

# MICROWAVING IN THE UK



a look at how it's done on the other  
side of the Big Pond

~ by Peter Day, G3PHO



# First we need a Geography lesson!



Microwaving in the UK is greatly influenced by its geographical location:

- On the Western edge of Europe
- Has a moist maritime climate like British Columbia





# Did you know that

- The state of Texas is almost 3 times larger in area than the UK ?
- That the population of Texas is around 3 times smaller than the UK's ?



# The “North South” Divide and the “Microwave Wilderness”

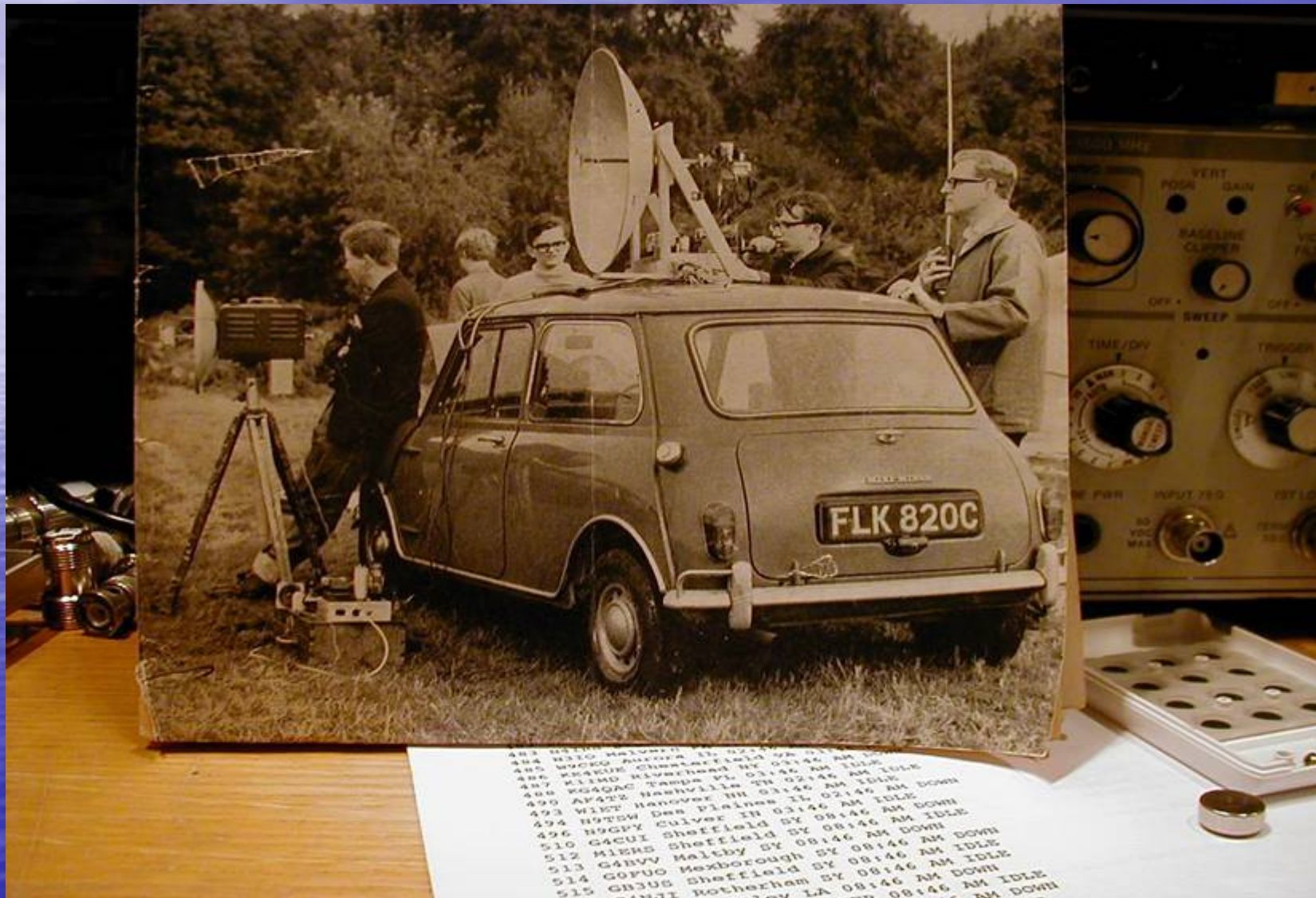


# The North of Britain ... a microwave wilderness



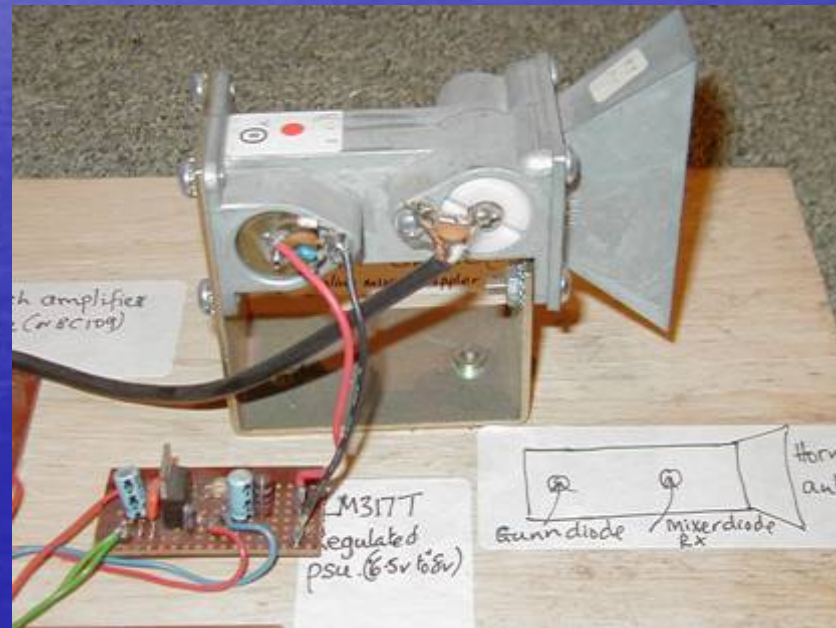


# In the Old Days ...





# It was all klystrons and then Gunn diodes ...



# Ascending the Cairnsmore of Fleet, SW Scotland September 1973





# 10GHz DXing with WIDEBAND GUNNPLEXERS 1985

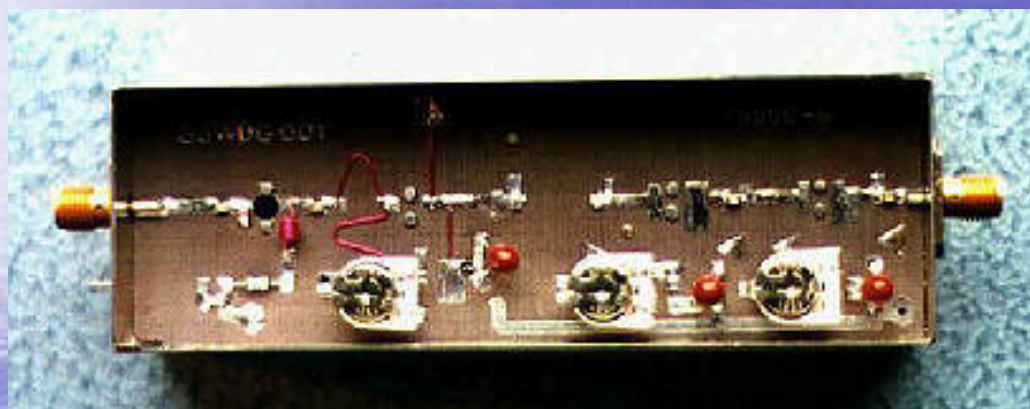


