An Amateur Radio publication for the Microwave enthusiast

MICROWAVE NEWSLETTER

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Lambda House, Cranborne Road, Potters Bar, Hertfordshire EN6 3JE

FROM THE EDITOR

2003 – JANUARY

A Very Happy New Year to Microwavers everywhere and especially to the readers of this Newsletter! Many thanks for the Christmas cards and emails sent to the editorial desk ... we just couldn't reply to them all but they were much appreciated

This issue contains the annual, pull-out Contest Supplement which you can pin on your shack wall to remind you when the various contest and activity days are and what is needed according to the rules. The Microwave Committee hope that readers recognise the improvements that have been made to the contest programme and that much more regular activity will be the result.

Our Activity News section this month includes a most interesting account of a regular 10GHz "sked" being run by G3LRP and G4ALY. We urge everyone to read it and maybe decide to do the same with a fellow microwaver this year.

The Monday night "Microwave Activity Night" seems to have the usual small core of regulars and needs an injection of new callsigns! If you have a home station please call on 144.175MHz for microwave contacts on any band, 23cm up.

Now for New Year Resolutions! What are you going to do this year on the microwave scene? Perhaps you might finally use that stuff bought at a fleamarket years ago and presently gathering dust on your spares shelf, or maybe you might get on another microwave band. There are other bands beside 3cm you know!

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

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

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

76GHz MIXER OFFER

Martin, G7MRF, wishes to add the following information to his offer made in last month's Newsletter (page 2) ..

From: Martin Farmer [g7mrf@prism-online.co.uk]

The current status is that the machined enclosure for the mixer has just been redrawn but I waited until after Christmas to give the drawing to the machinist for costs. I have changed it somewhat from the published picture in the newsletter to a bolt together section that meets with the X3 module - so no transition will be required.

I will let the interested people know just after the start of the New Year what the cost will be.

Please note my new email address

Two G3VVB brass cavities for 2320MHz (I worked OE5VRL using them) .. beautifully made. £40 each. Email Dave, G0RRJ at: **g0rrj@btopenworld.com**

HITTITE PRESCALAR ICS

From: David Wrigley, G6GXK, Rochdale, Lancs. [davidwrigley@ntlworld.com]:

Readers may be interested to know that **Grant Hodgson (www.ghengineering.co.uk)** has in stock a range of Hittite prescalers. The divide by 8 is a lower cost unit and readers can use the design for a 12GHz prescaler on the UK Microwave Group website **(www.microwavers.org)** - press the button marked "Software" and look on that page for the link headed "Latest Version of the 12GHz Prescaler design". This design, when tested at Martlesham, gave useful operation to 14GHz. Grant also has in stock a divide by 2, 10GHz divider.

In the pipeline at GH Engineering is a more expensive but much more convenient divide by 10 prescaler system (divide by 2 and divide by 5 in cascade). Grant is currently testing the pcb and it will be available through his website when development is complete. Incidentally his PCB should also be able to take the divide by 8 prescaler and so circumvent the problem of sourcing microwave pcb.

PRODUCT NEWS ....

17.0-27.0 GHz GaAs MMIC Up-Converter U1000

Mimix Broadband 's 17.0-27.0 GHz GaAs MMIC up-converter has a typical small signal conversion gain of 0dB with a typical third order intercept of +12 dBm across the band.The device is a single fundamental mixer followed by a single stage amplifier.This MMIC uses Mimix Broadband 's 0.15 m GaAs PHEMT device model technology and is based upon electron beam lithography to ensure high repeatability and uniformity.

The chip has surface passivation to protect and provide a rugged part with backside via holes and gold metallization to allow either a conductive epoxy or eutectic solder die attach process.This device is well suited for Millimeter-wave Point-to-Point Radio,LMDS, SATCOM and VSAT applications.

Further details can be found at www.mimixbroadband.com

A noise Power Indicator ... by Brian Coleman, G4NNS

A noise power indicator can be a useful tool for judging the performance of microwave receivers using the Y factor method (cold sky vs warm object). This relies on the fact that all bodies above absolute zero emit “black body” radiation which can be detected at the higher microwave frequencies. In practice this means that you can use the “cold” sky vs a known “warm” reference. I find aiming the antenna at the house nearby is best and you can assume its temperature is about 293K. Measurement as opposed to indication can be accomplished by using a precision attenuator in front of the indicator and using the same level at the detector to avoid any non-linearity in the system. I also use my system to ensure that my EME antenna is tracking correctly using moon noise of which I see about 2.5dB at 10GHz. Other uses of this tool can include antenna testing. It provides a more precise and easier to read system than an S-meter and can, in conjunction with a precision attenuator provide a means of making fairly precise measurements of the order of +/- 0.2dB. When using a warm source such as your house remember that it should fill the aperture of your antenna. This is why small antennas (more than about 0.5 degrees beam width) do not see the full potential sun or moon noise.

Circuit description (see Figure 1)

The system consists of a high gain amplifier (circa 70dBs) and a sensitive detector at the IF frequency (in this case 144MHz). The bandwidth needs to be as wide as possible but not exceeding that of the transverter front end. This is important as noise generated outside the desired pass band of the transverter is not relevant to the system performance and could swamp the power indication and lead to misleadingly poor indication of receiver performance. The 3dB bandwidth of this indicator is about 1MHz. Relative measurements are made by using a switched attenuator in front of the noise power indicator. Such attenuators can be found at microwave flea markets.

