An Amateur Radio publication for the Microwave Enthusiast

scatterpoint

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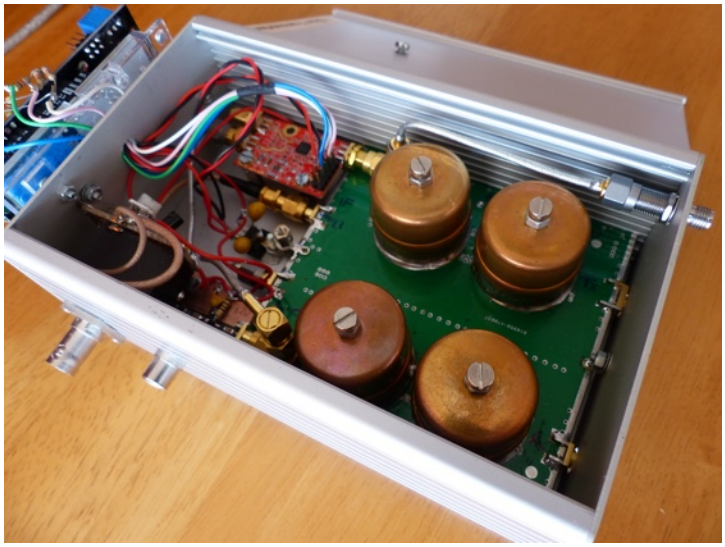
An accidental 13cm Transverter

By Geoff Pike, GI0GDP



In this Issue

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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

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 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

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

73 Martyn Vincent G3UKV

Silent Key – Dave Powis G4HUP

From Sam Jewell G4DDK

Sadly, I have to report that my friend of over 40 years, Dave, passed away on Thursday afternoon, 9th Feb. It was very quick and he didn't suffer. We don't know the cause yet.

I visited Jean on Friday. She was being supported by a couple of his sons and they are coping, but devastated, as you would expect. Hopefully, we will have funeral details in the next few days. We will let you know as soon as we can.

Please don't inundate Dave's family with calls. I think they would appreciate a bit of quiet time.

The world will be a sadder place without him. A true friend.

Vale Dave.

Dave at EME2012

From Martin R-H G8BHC

Sam brought me the very sad news this morning (Friday 10 Feb) that Dave Powis G4HUP had died suddenly yesterday afternoon.

Dave was well known in the microwave community. He held the post of Trophy Manager for the UKµG until last year and started his own business hupRF.com. He held a teaching post at West Suffolk College (part of UEA) until recently and was active with the Leiston ARC. He was also Chair of the Examination Standards committee of the RSGB. Some of you may have benefitted from his SMD workshops at UkµG Round Tables and other events.

Dave was a regular member of Codgers and the sub-group which meets regularly on Sundays and Wednesdays for coffee (or in his case, very weak tea – "namby-pamby tea").

A really good, enthusiastic and supportive guy. A friend who will be sorely missed.

From John Worsnop G4BAO

I was particularly upset to hear of the sudden death in February of my good friend Dave Powis, G4HUP. Dave was an educator, electronic homebrewer and a fine mechanical engineer. We regularly went over to Heelweg microwave together and travelled to Microwave Update in the US on several occasions. I first worked Dave back in the 1980s when we both were members of the "fortunate forty" who got the first UK 50MHz permits. Over the years, he operated all the bands up to 3cm on EME and terrestrial. Dave retired last year and had just got his new venture hupRF off the ground and getting some traction in the accessories and kit business.

He'll be greatly missed

Local tributes and other direct messages of condolence

Mike Rolph M0MCY,
Chairman Felixstowe & District Amateur Radio Society

I am really shocked and saddened by this news Dave was my tutor through my advanced exam and went way beyond what was expected. He will be sadly missed

Darren Hatcher G0WCW, Martlesham Radio Society

Like Iain, I first met Dave early in my time in BT in 1992 when I joined Martlesham Radio Society, having just started at BT. Lots of fun and support as G4MRS/P and the odd special event stations.

Always with projects on the go and helping others within and outside the hobby. A great mentor who will be missed by myself and many others. RIP Dave

Malcolm Bell G4CXT

While I can only claim to have known Dave for 30 years I would echo Sam's kind comments. For me he was equally a former colleague at BT, a fellow radio amateur and a good friend. I will miss his company at many levels. Sad news, RIP, G4HUP

From Iain Moffat G0OZS

Please pass on my best wishes when appropriate. I first met Dave when I started at BT in 1987/88 and have many good memories of G4MRS/P activities with him in the early years and have been grateful for his help and advice many times since then. I will miss him

Anne Keen G7DWN

He was a true friend and had time to listen. He helped me with several issues over and above amateur radio and issues. A true friend. He will be missed

Robin Gape G8DQX

Dave and I were both students at the University of Essex, far too many years ago, where our paths first crossed. I have happy memories of Dave, back in the '70s, procuring some fancy microphones for me — trading was rather more in his blood than in mine! It's hard to believe that the live wire that was Dave is no longer with us. My condolences to his family and friends. Vale.

Ian Dilworth G3WRT

It was brilliant to discuss with him education, etc., which I did at length a few times and I really admired his new business venture. A real loss.

Pat Gillen G4GVW

Real shock, Sam. The word condolence seems very inadequate. One of those who enhanced our world and hobby.

Graham Moore G4DML

So sad. Was only chatting with him a few days ago. Gobsmacked.

Geoff Blake, G8GNZ

My XYL asked what was the matter when I read of Dave's passing. I did not know him for more than maybe four or five years but he was always a friend and when we met, it was always an opportunity for a friendly chat, most recently at the Essex Hams meet at Danbury before Christmas. My condolences to his family and I will remember him well.

Gavin Nesbitt M1BXF

I've just heard and confirmed that Dave Powis, G4HUP, from Woodbridge, Ipswich, passed away suddenly this morning, while in the garden.

Dave was a regular at 'old codger' meetings, was a big supporter of the Camb-Hams and all things Flossie, helped organise the ever increasing Suffolk RED meetings (http://www.sargroup.co.uk/red2/) and ran the popular online shop **hupRF**, http://huprf.com/huprf/, which sold many useful VHF/UHF accessories including the DG8 preamp for 6m , 4m & 2m. I'll certainly miss the deep technical conversations, mainly over email, I had with Dave.

Guy F2CT & Corine

Dear friends, we cannot believe it ! Corine and I are very very sad. It was a real pleasure to meet him everywhere.

Please pass on our sincere condolences to his family .

RIP dear Dave. We miss you

Peter, G3PHO

Dave was a super bloke and a good friend. I first met him when microwaving on the Staffordshire hills back in the early 70s. He was always willing to share his considerable radio expertise with anyone. His contributions to the hobby, particularly in the field of training are immeasurable and he will be missed a great deal.

As a friend he supported me through a difficult period many years ago even though, as a result, he also became a target.

You couldn't wish for a nicer person.

Ian GM3SEK

A terrible shock indeed; but most of all for the family, to whom Nadine and I extend deepest sympathy.

Only last week, we were celebrating the fact that all 10 authors of 'The VHF/UHF DX Book' were still with us. And then - this.

Sam's description of Dave says it all. He is going to leave many different gaps in our lives, more than most of us can yet begin to realise.

Martyn G3UKV

This news came as a great shock this morning. As others have already noted, Dave was a great bloke, always willing to have a chat and share his experience to help others.Dave helped members of the local uW group (G3ZME, Telford) to get going on 10GHz WB in the 70s, and he visited us on the Brown Clee (IO82QL) at that time to compare equipment and results.

Just a couple of weeks ago, he agreed to come to our local club (TDARS) in April to give a talk and demo of surface mount techniques. Dave will be greatly missed for a long time to come. RIP

From the moon-net reflector

Joe Taylor K1JT

Oooooh, I am so sad to learn that G4HUP is no longer with us. Dave was a good ham, a good man, and a good friend to so many of us.

David Anderson GM4JJJ

What a dreadful shock. Dave was such a wonderfully clever person with a passion to help others and his business was just taking off. We will all miss him. RIP Dave.

Conrad Farlow PA5Y

The generosity and spirit of Dave is reflected in many of the messages on here, he was a popular man with good reason. I have been genuinely saddened by Dave's passing. I was also with Dave at Heelweg Microwave only a matter of weeks ago, where we were discussing Dish Azimuth drives. He also kindly brought an item from UK on behalf of someone else. This was typical of Dave's generous nature. I would like to extend my deepest sympathy and commiserations to Dave's family and also his circle of close friends who I know will be reading this - whatever shall we do without him? RIP my friend

Serge Szpilfogel FS/VE1KG

Very sad. Met Dave at EME 2010. Brilliant man. Rest in peace my friend

Brian Justin WA1ZMS

Very sad news. Dave was a very kind and very smart man. In fact he oversaw the "Practicals" for my UK exams a couple a years ago to obtain a UK license. I was looking forward to seeing him at Dayton later this year. My thoughts and prayers will be with his family. RIP Dave.

Les Listwa W2LPL

Such a shame and loss to the community, as well as his family. I just recently installed one of his wonderful PAT boards in my HF rig. He made a really nice products and gave great support.

Zdenek Samek OK1DFC

Just arrived home and can not to believe. We are missing other great EME ham from our community. It was always great to meet Dave and chat with him about our hobby. Last great chat we had in Italy during EME conference. I never forget his great presentation in Cambridge.

RIP my Friend I will miss you very much!

Alex, ZS6EME

Sad news!! Dave was a nice colleague and friend, I use many of his products like the inductance and capacitance meter, 10MHz splitters and his famouse Pat units We always exchange information specially during the EME conferences and he was a happy user of the Antenna Controller. Tremendous lost for our community.

