An Amateur Radio publication for the Microwave Enthusiast

scatterpoint

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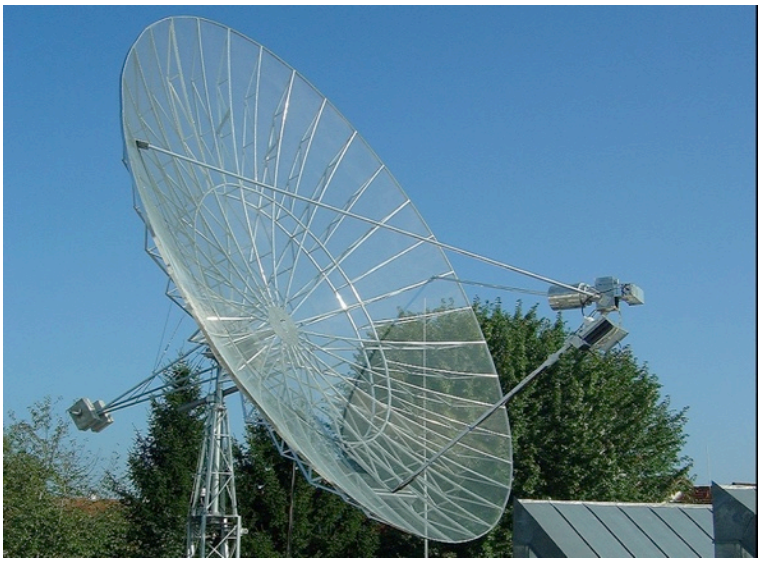
The Swedish EME conference 2017

By Peter Blair G3LTF



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Loan Equipment

Don't forget, UKµG has loan kit in the form of portable transceivers available to members for use on the following bands:

5. 7GHz 10GHz 76GHz

Contact John G4BAO for more information.

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 the Yahoo group 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 Chip Bank – A free service for members

The catalogue is on the UKµG web site at www. microwavers. org/chipbank. htm and has been updated to include the items from G4HUP's estate plus a few other additions and deletions.

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.

Minimum quantity of small components supplied is 10. Some people have ordered a single smd resistor!

The service may be withdrawn at the discretion of the committee if abuse such as reselling of components is suspected.

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.

Don't forget it is completely free, you don't even have to pay postage!

Mike Scott G3LYP

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

Chairman's thoughts – on Hamvention

Last year I attended what turned out to be the last Hamvention at the old Hara Arena, near Dayton. There had been rumours for several years that the Arena would close for various reasons. Judging by the state of the buildings that make up the complex, including the Hara Arena itself and the crumbling ash-felt car park on which the fleamarket was held, it was probably non-too-soon.

When it was confirmed that Hamvention was to move to a new venue in nearby Xenia I thought I ought to go and see the new location and how it would settle in.

Accommodation was, as always, in the Dayton University student block. Cheap, adequate and available. From the Xenia, Green County Fairground it is just 12 miles away. That's about the same as to the Hara Arena.

On Thursday, after booking into the accommodation, it was off to Mendelson's in Dayton.

Mendelson’s

Normally Mendelson's sets up a very large marquee in the Dayton fleamarket. All sorts of surplus items are offered for sale at ridiculously low prices. For 2017 Mendelson's decided not to go to Xenia but, instead, advertised that their in-town warehouse would be open to visitors. Mendelson's occupies the old seven story General Motors Delco building. Only two floors are open to the public, but you can buy just about anything here. I have rarely seen such a collection of parts in one place before. There wasn't much in the way of microwavey bits, but most of the miscellaneous hardware was probably available

The building is famous as the factory where the spark plug was invented (so the story goes). Delco stands for Dayton Electric Company.

After visiting Mendelson's (I didn't buy anything) it was off to Xenia.

We had to pick up entrance tickets, speaker's badges and fleamarket passes. Kent told me many years ago that it was worth speaking at one of the Hamvention forums as the speaker's badge allowed you early and unfettered access to the Hara Arena buildings. You could often spot bargains before the doors opened. It turns out that this is not such an advantage at Xenia as the general layout is more open and seemed to be more laid back than at Hara. Even so, it gives you a certain feeling of importance at such a large event. "Look at me. I'm an event contributor".

Once we found our place out on the grass centre area of the oval harness racing track we were able to plan our layout (four pitches and two cars) and 'case the joint' for more likely fleamarket vendors.

We were in the general area of several other microwave traders including Jeff Kruth, Bill Eaton and the Mount Greylock expeditionary contest group.

At this stage it was becoming obvious that a little rain would make the fleamarket area a real swamp. And so it turned out to be.

Some overnight and early rain turned the approach into a muddy track on the Friday morning and although it dried out a bit by the end of the hot and humid first day, more overnight rain and heavy showers on the Saturday left the whole area looking like a Louisiana swamp. I ruined a pair of walking boots.

Business was a bit slow on the first day. Way, way, down on Hara and hardly worth setting up. Other traders seemed to be doing better. The impression I got was that the layout was unfamiliar and the regular customers didn't know where to find the NTMS pitch. However, Kent had some nice microwave bits to sell in addition to his PCB antennas and these did go quite well.

When I was permitted to leave the pitch I went off browsing and found a number of items I was looking for in the fleamarket, but I was a bit disappointed by the overall selection of bits available. There were far fewer microwave parts than in previous years at Hara. I did find a selection of Bird slugs and some filters to buy.

Inside the trade halls it was much better although on the hot and humid Friday, with no air conditioning, it became a bit oppressive. After visiting the RSGB stand to check that they were all present and correct and being very British, I wandered over to the nearby ARRL booths to renew my membership, buy a new ARRL shirt and browse for any new books. I didn't see any I wanted.

I discovered a few companies buried away in one of the smaller outside marquees and was able to buy a few more items I wanted.

After attending the Friday evening VHF Weak Signal group dinner in Miamisburg, near Dayton, it was a good night's sleep and then up early to be on site before 7am on Saturday morning. More overnight rain had made the fleamarket even worse. We ended up setting up late and tearing down early as the passing trade was still very slow.

Late afternoon Kent and I were speakers at the VHF forum held in the Forum 4 building. This building presentation area seated around 100 people.