The main challenges to the circuit design and construction are:- 1) minimising the gain required to drive the detector. I.e. the detector must be as sensitive as possible and 2) keeping the gain stages stable at all frequencies including those outside the intended pass band. The first requirement is met by using forward bias on the schottky detector diode to move it into its linear and most sensitive region and by using a simple op-amp to amplify the DC difference between the RF detector and another matched reference diode, similarly forward biased but decoupled to RF, in the same SM package. The second requirement is achieved by using MMIC gain stages with careful construction, grounding and shielding. With so much gain on one frequency, great care has to be taken in the layout and construction to avoid instability. The stage before the detector and second band pass filter uses a JFET as this is more tolerant of impedance mis-match. No originality is claimed for any part of the circuit but some time and effort has been spent in trying to ensure the repeatability of the layout and simplicity of the PCB. If good practice for RF construction is followed, it should be possible to build the circuit and get it to be stable quite easily. The input must however look substantially resistive and be correctly matched at all frequencies. This can be achieved by the use of some fixed attenuation at the input.

Construction (see Figure 2)

A simple way to make the PCB is to cover the double sided copper laminate with sticky tape such as 3M Magic tape then stick a print of the track layout onto the tape and use a scalpel or sharp modelling knife to cut out and peel off the areas to be exposed to the etchant.

The design uses as many straight lines as possible to simplify this. I found it helpful to use a straight edge under a 3D magnifier. After etching and cleaning the PCB, the screens should be cut to size. The long, side screens are best made using 1/16” laminate as used for the main PCB. The inter stage screens are best made from 1/32” copper laminate or from tin plate. I did not find end screens to be necessary but if you fit them they should be made from 1/16” laminate. Drill 2.5mm holes to recess the MAR8s, which should be the “drop in” type, to minimise lead lengths. Also drill 0.8mm holes for the Via pins. These pins are essential for stability and it is possible that more than the four shown may be needed. (see setting up).

As with any PCB construction it is best to start with the smallest components first as the larger ones will otherwise get in the way **(see figures 3 & 4)**. Whilst the screens should be fitted last you may find it easier to fit L1 and L2 after fitting the long side screen closest to these inductors as this will make it easier to solder the seam. L1 and L2 are separated by about 3mm and are 2-3mm above the ground plane. Note also that the long side screens extend below the main PCB and should match the height of the inter-stage screens on the component side. They should be soldered both to the top and bottom surfaces of the main PCB. Make sure the side screens remain at 90 degrees to the PCB by “tack soldering” both sides and repositioning as necessary before soldering the entire length of the seams.

When assembling the DC amplifier it is again best to fit the smallest components including the wire links and pins first. I find it best to make the track cuts after the components are in place and to use this process as a check

for correct placement of the components. Start fitting the active components with the +5V regulator, and test this before fitting the voltage converter. Test that the + and – 10V rails are working before fitting the op-amp.

Setting up

Terminate the input with a good 50 Ohm load. This is essential for stability. Adjust VR1 for zero reading on the meter. If this is not possible the amplifier may be oscillating. This should not be happening! If it is try touching different gain stages to see if the meter reading changes. You may be able to identify which stage is oscillating by this method. You could try lifting one end of each one Ohm resistor in turn to identify the oscillating stage. Whatever you try, make sure it is reversible and restore it to the original condition before trying something else. Here are some things to try if necessary: 1) Change the capacitor and inductor tuning to see if the oscillation stops. 2) Add additional via pins close to the MAR8s. Those indicated in the design have proved sufficient but in some cases more may be required to achieve stability. 3) Try adjusting the values for R1, R6 or R7 for the stage that is oscillating.

Once the amplifier is stable and the meter set to zero, apply a small signal within the pass-band e.g. 144.50MHz from a 50 Ohm source through a switched attenuator. Tune VC1, VC2, L3 and L4 for maximum reading increasing the attenuation as you go to keep the meter on scale. The prototypes, when set up as described, had a Full Scale reading on the most sensitive range, corresponding to about –80 to –85dBm.

Next, connect to the receiver or transverter under test. The Indicator should show a non zero reading when the transverter is switched on but make sure there are no strong signals in the pass-band, such as local beacons. If the meter is on the end stop try inserting some attenuation between the transverter and the indicator

Applications

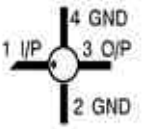
Receiver performance can be measured using ground noise and quiet sky noise. For EME systems where the antenna beam width is close to or less than the angular diameter of the source, Sun and moon noise measurements provide a useful indication of receive performance. The indicator can also be used for calibration tracking systems. The indicator also has potential for plotting polar diagrams and measuring gain of antennas for 2m or bands where a transverter has a 2m IF.

For EME, the indicator can display moon noise during receive periods to provide confirmation that the tracking system is functioning correctly.

For this purpose, it is necessary to supply a sample of the IF to the indicator through a splitter (T) and to switch the indicator out of circuit during transmit periods. It is desirable to switch off some of gain stages during transmit periods, to avoid overload. Some gain drift may be experienced but this is minimised if the smallest number of stages are switched off. Try switching off just the first one or two stages if possible. A spare power track is supplied on the PCB for this purpose. The circuit diagram shows the possible arrangement for RF switching. The number of stages to be switched will depend on the isolation of the relay used.

Notes

1. If you fit the unit in a box and it becomes unstable, try lining the box with conducting foam or lossy rubber where it is closest to the component side of the Noise amplifier.
2. On the supplied veroboard component layout for the DC amplifier, **C26** is missing. This decoupling capacitor can be conveniently soldered across the MX680 IC, from pin 8 to pin 5.
3. Further information, if required can be obtained from Brian, G4NNS, QTHR or email to: BrianColeman@compuserve.com
4. A component list, **figure 4**, is provided at the end of this article.
5. Except for the MAR8 modamps, semiconductor pin outs are shown on the circuit diagram.