Doug Friend VK4OE

Oh dear, oh dear! Another great bloke is lost from our ranks.....and it is only today that I have been thinking of Dave when wiring up one of his latching relay driver boards into a new microwave transverter project. And I'll miss the 'regular' (once every two or three years) meetings that I have had with Dave when I'm in the UK.

We'll all feel the loss of his having passed.....

Many other messages of condolence, including from:

Aldo IK3COJ	Mira OK1YK	Mario I1ANP	John F5VLF/G3PAI	Dan HB9Q
Geoff GI0GDP	Ian 2E0IJH	Peter G3SMT	Nick G4KUX	Volkmar HB9DUK
Mike Scott G3LYP	Mike G6TRM	John G0API	Sue G7MHO	Peter PA2V

Editor's note:

The Orders & Prices page of Dave's web site huprf.com/huprf/orders-prices/ now carries a suspended service notice.

Beacon Coordinator Vacancy

The UKuG Committee would like to recruit a volunteer to assist the group to coordinate UK microwave Band beacons.

The UKuG supports the UK beacon network with hardware finance, technical help and beacon applications.

The RSGB ETC Committee and the RSGB Microwave Manager are responsible for the interface to OFCOM, specifying beacon frequency allocations and overseeing the issue of the NoV to the beacon keeper.

The beacon keeper (NoV holder) is responsible for the technical design and maintenance of their beacon, maintaining the close-down list details and ensuring that the NoV is renewed at the specified intervals.

The successful candidate will be responsible for interfacing between the Committee and beacon keepers/ groups to enable the smooth operation of the network, identifying problems and keeping the Committee up to date on issues and the state of the beacon network.

The post would suit an active microwave enthusiast who has good organisational, communications and technical skills and who wishes to help keep the UK amateur beacon network in good operational condition.

If you think that this post would be of interest please contact the (Acting) Chairman, Sam Jewell, G4DDK at sam@g4ddk.com for more details.

UK Beacons and their License Renewals

Above is an advert for a new UKuG Beacon coordinator. Previously this post was held by Tony GW8ASD and, of course, before that, by Graham G4FSG. This is particularly timely given that...

In the coming months almost all UK Beacon NoVs are falling due for renewal as their 3-year term is due to expire. Indeed many Repeaters which are in the same boat are already being called in early by RSGB-ETCC in a phased process to spread the renewal workload rather than waiting to a big peak in April.

In the UK, the GB3xxx Beacons are licensed by NoVs on a 3yr renewable basis provided they can satisfy all the contact info, site access and closedown list requirements and operational status. The latter factor inevitably means that a few defunct beacons/sites will be officially cease to be (though, on the bright side, 3-years ago it was also the opportunity for some long-delayed changes to be approved and rolled out).

A novel factor this time around is that since Summer-2016, Ofcom have a new IT system. This means we will need greater consistency regarding email addresses and other contact info. So if you are involved, please do prepare…

Keepers: If you are a keeper in particular please ensure that you have re-registered and have full access to the new Ofcom IT system and a refreshed personal licence (the latest format includes a '#' symbol in your nominal callsign on its front page to indicate any regional prefix). Email addresses for your Ofcom Logon should match that used on the ETCC renewal process.

Closedown Operators: If you assist beacon keepers by being on a closedown list, please also ensure that your licence details are also valid with the new Ofcom online system and including your contact phone number (mobiles are preferred) – which also helps with the licence condition on the 5MHz/60m band!

One other thing: If there is a keeper change – this must be done **now**, PRIOR to any close down list update or NoV renewal….

All the Beacon forms are on the ETCC website at

https://www.rsgblicensing.org.uk/forms-index.php

Hopefully it wont be too onerous!

More broadly whist we will closely liaise, please help both the RSGB volunteers who continue to facilitate licensing and renewals, as well as the new UKuG beacon coordinator who will be better positioned to advise on technical/funding/support aspects.

Seasons Greetings
Murray G6JYB

These are the 3rd and final reminders

UKµG Notice: 2017 Annual General Meeting

Notice is hereby given that the 2017 Annual General Meeting of the UK Microwave Group will be held at 10:00am on Sunday, 9 April 2017 as part of the Martlesham Microwave Round Table event which takes place over that weekend.

This will include the election of the officers of the committee and the presentation of the Chairman's, Secretary's and Treasurer's Annual Reports.

John Cooke GM8OTI is standing down, Martin GM8IEM has been approached to be appointed as Scotland rep.

All other Committee officers/members are prepared to stand again, however, new members would be very welcome. We need a deputy Editor for Scatterpoint (see page 23).

Any UKuG member wishing to stand should notify the UKµG Secretary, John Quarmby G3XDY, by 11th March 2017.

If you have any agenda or AOB items for the AGM then please contact the UKµG Secretary, John Quarmby G3XDY by 11th March 2017, email: secretary@microwavers.org

Martlesham Round Table: 8 – 9 April

http://mmrt.homedns.org

Booking (essential!) is now open for the Martlesham Microwave Round Table, taking place over the weekend of April 8/9 2017 at Adastral Park (BT labs), Martlesham Heath, Ipswich IP5 7RE.

Accommodation

For 2017 we are returning to what is now the Ipswich Hotel, Old London Road, Ipswich, IP8 3JD.

Telephone: 01473 209988

Concessionary room rates are £50.00 double/twin B&B for the 8th April.

Please book by phone on 01473 209988 and quote booking code CH003751.

Don't book online as you won't get the special rate.

Dinner

Please book for the dinner on the main registration page

Menu

Starters

Tomato and basil Soup with crunchy croutons

Bacon and mushroom salad with a balsamic dressing

Duo of melon with a berry compote and mint syrup

Main Courses

Roast Turkey, Pork and Beef

Fillet of salmon with a herb crust and white wine sauce

Roasted vegetable risotto

Desserts

Lemon tart with crushed meringue abnd raspberry coulis

Homemade Chocolate Brownie with Chocolate Sauce and Ice Cream

Apple crumble tart with creamy custard

Tea or Coffee

Price: £26.00 per person

Draft Programme

Saturday 8th April 2017

10:00 Breakfast at Harvest Moon Café, Capel St Mary.
12:00 Doors Open
Refreshments available from 12:00 (drinks, biscuits & sandwiches)
13:00 Welcome & opening
13:15 Afternoon Workshop
15:00 Refreshments
16:30 Close
19:30 Meet for Dinner at 20:00

Sunday 9th April 2017

09:00 Doors Open
09:50 Welcome and Opening
10:00 UK Microwave Group AGM, Trophy Presentations
10:45 Refreshments & Judging of the Construction Contest
11:00 DL4OGI: Reflections on Aircraft Scatter
11:45 G8WRB: How not to fool yourself with vector network analyser (VNA) measurements.
12:30 Lunch Break
13:30 G0EWN: A Mixer Block for the Millimetre Wave Bands.
14:15 G8AGN: Antenna modelling at 134 GHz and 241 GHz using openEMS
15:00 Refreshments
15:15 UKuG Contest Forum – John G3XDY
16:00 Close

NB the order of the talks may change.

We look forward to welcoming you to the Round Table in April.

Adastral Park Image: heritage.atadastral.co.uk

Using the SDRplay RSP2 above a GHz

John Worsnop G4BAO

There are a dizzyingly large number of SDR “Dongles” and other receive-only hardware out there, with prices for the “RTL Dongle” as low as £10 up to some costing 20 to 30 times that price. They have all been reviewed somewhere but often only as a HF or VHF receiver or panadapter. The SDR Play “Radio Spectrum Processor 2” from SDRplay (1) falls somewhere in the middle of this price range, so what does it offer to those of us whose main interests lie above 1 GHz?

The SDRplay RSP2

The RSP2 is a new, enhanced version of the RSP1 and provides three software selectable antenna inputs, improved stability and the ability to lock it to a reference. It has continuous coverage from 1kHz to 2GHz with up to 10MHz display bandwidth. Many of us are used to the SDR-IQ and Funcube Dongle that cover just a 190 kHz portion of the spectrum, so it’s this bandwidth that made it stand out for me from other units. It’s a “proper” 12-bit ADC unlike the 8 bit ADCs used in the RTL dongles that limit dynamic range, and it has 10, high-selectivity, built in front-end preselection filters and a 1GHz high pass filter.

Feature list

- Continuous coverage from 1 kHz to 2 GHz
- Up to 10 MHz visible bandwidth
- Powers over the USB cable with a simple type B socket
- 12-bit ADC silicon technology
- 10 high-selectivity, built in front-end preselection filters
- Software selectable multi-level Low Noise Preamplifier
- Open API for new apps development
- 2 x SMA Software Selectable Antenna Inputs
- 1 x High Impedance Input for long wire antennas
- Software selectable MW /FM notch filters
- 0.5 ppm TCXO trimable to 0.01ppm
- 24MHz Reference clock input / output connections
- 4.7V Bias-T (Port B only)
- RF shielded case

Use as an IF Panadapter

The RSP2 can be conventionally connected to the IF output of your driver transceiver, maybe via an hupRF “PAT board” (2) to give you an IF-wide panadapter display. The the wide frequency coverage also allows you to use it directly on the IF of a transverter (with a separate RX-only IF output) at 144 or 432MHz. This would allow you to view the whole of a Microwave band with a single panadapter. The RSP2’s second RF input would allow you to look at the IF of two transverters at the same time allowing dual band watch during multi-band operation.

Use above 1GHz

The receiver’s coverage extends up to 2GHz, so covers the 1.3GHz (23cm) band directly. While there is no bandpass filter for 23cms there is a high pass filter in circuit that cuts off below 1GHz to keep low frequency signals away from the front end. It can be locked to a 24MHz reference, which, to an RF engineer like me, is an odd frequency to choose, but I guess it was done for cost reduction reasons. Many Microwavers have a shack 10MHz reference, very few will have a 24MHz one. That said, the 0.5ppm reference is adequate and can be trimmed in software.