I was on second and had just 15-20 minutes to talk about VHF transverters. Talk fast and don't breath..... The is similar to the talk I have (will be) giving at RAL in June. The other four talks were all interesting and I learnt a lot about sequencers from Marshal, K5QE, as well as from the other talks. If you get CQ magazine then Tony Emanuele, K8ZR, (Ex- WA8RJF), who was the forum chairman, has repeated his talk in the June issue, in his VHF column.

Saturday evening was dinner in nearby Beaver Creek with the Mount Greylock team (Brian, Dick, Doug and John) with lots of talk about microwaves and contesting in the USA

Back at the Fairground on Sunday we didn't even venture out on to the quagmire, instead choosing to park up on the oval track, browse the remaining halls, buy a few last minute items and some breakfast and then set off for Dallas. I don't know how Kent does it but he came back with his arms full of goodies bought around Hamvention. Sunday is a good time to buy as many vendors don't want to take their remaining items home again.

Would I do it again? Sure. I've been nine or 10 times already. Five talks in the forum. Ten states travelled thorough. Cost a fortune but full of memories I wouldn't trade for anything, including my Friedrichshafen trips.

The organisers did a fine job of making the move. The local police department did a great job of controlling traffic after the first day snarl-up and the duty staff at the fairground did an excellent job.

I may miss next year but I will be back. It is a real draw.

Thanks Hamvention. A truly great event.

Sam Jewell, G4DDK

Chairman, UKuG

Backscatter

Martin Richmond-Hardy G8BHC

Backscatter, a selection of technical articles from Scatterpoint and the Microwave Newsletter 1999–2006, is now out of print so here's a pdf version (10.8MB) – all 445 pages.

https://www.dropbox.com/s/k31kxk1ufurj4co/Backscatter.pdf?dl=1

There's an Errata page to be inserted after p347 here:

https://www.dropbox.com/s/0e48eovgaia8mle/Backscatter%20errata.pdf?dl=1

PS I'm contemplating producing Backscatter 2 covering 2007–April 2011 (when Scatterpoint was under Peter Day's editorship) and Backscatter 3 covering the period following. They will be electronic only.

IARU Region-1 Conference

Landshut, Germany, 16 – 23 September 2017

Murray Niman G6JYB

The IARU Region-1 Conference papers are now online.

Here are what the two mm ones look like after they went through the Region-1 Secretary.

(There are 48 others for VHF-Microwave!)

All can be downloaded from: https://www.iaru-r1.org/index.php/general-conference/landshut-2017

“RAL” RT @ Chilton Village Hall

Event Info

The event was held in the CHILTON VILLAGE HALL. The village hall consists of a large hall, a small hall, a committee room and a kitchen, together with parking and a large attached recreational field. The event opened at 10am and featured:-

- Surplus and small trade stalls will be available in the Small Hall (£5 per pitch please)
- Chipbank
- Round 2 of the Microwave Round Table Construction Contest
- Afternoon Talks - for which offers are most welcome!

The Round Table - Sunday 11th June 2017 - Timetable

1000	Doors open.
1030-1200	Informal socialising / bacon butties / surplus swap tables
1200-1245	Lunch
1245-1330	Talk-1: Sam Jewell G4DDK – Transverters
1330-1345	Talk-2: Paul Marsh M0EYT – Amateur Deep Space Reception
1415-1430	Tea Break
1430-1515	Talk-3: Discussion Forum
1615	Event closes

Paul Marsh M0EYT

Picture by Murray G6JYB

Sam Jewell G4DDK

Kevin Avery G3AAF sets up his stall

Lecture hall

More stuff for your projects

and, of course, The Chip Bank

Photo by Murray G6JYB

The Coleman Antenna

John G8ACE

We have been here before fellow Golfists with the camping gas can antenna so apologies for that, however, this might be seen as making it more robust.

I might have been first-ish back around 2000 at RAL with my demo of 76GHz waves using the camping gas can antenna and others have tried it successfully since.

Perhaps of interest here is a drum of Johnsons Cotton Buds from the lb shop used for cleaning those tiny parts was staring at me from the bench.

It suddenly occurred to me that the clearish plastic lid looked about the right size for todays small signal source build to protect the PA! diode on the coax feeder stalk. Sure enough its a good tight fit over the can rim. There is also the opportunity to attach a splash plate to the inside of this radome lid if desired. The plastic seems pretty transparent to mm waves being neither attenuator nor lens. In passing, the focal point for this antenna is about 32mm from the reflector centre. Radiation appears to be directly from the diode so the stalk may need bending sideways slightly to reduce squint. Focus is quite sharp 2mm adjustment either way reduces the gain. This is a x9 multiplier using15mW, from a DMC 13 GHz brick with output close to 122255 MHz suitable for testing my system with 122400 LO. Easily audible over a few metres at 122 GHz but highly directional. An anti parallel diode ex satellite LNB mixer requires no dc bypass choke as an odd order multiplier. It should be possible to make a simple harmonic multiplier receiver by taking an IF feed from the diode.

May 2017 Lowband Contest Results

John G3XDY, UKuG Contest Manager

Compared with 2016 entries were up a little on 2320MHz, but rather lower on 23cm and 9cm. Once again there was only one entry on 2300MHz.

The IARU region 1 contest gave some DX on 1296MHz and 2320MHz for those in range of the continent.

1296MHz saw most of the action with M0HNA/P beating their score of 49 in 2016 by one QSO. G8OHM was runner up and leading fixed station despite having worked some stations earlier in the weekend. G4KIY worked the best DX of the event with a 783km contact to DL0GTH.

M0HNA/P had the band to themselves on 2300MHz – more activity here would be very welcome.

On 2320MHz G4BRK repeated his win of 2016, with M0HNA/P in the runner up position. G4KIY worked the best DX on this band as well, a 507km contact with DF0MU.

On 3400MHz M0HNA/P won by a narrow margin with G4LDR as the runner up. DX distances were limited to around 200km, with G4BRK working G4ALY at 237km for the best contact.

The overall winner was the Combe Gibberlets, M0HNA/P, with leading scores on 1296, 2300, and 3400MHz and runner up position on 2320MHz. Overall runner up was Neil G4BRK who won 2320MHz and was third on 1.3GHz and 3.4GHz.

