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 – JANUARY

A Very Happy New Year to all our readers!

2001 should have gone out like a lion while this year came in like a lamb. Good tropo conditions on the microwave bands in mid December saw little activity and we wonder where everyone has got to. We know of several folk, including this editor(!), who have been grazing the greener DX pastures of the 50MHz band but it still leaves a potential list of over 100 who could have been active over the past two months. Rumours of some 76GHz activity in the north have not yet produced reports from the participants. If you are doing anything at all on our bands then please write in to the newsletter!

We make no apologies for devoting a whole page of this issue to the 2002 Microwave Update to be held in New England, USA, later this year. Update is the "Mecca" for any self respecting microwaver! This year presents an excellent opportunity to experience one as it's about as near to the UK as you'll ever get! Airfares to Boston tend to be the cheapest around and the end of October in New England is the "Fall" season when the region is at its most beautiful. Put the dates in your diary. Make a short holiday of it. If there are enough takers we might be able to organise "bulk transport"!

Many thanks to all who have contributed articles and reports to this issue.

Here is your resolution for the New Year ...

Get a new microwaver on the air!

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 0114 2816701

G3PHO: Email: g3pho@geocities.com or p.day@virgin.net

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

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

ERRATA ...

Last month's issue unfortunately contain a number of formatting and printing errors:

Page 3 was a complete disaster! You can read the correct version on the following page.

Page 4 saw G4UVZ'z email address omitted from his advertisement. It should read:
adrian.whatmore@tst.nhs.uk

Page 7 should credit David Wrigley, G6GXK as the author of the Noise Figure Measurement article ...sorry David!

The poor quality of the photos in the last issue was outside the editor's control.

FOR SALE

From: Bob Short, G3GNR ... email to:
[engineman@ntlworld.com]

Pending a Sale and move it looks like I am going to have to get rid of a lot of stuff ...

Complete 3cm station. Mast mounted 10watts in watertight box, as used to work SM from IO70! Includes psu, etc, **£250.**

Portable 10GHz rig 700mW 2dB NF rx requires 2 x 12v supply c/w DB6NT low noise preamp, £100, (the preamp cost that!).

Various 3cm Waveguidery etc . Also **HF Versatower** c/w **hf beams for 20 -10mtrs.** £250. (you dismantle and carry away).

All plus carriage but better to collect.

(Bob assures me he is NOT giving up microwaves!.....editor)

FOR SALE

2 Stage DJ9BV preamp kit for 3.4GHz: all parts including box, DC3XY professional Teflon PCB, and SMA connectors. See Dubus 1/95 for details.
Price: £40 including postage.
G3XDY, John Quarmby, QTHR, email g3xdy@btinternet.com, or phone 01473 717830.

TWT INFORMATION WANTED

Josef OK1UWA, <ok1uwa@ges.cz> has an EEV TWT amplifier type N4264 but it doesn´t work. He has the user manual but needs a circuit diagram.

Please email him if you have any useful information.

MICROWAVE OPERATING LADDERS AND LEAGUE TABLE

Due to pressure on space this month we have had to hold over the publication of the operating ladders until next month's issue. The Microwave League Table will show the final positions for the year 2001. In addition we will publish the latest All Time Squares/DX Ladders for all bands. If you want to be included in either list then please send your scores in as soon as possible. In the meantime you can get the latest, updated tables on the **"World Above 1000MHz" website**, whose URL is: **www.g3pho.free-online.co.uk/microwaves/**

The 2002 League Table is now open for entries! The rules are as before and can also be found on the website listed above.

GREMLINS STRIKE AGAIN!

The Editor's face is still glowing red after last month's unfortunate errors which crept into the antenna test results (pages 2 and 3). Page three was somehow processsed with much important data missing from the columns so we present it to you once again, in correct format this time! Please refer to last month's issue for the rest of the table.

G4DDK	RSGB '20dBi' horn from the Microwave manual	20.0	Calculates at 19.9dB at 10368MHz
G4ZXO	42cm dish with dipole and reflector feed	30.0	
G7JTT	Channelmaster minidish with tubular horn feed	30.3	One of the popular digital Sky dishes. About 42cm wide
G8GTZ	Grundig Sky minidish with G3PHO/W2IMU feed	30.3 !	Also one of the popular digital Sky dishes. About 42cm wide
G7JTT	16 slot (8 each side) waveguide	12.3	Typical beacon antenna
G3XGK	Horn	19.0	Commercial
G3XGK	25 inch prime focus with penny feed	32.0	Home brew fibreglass design
2.4GHz			
Callsign	**Antenna measured**	**Gain (dBicircular)**	**Comments**
G3LYP	16 turn helix (G3RUH design)	15.0	All 2.4GHz antennas measured were corrected for a known 2dB error on the range. Because of other problems with reflections on the 2.4GHz range that we weren't able to solve completely, gain measurements should be regarded as for information only. The likely error may still
G3LYP	60cm Amstrad dish with G3RUH short helix feed	23.0	
G3IRQ	90cm Amstrad dish with G3RUH short helix feed	23.5	
G8TTU	Sandpiper 20 turn helix	15.0	
G6GXK	WA5VJB PCB log periodic 2 to 6GHz (linear polarisation)	5.0dBi	
G4GFI	G3RUH dish and feed	21.0	

Joint Conference Announcement

Microwave Update 2002 (Sponsored by N.E.W.S.)