While the quoted 3.5dB noise figure at 1.3GHz is far from “state of the art,” for a receiver, it is certainly as good as many of the earlier 23cm transverters such as the Microwave Modules and LMW units or the general coverage receivers such as the ICR8500 that still are in use today. The addition of a decent, filtered, masthead preamp should make it perform well as a direct receiver on the band.

The 4.7V bias tee feature on port B could be used to remotely power a masthead preamp, but it’s a shame that the voltage is not 12V as most preamps have built in 5V regulators, so would need a voltage step-up to operate them. Again, I assume this has been done for cost-reduction reasons.

Terrestrial use

I tried the RSP2 as a receiver on 1296MHz by connecting to my 44 element Wimo via a very high gain G4DDK VLNA23 (3) . I don't have a really strong local TV or cellular station that gives me problems on the band but with or without my bandpass filter in front of the RSP2 I saw exactly the same 1 dB increase in noise when I point to my local TV station that I see with the G4DDK 1296 transverter. In terms of raw sensitivity with beacons, as expected the preamp dominates performance, so I could see no difference between the RSP2 and the transverter.

EME use

I've used the RSP2 as a second receiver on my EME system and it performs very well with the G4DDK VLNA23 in front of it. This will probably be my main usage of the receiver apart from interference chasing (see later). The frequency accuracy, without adjustment, was sufficient for me to find the ON0EME Moon beacon, (quite weak with my small system) just using the readout and calculated Doppler. I had to just adjust the reference by a few tenths of a ppm to get it exactly on my Rubidium locked signal generator at 1296MHz. It can be used with programs such as WSJT or PI4-RX for digital operation with JT and PI4 modes, via virtual audio cable software such as the donationware from VB-audio software (4). There has been some recent posting on the Moon-net reflector asking if the wide-band JT decoder, MAP25 supports the RSP2 yet. At the moment, the answer is no, but with the open API of the RSP2 it's likely to be supported in due course.

Use for receiving Es'hailsat2 and the 3cm band

Fingers crossed (or should I say "Insha'Allah," considering its source), the first amateur geostationary satellite, Es'hailSat2 (5) will launch successfully this year with a transponder downlink on 10.489- 10.499GHz. A satellite LNB with an LO of 9750MHz would convert this band down to 739-749 MHz, so the RSP2 could be used as an IF to receive signals. With the same LNB, an IF of 618-620 would cover the terrestrial 10368MHz (3cm) band so this is a good choice for a inexpensive receiver for this band.

Overall opinion

I've only scratched the surface of what I could do with this unit. Its wide bandwidth means that with suitable software it should be able to receive DATV, and I'm actively looking for such software! As a general purpose receiver, it is the best I've used yet for tracking down interference. The ability to look way outside the amateur band edges in one view is incredibly useful and can be used as general spectrum analyser to look at signals up to 2GHz or higher with a suitable downconverter such as an LNB. 3 inputs means that you can simultaneously monitor 3 separate antennas with the free SDRUno software.

Suffice to say I will not be returning this unit to the manufacturer after this review!

References

1. SDRplay: - http://www.sdrplay.com/
2. hupRF Panadapter tap board: - http://huprf.com/huprf/pat-board/

Editor's note: The Orders & Prices page of Dave's web site http://huprf.com/huprf/orders-prices/ now carries a suspended service notice.

3. G4DDK VLNA23 kit: - www.g4ddk.com/VLNASept13.pdf
4. Virtual audio cable: - http://vb-audio.pagesperso-orange.fr/Cable/
5. Es'hailsat2: - https://amsat-uk.org/satellites/geosynchronous/eshail-2/

Towards a Low-Noise 10GHz Oscillator

Chris Bartram GW4DGU

Introduction

The current generations of 'VCO on chip' fractional-N frequency synthesiser devices are quite remarkable. They are capable of of producing a narrowly spaced grid of frequencies with (just about!) adequately good spectral purity for many purposes up to several GHz or even more. Note though the faint praise ...

Producing an excellent frequency source for the more demanding amateur microwave uses has always been a difficult task. While modern synthesiser chips with integrated VCO have improved somewhat since I introduced their use in the range of 10GHz system components I used to make, they still have quite serious limitations. The problem lies with the performance of the on-chip VCOs. These have improved, but they still have a couple of issues, particularly far-out phase noise, which limit their use for critical applications such as our area coverage beacons. Nobody wants to live within range of a 24hour beacon transmitting significant noise at offsets of tens or hundreds of kHz.

We can't afford to settle for reduced performance simply because we're tied to the semiconductor manufacturers process limitations!

This work has been prompted by two 10GHz beacon projects: the resurrection of GB3RPE, and an update to GB3KBQ

To understand my approach, and to see the way forward, we have to look at the way in which oscillators and phase-locked-loops work.

Oscillators and noise

There are two ways of looking at oscillators: as a negative resistance interacting with a resonator, usually called a 'negative resistance' oscillator, or as a positive feedback loop around a resonator, known as a 'feedback' oscillator. The basic maths that underpins

these two approaches finally comes down to the same thing, so for reasons which will be obvious down the page, I'll concentrate on the feedback approach.

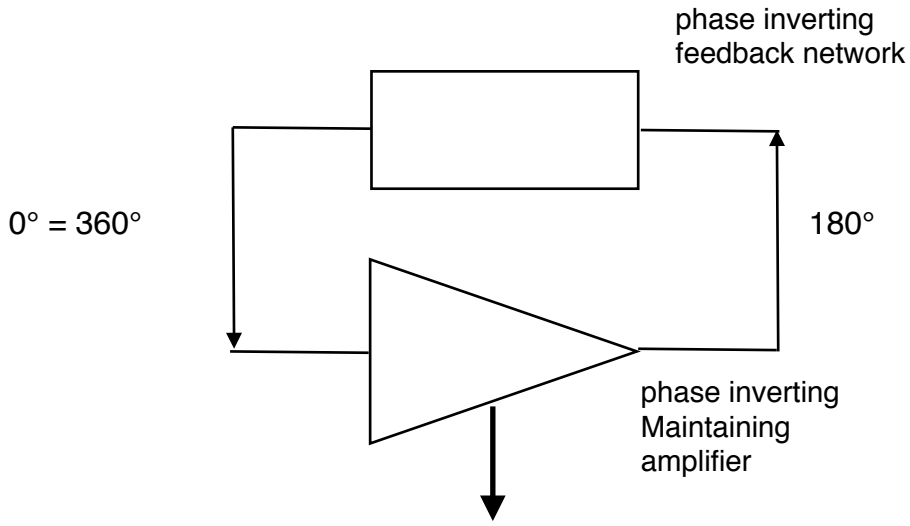


Fig 1. Basic Feedback oscillator

Active devices, such as bipolar transistors, and even more noticeably many microwave devices such as GaAs HEMTs and FETs have a noise characteristic (1/f noise) close to zero frequency which becomes increasingly significant as frequency is reduced. With GaAsFETs that corner frequency can be at tens, or even hundreds of MHz! Incidentally, IC devices, such as many internally matched gain blocks are not likely to have low 1/f noise, although some seem to behave better than others, possibly due to internal LF negative feedback.

When a device is used in an oscillator, the noise (Continuous, Random, Amplitude Perturbations) generated internally in its maintaining amplifier, modulate the gain of that device. This causes both amplitude and angle (phase/frequency) modulation of the oscillator output.

Amplitude to phase conversion is a phenomena which takes place, to some extent in all amplifiers, and is not confined to oscillators. It is, as just one example amongst many, one of the sources of nonlinearity in power amplifiers.

The feedback network in RF oscillators is usually a bandpass L/C filter, or L/C plus crystal network. The loaded Q is critical. One way to visualise this is to consider the network as averaging the phase of the signal, with larger loaded Q values and consequent smaller bandwidths, resulting in reduced phase excursions and thus noise.

Varactor diodes have their own problems. The really nasty effect, is called **varactor modulation noise**. I've never seen it discussed in amateur radio publications.

Looking at the usual equivalent circuit of a varactor, and disregarding packaging parasitics, the varactor can be represented by a voltage variable capacitor in series with a small loss resistance. Thermal noise currents are present are that loss resistance. This can also be seen as its parallel-form 'dual': a voltage variable capacitor in parallel with a large resistance. Thinking in terms of the transformed network, the large parallel resistance will generate broadband Johnson noise which will modulate the tuning voltage applied to the varactor. This is a major 'gotcha' in the design of VCOs, particularly broadband VCOs. One approach used by VCO designers to reduce the effect of modulation noise is to select a varactor with low Q to tune oscillators! Another is to maximise the voltage tuning range. The effect is internal to the diode, and it's not possible to eliminate it externally.

The synthesiser chip manufacturers are, of course, very aware of varactor modulation noise, and so they adopt an approach of minimising the tuning range of the VCO, and switching either the whole oscillator or the inductance, or both, to achieve the tuning range they require. This leads to complications, particularly the need to 'calibrate' the VCO when the frequency (or sometimes temperature) changes significantly.

The other problem which chip designers have to struggle with is the limited unloaded Q obtainable from the on-chip inductors. this, of course, is reflected in the achievable loaded Q.

While the internal VCOs of synthesiser chips have improved a great deal over the last decade, the problem of limited resonator loaded Q remains.

One relatively simple way around that, which doesn't involve microsurgery on the chip, would be to phase-lock an oscillator with low noise performance away from the carrier to the output of an internal VCO synthesiser chip. With suitable loop design, the output of the external oscillator could retain the programming convenience, and good close-in performance of the synthesiser chip, while combining that with its own good far-out performance. I've been looking at the practicalities of making an oscillator and locking circuitry which could be used to do that.

Comparing oscillators.

