An Amateur Radio publication for the Microwave Enthusiast

scatterpoint

Published by the UK Microwave Group

2008 JULY-AUGUST

NEW 24GHz WORLD RECORD ...

Guy, **F2CT/P** has set new 24GHz world records, twice! On the evening of 24th June, 2008, he made a rainscatter QSO with F6DWG/P at 637km and, just over an hour later, with LX1DB at an incredible **710km** ! With one giant leap through the 600km barrier, these two QSOs beat the previous 544km world record, 459km European tropo record, and the 423km rainscatter record **See page 4 for full details**.

F2CT/P - JN13IQ

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MANY THANKS TO ALL OUR CONTRIBUTORS THIS MONTH ... WITHOUT YOU THERE WOULD BE NO SCATTERPOINT!

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From the Editor's Desk …

Hello again after the midsummer break.

Since we last published there have been some changes in the UKuG Committee. We are very sorry to report that our Secretary, Ian Lamb, G8KQW, has had to resign his post due to his business commitments which, at present, are frequently taking him overseas for relatively long periods. As a result we have had to make a swift appoint or two! The Chairman has decided to split the secretary's job into two: Membership and General Business. This means that all membership enquiries should now go to the new Membership Secretary, Bryan Harber, G8DKK. However, we ask you not to contact him just yet as he is busy setting up for the job. **Meanwhile, until further notice, please send all membership applications, etc, to the Treasurer, G3FSG.** Full details can be found in the information panel above. Other general business, however, can now be routed via the new General Secretary, Lehane Kellett, G8KMH. Along with Sam, G4DDK, Lehane was a founder member of the UK Microwave group before it became it's present entity, after the RSGB Microwave Newsletter was moved over to the Group in early 2004. Welcome home Lehane!

We are, of course, very sorry to lose Ian, G8KQW, who was a really excellent and highly efficient secretary. Never one to mince words, Ian took his UKuG job very seriously and, as a result, the Group made rapid progress during his term of office. We wish him all the best in his business ventures and thanks him for all he has done for the UK Microwave Group.

73 from Peter, G3PHO
Editor

News, views and articles for this newsletter are always welcome. Please send them to G3PHO (preferably by email) to the address shown lower left. **The closing date is the Friday following the first Monday of the month** if you want your material to be published in the next issue.

UK Microwave Group scores yet another first ….

July 12-13th this year saw the UKuG, in co-operation with the Sheffield Amateur Radio Club, score yet another "first". The Sheffield Microwave Roundtable was held at the radio club's venue in southern Sheffield and, in addition to the Sunday lecture programme, featured the first of the Intermediate Microwave Workshops, held on the Saturday. In fact it was Sheffield that was the location of the very first Beginners' Workshop over two years ago. As if this was not enough, another and perhaps more important "first" was achieved that weekend… the live televising (down the Internet) of the whole event! Just a few days before the event, Peter Blakeborough G3PYB, President of the British Amateur Television Club, learned that SARC had just come online with broadband at their club premises. He liaised with Peter, G3PHO, organiser of the Sheffield microwave weekend, so that the talks on both days could be streamed, as they were presented, through BATC's new website ... www.batc.tv. This allowed people worldwide to enjoy the talks even though they could not attend themselves.

To say that this was a resounding successes is an understatement! Emails from far and wide poured in over the weekend while the chat facility on the BATC website was scrolling up faster than KST on a contest day! The streamed video was watched as far afield as Texas, Australia and the Sudan. Naturally a few "teething problems" were experienced since the camera and AV mixer team consisted of just two people, G3PYB and G3PHO (with a little extra help from GM4CXM on the Sunday). Arms and heads occasionally got in front of the cameras and audio levels had to be adjusted 'on the fly' as reception reports came in via the chat or email.

Giles Read, Technical editor of Radcom, came along for the whole weekend and was suitably impressed … enough to write an item for a future edition of the RSGB's magazine.

The video streaming was so successful that, just a couple of weeks later, G3PYB was asked to repeat the facility at the prestigious AMSAT UK Conference in Surrey. By this time he had honed the system to a higher level of efficiency and had managed to get more help with camera work and vision mixing. Martlesham maybe the next time UK microwaves go live on the internet.. The Sheffield weekend will be reviewed in next month's Scatterpoint but meanwhile … well done UKuG, Sheffield ARC and BATC for bringing amateur microwave radio into people's homes around the world. Go to **www.batc.tv** for archived footage of other amateur radio items. The Sheffield RT and the Amsat talks will eventually be available there for video download.

CRAWLEY MICROWAVE ROUND TABLE
Sunday 14th September 2008

As usual we will be running the UK Microwave Group annual construction contest for the G3VVB trophy. Please do bring along your constructed equipment and enter the contest. Entries do not necessarily need to have been constructed during the last year. Last year's winner was Chris G0FDZ – this year it might be you that carries away the trophy!

TIMETABLE

10:00	Venue opens
12:00	Construction contest judging commences
13:00	Lunch (rolls, sandwiches etc and tea/coffee available)
14:00	Opening address by Derek G3GRO and the results of the construction contest
14:30	The GB3FNM beacon complex – Brian Coleman G4NNS
15:00	Direct generation of signals from 300 to 1300 MHz using the ADL5370 Quadrature modulator from Analog Devices Michael White G3WOE & David Bowman G0MRF
15:30	Break
15:45	The Gemma project – Grant Hodgson G8UBN
16:30	End of meeting

The venue is the Crawley Amateur Radio Club hut:

Crawley ARC HQ - Hut-18,
Tilgate Forest Recreational Centre,
Crawley
NGR TQ269345

Directions: www.carc.org.uk/find_us/directions.shtml

F2CT/P sets new 24GHz World record

Robin Lucas, G8APZ

Tuesday 24th June 2008, started much the same as the previous few days. Some rainscatter was evident in small patches across France, with a good number of French stations out portable on the microwave bands for the week of "La Grande Bleu" activity (*May Scatterpoint, p16*). On most days there had been some RS, with some long 3cm paths worked.

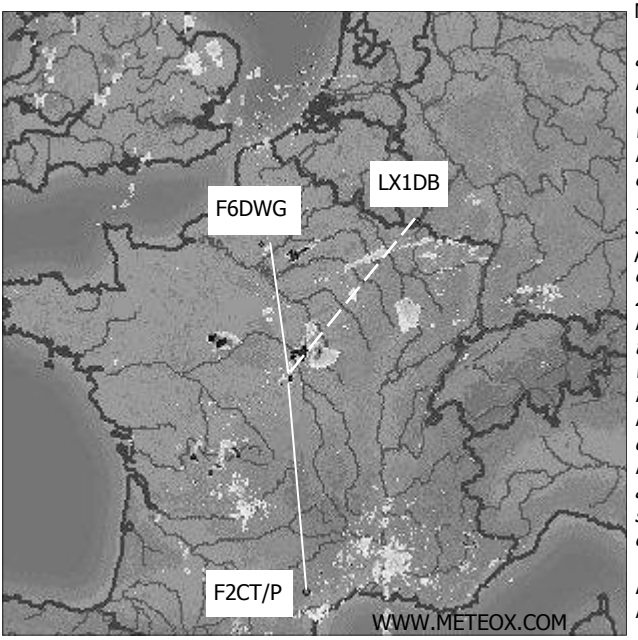
The day began with several stations forecasting a high probability of RS contacts on the band during the evening. However, as the day progressed, there was not very much rain anywhere across France, and by 17:00utc there were a few stations considering that any chance of RS QSOs was over for the day.

