An Amateur Radio publication for the Microwave enthusiast

MICROWAVE NEWSLETTER

Published by the Radio Society of Great Britain and edited by G3PHO and G8AGN.
Lambda House, Cranborne Road, Potters Bar, Hertfordshire EN6 3JE

FROM THE EDITOR

2002 – OCTOBER

For some reason not yet ascertained, the September issue of this newsletter did not reach all readers. We know more than a few readers who had not received their copies two weeks after everyone else. The editor has been trying to reach as many of you by email but if you are still without your September issue please contact RSGB Heaquarters and request a replacement. You can email them at: **sales@rsgb.org.uk** or write to them at RSGB , Sales Dept., at the address shown under the logo at the top of this page. Alternatively, you can telephone them on ++44 (0)870 904 7373.

Please do not contact the editor, who lives 150 miles away from HQ and cannot provided extra copies.

Once again we are very grateful to all readers who have sent in articles and other information for this month's newsletter. Many thanks!

Two articles this month are by G4DGU and G4JNT, both on basically the same theme of digital modes at microwave frequencies and written independently of each other .. It shows how great minds can think alike! Thanks very much Chris and Andy.

In this issue ...

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

G3PHO: Peter Day ++44 (0)114 2816701

G3PHO, Peter Day,
146 Springvale Road,
Sheffield, S6 3NU, UK

G3PHO: Email: microwaves@blueyonder.co.uk
or p.day@virgin.net

SUBSCRIPTION ENQUIRIES SHOULD BE SENT TO RSGB HEADQUARTERS AT THE ADDRESS SHOWN AT THE TOP OF THIS PAGE AND NOT TO THE EDITOR ..

For sale & wanted

For Sale - Dynatech model D3-416E39 change over latching relay, 12 v coil, SMA to 18GHz. **Price £40**

Wanted - ASTEC AT1020 TVRO tuner (950-1450MHz, IF 612MHz) used with AT3010 IF/Demod unit

Please contact: G8ZHA on 07867 831010
(Walsall, West Midlands)

WANTED: SSB Products XL0-1 oscillator/multiplier if possible with a crystal to suit a 144MHz IF.

QTHR or contact Graham via email at: **g3rsx@radio73.fsnet.co.uk**

For Sale

Due to my location being remote from the mainstream of activity, I am reluctantly disposing of **four DB6NT 24GHz modules, plus a free wave guide switch, and a 12GHz cavity filter, plus a waveguide splitter.**

(The freebies are only for the purchaser of the modules). The nearest 24GHz station is 195km away so I am outside of the range of most people here. And it's not easy for me to travel to sites which would work. The boys did warn me! The monies will be put to solid state amplifiers for 2.3GHz and 3cm ....

For sale are (brand new):

(Never connected to any DC power, not even a soldering iron on the feedthroughs!)

243WS Preamp with a 1.6db noise figure, In wg20
MKU24GA Transverter 0.3mW output, in wg20
244WH K-Band power amplifier 110mW, in wg20
Ku-band Local oscillator running at 12024MHz, in sma and tin box. The above are all built and tested by DB6NT and in milled boxes except the Local Oscillator

Also for sale ... waveguide 20 and 22 plus brand new wg20 flanges with sealing rings, also new. The DB6NT modules cost me with postage 1230 euros. **They were built and tested by DB6NT**, so only sensible offers please!

I will be attending Martlesham with above items.
Ralph Bird, G4ALY, QTHR or email: Bird@btinternet.com

For Sale: 24GHz part kits

From: Dave Powis G4HUP[dave. powis@redknee.com

I recently had dinner with Guenter DL4MEA (a local to me) and Luis, CT1DMK, who comes to Munich to work occasionally. I have a number of Luis's 24G module PCBs and some components (eg the trimmers, which are quite specific) which I will be making available for the Martlesham Microwave Round Table in early November. I'll leave them with Sam, G4DDK, when I go to UK at end of October. So, if anyone is interested in 24GHz part kits, let Sam know, please!

I haven't yet determined the price of the sets but its likely to be around **£8 per set** (mostly the price of getting the PCBs made). I have the LNA/PA, doubler and both the diode and PHEMT mixers available - each set has the paperwork with it.
Best 73, Dave

For Sale and Wanted adverts are free to all Microwave Newsletter subscribers.

For Sale: IC202 2m ssb transceiver

This classic "prime mover" for microwave transverters is becoming quite hard to find these days.

This one, for sale by **Doug Friend, VK4OE** and available for collection in the UK, is the 'original' model IC-202 (not 'S') and is in good condition, working perfectly, clean and unmodified (except that the input DC connector is now +ve at centre). It comes with microphone and original manual. It is crystalled for 144.0 to 144.4, plus the 145.8 to 146.0 satellite band. **Price: £80**

Doug will be bringing it with him from Australia in mid-November. From his base in Watford he will be able to send/deliver it onto the UK buyer.

Enquire in the first instance by e-mail to: **friends@squirrel.com.au** Doug's home (VK) telephone number is: ++61 7 3391 5526, and his Watford base is at 01923 231110. **Do not ring Watford before 15 November**.....for obvious reasons.

For Sale:

SMA connectors .. Ma-Com Type 2052-1352-00, SMA(f) extended dielectric, two-hole flange, panel jack (gold plated) Specs and a picture are available for the Suhner equivalent Type 23 SMA-50-0-3 / 111 NE - see:

http://products.hubersuhner.com/ These are ideal for microstrip launch onto Duroid up to 12GHz, or FR4 or wire at lower frequencies.

New, pack of **ten for £2.00**, post 50p in the UK, from:
Julian Hardstone, G3TFR,
17 Whitefield,
Heaton Norris,
STOCKPORT SK4 2PE
EMAIL:
j.omega@members.v21.co.uk

FOR SALE … Large quantity of surplus microwave gear and test equipment (ex G3KEU … Silent Key)

Peter, G3PHO, will be bringing this surplus to the Martlesham Round Table. Tim's widow wishes the proceeds to go to a suitable Cancer charity. There are boxes and boxes of components, waveguide 14 and 16 parts, switches, ICs, surface mount components, drums of good quality RF coax, including **new Heliax** (LDF2-50 and LDF 4-50) etc, as well as two items of useful test equipment and a **converted 10GHz "Whitebox**".