There is a simple equation that ties the noise performance of an oscillator to the parameters of its component parts. Developed in the 1960s by D.Leeson (W6NL), wearing his professional hat, it is still fundamental to oscillator design, allowing calculation of the carrier to noise power ratio at a given frequency offset in one sideband:

$$L(f_m) = 10\log\left[1/2\left(\left(f_0/2Q_l f_m\right)^2+1\right)\left(f_c/f_m+1\right)\left(FkT/P_s\right)\right]$$

where: $L(f_m)$ the relative noise power in dBc/Hz at the given frequency offset

Q_l the loaded Q of the resonator

f_m the frequency offset

f_0 the oscillator frequency

f_c the flicker noise (1/f noise) corner frequency of the maintaining amplifier

F the noise ***factor*** of the maintaining amplifier at the offset frequency

k Boltzmann's constant ($1.38.10^{-23}$)

T the physical temperature of the amplifier (°K)

P_s the oscillator power available at the input to the sustaining amplifier

The Leeson equation can be simplified to compare the potential phase noise of oscillators where all conditions, including the measurement frequency offset are held the same, and the resonator Q alone is varied. I've found this very revealing when comparing different approaches to oscillator designs. It comes down to 6dB improvement in phase noise for each doubling of oscillator loaded Q. So, if it's possible to make an oscillator

using a resonator having a loaded Q of say 250, rather than 25, we'd see an improvement in phase noise of 20dB at a given offset.

Making an oscillator voltage tuneable with a varactor brings the problem of varactor modulation noise into the equation. All ways of tuning an oscillator bring problems, and voltage tuning more than most!

A proof-of-principle prototype.

Over the last few months I've been working on a practical VCO for the 10 – 12 GHz region and I'm making some progress. This isn't a straightforward job. Due to other demands on my time, I have yet to get the voltage tuned oscillator prototype running, but I have a made a proof-of-principle prototype of a fixed-tuned transmission-mode oscillator, which has convinced me that I'm on the right track.

With the P-o-P prototype, simply laid across the bench (!) I've been able demonstrate the operation of an oscillator at around 10350MHz. I've used a dual resonator made from a single half-wave length of circular waveguide operating in TE11 mode. When excited in two orthogonal modes – think of those as vertical and horizontal polarisation, if you like - the individual resonators are very well isolated, typically by around 35dB, despite occupying the same physical space.

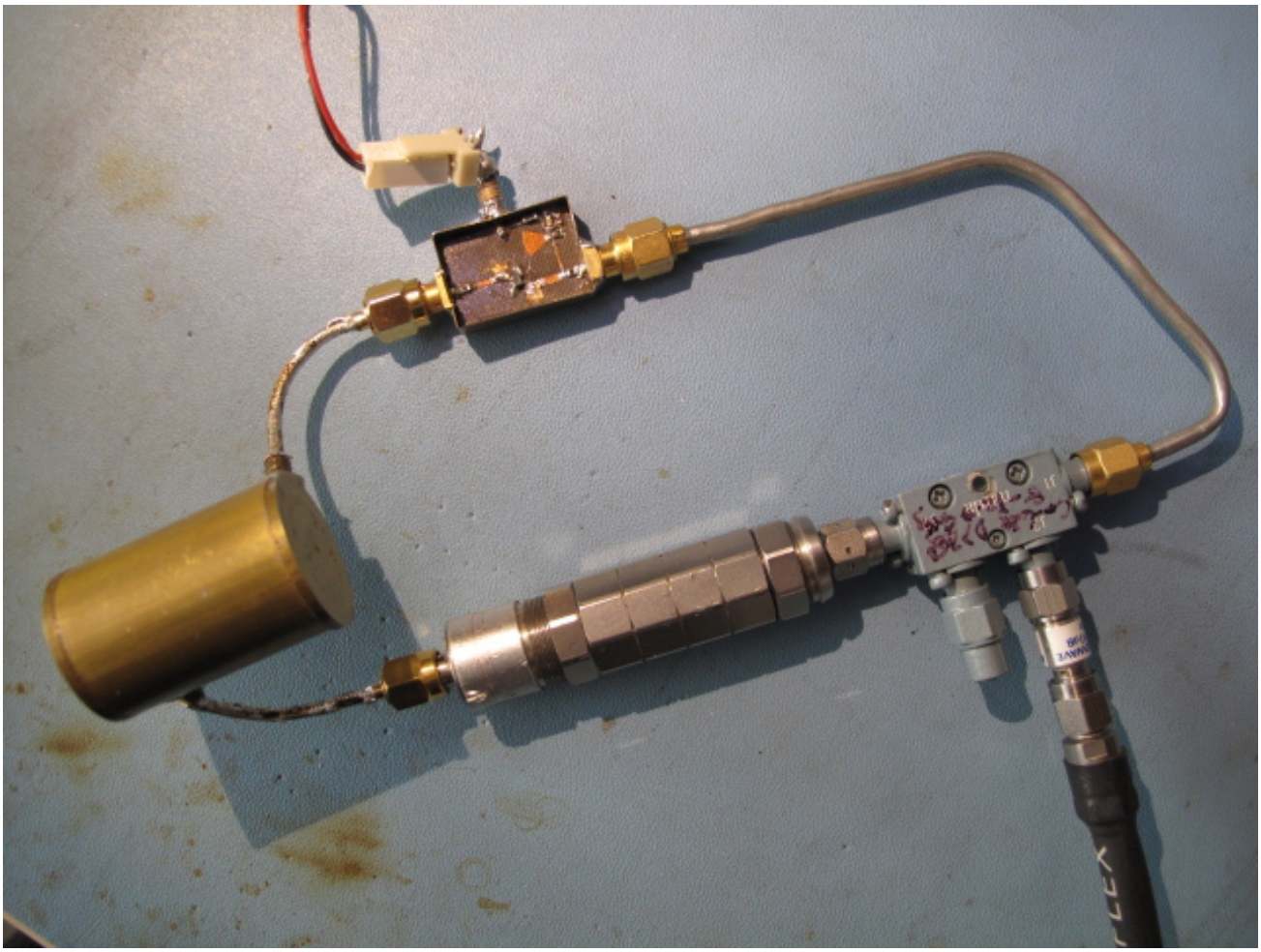


Fig.2 The P-o-P Prototype

Controlled coupling between them is achieved by introducing a small probe mutually at 45° to the e-field plane of the individual waveguide modes. Coupling into each resonator is by simple e-field probes, the length and penetration of which which has been adjusted for critical coupling and a -3dB bandwidth of ~30MHz. That equates to an equivalent loaded Q of about 350. The filter was designed, and optimised, using 3D electromagnetic simulation, and is not simply a random piece of tube! It would be easy to obtain much higher loaded Q, but I already had the filter, built as part of the development process for the image filter in my transverter system. The need to voltage tune the oscillator over a couple of 10s of MHz to allow for thermal drift, limits the maximum Q_L which can be used, and 350 seems to be quite a reasonable compromise. I have played- around with the idea of a silver-plated invar cavity but, unless a Fairy Godmother surfaces, that seems to be an unlikely solution!

The maintaining amplifier is a gain-block I made around 2005, using a cheap BGA 616 SiGe device which gives around 9dB gain at 10.4GHz. That was the first suitable amplifier that came to hand … It's not perfect, but being an SiGe device, the chances are that the 1/f noise performance is significantly better than typical HEMTs. I can probably extract the typical input 1/f noise characteristics from the the published SPICE parameters for that device and add those to the model. The loop is completed by an adjustable (mechanical) phase-shifter.

I take power out of the oscillator with a 10dB directional coupler in the maintaining amplifier output circuit.

Measurements of the noise performance are very close to (or possibly better than) that of my spectrum analyser, an HP70000 unit. Further testing will have to wait until I can phase-lock the oscillator, and make a measurement with my home-brew PN test set. The figures as currently measured are around 10dB better than the on-chip oscillators currently available.