MAR8 pin out connections

Figure 1

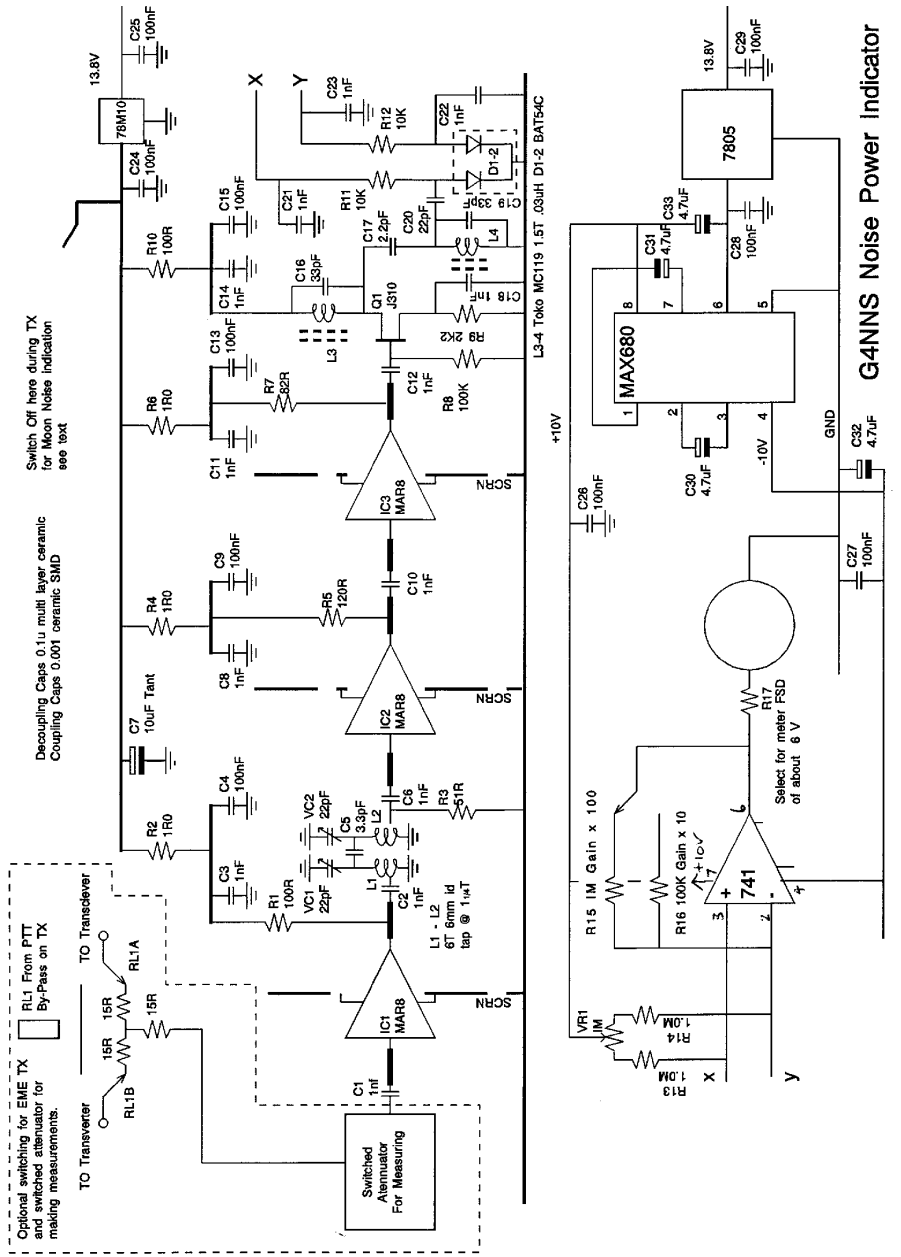
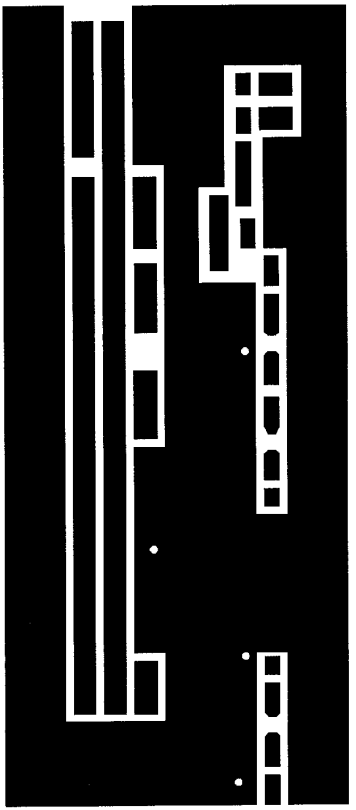
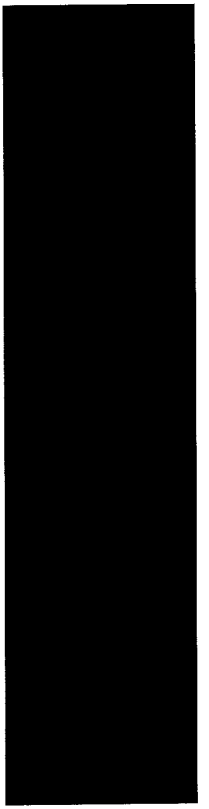

G4NNS Noise Power Indicator
Optional switching for EME TX and switched attenuator for making measurements.
RL1 From PTT By-Pass on TX
TO Transdever
TO Transverter
RL1A
RL1B
15R
Switched Atennuator For Measuring
C1 1nf
IC1 MAR8
IC2 MAR8
IC3 MAR8
SCRN
L1 - L2 6T 6mm id tap @ 1¼T
L3-4 Toko MC119 1.5T .03uH
D1-2 BAT54C
Q1 J310
Decoupling Caps 0.1u multi layer ceramic
Coupling Caps 0.001 ceramic SMD
Switch Off here during TX for Moon Noise indication see text
78M10
7805
MAX680
741
13.8V
+10V
-10V
GND
R15 1M Gain x 100
R16 100K Gain x 10
Select for meter FSD of about 6 V
VR1 1M
R13 1.0M
R14 1.0M
R17
X
Y
x
y

Figure 2

Intermediate Screens
1/32" Laminate
45 x 20mm
QTY 3



Main PCB 1/16 Laminate 105 x 45mm
Note position of 4 via holes.



Side screens 1/16" Laminate 105 x 25mm . . . QTY 2

This article continues on page 11 .....