By 19:00utc things started looking up on 3cm. F2CT/P (JN13IQ) worked F6DRO (JN03) via a scatterpoint in JN16, and was heard by F6DKW (JN18) fifteen minutes later who reported F2CT/P as "end scale" at 566km. By 19:30utc F6DRO could hear F6DKW via two scatterpoints (JN16 and JN17). At 19:40utc, F6DRO reported the distance to the scatterpoint was 432km for him, and that it must be very high, but at 19:50utc F6DRO had to dismantle his outdoor setup due to nightfall (21:50 local). The big signals on 3cm continued.

At 20:01utc Marc, F6DWG/P made a QSO with F2CT/P on 24GHz RS at 637kms. For what turned out to be a short while, this set a new world record, beating the previous world record by a big margin. F6DWG determined that the scatterpoint was at JN17LO, which was 210km from him, and 435km from F2CT/P

Guy, F2CT/P was operating from Roc de Montalet JN13IQ 1259 m asl (Monts de Lacaune) in Département 81 (Midi-Pyrénées) where the WX was cloud free, with a southerly wind (around 40km/h) and the temperature 19°C at 19:00utc. Guy gives this account of the QSO....

"The azimuth was +3° and elevation +5°. At 20:00utc the 24GHz signal from F6DWG/P was peaking to 6 dB/ noise with very large spread of +/5 kHz. The 10GHz signal strength was so high that I could hear the signal at S5 with a 70 dB attenuator in the 432 IF !"



Marc F6DWG continues....

"The QSO was made on 24th June at 2001GMT- I am in JN19AJ near Beauvais. I think we were using an extremely BIG storm because Guy was booming on 3cm 59RS++ . I have never seen such an extremely strong signal before on 10GHz !! I have determined the SCP to be JN17LO, 176°. After pointing my dish to the maximum on 3cm, I was transmitting on 24048.100 for one minute, and I received an SMS from F2CT - "Je t'entends" (I am hearing you). Guy was calling me on my frequency but at first I got nil from him. To copy him, I used 4 degrees of elevation on my dish. His signal was very weak occupying around 5kHz bandwidth, a very strange RS signal, maybe because of the very long distance..637kms ! The maximum RST was 41S on both sides and after the final rogers, I lost him in the noise."

The equipment:
F2CT/P used an FT817ND as a 432MHz IF with a transverter from I3OPW**.** The RX NF was 1.8dB and the TX output power was a hefty 7W! The dish was an 88cm Alcatel offset type (see photo).
F6DWG/P was using 2.5W out with a 90cm Gregorian offset dish, and DB6NT preamp, 2.5db NF.

Above Marc F6DWG/P Beauvais with 3cm transverter. The 24GHz equipment is on the ground. **Left** Guy F2CT/P on Roc de Montalet with 3cm transverter on the dish.

The fun didn't end there though! F2CT/P tried a 24GHz test with LX1DB at 710Km. The equipment at LX1DB is TX 4W at the feed, with RX NF 1.7db and 45cm dish. El 12°
At 20:55utc F2CT/P heard the LX1DB beacon on 3cm at 59s, and a few minutes later F2CT/P and Willi, LX1DB (JN39CO) were testing on 24GHz. Guy F2CT said *"... at 21:00utc the test with LX1DB was also successful twice with a reply on 10GHz. I got the report from Willi but unfortunately I didn't find him back on 10GHz; the RS was over !*

LX1DB had in fact received both his 52S report and RRR from F2CT/P at 21:30utc. Guy has a recording of the signals from LX1DB on which both callsigns and his 43S report are audible. The distance between JN39CO and JN13IQ is 710km !

In an email to me, LX1DB said: "*I confirm that for me the QSO is valid. JN13IQ Roc de Montalet Dept 81 at 1259m asl to JN39CO 380m asl. The identification and also the report were exchanged in the correct way. The report from my side 43S was due to the fact that the signal was very wide in spectrum and even with the relative high field strength not easy to read, maybe due to 2 scatter point reflections.*

I also did not give the transmitted report by email so Guy really copied it. By the way I have no recording of the QSO as Guy does. I do normally record on EME but I was not prepared for the phenomena."

Conclusions:
The rain cell responsible for this amazing propagation was small but intense; it was at a very high altitude (elevation was required at both ends), and one station was at a good altitude. This was ideal for a QSO, because a widespread rain cloud may have attenuated the signals otherwise. With one leg of the path at 435km and elevation still being required, it would indicate that 800km should be possible, and maybe even 900km!

Rainscatter distances have steadily increased during 2008. On 30th May, DB6NT heard DC6UW via RS at 466km (no QSO), and a few days later, on 2nd June, PA0BAT and F6DWG covered 423km which was believed to be the RS record at the time.

The new rainscatter record at 710km not only exceeded the European tropo record between I0LVA/3 and IW3EHQ/3 (459km) but it also exceeds the world tropo record between WW2R/5 and W5LUA (543km). In most of these DX contacts, one or both stations were portable stations, and all were using QRO (2.5W-10W). 24GHz RS at these distances would seem to require "end stop" signals on 3cm for a good chance of success and, even then, signals are low level.

A 20mm Waveguide to SMA transition for 10368MHz

© Chris Bartram GW4DGU

Fig. 1 Two transitions: one with a flange used on the Skobelev dual-mode feed, and the one it replaced, integrated with the old W2IMU feed.

I needed a transition to feed the 1.8λ aperture W2IMU dual-mode horn feed horn I originally used with the 0.935f/D, 2.4m offset dish I use for 10GHz EME with 0.141inch semi-rigid coax. The design I selected uses a relatively long e-field probe placed at about 0.75λ_g from a backshort, as it seemed from some simulations that it would be slightly less critical to make than the more usual ~0.5λ_g and relatively short probe configuration.

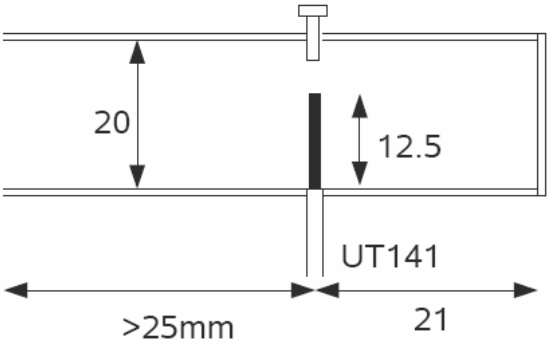


Fig 2. Dimensions of transition.

Rather than use an SMA socket mounted on the circular guide, I chose to make the probe an extension of the centre conductor of the UT141 cable, thus saving potential losses in that connector. EME, particularly with a coax-based system at 10GHz, makes you very aware of *any* losses!! I used the body of a cheap, two-hole nickel-plated SMA socket to support the cable. Some fine wire wound around the semi-rigid took care of the size difference.

Assembly is straightforward. The backshort should be soldered with minimum solder entering the guide. I used solder paste – and not a lot of it – painted around the outside of the joint. It would be possible to use silver-loaded epoxy rather than solder.