and the

28th Eastern VHF/UHF Conference of the Eastern VHF/UHF Society

October 24 – 27, 2002

Radisson Hotel, Enfield, Connecticut, U.S.A

Date	Microwave Update	Eastern VHF/UHF Conference
Thursday 24 October	Afternoon: **Tour of ARRL Headquarters**	**No sessions Thursday or Friday**
Thursday Evening	**Hospitality Session** — hosted by DEMI	
Friday 25 October	**Technical Sessions**	
Friday Evening	**Swap session** for registered attendees (of either conference) plus invited surplus dealers	**Registration** **Hospitality Session** hosted by N.E.W.S.
Saturday 26 October	**Microwave Technical Sessions**	**VHF/UHF Technical Sessions**, **Band Sessions** **& Noise Figure Lab**
Saturday Evening	**EVENING BANQUET** Awards & Prize Drawing (First 10 prizes to Banquet ticket holders)	**Banquet** - held together with Microwave Update attendees
Sunday 27 October	**8 am (no early birds): FLEA MARKET** in parking lot open to all **ANTENNA MEASURING**	As for Microwave Update (see left)

SPOUSE'S PROGRAM: Friday and Saturday, including New England foliage tour, Old Sturbridge Village, Quadrangle Museums, and, of course, shopping.

LOCATION: Enfield, Connecticut is on Interstate Highway 91 at the border of Connecticut and Massachusetts, 5 minutes south of Springfield, MA, and 20 minutes north of Hartford, CT. The closest airport is Hartford, with a shuttle van to the hotel. Other convenient airports are Boston (about 1.5 hours), Worcester, MA, Providence, RI and Manchester, NH. International flights generally go to Boston or Hartford, but the New York airports are within reasonable distance if you find a bargain fare.

SURPLUS TOUR: The surplus dealers in New England are scattered, so an inordinate amount of driving would be required. Instead of the traditional surplus tour, we are inviting the best surplus dealers in the Northeast to setup at both the Friday evening swap session and the Sunday morning flea market. In addition, the dealers who have setup at previous Microwave Updates have promised to bring even more delectable goodies. If there is sufficient interest, it may be possible to arrange a tour of a very large dish on Thursday morning.

Latest updates, registration forms and hotel info at http://www.microwaveupdate.org

Measurements and Enhancements to the G3WDG 13cm Transverter ... by Bryan Harber, G8DKK

Background

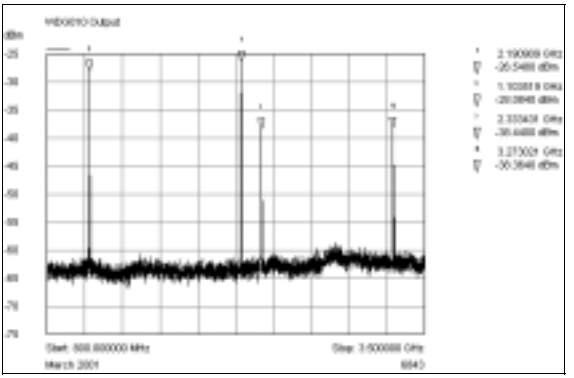
I have a WDG010, 13cm transverter that has a beta version board. The measured performance of the receiver is excellent: 1.2dB NF (Adastral Park Round Table 1999). On transmit, the beta version board delivers 1mW maximum from the single MAR6 MMIC that follows the mixer + filter combination. Later versions of the board have a second MAR6 to increase the output level to around 3-5mW.

I have the companion WDG035 PA, also the earlier IC based version (now obsolete), that is specified to deliver 1W output from 5mW of drive. The output power of the transmit converter/ amplifier combination measured with my professional microwave power meter is 500mW. This indicates the amplifier gain of 27dB is about 4dB greater than predicted.

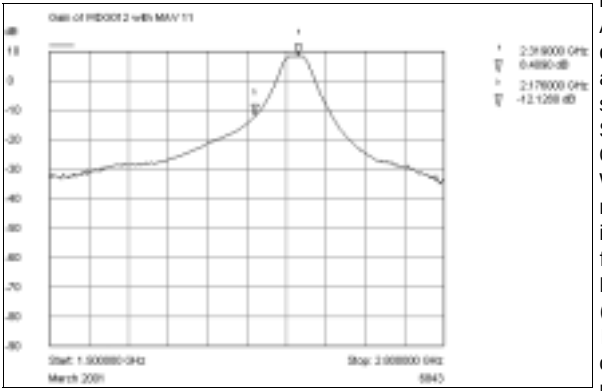
During the process of measuring the 1W output, a disturbing feature was observed: with no 144MHz drive applied the power meter was showing an output power of –7dBm, 34dB below the wanted output power. The 144MHz source had been disconnected and the transverter manually set into the transmit mode to confirm the problem.

Further Measurements

The transverter was taken into my place of work and the transmit output observed on a microwave spectrum analyser. The source of the unwanted output was the 2176MHz LO component that was indeed at –7dBm at the PA output. Removing the PA and measuring directly at the transmit output of the transverter module showed the 2176MHz signal was now at –34dBm as expected. A further unwanted component was also observed at 1088MHz but this is more than 50dB below the wanted output and some 20dB below the level of the 2176MHz signal. The output spectrum is shown right in **Figure 1**.



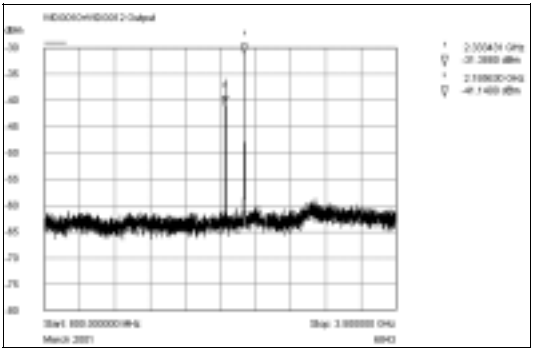
These results were entirely compatible with the design that uses just a single filter, consisting of 2 coupled lines, following the mixer.