**1985: GM3PHO/P and GM1BHQ/P** on the Cairnsmore of Carsphairn, Galloway, SW Scotland in contact with Eric, **GW3MWN/P** on Snowdon summit. Both stations were using 10mW Gunn transceivers on 10GHz wideband FM over the 245km Line-of-Sight UK DX record distance.

# Then along came narrowband ...

- In the 1980s G3JVL developed a 10GHz transverter in waveguide
- This was copied to other, lower bands
- Bulky and low power (0.5mW) ... 8dB NF





In the early 1990s, Charlie Suckling, G3WDG and Sam Jewell, G4DDK developed modules based on PCB circuitry. These were made available in kit form and revolutionised UK 10GHz operating!

# Kits from the RSGB

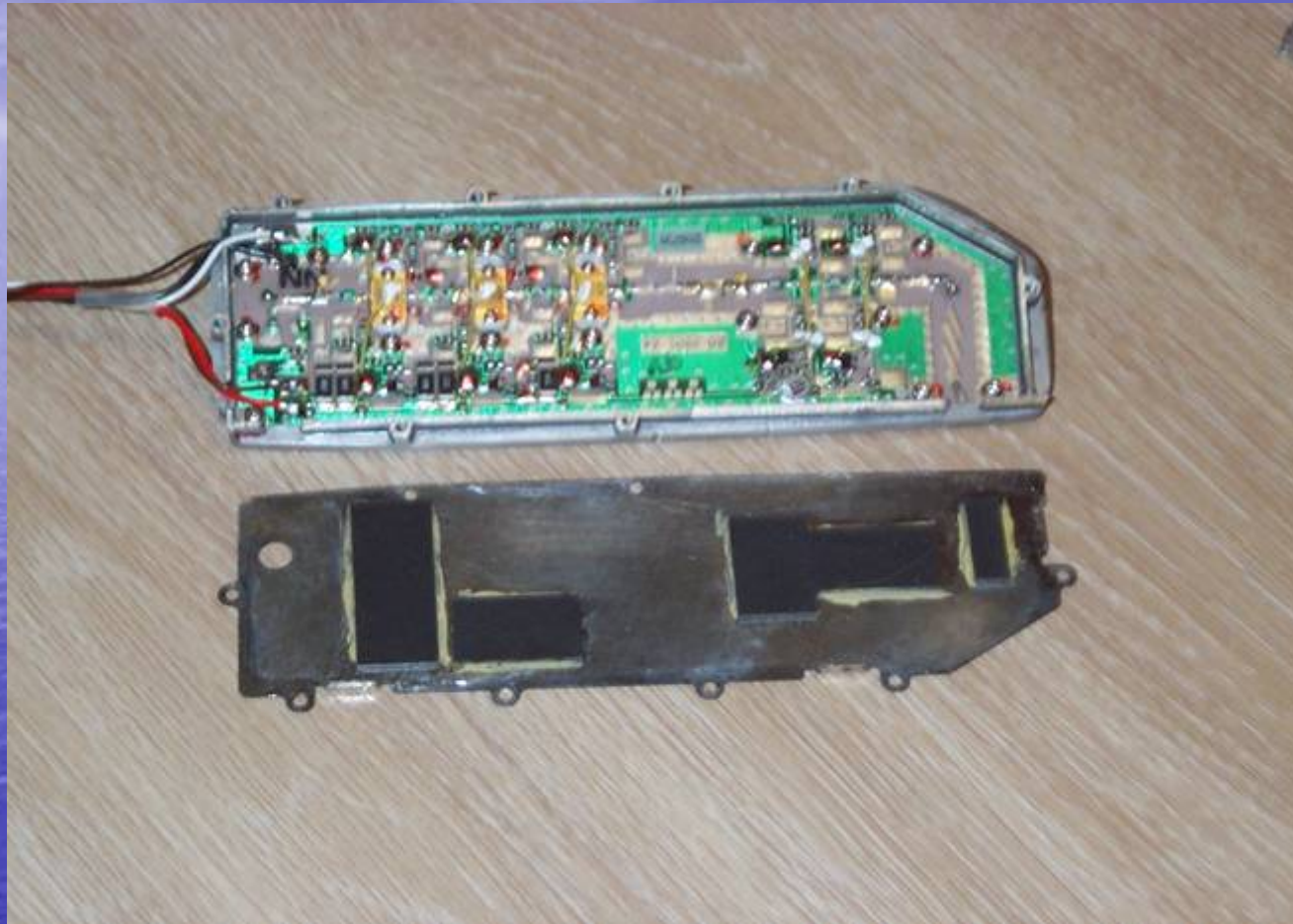




# Narrowband changed the face of UK microwaves ...

- The gear has become more powerful and therefore greedier in terms of batteries
- Gone are the days of light weight hill topping and backpacking up Scottish mountains!
- Portable these days means from a car or van
- Home station operation is now very common (unusual on 10GHz before 1985)

# QUALCOM 10GHz PA



Thanks Kerry and Chuck !