Tolerances of 0.5mm are needed. The tuning screw is helpful in reducing the need for great accuracy. It should be possible to adjust the the screw for a return-loss of significantly greater than 20dB. A small amount of fore-and-aft adjustment of the end of the probe can also be used to optimise the return loss.

MANY THANKS TO OUR CONTRIBUTORS THIS MONTH …

Robin, G8APZ
Chris GW4DGU
Roger G8CUB
John W3HMS and Charlie K3VDB
John G4EAT
Carl Gustav SM6HYG
Carl-Olaf SM6HCJ (now S.K)

… and all the others who sent in reports and other news items.

Martlesham Microwave Round Table 8th/9th November 2008

Preparations for the next Martlesham Microwave Round Table are well under way.

As usual, the event will be held at Adastral Park, Martlesham Heath, Ipswich IP5 3RE, on **Saturday and Sunday 8th/9th November 2008.**

The dinner on the Saturday evening will be held at the Holiday Inn Ipswich, London Road, Ipswich. **Please note that this is not the hotel used last year** (which was the Holiday Inn Ipswich Orwell).

The **dinner** price will be **£24** a head, full details of the menu choices and booking will be available shortly when the Round Table booking site opens.

There will also be a block of **rooms** available at **£65** per room per night including breakfast. Please note that you may be able to find lower internet rates but these will not generally include breakfast, and availability may be limited.

Please look out for a further update when the round table booking site is up and running.

73 John G3XDY

GB2RS now on 23cm

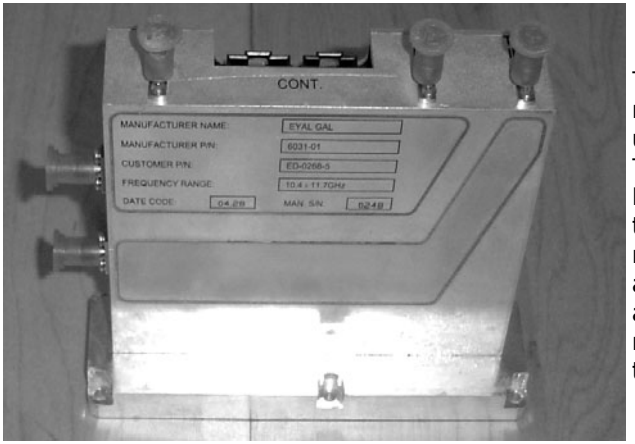
Laurie G0MRL, the North West GB2RS newsreader, has recently appeared on 23cm having found a module for his IC-970H. His coverage is pretty localised but maybe this "enhanced plug" in Scatterpoint might be worthwhile in getting others further afield to listen.

If you are in the NW England region take a listen. No exact frequency or mode were given.

73 from John, MW1FGQ

Using the Eyal Gal 11GHz Transceiver on 10GHz

by Roger Ray G8CUB



These units, with the part number 6031-01, will work un-modified at 10368MHz. They consist of a receive LNA & mixer, plus a transmit amplifier & output monitor, thus just needing an LO, Tx mixer and filter, and a couple of relays to make a neat 10GHz transverter.

Measured performance on receive with a 432MHz IF:
Conversion gain +22dB
System noise figure 3.9dB
Image rejection (9.94GHz LO) -24.5dB

Performance on transmit:
+32dBm output - 1dB compression
+53dB gain
Saturated power output on transmit is >2W.

Supply requirements:

Receive	(Tx Inhibited)	Full Output
+8.0V	380mA	720mA
+12V	50mA	1.93A
-12V	105mA	105mA

The IF response is flat from 75 to 1700MHz, but a 144MHz IF would only give you 2dB image rejection, so is not practical. With the high transmit gain, it is necessary to either use an input attenuator, or use the AGC control to turn the gain down.

In my 10GHz system I use the Eyal Gal block with an Alcatel synthesiser and 10MHz reference. The block dissipates a fair amount of heat, so don't remove the aluminium slab base plate. As you can see in the picture of my complete transverter, I have done just that! But, I have replaced it with an L-bracket to the base plate, which works just as well.

A specification sheet was available on the web [http://www.eyal-emi.com/siteFiles/1/32/1081.asp] but no connection details, so I had to work those out.

The output power measured was much greater than that indicated by the specification sheet (harmonics are quoted with a +26dBm power, and IP3 as >+38.5dBm). I can only put that

down to the fact that I am using it at the bottom end of its frequency range.

Pin-out on the two connectors as pictured above, left to right, is as follows.

Connector 1 (6 way)

1	2	3	4	5	6
n/c	+8V	-12V	0V	n/c	+12V

Connector 2 (5 way)

7	8	9	10	11
n/c	Tx Det	AGC	0V	Tx Mute

Connections to the unit are by two, 0.1" pitch single in line connectors. It is quite easy to solder wires straight on if you don't have suitable mating plugs.

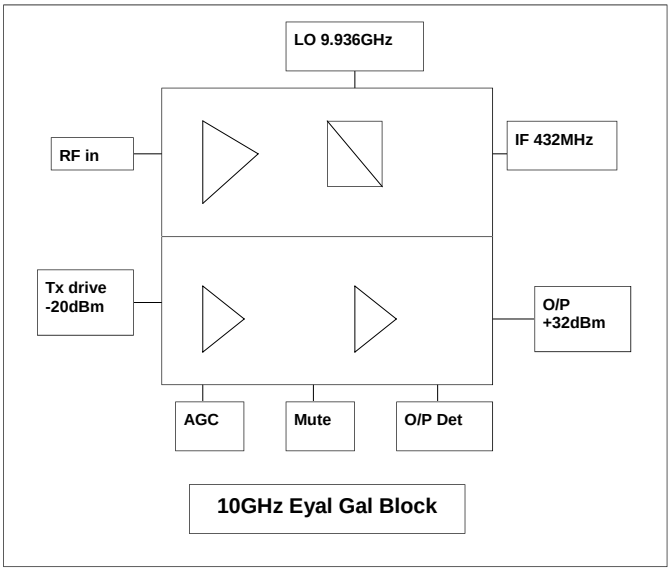
In my system, the 8.0V supply is provided by a 7808 regulator. The 12V supply is a direct battery feed. Both are internally regulated, so the exact voltage is not critical. The -12V is provided by a block DC-DC converter.

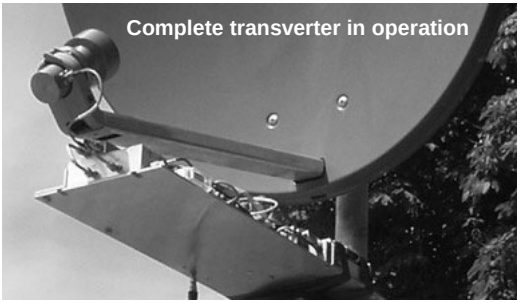
I have not had the courage to remove the -12V supply to see if the unit is internally protected but, equally, I have not blown one up yet!

Tx Mute – 0V to inhibit
Tx Det – DC proportional to dB output power (log detector) Max ~ 4.3V
AGC – 0- 5V Control - from the data sheet turning the power down more than 10dB will limit he output power (I have not tried this, just left the pin o/c)

Local oscillator power required is +3 to +6dBm (9.936GHz). Around -21dBm Tx drive will give you full output (at max gain). The two SMA output connectors allow easy use of a coax relay or the addition of a single stage low noise amp and/or PA.

