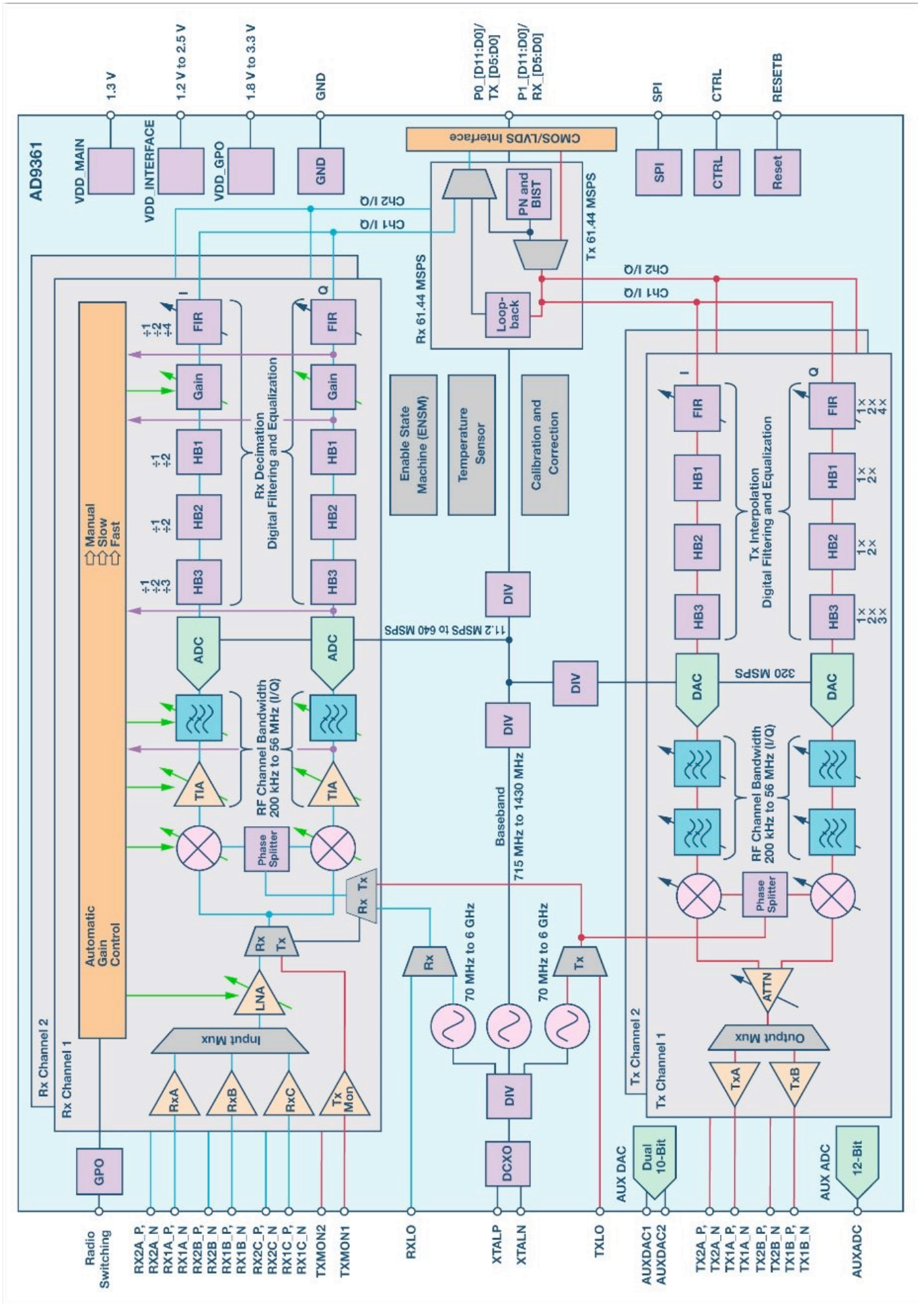
I don't have an exhaustive list of applications that work with the Pluto but I do know the following ones work, DATV-Express, leandvb, Analog Devices IIO Oscilloscope, GNURadio, GQRX, Matlab and support for SDR# is partially working. This is still early days for this device.