Marconi Spectrum Analyser Type TF2371
Covers 0-200MHz. No manual or information. Has digital frequency readout. Unusual trace includes electronically generated graticule scale. Heavy but is table top gear! **Offers?**

Marconi Signal AM/FM Generator Type TF2008
Frequency range 10kHz to 510MHz. Mains supply lead , missing but unit believed to be in working order. Table top equipment. No manual or information. **Offers?**

If you are interested in any of this equipment please contact Peter, in advance of the Martlesham Round Table (November 9th).
If you wish to view and collect from Peter's QTH (Sheffield), this can be arranged). **Contact Peter, G3PHO** by telephone at **0114 2816701** or email at:
microwaves@blueyonder.co.uk

All this gear must go! Hence no reasonable offer will be refused!

STOP PRESS …

Two of the South Coast beacons are temporarily off the air for maintenance. **GB3SCS**, 2.3GHz, showed low power o/p when test on site, due to an intermittent fault on an SMA connected mounted on a tin plate box. **GB3SCK** (24GHz) was also running low power, the output to the feed at 12GHz being about 10dB below spec. Fortunately both faults are in the bottom units so the mast doesn't need to be lowered! Hopefully they shouldn't be off the air for too long.....

So far, the best Dx reports for are from G8IFT on Brown Clee for 3.4GHz and G0HNW in Derbyshire for 5.7GHz ... unless others know better !

73 from Andy G4JNT

MICROWAVE BEACON NEWS

Martlesham Beacons

Emails from John, G3XDY, describe the latest happenings in Suffolk ...

GB3MHS on 3400.830MHz went into service at 12:00z on 26th September. We braved the winds and managed to get the antennas for the GB3MHS 3.4GHz beacon installed and re-installed the 10GHz Beacon at the same time. We also checked and reset all the beacons using a GPS locked frequency counter, so they should be very close to their nominal frequencies now. Unfortunately something went awry when we adjusted the 13cm beacon, which is on 2320.823 at present as a result. We will reset it again soon.

The new GB3MHS 3.4GHz beacon uses a DB6NT beacon transmitter unit feeding an ex-Ionica PA module. This is followed by an 8 cavity filter (again ex Ionica Base station) and produces about 10W at the output connector. Keying is courtesy of a WW2R/ G4FRE PIC keyer. The antennas are also ex Ionica (thanks to Mark GM4ISM), with 14dBi gain and 120 degree horizontal beamwidth. One beams East (covers 030 to 150 degrees), the other West (210 to 330 degrees) and taking, into account feeder losses, the EIRP is about 75W. Reception reports will be very welcome.

Early Reports on the DX cluster and by email/phone indicate it is getting out well, with signals heard out to 500km in Germany during enhanced tropo in early October. Bob G8GDZ reported that it was just audible using a feedhorn a few feet off the ground in IO82QL during the contest weekend.

On 10GHz the outdoor multiplier/PA unit of GB3MHX has been re-built by Sam G4DDK to include a PA module donated by G4BAH and now produces 500mW at the antenna, giving an EIRP of about 5W, a 7dB increase on the previous system. We hope that the increased power will be useful for spotting rainscatter conditions. Again, reception reports by email or on the DX Cluster are always appreciated. MHX is screened from much of the UK by the reinforced concrete tower, but it should be a good rainscatter indicator over the North Sea.

The beacons are located 10km East of Ipswich in JO02PB.

NEW GERMAN 24GHz BEACON

From: DF6NA [df6na@df6na.de]
Sent: 04 October 2002
Subject: DB0AJA 24GHz

On October 3rd I mounted the new 24GHz beacon and moved the 10GHz antenna 2m higher.

Here is the complete DB0AJA-beacon info:

Beacon DB0AJA in JN59AS
(360m asl + 4m agl):

24192.945MHz 0.1 W out
- slotted waveguide (2 x 8 slots)
- DF9LN-OCXO + DB6NT MKU24 LO + MKU 241PAW

10368.945MHz 1W out
- slotted waveguide (2 x 10 slots)
- DF9LN-OCXO + DB6NT MKU10 BAKE + MKU101N

5760.945MHz 10W out
- slotted waveguide (2 x 10 slots)
- DF9LN-OCXO + California Microwave brick osc. + MT5.7-Z10WA

Soon ..
3400.045MHz 20W out
- 4 x Andrew Sector-Antenna 14dBi (tnx GM4ISM)
- DF9LN-OCXO + Cal.Mic. brick oscillator + Toshiba 20W PA

2320.960MHz 10W out
- 10dB ISM-Antenna -> NW
- DF9LN-OCXO + DB6NT MKU 23 BAKE + DL2AM MT2.3-Z11W

Please send reception reports to :
DF6NA-9 > DB0AJA-15 (DX-Cluster)
Or email to: df6na@df6na.de
vy 73, Rainer

"The strawberry nets"

From: Ken Vickers, G3YKI [Ken.Vickers@crowncastle.com]

Here is a picture of my plywood and chicken wire 2.4m dish for 23cm. Built about 20 years ago, it is colloquially known as "The strawberry nets". It was designed for transportation on top of a car and used to get one or two outings a year for portable contests when I used to do those. Nowadays I put it on the tower if:

a) I have reason to expect there will be stations on.
b) The weather forecast is calm.
c) I am feeling energetic, hi.

As you can see it does not leave a lot of room for other antennas but I have been known to put it back to back with the 3cm dish.

73 Ken, G3YKI

The next issue ...

In order to avoid the annual "Christmas Rush" and give the poor old postman a break, next month's RSGB Microwave Newsletter will be a two month version, covering November-December 2002, so you won't receive the one after that until mid-January 2003. Don't think your December issue has gone missing ... you will have got it in November!

If you have any items for inclusion in the Newsletter please bare in mind the long gap between the next issue and mid-January next year, particularly if your item is an advertisement.

Articles of any standard are most welcome ... any format but most appreciated if they are sent by email or on a cd or floppy disk.

MARTLESHAM MICROWAVE ROUND TABLE — AN UPDATE

The booking system can be directly accessed at **http://mmrt.myip.org**
Use the menu on the left to navigate - "Book" takes you to the online booking system.