**Left: G3PHO/P in the mid 1980s**

The complete station, 10GHz Gunn transceiver and 144MHz talkback ssb transceiver, 24" dish and support mast all fitted in a rucksack and was carried up 3000 foot mountains!

**Right: G3PHO/P in 2004**

**PROGRESS?**



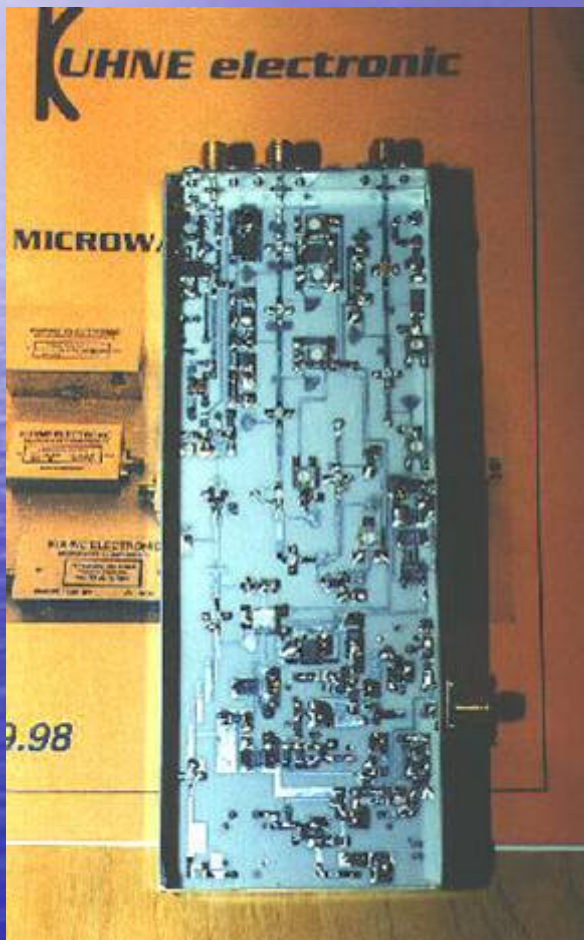
# 21<sup>st</sup> Century UK Microwaving

- 99.9% of UK phone/cw microwaving is narrowband
- Wideband FM has almost disappeared
- Entry level on 10GHz is now 1 watt (5mW in 1975 !)
- Many stations run several watts, even up to 24GHz
- Many more home stations compared to 1980s
- Microwave EME is on the increase
- Rapid growth in highly stable local oscillators and accurate frequency measurement due to the work of G8ACE, G4JNT and G6G XK
- Widespread adoption of DB6NT kit sets