UK MICROWAVE COMMITTEE
MICROWAVE CONTESTS 2003

Aims and comments:

This year sees some major changes to both the microwave contest calendar and format of the actual events. These changes have been introduced to encourage activity on all bands from 1.3GHz up and to provide something for everybody, from low power portable stations to high power home stations, from the lower microwave band exponent to the millimetre wave enthusiast. In planning the year's contests we have tried to avoid clashes and adjacent weekends with major VHF contests and events such as rallies and microwave meetings but, inevitably, this has not been possible in all cases.

We are also trying to encourage activity on the "neglected" bands such as 3.4GHz and 5.7GHz. Kitset transverters are now easily obtainable for these bands and surplus solid state PAs can be found at very reasonable cost.

24GHz is now given its own series of contests. We feel there is sufficient potential UK activity on this band to support its own contest. 47 and 76GHz however are still relatively underpopulated and the committee feels these bands cannot yet support more that the single event shown on the calendar for this year.

New certificates have been designed for all of the contests and a new trophy, the G3KEU Memorial cup, introduced for the 5.7GHz cumulative contest.

With the introduction of new contest events and the modification of existing ones, the Microwave Committee believe they are offering the UK microwave operator a wide choice of events and chances to have an enjoyable year of operating and interesting contacts.

Microwavers in Europe are most welcome to join in our UK contests. There is already a core of French, Dutch and Belgian stations who appear regularly in our summer contests. We would like many more to do the same!

THE RULES listed below are final and binding for 2003 (there are significant changes from 2002). The following contests are scheduled for 2003:

- Low Microwave Bands - 1.3GHz/2.3GHz/3.4GHz (2 contest days)
- 5.7GHz Cumulatives (6 contest days with 3 to count for scoring purposes), on the same days as the 10GHz Cumulatives.
- 10GHz Cumulatives (6 contest days with 3 to count for scoring purposes), on the same days as the 5.7GHz Cumulatives.
- 24GHz Cumulatives (3 contest days with 2 to count for scoring)
- 47GHz and 76GHz (1 contest day)
- 10GHz Trophy (1 contest day, arranged by VHFCC, see the VHF listing for further information.)
- In addition there are three non-competitive winter activity days.

The full contest programme and rules are also published in the January 2003 issue of the RSGB Microwave Newsletter and are also available on the Internet at: **http://www.g3pho.free-online.co.uk/**

General Rules (applicable to all events)

ALL THE CONTESTS (except the 10GHz Trophy) run from 0900 to 2100UTC on a Sunday.

The Contests are open to all comers (you do not have to be an RSGB member), except for the 10GHz Trophy where contestants must be members of RSGB if they wish to submit logs.

Contestants are expected to enter in the true spirit of the event and to adhere strictly to any equipment or power restrictions that apply to the particular contest.

Operators may enter as home station or portable (either mixed or separately).

The following VHF/UHF/SHF General Rules will apply unless stated otherwise: **1** a, e, f, h; **2** e, i; **3** b, c unless the Rover rule is invoked, d, f, g; **4** d, e, f unless the Rover rule is invoked, g, h, i, k; **5** b, c; **6** a.

Scoring: 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.

Exchanges: 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 (ie a common sequence across the bands is NOT to be used).

Mobile phones must not be used to exchange any contest log information. All such information may only be exchanged by amateur radio.

Paperwork/Entries: 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 3.5in diskette (IBM PC format), or via e-mail. For electronic entries, the format should be one of the following: ASCII text, Microsoft Excel, Microsoft Word, or the G4JNT contest software format. E-mail 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

Awards: Certificates will be awarded to overall contest winners and individual section leaders and their runners up. 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.

Special Rules: Applicable if called up for the specific contest:
Rover Concept: The 'Rover' concept is to encourage lightweight, low power portable activity. 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. Details of the equipment used for this type of operation should be included on the log summary/cover sheet.

Low Band Microwave Contest Rules

This contest aims to encourage home station operation on the three lowest bands in the amateur microwave allocation, particularly as there is growing UK interest in 3.4GHz equipment and triband antenna feeds for these three bands. Portable operators are, of course, welcome to enter, in spite of the chances of inclement weather at the time these contests are staged!

1. The General Rules listed above apply.
2. There are two contests, one in March and the other in November.
3. There is only one section - open.
4. Each band will be scored and tabulated separately. The total points for each band will then be normalised by the adjudicator to 1000 and the normalised band totals added up and tabulated.
5. Each session will be scored separately - there are no cumulative scores.
6. For each session, March and November, certificates will be awarded to
- the leading entry on each band
- the overall leading entry across the three bands
- the runners up to both the above categories

7. All logs should be sent to the contest adjudicator, Steve Davies, G4KNZ, within 16 days of the end of each of the two contests.

5.7GHz Cumulatives Rules

The 5.7GHz and 10GHz cumulatives have been run concurrently because of the growth in activity on 5.7GHz, and the ease of combining the two bands on the same dish. Although they are on the same days, they are completely separate contests. Either band or both bands can be used on any of the 6 days, and any three days submitted for either band.

1. The general rules shown above apply.
2. There are six, monthly, events, from May to October inclusive.
3. Any three of the six events may be used for final scoring purposes. Logs for all events entered should be submitted.
4. There are two sections:

Open

No power or antenna restrictions (other than those laid down in the amateur licence) on either 5.7GHz or on the talkback band.

Moving location during the contest is allowed - the Rover concept is applicable.

Restricted

5.7GHz transmit output not to exceed 0.5 watt to the antenna.

No power restrictions on the talkback band. No antenna restrictions

Moving location during the contest is allowed - the Rover concept is applicable.

5. The final results table will show entries in rank order for each section. In addition to the usual leader/runner-up certificates for each section, the following certificates/trophies will be awarded:
- leading entry in the Open section - 5.7GHz the G3KEU Memorial Trophy
- leading home station in each section

6. All logs should be sent to the contest adjudicator, Steve Davies, G4KNZ, within 16 days of the end of the final session of the contest.