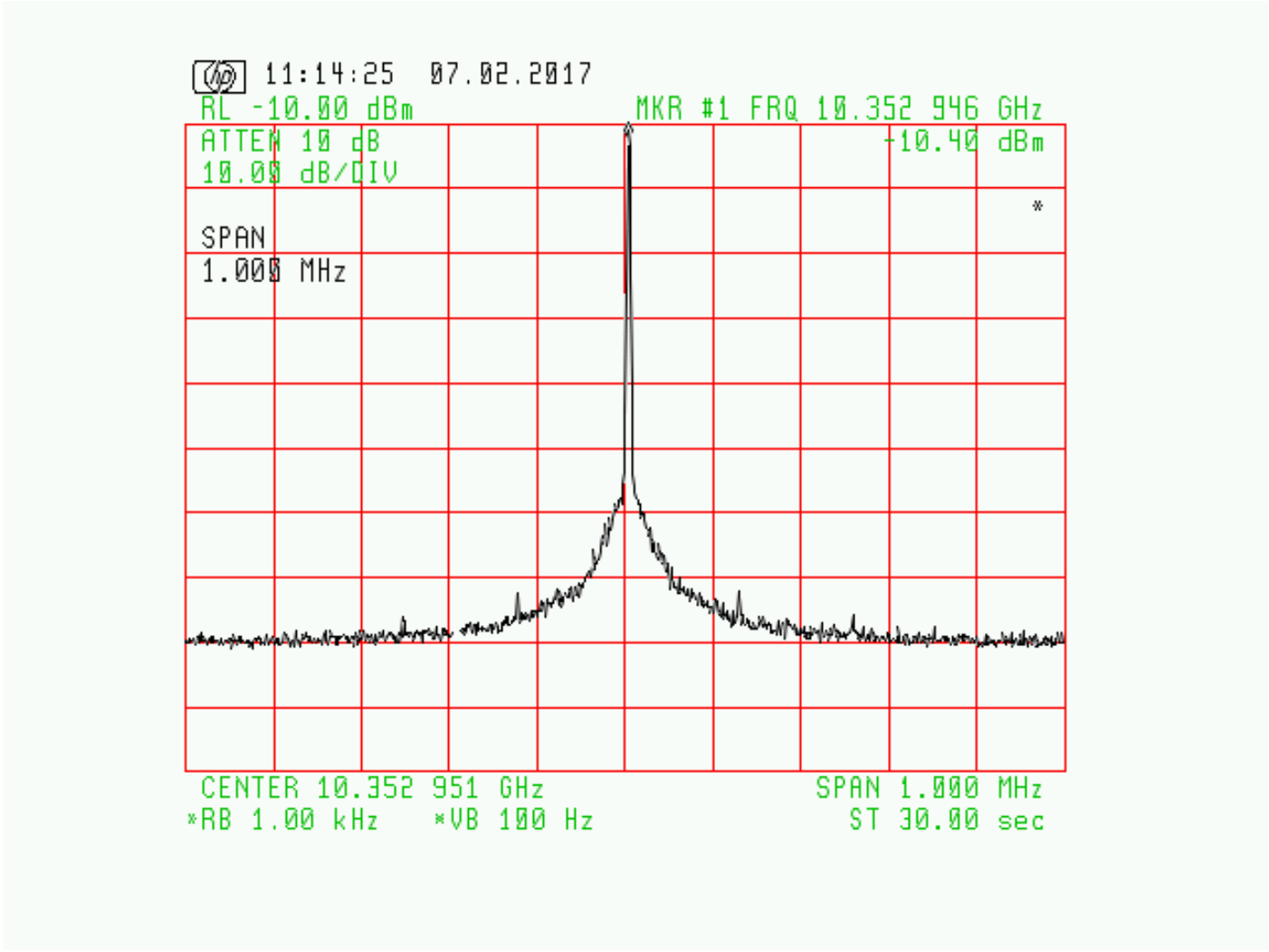


Fig. 3. Spectrum – 1MHz Span.

This plot basically shows the performance of my spectrum analyser in the 10GHz region, although I am using the P-oP prototype oscillator as a source!

From this it's possible to infer that the phase noise at 100kHz offset will be significantly better than -107dBc/Hz.

Where to next?

The next step will be to make the oscillator voltage tuneable. This is most simply done by placing a voltage controlled phase shifter in the feedback loop.

While it may not be intuitively obvious, tuning an oscillator always involves changing the phase shift of a feedback loop. An oscillator will only generate energy if the total phase shift around the loop is an integer multiple of 360° at the operating frequency, and it has greater than unity loop gain. That's as true for negative resistance oscillators as for feedback oscillators.

The tuning range of this oscillator will be defined by the filter: when the oscillator operating point is shifted far enough down the slopes of the the filter, the loop gain will fall below the level at which oscillation can continue.

Voltage-controlled phase shifters are relatively easy to make at microwave frequencies. Most simply, a couple of varactor diodes, and a printed branch-line hybrid should be enough. Finding suitable diodes can be a problem, but a solution probably exists in the low-cost mixer diodes made for TV downconverters. There are a few candidate devices which I want to investigate. All suffer from fairly limited reverse breakdown voltage, limiting the tuning range. My simulations suggest that a phase shift of perhaps ±70° is available fairly simply: that should be adequate to tune the oscillator over about 20MHz – sufficient to compensate for thermal drift, but not enough for the varactor modulation noise to make great inroads to the oscillator performance. My initial estimate is that given the expected performance of the tuning diodes, the VMN will be in the region of -119dBc/Hz at 100kHz, so it won't add more than a dB or two to the total phase noise.

The tuning range of this oscillator will be defined by the filter: when the oscillator operating point is shifted far enough down the slopes of the the filter, the loop gain will fall below the level at which oscillation can continue.

I'm now starting to work on what I hope will be a relatively simple PCB design which will include the maintaining amplifier, phase shifter, phase detector, out of lock detector, and loop components.

The phase-lock circuitry is fairly straightforward. The phase detector can essentially be a printed balanced mixer. I also plan to look at the possibility of using a simple harmonic mixer, so that it's possible to lock the VCO at 10GHz while using a source in the 5GHz region.

Final ...

That's all I have to say for now. This is a work in progress, and I can't give an estimate of when it will be finished! However, I will put-together some more notes as I continue.

Chris Bartram GW4DGU

Awards News Feb 2017

John QuarmbyG3XDY, Awards Manager

Awards for the First QSOs on 122GHz and 241GHz

Chris G0FDZ/P and Roger G8CUB/P have received well deserved First awards for their contacts on the 122GHz and 241GHz bands which took place on 19th February 2016 on 241GHz and 17th July 2016 on 122GHz, using CW over line of sight paths on both occasions.

Further awards for G4NBS

Following on from his recent squares awards, Tony G4NBS submitted more QSL cards to take him to the 75 squares sticker for 1.3GHz and 25 squares on 2.3GHz. Some very nice DX from France round to Norway was included in the cards submitted.

Full details of UKuG awards can be found at: http://www.microwavers.org/awards.htm

Scatterpoint renewals - email addresses bouncing

If you have changed your email provider/address in the last 18 months would you please confirm the new address to the membership secretary forthwith.

A recent batch of membership renewal reminders resulted in 9 bouncing emails. Failure to submit a renewal subscription as a result of receiving no reminder when overdue will result in termination of UKuG membership and no access to the Scatterpoint Yahoo group.

Please confirm new email addresses to the membership secretary at:

bryanharber@fastmail.co.uk and **give your callsign**.

Thanks

Bryan, G8DKK

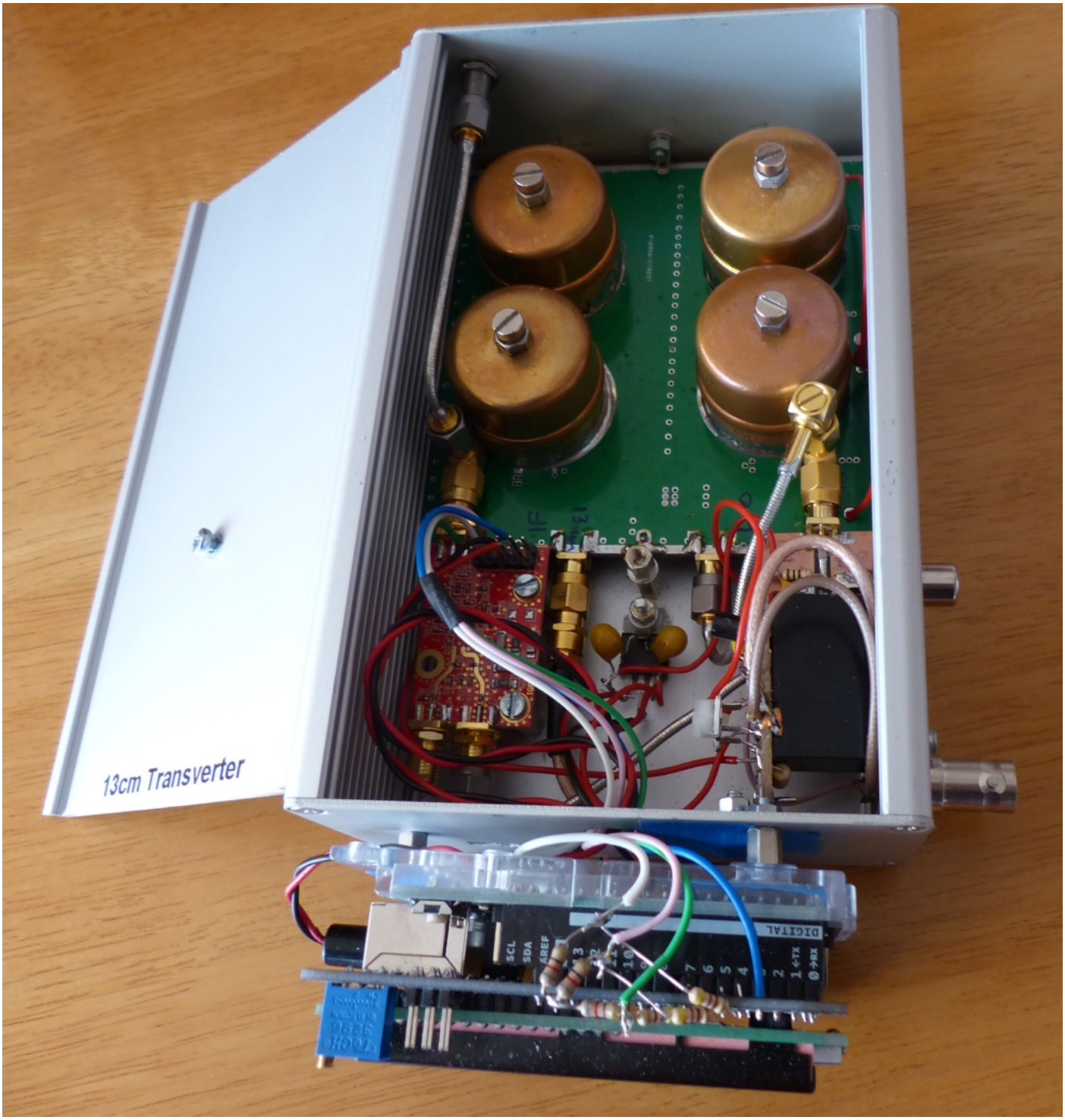
The Accidental 13cm Transverter

Geoff Pike, GI0GDP

This is accidental in that I accidentally bumped into Brian Flynn GM8BJF at Burntisland last November and he was showing someone his transverter and then I noticed he had some spare boards. After an exchange of words and money, I took 2 boards and put them in my pocket.

When I got home the first thing was to see if I could get tall 28mm end stops.

These are seemingly easier to get in the USA than UK. My first attempt got ones that were just 21mm tall.



These weren't much use on 13cm but showed usefulness at 9cm. The trip to B&Q was a surprise as they had ones that were about 26mm tall (Yorkshire types).

