



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

There's no doubt that our amateur radio hobby is under serious threat from a number of sources ... commercial demands for more spectrum allocation, broadband internet developments such as PLT and now, as you can read on page 13 of this issue, Short Range Radar (SRR) systems on the millimetre bands. This latter threat should not be underestimated. Sadly, the number of microwavers currently interested in the area above 47GHz is very small in comparison to those on the "bread and butter" bands such 10GHz and, as a result, the threats to the millimetre bands are often ignored. Make no mistake, ALL of our amateur microwave spectrum is under threat from external sources and it behoves us all to respond as best we can. Please read Arie's (PA0EZ) report on page 13. He and others (including our own Mike Dixon, G3PFR) work tirelessly on our behalf to protect what we already have and to seek out solutions to problems such as are described in Arie's report. It matters not if you are a single band operator or a dedicated multiband person. What is happening on the higher microwave frequencies is the concern of all ... it could be "your" band next !

The UK amateur microwave scene is now being cared for by the UK Microwave Group, working, through Mike Dixon G3PFR, with the new RSGB Spectrum Forum. Your views, suggestions, etc, can be channelled via this Newsletter to those involved at the "decision making" end of the chain. Please become involved!

MANY THANKS TO ALL OUR CONTRIBUTORS THIS MONTH

2004 – FEBRUARY



In this issue ...

- For Sale and other notices
- Local Oscillator Sources for
- Microwave Use — by Andy, G4JNT
- New Mitsubishi 23cm 'brick' PA
- Austria halts PLT tests
- New Product news
- It's Your Say Readers' forum
- IARU Region 1 news from PA0EZ
- Activity News
- Farewell to Jack, G3JMB

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 0114 2816701



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



G3PHO: Email: microwaves@blueyonder.co.uk

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



TWT amplifier type
 WCMC19A, from a 13GHz
 link, gain 46.5dB and Power
 supply (-24v input). Price,
 complete with ccts **£150.**

EIP 545 10Hz-18GHz Microwave
 frequency counter and **power meter**
 complete with manual **£350**

Wanted: 1152MHz 200mW source.

Telephone 07974 916186 (Walsall,
 West Mids)

Richard Morrall
[g8zha@blueyonder.co.uk]

**WANTED
 URGENTLY !**

**ARTICLES
 FOR THE
 MICROWAVE
 NEWSLETTER**



USEFUL FILTER INFORMATION

From: G3XDY [g3xdy@btinternet.com]

I recently built a filter described on GOORY's
 web pages (<http://www.qsl.net/g0ory>).

If you want a simple but small/good filter
 for 13cm then this is worth a look. Meas-
 ured performance (Thanks to Sam G4DDK):

Mid band Insertion loss: 1.75dB

3dB Bandwidth: 48MHz

Rejection at 2.1GHz > 55dB

In band return loss > 15dB

The filter is very useful for putting after a
 preamp to keep 3GHz base stations out of
 the receiver front end!

Thanks Adam for a great design.

73 from John G3XDY

Editor's note: Another useful website in
 this respect is that of Dave, G4HUP
 (presently working as DL4MUP).

Take a look at www.qsl.net/dl4mup



MICROWAVE UPDATE 2004

Microwave Update 2004 will be hosted by the North Texas Microwave
 Society and will be held in Dallas near the DFW airport on October 14, 15, and 16,
 2004

A formal announcement with all the details will be placed on www.ntms.org and
www.microwaveupdate.org very soon.

Looking forward to seeing you all in Dallas!

73 from
 Al Ward W5LUA
 Kent Britain WA5VJB
 Bob Gormley WA5YWC

Locked Oscillator Sources for Microwave Use

... by Andy Talbot G4JNT

For some time I have been looking at ways of locking microwave source oscillators to a master frequency standard to allow high stability operation for propagation monitoring of beacons and to remove frequency drift with temperature and ageing. Most good quality frequency standards operate at either 10MHz or 5MHz, whereas microwave sources generally start from a crystal in the 100MHz region and are multiplied up. Going from 10MHz to some arbitrary 100MHz value is not straightforward. For local oscillators which generally operate at multiples of exact MHz, it is sometimes possible to find frequencies that can be generated relatively easily from 10MHz (eg 106.5MHz for a 10GHz LO source when multiplied by 96) but a beacon on 10368.905 (GB3SCX) needs 108.0094270833MHz - not nearly so easy!

The Conventional Approach

The approach taken by WA6CGR (www.ham-radio.com/wa6cgr) in his phase locked microwave source is to use a Phase Locked Loop with arbitrary values of division for both the reference and VCO divider chains, as shown in Figure 1. The output frequency is given by :

$$F_{rf} = M * N / R * F_{reference}$$

where M is the RF multiplication, N is the PLL VCO division and R is the reference division value. It is usually possible to find some pair of values of N and R where the resulting locked frequency is "near enough" to the wanted value to be acceptable. N and R should not be made too high as otherwise the divided down comparison frequency becomes unmanageably low, and some arbitrary value has to be decided on when working out R and N values, which usually have to be derived by trial and error, or more easily by a computer search of all possible values, given the dictates.

For the example above comparison frequency was specified as being 10kHz minimum (see below for justification) and a computer search came up with values of R = 849 and N = 9170 with an RF multiplication M of 96 for a result which is 406Hz low - probably good enough in practice. The comparison frequency ended up at around 11.79kHz

For our purposes on microwaves we probably have one of the most stringent stability and phase noise specifications of any user on these frequency bands. Microwave amateurs are (probably) the only group who are concerned with phase noise performance at GHz that is only tens or even hundreds of Hz away from the carrier centre. Poor phase noise performance in this region manifests itself as an annoying rough tone to recovered SSB or CW signals, and even closer in to the carrier as a frequency jitter or wandering.