The talks timetable now looks like this:

10:45 Welcome and Opening by Graham, G4FSG
11:00 Talk1 - Chris, GW4DGU on Crystal Oscillator design
12:00 Talk 2 - Paul, W1GHZ on Parabolic dish feeds - More than a pennysworth
13:00 Lunch break
14:00 Talk 3 - Grant, G8UBN on 'New components for Amateur Microwaves'
15:00 Microwave Contest Forum - Moderator Peter, G3PHO
15:45 UK Microwave Group AGM
16:45 Close

Many thanks to John, G3XDY, for this extra information ... editor

A DIGITAL WEAK SIGNAL MODE FOR MICROWAVES?

- by Chris Bartram, GW4DGU
(chris@chris-bartram.co.uk)

Returning to an active interest in microwaves over the last year or so, I've been struck by the way in which there has been a drift of formerly active microwave people to VLF. While I appreciate the challenges of long-wave, and could even share the enthusiasm of a friend, professionally involved in RF power amplifier design, who points out that he can legally and easily build 10+kW power amplifiers for 136kHz(!), I feel that the bands above 1GHz still offer some serious challenges. This doesn't necessarily mean translating existing (dated!) technologies to higher and higher frequencies, interesting as this can be.

An area where the VLFers have made progress has been in the application of very narrow band modulation schemes, allowing them to combat the inherent high antenna noise temperatures and small antenna efficiencies at those frequencies. It's easy to do this at VLF where the transmission path has relative phase and amplitude stability. It's still possible to do similar things at VHF: Joe Taylor, W1JT, has demonstrated that his JT44 multi-tone FSK modulation (anyone remember Piccolo?) scheme based on the work of Bob Larkin W7PUA, operating in 5.8Hz demodulation bandwidths, has been effective for 50 and 144MHz and, to a lesser extent, 432MHz and 1296MHz EME using relatively small antennas. Bandwidth reduction also has applications on the microwave bands but there's a snag: microwave transmission paths, particularly beyond line-of sight, tend to be anything other than phase and amplitude stable!

Poor phase and amplitude stability results in the spectrum of the signal spreading: quantifying this isn't a precise art, but troposcatter at 1.3GHz results in a received bandwidth of perhaps 30Hz, whilst 24GHz EME has been reported to show spreads of maybe 250Hz. Conventionally this limits the minimum usable bandwidth to those figures: reducing the bandwidth further will decrease the signal-to-noise ratio, or conversely, increase the receiver threshold! Human ear/brain processing can sometimes recover data from decorrelated signals but even that has limits. If a way can be found of reducing the decorrelation, the benefits could be very significant. 13dB system gain could potentially be obtained by reducing the decorrelation bandwidth of a 10GHz EME signal from, say, 100Hz to 5Hz. Potentially, this could allow contacts between stations using good quality tropo systems (5 - 10W and 100K receivers with cheap(ish!) 1.5m offset dishes using off-the-shelf satellite TV positioners, making 10GHz EME a very attractive proposition to a large number of operators.

So how can we do that? The key seems to be the use of a modulation format which includes a reference vector. A reference vector is simply a component of the modulating signal of which the receiving system has a priori knowledge. It could be as simple as a constant carrier. If the received reference vector can be reconstructed, then as we are considering a narrow-band signal, the complex function required to reconstruct the reference can be applied to the whole signal spectrum, and data can then be recovered in narrow bandwidths.

There's nothing really new in this. A similar technique has been very successfully used in the Linear Modulation (LM) systems developed for ssb speech and data transmission in mobile radio environments. Incidentally, the use of a reference vector isn't the same as the use of a reference frequency in the JT44 modulation format. That provides a non-continuous frequency reference: I'm suggesting that the reference vector is transmitted continuously to provide a coherent reference.

Although some elegant solutions, such as various forms of PSK, and even QAM, exist, multi-level FSK combined with a reference vector could provide a simple solution. This wouldn't give a constant amplitude signal - which may or may not be desirable - but it would work with standard ssb transmitters, albeit probably generating some transmit intermodulation. It presents a similar challenge in terms of transmitter linearity to PSK31. Whether this is significant (most of the time!) on the microwave bands is a moot point! There are a number transmitter linearisation techniques, particularly cartesian feedback loop topologies, available if it's necessary to clean-up the intermods.

These ideas need testing by proper modelling (Matlab, anyone?) and maybe then by building a test system based around PC sound cards. I can't see myself having the time to do this in the next few months as I'm involved in a protracted house-move and I'm also pretty busy in my work. I'd also be on a steep learning curve in certain areas. I'd be very happy to co-operate with anyone with the necessary skills. I believe algorithms exist to allow reconstruction of the reference vector and the other signal processing tasks are if not trivial, not the DSP equivalent of rocket science.

As the VLFers and K1JT/W7PUA have demonstrated, the use of PC based techniques to increase the capability of existing VLF to VHF systems is entirely practicable. Currently available software is of limited use in the microwave bands, and a properly thought-through system taking into account the properties of the microwave transmission medium is needed.

Data mode for microwaves

~ by Andy Talbot, G4JNT
[ACTALBOT@mail.dstl.gov.uk]

There is a datamode in existence which may prove to be successful on microwaves. It has been implemented on a Soundcard by Charles, G4GUO, in a form that allows simple messages to be sent with no error detection/correction (at this stage), making it ideal for testing purposes.

The mode is based on a military standard, now in the public domain, called Mil Std 188-110A and similar to another in widespread use, Stanag 4285. The basic waveform consists of 8 level PSK sent at 2400 Baud symbol rate. By heavy coding and interleaving of the data, plus the addition of a waveform training sequence every 110ms to allow the demodulator to continuously adapt itself to the link, various fallback data rates are possible ranging from 4800 B/s right down to the most heavily coded version sending at 75 B/s.

The waveform was designed for very reliable HF comms across some of the worst conditions that HF can throw up - such as auroral flutter and chronic multipath on trans-polar routes where the signal can be spread over many Hz with fast fading. At 75 B/s it is the ONLY waveform out of all the amateur and commercial systems that can cope with this path on the standard HF simulator tools. It is in very widespread use on HF, and if you listen on these bands sounds not totally unlike a diesel engine chuntering away, ie. whitish noise with an underlying 9Hz rhythm to it. Those were at the last Crawley Roundtable will have heard the demonstration of this waveform.

My proposal is to try this datamode over microwave paths, particularly when using the heavier coding options. The waveform fits into a 3kHz SSB bandwidth and ought to be adaptable for up to 100 - 200Hz tuning error. This sounds a lot but is the difference between a correctly tuned SSB voice and one that sounds 'wrong'. We just don't know how well it will work on these bands with tuning errors, doppler shift, scatter etc. On HF it is an order of magnitude better than CW, in 75B/s mode it works reliably at -5dB S/N (in 3kHz BW) which compares favourably with PSK31 with the additional advantages of not being an ultra narrowband waveform.