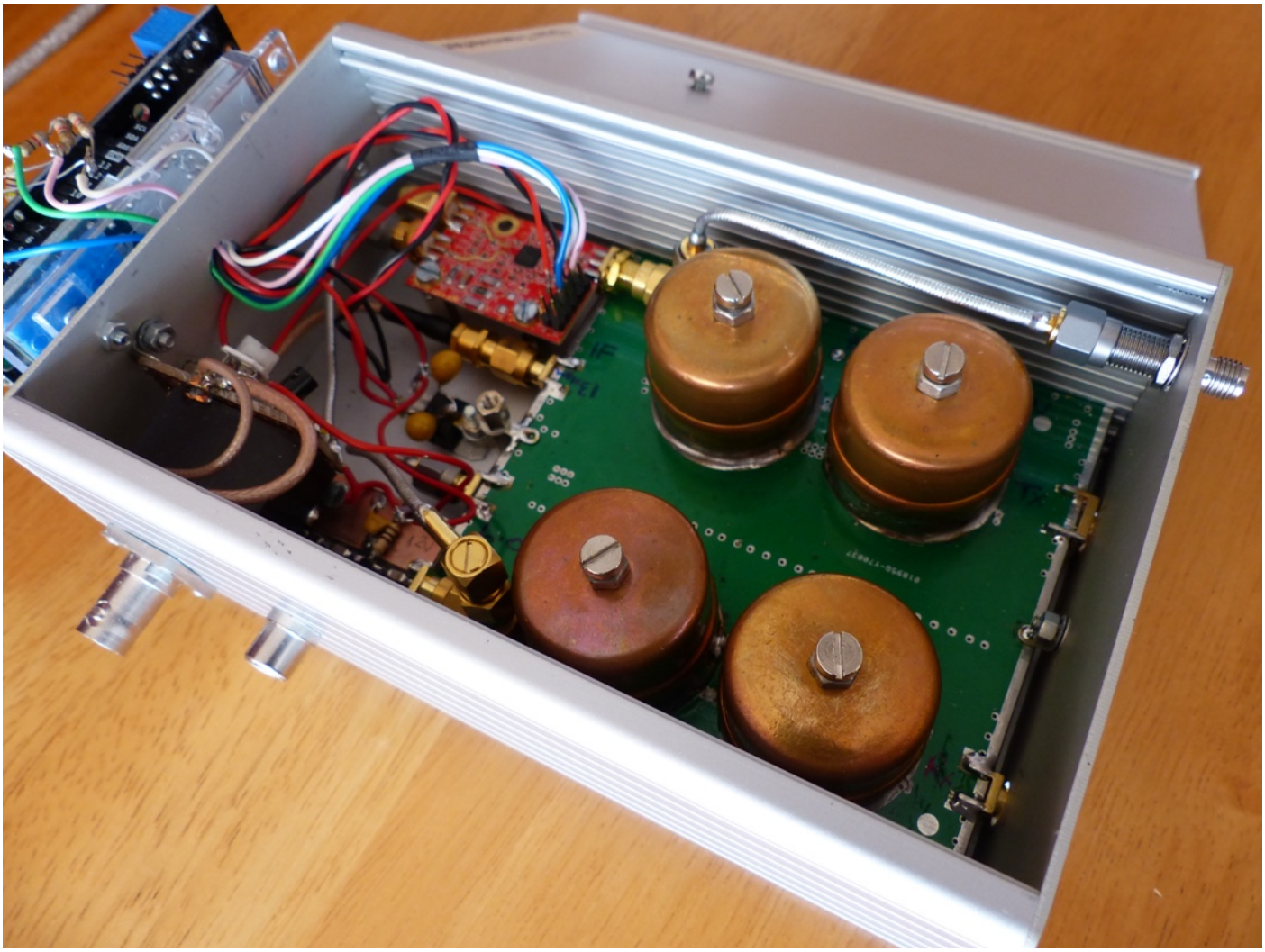
After getting some new 4BA bolts and nuts another attempt was made and the result was rather good. I used pins (jewellery pins) that were 13mm above the PCB.

I used ERA-5s and I think a BGA-6489 in the RX and the mixer was a Mini circuits one only spec to 2GHz and the results more than acceptable.

At this stage I was using signal generators for the in coming signal and LO at 1868 MHz.

With some experience with these pipe caps I then added the TX side to the PCB, obviously space was getting tight but between heating the end stops on the oven and the 50 Watt iron on max I managed to get them soldered before things went cold.

Again ERA-5s were used in the Tx section and, although it was a bit lively, I managed to calm it down with absorbing rubber and damping one of the PCB supply inductors to the first ERA-5. From memory I got about 30mW and excellent LO suppression. I was pleased with the LO rejection as the last time I used pipe caps at 3cm the LO suppression was mediocre to poor.

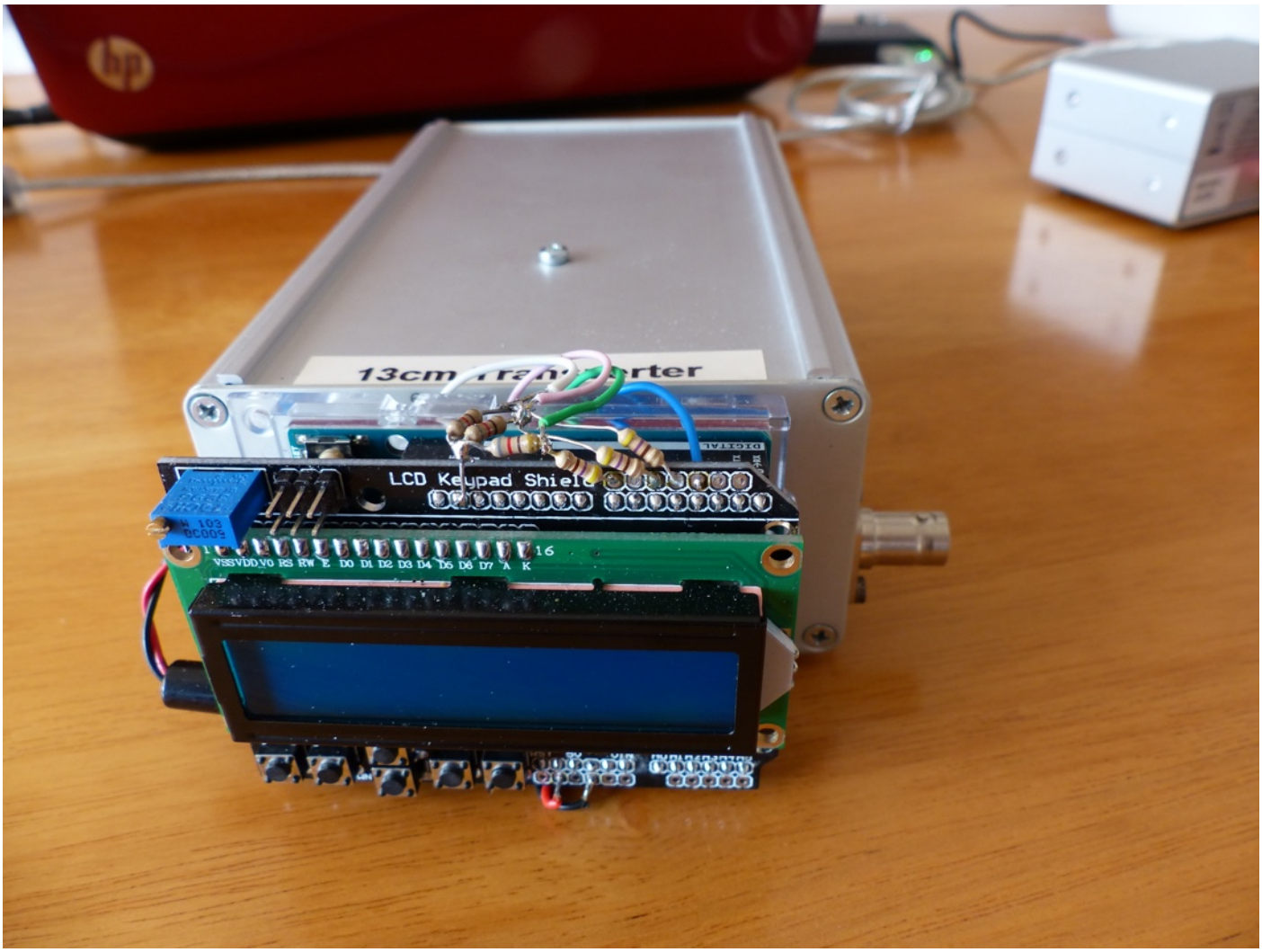


So time to box up and go digital, the boxing is self evident from the picture but the Arduino and ADF4351 was interesting. As I had mentioned somewhere else the main problem was twisting the control wires from the Arduino to the SV1AFN PCB. NOT A GOOD idea so, as soon as they were untwisted, things began to work.

The Arduino uses the sketch from F1CJN. Once the lock light came on I was ready to inject a signal and get a feel for sensitivity, all good -120 dBm was easily heard BUT the tone was T0 if that's possible it was just awful. All sorts of things came to mind as it was OK before on a signal generator as the LO. Anyway, being in a unnecessary hurry, I had used the sig gen as the 10 MHz ref.; BAD idea. As soon has a OCXO at 10 MHz was plugged in, sanity returned with a perfect tone and steady to boot.

The SV1AFN PCB needed some lift to drive the mixer and again I used an ERA-5, the FT-790 was used for IF and the 6.8V on Tx was used to effect PTT, although I have fitted a phono socket to do the same job if needed.

The Arduino and LCD display is a bit big stuck on the end but it makes the thing very frequency-agile and that's needed for 13cm. All I need to finish is a PA and an antenna and I am not sure whether to use a dish or a DL6WU Yagi.