Around about the time I started writing this article news was released of a new SDR from Lime Microsystems called the Lime-SDR Mini. This is a lower priced single channel version of the Lime-SDR it is priced to compete with the Pluto. While it only has a frequency range of 10 MHz to 3.5 GHz it does have a USB3 interface which makes it better for high bandwidth modes. The software interface is supposed to be the same as that of the original Lime-SDR, so once I have completed support for the Lime-SDR I should also have support for the Mini. The Mini is supposed to be available around the 31st of December. The LimeSDR Mini is available from Crowd Supply.

*All illustrations are courtesy of Analog Devices and are made available for non commercial use.*

The photos are my own.






AD9363 block diagram

# Laugharne Rally Microwave Talks March 24th

**Peter Harston GW4JQP, Wales Regional Contact**

The Microwave stream “Getting started on 10GHz...” with a series of four talks was very well attended, with the room being full throughout, and at some points it was standing room only. The audience included absolute beginners through to our most experienced operators, some of whom had travelled considerable distances.

In the opening talk, Chris Bartram GW4DGU spoke on “...what you can expect to work from SW Wales” and gave a very interesting and wide ranging description of propagation modes, paths and operating.

This was followed by Derek Kozel MW0LNA whose topic was “...bits to volts: transmitting and receiving with a software defined radio. An introduction to the GNU radio toolkit with over the air demos of transmit and receive” Derek gave a fascinating insight into the new generation of SDR equipment and software and how we may use this in place of some of the established technology.

Next up was Peter Harston GW4JQP, who with “...a low cost 10GHz receiver” showed that it is possible to make a very sensitive receiver suitable for narrowband operation for around £25 using commercially available TV modules and used SKY dishes. This PLL LNB/SDR solution can provide a starting point for those interested in exploring the band without a big investment.

Finally, there was an update on the GB3RPE 10GHz beacon project. Pending the grant of an NoV for the move from Swansea, the Mk2 unit will be installed as an attended beacon GW8KCY at the Trinity St Davids campus in Carmarthen. The team are just waiting for a spell of stable weather to install the equipment on the roof of a 10 storey building.

Very grateful thanks go to the guest speakers and to all those who travelled far and wide to support the event.

It is hoped to post the Powerpoint presentations with audio on the Carmarthen ARS website 10GHz pages, which can be found at: www.radiosoc.org.uk/10GHz

# 2.3 GHz and 3.4 GHz band plans based on final auction results

**Murray Niman G6JYB**

**Source: https://www.ofcom.org.uk/spectrum/spectrum-management/spectrum-awards/awards-in-progress/2-3-and-3-4-ghz-auction**

The 2.3 and 3.4 GHz spectrum is likely to be used by mobile network operators to deliver additional capacity for mobile broadband. The 3.4 GHz spectrum may be used for 5G services.

## 2.3 GHz band plan


## 3.4 GHz band plan


The 2.3 and 3.4 GHz spectrum is likely to be used by mobile network operators to deliver additional capacity for mobile broadband. The 3.4 GHz spectrum may be used for 5G services.

The 2.3 GHz band we lost went for £5m/MHz - and 3.4 GHz even more. See pdf here

# Contest results

**John Quarmby G3XDY**

## March 2018 Lowband Contest Results

Entries on 1.3GHz were well up this year, with the other bands remaining about the same as 2017. A range of continental stations were available on the lower bands to stations nearer the East coast, but G3UVR noted that this was no real help to stations in the North West.

On 1.3GHz the Combe Gibberlets group (M0HNA/P) ran out winners with Conrad PA5Y running them fairly close, and John G4ZTR in third place. M0HNA/P included 12 continentals in their haul of 32 contacts. Best DX was the contact between PA5Y and GU6EFB at 637km. John G3SQQ was the leading low power station.

As last year 2300MHz is treated as a separate band to encourage operation on this segment, however there is still only one entry. At least the number of contacts made increased this year.

The Combe Gibberlets lead on 2320MHz by a good margin over runner up Neil G4BRK. M0HNA/P worked the best DX on this band with PI4GN at 547km. Graham G3YJR takes the certificate for the low power section.