Charles is not making the software (called M110A) to run the mode publicly available via any web site. There are many who would try to use it on HF, and a 3kHz wide keyboard to keyboard data mode in widespread use on the Amateur bands would be very anti-social, especially one that is so good! However, for anyone interested in trying in on the uWave bands I can supply a copy of the software direct, on the understanding it is only to be used on these bands. You will need a moderate speed Pentium with a Soundcard, plus the audio interfacing leads / attenuator, but that is all. The M110A software is only about 50k in size itself, but it does call on some other packages (DLL's) which should already exist if you have some of the other data mode software packages, otherwise I can supply these with installation instructions.

There are no existing amateur data modes really suited to our microwave paths on the higher bands - WSJT is possibly the only exception and that is geared towards MS and EME operating with lower tuning errors than we see. If M110A does not prove suitable, then it will be necessary to design from scratch something specific to the paths.

Making Helix Antennas

~ some notes by Des Clift, VK5ZO

Over the last few years I've made quite a lot of helix antennas from 23cm up to 3cm on 2.4GHz, 3.3, 4.5, 5.7, 8 & 10GHz. I solved the problem of obtaining suitable wire by using capillary tubing service packs that are used by refrigeration people. They are made in Adelaide and are available in 12 or 13 sizes from 1.72mm to 3.54mm O.D, so you pick a suitable size for a particular frequency. They are annealed and very nearly keep their shape when wound on a wooden mandrel. Even buying them retail, I get about two 15T to 20T helixes from an $18 pack (about £6 pounds sterling) and many more 4T to 6T ones. Considering they work so well and are easily available, that's not bad. The ex-factory price I got is less then half the retail price and they seem as though they would supply me with small quantities, which is a bit unusual.

The retailer also keeps dozens of copper cap and tapered sections like your dual mode feeds. Unfortunately, the factory does not have an agent in UK. He only seems to supply VK, ZL & S. E. Asian countries. I would imagine there are similar sources of tube made in the UK or Europe, so it may be worthwhile looking into. For your information the packs are 150mm diameter and the ODs and lengths of the type they make are as follows:-

PART No.	O.D. (mm)	USEABLE LENGTHS (mm)
SP1	1.72	3660
SP2	2.06	3660
SP3	2.18	3660
SP4	2.16	4270
SP4.5	2.26	4270
SP5	2.58	4270
SP6	2.70	3660
SP6.5	2.82	3660
SP7	2.94	3050
SP8	3.10	3660
SP9	3.06	2750
SP10	3.44	3050
SP11	3.54	3660

PLEASE NOTE … NEW NEWSLETTER EMAIL ADDRESS

The preferred contact email address for the Microwave Newsletter Editor (G3PHO) is now: **microwaves@blueyonder.co.uk**

Please amend your email address books and other records accordingly and remove the qsl.net address at the same time. The virgin.net address is still usable but suffers from an enormous “spam mail” problem! Of 50 emails received via the virgin.net address, 49 are usually junk mail. The Blueyonder address is not published on websites or anywhere else but this newsletter and so should (fingers crossed) remain “spam free” for a long time!

Many thanks,
Peter, G3PHO

Are we using The Technology?

John Hazell, G8ACE [hazell@dsl.pipex.com] asks us to examine our operating methods in the light of what is available in the 21st century ....

The storms of the last few days seems to bring home just how the UK is lagging behind Europe in making rainscatter contacts. I worked only G3XDY on RS one recent Monday night. The number of 10368MHz spots from Gs on the Dx Cluster can be counted on one hand with fingers missing (!) yet there was an enormous number of European spots. The Convers Network equally shows little G activity. Are we in the UK using the Available Technology to fully help ourselves in keeping 10G alive? 144.175MHz may be the traditional UK method of setting up a contact but it has severe limitations.

The traditional way, (maybe ?), is to use the packet network to connect to the Cluster. This is both slow and unreliable. I quickly discovered that, if you need to do several hops in the packet network to reach the service you desire, you can suddenly find your access through some nodes removed. TCIP, from my experience, can be better as it gives access to both Dx Cluster and Converse here in Hampshire and does the routing itself avoiding the AX25 routing problems but again the system is prone to outages. Unless you are very lucky with your local radio packet provision, it soon tries your patience and giving up is the easy understandable solution.

The Internet provides a much more reliable solution with several options. With a number of us finding it worthwhile to subscribe with 24/7 access, or in my case with an ADSL connection, are we fully utilising its potential to help us with the hobby? Using your browser connecting to Dx Summit: **http://oh2aq.kolumbus.com/dxs/** provides DX spots with the ability to filter band information. However sending a 10G spot does not seem possible in this system. It doesn't work for me.

Using a Telnet programme to connect to one of a number of sites eg: GB7DXL.G6YIN.org port 7300 enables the Dx Cluster to be used in the same way as on Radio Packet. However finding a really user friendly Telnet programme can take time depending on your personal programme styling preferences. The best solution I have found is to connect to: 131.155.192.179 which is PI5EHV-8 using your Internet browser. I use Explorer Version 5.50 with all the available Microsoft patches. (Earlier versions might just behave differently.) Using the login, it's possibly to get a user friendly two way Dx Cluster connection with all the facilities it provides.

The Converse only seems to be available through using a Telnet programme. Connect to: lurpac.lancs.ac port 3600 The Convers quickly shows 10G active stations by logging on to Channel 10368 Besides being a useful tool for that Dx contact, as a chat channel it's invaluable to exchange information with stations whose email address is unknown and who are out of normal radio range.

I find it very useful at times to employ two monitors, Windows 98 allows this. The converse displayed on one and the Dx Cluster on the other. If you're a real Dx operator, which I am not, then this allows a clear view of what's happening as only a few operators seem to employ both the Dx Cluster and Convers simultaneously.

It seems to me that someone out there who is reasonably computer-literate ought to write up an article based on this info. It may not be strictly Technical Microwave but it might help to stop us floating up a back water compared to Europe.