So the basic microwave oscillator source at 100MHz has to have a very good performance so that when multiplied up many times its own phase noise (which is multiplied by the square of the multiplication factor) is acceptably low. 100MHz overtone crystal oscillators are usually quite adequate in this respect, although their frequency setting accuracy, temperature drift and ageing leave a lot to be desired. Furthermore, unless they are designed and cut for operation at elevated temperature, putting them in an oven or adding a clip on crystal heater hardly helps in temperature stability which can cause several parts per million change even over day / night inside a house. A varicap diode in series with the crystal can easily be added to and allows the crystal frequency to be pulled a few parts per million - a few hundred Hz - by varying the control voltage applied to the varicap. This item will be referred to as the VCXO, or Voltage Controlled Crystal Oscillator.

10MHz reference oscillators on their own, free running, make use of the very best quality crystals there are, and the inherent phase noise of these if they could be multiplied up directly is usually more than good enough for our final requirements. However, being forced to use a phase locked loop in the frequency determining process can undo all the oscillator manufacturers good work!

So if we can phase lock the crystal to a divided and multiplied version of a reference we're home and dry. The main problem here is the restricted pulling range of the 100MHz overtone crystal oscillator. As a rule of thumb, the bandwidth of a phase locked loop - which dictates the time required to lock up and the phase noise performance - has an absolute maximum value given by the product of the Voltage Controlled Oscillator control constant (K_v) defined in Hz/Volt and the Phase Detector constant (K_d) defined in Volts per radian. Where the output of the VCO is divided down, the K_v value has to be divided by N .

To a first approximation the absolute maximum PLL bandwidth is given by :

$$BW = K_v \cdot K_d / N$$

Phase Locked Loops in other applications often filter to narrower bandwidths, but for synthesisers we always want the absolute maximum bandwidth that can be achieved to minimise any noise added onto the VCO from external or internal sources. - this can make PLL design both easier - in the area of loop filtering, and also more difficult - in the area of high speed phase comparator performance.

For the GB3SCX example above, K_v of a typical VCXO Butler oscillator was measured at 250Hz/Volt (divided by 9170), and a standard edge triggered phase detector in a 5V system usually has $K_d = 1.6$ V/radian, giving a maximum loop bandwidth :

$$BW_{(Max)} = 250 \times 1.6 / 9170 = 0.04\text{Hz or } 1 \text{ cycle per } 23 \text{ seconds}$$

Since loop lock and stabilisation from switch on up can take several cycles we are looking at a period of several minutes before an acceptable output stability is achieved. Furthermore, and even more serious for our purposes, the inherent stability of the VCXO has to be stable in its own right within this bandwidth period, as otherwise the loop cannot correct it. Asking a non-ovened crystal oscillator to hold a few parts in 10^{-9} (several tens of Hz at the final 10GHz microwave frequency) within even one cycle of loop bandwidth is not really on with temperature shifts and draughts. So it looks as if even the VCXO has to be oven controlled itself if taking this route.

I first encountered this VCXO / PLL problem not originally on the microwave bands, but at LF when playing with ultra narrow band processing where the frequency stability requirements, (in relative terms anyway) are similar. A 24.576MHz clock oscillator had to be locked to a 5MHz reference and the only common frequency for comparison was 8kHz. It was necessary to allow 30 minutes for satisfactory PLL stabilisation and this was using a fundamental mode crystal with inherently higher pulling ability.

Direct Digital Synthesis

A few years ago DDS devices became widely available to amateurs and it became easy and straightforward to construct a source of virtually any arbitrary frequency up to a value of about 40% of the clock applied to the DDS - which is typically in the 100 to 200MHz region for low cost devices. See my DDS module design published in RadCom November 2000. This used an AD9850 DDS with a maximum clock of 120MHz, allowing frequencies up to around 40MHz to be generated with a resolution, or tuning step, of $F_{clock} / 2^{32}$. A later device, the AD9851, which is pin compatible with the AD9850, allowed a clock frequency up to 180MHz, and also had an internal X6 PLL multiplier on board the chip itself so the actual clock source need only be 20MHz maximum. The beauty of DDS solutions is that there is no inherent increase in phase noise due to the DDS process - phase noise in is scaled exactly by the frequency division process. I did wonder if the internal X6 in the AD9851 added any phase noise, but it is a very high bandwidth PLL and the data sheet states that this is "insignificant". Tests by multiplying a DDS output up to 10GHz did tend to agree with this statement. By driving an AD9851 with 10MHz from a frequency reference, a 60MHz clock results which can generate any frequency from 0 to around 24MHz in steps of 0.014Hz