Block diagram





Availability

Always when writing about something, that gets published some time later, there is a danger that supply has disappeared. Try searching ebay as a first off, or surplus suppliers in Israel. I have a small number of new units, which I will make available to members on a first come first served basis. £47 each Plus postage of £3.50 UK, £6.50 Europe. Contact Roger via email at:

littlemallards@hotmail.com

Building Beacons for 23 cm, 13 cm, and 6 cm

by John Jaminet, W3HMS and Charlie Heisler, K3VDB

This article, originally appeared in "CQ-VHF" for Fall 2007 less the 6 cm beacon. It appears by permission of the Editor, Joe Lynch, N6CL.

Overview

The microwave community makes extensive use of beacons for equipment and propagation checking on all bands from 50MHz -24GHz so why not do the same for satellite users on 2401MHz? Yes, that is what we said, so we set about to build a dual beacon for 1296.063MHz horizontal polarization and 2401.001MHz circular polarization, all 3 in the same box. The "WE" in this case is Fred Lowe, W3MMV, Joe Lockbaum, WA3PTV, John Jaminet, W3HMS and Charlie Heisler, K3VDB. We defined the tasks to be done and the purchases to be made then shared same among our group. I (W3HMS) have operated a Kuhne Electronics beacon on 10 GHz for about 7 years now and was so very pleased with the dependability of their beacon products which is consistent with their other products that I use contesting on VHF, UHF and microwaves. The two band beacon went on the air in June 2007 and the 6 cm/5760.215MHz beacon was added in May 2008.

Technical Summary

The heart of the beacons is the Kuhne Electronics of Germany "Bakensenders" for each band. Each was ordered with the frequency specified . Each uses F1 FSK keying vice classic "make and break" keying which promotes better short term stability. The frequency will change a few kHz over time as the crystal ages. W3MMV volunteered to fabricate the horizontally polarized Alfred Slot antenna for 23 cm from "scratch" then the 6cm 8 slot antenna for 5.76GHz, as did K3VDB for the 13 cm circularly polarized Lindenblad antenna. The 10GHz experience told us that we wanted to use a WW2R keyer with telemetry so we could remotely monitor the health of each beacon which is keyed by the same keyer for 23 and 13cm and another keyer for 5.76GHz as that give us more telemetry positions. We use two blowers, both for air flow and dependability, turned on and off by a thermostat set to about 80 degrees. All is mounted in a waterproof box designed for the electrical trade to house the 3 beacons. A single coax cable feeds 13 VDC to the beacons. The 23cm beacon has an output power of 1.5 watts, the 2401MHz beacon has 1100 mW and the 6cm (5.76 GHz) has 210 mW.

The 23 cm beacon is Kuhne Model 1.3GHz BAKE, the 2401MHz beacon is Model number MKU 23 BAKE and the 6cm is Model MKU57 BAKE.

The power supply furnishes 13.79VDC at about 1.7 amps to the beacons. The 23cm slot antenna gain is about 4dB, the Lindenblad about 3dB , and the 6cm 8 slot antenna about 8dB as estimated by

W3MMV. The 3 antennas are housed in individual radomes with weep holes.

Telemetry

Each keyer has 4 positions of information. Each was designed and built and the PIC programmed by Doug Robinson, G4FRE/WW2R in Texas. All the details are available on his Web site which I found with "WW2R" in Google. The keyer with telemetry is called an "Intelligent Keyer" and it is viewable on his site under this title with schematic.

Doug programs your desired message at purchase time. The 13cm beacon has a power output monitoring capability which we now send on the 6cm beacon as the 4 positions on one keyer were exhausted. It is possible to send any sensor value which can be expressed in the range 0-5 VDC.

Beacon Message.

We decided we wanted to send: W3HZU/B W3HZU/B FN10PA FN10PA QSL to W3HMS@aol.com (then the telemetry in 4 groups for three numbers like) 123 456 789 101….then recycle.

- DC Bus Voltage: The DC voltage on the beacon bus is calculated by a formula a bit too complex to use in your head but easy to define in an EXCEL spreadsheet for common values. Lets say you copy the number 064, that is 13.79VDC in the beacon box.

- Thermometer:The second set of 3 numbers is the thermometer mounted on the beacon box cover. One half of the temperature in F is sent in CW. As an example, 034 is sent so 034 x 2=68F. The thermometer is the reasonably priced LM34DZ.

- Vent Fans: If the 2 vent fans are ON, the numbers are more like 164 than 000, as the latter indicates the fans are off. The fans cycle on and off about every 6 minutes at 70 degrees F.

- Outside Temperature: The temperature outside the beacon is sent as defined above for beacon temperature.

- 2401MHz Beacon Output Power: This value is 1.28 VDC which represents an output of 210 milliwatts as defined in the DB6NT spec sheet with the beacon.

Performance

The beacons (less 6cm) entered service at a temporary site on 6 June 2007. Initial tests from the W3MMV QTH confirmed good operation but the signal was weak at any real distance. K3VDB was able to obtain temporary permission to mount the beacons at a height of about 1130 feet ASL on a tower in Red Lion, PA, grid square FM19QV.

The beacons sign W3HZU and FN10PA as that is the ultimate destination on their 200ft tower at about the 150 foot level. We have had excellent reports on the 23cm beacon out to 100 miles/160 km plus. The 2401MHz beacon has been heard at about the same distance. The 2304 group has asked why not 2304MHz and we have explained the needs of satellite operators at 2401MHz. An EXCEL spreadsheet has been developed, then enhanced by K3VDB, to record telemetry data in a scientific manner. The 6cm beacon has been heard at about 60 miles/100km by Dave, K1RZ.

Cost

These beacons are quality instruments and as such are not cheap! We will be happy to discuss this aspect with serious prospective builders. The Euro/dollar rate is indeed NOT in our favour!

For further information and technical details, please contact John Jaminet , W3HMS at:

W3HMS@aol.com

North Sea Coastal Reflections

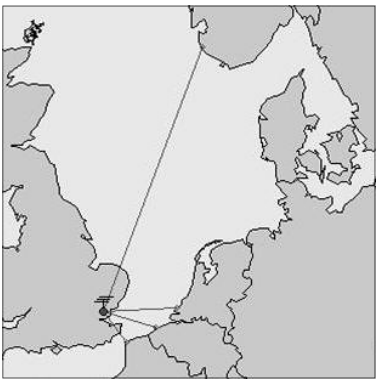
John Wood, G4EAT

During the unusually hot first week of May 2008, the LA4SHF 23cms beacon, 45km south of Stavanger, was heard by several stations in G and PA both during the day as well as evening and mornings. www.beaconspot.eu logs at least some of them (See web site for details).

From my location in central Essex, JO01HR, the North Sea is approx 15km directly to the east but 140km overland through Suffolk and Norfolk in the direct path (021 deg) to LA4SHF (JO28UO) at 829km. According to the beacon web site, LA4SHF has 45W ERP and has a co-linear antenna beaming due south.

It is common during the summer months to get sea ducts formed primarily from temperature inversions and it is frustrating to hear the DX being worked from East Anglia but not to detect any DX signals until the duct travels inland some hours later.