Anyway it was a journey into ADF4351 PLL/VCOs and Arduinos. This will be fed from another F1CJN project – the NE0-7/Arduino nano and G3RUH PLL for the 10 MHz ref.

Plenty of LCD displays on this project.

Thanks to Brian for having the extra pcbs at Burntisland and I suppose also to the writers of the software.

Geoff Pike, GI0GDP

UKuG Microwave Contest Calendar 2017

Dates	Time UTC	Contest name	Certificates
5-Mar	1000 - 1600	1st Low band 1.3/2.3/3.4GHz	F, P,L
23-Apr	1000 - 1600	2nd Low band 1.3/2.3/3.4GHz	F, P,L
7-May	0800 - 1400	3rd Low band 1.3/2.3/3.4GHz	F, P,L
21-May	0900 – 1700	1st 24GHz Contest	
21-May	0900 – 1700	1st 47GHz Contest	
21-May	0900 – 1700	1st 76GHz Contest	
28-May	0600 - 1800	1st 5.7GHz Contest	F, P,L
28-May	0600 - 1800	1st 10GHz Contest	F, P,L
4-Jun	1000 - 1600	4th Low band 1.3/2.3/3.4GHz	F, P,L
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)

Activity News : January 2017

By Neil Underwood G4LDR

Please send your activity news to:

scatterpoint@microwavers. org

Introduction

Once again there has been no activity reports received for last month. Hopefully there may be something to report in the next issue.

UK Beacons

https://groups.yahoo.com/neo/groups/uk_beacons/info

Technical & Operating matters, licensing, news etc

162 members and quite close to UK Microwaves for relevant info

73

Murray

Distance records

New Australian Record - https://groups.yahoo.com/neo/groups/VK-Microwave/conversations/messages/1903

Advisory : New National Records - 47 GHz. Alan Jan 15 6:06 AM

Gidday All,

this to advise the 47 GHz VK National Records on both SSB and Digital Modes were extended by VK3 Operators on Wednesday, January 11.

The new Distance Records for both these Modes on 47 GHz are now out to 177.9 km.

The following is a brief summary of our activities and the equipment used.

Our initial activities started on Tuesday, Jan 10th with the team of David - VK3HZ and Peter - VK3APW setting up at the Mt Dandenong Observatory, East of Melbourne.

Alan - VK3XPD drove to a spot near Mt Cottrell, west of Melbourne. This site delivered a Line Of Sight (LOS) path of 64.2 km. Crushingly strong signals were experienced on both 47 GHz and 78 GHz over this somewhat modest path.

Alan subsequently drove (and operated) further west at Myrniong (90.2 km) and finally Mt Buninyong (127.1 km) where he was visited by Ian - VK3AXH as an interested observer.

These progressively longer QSO's were a "shakedown run" for the main event planned for the next day.

To avoid excessive driving on his part, Alan then drove further west and stayed overnight in a Motel in Stawell. Next day - Wednesday, it was only a relatively short drive to the Summit of Mt William, south of Halls Gap.

David and Peter took a little longer driving from Melbourne to Colac.

At around 1030 Hrs, Alan - VK3XPD arrived at the 1158 metre summit of Mt William in western Victoria. Visibility was only a few metres due heavy misty clouds and there was (initially) no Cell coverage.

The team of David - VK3HZ and Peter - VK3APW initially drove to a location south of Colac from which both the SSB and DIGI Records were extended to 149.6 km.

Later the same day, David and Peter relocated to Mt Sabine in the Otways, east of Beech Forest from where these new National Distance Records were further extended to 177.9 km.

Equipment:

VK3XPD/3 - Homebrew OCXO-Locked Transverter, 20mW output, 300mm dish, FT-817 IF.

VK3APW/3 and VK3HZ/3: - Kuhne OCXO-Locked Transverter, 80mW output, 300mm dish, FT-817 IF.

QSO's on 78 GHz were also attempted and although we did detect very weak "Ident" signals albeit briefly, we were ultimately unsuccessful due to poor propagation (high path losses) on this band.

At the end of this very long day, we all headed home - sunburnt and rather tired but pleased our significant efforts had been rewarded !

Cheers,
Alan - VK3XPD

For and on behalf of David - VK3HZ and Peter - VK3APW

New 47 GHz Records

The following new records have been added to the list:

47 GHz VK3 Home/Portable record

47 GHz National Home/Portable record

47 GHz National Digital Modes record

VK3HZ and VK3APW to VK3XPD, 11/01/17, 177.9 km

The full lists of current and past VHF-UHF records are available at
http://www.wia.org.au/members/records/data/edit/index.php

John VK3KM

… and finally

The deadline for activity news for the next edition of Scatterpoint is Wednesday 1st March 2017.

Wanted: Deputy Editor

Martin Richmond-Hardy G8BHC

Now in my 70th year, and conscious of recent sad events, it would be really helpful to have a deputy for occasions when I'm indisposed.
Although I use Pages '09 on a Mac, you don't have to have a Mac – LibreOffice, MS Word, Scribus, or whatever word processor you are used to will do the business. The only requirement is to be able to publish as pdf in A4 and booklet format.
Drop me a line editor@microwavers. org if you're interested.

Still some G4BAH items for sale

As some of you will be aware I am dealing with the radio aspects of Bob G4BAH's estate. Whilst most of the newer equipment, masts and antennas will be kept for HF and VHF contest use, there are also a considerable number of items still for disposal. See the list in the December issue, pp19,20.

My apologies to some who have emailed me and not yet got a reply. This pile is on hold whilst I deal with a number of more urgent issues with the estate, lawyers, etc. There is about 1/3 of the items left.

John G4SWX john.regnault@btinternet.com

For sale: 2.4GHz gear

Peter Harston GW4JQP pharston@theiet.org

I would like to dispose of my collection of 2.4GHz professional broadcast gear. All prices are negotiable, and I am interested in considering swaps for 10GHz kit.

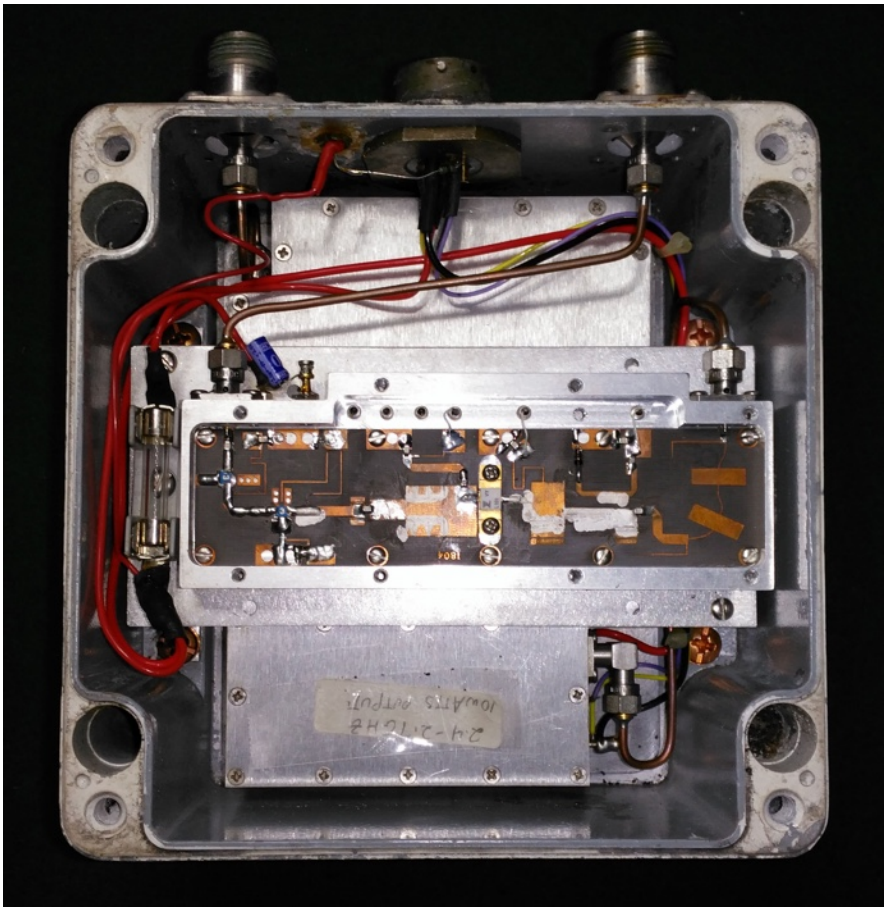
All have N-type connectors unless stated. Antennas have useful gain between 2.0 and 2.7GHz The feeds are set up for circular polarisation with stripline phasing sections which you can reconnect internally for linear polarisation if required.

1. Heavy duty 60cm prime dish complete with L-mounting bracket and dual polarity feed.
2. Heavy duty 60cm prime dish with tie-down holes ideal for operating in gale-force winds!