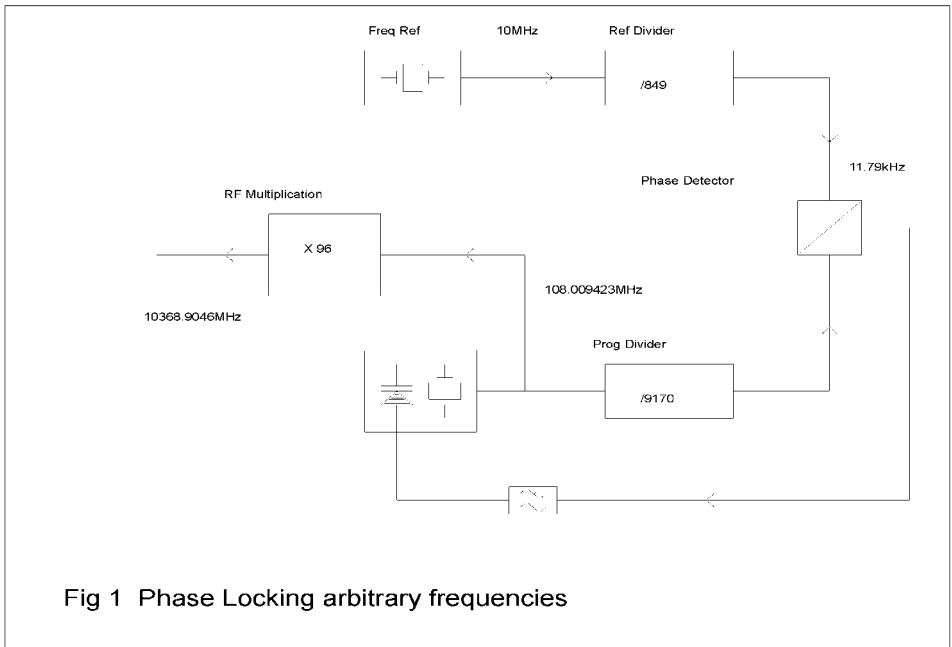


Fig 1 Phase Locking arbitrary frequencies

The downside to DDS sources is that they are not very clean, 50 - 60dBc spuri are common, and these seem to bear no relationship to the carrier frequency (they do, but the relationship is complex and is based on harmonics, alias products, harmonics of alias products and intermods). Suffice to say, the sprogs are troublesome, and some low level 'sprogs' are quite close to the carrier, albeit many dB down.

I initially thought the DDS output at 21.6MHz could be multiplied by 5 directly to 108, and did try a breadboard of this, generating a test signal multiplied up to 10368GHz. It sounded terrible! The centre frequency has a 'pure' enough tone, but it was surrounded by whiskers and rubbish that sounded like very high level of phase noise. What was happening was that all the close in spuri, that may well have been 80dB down and undetectable on the source, when multiplied by 540 were increased by the square of the multiplication factor and were now very significant. This idea was very quickly abandoned.

Next I considered the PLL route - see Figure 2.

Since the DDS can generate tens of MHz directly, the loop bandwidth could be made very high - certainly in the tens of kHz region and ought to be capable of stabilising a poorer quality oscillator such as an LC design. Various attempt were made to do this, but a sufficiently high bandwidth PLL never materialised. Edge triggered phase/frequency detectors require high speed logic to make them operate and I was losing patience at this point, quite apart from the fact that the DDS spuri were still proving difficult to filter out with loop bandwidths sufficient to clean up an LC source. More perseverance with good LC oscillators and fast logic may have come up with something, but I could be bothered.

So, back to a crystal oscillator as the source - at least these are always clean. Now a PLL using this as the VCXO does not have to divide down by a large factor, as the comparison can be made at tens of MHz. By using a simple divide by 8 prescaler the VCXO can be brought down to 13.5MHz for comparison with a reference generated from the DDS. The exact division ratio is

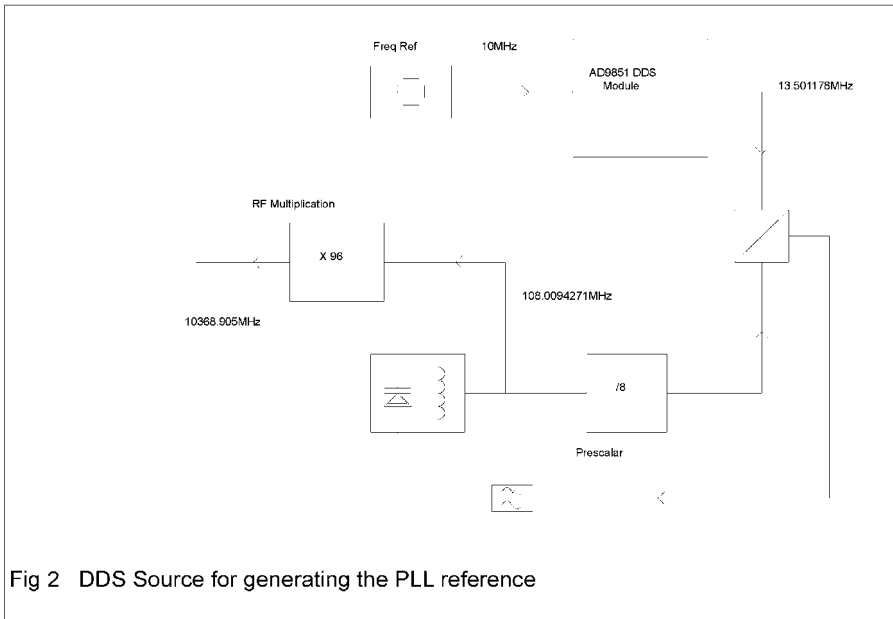


Fig 2 DDS Source for generating the PLL reference

unimportant as the DDS can generate any frequency, and a divide by 10 would work just as well. A simple mixer type phase detector was implemented using an NE612 receiver chip followed by a low noise op-amp, rather than trying to make a complex high speed edge triggered D-type flip flop design. Kv of the VCXO was 250Hz/V now only divided by 8, and the NE612 / amplifier combination had a Kd of 2 V/rad - or more depending on the amplifier gain.

Now, maximum loop bandwidth = $250 * 2 / 8 = 63\text{Hz}$ much more acceptable.

The circuit of Figure 3 was built up and tested. It locks up virtually immediately, the note when multiplied up to 10GHz sounds 'perfect' and all appears to work as required. No particular effort was made to optimise loop filtering - as the inherent loop bandwidth is dictated solely by the Kv.Kd product this was just left to cope as best it could and give the highest possible bandwidth, with no attempt to control overshoot or anything. As with any PLL based on a mixer rather than an edge triggered phase detector, the loop will only lock up if the initial frequency error at switch on is within the loop bandwidth. So the crystal oscillator has to be within $63 * 8$ or around 500Hz of the wanted frequency. In practice, and to cope with temperature shifts, a starting frequency of significantly less than this should be aimed for - say within 200Hz which corresponds to a couple of PPM. This is getting a bit tight for a non-ovened crystal to be used over a wide frequency range, but, with decent overtone devices, it can usually be achieved. The divide by 8 prescaler chip used here, the SP4908 is probably obsolete now, but I had one Any suitable device from the junk box will do, and doesn't have to divide by exactly 8 - so long as the final frequency is within the range of the DDS source. VHF prescalars are not too common now as synthesiser chips themselves operate at 1 - 2GHz; the prescalars that are around tend to operate at many GHz, but even one of these can be pressed into service as they usually operate down to DC.