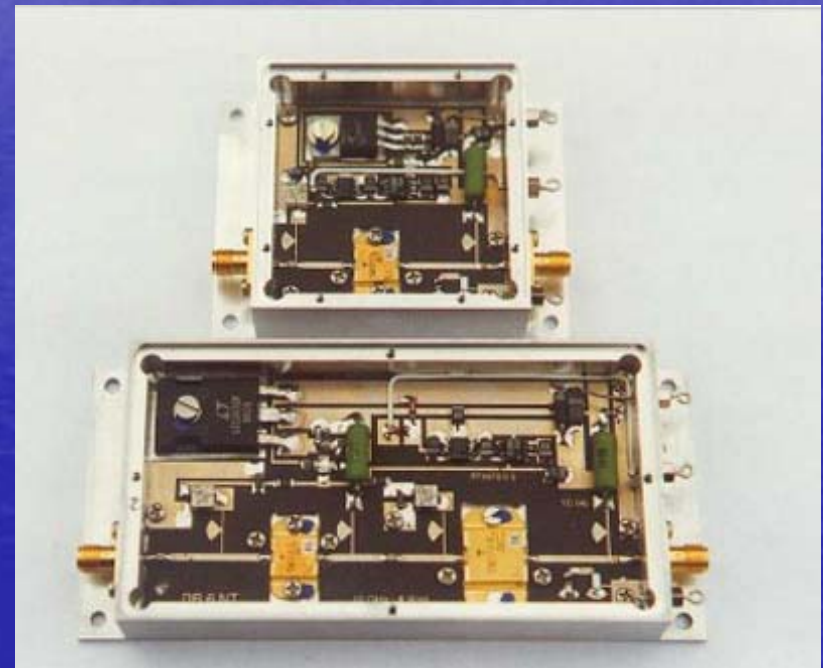


# DB6NT

~ making microwaves accessible to all



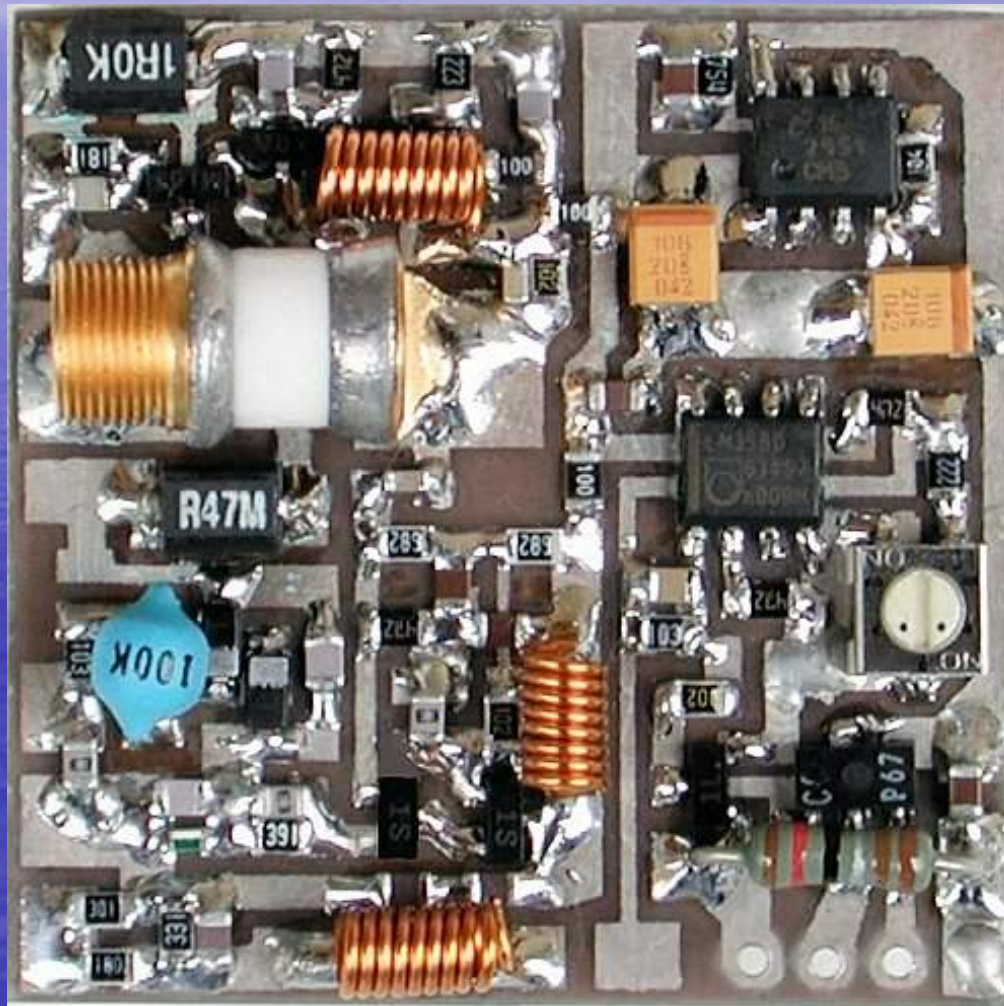
# Modules from DB6NT Kuhne Electronic





# THE G8ACE OCXO

~ keeping the UK stable !





# Michael Kuhne ~ DB6NT rules!





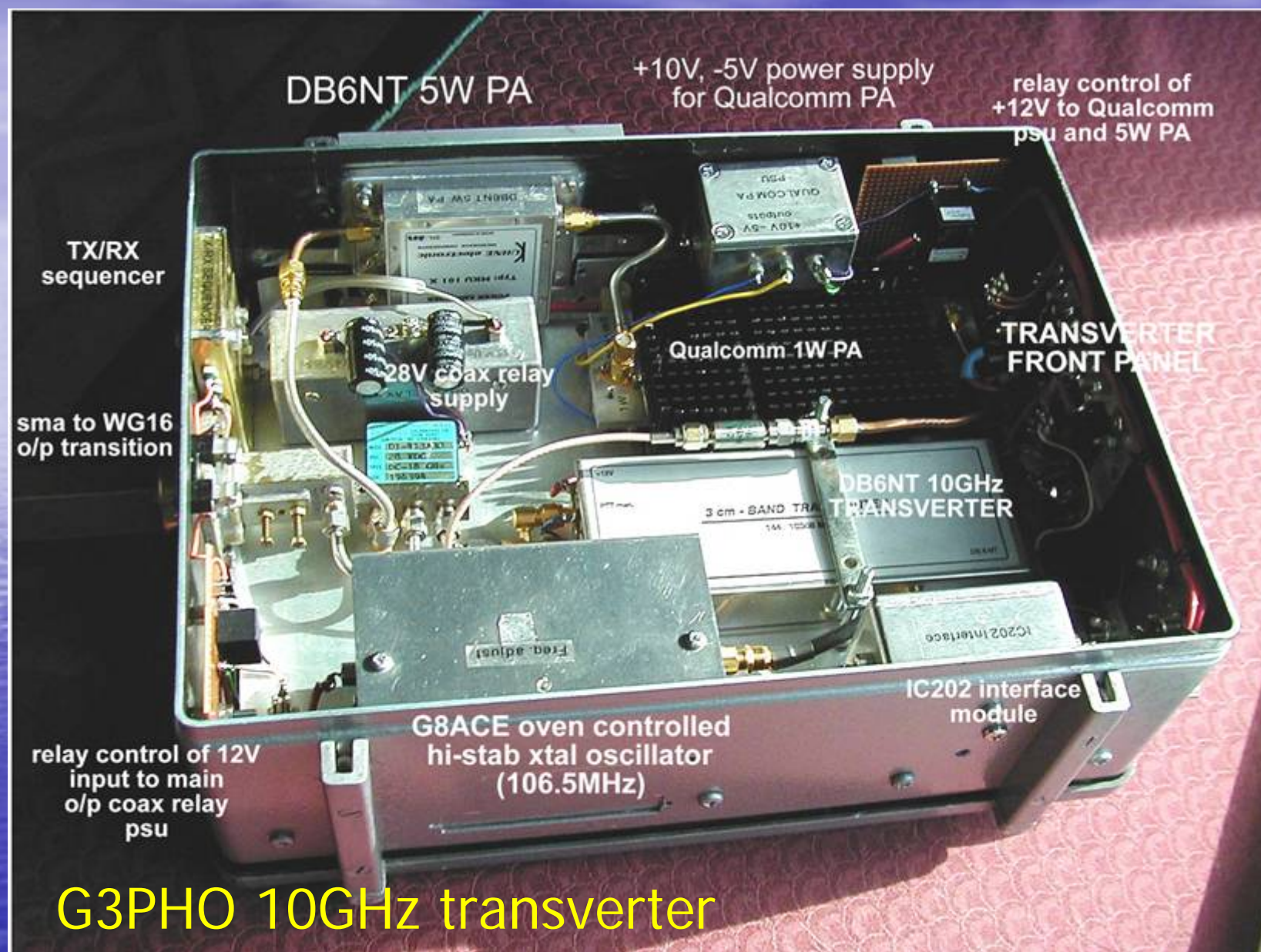
# GREAT MINDS THINK ALIKE?