For several successive days I could not hear the beacon on a direct heading but found it over a wide arc of headings 080 to 140 degrees with a discernable peak of S7 at 125deg. This corresponds to a 200km coastal range from Rotterdam to south of Calais. My antenna system is 4x23ele with a 2x5 degrees 3dB beam-width. During the same week, Andrew, M0SPS, in JO01IS also reported the same effect on LA4SHF.



I have seen this propagation for several successive years but did not record signal strength and heading information. My assumptions to date were that the sea duct has an abrupt discontinuity where the warm moist duct comes into contact with the cooler dry coastal land. This could be temperature as well as humidity discontinuities sufficient to form a very efficient reflective point.

After discussion on ON4KST it became apparent that these effects had been documented some years ago by Scandinavian amateurs. SM6HYG (circa 1989) reported similar propagation in QEX, where a small island called Laso, situated between OZ and SM, gave rise to many back scattered and distorted signal QSO's from 23cms to 3cms. ***[This article is reproduced on the next page - Editor]***

During the same March observation window, I also had good signals from GB3MHX on 3cms over 090 to 160 degrees with an S9 peak at 125 deg. Antenna 60cms 3dB beam-width 4 degrees. The direct signal overland was S6. GB3MHL on 23cms tends to be end stop during these type of conditions and showed similar enhancements. It was S9+ on all bearings 040 to 120 deg.

In 2005 SM6HCJ, Karl-Olaf Wiman SK, reported 13cms SM-SM QSO's via a reflection point at the coast of North Jutland Island OZ. (Note the article shows the signals passing very close to Laso island!) ***[This article is reproduced on page 14 - Editor]*** Bragg (back) scatter propagation was proposed as the likely cause but is claimed to be frequency dependent and so Karl-Olaf postulated that at 24GHz it would most likely be Fresnel reflection effects.

I also heard recently (via ZL1TPH) of Japanese amateurs experiencing "Horse Shoe Ducting" on 23cms by pointing away from direct path towards the sea.

I don't understand how expert these documented cases have been and how it relates to the professional propagation studies world, but I am sure that some advances could be made in amateur radio circles if only to understand how best to find that DX! I would recommend if at first you don't hear beacons that others do, take a look in alternative directions. If anything unexpected occurs, record for posterity on beaconspot.eu. In time this could become a very useful database for propagation studies.

North Sea Coastal Reflections

Carl Gustav Blom, SM6HYG

This article first appeared in the Correspondence Column of QEX magazine in 1989

Tropo Backscatter.

Because of the high gain/narrow beamwidth antennas used on the microwave bands, it's almost impossible for stations outside of the direction in which the antenna is pointing to participate in roundtable QSOs. During a QSO in April 1980, B.J. Klausen (OZ8WK), Morgan Larsson (SM6ESG) and I (SM6HYG) found a way to communicate between the west coast of Sweden and the eastern coast of Denmark on the 23cm-3cm bands.

As you can see from the map in Figure 1, the path between my station and OZ8WK's is about 150km, mainly over water, with no high mountains in between to interfere with our signals. Despite the good path, all attempts to QSO on 13cm were unsuccessful, even when the signals on the 70cm and 23cm bands were RS59 at both ends.

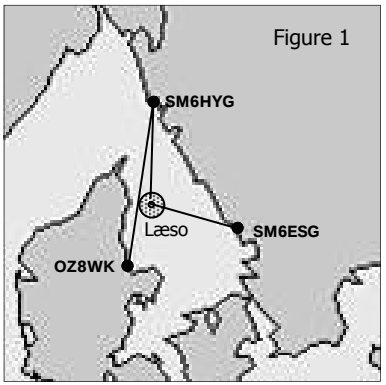


Figure 1

During one of the QSO attempts, SM6ESG was able to hear my signals on 13cm at s5-6 when he was beaming towards OZ8WK. In fact, no signals would cross the direct path between me and SM6ESG; we could only hear each other when we both aimed our antennas at OZ8WK. What was causing this reflection? Why didn't OZ8WK hear me at all? OZ8WK was hearing SM6ESG with good signal strength, so there appeared to be some sort of a wall between me and OZ8WK.

A closer look at the map covering the sea between Sweden and Denmark showed the small island of Læso with its shallow sand beaches. For several hundred metres around Læso, the surrounding water is only a few metres deep. On a clear, calm spring day when the sun heats up that water, a bubble of hot humid air rises above the island.

Because of the rapid change in the refraction index, there is no way for the microwave signals to penetrate that wall. Instead, the signal is scattered in different directions, making QSOs possible with the beam headings shown in Fig. 1.

Due to the scattering effect, the signals get distorted, sounding like modulated raw AC., and there is a phase shift as the beam heading is altered. If one operator changes the direction of his antenna, the other station has to change his antenna direction too - probably to maintain the proper angle for signal reflection. The total angle that can be used on either side of the optimal point is much smaller at my location than at SM6ESG's because of the different distances between the stations and the point of reflection.

Since the first QSO, several hundred QSOs involving many stations have taken place on all frequencies from 23cm to 3cm. Even the LA1UHG beacon on 10.368 GHz has been heard this way.

What happened to the "impossible" QSO between me and OZ8WK? Well we just had to wait for a day with equal temperature along the whole path, and the QSO was made with ease. Probably there are many locations in the world where this kind of tropo backscatter propagation is possible.

Why don't you try it the next time a direct line QSO doesn't work?

North Sea Coastal Reflections

From an article by SM6HCJ, Karl-Olaf Wiman (SK)

This was extracted from a document on the internet (now no longer available)

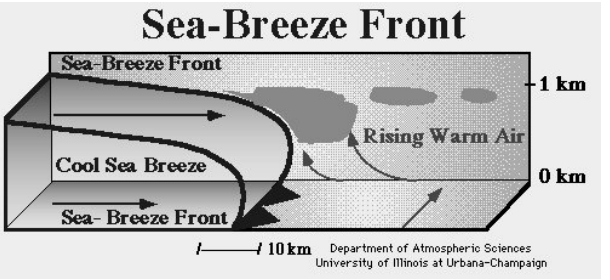
Bragg (back) Scatter propagation over the Kattegat, the reflection point.

One of the most common questions concerning propagation among the microwavers along the Swedish coast is the mysterious phenomenon of the "reflection point". It is possible to make two-way QSOs between stations along the west coast of Sweden, pointing the antenna more or less west (instead of NNE/SSW - the LoS direction), and there is a possibility for amateurs (far enough north) to reach the southern tip of Norway by beaming south-east (instead of north west - LoS direction). With this propagation, the signal strength maxima is very undefined. SK7MHI can be heard at my QTH from due west almost to the "correct" direction with two peaks (NE and NNW).

The explanation for this "strange" way of communication is most probably a phenomenon known as "Bragg - backscatter". Bragg scatter occurs when steep gradients of the refractive index are present. The phenomenon can also be observed by eye on hot summer days when you look at a tarmac road in the distance. It looks like water. However, what you see is a reflection of the sky (that is visible light, THz) on an uneven surface, which is in reality a steep gradient in the refractive index a few inches above the asphalt. Rarely, one can also see ships "soaring" above the horizon.

If we accept the phenomenon as "existing", the question arises: How can there be such a large refractive index gradient with a vertical orientation, and how can it be semi stable over the west Kattegat?