Neil G4LDR is the winner on 3.4GHz, with Neil G4BRK in the runner up slot.Best DX was somewhat down at 237km between G4BRK and G4ALY in IO70 square.

The Combe Gibberlets group were overall winners, with Neil G4BRK in overall runner-up position and leading fixed station.

Certificates go to M0HNA/P as overall winner, to G4BRK as runner-up and to the following band leaders, runners-up and leading fixed and low power stations.

| | |
|---|---|
| 1.3GHz | M0HNA/P, PA5Y, G3SQQ |
| 2.30GHz | M0HNA/P |
| 2.32GHz | M0HNA/P, G4BRK, G3YJR |
| 3.4GHz | G4LDR, G4BRK |

Normalised scores will be included in the overall championship table which will be published when the results of the next low band contest are available.

| Overall | | | | | | |
|---|---|---|---|---|---|---|
| Pos | Callsign | 1296MHz | 2300MHz | 2320MHz | 3400MHz | Overall |
| 1 | M0HNA/P | 1000 | 1000 | 1000 | 592 | 3592 |
| 2 | G4BRK | 853 | | 685 | 695 | 2233 |
| 3 | G4LDR | 449 | | 491 | 1000 | 1940 |
| 4 | PA5Y | 947 | | | | 947 |
| 5 | G4ZTR | 856 | | | | 856 |
| 6 | G3UVR | 96 | | 403 | | 499 |
| 7 | G4KIY | 426 | | | | 426 |
| 8 | G3TCT | 362 | | | | 362 |
| 9 | GU6EFB | 324 | | | | 324 |
| 10 | GM4BYF | 290 | | | | 290 |
| 11 | G3SQQ | 182 | | | | 182 |
| 12 | G3YKI | 138 | | | | 138 |
| 13 | G8GTZ/P | | | | 129 | 129 |
| 14 | G8EOP | 25 | | 99 | | 124 |
| 15 | GM8IEM | 69 | | | | 69 |
| 16 | G4GSB | 57 | | | | 57 |
| 17 | G3YJR | | | 47 | | 47 |
| 18 | G1DFL | 36 | | | | 36 |

## 1296MHz

| Pos | Callsign | Locator | QSOs | Score | ODX Call | ODX km |
|---|---|---|---|---|---|---|
| 1 | M0HNA/P | IO91RF | 32 | 9257 | DF0MU | 549 |
| 2 | PA5Y | JO21VO | 24 | 8766 | GU6EFB | 637 |
| 3 | G4ZTR | JO01KW | 26 | 7921 | DL3IAE | 602 |
| 4 | G4BRK | IO91HP | 27 | 7899 | DK2MN | 580 |
| 5 | G4LDR | IO91EC | 16 | 4156 | PI4GN | 620 |
| 6 | G4KIY | IO92WN | 16 | 3947 | DF0MU | 507 |
| 7 | G3TCT | IO81QC | 12 | 3347 | PA5Y | 587 |
| 8 | GU6EFB | IN89RK | 9 | 2996 | PA5Y | 637 |
| 9 | GM4BYF | IO85JV | 7 | 2683 | M0HNA/P | 548 |
| 10 | G3SQQ | IO93JC | 11 | 1681 | GM4BYF | 337 |
| 11 | G3YKI | IO92BD | 6 | 1281 | PA5Y | 530 |
| 12 | G3UVR | IO83KH | 5 | 890 | M0HNA/P | 291 |
| 13 | GM8IEM | IO78HF | 2 | 639 | GI6ATZ | 428 |
| 14 | G4GSB | IO82XM | 5 | 527 | G4DBN | 156 |
| 15 | G1DFL | IO91NL | 4 | 337 | G4ZTR | 131 |
| 16 | G8EOP | IO93EQ | 3 | 229 | G3UVR | 108 |

## 2300MHz

| Pos | Callsign | Locator | QSOs | Score | ODX Call | ODX km |
|---|---|---|---|---|---|---|
| 1 | M0HNA/P | IO91RF | 2 | 432 | G4DBN | 279 |