Certificates go to the overall Winner M0HNA/P and Runner-up G4BRK and to the following winners and runners–up:

1296MHz	M0HNA/P, G8OHM, G3YJR (Low Power)
2300MHz	M0HNA/P
2320MHz	G4BRK, M0HNA/P, G3WJG (Low Power)
3400MHz	M0HNA/P, G4LDR

May 2017 Low Band Results

Overall Pos	Callsign	1296MHz	2300MHz	2320MHz	3400MHz	Overall
1	M0HNA/P	1000	1000	920	1000	3920
2	G4BRK	534		1000	901	2435
3	G4LDR	296		615	973	1884
4	G8OHM	630		805		1435
5	G4KIY	449		780		1229
6	G3YJR	480		227		707
7	G3WJG	94		381		475
8	GM8IEM	112				112
9	M0XIG/P	91				91
10	G7SOZ/P	48				48
11	G1DFL	17				17

1296MHz						
Pos	**Callsign**	**Locator**	**QSOs**	**Score**	**ODX Call**	**ODX km**
1	M0HNA/P	IO91RF	50	9926	PI4GN	547
2	G8OHM	IO92AJ	29	6257	DL0GM	682
3	G4BRK	IO91HP	29	5300	DK2MN	580
4	G3YJR	IO93FJ	18	4767	DF0MU	612
5	G4KIY	IO92WN	21	4459	DL0GTH	783
6	G4LDR	IO91EC	16	2940	OR6T	456
7	GM8IEM	IO78HF	3	1116	G4KCT	548
8	G3WJG	IO91RP	10	934	M1CRO/P	129
9	M0XIG/P	IO91GI	11	901	G3XDY	200
10	G7SOZ/P	IO92VG	6	472	G8OHM	120
11	G1DFL	IO91NL	4	168	G4LDR	67
2300MHz						
Pos	**Callsign**	**Locator**	**QSOs**	**Score**	**ODX Call**	**ODX km**
1	M0HNA/P	IO91RF	1	174	G4ODA	174
2320MHz						
Pos	**Callsign**	**Locator**	**QSOs**	**Score**	**ODX Call**	**ODX Kms**
1	G4BRK	IO91HP	12	1965	GD0EMG	354
2	M0HNA/P	IO91RF	14	1808	G4KCT	304
3	G8OHM	IO92AJ	8	1582	PE1CKK	488
4	G4KIY	IO92WN	10	1532	DF0MU	507
5	G4LDR	IO91EC	8	1209	G3XDY	223
6	G3WJG	IO91RP	8	749	M1CRO/P	129
7	G3YJR	IO93FJ	4	446	G3XDY	238
3400MHz						
Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX km
1	M0HNA/P	IO91RF	7	791	G5B	174
2	G4LDR	IO91EC	5	770	G3XDY	223
3	G4BRK	IO91HP	5	713	G4ALY	237

Low Band Championship 2017

After three events, the best three events count towards the total

Overall					
Pos	**Callsign**	**05-Mar-17**	**23-Apr-17**	**7-May-17**	**TOTAL**
1	M0HNA/P	3646	4000	3920	11566
2	G4LDR	446	1848	1884	4178
3	G4BRK	1251		2435	3686
4	G3UKV	1219	1773		2992
5	G4ZTR	1000	688		1688
6	G8OHM			1435	1435
7	G3YJR		716	707	1423
8	G4KIY			1229	1229
9	G8EOP	57	951		1008
10	G0LGS/P		838		838
11	GI6ATZ		695		695
12	GM4BYF	385	251		636
13	G3WJG		159	475	634
14	G4BAO	492			492
15	G1DFL	147	102	17	266
16	GM8IEM		66	112	178
17	G6KWA		154		154
18	GU6EFB		152		152
19	M0XIG/P		12	91	103
20	G7SOZ/P			48	48
21	GM7GDE		9		9
22	GM4DIJ/A	8			8
23	M0GDX/P		1		1

1296MHz					
Pos	**Callsign**	**5-Mar-17**	**23-Apr-17**	**7-May-17**	**TOTAL**
1	M0HNA/P	646	1000	1000	2646
2	G4ZTR	1000	688		1688
3	G4LDR	113	488	296	897
4	G4BRK	314		534	848
5	G3YJR		337	480	817
6	GI6ATZ		695		695
7	G8OHM			630	630
8	GM4BYF	385	205		590
9	G3UKV	206	376		582
10	G4KIY			449	449
11	G4BAO	308			308
12	G0LGS/P		294		294
13	G8EOP		259		259
14	G1DFL	113	61	17	191
15	GM8IEM		66	112	178
16	G6KWA		154		154
17	GU6EFB		152		152
18	M0XIG/P		12	91	103

19	G3WJG			94	94
20	G7SOZ/P			48	48
21	GM7GDE		9		9
22	GM4DIJ/A	8			8
23	M0GDX/P		1		1

2300MHz

Pos	Callsign	**5-Mar-17**	**23-Apr-17**	**7-May-17**	TOTAL
1	M0HNA/P	1000	1000	1000	3000

2320MHz

Pos	Callsign	**5-Mar-17**	**23-Apr-17**	**7-May-17**	TOTAL
1	M0HNA/P	1000	1000	920	2920
2	G4LDR	333	695	615	1643
3	G4BRK	615		1000	1615
4	G3UKV	615	770		1385
5	G8OHM			805	805
6	G4KIY			780	780
7	G8EOP	57	692		749
8	G3YJR		379	227	606
9	G0LGS/P		544		544
10	G3WJG		159	381	540
11	G1DFL	34	41		75
12	G4BAO	74			74
13	GM4BYF		46		46

3400MHz

Pos	Callsign	**5-Mar-17**	**23-Apr-17**	**7-May-17**	TOTAL
1	M0HNA/P	1000	1000	1000	3000
2	G3UKV	398	627		1025
3	G4LDR		665	973	1638
4	G4BRK	322		901	1223
5	G4BAO	110			110

Squares Awards

John G3XDY, Awards Manager

John G4BAO achieved a significant milestone recently on 23cm, collecting the 100 cards needed to claim the UKuG 100 Squares Award. He receives award number 3 at this level. The latest confirmations included a mix of EME and tropo QSLs, ranging from GM4ODA/P on tropo in the Shetland Isles to EME QSOs around the globe with stations such as PY2BS, VK2JDS, KL7UW, W5LUA on both JT65 and CW modes. Several of the EME cards are from stations with modest sized systems, so it shows that EME is becoming much more accessible. Congratulations go to John on this fine achievement.