I'd like to point you to my website for screen pics .....

http://www.microwaves.mcmail.com/cluster/cluster.htm

73 John, G8ACE

PRODUCT NEWS ….
NEW 24GHZ CHIP

XP1000P1 Provides Broadband Response That Closely Matches Die Performance

September 16, 2002, Houston, Texas – Mimix Broadband, Inc**.** announced the introduction of a gallium arsenide (GaAs) monolithic microwave integrated circuit (MMIC) high power amplifier supplied in a surface mount leadless chip carrier compatible with high volume surface mount technology (SMT) process. This SMT packaged two-stage amplifier is optimized for linear operation with a third order intercept point (IP3) of +36 dBm and a small signal gain of 18 dB. Using 0.15 micron gate length GaAs pseudomorphic high electron mobility transistor (pHEMT) device model technology, this chip covers the 17 to 24 GHz frequency band and has been specifically designed to provide excellent linearity for applications utilizing modulation levels up to 64QAM. The device also includes an on-chip temperature compensated, output power detector and provides excellent input/output return loss.

This SMT packaged power amplifier, identified as XP1000P1, is well suited for wireless communications applications such as millimeter-wave point-to-point radio, local multipoint distribution services (LMDS), SATCOM and VSAT applications. Furthermore, Mimix performs 100% on-wafer RF, DC and output power testing on the XP1000P1.

"The XP1000P1 SMT packaged power amplifier has a broadband response that closely matches die performance with good thermal conductivity providing a reliable surface mount power amplifier," stated David Richardson, Director of Engineering of Mimix Broadband, Inc. "The SMT package permits assembly using standard SMT processes with no specialized die attach or wire bonding required, which leads to more rugged assembly for testing and tuning."

Engineering samples are available in limited quantities from stock and production quantities are available within 8 weeks after order processing. Technical support is also available from Mimix's applications engineers at 281.526.0536. Additionally, please visit Mimix's website (www. mimixbroadband.com) for the XP1000P1 datasheet and additional product information.

Editor's comment: It's devices like these that are going to change the amateur milliwave bands in the next few years….. just think what you could do with a few of those "engineering samples"!

A few things to fill in the winter hours

- Encourage someone else to get onto microwaves
- Build gear for another microwave band
- Join in the Monday Activity Nights at 8pm
- Write a short piece for the Newsletter

Above all, be AN ACTIVE MICROWAVER!

10th International EME Conference

- by Peter Blair, G3LTF

Editor's comment ... no, this is not the same article as last month! This one is written from a different perspective to that by Dave, DL4MUP (September 2002 issue). Many thanks to both contributors for telling us all about what was obviously a very enjoyable and informative conference.

This conference took place in Prague from August 19th to 21st and was acclaimed as an outstanding success despite the disruptive flooding in the city centre. The success was due to the outstanding organisation and energy displayed by the OK team lead by Daniel OK1DIG and Zdnek, OK1DFC. Sadly the whole of their OK1KIR EME station was inundated by the floodwaters. The conference was well supported with 101 delegates among them 8 from the UK. The UK microwave community was represented by G3LTF, G4NNS and G4CCH. There were several items in the programme of interest to the wider microwave community as well as those active on EME.

OK1DFC described the practical implementation of a circular polariser, from the 1960s work of Tsandoulos, which uses a stepped septum to provide isolated, orthogonal polarised ports with low VSWR and 10% bandwidth. This feed has been used by the OK1KIR crew on several bands from 1.3 to 10 GHz. It has the advantage of simple construction and alignment compared to the widely used probe polarisers.

The conference voted to adopt circular polarisation as the preferred mode for EME operation on all bands above 1.3 GHz. G3LTF presented a paper describing various ways to increase 2.3 GHz EME activity, which suffers from being spread over several segments worldwide, 2304,2320 and 2424 MHz thus making crossband operation essential. The conference agreed to adopt transverter designs which minimise the frequency offset errors between segments by using a single microwave LO and a broadband IF with each segment accessed by an appropriate down-converter.

An interesting and detailed overview of the 24GHz EME work was given by Barry, VE4MA, covering his own, W5LUA's and RW3BP's stations. All three key aspects, antenna, PA and front end were described, the most difficult being the generation of 20-40 W of power. The TWTs required magnet tuning, o/p port tuning and voltage adjustment for success. Barry has already reported the antenna measurements. All three stations are working on 47GHz EME systems. Marco S59UU described a home-built, pulsed TWT PSU that can be used to adjust unknown, or partly known TWTs to optimise power o/p or even to discover what band they cover, without stressing their dissipation.

Joe, K1DT described and demonstrated his JT44 digital communication system, which is claimed to provide up to 29dB improvement over average CW readability in 500Hz bandwidth. This is an impressive piece of work and, provided that the frequency can be accurately set, is capable of extending many microwave paths. It has already been used by K2UYH on 1296 EME to contact a 2-yagi 100W station. After much debate it was decided to adopt 1296.044MHz as the preferred JT44 calling frequency for random QSOs and .044 up from the lower edge on the higher bands. On the thorny question of how JT44 contacts score in the various tables, lists and contests, the conference was divided. The Tropo community has to face the same issue!

Pictures, NF contest results and information on how to obtain a copy of the conference proceedings CD are at:

www.emeconference2002.cz

The next conference is scheduled for 2004 in Trenton NJ USA.

Peter Blair, G3LTF

ACTIVITY NEWS FROM THE WORLD ABOVE 1000MHz

The so-called Summer Contest season is almost over as these pages are being written. With one 10GHz cumulative and a Millimetre Bands contest to go it's worth a quick look back at the past year. A quick look back is all we need because the activity levels have been nothing to write home about! We put 2001's poor activity down to the Foot and Mouth problem but, be honest folks, there's been nothing much to stop you this year has there? Yes, we know many of you are under pressure at work and have domestic responsibilities (having been there an got the T-shirt!) but somewhere along your busy schedules can't you just find one or two hours a month to at least put out a CQ call? It's the retired folk amongst us who are also not coming on the air ... just what are you doing instead, building gear or surfing the Web? Anyway after that rant let us all hope that activity goes up next year. Present levels are almost 50% down on two years ago. In contrast we hear that in the USA there is a lot of interest in microwaves as more and more "newbies" are coming into this section of amateur radio. How do they do it?

Next year's contest programme was recently discussed at a Microwave Committee meeting. It should be published within the next few weeks. There are some interesting departures from previous years with more attention being given to the 23, 13 and 9cm bands, a fairer deal for 24GHz and a new trophy to encourage activity on 5.7GHz. Of course, the "bread and butter" band, 10GHz, receives it's usual share of the schedule so you single banders (3cm only) need not fret, your cumulatives have not disappeared!