## 2320MHz

| Pos | Callsign | Locator | QSOs | Score | ODX Call | ODX km |
|---|---|---|---|---|---|---|
| 1 | M0HNA/P | IO91RF | 9 | 1923 | PI4GN | 547 |
| 2 | G4BRK | IO91HP | 8 | 1317 | PI4Z | 363 |
| 3 | G4LDR | IO91EC | 5 | 944 | PI4Z | 386 |
| 4 | G3UVR | IO83KH | 4 | 775 | M0HNA/P | 291 |
| 5 | G8EOP | IO93EQ | 3 | 191 | G3UVR | 108 |
| 6 | G3YJR | IO93FJ | 2 | 91 | G4DBN | 58 |

## 3400MHz

| Pos | Callsign | Locator | QSOs | Score | ODX Call | ODX km |
|---|---|---|---|---|---|---|
| 1 | G4LDR | IO91EC | 5 | 596 | G3XDY | 223 |
| 2 | G4BRK | IO91HP | 4 | 414 | G4ALY | 237 |
| 3 | M0HNA/P | IO91RF | 4 | 353 | G3XDY | 153 |
| 4 | G8GTZ/P | IO91JH | 2 | 77 | G4BRK | 39 |

# UKµG Microwave Contest Calendar 2018

| Dates 2018 | Time UTC | Contest name | Certificates |
|---|---|---|---|
| 4-Mar | 1000 - 1600 | 1st Low band 1.3/2.3/3.4GHz | F, P,L |
| 8-Apr | 1000 - 1600 | 2nd Low band 1.3/2.3/3.4GHz | F, P,L |
| 6-May | 0800 - 1400 | 3rd Low band 1.3/2.3/3.4GHz | F, P,L |
| 20-May | 0900 – 1700 | 1st 24GHz Contest | |
| 20-May | 0900 – 1700 | 1st 47GHz Contest | |
| 20-May | 0900 – 1700 | 1st 76GHz Contest | |
| 27-May | 0600 - 1800 | 1st 5.7GHz Contest | F, P,L |
| 27-May | 0600 - 1800 | 1st 10GHz Contest | F, P,L |
| 3-Jun | 1000 - 1600 | 4th Low band 1.3/2.3/3.4GHz | F, P,L |
| 10-Jun | 0900 - 1700 | 24/47GHz Trophy / 76/122-248 GHz | |
| 24-Jun | 0600 - 1800 | 2nd 5.7GHz Contest | F, P,L |
| 24-Jun | 0600 - 1800 | 2nd 10GHz Contest | F, P,L |
| 29 -Jul | 0600 - 1800 | 3rd 5.7GHz Contest | F, P,L |
| 29 -Jul | 0600 - 1800 | 3rd 10GHz Contest | F, P,L |
| 26-Aug | 0600 - 1800 | 4th 5.7GHz Contest | F, P,L |
| 26-Aug | 0600 - 1800 | 4th 10GHz Contest | F, P,L |
| 16- Sep | 0900 - 1700 | 3rd 24GHz Contest | |
| 16- Sep | 0900 - 1700 | 3rd 47GHz Contest | |
| 16- Sep | 0900 – 1700 | 3rd 76GHz Contest | |
| 30 -Sep | 0600 - 1800 | 5th 5.7GHz Contest | F, P,L |
| 30 -Sep | 0600 - 1800 | 5th 10GHz Contest | F, P,L |
| 21 -Oct | 0900 - 1700 | 4th 24GHz Contest | |
| 21 -Oct | 0900 - 1700 | 4th 47GHz Contest | |
| 21 -Oct | 0900 – 1700 | 4th 76GHz Contest | |
| 18 -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) | |

# French microwave activity for 2018

**Ralph G4ALY**

# Activity News : March 2018

**By Neil Underwood G4LDR**

***Please send your activity news to:***

scatterpoint@microwavers. org

## Introduction

Is there no end to the poor weather conditions and the associated poor band conditions? Cold wintery conditions finally arrived in the south of England in early March with the first real snow and freezing weather for some years. At my QTH near Salisbury it is not unusual to be able to receive five or six 3cm beacons and a number of others on lower and higher frequencies. In the last couple of months, apart from my local beacon, GB3SCX which is 45km away and which is always 599+; I have heard very little including GB3SEE which is normally a weak but reliable signal.