Full details of the UKuG Squares awards are on the UKuG website at
www.microwavers.org/squares.htm

More applications would be very welcome!

Congratulations go to **Gordon G8PNN** for achieving 40 squares award number 4 on 2.3GHz. The additional cards submitted included some nice DX such as DL1SUZ in JO53 square, and DK6AS in JO52. All the contacts were on SSB by tropo propagation.

May 2017 Highband Contest Results

John G3XDY, UKuG Contest Manager

24GHz Contest May 2017

Four station submitted logs for this event. The competition was between G3ZME/P and G4IDR/P with 6 QSOs each, but the better distances worked by the former gave them a good lead. As can be seen from the results logging errors can have a big impact. The scores will go forward to the mm-wave championship.

Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX km
1	G3ZME/P	IO82QL	6	677	G4LDR/P	141
2	G4LDR/P	IO81XG	6	506	G3ZME/P	141
3	GW3TKH/P	IO81LS	4	368	G8CUB/P	93
4	G8CUB/P	IO91CL	0	0		0

47GHz Contest May 2017

Three entries were received for this event. Congratulations to Keith GW3TKH/P who had two good long distance contacts. Runner up G4LDR/P roved between IO91CL and IO81XG . The scores will go forward to the mm-wave championship.

Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX km
1	GW3TKH/P	IO81LS	2	186	G8CUB/P	93
2	G4LDR/P	IO81XG	3	147	GW3TKH/P	89
3	G8CUB/P	IO91CL	2	122	GW3TKH/P	93

76GHz Contest May 2017

Three entries were received for this event. Congratulations go to Roger G8CUB/P who won by working the two other entrants . The scores will go forward to the mm-wave championship.

Pos	Callsign	Locator	QSOs	Score	ODX Call	ODX km
1	G8CUB/P	IO91CL	2	122	GW3TKH/P	93
2	GW3TKH/P	IO81LS	1	93	G8CUB/P	93
3	G4LDR/P	IO81XG	2	58	G8CUB/P	29

80m UK Microwavers net – Tuesdays 08:30 local on 3626 kHz (+/- QRM)

73 Martyn Vincent G3UKV

UKuG Microwave Contest Calendar 2017

Dates	Time UTC	Contest name	Certificates
18-Jun	0900 - 1700	24/47GHz Trophy / 76/122-248 GHz	
25-Jun	0600 - 1800	2nd 5.7GHz Contest	F, P,L
25-Jun	0600 - 1800	2nd 10GHz Contest	F, P,L
30 -Jul	0600 - 1800	3rd 5.7GHz Contest	F, P,L
30 -Jul	0600 - 1800	3rd 10GHz Contest	F, P,L
27-Aug	0600 - 1800	4th 5.7GHz Contest	F, P,L
27-Aug	0600 - 1800	4th 10GHz Contest	F, P,L
17- Sep	0900 - 1700	3rd 24GHz Contest	
17- Sep	0900 - 1700	3rd 47GHz Contest	
17- Sep	0900 – 1700	3rd 76GHz Contest	
24 -Sep	0600 - 1800	5th 5.7GHz Contest	F, P,L
24 -Sep	0600 - 1800	5th 10GHz Contest	F, P,L
22 -Oct	0900 - 1700	4th 24GHz Contest	
22 -Oct	0900 - 1700	4th 47GHz Contest	
22 -Oct	0900 – 1700	4th 76GHz Contest	
19 -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)	

Modifications to 76GHz PWM Tx

Barry Chambers, G8AGN

I've been looking at the spectrum of my 76GHz PWM Tx as received via a RSP2 SDR tuned to the 430MHz Rx IF. The Tx and Rx were separated by 18m in the garden with the Tx (no antenna) looking away from the Rx and relying on reflections from a bamboo fence.

I had not done such measurements before but always felt that perhaps the modulation index was low and today's measurements confirm this. So I've slightly modified the Arduino sketch which appeared recently in Scatterpoint - see below (only the altered lines are shown).

```
42 ISR(TIMER1_CAPT_vect) {
43   // get ADC data
44   unsigned int temp1 = ADCL; // fetch the low byte first
45   unsigned int temp2 = ADCH;
46
47   // output high byte on OC1A
48   OCR1AH = temp2 >> 6;        //was 7 as published in SP
49   OCR1AL = temp2 << 2;        //was 1
50   // output low byte on OC1B
51   OCR1BH = temp1 >> 6;        // was 7 as published in SP
52   OCR1BL = temp1 << 2;        // was 1
53 }
```

The Swedish EME conference 2017

Peter Blair G3LTF

The 5th Swedish EME conference at Orebro took place on May 20-21 with 32 attendees from 11 countries including for the first time Canada and the USA. G3LTF, G4BAO, G4NNS and G4RGK formed the UK contingent. The content of these meetings is mainly about microwave EME and very much about how to build stuff and what works and what doesn't. In addition we had three fascinating lectures on radio astronomy topics. All of the presentations are available on the website www.moonbouncers.org. I will touch on just four.

Sergei RW3BP, who has developed a 77GHz system that can detect echoes, described how he reduced the noise figure of his CGY2190UH MMIC LNA with 25dB gain from 3dB to 0.85dB by cooling. Forget Peltier coolers, Sergei's solution used a Stirling cooler (E-bay!) followed by liquid nitrogen with the LNA in a vacuum chamber and input / output coupling by waveguide horn coupling. The 12dB system improvement he obtains means that a 5W SSPA rather than a 60W TWT may be feasible.

Hannes, OE5JFL has been using his HB 7.3m offset dish to detect pulsars on 1296 and 424MHz, 22 so far. Long observation times are required with good tracking and system stability and the facility to make highly accurately timed recordings. To detect the pulsar these recordings are then folded back on top of each other knowing the precise repetition rate of the pulsar. A recording is on the webpage.