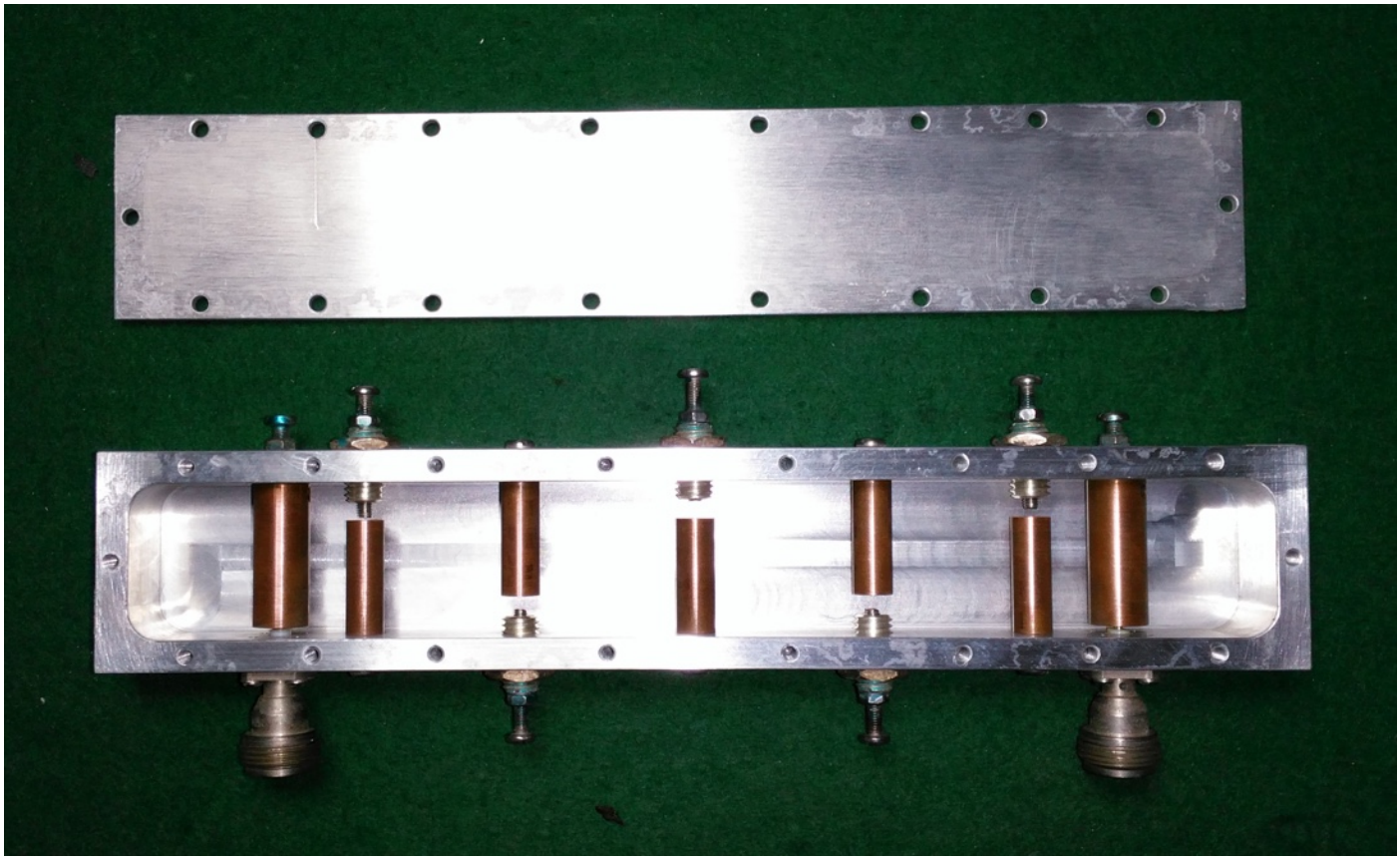
3. 4 off 17dB disc yagis dual pol. These can be rear mounted as pairs or quad and phased together for maximum gain. 110cm.
4. 9dB omnidirectional antenna, ideal for beacon. 85cm.
5. Gigawave 18dB helical rod antenna. 56cm.
6. Gigawave omni antenna. 56cm.
7. Gigawave omni camera antenna. 38cm.
8. Omni antenna SMA connector. 11cm.

9. RF208 150mW to 10W amp 24V needs looking at, but has preamp, two circulators, filter and control board.

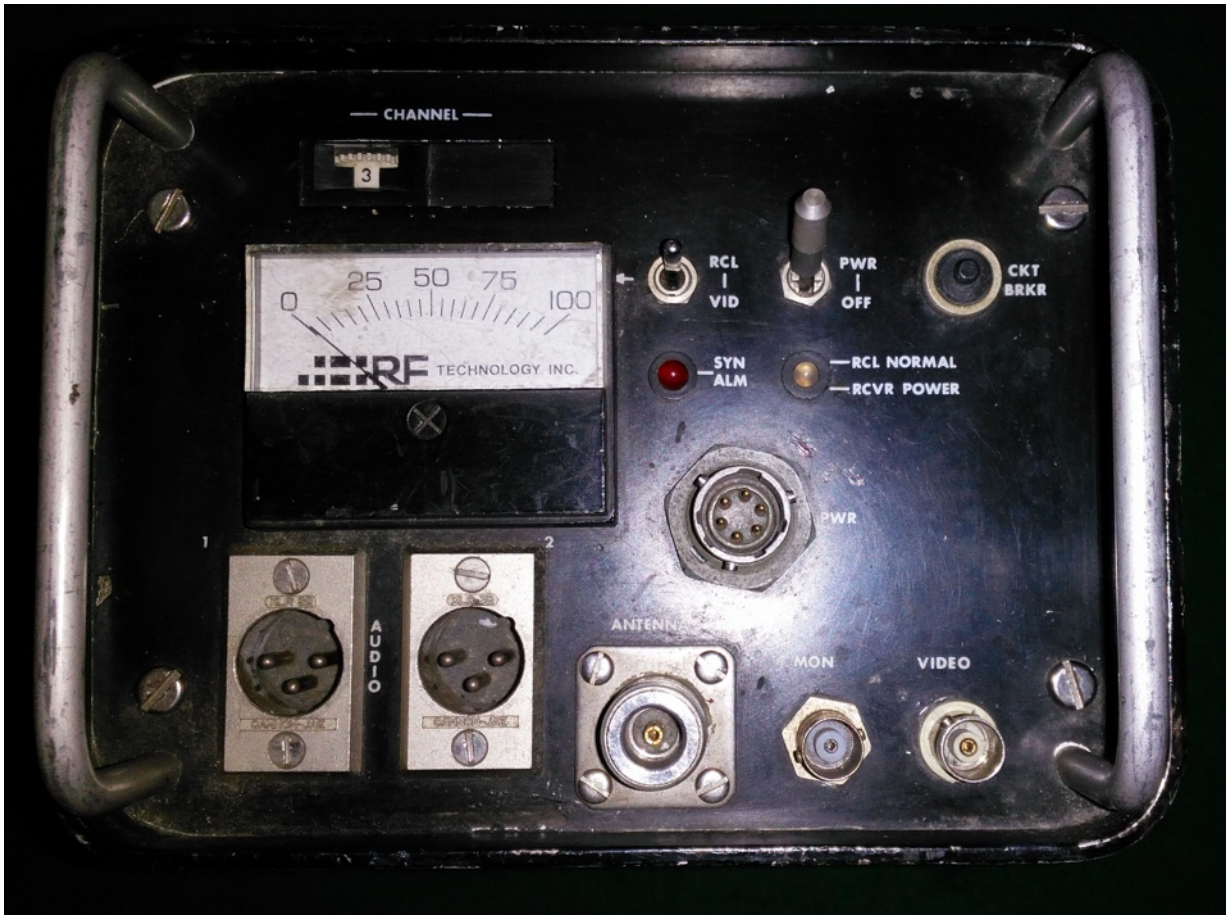
10. RF Tech 2.4GHz 100mW to 10W amp.



11. 2.2-2.6GHz 7-pole interdigital filter. Easy to adjust.



12. 2 off RF Technology synthesised FM receivers plus spare for parts.



17th Microwave Technical Meeting – Bydgoszcz, Poland

April 22-23 www.mikrofale.iq24.pl/default.asp?grupa=160446&temat=447910

Location: JO83xc The meeting will be held at the Inn Fojutowo http://www.zajazd-fojutowo.pl/kontakt

Saturday 22 April

10:00		Welcome, the start of the meeting.
10:15	13:00	papers and an individual; measurement devices;
14:00		Lunch
15:00 - 16:30		papers and an individual; measurement devices;
17:30		Dinner
18:30		meetings and discussions in groups of interest;

Sunday, 23 April

08:00 - 09:00	Breakfast
9:15 - 12:30	measurement devices; meeting in groups of interest; Other topics ...
13:00	End of the meeting;
14:00	Lunch

For those with VHF interests, on 18 August 18-20 2017 there is the 56th SP-VHF-Club Convention and 19th VHF Technical Meeting - Morawa.

www.mikrofale.iq24.pl/default.asp?grupa=160446&temat=447382 or www.pk-ukf.org.pl

73

Tomasz Babut SP5XMU / SN5R

RadioActive 50MHz & above

www.sp5xmu.pl

Websites are only in Polish so many of you will have to rely on Google Translate. Ed.

Events calendar

2017

Feb 11	Tagung Dorsten	www.ghz-tagung.de/
Apr 8	CJ-2017, Seigy	cj.ref-union.org/
Apr 8–9	Martlesham Microwave Round Table & **UKμG AGM**	mmrt.homedns.org
Apr 22	RSGB AGM, Cardiff	rsgb.org/agm
April 22-23	17th Microwave Technical Meeting – Bydgoszcz	www.mikrofale.iq24.pl/default.asp?grupa=160446&temat=447910
May 19 – 21	Hamvention, Dayton	www.hamvention.org/
June 11	RAL @ Chiltern Village Hall OX11 0SH	
July 14 – 16	Ham Radio, Friedrichshafen	www.hamradio-friedrichshafen.de/
July 8 – 9	Finningley Roundtable	www.g0ghk.com/
Sept 8 – 10	62.UKW Tagung Weinheim	www.ukw-tagung.de/
Sept 17–21	IARU-R1 Conference, Landshut, Germany	www.iaru2017.org/
Sept 29–30	National Hamfest	www.nationalhamfest.org.uk/
Sept 10	Crawley Roundtable	carc.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/
tbc	Microwave Update, San Jose, California	

2018

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 2017/18/19 event links may not be working/updated yet.

EME 2018

The website http://eme2018.nl/ is online. Only very basic info yet. More soon!

And a Facebook page was created: https://www.facebook.com/EME2018/

73!
Jan
PA3FXB (team PI9CAM)
team EME 2018