An incidental advantage of the loop locking up quickly it that is just about possible to generate frequency shift keying by reprogramming the DDS. Provided the frequency shift is small - no more than around 1 to 2kHz - the loop can track this change within a few milliseconds. If CW at around 12WPM is used then the keying just sounds a little soft, as the tone changes from mark to space.

Much faster than this, and the edges are smeared out too much.

The DDS frequency resolution is $F_{\text{clock}} / 2^{32}$ which for a 60MHz clock is 0.014Hz. When multiplied up to 10GHz by the X8 prescaler and X96 RF Multiplication, this step size translates to a little over 10.7Hz - probably accurate enough for most purposes!

An afterthought that occurred to me as this article was being written ...

Instead of using a prescaler to divide the VCXO down to a frequency that could be generated by the DDS, why not use the VCXO directly as the DDS clock (without the X6 PLL option enabled)? Then by thinking backwards, programme a value into the DDS that generates exactly 10MHz from the chosen oscillator frequency. As the internal PLL is not needed, and the device is only operating at 100MHz the original AD9850 can be used in this adaptation.

This concept will form the basis of the Mark two design. Generating the accurate 10MHz signal is a subject I'm also closely involved with, but that will have to wait for another article.

Another possibility for the next generation is using the AD9852 DDS. This chip can have a clock of up to 300MHz and an internal PLL which is programmable between 4 and 2. It also has a 48 bit accumulator so frequencies can be set to a resolution of 2^{-48} of the clock. At 108MHz clock frequency, followed by multiplication to 47GHz, this still allows a final frequency resolution of 0.16mHz (no, that is **not** Megahertz, it's **millihertz** !!!)

More afterthoughts ...

I'm not sure GPS LOCKING is necessarily the best route for high frequencies - with the long time constants needed, when used in /P or situations when the temp changes the freq can wander around quite a lot whilst still being "locked". I'd rather maintain a very good 10MHz source in a separate box with its own batteries that can be carried around and calibrated when necessary.

Locking is good idea, though, for beacons and home stations where a reference can be maintained always switched on - but still with battery backup for coping with power cuts. I much prefer using GPS to gate a frequency counter that then measures the reference oscillator freq over a long period - 1000 or 10000 seconds (17 minutes or 2.8 hours) for calibration only. Displaying 5 or 10MHz on a scope triggered at 1 pulse per second is feasible for getting very accurate calibration, provided you do it in a darkened room.

For the best of both worlds, make a locked source for home use only (the MSF one is probably good enough), then check the portable unit against this using a scope which will only take a few minutes to set both traces to appear stationary against each other.

Andy

MITSUBISHI 23CM 'brick' PA replacement now available....

The following two pages represent some interesting discussion that recently took place on the WA1MBA microwave reflector in the Internet. The emails refer to the new 23cm "brick" module, the **RA18H1213G** and are a good example of the usefulness of email reflectors such as this one. If you have not yet subscribed to Tom Williams' (WA1MBA)reflector why not do so? Just send an email with the word "subscribe" in the header and body of the email to:

microwave@wa1mba.org

Or take a look at **<http://lists.valinet.com/mailman/listinfo/microwave>**

It's all free of course! We in the UK also have our very own reflector in the shape of ukmicrowaves@yahoo.com ...

From: microwave-admin@wa1mba.org on behalf of Sam Jewell [jewell@btinternet.com]
Sent: 20 January 2004 22:14 To: microwave@wa1mba.org Subject: [Mw] Mitsubishi 23cm PA module

I mentioned in an e-mail last week that I had ordered one of these new Mitsubishi 23cm PA modules from the UK distributor, now that they are in stock. I have received my module and built it into a suitable heatsink case and have some preliminary results.

I am currently achieving 25W saturated output from 13.5V supply and V_{gg} set at 4.6v. This is about 0.1V above the apparent recommended V_{gg} value. I will experiment with the bias level when I can get the amplifier onto IMD testing. 4.6V bias gives 1.7A quiescent current. At 25W output the supply current is about 8A. The required drive is about 500mW for this output power. A few observations are in order. The power leads are not thick enough (or maybe too long - they need to reach my only available PSU!) and so I get about 0.7V drop at the amplifier at 8A. When I shorten these I expect to get about 1dB more output. At this level the efficiency is about 25 percent.

When switched to transmit but no RF drive the quiescent current slowly increases to about 1.8A and then stabilises.

After several seconds of hard RF drive and then removing the drive the result is the quiescent current slowly falling back to about 1.7A over several minutes. The heatsink is more than adequate to dissipate several hundred watts for a reasonable temp rise above ambient.

I am surprised at how much drive the amplifier needs. I haven't analysed this yet, but initial reaction is that it is more than expected even allowing for the saturated output condition. I will have to re-think the transmitter drive chain levels!

I have posted a few pictures on my web page at www.btinternet.com/~jewell. Follow the links from Technical information.

One well-known amateur radio equipment producer has posted information on his commercial single and dual module amplifiers using the Mitsubishi module. The claims appear to be that two bricks will give 90W saturated output. Maybe there is an even more powerful version of the module available now?

I am pleased with the initial results. I haven't blown up the brick yet despite a pessimistic comment regarding the new LDMOS amplifier modules!!

45W? Ummmmm! 73 de Sam, G4DDK

From: microwave-admin@wa1mba.org on behalf of Sam Jewell [jewell@btinternet.com]
Sent: 21 January 2004 23:07 To: microwave@wa1mba.org Subject: [Mw] Re: Mitsubishi 23cm PA module

I have had a number of responses to my comments about the new Mitsubishi module. I'm responding to the group instead of to individuals. I think the information may be of general interest.