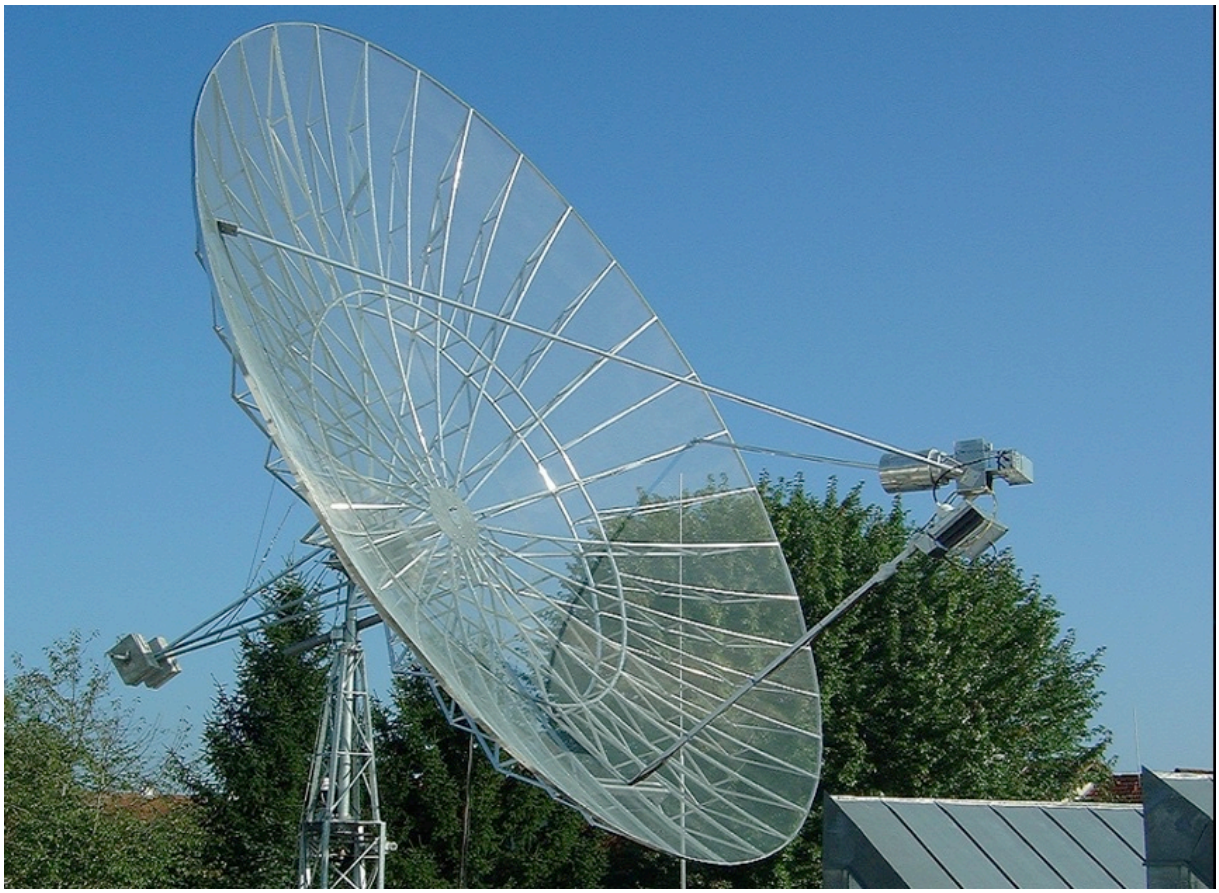
Zdenek, OK1DFC, is making an EME dxpedition to Morocco in October with gear for 23-3cm. He described the system in some detail with some interesting comments on the inaccurate profiles of pressed dishes and the way in which he has engineered the units with a common architecture, monitoring and mechanical interface to allow rapid changes between the microwave bands. Lots of neat ideas and excellent mechanical construction.

My final selection is the paper by **Dmitry, UA3AVR** on the calibration of mm wave antennas and receivers using moon radiation. The variations in solar radiation, especially when active, mean that something else must be used as a known temperature reference. Radio stars are too weak at these frequencies. He quantified all of the effects that have to be accounted for, atmosphere, beam width, temperature variation across the moon surface and by using the normal Y-factor method a noise figure for the receiver can be estimated. A spread sheet is provided. Serious emers struggle with this same problem at lower microwave frequencies and I hope that his work can be usefully extrapolated to check the widely used EMECalc programme.

Be sure to look also at the great work by Eddie, ON7UN and Michael DL1YMK / SA6BUN on their high power 3cm PA systems. Lots of interesting ideas there.

As well as the fascinating lectures **Dom, HB9BBD** (aka HB9CW) ran a NF measurement bench and the results are on the website. We enjoyed excellent food and beer and discussions until our voices (and/or beer) ran out. Everyone voted for a return in 2019 and gave a huge thankyou to Lars SM4IVE for organising it all.

Editor's note: Peter's own paper is downloadable from here G3LTF 6cm EME for SM Meeting .pptx



OE5JFL's 7.3m Offset dish used to capture 22 pulsars

NF measurement. L-R OE5JFL, RW3BP, HB9BBD and UA3AVR

Activity News : May 2017

By Neil Underwood G4LDR

Please send your activity news to:

scatterpoint@microwavers. org

Introduction

May is a busy month with a number of contests; i.e. RSGB and IARU 432MHz to 241GHz event at the beginning of the month with incorporated the RSGB 10GHz Trophy and the UKuW Low Bands contests; the usual Tuesday evening UKAC microwave contests; the first of the 5.7 and 10GHz UKuW cumulative events; and the first 24, 47 and 76GHz cumulative. In addition there has been activity on the higher mm wave bands (122 and 241GHz).

cm Wave Bands

From G4UVZ IO81

I did a little portable sortie to North Hill, Minehead, where I received three microwave beacons on the 10GHz band; GB3KBQ and GB3SCX over obstructed path S7-S9 and GB3CCX end-stopping.

Then I had a QSO with G4UTM back in Taunton hidden behind the Quantock Hills. Brian was operating from indoors and we exchange sigs up to S9 / fully quieting on FM. In in interestingly when he closed the double glazed window signals totally disappeared.

Photograph shows G4UVZ's operating location at North Hill, Minehead, Somerset.

From G3ZEZ

Just to comment on the May microwave contest where I found conditions poor and not as much activity as usual.

However I was pleased to work M1CRO/P on all 7 bands from 432MHz to 24GHz for a "full house" I believe there only 24GHz contact.

Keep up the good work.

May Activity Report

From John Quarmby G3XDY

Distances are >500km on 23cm, >400km on 13cm and >300km on the higher bands.