G8ACE

DB6NT







# UK Microwave Bands 2004

23cm	1240 - 1325MHz	NB 1296 - 1298MHz
13cm	2310MHz - 2450MHz	NB 2320 - 2322MHz
9cm	3400 - 3475MHz	NB 3400 - 3402
6cm	5650 - 5850MHz	NB 5760 - 5762MHz
3cm	10.0 - 10.125GHz	ATV and other wb modes
3cm	10.225 - 10.500GHz	NB 10.368GHz
12mm	24.0GHz - 24.250GHz	NB 24.048GHz
6mm	47.000 - 47.200GHz	NB 48.088GHz
4mm	75.5GHz - 81.0GHz	
2mm	144 - 144GHz	
1.2mm	248 - 250GHz	

**We also have the following bands:**

122.25 - 123GHz, 134 - 141GHz, 142 - 144GHz (until end 2006)  
241-248GHz

# UK MICROWAVE BAND OCCUPANCY 2004

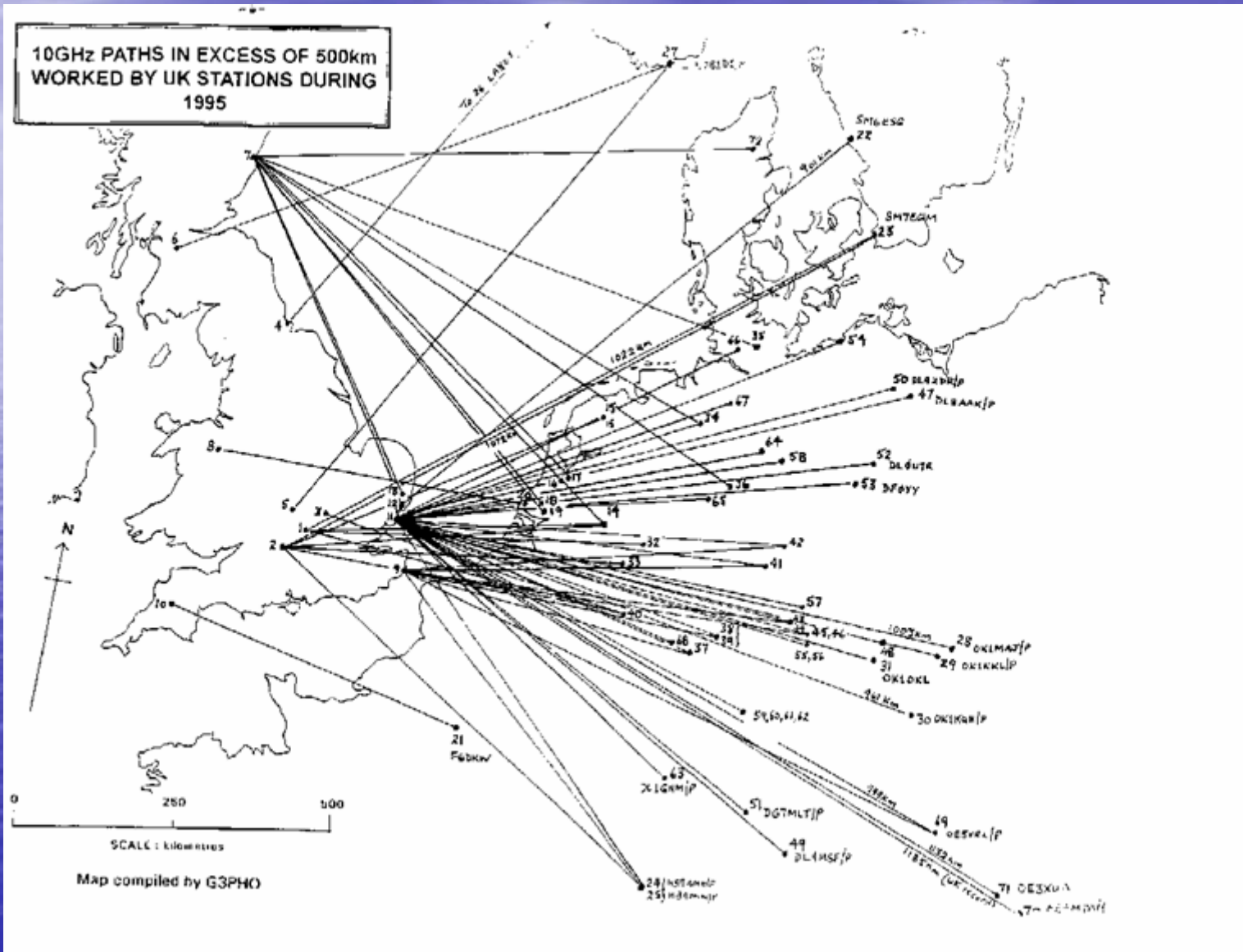
23cm:	100-200 operators
13cm:	less than 100
9cm:	10 – 20
6cm:	15 – 20
3cm:	c. 100
24GHz:	35
47GHz:	10 - 12
76GHz:	8 - 10



# **UK Microwave Terrestrial Records**

• 1.3GHz	2617Km
• 2.3GHz	1083Km
• 3.4GHz	980Km
• 5.7GHz	1244Km
• 10GHz	1275Km
• 24GHz	391Km
• 47GHz	203Km
• 76GHz	79.6km
• 145GHz	1.29km
• Light (red)	76km

# When conditions are good .....





# TYPICAL HOME BASED MICROWAVE STATIONS

- Mast head mounted transverters
- Typically 10 watts on 10GHz
- Ex SAT TV dishes 60-90cm common
- RF talkback liason 144.175MHz
- Increasing use of Internet "talkback" via the ON4KST Microwave chat room and the Convers network

# G4ALY IO70VL , Cornwall





# G3XDY ~ JO020B

John is the leading terrestrial microwave operator in the UK and operates all bands 23cm up to 10GHz



Band	Grids	Countries	Best DX
23cm:	133	25	1561 km
13cm:	56	13	1176
9cm:	21	5	980
6cm:	33	9	1240
3cm:	58	14	1240



# G0RRJ ~ IO91FE



Dave's home and available land space is typical of the UK ... small plots and complaining neighbours!



# G4NNS

## IO91FF

Brian is one of the  
leading UK 10GHz  
moonbouncers



# PORTABLE MICROWAVERS

- 50% of UK 10GHz and 5.7GHz contest entries are from portable stations
- 24GHz almost entirely portable operation
- Higher bands 100% portable
- US style "roving" not yet popular



# EXAMPLES OF UK PORTABLE MICROWAVE STATIONS



# Paul M0EYT/P uses 2.4GHz WLAN for internet talkback !





# G4ZXO/P 1090TV South Coast





Portable  
microwavers  
like hard work

The G4ZXO/P team pull  
their microwave gear up  
to the summit of the hill  
using a set of wheels and  
the VHF mast as a  
trailer!





# GM4PLM/P ... a rare excursion into the microwave wilderness!



Located on the Mull of Galloway,  
SW Scotland in IO74.

G8IFT/P

# South Birmingham Radio Society

Here they are set up on Brown Clee Hill in Shropshire with gear for most microwave bands to 47GHz.