10GHz Cumulatives Rules

The 5.7GHz and 10GHz cumulatives have been run concurrently because of the growth in activity on 5.7GHz, and the ease of combining the two bands on the same dish. Although they are on the same days, they are completely separate contests. Either band or both bands can be used on any of the 6 days, and any three days submitted for either band.

1. The general rules shown above apply.

2. There are six, monthly, events, from May to October inclusive.

3. Any three 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

No power or antenna restrictions (other than those laid down in the amateur licence) on either 10GHz or on the talkback band.

The 'Rover' concept does not apply to this section.

Restricted

10GHz transmit output not to exceed 1.0 watt to the antenna.

No power restrictions on the talkback band. No antenna restrictions

Moving location during the contest is allowed - the Rover concept is applicable.

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.

Moving location during the contest is allowed - the Rover concept is applicable.

(There is no separate section for portable stations.)

5. The final results table will show entries in rank order for each section. In addition to the usual leader/runner-up certificates for each section, the following certificates/trophies will be awarded:
- leading entry in the Open section - The G3RPE Memorial Trophy
- leading home station in each section.

6. All logs should be sent to the contest adjudicator, Steve Davies, G4KNZ, within 16 days of the end of the final session of the contest.

24GHz Cumulatives Rules

It is felt that there are now sufficient numbers of UK stations equipped with moderate power equipment to make this type of contest viable. The Committee earnestly hope that those so equipped will make every effort to support these contests and thus give 24GHz the attention it deserves.

1. The General Rules listed above apply.

2. There are three sessions to the 24GHz cumulative in April, July and August. The best 2 sessions out of three will be used for scoring purposes.

3. There is only one section - open.

4. Operation may be from portable sites or home stations.

5. Moving location during the contest is allowed - the Rover concept is applicable.

6. Certificates will be awarded to:
- the leading station and runner-up for the two sessions combined
- the leading home station for the two sessions combined

7. All logs should be sent to the contest adjudicator, Steve Davies, G4KNZ, within 16 days of the end of the final

session of the contest.

47 and 76GHz Contest Rules

There will be one event of this type. With the relatively low numbers of operators presently active on these bands, it is hoped that the contest day will provide opportunities for experimentation with equipment and paths, thus providing an enjoyable and valuable day out.

1. The General Rules listed above apply.
2. There is one contest in September.
3. There is only one section - open.
4. Moving location during the contest is allowed - the Rover concept is applicable.
5. Each band will be scored and the results tabulated separately. The total points for each band will then be added up and the results tabulated.
6. Certificates will be awarded to
- the leading entry on each band
- the overall leading entry across the two bands
- the runners up to both the above categories

7. All logs should be sent to the contest adjudicator, Steve Davies, G4KNZ, within 16 days of the end of each of the two contests.

Other Microwave Contests

The first weekends of May and October see the RSGB 432MHz -248GHz Multiband Contests staged in parallel with the Region 1 IARU UHF/SHF Contests. As a result on considerable discussion, The RSGB Microwave Committee feel there is no need to add yet a third "layer" of contest activity on those weekends.

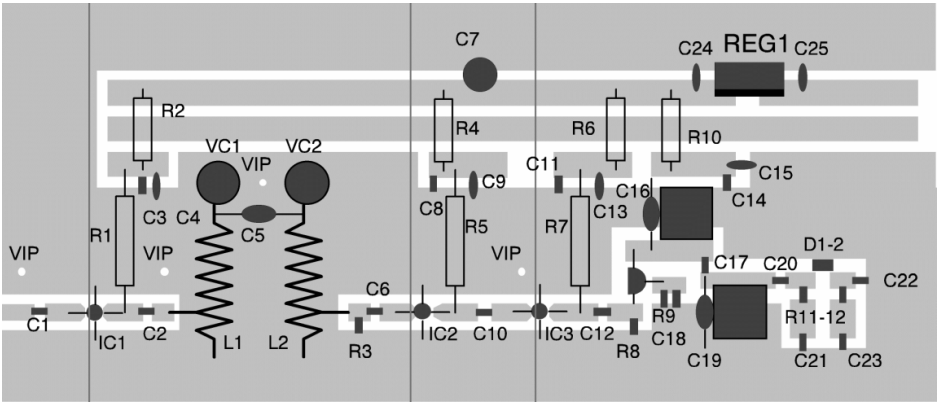
The 10GHz Trophy is run by the VHF Contest Committee on the 4th May, and the rules can be found in the VHF contest rules.

In addition there are many other Continental UHF/SHF Contests held over the summer months and interested UK microwavers are urged to be active during these. Their details may be found on the Internet.