Enhancement Solution

A few dB of extra gain is required to drive the PA to full power and an additional 20dB of filtering of the LO signal would reduce the LO leak signal. Still in the Microwave Components Committee development list is the WDG012 filter/amplifier module. This module is configured with a filter identical to that in the transverter followed by a MMIC amplifier, an MAV11, contained in the smallest (37mm x 37mm) tin-plate box.
I obtained one of these modules and completed it in 2 hours. The measured response is shown left in **Figure 2.**

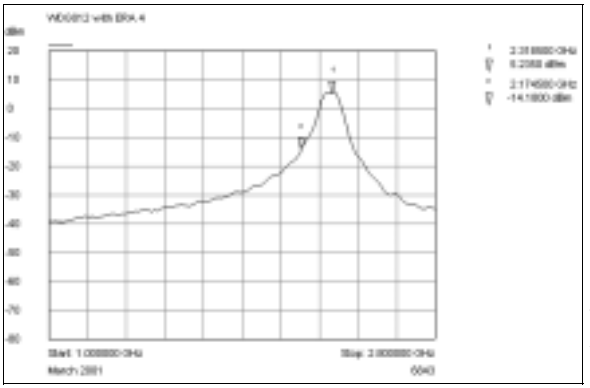
A gain of 3.15dB was obtained with an input power of approximately 1mW that represents an output power of +3.5dBm or 2.25mW. As can be seen in the plot the marker at 2176MHz shows that the filter provides a rejection of some 20dB compared with the level at 2320MHz. The filter also gives around 50dB rejection at the LO sub-harmonic frequency of 1088MHz.



Connecting the WDG012 module to the transmit output of the transverter provides a much improved spectrum, in fact I was now unable to measure the 1088MHz signal and the 2176MHz signal has dropped to a very satisfactory 35dB below the wanted signal level. In the spectrum shown right, **Figure 3** , the spectral line at 2.320GHz (marker value 2.333431GHz) is shown with the applied drive level 30dB lower than that normally applied by the 144MHz transceiver.

Further Enhancement

All looked good but I was surprised that the MAV11 provided only just more than 3dB of gain until I studied the manufacturer's data for this device. It is rated to only 1GHz and although I may not have an ideal grounding of the device it explains why the gain is lower than expected, although adequate in this application. The output power and output –1dB gain compression point are also satisfactory at 2.25mW and +12dBm respectively.



I had recently come by some of the newer ERA series of MMIC amplifiers and decided to try the ERA4. This device is rated up to 4GHz with a –1dB compression point of +15dBm. I exchanged the MAV11 for an ERA4 and re-measured the amplifier with the following results:

Gain is now 9dB at 0dBm (1mW) of drive giving an output power of 8mW and the –1dB output gain compression point measured as +15dBm (30mW) with an input power of +7dBm (5mW). All of the filter characteristics remain unchanged and no sign of spurious oscillation was observed on the spectrum analyser. The measured response of the WDG012 with ERA4 is shown above in **Figure 4**.

Final Results

The completed modules are now assembled in a waterproof ABS box that is mounted just below my 13cm yagi antenna. The completed transverter consists of: WDG010 transverter module, WDG012 amplifier/filter fitted with ERA4, WDG035 PA (early IC based version, now obsolete). The final output power of the combination of transmit converter + amplifiers measured with my microwave power meter is 1.1W.

Conclusion

The WDG012 module provides worthwhile additional filtering to the WDG010, 13cm transverter in that it reduces the output levels of unwanted products that will otherwise be amplified by the following broadband amplifier stage(s). Fitting the ERA4 in place of the MAV11 seems to give a worthwhile, although not essential, improvement in the performance of the WDG012 module.

MICROWAVE CONTEST RULES 2002

These rules listed below are final and binding for 2002 (they are essentially unchanged from 2001).

The following contests are scheduled for 2002:

- 10GHz Cumulatives (6 contest days with 4 to count for scoring purposes)
- Millimetre Bands Contest: 24GHz and up (4 separate events - not cumulative)
- All Bands Contests (3 separate events - not cumulative)

In addition there are 5 non-competitive activity days

NB: The 10GHz Trophy is organized by the VHF contest committee, see the VHF listing for further information.

GENERAL RULES (applicable to all events):

- All the contests run from 0900 to 2100GMT on a Sunday.
- The Contests are open to all comers (you do not have to be an RSGB member).
- Contestants are expected to enter in the true spirit of the event and to strictly adhere to any equipment or power restrictions that apply to the particular contest.
- Contacts are scored on the basis of 1 point per kilometre for full, two way microwave contacts and at half points for one-way (ie crossband) contacts.
- Contest exchanges on the microwave bands consist of RS(T) + serial number (starting at 001). In addition the six (or eight) figure QTH LOCATOR must be exchanged either via the microwave band or on the talkback frequency. Where the LOCATOR is not known, a full six figure National Grid Reference (UK only) must be provided. In multiband contests, the serial number will start at 001 for each band (i.e. a common sequence across the bands is NOT to be used).
- Operators may enter as home station or portable (either mixed or separately).
- Except where indicated, the VHFCC general rules also apply.
- Contestants are asked to make sure their entries have been scored correctly and that all relevant bonus points and multipliers have been claimed. The adjudicator will not do this for you!
- All entries must be prefaced with an appropriate summary/cover sheet (either an RSGB VHF-UHF type or a personal one) showing : Title of contest, name(s) of operator(s), location(s) of station, section entered, callsign used, band score(s), multipliers or bonus points, final claimed score. The sheet should also detail equipment used, particularly the power output, antenna and receiver for both the microwave band and the talkback. This is very important if the logs are entered in one of the restricted sections. Where the contest has a "rover" facility, it is essential that each location used is clearly stated.
- Where Locator squares and/or countries are used as multipliers for bonus points, a summary list of the squares and countries worked must be attached to the contest cover (summary) sheet. This list should include the callsign and date of the first contact for each square/country.
- Log entries may be submitted directly on paper, using standard RSGB VHF Contest sheets or self-prepared contest sheets, on a 3.5 inch diskette (IBM PC format), or via email. For electronic

entries, the format should be one of the following: ASCII text, Microsoft Excel, Microsoft Word, or the G4JNT contest software format. Email entries will be acknowledged to confirm receipt.