G3PHO/P in IO85VE  
(in the microwave "wilderness")  
July 2004







Getting ready to go  
out portable



Lots of gear to  
carry



That's it all in the van



But there's lots left  
filling up the garage!





**G3PHO/P**

12 watts on 5.7GHz  
5 watts on 10GHz  
1.2m prime focus dish

# Operating position at G3PHO/P





# The Millimetre Men ....



**John G8ACE    and    Peter G3PYB**



John  
G8ACE/P



G3FYX, G8BKE and G3PYB receive  
the G3BNL Trophy for their efforts  
on the millimetre bands



Martin G7MRF





David G8VZT



# G3PHO/P on 24GHz and 47GHz

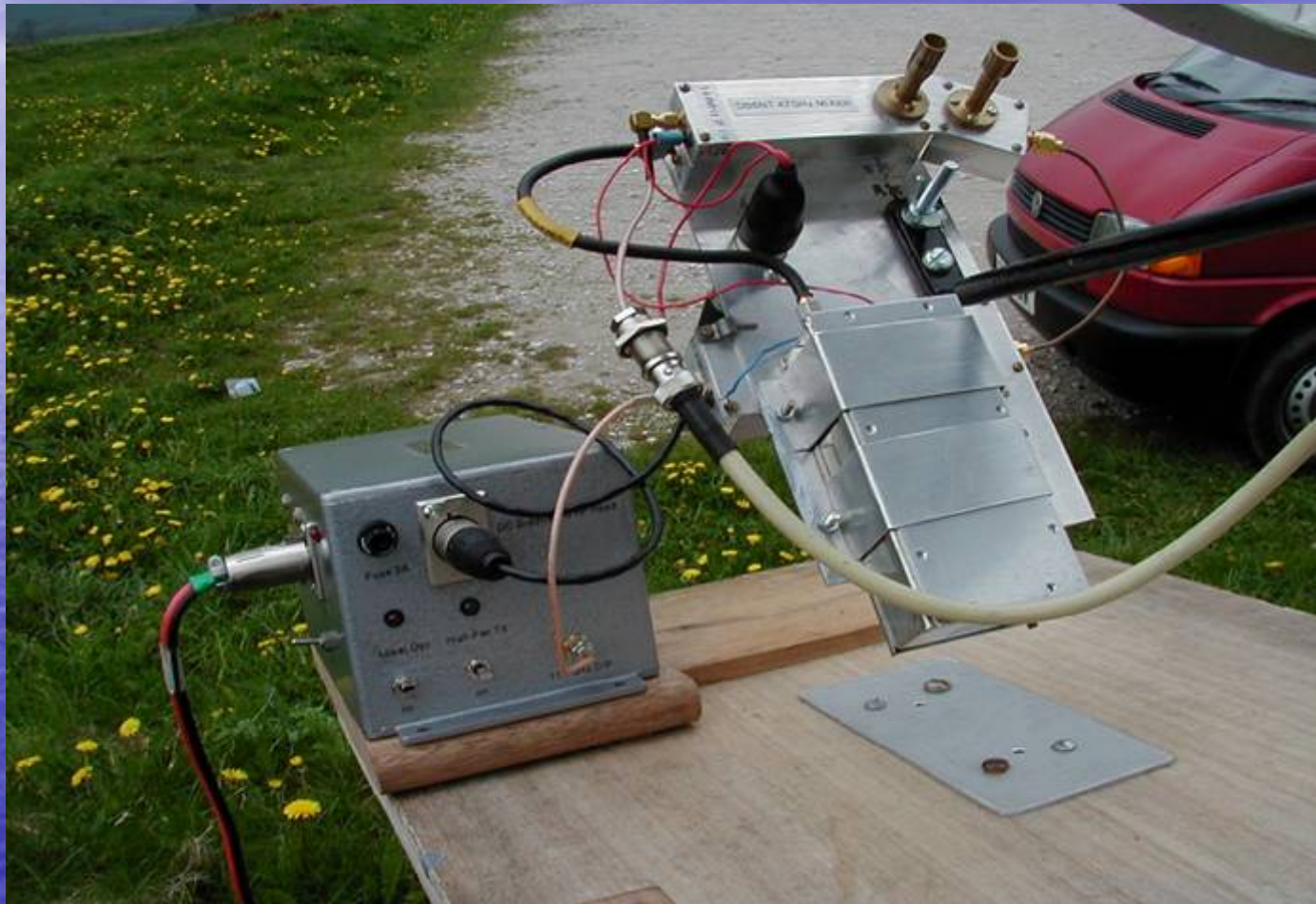


2 watts on  
24GHz to  
60cm offset  
dish

22 milliwatts on  
47GHz to 35cm  
offset dish



# 47GHz transverter at G3PHO/P



# 24GHz ~ the neglected band

- “Flood” of half watt PAs from Endwave in the USA ...now estimated to over 50 in the UK!
- Seven 2 watt PAs arrived from USA via Paul Drexler W2PED
- But still low activity!