Now I must turn to meteorology, quite an unknown science for me to find an explanation for the phenomenon. Denmark (at least the most northern part, known as Vendsyssel or North Jutland island) is a very low island between two seas (North Sea and Kattegat). During a spring day, when the sun is shining, the two bodies of water stay cold, whereas the land gets warm. If you are not a radio amateur (or radar operator) the most significant result of this process will be sea-breeze. However, we are now facing two rather nearby coasts (E and W of Vendysyssel/N Jutland). This will resulting a rather complex situation where the air pressure will go (at the surface, from east to west) High/Low/High, and at altitude Low/High/Low. A "bounce" situation can occur if we are going from Low to High.



So much for the science. Now my thoughts: For a Swedish radio station at Kattegat it is probably necessary to be in quite a narrow zone to be able to experience the phenomenon fully. If you are located at the correct distance from the sea, the outgoing radio wave will *not* pass any refractive index gradient of considerable size, but it *will* be high enough to " bounce" at the Danish side. Stations too far away from the coast will *probably* only experience "normal" tropo-scatter. There is no distinct "reflection point", but there is an area where a scattered reflection occurs.

Are there any indications that this is really the thing happening at the "reflection point"? Bragg scatter is frequency dependent (the refractive index gradient can not have very high values. So the phenomenon, as described in RADAR literature exists on frequencies approximately from our 70cm band to our 3cm band. *[discussion of 24GHz and Fresnel reflection omitted here - Editor]*

And exactly what will happen near to Skagen? The meteorological situation is very unclear. There will exist a point a small way southwest of Skagen where the two (North Sea/Kattegat) pressure systems will meet. There might be an "amplification" of the phenomenon there, I cannot say - is this the "best reflection point"? *[Skagen is at the northern tip of Denmark - Editor]*

Spanish amateurs have reported something they believe is "land bounce". However, I believe it is Bragg scatter also in this case.

North Sea Coastal Reflections

Robin Lucas, G8APZ

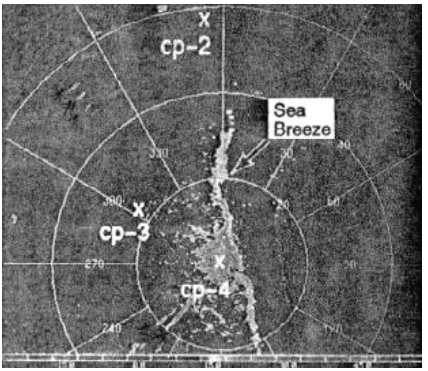
In 1970, when I lived in West London, on rare occasions I had experienced signals from Holland on 70cm on a heading much further south than expected during some intense summer tropo lifts. I had discussed it with some of the "experts" of the day but was told that this could not happen. Since then, I have never experienced this phenomenon again and had forgotten about it - until early May this year.

On 7th May 2008, John G4EAT (JO01HR) logged LA4SHF on 23cms in www.beaconspot.eu at 18:31 with the comment "579 Ducting. QTF 80-140. Direct nil". The following day, Andrew, M0SPS (/A at JO01IS) mentioned in 'KST that he was receiving LA4SHF on an unusual heading, and he logged it at 19:15 with "419 Heading Peak 091 degrees! ". In subsequent conversations, John said he had experienced this previously, and Andrew mentioned that about 10 years ago he had worked GM4LBV on 23cm via a similar easterly direction.

Just a week later on 13th May Gordon G0EWN (IO93FK) posted a 3cm spot for GB3SEE at 23:41 with the comment "529 very unusual on QTF 128 with fading". The beacon was inaudible on the direct heading.

These cases prompted some discussion, resulting in the articles which appear on the previous three pages, together with this one. I have been searching for information on radar clear air echoes, and looked at documented cases where radars have clearly shown sea breezes. When coastal land is warmed by the morning sun, the air above it rapidly becomes warmer and more buoyant than the air above the neighbouring sea. This rising air is replaced by cool, moist air, drawn in from above the sea. A circulatory system develops, with warm air rising over the land and descending over the sea to flow back onshore as a gentle sea breeze. The boundary between sea and land air—the sea breeze front—can mark sharp contrasts in temperature and humidity, and may move tens of kilometres inland. At night, the effect tends to reverse, and we get a land breeze.

The actual type of scattering and refraction from sea breeze fronts has been the subject of much research and debate in radar circles (Bragg, Rayleigh, Fresnel, Mie etc.) The results have often been inconclusive and there have been frequent discrepancies between theory and reported data. Two overriding observations were made, however. Firstly, that the fine detail of the atmospheric structure, and hence the refractive index field, is significantly more complex than at first thought, and secondly, that reflectivity records were regularly substantially greater than expected by Bragg theory. Let's leave them to debate the *type* of scatter, and take a look at what is going on here. There are a number of known characteristics of sea breezes:



The leading edge can be highly reflective, and can be seen by radar. The photo opposite shows such a case. They form over the sea (up to 20km from land) and move landwards. At the same time, Cumulus clouds form over land and move out to sea above the sea breeze front, the height of the front being anything up to 3km. The sea breeze front generally forms a "thin line" which runs parallel to the coastline, and a marked drop in temperature occurs at the front. The temperature gradient at the front is substantially vertical, which probably explains the reflectivity. The front contains turbulence, and moves slowly onshore.

Opposite. A radar thin line corresponding to a sea breeze front moving onshore on the east coast of Florida (After Wilson et al , 1994).

Looking at the cases reported recently, the various headings reported, when plotted on a map all cross an area off the Essex coast in the Southern North Sea. The G4EAT path suggests a reflection point somewhere offshore (Maplin Sands). The M0SPS path crosses Gunfleet Sands, whilst the G0EWN path crosses Rough Sands. All of these areas are at least 6km offshore in relatively shallow waters. The colder and deeper water is likely to be perhaps 15km offshore, and these are possible areas where sea breezes form, giving rise to reflections.

The Swedish cases almost certainly match this pattern. It could be *either* a sea breeze front originating in the North Sea passing over the northern part of Denmark with the front being visible as it approaches the Kattegat, *or* a front originating in the west Kattegat approaching Læso island.

We will need to observe and record QTFs from several simultaneous observations whenever this phenomenon is present. With such data, we can build a picture of where the reflection point is and whether it is moving.

By Robin Lucas, G8APZ

A new World Record on **24GHz** has been set at an incredible distance of **710km**. The achievement by these very well known microwavers, Guy, **F2CT**, **Willi, LX1DB and Marc F6DWG** should not be underestimated. In particular, they frequently operate portable on the microwave bands, not only at contest times but throughout the week and during the evenings. They have shown much tenacity in pursuing DX at these frequencies and these super DX QSO are richly deserved (see p.4) Congratulations to all. Now for 800km+ ?