MICROWAVE CONTEST CALENDAR 2003

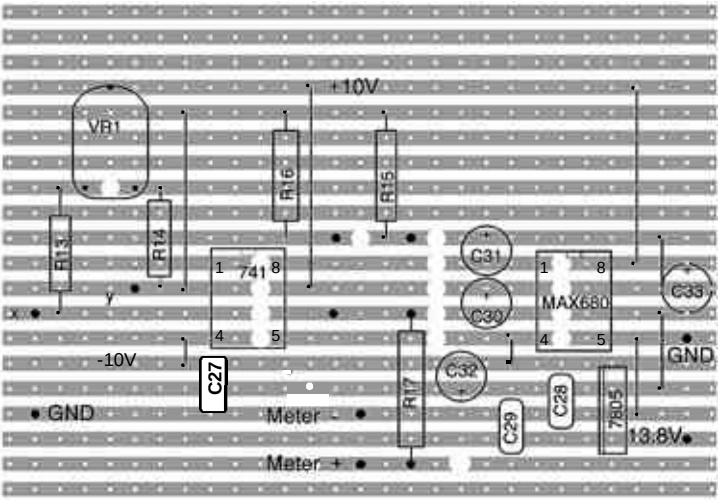
Dates, 2003	Time (UTC)	Contest name	Sections
26 Jan	0900 - 2100	All-band Activity Day	Non competitive
23 Feb	0900 - 2100	All-band Activity Day	Non competitive
30 Mar	0900 - 2100	1.3GHz/2.3GHz/3.4GHz	Open
13 Apr	0900 - 2100	1st 24GHz Cumulative	Open
3 May		10GHz Trophy	See VHFCC Rules
25 May	0900 - 2100	1st 5.7GHz Cumulative	Open
25 May	0900 - 2100	1st 10GHz Cumulative	Open, Restricted, WB
22 Jun	0900 - 2100	2nd 5.7GHz Cumulative	Open
22 Jun	0900 - 2100	2nd 10GHz Cumulative	Open, Restricted, WB
13 Jul	0900 - 2100	2nd 24GHz Cumulative	Open
27 Jul	0900 - 2100	3rd 5.7GHz Cumulative	Open
27 Jul	0900 - 2100	3rd 10GHz Cumulative	Open, Restricted, WB
10 Aug	0900 - 2100	3rd 24GHz Cumulative	Open
31 Aug	0900 - 2100	4th 5.7GHz Cumulative	Open
31 Aug	0900 - 2100	4th 10GHz Cumulative	Open, Restricted, WB
21 Sep	0900 - 2100	5th 5.7GHz Cumulative	Open
21 Sep	0900 - 2100	5th 10GHz Cumulative	Open, Restricted, WB
28 Sep	0900 - 2100	47GHz and 76GHz	Open
19 Oct	0900 - 2100	6th 5.7GHz Cumulative	Open
19 Oct	0900 - 2100	6th 10GHz Cumulative	Open, Restricted, WB
30 Nov	0900 - 2100	1.3GHz/2.3GHz/3.4GHz	Open
28 Dec	0900 - 2100	All-band Activity Day	Non competitive

G4NNS NOISE AMPLIFIER (continued)



Above: Main amplifier pcb tack and component layout

Below: DC amplifier Veroboard layout. Note that C26 is missing from this diagram and should be soldered from the +10V line to ground at a convenient point (eg across pins 5 and 8 of the MAX680)



G4NNS NOISE AMPLIFIER—COMPONENT LIST

R1	100R Ax	
R2	1R Ax	
R3	51R SMD	
R4	1R Ax	
R5	120R Ax	
R6	1R Ax	
R7	82R Ax	
R8	100K SM	
R9	2K2 SM	
R10	100R Ax	
R11	10K SM	
R12	10K SM	
R13	1M0 Ax	
R14	1M0 Ax	
VR1	1M	
R15	1M Ax	
R16	100K Ax	
R17	SOT	
VR1	1M0	
VC1	22pF	
VC2	22pF	
L1	6T 6mm id	
L2	6T 6mm id	
L3	MC119 1.5T	1st 10 SAE to G4NNS
L4	MC119 1.5T	or try BONEX
Q1	J310	
IC4	741	
IC5	MAX 680	Farnell 246_451
REG1	7810	
REG2	7805	
IC1	MAR8	
IC2	MAR8	
IC3	MAR8	
D1-2	BAT 54C	Farnell 302_284

C1	1nF SM
C2	1nF SM
C3	1nF SM
C4	100nF SM
C5	3.3pF Rad
C6	1nF SM
C7	10uf Tant
C8	1nF SM
C9	100nF SM
C10	1nF SM
C11	1nF SM
C12	1nF SM
C13	100nF SM
C14	1nF SM
C15	100nF SM
C16	33pf Rad
C17	2.2pF SM
C18	1nF SM
C19	33pF Rad
C20	22pF SM
C21	1nF SM
C22	1nF SM
C23	1nF SM
C24	100nF SM
C25	100nF SM
C26	100nF Rad
C27	100nF Rad
C28	100nF Rad
C29	100nF Rad
C30	4.7 uF
C31	4.7 uF
C32	4.7 uF
C33	4.7 uF

MACOM SYNTHESIZER - PE334

At recent rallies and Microwave Roundtables there have been for sale a range of microwave synthesiser bricks. The data sheet supplied with these had several errors and this note has been provided to help users get them working.

Power supply requirements:

+20V at approximately 400mA for the analogue circuitry on the pin marked
+5V at 150mA for the logic

Frequency control is via a 26 way IDC type connector, with TTL level signals on 12 parallel lines. Logic level is positive true, and the lines float high to a logic '1', they need to be pulled to ground for a logic '0'. The pin configuration is detailed below, shown looking at the synthesiser module.

Pin 1 is missing.
25 23 21 19 17 15 13 11 9 7 5 3 (1)
26 24 22 20 18 16 14 12 10 8 6 4 2

Connections :

1 to 11	No connection	19	B5
12	B11 (MSB)	20	B4
13	B10	21	B3
14	B9	22	B2
15	B8	23	B1
16	B7	24	B0
(LSB)			
17	B6	25	Ground
18	No Connection	26	Ground

There are four types of synthesiser module covering different frequency bands and step size:

SAC12-01	4.7 - 5.1GHz	Step size	0.625MHz
SAC32-00	6.35 - 6.76 GHz	Step size	0.25 MHz
SAC32-01	6.65 - 7.16 GHz	Step size	0.25 MHz
SAC42-01	10.95 -11.45 GHz	Step size	3.125 MHz

Programming

The three lowest frequency units are programmed by applying a straightforward binary code to the 12 parallel programming lines. The frequency of each of these can be set by determining the value of the programming number, N, then applying this value to the lines. The 11GHz module requires two separate six bit programming numbers to be calculated.