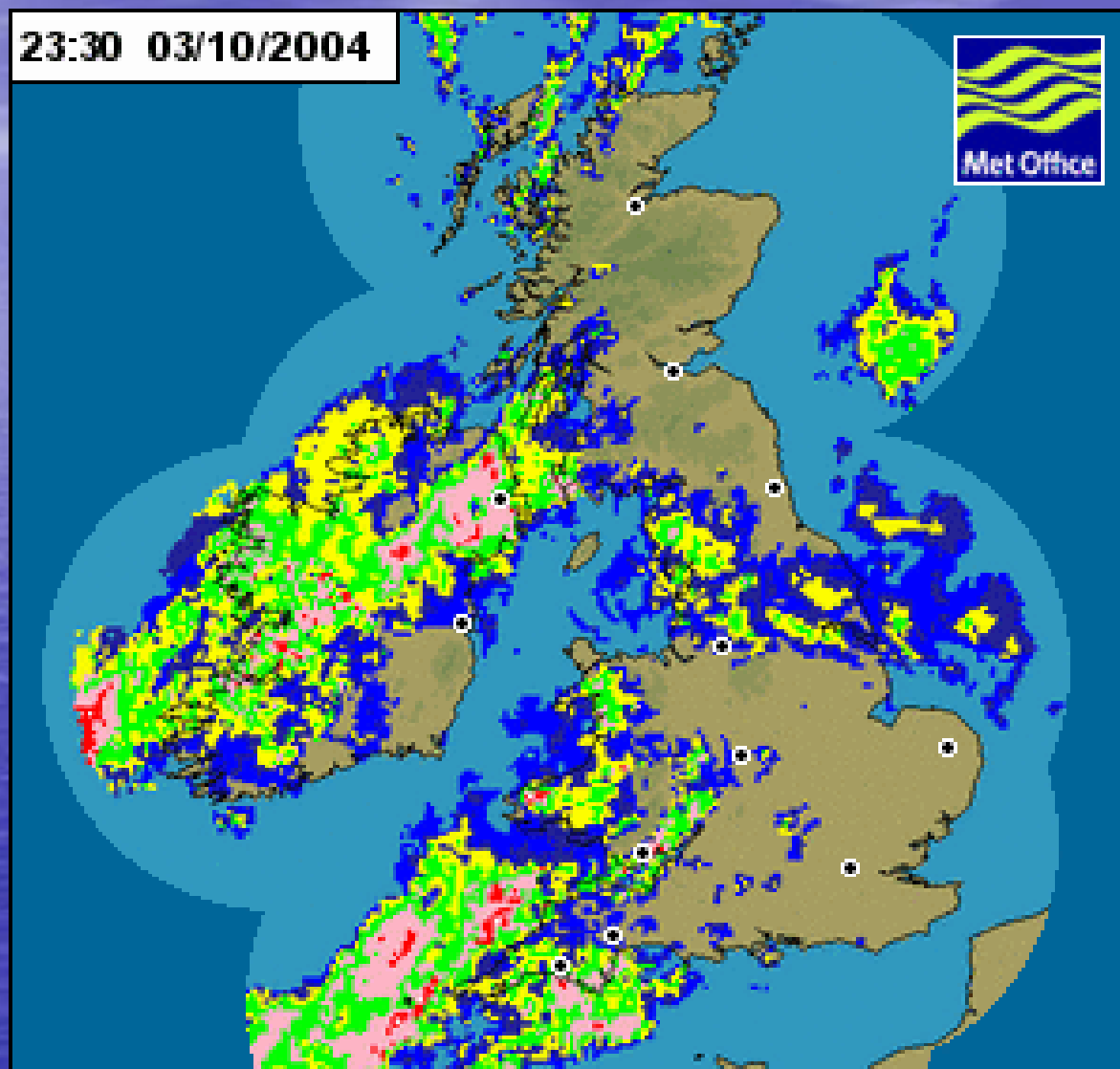
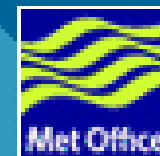
# Why G3PHO goes /P !



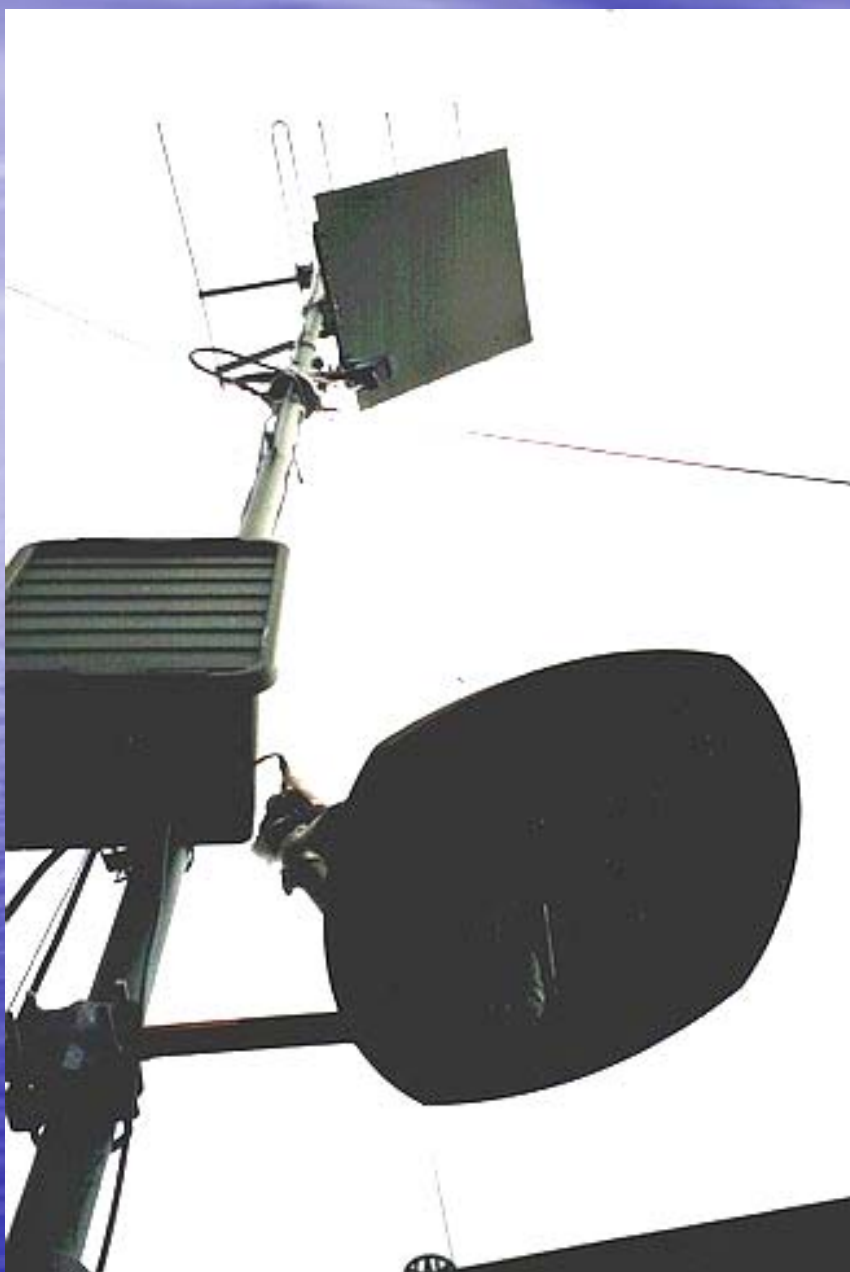
The view from the G3PHO home QTH ... clear only from 070 to 130 degrees. The rest looks straight into hillsides within a few yards.