CONTEST and ACTIVITY REMINDER

July

20-Jul 0900 - 1700 2nd 47 / 76 GHz Cumulative
26-27 Jul French Journée Activite (Activity Day)
27-Jul 0900 - 2000 3rd 5.7GHz Cumulative
27-Jul 0900 - 2000 3rd 10GHz Cumulative
27-Jul 0900 - 2000 3rd 24GHz Cumulative

August

19-Aug 1900 - 2130 1.3/2.3GHz Activity Contest
Arranged by VHFCC (RSGB Contest)
24-Aug 0900 - 2000 4th 5.7GHz Cumulative
24-Aug 0900 - 2000 4th 10GHz Cumulative
24-Aug 0900 - 2000 4th 24GHz Cumulative
30-31 Aug French Journée Activite (Activity Day)

September

16-Sep 1900 - 2130 1.3/2.3GHz Activity Contest
Arranged by VHFCC (RSGB Contest)
21-Sep 0900 - 2000 5th 5.7GHz Cumulative
21-Sep 0900 - 2000 5th 10GHz Cumulative
21-Sep 0900 - 2000 5th 24GHz Cumulative

JUNE LOW BANDS CONTEST

There were plenty of UK stations QRV. On 'KST alone, I counted 23 **G** , 4 **GM** and 2 **GW** stations. Until 14:00 the 'KST screen was full of Western European contest stations, and with 25-30 messages per minute it was hard to spot a UK station, or to follow the flow. As soon as 14:00 arrived, all the EU activity ceased, and there was a noticeable change of traffic to UK only! There seemed to be plenty of tests taking place on all three bands, **23cm**/**13cm**/**9cm**.

From: Ray James, GM4CXM (IO75TW)
Bearsden.10km NW of Glasgow

On **23cm** conditions appeared to be fair to middling and despite a number of regulars missing, activity was pretty good and most stations appeared to be kept busy right to the end.

14 contacts in all from here which is 2 down on last month but still well up on my average earlier this year.

GM activity was down on last month from 7 to 3 whereas **GW** and and **GI** saw an increase.

One new station (Andy **M0IDU**) took my total of "different stations worked on **23cm**" to 149 (since August 2005).

Talkbalk on 144.175 brought no results but direct CQ calls did provide an increased number of contacts which means a lot more stations actually looked up country for contacts. KST schedules filled in any activity gaps.

Best DX was **G4DDK**,(JO02PA) at 572km, followed by **M0IDU**(534km), **M0GHZ** (521km), **G4BAO**(506km), **G4KIY**(466km), **GW4DGU** (450km). Worked eight others, of which six were over 300km.

Conrad, **G0RUZ** went out portable for the low band event and tells a tale of woe. At least the problems he experienced this time appear to have been solved. Conrad picks up the story.

"....Well what a weekend. I did get to Ravenscar at about 6pm on Sunday! I still

hoped to give a few points away but it was not to be. I was able to hear very well but a single rogue path lead killed off the TX. Looks as though the **PE1RKI** power amps can indeed stand a fair bit of a mismatch. I could hear the following beacons:

* **GB3MHL** 599 some mild QSB
* **GB3MLE** 579 quite fluttery at times
* **PI7QHN** very stable 559
* Could not hear **GB3ANG** or **GB3CLE**

I wasted an hour trying to figure out why I couldn't hear anything on **23cm** when I realised that I had the **13cm** antenna plugged in, it pays not to be rushing around when you are doing this stuff!

Listening around the band for the brief time that I had tells me that the site is good; the local mast did not give me any intermod problems, even with the masthead preamp on (which I have decided that I probably don't need.) Also there is 3G coverage so I do get reliable 3.5 Mbit/s internet access.

I underestimated the time that this lot would take by a large margin that's for sure, but on reflection I am closer to being ready to go out portable in the future. I have a mast that works well and a 14V and 28V battery system that works.

I have ended up with 3 x 55A/h batteries which seem to be most happy to run the amp. I tested this into a load before I set off. The use of a fully isolated 8 amp charging converter enables the series 3rd battery used for the 28V supply to be charged from the car alternator.

I will get there eventually I'm sure.

73 Conrad

SOTA ACTIVITY ON 10GHZ

Richard, **G3CWI** continues to activate summits on **3cm**. On Saturday 7th June he activated Yr Aran **IO73xb** (747m) which is 4km south of Snowdon. The summit has good take off in most directions but is blocked by the higher Snowdon massif from NNW-NE.

He made contacts with **G4PBP** on CW (138km) and **MW1FGQ** on SSB (55km), but a try with **G4EAT** at 350km produced very weak signals which could only be heard occasionally.

The next day, 8th June Richard returned to Snowdonia to tackle Moel Hebog **IO72wx** (782m). Luckily, the weather was hot and sunny. He had an SSB contact with with **G3PHO/p**, Merryton Low(124km), and CW contacts with **G3LRP**(196km), **G4PBP** (141km) and **G4BRK** (239km).

Tests with **G0DPS/P** near Huddersfield failed (equipment problem at Mike's end suspected). The Manchester beacon was audible but weak, since the 150km path passes over the Snowdon massif.

Richard's portable setup has 1W output and a small 17dB horn. Analysis of his experiences so far with this **10GHz** lightweight kit suggests the need to have stations within 200km to have a good chance of success. The success rates are 0-100km 95% (Failures mainly operator error or equipment problems) 101-200km 80%, 201-250km 50%, 251-300km 25%, 301km+ 0% (based on a small number of tests).

Richard also activated Mount Snowdon during the previous week, and worked 5 stations. He had no pole for the 2M antenna, which had to be handheld whilst in QSO!

GW3CWI/p on Mount Snowdon

PERSONAL 24GHz BEACON

Chris **GW4DGU**, **Pen-y-Bont** (IO71sv) has built a personal beacon for **24GHz**. It is on **24048.800MHz** but Chris spotted it himself recently from a portable location near Tenby on **24048.810MHz.**

It runs 200mW into a sectoral horn on a QTF of 190 degrees. Reception reports directly to Chris please, and/or spots on beaconspot.eu would be very welcome.

5.7, 10, 24GHz CUMULATIVES

From: John Wood, G4EAT, JO01hr

24th June. High winds over most of the UK curtailed much of the portable activity for this session and it seems several of the normally active home stations failed to be QRV too.

During the morning, I worked all I could hear on 144.175MHz and also the **G** home stations with **ON4KST** only. A new station via 2m was Roger **G8CUB/P** at JO01ep with both **10GHz** and **24GHz**.

After lunch I saw on the Meteox web pages a long line of rain showers from northern **DL** across **ON**, **LX** into northern France. So the question was where to point in order to find the activity, given that at 300km it covered 30-40 degrees of azimuth!

Fortunately that well known RS beacon (!) **DJ5BV** JO30 was transmitting close to .100 on **3cm** so I quickly found one good scatter point and made the QSO. After calling CQ direct on **3cm LX1DB**(JN39) came back for **3cm** and **6cm** QSOs. (I should have tried **24GHz** with Willi who was 9+20dB on **3cm** but will save it for next time!). Also on **3cm** I worked **ON5TA** (JO20), **DL3IAS**(JN49) and **DB6NT**(JO50) both for **3cm** and **6cm**. Pointing much further north I worked **DC6UW**(JO44) (300W TWT) on **3cm** but NC on **6cm**.

It makes a change to have good propagation during a contest. This is the first time for several years I have worked over 460km during one of these Cumulative sessions and it was very welcome too! **73 from John G4EAT**

During the first session on 25th May Richard, **G3CWI,** made 20 QSOs in just two and a half hours operating on **3cm**.

In the second session on 22nd June, in very windy conditions, he made 9 contacts from two different sites, seven of the contacts were from Brown Clee (IO82ql), with the best DX being **G8DKK** (174km). At one point Richard had a "pile-up" when two stations called on SSB after a CW contact!