Hopefully as we move into the spring and summer seasons things will improve with fine weather and lots of DX being worked not only during the many contests taking place over the coming months but also at other times!

## Band Reports – cm Bands

**From Graham, G3YJR, IO93.**

Graham reports on snow scatter contacts on 3cm and getting going on 6cm with 5.8GHz drone receive and transmit modules.

I entered the January and February SHF UKACs with 2W on 13cm & 3W on 3cm. In the February contest I worked Denis G3UVR on 3cm via snow scatter over the Pennines. His CW had a good mushy sound. It was great to work Nick G4KUX again on 3cm. He was easy copy. Keith, G4ODA always seems to pull me in.

On the 28th February I managed to work Peter G3PHO on 3cm, something which has proved impossible hitherto, there being a couple of hills between us and no easy reflections. After our usual chat with Peter and Joe G3LLV on 2m, I met up with Peter again to attempt to find a route around the geography using 3cm.

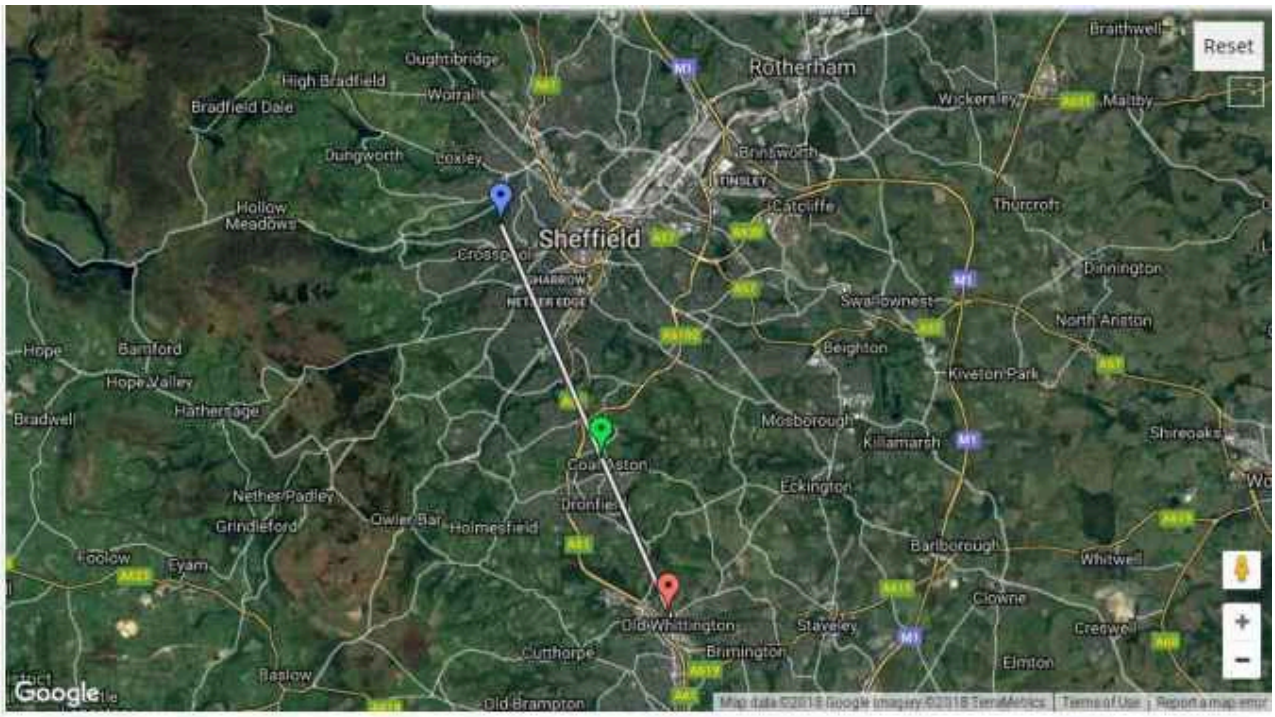
At my end (blue marker) (see map below), I have the top of Crosspool hill in the way of the direct path, so to the south, well, 160 deg-ish, I am beaming into the houses of Mulehouse Road which are a bit higher up. Further towards Peter (red marker) is the hill above Coal Aston/Dronfield (green marker). We have had several attempts in the past to find a reflection route around these obstacles and failed. This is frustrating as it is only about 14km away.