UHF Contest 6/7 May

1.3GHz

OZ9PZ JO46, DF4IAO JN48, DF0YY JO62, DR5T JN47, DL0GTH JO50, DL3YCW JO42, OK2A JO60, DJ3AK JO52, F6KFH JN39, DK2ZF/P JO43, DM7A JO60, GI6ATZ IO74, OZ7Z JO44, DJ5AR JN49

2.3GHz

DL0GTH JO50, DL3IAE JN49, DJ5AR JN49, DL0GM JO31, DF0MU JO32, DK1VC JO31

3.4GHz

DL0GTH JO50, DK1VC JO31, DL3IAE JN49, DK0PU JO31, DL0LN JO31, PI4GN JO33, DF0MU JO32, DK2MN JO32

5.7GHz

DL0GTH JO50, DK2MN JO32, PI4GN JO33

10GHz

DF0HS/P JO31, G4KUX IO94. PI4GN JO33, DF0MU JO32, DK2MN JO42, F6DKW JN18

1.3GHz UKAC 11 May

GI6ATZ IO74, DI3IAE JN49, DF9IC JN48, DJ5AR JN49, DJ3AK JO52, GM4JTJ IO86, OZ7Z JO46, OZ9KY JO45, OZ1FF JO45, OZ9KY JO45, DL0VV JO64, SK7MW JO65

SHF UKAC 18 May

2.32GHz

DL0VV JO64, OZ3Z JO55

3.4GHz

DK2MN JO32

5.7GHz

DK2MN JO32

UKuG 6cm/3cm 28 May

5.7GHz

DL3IAE JN49 RS SSB, F6APE TR CW, G4ALY TR CW, DK2MN TR CW

10GHz

F5DQK JN18 RS CW, DL6KAI JO30 RS CW, M0DTS/P IO94 TR SSB, DL7QY JN59 RS CW, DL3IAE JN49 RS CW, F6APE IN97 TR CW,

DL3IAS JN49 RS CW, F4CKC/P JN19 TR SSB, F1NPX/P JN19 TR SSB

mm Wave Bands.

From G4LDR IO91 (IO81)

I finally completed building my higher performance 47GHz system just before the mm wave contest on Sunday 21st May. The system should have a noise figure of around 5dB and an output power up to 250mW. I was therefore keen to try it out.

I began operating from Stoke Hill on the northern edge of Salisbury Plain near Devizes IO81XG. On 24GHz I worked Keith GW3TKH/P on the Blorenge in South Wales, the Telford contest group G3ZME/P on Brown Clee Shropshire (130km) and G0FDZ and G8CUB on Hackpen Hill Wiltshire. I also worked G0FDZ/P and G8CUB/P on 47GHz and 76GHz over the 29km line of sight path. An attempt to work GW3TKH/P on 47GHz over the 89km obstructed path to the Blorenge failed.

I then moved to Hackpen Hill to join G0FDZ/P, G8CUB/P and M6**** who was providing 2m talkback. I again worked G3ZME/P on 24GHz and GW3TKH/P on both 24 and 47GHz but not on 76GHz. By this time G1DFL had driven to Christmas Common in Oxfordshire and we attempted a contact on 24GHz.Unfortunately the path is slightly obstructed at Hackpen and the attempt failed.

The Higher Millimetre Bands - System Design and Operating Suggestions

John Hazell G8ACE, with contribution from Ian Lamb G8KQW

May 21st 2017 saw G8ACE and G8KQW using previously tested one way transmission paths in the Winchester area achieve new two way UK distance records of 6.8 Km on both 122 and 241 GHz. Refer to the video1 for the contacts.

Photograph shows the 122GHz system of G8ACE mounted on John's roof

To ensure successful signal acquisition of millimetre wave signals slow motion azimuth /elevation dish drives are essential to enable the cross hairs in the necessary rifle sight to be placed exactly onto the far location. A mirror reflecting the sun, if available, will aid correct initial alignment especially useful to identify the G8ACE QTH in the middle of many houses in town rather than an open country location. One degree initial dish pointing errors at both ends will probably mean a signal is never acquired with tiny transmit powers and high noise figure (NF) receivers. Highly accurate frequency control and stability is essential to remove frequency uncertainty and negate the need for tuning whilst also panning dishes. The use of double oven reference OCXOs in each equipment means the IF receiver can be set to the previously used frequency with confidence leaving just the dish to be pointed. GPS lock is not required with a high quality OCXO and 2.5KHz wide IF and only adds another layer of complexity. Once a signal is heard then the dish azimuth / elevation at each end needs repetitive critical adjustment to obtain the optimum signal on the path. Where two dishes are used for duplex operation (241GHz) there may well be elevation differences for the two communication directions. This effect becomes apparent from 47 GHz upwards.

The principle of operation on 122GHz is a frequency difference of 145 MHz, 432 MHz or other could be used. This enables one unit to work for both transmit and receive with minimum design complexity. Frequencies of 122.255GHz and 122.400GHz are used for transmitting and receiving thus providing the 145 MHz difference IF where the transmitter serves as receiver local oscillator. Other synthesiser frequencies are switchable to enable compatibility with users on 122.829GHz, 432MHz IF's etc. The equipment was designed to operate at the bottom end of the 122GHz band because of the HF roll off in performance of the surplus 38-40GHz tripler amplifiers ensuring there is sufficient drive for transmit. The LO power is substantially reduced in receive mode

to achieve best noise figure. The Rx / Tx panel switch allows selection of the lower diode drive power. 122GHz Tx output is achieved by multiplying the output of a 40GHz tripler amplifier by three. An anti-parallel pair of diodes is used because the resulting odd harmonic multiplication does not cancel out the RF output of this type of multiplier, it provides an easy solution for common Tx and Rx. Since the second harmonic is cancelled little second harmonic power is produced in transmit to reduce out of band signals. The output wave guide is anyway sized as a High Pass Filter (HPF) to attenuate any second harmonic produced by diode pair mismatch. Any fourth harmonic output will also be minimal from two diodes. The 122GHz multiplier diode is driven by a commercial 40GHz tripler as tens of milliwatts drive power at 40GHz is required and is therefore beyond average home construction. Otherwise in common with 134 and 241 GHz systems all modules are home brew except for the reference OCXO on which the stability and frequency accuracy for success depends. The Reference OCXO used may need selection in usage requiring critical performance assessment.