In view of what has been said above, have you plans to become active on one more microwave band.? If you are still only on 10GHz then how about trying 5.7GHZ. It's an excellent band, with a good DX potential and rainscatter conditions from time to time. It's easy to make dual band 10 and 5.7GHz feedhorns so you don't need an extra dish!

3.4GHz is another band showing signs of increasing UK population. The ubiquitous DB6NT kits are available at moderate prices and there is a spate of 14W surplus solid state PAs in the country. The latter are very reasonably priced also. By using one of Kent Britain's log periodic microstrip dish feeds it would be possible to have 2.3, 3.5 and 5.7GHz all on one dish!

So, inject a little excitement into your microwave life this coming winter .... build for another band!

Operator email reports ...

From: Peter Blair, G3LTF (IO91GG) [100633.1656@compuserve.com]
Sent: 14 October 2002 21:55

Herewith recent activity above 23cm:
During the summer I completely rebuilt my 6m EME dish and resurfaced the centre 4.3m with 6mm square mesh. It now works much better on 13cm, with about 2dB more gain! It will, I believe, be good up to 6cm when I have finished the final tweaking of the profile.

On 28th Sept via EME I worked OK1CA 549/549, HB9SV, 559/559 and JA4BLC 559/449 QRM at the JA end from microwave ovens at JA breakfast time! On the next day I worked WA6PY with O/M reports. He has only a 2.4m dish and 50W. I have the same power at the feed and now have worked him on 70,23 &13 on his tiny dish!

I was on in the early October IARU terrestrial contest and worked on 13cm, PA6NL, 391km, PA6C, 573km, and PA0WWM, 418km. I heard F6KPQ at 389km. Conditions were about normal. This was with my h/b yagi (see a previous Microwave NL), 100W and 0.5dB NF preamp at the feed.

From Al Ward, W5LUA [al_ward@agilent.com] Sent: 20 September 2002
comes this prophetic email ...

Having conquered 24 GHz EME , VE4MA and I are actively pursuing 47 GHz EME because we have TWTs capable of 15 to 30 watts but 76 GHz ..... no power there yet!

From: Pete, F1VBW [icom.flo@wanadoo.fr]
Sent: 20 September 2002 08:01

I was surprised to see how to repair a 8555A in the newsletter, especially as I had done the same last year! I guess I was luckier in that the mixer diode had failed o/c and I managed to 'glue' (with conductive paint) a beam-lead on top. Most of the stations here have been rebuilt or modified during the last year, so activity had been very much reduced. The biggest change has been on 10GHz where the power has been raised considerably with a 0910-4 driving a pair of 0910-10s. There's 20w at the feed now. I used DB6NT pcbs, cut up and modified as the basis. Just need to replace the old 60cm Amstrad dish with a 85cm grp one but already the differences are remarkable, especially for RS. **73 Pete F1VBW (jn03)**

From: Jonathan Naylor HB9DRD/G4KLX [jonathan.naylor@ggaweb.ch

We had a marvellous RS opening on the 30th July. The highlight was probably OK1JKT working G3LQR, not bad at all. I think other G stations were involved also. I worked PA4ZP (G4EZP) on 3cm and I probably gave him a shock as activity was very low and HB9 was not well represented. Even DL was quiet ... maybe the holidays were to blame. I was happy to work some PA stations on 6 and 3cm including Uffe, PA5DD but Wim, PA0WWM, who is 20km further, couldn't hear me and so no QSO was made. I also worked Uffe on 6cm for his new ODX on that band.

I think that during the opening **I made the new Region 1 record RS QSO on 5.7GHz.** I worked Eene, PA3CEG, in JO33FB at **a distance of 654km**. He was 58s on 3cm and 54s on 6cm but, at least according to official records, it is the furthest. I will submit it and see what happens.

In due course I will put my new log entries onto my web pages, I hope to get some photos of my new dish and PA onto the site as well soon.

From: Chris Bartram, GW4DGU [chris@chris-bartram.co.uk]

Even before I move into my new house, its clear that, even more than the SW of England, my location puts me on the side, or even worse, in the first sidelobe null of most habitually aligned 2m beams in the North and Midlands of England. I need to be able to wake people up! Unfortunately, as the amplifier runs on 28V, and it's a major hassle to take portable. The 80W amp will have to do for now! Everyone, please look for me on 2m. SW Wales is further west than you think!

During the August 10GHz Cumulative I had a very frustrating day. Although I heard two beacons at around the 100 mile mark (GB3CCX, and GB3KBQ) without difficulty, heard F6DKW at well beyond 500km, and made a number of contacts beyond 200km, it was very difficult to attract attention from stations - even on 144MHz - anywhere north of me. It wasn't the site. The Welsh mountains don't present an insuperable barrier on 3cm! Ask GW8AWM - much to Frank's surprise, we had a good QSO between Monmouthshire and Carmarthenshire right 'through' obstructions such as the Brecon Beacons and Black Mountains. Had I'd not had a vertical squint in my antenna system at the time, which I estimate cost 8 - 10dB, we'd have had a very easy QSO.

A more profound problem exists in operating practice and expectations! I lived in the (English) West Country for a significant part of my amateur radio life, and became used to people not beaming to the west. With a certain amount of brute force, it was usually possible to wake people up, however, SW Wales sits in the first null of the pattern of typical small 144MHz yagis aimed south from the north of England and, even with reasonable gear from a good site (60 - 80W and a 9 ele yagi), it is very difficult to hear and be heard.

The solution is in my hands, of course. When, eventually, we move to our new house I'll be able to use my solid state 144MHz EME PA to a decent antenna system to attract attention but a more adventurous beaming policy by some of you guys in the Midlands and north of England could get you even more QSOs, now!

I haven't yet got the 10W SSPA going, as I'm awaiting delivery of a PSU PC I've designed and I've been concentrating on trying to finish my big (800W)144MHz SSPA. I'll need that to get people to turn their beams this way once I've finally moved QTH!

Incidentally, I'm not the only station QRV on 10GHz in Carmarthenshire/IO71. Stuart GW3XYW in Pontarddulais is also QRV but he has given-up trying to work people on tropo, and is getting results on the moon with a home-made 2.7m dish and 10W.