At first I tried to access Mow Cop SDR in the personal beacon band. I saw & heard nothing of my own signals. I knew GB3FNY was peaking at 070 deg. azimuth, rather than the 067 deg. that it should be. So I aimed at 240 deg. on the dial for Mow Cop. I believe it should be 237 deg. to aim at IO83VC47nl. Then Peter's signal showed up on Mow Cop. With a bit of elevation and backing the dish a bit, I found my own signal too, bearing 222 deg. on the rotator dial. The signals looked quite wide. Then we realised we could hear ourselves over about a 40 deg. swing of the dish. This was snow scatter!

Then I noticed I could hear Peter's signal on my receiver about 20dB over noise. I peaked up on him at 242 deg. on the dial (maybe 240 deg. true) at about 20-something dB over noise & we completed our first 3cm QSO! The CW had a nice mushy sound. I noticed this on Denis G3UVR's signals the night before, again over the Pennines. It gets some snow up there!

Sweeping the dish through the scatterpoint moved the frequency of the reflection several hundred Hz, so there was quite a Doppler shift going on. (All my kit was frequency-locked to the GPSDO).

On 6cm I'm not quite on the air yet, but I am tinkering with some "5.8 GHz" ATV modules. Barry G8AGN has got me interested in this. I've just made a little horn which I intend to use with them.


Reset
Rotherham
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Hollow Meadows
Catcliffe
Thurcroft
Dinnington
Swallownest
North Anston
Hope
Bamford
Hope Valley
Bradwell
Harthersage
Beighton
Kiveton Park
Mosborough
Killamarsh
Shireoaks
Eckington
Nether Padley
Grindleford
Owler Bar
Holmesfield
Dronfield
Barlborough
Whitwell
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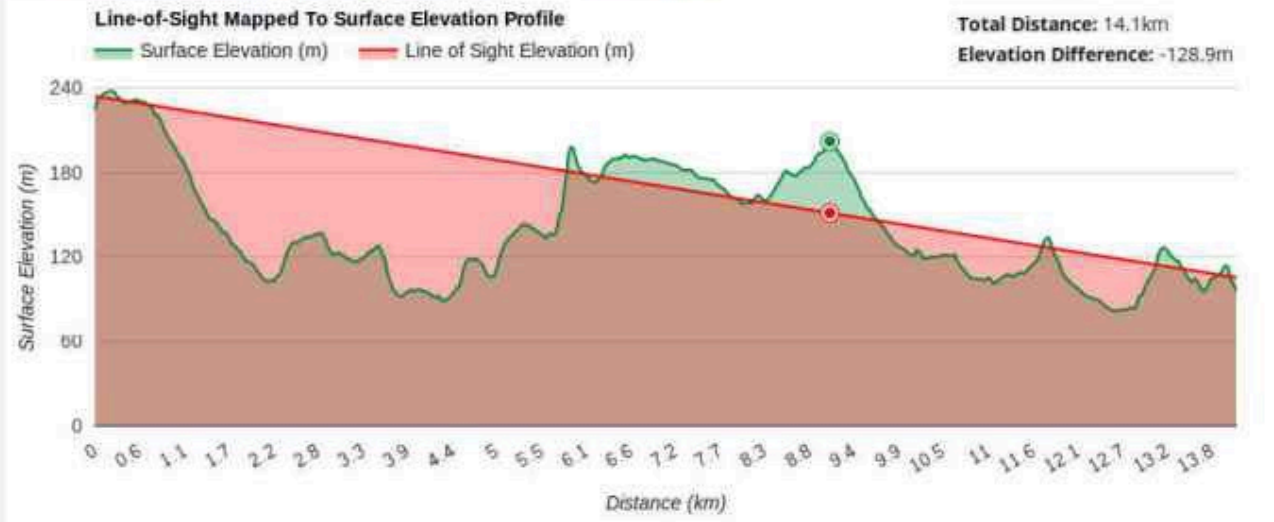
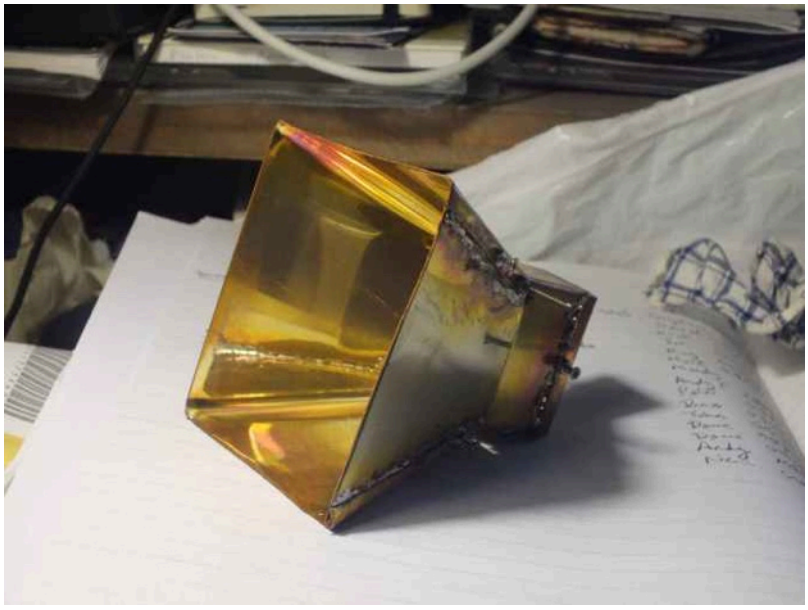
Staveley
Creswell
Cuthorpe
Brimington
Elmton
Baslow
Old Brampton
Google