The 241 GHz units cannot utilise the benefits of anti-parallel diodes for transmit using a 40GHz driver due to requiring an even numbered output harmonic. A single multiplier diode is used in the transmitter x6 optimally biased for harmonic production. Attenuation of the 5th and lower harmonics reaching the antenna is performed by using a 0.89mm diameter circular waveguide HPF in the diode block. The separate receive mixer utilises an anti-parallel diode. Because separate Tx and Rx units are employed transmitters can operate nominally on the same frequency enabling the transmit signal to be monitored at the local receiver for operational confidence. In practice 10kHz spacing of transmitters was used by small reference frequency offset so that the local Tx is clear of the remote Tx reception.

Due to the presence of some system phase noise it was found A1 keying was to be preferred such that all energy is then contributed to useful purpose. F1 keying of the synth used was not possible due to frequency step size and F1 keying of the OCXO reference gave a chirp due to internal capacitance at the frequency set pin. A1 keying is easily performed using the TTL output inhibit of the 40GHz dc supply regulator. G8AGN has been exploring pulse width modulation with success on these millimetre bands as a modulation alternative for transmissions where FM cannot be used. SSB is not worthy of consideration for low power operation due to mixer conversion losses in producing a signal.

Good antennas are a vital part of the system providing considerable gain to combat path and atmospheric losses. Around 45db gain at 122 GHz and 50db gain at 241 GHz for a 30cm diameter dish. Tests show the white plastic Nortel Nurad dish to be very good up to 134 GHz and is robust for portable use. These were plentiful at Martleshum RT some years ago but have become rare recently. It is difficult to measure any performance differences between the Nurad and NEC dishes at 122 and 134 GHz. The NEC dishes used at 241 are superior to the Nurad by around 2db, that's 4db using one each end and its likely losses in the thickness of the front radome of the Nurad dish are responsible for its performance reduction above 134. Dishes have a nylon centre mounting boss and slide snugly onto the custom feed horn, concentricity being vital in the assembly for cassegrain feeds. The focus itself is not so critical and is helpful to 'in the field' antenna assembly. Rifle sights are a necessary part of dish alignment when working with sub one degree beam widths. The garden test range was used for this dish to rifle sight optimisation. It is important to remember that the rifle sight "cross hairs" be adjusted to be the same distance away from the signal source centre as the Rx sight is from its dish or there will not be convergence at infinity. Adjusted to look directly at the local source will mean the dish looking well away to the side at 1Km. This pre-adjustment procedure has worked well especially for unattended transmit on bore sight use in one way system performance testing. The screw thread adjustable azimuth / elevation pan and tilt heads used are part of the Sky Watcher telescope tripods used.

There is always the danger of use it or loose it to our amateur bands particularly where there is low utilisation. If you have mastered 24GHz then you have a source for driving a multiplier diode for 122 x 5 or for 241GHz x 10. A 24 GHz source will need to be operated with frequency set low for x 6 or high x 5 for the 134GHz band. The alternative for 134 is a 33GHz surplus multiplier amplifier x4. A 40GHz tripler unit from a commercial 38GHz link is better of course and can be used x 3 for 122GHz or x 6 for 241GHz. The ultimate for 241GHz is perhaps an 80GHz driver source then multiplied x 3 with a single anti parallel diode so it can be used for both transmit and receive using split frequency simplicity. The last hurdle of millimetric band construction is the installation of the beam lead or 0201 flip-diode and is really the only demanding mechanical part of millimetre construction. PCBs for diodes are available from DB6NT. PCBs are normally installed ground side down using silver epoxy all over the ground area, however with the very small guide sizes used the epoxy would almost certainly creep into the output guide in assembly possibly preventing any RF output. PCB clamping only is employed around the wave guide port using the wave guide back tuning block to ensure good bonding between PCB foil and the enclosure. The silver epoxy is applied to the signal input ground area to ensure good input power transfer to

the PCB track. It is useful to utilise standard wave guide flange fixing dimensions for your mechanical assembly so that interfacing to professional measurement equipment at Round Tables etc is possible. G8ACE uses UG385/U fixings, dimension drawings can be found on the Flann Microwave website. Whilst it is somewhat insensitive a wave guide 20/WR42 power meter head with either an intermediate size of waveguide adapter or better a wave guide taper will give a few uWs of deflection on the power meter to give a useful means of optimal output power adjustment for the final multiplier.

References,

1. G8ACE video, search UKG8ACE on YouTube.

Another Millimetric record

From John G8ACE

A few OPs may have become aware that G8KQW and myself G8ACE spent Sunday 21st May testing and succeeding in extending two way communication distances on 122 and 241 GHz. The two way UK distance claim is now 6.8km. I am most grateful to Ian G8KQW whom drove over to Winchester spending twelve hours of his time driving and testing to make a two way possible. There is a lengthy supporting video on my YouTube channel of the testing, search UKG8ACE. Same videos are also on my web page.
www.microwaves.dsl.pipex.com http://www.microwaves.dsl.pipex.com

I shall add information to the video as time permits including some details of the equipment etc.

Note initially on both bands a 3.9Km path was tried and then with success at that distance a move was made by G8KQW to another location 6.8Km away. In each instance G8ACE was operating from his home qth.

EME on 6cm

From Peter Blair G3LTF

Most of the time the weather was good and the promised storms missed us here. I worked, all random CW, DF3RU, UA3PTW, JF3HUC, JA4BLC, OK1KIR, OF2DG, HB9Q, OZ1LPR, HB9SV, OK1CA, SQ6OPG, SM6CKU, OH2AXH, ES5PC, JA6AHB #, LX1DB, OF1LRY, SP2HMR #, IK3COJ, PY2BS, VE4MA, WA9FWD, K2UYH, WA6PY, VE6TA, KL6M, VK3NX, JA1WQF, SP6GWN, G4NNS, SM6PGP, and LX1DB on ssb. Total 31.

On Saturday the libration made even strong signals difficult to read for some reason. Got-aways were HB9BCD, disappeared without a report, (hope all is OK Carlo), 9A5AA heard once very weakly in QSO, IK2RTI heard twice in QSO.

Moon noise measured 1.5dB and Sun (Sunday) 14.8dB. I can be QRV during the week on 70-6cm for tests or skeds. Thanks to all for nice QSOs.