Now that I have further examined the 'full' data sheet mentioned by Jeffrey Pawlan a few days ago I think it is now likely that I have been very cautious with the module (nothing wrong there!) and that the quiescent current can be increased beyond the 1.7 amps I'm now using. The data sheet suggests it should be possible to get 40W sat. out at V_{gg} of 5v, corresponding to something like 4A quiescent! Increasing the VCC to 15V may be how to achieve 45W but I can't help thinking that could be expensive.

The data sheet shows 200mW drive should be sufficient to achieve 30W output and that 300mW is the maximum so I will definitely need to back off from the 500mW tried.

My tests were all done at 1296MHz but a brief check showed a little more gain available mid band and useable gain to 1325MHz (the top of the band in the UK).

Does anyone have any new information on the LDMOS bias 'memory effect' mentioned in one or two professional LDMOS HPA papers? A colleague, who was working on these devices for cellular amplifiers until a year or so ago, thought that the concerns were overstated.

I will continue my tests later this week. I am extremely hopeful that these modules will help to 'drive' interest in the band. LDMOS does look like the way forward for those of us who don't want to use valve amplifiers for various reasons and yet want to run more than the usual 10W bricks.

BTW, it does seem that these modules may be somewhat cheaper to buy in the southern hemisphere leading to thoughts of cost-effective multi-module amplifiers without it costing an arm and a leg!

Thanks to all who responded, both on the reflector and off.

Anyone else out there built a module (or two) and have some results to share?

73 de Sam, G4DDK

From: microwave-admin@wa1mba.org on behalf of Grant Hodgson [grant@ghengineering.co.uk]
Sent: 23 January 2004 07:26 Subject: Re: [Mw] Mitsubishi 23cm PA module

Sam et al

The data sheet says that the absolute maximum O/P power is 30W; I wouldn't recommend trying to get more than 25W out - they are designed to be 18W devices..... Also, the devices are well into saturation at this point; fine for CW (or FM ATV if you have a big heatsink) but not very desirable for SSB.

I've built an amp with this module but haven't had time to test it yet, but the quiescent current was 3.5A @13.8V. I don't recommend going above 13.8V. I'll do the RF testing when I get time - too busy with other things at the moment.

LDMOS devices definitely have a 'memory' effect, although often it manifests as a 'drift'. Some manufacturers of mobile phone (cellular) base stations go to extraordinary lengths to ensure that the long term (several years) bias conditions are maintained; this is essential to maintain linearity for the new generation systems such as EDGE and W-CDMA (aka '3G').

However, I am not sure if the Mitsubishi modules are LDMOS - they are certainly enhancement-mode MOSFETs, but I'm not convinced that they are laterally diffused (LD). If they are, then this would explain the poor efficiency - most, if not all, LDMOS FETs that work above 1GHz will only work properly at ~26 - 28V DC, and I believe that there is some development in 48V LDMOS devices. Running them from 12V gives poor performance - which would explain the high quiescent current of the RA18 if it is indeed LDMOS.

As for combining them - it should work OK as long as the splitters/combiners have good isolation between ports; Wilkinson, Gysel, 90 degree hybrids and 'Rat-races' can all exhibit good enough isolation if designed and built properly. I'm working on a design for a combiner/splitter that can be configured as a Wilkinson for the input and a Gysel for the output; initial results look promising but there's a bit more tweaking to do - I'll post some details when it's ready.

73 front Grant HodgsonG8UBN

From: microwave-admin@wa1mba.org on behalf of Sam Jewell [jewell@btinternet.com]
Sent: 24 January 2004 20:54 To: microwave@wa1mba.org
Subject: [Mw] Mitsubishi 23cm power module RA18H1213G

Folks,

I have completed some further tests on my Mitsubishi 23cm power module. The results are published on my web page www.btinternet.com/~jewell Follow the links through Technical Information and then RA18H1213G.

I'm not sure if I'm disappointed or not. It certainly does what the data sheet SAYS it does, but not what the sheet SHOWS it does! Incidentally, someone pointed out to me that the data sheet says RF MOSFET module and doesn't specifically mention LDMOS. This might be significant.

I'm puzzled as to how one amplifier manufacturer is able to get the higher power output indicated on the data sheet as I can't get anywhere near it. Ho Hum.....
At least the module is proving resilient.

73 de Sam, G4DDK

Austrian Authorities Pull the Plug on PLT Tests

The 'ARRL Letter' has quoted a report from the Austrian national amateur radio society, OVSV, saying that a PLT, or Power Line Telecommunications, test in the city of Linz has been cut short due to excessive radio interference. OVSV said that the Austrian Ministry for Commerce, Innovation and Technology closed down Linz Power Company's PLT pilot project because it was generating interference on the HF bands. The short-wave broadcaster Radio Austria says the case that brought the issue to a head was a Red Cross report that emergency services' radio traffic during a disaster response drill last May was the victim of massive PLT interference. The Radio Austria report said the Commerce Ministry order not only means the end of the Linz PLT pilot project, but the end of the deployment of this technology in Austria. According to the report, measurements indicated that radiation from the PLT system exceeded permissible field strength levels by a factor of 10,000.

OVSV says radio amateurs in Austria have opposed deployment of all PLT experiments as neither legal nor compatible with "vital, world-wide short-wave radio communications." In the autumn, representatives of OVSV and Linz amateurs got together with power company representatives in an effort to resolve PLT's incompatibility with HF radio operation. The company agreed to look into the possibility of a 100-metre protective zone around each amateur's location, notch filters for amateur frequencies, network system filters and the use of 5GHz wireless local area networks.