ALL LOGS SHOULD BE SENT TO THE CONTEST ADJUDICATOR, G4KNZ, within 16 DAYS OF THE END OF THE CONTEST. Late entries will be acknowledged but not used in the final ranking.

G4KNZ's address is: 17 Haywood , Bracknell, Berks., RG12 7WG, UK

Or e-mail: steve.davies@nokia.com

Appropriate Certificates will be awarded to overall contest winners and individual section leaders. Additional Certificates of Merit may be awarded at the discretion of the RSGB Microwave Committee. With these, as with the logs, the adjudicator's decision is final.

RULES FOR THE 10GHz CUMULATIVES:

1. The general rules shown above apply.

2. Six events, approximately monthly, are available from May to October inclusive.

3. Any four of the six events may be used for final scoring purposes. Logs for ALL events entered should be submitted.

4. Contestants may submit logs for any one of the following sections:

- Open
- Restricted
- Wideband

There is no separate section for portable stations. However, the Restricted and Wideband sections offer much scope for portable work.

The sections have individual restrictions as follows:

Open: No power or antenna restrictions (other than those laid down in the Amateur Licence) on either 10GHz or on the talkback band.

Restricted: 10GHz transmit output not to exceed 1.0 watts to the antenna. No power restrictions on the talkback band. No antenna restrictions on either band.

Wideband: 100 milliwatts maximum transmit power to the antenna. Modulation bandwidth to exceed 50kHz. This section includes wideband modes such as FM (voice), MCW, ATV and DATA

For both the Restricted and Wideband sections contestants are free to use the "Rover" concept of portable operation. This allows the location of the station to be moved as many times as desired and by a minimum of 16 linear kilometres, at any time during the contest period. From each new location, stations worked from any of the previous locations during the event may be worked again, both stations involved in the contact gaining points. The serial number however will not revert to 001 each time a move is made but will carry on consecutively from the previous contact.

The "Rover" concept is to encourage lightweight, low power portable activity. Details of the equipment used for this type of operation should be included on the log summary/cover sheet.

The "Rover" concept is NOT applicable to the Open section.

5. Scoring - as detailed in the General Rules (i.e 1 point per km). In addition the following BONUS points will also apply:

LOCATOR SQUARE MULTIPLIER: (applicable to all sections):

The final, total kilometre score for the best four cumulative sessions will be multiplied by the total number of different Locator Squares ("grids"), for example IO92, IO81, etc) contacted over the entire cumulative (ie up to the six events maximum). To claim this bonus it is therefore essential to submit logs for all events entered, not just the best four. Please include a separate check list of the squares worked with your cover sheet.

WIDEBAND BONUS: (applicable to all contacts in which a wideband mode forms at least one half of the microwave contact):

- Two-way wideband contacts multiply the distance points by 2
- Wideband to non-wideband contacts multiply the distance points by 1.5
- One-way contacts score half the points a full contact would have made, including the multiplier.

The wideband bonus applies to both sides of the contact. Therefore a narrowband operator working a widebander would also multiply the score for that contact by 1.5.

NOTE: Wideband stations do NOT multiply the Locator Square Bonus as well!

It is appreciated that operators who use computer contest log software will not yet have the facility to automatically include the wideband bonus in their logs. For the moment, the bonus will have to be added manually to the final score. All bonus carrying contacts should be clearly marked as such.

6. **Logs should be sent to the adjudicator, G4KNZ (address shown above) posted no later than Tuesday, 22nd October 2002.**

RULES FOR THE MILLIMETRE BANDS CONTESTS

1. The rules are identical for each of the millimetre bands: 24GHz, 47GHz , 76GHz and higher.

2. These band contests are "stand alone" events and will be scored as such. However, as an incentive to millimetre wave activity, an award will also be made to the operator with the highest combined 24GHz scores, a further one to the operator with the highest combined 47GHz scores and likewise to the operator with the highest combined 76GHz scores, and above, over the four sessions. These awards will be in addition to the band leaders in each event.

3. The General Rules apply (see above)

4. Sections: One section only (Open) on each band. There will be FOUR contests for each band held over the summer season.

5. Scoring: Each contact will be scored on a 1 point per km basis. Crossband and one-way contacts score half points. The "rover" concept is applicable to both bands (see 10GHz Cumulative rules above) as it has been in previous years for the 24GHz contests. There are no bonus points for wideband contacts, unlike the 10GHz contests.

6. Logs should be sent to the adjudicator, G4KNZ, posted no later than 16 days after the contest.

RULES FOR THE ALL BAND MICROWAVE CONTESTS

1. The General Rules (see above) apply to this contest.

2. Three All Bands Contests will be held, each a "stand alone "event.

3. Each band will be scored separately and band leaders will receive certificates. The overall contest

winner will be the operator with the highest normalised scores for the whole band range 1.3 to 47GHz.