From Dan HB9Q using 10m solid dish 100W

We had great fun this weekend. We have been QRV on Saturday about half the moon-time and on Sunday just 2 hours, working a total of 35 stations, all CW. Especially nice to work 5 new initials (total now 62) and 3 new DXCCs (total now 29): YO2BCT (#27), SP2HMR, HB9BCD, LZ1DX (#28) and 9A5AA (#29).

Due to not being QRV all the time we have probably missed several stations, sorry about that. In case you would like to work us, please send e-mail, we can be QRV for you in the coming days.

From John G4BAO

This weekend I operated 6cm using just 16 Watts to a 1.9m PF dish with an RA3AQ septum feed (kindly loaned to me by G3LTF) On RX, a single stage 0.9dB LNA based on a "Franco" LNB board. See RSGB RadCom "GHz Bands" column July 2014 for details.

I had 7.5dB sun noise and 0,25dB Moon noise.

On CW I worked OK1KIR, HB9Q and DF3RU. "Gotaways" on CW were OK1CA, OF2DG, ES5PC, PY2BS all identified calling CQ. I need more power!

On JT4F I worked HB9Q, OK1KIR, OK1CA UA3PTW, OZ1LPR and PY2BS.

A good start to the 6cm project at G4BAO. Watch this space, more power planned!

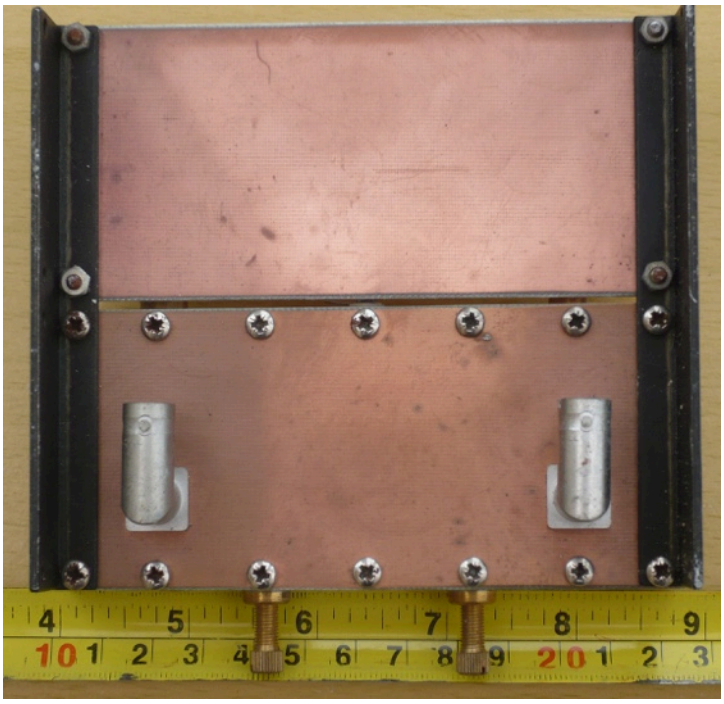
…..and finally

The deadline for activity reports to be included in the next issue is Saturday 1st July 2017.

For Sale

ex G3VVB 1.7GHz Interdigital filter / mixer

Bob White G8SPC g8spc@blueyonder.co.uk



1. Pictured. A **1.7GHz interdigital mixer / filter** made in the late 1980s by the late Cyril James G3VVB in Goran Haven Nr Mevagisy Cornwall. I purchased it from Cyril on one of a number of visits to his QTH with the intention of building a weather satellite system. (also to sample Cyril's excellent homebrew) I was already monitoring the polar orbiting satellites on 137MHz and suffering considerable pager interference. however work and family commitments conspired to prevent progress, hence the current situation.

2. **Length of Waveguide 16 and separate flange with tripod mounting block** made by Cyril, purchased around the same time.

3. **10GHz broadband FM system based on a Solfan Gun diode** head fully built and cased in a di-cast box. from memory this was made from boards supplied by the long defunct Microwave Group that were I believe based in the Coventry area in the 1990's

I have had the interdigital mixer / filter on Ebay for sale lately with no interest and I am very reluctant to bin / skip them. Open to offers. i just felt it was all to good to just scrap it.

Any item can be collected from my home on Clevedon North Somerset. Full info as callbook / QRZ.com) as postage is likely to be fairly expensive. The interdigital filter/mixer and the waveguide are fairly weighty.

Events calendar

2017

June 11	RAL @ Chiltern Village Hall OX11 0SH Registration via Ann Stevens g8nvi@microwavers.org	www.microwavers.org/ral-2017.htm
July 14 – 16	Ham Radio, Friedrichshafen	www.hamradio-friedrichshafen.de/
July 8 – 9	Finningley Roundtable	www.g0ghk.com/
August 18 – 20	SP VHF Convention and Technical Meeting - Poland	www.mikrofale.iq24.pl
Sept 8 – 10	62.UKW Tagung Weinheim	www.ukw-tagung.de/
Sept 10	Crawley Roundtable	carc.org.uk
Sept 17–21	IARU-R1 Conference, Landshut, Germany	www.iaru2017.org/
Sept 29–30	National Hamfest	www.nationalhamfest.org.uk/
Oct 13 – 15	RSGB Convention, Kents Hill Park Conference Centre, Milton Keynes	rsgb.org/convention/
Oct 14 – 15	Amsat-UK International Space Colloquium, Kents Hill Park Conference Centre, Milton Keynes	https://amsat-uk.org
Oct 8 – 13	European Microwave Week, Nürnberg	www.eumweek.com/
Nov 4 (tbc)	Scottish Round Table	www.gmroundtable.org.uk/
Oct 26 – 29	Microwave Update, Santa Clara, California	www.microwaveupdate.org

2018

February 9–11	Hamcation, Orlando, Florida	www.hamcation.com
June 22–24	Ham Radio, Friedrichshafen	www.hamradio-friedrichshafen.de/
August 17–19	EME2018, Egmond aan Zee,NL	https://www.eme2018.nl
Sept 23–28	European Microwave Week, Madrid	www.eumweek.com/

2019

June 28–30	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.

EME 2018

The website http://eme2018.nl/ is online. Only very basic info yet. More soon! Email info@eme2018.nl to register interest and for updates

There's also a Facebook page: https://www.facebook.com/EME2018/

73!
Jan
PA3FXB (team PI9CAM)
team EME 2018