Line-of-Sight Mapped To Surface Elevation Profile
Surface Elevation (m)
Line of Sight Elevation (m)
Total Distance: 14.1km
Elevation Difference: -128.9m
240
180
120
60
0
Surface Elevation (m)
0 06 11 17 22 28 33 39 44 5 55 61 66 72 77 83 88 94 99 105 11 116 121 127 132 138
Distance (km)



## Band Reports – 24GHz

**From Neil, G4LDR, IO91**

Once again Digital Amateur Television (DATV) tests on the 24GHz band on the 10th March resulted in the opportunity of some narrow band contacts.

Noel, G8GTZ/P, was located on Butser Hill, IO91MX, north east on Portsmouth and Dave, G8GKQ/P was located at Povington, IO80WP, west of Swanage in Dorset, both with DATV equipment on 24GHz and 5.7GHz FM using the £20 drone receivers and transmitters. In addition Barry, G4SJH/P was located on Walbury Hill, IO91GI, south of Hungerford in Berkshire. I was at my home location, IO91EC, near Salisbury.

Noel and Dave managed to exchange TV pictures on 5.7GHz and (I believe - Ed.) had at least a one way contact on 24GHz over the 91km path between Butser and Povington. I was unsuccessful in receiving TV pictures from either Noel or Dave on 24GHz despite exchanging 59 signals on NBFM and having received DATV pictures from Butser Hill a month earlier whilst G8GKQ/P operated from there.

Barry on Walbury hill worked me and the other two stations on narrowband (Barry was not equipped for TV).

It has been good to work stations on 24GHz outside the normal activity period of Monday evenings or during contests. Over the period from late January to early March there have been a total of 7 stations active on 24GHz, (G1EHF, G1JRU, G4LDR, G4NNS, G4SJH, G8GKQ and G8GTZ) in the Hampshire, Berkshire, Wiltshire and Dorset area, probably a record for the winter months.

## Beacon News

**From Keith GW3TKH, IO81**

I am in the process of rebuilding the GB3AMU 24GHz beacon. All the electronics are completed, I'm now at the stage of cutting metal and plastic to make a new bulletproof (*do the locals use the beacon for target practice? Ed.*), and waterproof enclosure. Then an outdoor test to ensure it remains dry internally.