4. The raw claimed scores will be "normalised" to a maximum score of 1000 and then ranked.

5. There are no bonus points. The normalisation of scores takes care of differences in activity and "difficulty" from band to band.

6. "Rover" contacts may be made on 24 and 47GHz only (see 10GHz Contest Rules for a definition of this).

7. There are no separate sections for low power, wideband, etc.

8. Logs should therefore only include the exchange of information outlined in the General Rules.

9. One-way and crossband contacts score half points.

10. If the 10GHz logs are to be also entered in the 10GHz Cumulative Contest they will need to be rescored for that contest in the light of the Cumulative Contest rules (see earlier).

11. **The completed logs and summary/cover sheets should be sent to the adjudicator, G4KNZ, posted no later than 16 days after the contest.**

G4KNZ, 13 November 2001

MICROWAVE CONTEST DATES 2002

Month	Contest name	Sections	Date 2002	Time GMT	Clashes
Jan	All-band Activity Day	Non competitive	27-Jan	0900 - 2000	
Feb	All-band Activity Day	Non competitive	24-Feb	0900 - 2000	
Mar	All-band Activity Day	Non competitive	24-Mar	0900 - 2000	Avoids Easter Sunday Mar/31
Apr	Millimetre Bands	Open	21-Apr	0900 - 2000	
May	All Band Microwave	Open	5-May	0900 - 2000	Moved to May to coincide with IARU
May	1st 10GHz Cumulative	Open, Restricted, WB	26-May	0900 - 2000	Avoids Drayton 19/May
Jun	Millimetre Bands	Open	9-Jun	0900 - 2000	
Jun	2nd 10GHz Cumulative	Open, Restricted, WB	23-Jun	0900 - 2000	Avoids Longleat 30/Jun
Jul	3rd 10GHz Cumulative	Open, Restricted, WB	28-Jul	0900 - 2000	Avoids early July VHF NFD
Aug	All Band Microwave	Open	11-Aug	0900 - 2000	
Aug	4th 10GHz Cumulative	Open, Restricted, WB	25-Aug	0900 - 2000	
Sep	Millimetre Bands	Open	8-Sep	0900 - 2000	Avoids Telford 01/Sep
Sep	5th 10GHz Cumulative	Open, Restricted, WB	22-Sep	0900 - 2000	
Oct	All Band Microwave	Open	6-Oct	0900 - 2000	Coincide with IARU R1
Oct	6th 10GHz Cumulative	Open, Restricted, WB	20-Oct	0900 - 2000	Clocks still forward
Oct	Millimetre Bands	Open	27-Oct	0900 - 2000	Clocks go back. Clash with uW update
Nov	All-band Activity Day	Non competitive	24-Nov	0900 - 2000	
Dec	All-band Activity Day	Non competitive	29-Dec	0900 - 2000	

LETTER FROM AMERICA ..

A guest editorial from Texas, by Kent Britain, WA5VJB

I always enjoy the UK microwave events such as the Microwave Roundtable Meeting in November.

It is interesting to see the different ways of doing the same thing but I was very surprised that there is no 3cm WBFM activity in the UK!

Most of you know how active I am on 3cm, including the first EME QSOs during the US 3cm contest. (G3WDG was worth over 9000 distance points!) yet going back over my logs, over 50% of my QSO's are still on wideband FM.

This is how we get the new stations on the band. It's just not reasonable to expect a young lad's first 3cm station to be 1 watt of SSB!

It's so easy to build up a 3cm wideband station today. (Especially if you already have most of the bits). A 10 Ohm dropping resistor and a 2N2222 circuit becomes a PSU. One of the new, general coverage, multiband talkies becomes the IF. An old door opener or Radar Detector becomes the RF head.

I will tune up and give away the RF head to any young ham who will build up a PSU/IF. I picked up 7 more RF heads at the UKuG meeting at Martlesham that were passed up by everyone else.

Even Zack Lau, W1VT, makes a large number of FM QSO's up in our North East corridor. Using a directional coupler, separate TX/RX antennas, GaAsFET preamp and 1 watt amp, Zack makes some fantastic FM QSOs.

Consider lowering that first step for microwave newbies ... dust off that WBFM station!

73 from Kent, WA5VJB

REPAIRING HEWLETT PACKARD POWER METER HEADS ...

by Tom Williams, WA1MBA

Several people have asked me if it is possible to repair an HP 478A-style thermistor mount (Power Head for 431 / 432 power meters). Surprisingly, in SOME cases, the answer is YES!

The first step is to do triage - figure out if the head is completely fried. Some of these heads will withstand 1 watt for 10ms and appear broken but can be brought back to life.

The only way to tell if a thermistor resistance is within specification is to measure the resistance under simulated operating conditions. This is complicated and I'll outline how to do it at the end of these notes.

In the case of a power head that pins the power meter (one way or the other) you don't care about resistance being within spec - IT ISN'T. What you do care about is whether it is totally fried or can be brought back. To determine if it is repairable, measure the resistance between pins 1 and 2, and also between 3 and 4. The resistance should measure between 1000 and 5000 ohms. Use a good digital ohmmeter on the 20K scale so that it draws very little current. Don't leave the meter connected for more that a second or two. The absolute maximum current that a thermistor can take is 13 mA. If you read an open or a short, you have blown thermistors, and might as well trash the unit. If they are both about 1K to 5K, proceed to repair/ adjust.

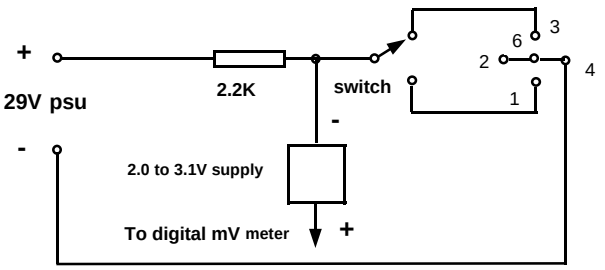
Don't forget to check the cable... if there is an open, or a faulty connection, this can cause the same symptoms as a bad head.