SAC12-01	Freq (GHz)	=	2560 + 0.625.N	or	N = 1.6 * (F - 2560)
SAC32-00	Freq	=	6160 + 0.25.N	or	N = 4 * (F - 6160)
SAC32-01	Freq	=	6144 + 0.25.N	or	N = 4 * (F - 6144)
SAC42-01	Freq	=	8000 + 125.L + 3.125.M		

For example, to set the SAC32-00 to 6400.25MHz,

N = (6400.25 - 6160) * 4	=	961	
Convert to Hex / Binary	=	0x3C1	= 001111 000001

Only frequencies that are within (or close to) the allowed frequency bands can be programmed, thus the full range of programming numbers possible are not all valid, any attempt to set these invalid codes results in the synthesiser VCO free running. *It is possible that by adjusting the VCO centre frequency by tuning the cavity, the lock range can be moved. This has not yet been tried.*

The X band module, SAC42-01 is more complex in its frequency setting than the other types. The control lines do not all follow a simple binary sequence but are weighted as follows :

B0 - B5 Six bit binary value M giving 64 * 3.125 MHz steps up to 200MHz
B6 - B11 Six bit binary value L giving the 125 MHz steps.

Note that in some cases a specific frequency may be obtainable with more than one programming code, codes within the ranges shown in the examples below have been tested :

10850 MHz	=	0x5A0	=	010110 100000	Below lower freq spec.
11000 MHz	=	0x600	=	011000 000000	
11125 MHz	=	0x628	=	011000 101000	Two codes for this freq
11125 MHz	=	0x640	=	011001 000000	" " "
11275 MHz	=	0x670	=	011001 110000	
11400 MHz	=	0x6B0	=	011010 110000	
11571.875 MHz	=	0x6FF	=	011011 111111	Above frequency spec.

G4JNT 2002/11/29

13cm MOONBOUNCE REPORT

From: Peter K. Blair
[100633.1656@compuserve.com]

I was active in the November ARRL E.M.E contest on 13cm and on the 23rd November I worked 6 stations W5LUA, F2TU, OZ4MM, OE9XXI, JA4BLC and LX1DB. The OE and LX were 2 way on 2320MHz but all the others were cross band. I heard WA6PY but he could not hear me on 2320 due to local noise from local computer comms systems. This is with a 2.4m dish and elevation, so its a serious problem ... heading our way I suspect. I did work him in October but since then the problem has worsened.

I also heard DK7LJ, who had receiver problems and only works ssb (!) and OK1CA.

Scores overall in the contest were down due to bad wx , I worked 48 stations on 1296 and 39 on 432. Equipment is a 6m dish, 50W at feed and 0.4dB NF. The work I did in the summer on resurfacing the dish certainly has paid off. A 3.4GHz system is under construction.

Beacon News ..

A new **23cm beacon, DB0RG**, has become active on 1296.936MHz Germany from JO51GO.

After being damaged by vandals (ie shot at!!) the **GB3AMU 24GHz** Cardiff beacon has been serviced and rehoused in what is hopefully a bullet proof box! It has been set a little higher than its nominal frequency so that it should be on frequency in Spring and Autumn but slightly off during the extremes of winter and summer. Reports would be very welcome! Send to Keith,GW3TKH via email at **GW3TKH@aol.com**

New UK 3.4GHz Beacon ...

From: Martyn Vincent G3UKV
[ukv@globalnet.co.uk]

As planned, we got the 3400.910 MHz beacon operational in mid December 2002, albeit on QRP at present, to a single antenna, with 120 degree beamwidth.

Callsign: GB3ZME
Frequency: 3400.910 MHz
Locator: IO82SQ40
QTH: Telford, Shropshire
Altitude: 198 m.a.s.l
Power: 200mW output (pending increase to about 15 watts in the New Year.)
Antenna: Ionica 3.4GHz slots 14 dB gain. Single unit (120 degree beamwidth, centred eastwards) to be increased to 3 units to give omni directional output in the near future, if no problems encountered. Height approx. 10metres AGL.
Operational: 11:30 hrs on Sunday 15 December 2002.
Reports: Very welcome, **PLEASE.** (G3UKV) ukv@globalnet.co.uk or phone 01952 255416

RADIO HEADPHONES ~ A HANDY TIP FOR PORTABLE MICROWAVE USE

Cordless headphones are readily available in both infrared and radio transmitted versions. So if you need to 'listen' to your receiver or transceiver whilst adjusting something in a remote location, say the aerial in the garden or connections in the attic etc, you could connect a radio cordless headphone transmitter to the audio output of the equipment in the shack and you are then able to listen to the results as you are actually adjusting the aerial, thus saving lots of running back and forth, or you and the XYL shouting the odds at each other. Radio headphones will work when you don't have a line of sight optical path, e.g. through walls and fences etc.

10GHz Tests ~ G3LRP/G4ALY

Editor's comment: *The following account, kindly supplied by Ralph Bird, G4ALY, details a series of 10GHz between G3LRP and himself over the latter quarter of 2002. These tests began after G3LRP's daily skeds with Tim, G3KEU, came to a sad end when Tim passed away earlier in the year. What should encourage all of us to try something similar is the fact that the distance involved is almost 400km and contacts are being made by a variety of propagation modes, mainly aircraft scatter. The path (IO71VL to IO93HO) is a difficult one and would certainly deter the casual operator used to RS59 reports! What you read from now on shows what weak signal microwave DXing can be about and how two stations have steadily improved their systems to get more reliable results. We'd be keen to hear of other stations doing similar things on the microwave bands....*

Peter G3LRP and I (G4ALY) have been conducting tests on a regular basis since the 1st of October 2002. The path is not particularly good and the distance is 398.8km give or take a fraction of a km. Operating Frequency is 10368.120MHz. We use accurate (MSF) Clocks and set 3 minute TX/RX periods pre-arranged by telephone. The contacts have been mainly on aircraft scatter, though some rain and lift conditions have played a part with some tests (not many). Most contacts have gone best during dry spells. One exception to this was when, prior to the test period, we had an excellent rainscatter contact on SSB on Aug 7th 2002 at rst 55/56 as well as a cw contact at 559/569.