(This extract is from the RSGB News Broadcast for 18 January 2004)

PRODUCT NEWS

LCD DIAL REPLACEMENT KITS

Many of us still use equipment with analogue frequency readout ... the ubiquitous IC202 144MHz transceiver immediately comes to mind. Now you have a chance to come in to the 21st century and upgrade to a digital LCD readout at very reasonable cost!

Cumbria Designs at Penrith, on the edge of the English Lake District, have recently introduced two nice kitsets, the FD-01 multi purpose display module and the MiniCounter. These two kits could be the answer to those inaccurate dials on gear such as the old Kenwood and Yaesu VHF transceivers. The LCD panel is a little too large to fit the IC202 but could be used as an external module with it.

The FD-01 display module (price approx. £50) is constructed on a 95mm x 75mm PCB with ground configurable 2.54mm mounting holes. It has a remote LCD mounting using 16 way ribbon cable. Usable as a dial replacement or a standalone frequency counter, it specifies 100MHz operation with a resolution to 10Hz. The LCD readout includes a bar graph S meter with S points and plain bar formats, together with transmission mode indicators. There are two User Programmable IF offsets, 10Hz to 999.999,99MHz. Also included is a TX/RX indicator, a Delta Offset measurement mode for accurate QSY or drift measurement and a multiplier function with two user programmable factors, ideal for VHF multiplier chains or prescalers. The display is easily set up for radio or general test equipment use. It is backlit as standard.

The module has high impedance at HF and a sensitivity of around 15mV RMS at 5MHz and 110mV RMS at 100MHz. Power requirements for the FD-01 are +12V nominal (+8 to +30V) at 50mA at 12V (110mA with backlight).

Further details of this interesting kit and the mini counter can be obtained from:

**Cumbria Designs, The Steading,
Stainton, PENRITH, Cumbria, CA11 0ES**

or email: sales@cumbriadesigns.co.uk.

They also have a website at :

www.cumbriadesigns.co.uk

IT'S YOUR SAY READERS' COMMENTS

From: g3dvv
[john.brown@g3dvv.demon.co.uk]
Sent: 03 February 2004
Subject: K2RIW's January article

At last someone has corrected the canard that BNC stands for British Navy Connection. I think that the myth started in the Microwave Handbook. However, I believe that the man's name was Concelman and not Councilman, which gives (B)ayonet (N)eill (C)oncelman. The full story is given in the September 1986 issue of Ham Radio (much missed). The original source for this info is "A Designer's Guide to RF Connector Selection" rfdesign Sept/Oct 1980. 73 from John, G3DVV

From: Graham Shirville, G3VZV
[g.shirville@btinternet.com]
Sent: 12 January 2004
Subject: Microwave Newsletter January 04

I was interested in G3XDY's comment about DATV units. I think that the groups involved are hoping/expecting/intending narrower signals not wider ones. I understand the risk of "spectral regrowth" and the UK groups involved already contain professional experts in the field. There's no harm in re-enforcing the point though! See this week's GB2RS feature or look at the RMC front page.

The Dunstable Downs Radio Club is experimenting with 4Mps DATV QPSK on 2440MHz with now five people able to receive the 1 watt signal from a 10 watt Class A linear amplifier. Hopefully any QRM should only be to the odd WLAN, domestic video sender or microwave oven! Still as Jack G5UM used to say "use it or lose it!" 73 from Graham, G3VZV

From: GW3HWR@aol.com
Sent: 18 January 2004
Subject: Multiband Dish Feed

The article in the Jan. 2004 issue of "Microwave Newsletter" by K5VH reminded me of an idea I had some years ago and has been swilling around in my head, trying to get out, ever since.

A dipole and reflector is not ideal for feeding a dish because the polar diagram in elevation is different from that in azimuth (I will assume horizontal polarisation, for which it is wider). If

one stacks two such dipole/reflector pairs the polar diagram in azimuth is practically unaffected but the diagram in elevation is narrowed and can be adjusted by changing the separation of them. A development of this is to use a "cubical quad" as the feed.

All this is old stuff but what I have not seen pointed out is that the phase centre is near the middle of the array and is FREE OF METAL. Therefore, just as one can nest yagi stacks or cubical quads for the DX bands, you can nest feed arrays for each microwave band of interest. All you have to do is the make the phase centres of the dipole pairs all coincide with the focus of the dish.

There is no way that I can put up a significant dish at this location so all I can do is to pass the idea on to you. 73 from Heath, GW3HWR

From: G3PFR, [Mikeg3pfr@aol.com]
Sent: 13 January 2004
Subject: WLL on 5.7GHz

A little more research has revealed the following statements, carefully hidden away in the FAQ's of the Ofcom site. At least it is not a protected service - yet

14. What is the quality of spectrum in this band?

This frequency band is offered on a 'best endeavours' non-interference, no protection basis only. Ofcom will offer no protection against interference from other services, except in the case of illegal use of the band. However action will be taken to protect primary users from interference by fixed wireless access applications.

15. What is the width of the channels?

There are no mandatory channel widths in this band. There are channel plans provided in the informative annex of IR2007 for 5, 10 and 20MHz channel widths. These channel plans will be used by Ofcom for planning purposes when carrying out sharing studies for this band.

16. What is the maximum eirp allowed?

The maximum Power Spectral Density for the band is 100mw/MHz E.I.R.P. with a maximum eirp allowed of 2 Watts based on a 20MHz channel bandwidth.

73 from Mike Dixon, G3PFR (Microwave Spectrum Manager.. RSGS Spectrum Forum)

IARU REGION 1 VHF/UHF/MICROWAVES COMMITTEE 2004 INTERIM MEETING

Source: Chairman (PA0EZ) Subject : IARU and CEPT/ITU Microwave allocations

1: 24GHz

In some VHF Newsletters I have indicated what is happening in CEPT above 24GHz. The main issue from our point of view is the pressure from the European car manufacturers to obtain spectrum for their S(hort) R(ange) R(adar). This is a system with a narrow band Doppler radar, together with a wideband (4-5GHz) impulse radar. Per car, there are many transceivers mounted to give the car "eyes" all around.