The procedure follows on the next page ....

1. Take the can off the N connector by removing three set screws. Slide the cover can off.
2. Plug the unit into your 431 / 432.
3. Set the resistor mount ohms to 200 (assuming you are repairing a std 478A - some of the microwave heads are 100 ohms, so set the control accordingly).
4. Turn the power on.
5A. If the meter is pegged down scale
a. Set Range to 10mW
b. Set ZERO and VERNIER to mid-range (on the 432, carefully count the turns of the screw-driver coarse- zero pot and set it to mid range)
c. On the back of the thermistor mount there are two small brass screws. Take your time. Turn one of the screws 1/8 (yes 1/8) turn clockwise. Then turn the other screw 1/8 t clockwise. If there is a sudden jump in meter indication when advancing either screw, back it off 1/8 turn, and do NOT advance that screw any further. If either screw bottoms, do not apply force - it is likely that if a screw bottoms, the thermistor is fried.
d. The best result is when at some point in the alternating "turning of the screws" the meter rises. Once it starts to rise, trim it to zero by turning each screw a little.
5B. If the meter is pegged upscale,
a. Set meter to Zero (as in 5A above step b)
b. Set RANGE to highest power position which will not peg the meter.
c. Turn one of the little brass screws counter clockwise (leftwards) to obtain a meter reading of half the deflection noted in step b.
d. Turn the other screw counter clockwise to zero the meter. If it is impossible to zero the meter, at least one of the thermistors is fried.
6. Replace the cover. Congratulations! The head works, is no longer calibrated, but is probably within one dB of its original calibration. Check it with a known good source or another meter to get a calibration factor.

Note. Some waveguide type units have only one adjusting screw. Follow approximately the same procedure, adjusting only the one screw.

If you really want to check a mount for thermistor match you need a 29V DC power supply, a second high resolution supply with floating terminals adjustable 2 to 3.1 V, a switch, a 2200 Ohm resistor and a millivolt resolution digital volt meter. You set up the circuit below and adjust the adjustable supply as a bucking voltage to get a very small reading on the volt meter and then switch between the two thermistors to make sure that the readings do not vary by more than .030 volts. Non-operating units with readings as high as .150 difference can usually be repaired per instructions. I don't recommend that you do this, first of all, its not usually necessary, and second of all, if you get it wrong you can fry the thermistors!



ACTIVITY NEWS FROM THE WORLD ABOVE 1000MHz

JAPANESE OPERATORS SET NEW WORLD RECORD AT 75GHz ...

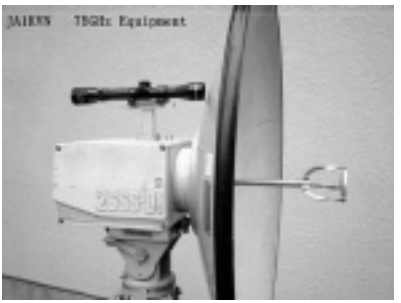
On 16 November 2001, at 1310 Japanese standard time, JA1ELV/2, located in PM95JI, worked JA1KVN/1 in QM06BF, on 75GHz SSB for a new world record of 151 kilometres, just 6km more than that set up earlier in the year by Will, W0EOM and Bob,KF6KVG.

JA1ELV/P was heard at RS45 while he copied JA1KVN/1 at RS43.

JA1ELV/1 had 3mW output to a 50cm dish and was located at just under 2000 metres asl on the side of Mt. Fuji. The photo below shows him with his 5 microwave band set up. The two large dishes are for 142GHz and 75GHz. There was

snow on the ground at the time of the contact.

JA1KVN/1 had 1mW output to an 80cm dish and was located 296 metres asl on the the slopes of Mt. Tukuba. His equipment is shown in the



second photograph.

It's interesting to see the use of telescopic sight with these large dishes. Note also the cassegrain sub reflectors on all the dishes. This sort of distance on these higher millimetre bands does not come easily and everything has to be as efficient as possible ... congratulations to both amateurs on a fine job.

241 & 322GHz DX RECORDS SET BY USA MILLIMETRE MEN ...

From: WA1ZMS, Brian Justin [wa1zms@worldnet.att.net]

I'd like to claim what I believe are a pair of North American DX records for the upper two amateur radio allocations, that being 241GHz and 322GHz.

At 01:45z on Dec 15th, 2001 a QSO was made between W2SZ/4 (op:WA1ZMS) and WA4RTS/4 on the 322GHz band over a whopping distance of .05Km. Both stations were located in FM07JI.

I know it's not much as far as DX is concerned, but it's on par with DB6NT's 411GHz DX record and is a North American first for the >300GHz band, excluding light.

About an hour later.....

At 02:35z on Dec 15th, 2001 a QSO was made between W2SZ/4 (op:WA1ZMS), located at 37-21-13N 79-10-15W (FM07JI) and WA4RTS/4, located at 37-21-49N 79-10-19W (FM07JI) on 241GHz over a distance of 1.1Km. This is a North American first for the band and a new NA record at the same time.

Both of the above QSOs were made using MCW and wideband FM IF receivers. Power output on 322GHz is estimated to be just a few microwatts while on 241GHz the power is a measured 0.75mW. The stations are constructed of 80.6GHz free running Gunn oscillators driving GaAs diode triplers (Univ of Virginia design) to give output on the 241GHz band. The triplers have a tiny amount of 4th harmonic output which was used for the 322GHz QSO. Both stations use homebrew 6 inch parabolic dishes with hyperbolic sub-reflectors.