All these test contacts have been on cw at around 20wpm. All contacts have taken place around 1830/1930 local time with two exceptions.

G4ALY station Equipment: A 75cm Hirschman offset dish with a dual mode horn up at 26ft above ground on a site 138.6m ASL. I'm using a DB6NT MRU10G2 Transverter front end (Nf 1.2dB) using internal oscillator and no preamplifier, a DL2AM, 5 watt amplifier. I also use an SMA relay, rather than a waveguide switch for antenna c/o. The IF at the moment is an IC202 modified for volts on TX. I also use a DSP filter to recover the sometimes very weak signal. The use of a PIC beacon saves the elbow a little! I swap to an electronic keyer for transmitting the report information. Frequency accuracy is very important to cut down on variables. Using an Adret synthesizer, locked on to Droitwich, driving a G8ACE multiplier board, gives me accurate markers on the 96th harmonic of 108MHz. The dish bearing is also accurate to within a degree, my antenna rotator being the excellent worm gear driven Pro.Sis.Tel "Big Boy".

G3LRP's Station Equipment: A 60cm offset dish with dual mode horn, set up on small stub mast clamped to the shack window ledge, 6m above ground at 101 m.a.s.l. he transverter is a DB6NT type with a DB6NT 0.65dB NF preamplifier in wave guide. The power amplifier, up to the 4th Octobe,r was a 5 watt DB6NT, after which a 15 W DL2AM amplifier was used. Antenna c/o is by a remotely controlled waveguide switch. The IF is an IC706. Frequency accuracy is ensured by using a DF9LN OCXO, left on permanently and checked by a G4JNT off air standard at 108MHz, driving a diode multiplier, in WG16, as a marker at 10368.000MHz.

Test results were as follows: (I have kept a log of WX and Barometric pressure at the time of the tests on most occasions but no accurate signal levels measured)

October: 23 two way contacts made. 6 days where no tests were conducted. 1 failed attempt. 2 one way only. 4 contacts of the total 23 made on same day one in the morning and one in the evening on the 1st Oct. One in the morning and one in the evening of the 15th Oct.

November: 19 two way contacts made. 7 days when no tests were conducted. 1 failed attempt. 3 one way only.

December: 22 two way contacts made. 6 days when no tests were conducted. 1 failed attempt. 1 one way only.

Total of successful contacts: 64 out of 73 attempts for these tests were achieved.

These trials are still continuing into 2003 but the transmit/receive times have been reduced from 3 minutes to two. Nevertheless, several complete contacts have been made by aircraft reflection in as little as ten minutes.

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NEWS FROM AROUND THE UK

From Dave, G0RRJ [g0rrj@btopenworld.com]
Here's a summary of my microwave contacts made from Andover, during 2002:

23cm: 90 different stations. DX EA1CRK @908KM
13cm: 9 different stations. Best DX G3XDY @213KM
3cm: 38 different stations. Best DX PA0WWM @428KM

My winter project this year has been to rebuild my 2320MHz station which is now complete except for a new antenna. I now have a DB6NT 144/2320 transverter, DB6NT 20W PA, DB6NT sequencer and 12v to 24v converter, all built into a diecast box. I've installed the system in the loft, by doing this I've eliminated 9 metres of LDF450 (1.12dB) and as a result I now only have 4.5 metres of LDF450 between the 25 ele 2320MHz Tonna and the transverter. So far, I have worked G1JRU, G4LDR & G4BRK. I hope to replace the antenna with a long yagi very soon. Prior to shortening my LDF450, I could not detect the GB3SCS beacon. However, from time to time, I can now detect it, hearing it strongest when its been raining hard. This has happened on two occasions. I am looking for QSOs and can be contacted on my new email address: **g0rrj@btopenworld.com**

From: John, G3XDY [g3xdy@btinternet.com] in Suffolk:
I've not been very active here for the past few weeks - busy at work and on other things at home. Also conditions have been dire, which has hardly encouraged activity!

Final scores for the Microwave League 2002 are:

1.3GHz	161 worked	DX 978km
2.3GHz	57 worked	DX 923km
3.4GHz	19 worked	DX 500km
5.7GHz	19 worked	DX 415km
10GHz	70 worked	DX 947km

I'm looking forward to seeing how the new Microwave contest calendar works out this year and to some more activity on 3.4GHz and 5.7GHz as a result. I'm not sure that making the VHFCC activity contests on the third Tuesday all band affairs will be a good idea in practice, as it will dilute activity on 1.3GHz as people disappear off to the higher bands for several minutes at a time.

From: David Wrigley, G6GXK, Rochdale, Lancs. [davidwrigley@ntlworld.com]
I'm hoping that by January I will have completed the DSP-10 transceiver as a 144MHz IF for microwave. I am also building up a new portable operating console and the cabling for it, so that I can control the 2.2m trailer mounted dish and 10GHz transverter from the dry warmth of the car. It should make portable operating a more pleasant experience, so I might get out a bit more and also avoid my name appearing as a "no-show" on G3PHO's annual Martlesham "who's been active?" list for 2003!

FINAL CALL!

The 2002 Microwave League Table is now closed and final scores should reach the Newsletter Editor within two weeks of you receiving this newsletter. The tables will be published in next month's Newsletter so don't "miss the boat" if you want your scores included! For the latest positions you can always find the tables and rules on the Internet at:

http://www.g3pho.free-online.co.uk/

Many thanks to those who sent in their scores just after the Christmas period.

Our thanks go to the contributors to this month's issue, G4NNS, G4JNT, G4ALY and G3LRP, together with those who sent in activity news.

We also still have on file material from W3HMS WA5VJB and PA0EZ. Unfortunately the pressure on available space this month was too great for these to be included but we will publish their stuff in the next issue … promise!

Look out also for, coming soon, details of the 2003 Microwave Update convention to be held in Seattle, USA at the end of September 2003. It looks like being a great event once again so start searching the Web for those bargain airfares!