MILLIMETRE BAND TESTS

On Saturday 14th June, four stations organised another day of field tests, this time on **76GHz.** Ian **G8KQW** and Chris **G0FDZ** were located at Butser Hill (IO90MX), with John **G8ACE** and Chris **G8BKE** at Lanes End (IO91JA). They were conducting some **76GHz** equipment checks

over a 19km path. Lots of signals were exchanged and **G0FDZ/p** (photo) worked his first stations on **76GHz** with an FM QSO with John **G8ACE/p** and on SSB with Chris **G8BKE/p**.

EME 9cm ACTIVITY WEEKEND

From: Peter Blair, G3LTF, Andover IO91GG

The main activity this month was the **3.4GHz** activity weekend (AW). I used the same TX/RX as last year with 28W at the feed of the 6m dish but a new feed which is a circular septum with a super **VE4MA** choke (see picture) and which definitely performs better than the old square septum with choke.

On the first pass, June 7th, I worked **LX1DB**, and then **VK3NX**, I copied him right down to his moon set, then **OK1KIR** who is certainly

louder now they are on circular polarisation.

Then **PA0BAT** #13, **OK1CA**, **G3LQR**, and **W5LUA**. I heard **GM4ISM** very weakly, T/M level, but he couldn't hear me at all.

On June 8th, I spent some time ensuring the feed was accurately pointing at the centre of the dish and also optimised its position and this with some minor profile corrections made earlier in the week probably added another 0.75 to 1.0dB to the dish gain. As a result I worked, on sked, **GM4ISM** #14 who came up to M copy and on random **DL4MEA**, **PA0BAT**, **WD5AGO** #15 and **VE6TA**. **F2TU** reported my SSB as R3S3, and I heard and called **VE4MA** who also heard me.

I ended with a total of 12 stations worked, 3 initials and several QSOs with smaller dish stations. The real benefit of the AW with a sked list is that it enables new stations to try the system with the knowledge that there is activity, and people are not in a rush as in a contest. It also allows a direct comparison of systems so you get to know where the shortcomings are (dish, preamp, TX power, frequency accuracy) I can be QRV on **3.4GHz** any time that the moon is above zero degrees declination.

The next project is to finish the **6cm** system and to build a similar new **2.3GHz** feed.

73 Peter

URUGUAY ON 13cm EME

In the May column, we mentioned that **G4CCH** worked **DL1YMK/CX** on **23cm**. It looked as if Howard would miss the chance to work **CX** on **13cm.** The last day of the expedition for **13cm** was 9th, and he still had a lot of work to do to complete his **13cm** station.

FROM: Howard Ling, G3CCH, Lincs.

"Unfortunately, I wasn't ready on the 9th and it looked like the chance had evaporated, then Michael announced that he would take some extra skeds on the evening of the 11th.

I worked all weekend, and finally heard my echoes at 2030z on 11th May, and made my first QSO with Peter **G3LTF** 569/569 at 2120z after a phone call to let him know that I was on. Thanks Peter for the fantastic first QSO... #1

I heard Michael calling CQ prior to my sked at 2200z and called him at 2155, the QSO was completed by 2202z, O/O for #2 and mission accomplished!

Two others were worked on **13cm** on 13th May, **PA0BAT** 559/549... #3, and 14th **OZ4MM** 569/559... #4.

My system is a 5.4m dish, with round septum feed, 250W SSPA and **G4DDK** LNA, but the SSPA is in the shack (3dB cable loss). I have approx 125W at the feed, but eventually, the SSPA will be relocated nearer the feedpoint."

MICROWAVE FIRSTS

The Uruguay contacts in the EME reports prompted me to look at the UK **23cm** and **13cm** firsts on the UKuG website.

There are plenty of gaps for firsts which must have been done decades ago, but no records exist. It will be more difficult to reconstruct the past as time passes, so do check the lists to see if you can fill in any gaps.

NORTH SEA REFLECTIONS

The articles on the pages 12-15 (North Sea Coastal Reflections) will raise awareness of the phenomenon of signals arriving from the wrong direction. If only we had the radar tools that the meteorological people have access to, we might be able to find some answers more quickly.

Some things we can do though. We can ask others to observe, and to take repeated bearings over the duration of the reflections - in the event of the bearing changing. With multiple bearings we will be able to pinpoint where the reflection point is. Record the UTC and bearings accurately, and note signal quality and level - even record the signals. Collectively, we can contribute a great deal to propagation studies. Good luck.

...AND FINALLY

The new 24GHz record will be hard to beat. It may appear to be easier on rainscatter than on tropo but it sets a target for the autumn and winter months. Go for it!

Your news of DX and activity reports for July and August will be in the September column - at least it will be, if you send me some input !

73 from Robin, G8APZ

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

FOR SALE AND WANTED

For Sale: Bird Model 43 Thru-Line power meter plus a Bird TermaLine dummy load and two N-type patch leads. The Model 43 power meter is in mint condition and comes in the Bird simulated leather carrying case with with three elements, i.e. for 10 watts and 50 watts at 2 metres and 10 watts at 23cms. It has interchangeable connectors, either N-type or BNC (two of each) and the Bird instruction book is included.

The Termaline dummy load is model 8125 (I think, the label is not very legible), 50 ohm 50 watts. It is oil-filled, finished in grey crackle enamel and measures 2½" wide by 4½" high by 6½" long (plus the N-type connector). I believe that this series of Termaline loads are only officially characterised up to 1 GHz but this one seems to match OK at 23cms.

For sale as one lot, **£175.00 plus P&P, no offers**.

Phone **01730 300414** or email **Pete.weedon@ntlworld.com**.
Alternatively, buyer could collect from Petersfield, Hampshire (just North of Butser Hill).

SKEDS WANTED

Marc **F6DWG (JN19AJ)** Beauvais has been looking for **IO90** on **5760MHz** for a long time.
If you are QRV, or know someone who is, please email Marc FABRIE - **fabriema@wanadoo.fr**

www.beaconspot.eu - microwave beacon site

Now over 250 users in 22 countries

BATC Television Streaming

www.batc.tv is now bringing streamed ATV to the internet and allows cross repeater working from its multi screen display.

The site also carries a library of ATV programmes and is a port for other ATV events (eg the Sheffield Microwave weekend in July 2008) that will be streamed from around the world. Some of you may have already seen Camstream and other repeater streaming, so how does this site differ? The software has been written to allow multi user display, so that more than one repeater can be viewed at the same time thus allowing CQ ATV to be called on one repeater and others monitored for a duplex QSO. In the past, using single repeater monitoring, this has been possible but only a single repeater could be monitored and delay was a major problem.

www.batc.tv is located in the Telehouse, Docklands data centre here in the UK and connected to a major internet pipe to minimise delays. The streamer uses flash media so the picture quality is the very best that modern technology can provide at the present time. This is an expensive venture and although no charge will be made to ATV repeater groups for streaming The **British Amateur Television Club** are looking for other users and sponsors to help make this site a place to visit. Ventures from other users are not restricted to ATV or even ham radio.

If you would like to start your own streaming service then please contact us—we have the necessary space available. If you are a company and would like to help support this project, then for a small donation we can display and hyperlink your logo from our front page. If you would like to stream your repeater or have a live event coming up that you would like to stream or if you have library ATV material suitable for this site, please contact **info@batc.tv**

(This information was taken and adapted from the BATC website ... editor)