If that goes well, probably the longest wait will be for a rigging slot to get it back on the mast, but hoping it will be in service by the end of the summer

**From Murray Niman G6JYB**

| | | | | |
|---|---|---|---|---|
| GB3IOM | 10368.900 | Isle of Man | New Beacon | Approved Mar-2018 |
| GB3FNY | 24048.850 | Finningley | New Beacon | Approved Mar-2018 |

## Stop Press: Virginia Radio Amateur Completes Contacts on All 29 Ham Bands

**From Murray Niman G6JYB**

Brian Justin, WA1ZMS, in Virginia, saved the lowest band for last. On April 11, he completed a CW contact on the new 2200-meter band with K3MF in Pennsylvania, wrapping up a sweep of completed contacts on all 29 Amateur Radio bands. More details can be found at:

http://www.arrl.org/news/virginia-radio-amateur-completes-contacts-on-all-29-ham-bands

## …..and finally

The deadline for activity reports to be included in the next issue is Tuesday 1st May 2018.

# Events calendar

## 2018

| | | |
|---|---|---|
| January 13 | Heelweg | info@pamicrowaves.nl |
| February 9–11 | Hamcation, Orlando, Florida | www.hamcation.com |
| February 17 | Tagung Dorsten | www.ghz-tagung.de/ |
| March 24 | Laugharne Rally (see p15) | Peter Harston GW4JQP, pharston@gmail.com |
| April 6–8 | OK EME and MW seminar | http://www.vhf.cz/seminar-2018-eng/ |
| April 7 | CJ-2018, Seigy | http://cj.r-e-f.org |
| April 9–13 | EuCAP 2018 European Conference on Antennas and Propagation, London | www.eucap2018.org |
| April 13–15 | 18th Microwave Technical Meeting – Bydgoszcz, Poland | www.mikrofale.iq24.pl |
| April 14–15 | Martlesham Round Table / AGM | http://mmrt.homedns.org/ |
| April 21 | RSGB AGM, Birmingham | http://rsgb.org/agm |
| May 18–20 | Hamvention, Dayton | www.hamvention.org/ |
| June 1–3 | Ham Radio, Friedrichshafen | www.hamradio-friedrichshafen.de/ |
| June 17 | RAL | |
| July 7–8 | Finningley RT | www.g0ghk.com/ |
| August 17–19 | EME2018, Egmond aan Zee,NL | https://www.eme2018.nl |
| Sept 7–9 | 63.UKW Tagung Weinheim | http://www.ukw-tagung.de/ |
| Sept 9 | Crawley Round Table | https://crawleyuwavert.blogspot.co.uk |
| Sept 15–16 | BATC Convention (CAT 18), Midlands Air Museum | https://forum.batc.org.uk/viewforum.php?f=115 |
| Sept 23–28 | European Microwave Week, Madrid | www.eumweek.com/ |
| Sept 28–29 | National Hamfest | www.nationalhamfest.org.uk/ |
| Oct 11–14 | Microwave Update, Fairborn, Ohio USA | http://www.microwaveupdate.org/ |
| Oct 12–14 | RSGB Convention & AMSAT Colloquium | http://rsgb.org/convention/ |

## 2019

| | | |
|---|---|---|
| May 17–19 | Hamvention, Dayton | www.hamvention.org/ |
| June 21–23 | Ham Radio, Friedrichshafen | www.hamradio-friedrichshafen.de/ |
| Sept 15–20 | European Microwave Week, Utrecht | www.eumweek.com/ |

*NB Some of the 2018/19 event links may not be working/updated yet.*

# Ham Radio in Friedrichshafen Shifts to Early June this Year

ICYM: After taking place in late June for many years, Germany's Ham Radio 2018 exhibition — Europe's largest Amateur Radio gathering — has become a bit of a moving target. This year's show will shift to June 1 – 3, in conjunction with the 69th Lake Constance Convention — both organized by the Deutscher Amateur Radio Club — and the separate **Maker Faire**. The Messe Friedrichshafen convention centre will be the venue for all three.

# 80m UK Microwavers net

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

**73 Martyn Vincent G3UKV**