It is hoped that the Gunns will be phase

locked in the future allowing the use of narrow band modulation thus resulting in better DX.

I'd like to also thank Pete, W4WWQ and Geep, WA4RTS for their help with tonight's QSOs. For those who want to see a couple of photos of the gear used for the 241/322GHz QSOs you can go to: **www.mgef.org** and follow the News link.

There is also a **.wav file** of a portion of the 322GHz QSO. Signals on 240GHz were about the same, and so it took a few repeats to make the QSO. Modulation used was MCW. The primary problem is that the phase noise from the free running 80.6GHz Gunn source is so high to start off with, that the resulting signal after X3 multiplication is about 500KHz wide! The widest RX IF I had was 200KHz, so most of the signal power was outside the RX passband. The hope is to get that under control some day by phase locking the Gunn sources to crystal oscillators. The guide that comes out of the X3 multipliers is WR-3. It's a whopping .03 x .015 inches! I just let it over-mode when on 322GHz. The real fun was in making the dishes and the sub-reflector feeds, making the mounts for the sub. Lots of time spent in the machine shop. By the way, WR-3 is the smallest standard size waveguide in the WR series. Anything higher in freq and you'll need to size your own!

73 from Brian, WA1ZMS

(Many congratulations Brian on a superb effort ....editor)

And if all the preceding millimetre news was not enough just read on! .....

250 Kilometre 47 GHz SSB QSO in France ... from a report by F6BVA and translated by John, W3HMS:

For the last day of the year 2001, Dominique, F5AXP and Jean-Marie, F6ETU braved the cold, 3C and the storm on Mount Tauch (JN12IV) . For my part (Michel, F6BVA), weather wise it was no better than going on the slopes of Mount Ventoux in grid JN24PD at 1400m (about 4300 ft) plus a violent Mistral with the temperature at -8°C/18 F. The WX was quite changeable between the morning and the afternoon QSOs. We noted that aluminium boxes were completely frozen!

However, we did make a superb QSO on 47GHz over 250 Km/152 miles. The SSB signals were profoundly affected by QSB at levels between RS51 to RS56.

The QSB was not due to dish movements, as our tripods are stable and the mechanical apparatus was designed to avoid slippage. For my part (F6BVA), I have always stated that QSOs at distances, with or without wind, have multiple causes of QSB. For this QSO of 31 Dec, the trajectory followed very close to the coastal fringe of the Mediterranean, a very unstable zone whose hygrometry is very difficult to master. The force of the northern wind amplifies this phenomenon. Also, along our path was a very large, unstable mist which diffused and dispersed the signal (and this in spite of the wind). To be more specific, all the contacts made by me in past at more than 150 km on 47GHz have always been affected by QSB , even those on beautiful days with nice, warm temperatures.

Feeds: F6ETU illuminates his offset dish with a homebrew conical horn. He used the SABOR software to determine the dimensions. The offset parabola is 1 meter/39.37 inches in diameter with an equivalent F/D of 0.6. The theoretical gain of the horn is 12.5 dB for a 3db theoretical opening of 46 degrees. The predicted gain of the feed and dish together 51.5 dB. Michel, F6BVA, said that he does not have the measuring facilities on this band for optimising the illumination of his dish. His offset dish is illuminated directly by a homemade conical horn. He prefers simple systems which are well-optimised.

Antennas: F6BVA uses an 80cm dish while F5AXP uses a 1.2 meter offset

Equipment: The 24GHz equipment is the basic DB6NT units with amplifiers by G8ACE. On 47.1 GHz the mixer is by DB6NT with about 100 microwatts output. The local oscillators are operated on 12 VDC on both 24 and 47GHz. A beacon was made with a quartz thermostat with output on 430 MHz. It is coupled to a piece of semi – rigid coax terminated by two microwave diodes to generate harmonics usable at 24GHz and 47GHz.. A horn antenna is used.

This QSO was started on 10 GHz with very strong signals and, without touching the azimuth setting, passed to 24GHz with equally strong signals. Then we changed the feed to 47GHz . Then one station transmitted while the other searched for this signal on 47 GHz. Two metres

was used for liaison.

It was Michel who had the worst weather environment, on Mt Ventoux, and who had to wait for some time before trying a QSO on 47GHz at 300 km/180 miles. Unfortunately this was not made.

Thanks to Dominique, F5AXP and to Jean-Marie, F6ETU for this fine QSO ... just 36km short of my world record distance!
73 from Michel, F6BVA.

NEWS FROM THE UK ...

From Ted, G3JMY, [EDWING3JMY@aol.com]
Apart from my ZL expedition earlier in the 2001, where I spread the word on microwave operation in the UK, I have also been visiting my daughter in the 'States (no microwave operation in Idaho !) and missed the September 10GHz Cumulative. I managed 4 sessions though and sent my entry in - early - as required. In the August event I was fortunate to work F6DKW, Maurice, in or near Paris, for the second time ever - CW both ways too ! This brought my 2001 score to 28 stations worked on 3 cm, with a DX of 456 km. Not the best of scores, but I tried ! 10GHz and other bands were badly hit by Foot and Mouth epidemic for the portables, so maybe my score wasn't too bad.

From G4LDR, Neil Underwood (Wiltshire) [g4ldr@btinternet.com]
Conditions during the 23/13cm cumulatives seemed quite good in 2001, at least for the middle three sessions (I missed the first one). More stations were worked in each session than in previous years and there was much more activity on 13cm, with 80 to 90 percent of stations worked having both bands. Unfortunately I missed the deadline for submission of entries!