For the record, I did go out in the early October multiband contest. However disaster struck! I haven't yet had the time to check properly but it seems that the ~*&\#*^$! 3cm antenna relay died. I couldn't even hear Martyn, GW3UKV/P, 80km away on a near optical path! I restrained myself from pulling the transverter apart! Still, I had a very pleasant day in the sun(!), saw a couple of Red Kites and met one local GW0 who is currently inactive,but seems to be very interested in microwaves! I'll work on him ...

Hopefully by next season I'll be fully QRV from my new home.

From: John, G3XDY (Suffolk) [g3xdy@btinternet.com]
Sent: 07 October 2002 23:52

I have been working hard to get a 6cm system finished for the IARU contest and just made it in time! The first QSO was with Simon G3LQR on Friday 4th October. I built the DB6NT 5.7GHz transverter kit, which worked first time and exceeded its specs by a good margin and this is followed by a 15W output SSPA from DL2AM. I modified my G3PHO 10GHz feedhorn to add another feed probe for 5.7GHz in the larger section of the horn to effectively make a coffee can feed (similar to the W5LUA dual band feed in the ARRL Microwave projects manual). The isolation from 10GHz to 5.7GHz is only about 12dB, so I have an extra relay in line plus interlocking between the bands so that transmitted RF on 10GHz does not get into either the 5.7GHz transmitter or receiver. Results in the contests exceeded my best hopes, with a total of 18 QSOs in 14 locator squares and 5 countries, despite flat conditions. Best DX was DK2MN in JO32PC at 415km.

The other bands also went well considering the average conditions (apart from a TX feeder fault on 23/13 on Sunday afternoon):

1.3GHz: 47 plus 2 one way QSOs, best was DK2GR in JN59IE (also heard on 13cm but incomplete)

2.3GHz: 26 plus 1 one way QSO, best was DK2MN

3.4GHz: 13 QSOs, best DK2MN

10GHz: 27 QSOs, best DJ6JJ in JO31LG

Activity in the UK microwave event seemed limited, CQ calls on 144.175 did not seem to have much result over in this part of the UK, despite running 200W on that band. Many of the usual contest groups were noticeable by their absence this year, I suspect this reduced activity overall.

From: David Warr, G4RQI (West Yorkshire) [g4rqi@blueyonder.co.uk]
Sent: 08 October 2002 20:58

I have managed to build the offset dish feed from G3PHO's web site using plumbing parts. A friend of mine at work insisted on getting it silver plated for me and another chap has donated a 60cm ex-sky dish so I'm almost there!

I've obtained an sma to waveguide transition, which also came with a low power circulator, plus a small sma antenna changeover relay which is good to 20GHz, so all I've got to do now is box everything up and buy a suitable driver such as an FT290 or FT817.

I've also built and boxed a WB 10GHz transceiver but I need to add an AFC circuit at some point. It seems to work ... best dx so far is G4TIW at 20ft !!

I'll let you know when I'm in a position to put a narrow band signal out on 10GHz, probably portable, maybe from IO93PW on the Yorkshire Wolds.

From: Steve Cooke, G1MPW [scooke@tiscali.co.uk]
Sent: 27 September 2002 11:23
Subject: SEPTEMBER CUMULATIVE

Myself, G1MPW and Dave, G6KIE, tried an old site that we haven't used since the days of wideband, just west of Guildford IO91QF (good to the north and east but shielded by trees to the south). We managed 8 contacts and the best DX of the year G3PHO/P (many thanks !!) at 348 Km. To work G4ZXO/P we had to resort to bouncing signals off Guildford Cathedral but it seemed to work ok.

Just a quick observation -- it might be so obvious that everyone does it but no one talks about it -- we struggled with one contact that should have gone quite easily but we couldn't get it to work . However we could both hear GB3SWH on 10,368.240 and by both netting on that and then coming down 100 KHz we knew we had eliminated any frequency error and a two way contact ensued easily after that. If the above is commonplace and I am trying to " teach my grandmother to suck eggs" then I apologise but if it's not then it might just help someone else out. (Editor ... you'd be surprised how many folk are still not sure, within a few tens of kHz, where they are on the microwave band!)

From: Neil, G4LDR [g4ldr@btinternet.com]
Sent: 13 September 2002 08:38

Some of you have probably already heard that G4BRK heard G1JRU on ssb over a **very obstructed 24GHz** path of 91 km last Sunday. G1JRU also heard G4BRK but his RX was the Milliwave as pre-amp so probably not a very low noise figure compared with G4BRK's set up. G4BRK also heard G1JRU again on Monday. (This augures well for anyone contemplating a home station on 24GHz ... editor)

From: Ted, G3JMY@aol.com (Bristol, IO81RM)
Subject: August Cumulative

Sunday was not too active - Roy, G3FYX and I came on at 0900z and thought it was going to be a good day. By 12.00z we had worked 8, all, bar G3PHO, being shorthaul. I had a short skirmish with F1PYR/P at 11.38, but he did not understand the QSY procedure to get off the calling channel and I lost him.

The afternoon brought a one-way with Eric, F1GHB/P, showing that conditions were down and the rest of the afternoon I logged only 4 more stations, the last one being Peter, G3LRP, who was the best two-way DX of the day.

Although I only have one band - 10 GHz - I am still keen to work it. Even with all the other bands available, others show more interest in this band, it seems to me.

In the August All Microwave Bands Contest I managed 6 contacts in the first 2 hours and then had a masthead preamp problem. I lost 7 1/2 hours fixing it. This involved lowering my tower, drying out the preamp, fixing a stuck relay contact and getting everything up and working. It has remained OK since and I don't want to have to do that again too soon!

Now on to the September 10GHz Cumulative.. Conditions seemed down a bit on Sunday and the turnout was thin. I heard about 20 stations on the calling channel and finished up with 14, including F1PYR/P, but heard no other continentals.

The new dish performed OK, but I found it very sharp by comparison with the 18" and had to do some work on the rotating mechanism to eliminate a small but significant amount of backlash. The dish seems to be around 2 degrees, or less, in beamwidth, with a very sharp cutoff either side of that.