Although, already for quite a while, a special 1GHz wide band (76-77GHz) has been made available within ITU and CEPT for vehicle radar, and this band already is used by many manufacturers, it appears the manufacturers want, besides this band for relatively longer distances radars, a wide band for the shorter distances.

It appears that CEPT will now allow, for a limited time (expected till 2014), SRR systems to be placed onto the market using the band 21.5 - 26.5GHz for wideband radar and 24.05-24.25GHz for the associated Doppler radar This [even after] a lot of resistance has come from radio astronomers, meteorologists, fixed-service operators and radio amateurs (IARU).

Even if this application finally will be allowed, it is only [for] a limited time but it will take a long time before the cars with equipment from <2014 will have totally disappeared. In the mean time, our weak signal DX will be interfered with by this "noise"

2: 79GHz

CEPT foresees that, finally, those SRR systems will have to use a band near 77GHz and it now is becoming clear that 77-81GHz will be used. IARU has, in CEPT FM/SRDMG and SE24, made clear that, although there is in the current ITU/CEPT allocation table the 76-81GHz segment made available for RADIOLOCATION, there is a "hole " in this segment, 77.5 - 78GHz, where a PRIMARY allocation exists for the amateur (satellite) service. IARU has shown that the 79GHz SRR will create interference to amateur stations using this band.

But the political pressure in Europe to make the 77-81GHz band fully available for the SRR is so heavy that the only solution would be to make another segment available for the amateurs. Well in fact we still have the "old" 75.5 - 76GHz segment as a primary (shared) allocation but this segment will disappear from the table after 2006.

IARU Region 1 has suggested that a possible solution could be that CEPT (in the European common allocations table) will eliminate this limitation to 2006, thus in fact giving amateurs an "SRR free" primary segment. There is a good support for this proposal as you can read from the extract of the meeting report from CEPT/FM, but we still have to "wait and see" if this will be implemented.

Then a necessary follow-up should be that this same change would be placed on the agenda of WRC2010. Here I foresee a problem as the FCC recently has downgraded the 75.5 - 76 GHz amateur allocation nationally to SECONDARY.

3. Considerations

From the report above you can learn that there are, and will be, attacks on our microwave allocations from other users. IARU R1 currently spends time and money to defend our interests but what are in fact our interests? I have a feeling that the microwave amateurs using those bands are not at all too interested in what is happening.

A clear sign is the difficulty to get them to move to the exclusive/primary parts of the allocations. On 24GHz this has taken a decade.

What will happen on 76GHz ? I got a message from some German amateurs that they want to continue their activities in the 76-77GHz vehicle radar segment. Of course they are free to do so but why then should IARU spend effort/money to arrive at a protected (from radar) amateur allocation?

Do the IARU member societies have any interest in safeguarding the future for technical amateurism or is their main goal spectrum for push-to-talk activities ?



ACTIVITY NEWS FROM THE WORLD ABOVE 1000MHz

Another month goes by and your scribe can't help but feel that most UK microwave operators have flown south for the duration! Very little news has been received so we hope it's not a sign of things to come for the coming "microwave season". Here's the first report

**From: Neil Whiting, G4BRK,
[neil@ignika.com]**

Sent: 18 January 2004

A bit of tropo on 4/5 December, in an unusual direction (south of East) for here (IO91DP), gave QSOs with DL6NAA (JO50) on 13cm (4 Dec) and OE5XBL (JN68) plus OE5VRL/P on 23cm on the 5th Dec. A try with Rudi, OE5VRL, on 13cm wasn't expected to produce anything but signals were heard and the QSO was made there too - 1194km for my best ever on the band. Nothing was heard on 3cm unfortunately.

So it wasn't a bad 2003 year, with several patchy tropo openings, plus one good one giving many Scandinavian beacons but no QSOs and the December one with some good distances. Fingers crossed for 2004!
73, Neil G4BRK

Peter, G3PHO, IO93GJ, has been busy over the winter period making the odd improvements to the microwave gear and doing the "big 24GHz QSY". The improvements were in the form of a foolproof reverse voltage protection arrangement on the 3.4GHz transverter. During last November's low band contest he accidentally reversed the supply connections to this gear and instead of the fuse blowing it was the "idiot diode" that suffered instead! The

shock of almost losing the transverter through sheer carelessness meant a more reliable system had to be fitted. Now a relay and series diode across the supply makes reversal harmless! The only drawback with this of course is the fact the relay draws extra current during operation as it is always on when the supply is connected properly. The relay, by the way, is one of Maplin's 12 volt automotive type with a very conservative current rating to handle the demands of the 3.4GHz transverter.

The first of this year's "epics" for Peter was the HP8558B spectrum analyser going on the blink. This was caused by the springy, metal wiper contacts of the front panel bandwidth switch detaching themselves from the rotary wafer! The complete dismantling of the front panel in order to get at the switch was quite a task, even though the workshop manual was available. On getting access to the switch assembly, it was obvious that the other switches were also shortly going to disgrace themselves so the opportunity was used to fix the whole lot. Rapid setting Araldite was used to stick the wipers back into place and everything seems to work now. Unfortunately one wiper was missing completely and Peter has to be content with slightly reduced facilities until a replacement wiper can be found. Does anyone know of a source of supply?

The 24GHz transverter was moved from 24.192GHz to 24.048GHz with surprising ease. The post mixer filter, a surplus Teletra 23GHz 3-cavity type, tuned nicely, without the help of the spectrum analyser and the 2 watt PA seems to work just as well as it did on the higher frequency. A minor difficulty here was reducing the drive to the PA down to 10 microwatts (!) as double that could damage the PA. The Marconi power meter head is not known for accuracy or stability at these levels!