There were very good conditions on all microwave bands between the 8th and 11th December. Unfortunately there was virtually no activity at the times I was operating. Many beacons were heard, some for the first time. I worked PA5DD and PA0WWM on the 9th, both on the four bands, 23, 13, 6 and 3cm. Signals were super-strong, many times stronger than locals on nearby hill tops (there was receiver overload, with mixer products up and down the band for several 100 kHz! The path loss must have been much less than free space loss. Even G4EAT in Essex was 59 ++ when he was beaming away from me. My best DX was at 2256 on the 11th Dec 2001 in the form of OZ1FF in JO45BR, at 825 km. Signals were RS56 and RS54.

There's been little activity since the opening. The Sunday activity period on the 30th Dec resulted in only two local contacts, G1JRU and G4NNS. G0HNW was heard on 2 metres but could not be raised.

From: John, G3XDY [g3xdy@btinternet.com] in Suffolk:
There was a good 3 day tropo opening starting from 8th December, with very strong signals from many stations. DJ6JJ in JO31 was 59+ on 1.3/2.3/3.4/10 GHz on the evening of the 9th, and GD4GNH was worked on 2.3GHz for a new country and square. GD4GNH had a pile up of PA and DL stations calling him direct on 2.3GHz and exchanging 59 reports! My best QSO on 1296MHz was DL7VTX in Berlin at 805km. DL5LF in JO54 was a new square on 10GHz at 635km.

On the 10th I worked G6DER and G3LRP on 10GHz. 3.4GHz produced good QSOs with G6DER, DG1KJG, DC9KK, PA0BAT, and G8OHM. The evening was rounded off by exchanging 59 reports with OZ1FF on both 1.3GHz and 10GHz.

Overall, conditions in this part of the UK during 2001 have been very respectable, with some good tropo on several occasions (although usually only for a short period) and good rainscatter too. *(I must emigrate to JO1 or JO2 square...editor!)*

Peter, G3PHO (Sheffield, IO93GJ) is ashamed to say he gave into temptation on December 10, 2001! The Dutch beacon, PI7EHG, on 10368.180MHz was coming in loud and clear on a 60cm dish inside the master bedroom! There was no sign of any amateur activity and so, in sheer desperation, Peter had to resort to posting on the Internet DX Cluster... something he had vowed never to do!! Within less than a minute of doing this PA5DD come up on 10368.100MHz CW calling him directly and a nice contact ensued. After that it was back to listening to the beacon and no amateur signals! A similar situation *seemed* to exist on 23cm, GB3MLE being RST579 on an indoor beam! Later it was found that the coax inner had come adrift in the N connector, which may account for a lack of contacts as a result of calling CQ on an apparent dead band!
73 until next month .... More reports please!

RSGB 10GHz CUMULATIVES 2001 : RESULTS

Open Section

		May	June	July	Aug	Sep	Oct	Pnts	Mult	Total
1	G3PHO/P	4463	4811	7229	6412	3247	1911	22915	18	412,470
2	G4ZXO/P	4269	4380	5538	3887	3772	1741	18074	18	325,332
3	G4LDR	2754	3308	3115	2971	304	444	12148	17	206,516
4	G4NNS	2454	1631	3493	2081	437	926	9659	15	144,885
5	G0API	54	3402	2518	2972	1586	247	10478	13	136,214
6	G3JMY	1509	1488	1862	2550	0	0	7409	11	81,499
7	G3LRP	1292	1357	1853	2544	893	1382	7136	10	71,360
8	G3JMB/P	0	423	712	0	0	25	1160	6	6,960

Restricted Section

		May	June	July	Aug	Sep	Oct	Pnts	Mult	Total
1	G8LSD/P	973	3150	3788	0	0	0	7911	13	102,843
2	GW3ATM/P	0	2638	1975	2572	747	0	7932	12	95,184
3	G4BRK	1069	1003	1424	884	365	0	4380	9	39,420
4	G7JTT/P	0	0	0	2094	0	0	2094	7	14,658
5	G0RRJ	0	978	0	1007	0	0	1985	7	13,895

A total of 13 entries were received for the 2001 10GHz cumulatives - 8 in the open section and 5 in the restricted section. This compares to a total of 8 entries in 2000, and despite the Foot & Mouth restrictions on using some portable sites in the earlier part of the year.

In the Open section, congratulations to G3PHO/P, who leads with a convincing score, due in part to very good scores for the July and August events. In July, 33 stations were worked, best DX 572km, and in August, 29 stations were worked, best DX 585km. Peter was using a 5W PA and 1.3dB NF receiver, mounted behind a 1.2m diameter dish at 3m agl, also 50W talkback on 2m with an 8 element Yagi. The runner-up in the open section was G4ZXO/P.

In the Restricted section (max 10GHz power of 1W), congratulations to G8LSD/P, who narrowly beats GW3ATMP, due to tallying one extra locator for the multiplier. Allan was using just under 1W to an 80cm dish, also mounted 3m above ground.

Some people cannot read the rules and did not score correctly! The best 4 sessions should be counted, multiplied by the total number of squares worked over the entire cumulative. Some people only counted the squares worked in the best 4 sessions. Some people did not state whether they wished to enter the Open or Restricted session - in which case, they were entered according to the output power they declared they were using (but, if in doubt, in the Open section).

There were no entries for the Wideband only section in 2001.

A check log is acknowledged from G3XDY, who was not able to be active in all the sessions.

Finally, the dates for 2002 are now published and the rules are unchanged. Lets hope we see some good activity on 10GHz, and please do send in your entry, even if you can only make one or two of the sessions.

G4KNZ , Contest Adjudicator
January 2002