From: Ralph Bird G4ALY (Cornwall, IO70VL) [Ralph.Bird@btinternet.com]
Subject: 22nd Sept. 10GHz Cumulative

12 stations were worked. In order of contact they were:-
G4NNS, G0RRJ, G4ZXO/,P G3FYX, G3JMY, GW8AWM/P, G8ACE/P, G8BKE/P, GW3ATM/P G4MAP G4LDR and G3LRP. The best, of course , being G3LRP(IO93HO08) at 399.1km. G3JMY was a one-way contact only this time, Ted not hearing me on very well on 3cm. No French stations were heard here at all. Contact on 2 metres with Pete, G3PHO/P (IO94MI), failed late in the day, which was a pity as this would have taken up my personal distance record a further 84 km. The contact with G3LRP took 30 minutes of 3mins TX/3mins Rx to get a full contact. A mix of aircraft scatter and tropo (?) but we did it!
See you all next time .. 73 Ralph.

From: Noel Matthews, G8GTZ, [noel@snap.clara.net]Sent: 07 October 2002 18:26

I went /P out to Norfolk lafor the Oct IARU weekend but had a pretty poor time and only worked PA6NL on 3cm at 222km. I took 2m and 70cm talkback but only heard M0JTT on 2m. Either no one was on or they did not beam my way - often the problem in Norfolk and I did not have enough erp on 70cm to raise many of the continental stations who were in contest mode! Oh well, the weather was good!

From: Ken Vickers, G3YKI, (Stratford) [Ken.Vickers@crowncastle.com]

Saturday 17th August gave tropo for early risers with good signals from DJ6JJ on **23cm** reaching as far as Evesham at 0600z. This was on my small yagi but he has 100W and 2m dish. He sent to me on 3cm but nothing was heard. He had already worked G4EAT on both bands. All signs of enhanced propagation had gone by 0700z, with GB3MHL dropping from 9+20dB back to normal S6.

From: Neil Whiting, G4BRK (Swindon, Wilts) [neil@thewhitings.freeserve.co.uk]
Sent: 27 September 2002 21:51

Best DX on 9 and 3cm, both by Rain scatter, occurred on 14th June. That was the only real DX opening seen this year so far on microwaves and gave 7 QSOs with F and PA. There was some tropo around 12-17 Sept but it wasn't doing much above 70cm. SM6ESG was heard weakly on 23cm on 12 Sept.after a 70cm QSO, but he couldn't hear me. So still hoping for some conditions!
73, Neil G4BRK

Peter, G3PHO (Sheffield) details his portable activities over recent weeks...

After missing out on the September Millimetre Bands contest due to being at the Weinheim Convention (see last month's newsletter) I was hoping for a good time in the **September 10GHz cumulative** on the 27th. I chose a site, Balkey Ridge, on the North York Moors, IO93MI73. It's a very convenient roadside layby with stacks of room for my gear and just 2 hours drive from home. Little did I know what was about to happen later in the day! The weather was bitterly cold for the time of year, a strong Northerly brought showers and the temps down to an effective single figure wind-chill. Conditions on both two metres and 10GHz seemed poor once again (as most weekends this year!) yet there were the Frenchmen again, **F6DKW** and **F1PYRP** coming through on 2metres over 600km+ when nearer UK stations were inaudible or at best running a dB or two above noise. There is no magic secret to Maurice's and Andre's signals ... they just have a decent beam fed with good coax! However, it was not easy on 10GHz with them and only weak "dotted" carriers were heard both ways from the occasional aircraft reflection. F1PYR/P was heard by me on **5.7GHz** also but no contact resulted. Remember that the path is over 600km on a flat band so I was pleased even to be heard! All in all 17 contacts on 10GHz were achieved with G4ZXO/P(IO90WV) as best DX. Activity was low again but not quite as bad as other Sundays this year. 29 UK and 2 French operators were known to have been active on 3cm that day. Thanks folks .. it makes the 2 hour journey worthwhile when there is a reasonable turnout.

By 1500z things seemed to go awry. Stations were not hearing me on 3cm though I was hearing them! Eventually I traced the problem down to the 24V change over relay supply having failed. A quick dip into the spares box brought out the good old trusted Ma/Com "Whitebox" (!) which I fired up complete with drifting LO and only 800mW output, to work G3UKV (IO82RR) for the final contact of the day. Strange how, after you have moved up a notch with the latest transverter kit and QRO SSPA, the going back to the old converted surplus kit brings back all the memories of the "good old days" !

The next contest was the October IARU weekend for which, on the Sunday only, I put on a portable four band microwave (+2m talkback) station single-handed on Houndkirk Moor (IO93EH98). I hope that's the last one I do by myself as it takes over 90 minutes to set up and almost an hour to dismantle. During the contest you feel as if you could do with 8 pairs of hands!

Once again the activity levels were poor, with only 31 different UK operators known to be on from 23cm through to 47GHz. 22 of these were on 10GHz, a very low turnout on what is the mainstay band of UK microwaves. Only **ONE** UK contest group appeared on the microwave bands! Congratulations Ian and the lads from South Birmingham (G3OHM)! Your devotion to the "cause" will not go unrewarded! The only other group known to be out, M1CRO, was limited to 70cm only.

I was pleased to work 11 stations on **23cm,** higher than in several of the 23cm RSGB summer evening activity nights. **5.7GHz** brought six stations but we know there are many others in the UK with gear for the band. **10GHz** netted 16 contacts, the best of which, once again was Maurice, F6DKW (JN18CS) at 572km. F1DBE/P was known to be around but I didn't hear him on 144MHz talkback. **24GHz** brought just one contact, with G3LRP over a few dozen km. An attempt with GW3UKV/P on Pen y Gadair Fawr (IO81KW) failed on 24GHz (it was a long shot anyway) but I had a nice contact with them on 10GHz.

The 24GHz contact was some relief to me because, just four days before the contest, the first stage in my 4 stage DB6NT preamp decided to not work for some reason! I think it could have been a "spike" from a mains PSU I was testing the unit with so I will use a battery in future! That Wednesday afternoon saw my shack look like an operating theatre in "Casualty" as I gingerly removed the lid from the preamp box and tried to get the offending NE32584 HEMT out of the circuit. After attempts with a tiny soldering iron bit and solder wick I gave up an cut out the dead critter with a fine scalpel blade. A bit of cleaning up afterwards and I soon soldered in a new HEMT, a n NE32**9**84D this time as I only had these as spares. These latter devices are supposed to be half a dB NF better at 12GHz so I expected good results on 24GHz. However, I soon realised I still need to "snowflake" the input line on some decent test gear. The present NF seems decidedly worse than the 2.2dB I had before. Still the amp works now and it didn't on that Wednesday! **73 from Peter, G3PHO**