Winter Millimetre Band activity

**From: Chris Towns, G8BKE
[ctowns@tesco.net]**

Despite rather cold but very fine weather John, G8ACE and myself when out /P on Dec 17th 2003 with 47GHz narrowband and managed to get a signal over a new path from Cheesefoot Hill to Bell Hill, a distance of 76km. The signal

was 1-2dB above noise with 10mW to a 20dB horn on transmit and a 18" dish and DB6NT transverter on receive. A try over the slightly greater distance from Bell Hill to Lane End failed perhaps due to a slight mid-path obstruction.

First contact of the year on 24.048GHz for Peter, G3PYB (Portsmouth).....

I decided to use the first non-competitive outing on Sunday 25th to prove the 24GHz rig had been successfully modified to the 24.048GHz segment. I was quite pleased that my near microwave stations were positive about making the frequency change. Good, solid contacts were made with Chris, G8BKE, on Oknalls and John, G8ACE, at Lane End on 24GHz. The Bell Hill beacon, GB3SCK, (IO80UU) proved easy copy from a location near Salt Hill, not far from the home of Cricket at the "Bat and Ball pub"!

G8BKE had his 47GHz beacon with him and a test over the highly obstructed path from Oknalls in the New Forest provided a good signal on my 45cm offset. I look forward to the 47GHz beacon becoming active from Bell Hill as the accurate frequency marker is invaluable in calibrating equipment.

Thanks must go to all the microwavers who not only contribute to the UK beacons but also to those who are involved with the actual building of new beacons. 73, Peter, G3PYB

WAVEGUIDE SWITCH BONAZA HITS UK!

UK 24/47GHz operators were given a nice Christmas present when it became known that a large quantity of brand new electrically operated, WG22, three port waveguide switches had been found. Although the source is 12,000 miles away in New Zealand it did not deter Peter, G3PHO from emailing the supplier, the Wellington VHF Group, NZ, to arrange for around 30 of these little beauties to be shipped over the UK. The relays work well at both 24GHz and 47GHz and operate with a short pulse of around 8 to 9 volts DC. The insertion loss is less than .25dB and the isolation is 50dB or better. If anyone is interested in how to obtain one or more of these items please email Peter at microwaves@blueyonder.co.uk and he'll send you an Acrobat PDF file with details of price, connections and who to email in NZ.

Apparently there is a large supply of these switches and other mm wave items!

ARE YOU ACTIVE ON 24GHz YET?

IF NOT, WHY NOT?

**HAVE YOU QSY'd YOUR
TRANSVERTER DOWN TO
24.048GHz yet?**

IF NOT, WHY NOT?

**COME ON ...
TIME WAITS FOR NO MAN!**

2003 LEAGUE TABLE AND ALL TIME SQUARES/DX TABLES

The final positions for the 2003 Multiband Operating Table have been set and the complete listing, along with the latest All Time Squares/DX Table can be downloaded as Excel files from www.g3pho.org.uk. Unfortunately we don't quite have room to publish them in this issue.

A040 OUT OF ACTION

By now most of you will know that the A040 satellite is apparently not functioning and it's not known, at the time this issue is being put together, whether it will ever work again. This is most unfortunate, especially for those like your humble editor who was looking forward to testing his very recently modified 24GHz transceiver (QSYd to 24048MHz) on that "bird"! It was hoped the 24GHz beacon might be used to check various dishes that have been slowly collected for millimetre band use... oh um, can't be helped I suppose!

THAT'S IT FOR THIS MONTH ...let's have a lot more input for next month's edition!

73 to all our readers, from Peter G3PHO

G3JMB –SILENT KEY

Just as this issue of the newsletter was in its final stages, I received the very sad news that our dear microwave friend **Jack Brooker, MBE, G3JMB**, had passed away on Thursday the 12th of February this year. He was in his early eighties.

Jack, as many readers will already know, had spent the past few years fighting ill health but, with characteristic fighting spirit, he continued to get as much enjoyment as he could from his amateur radio hobby and, in particular, his microwave activities.

I have many fond memories of Jack, from the many 10GHz contacts we had, portable-to-portable station, to attempts at giving him new locator squares such as IO94, and working him when he was in tandem with his son-in-law Allan, G8LSD. Sometimes he was accompanied by his wife, Margaret, who braved the elements to turn his antennas for him and keep him company on the hilltop. How we all envied him that kind of support! He was a popular figure at the various microwave round table meetings and I have very pleasant memories of him celebrating his birthday at the Martlesham meeting a few years ago ... very little could keep him away from meeting his microwave pals!

Jack was a keen home constructor and during the days long before he joined the 10GHz "narrowband revolution" of the early 1990s, he was busy with wideband FM, working long super-refraction paths along the South Coast and across the English Channel.

As President of the Mid Sussex Amateur Radio Society and a founder member of the Crawley Amateur Radio club, Jack was held in very high regard in the South East of the country. Everyone who met him could not help feeling that they were in the company of a gentlemen, in the very best sense of that word. He was always as helpful as he could be to those wanting to learn about our hobby and he made it as much a family affair as possible with his daughter Mary marrying Allan, G8LSD and his other daughter holding an amateur callsign.

Jack's interest in amateur microwaves was underpinned by his Royal Air Force career as a Radar Instructor. After leaving the RAF, he entered a long career with the Post Office. It was not all microwaves with Jack though ... he operated on HF and VHF as well as his beloved 10GHz.

At the time of writing this we have no information about funeral details, etc, but by the time you read this many of you will have already made your tribute to Jack in your own way.

Amateur Radio and UK microwaves in particular, has lost a most respected and valued member of its ranks. To Margaret, his wife and to his family, we extend our deepest sympathy.

Peter, G3PHO

(My thanks go to Derek, G3GRO, for some of the background information used above)