# RAINSCATTER

23:30 03/10/2004







**GW3ATM** uses  
this flyswatter  
on 10GHz to  
make  
rainscatter  
contacts from  
an "impossible"  
QTH

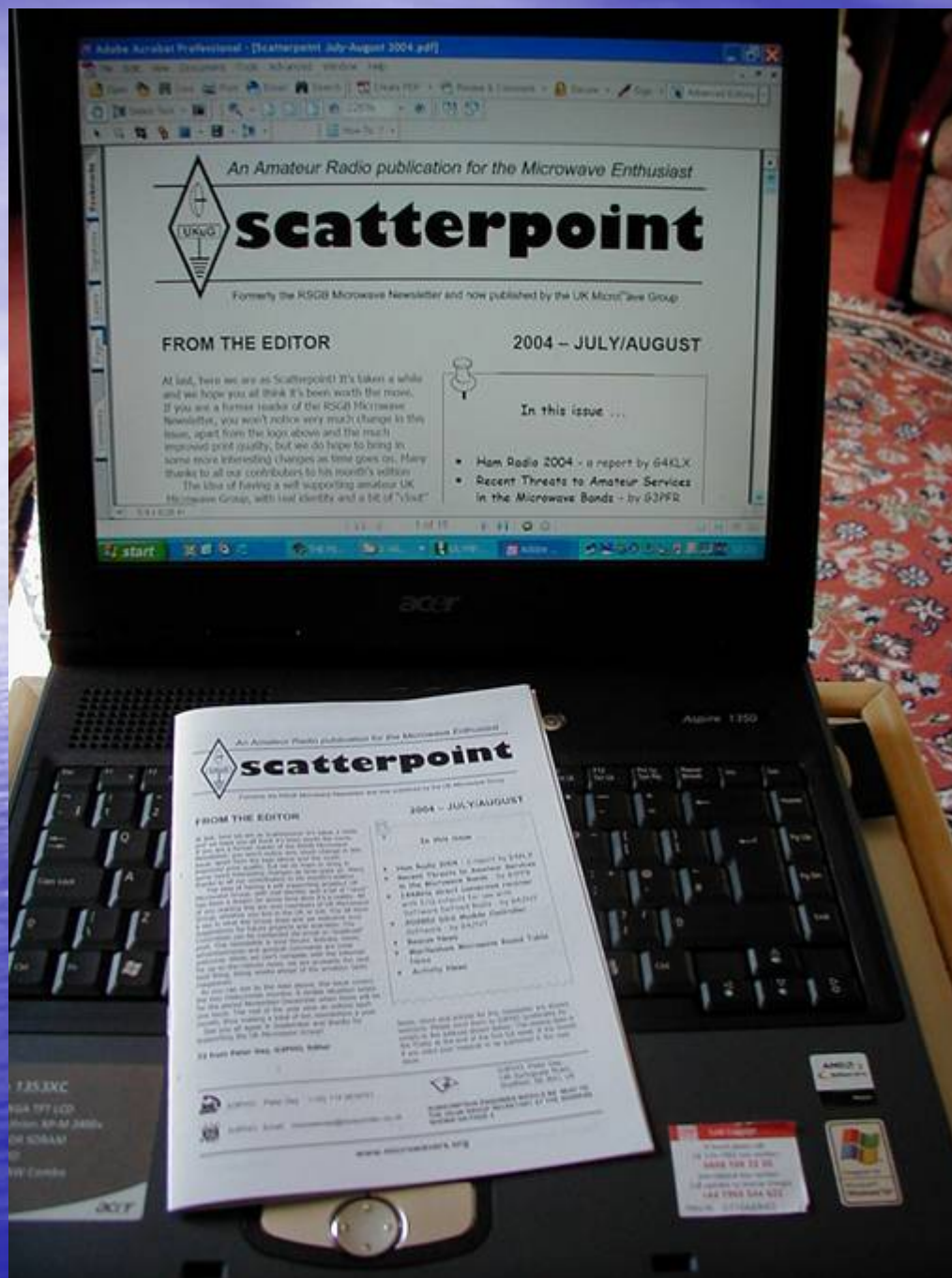
# The UK Microwave Group



- Founded about 4 years ago
- Now the “voice” of UK Microwavers
- membership open worldwide
- produces Scatterpoint, a microwave newsletter, ten times a year.

[www.microwavers.org](http://www.microwavers.org)





The present version of Scatterpoint was formerly known as the RSGB Microwave Newsletter for 24 years until it was taken over by the UK Microwave Group after the RSGB abolished it's own Microwave Committee

# WHAT DOES THE UK MICROWAVE DO?

- Supports and represents all UK microwavers at RSGB level. It's our ONLY voice !
- Organises an annual contest program
- Offers achievement awards and trophies
- Supports and organises microwave conventions ("round table meetings")
- Is a source of help and guidance for newcomers
- Produces Scatterpoint ten times a year



# UK MICROWAVE CONTESTS

Each year the UK Microwave Group runs ...

- Six monthly 10GHz and 5.7GHz cumulatives from May to October
- Four 24GHz/47GHz cumulatives
- Two 1.2GHz/2.3GHz/3.4GHz contests

In addition the RSGB and IARU Region 1 holds “432MHz up” contests in May and October’

There are also monthly short evening contests run by RSGB as well as numerous ones in mainland Europe

Certificate No. \_\_\_\_\_





## MICROWAVE DISTANCE AWARD

This is to certify that \_\_\_\_\_ call sign \_\_\_\_\_  
 located at \_\_\_\_\_  
 has duly satisfied the Board of the Radio Society of Great Britain  
 that he/she has made two way microwave radio contact  
 over a distance of \_\_\_\_\_ kilometres on the \_\_\_\_\_ GHz band  
 with station \_\_\_\_\_ located at \_\_\_\_\_  
 on (date) \_\_\_\_\_ and transmitting in the \_\_\_\_\_ mode.

Signed \_\_\_\_\_ Honorary Awards Manager  
 By order of the Board

Date: \_\_\_\_\_

## Distance achievement award



**10GHz  
Trophy**

**G3KEU 5.7GHz Memorial Trophy**



# Round Table Meetings



# MICROWAVE ROUNDTABLES

THREE main ones each year

- Martlesham (Eastern England)
- R.A.L (near Oxford)
- Crawley (South of London)



# MARTLESHAM

- This microwave round table meeting is held over a weekend in November each year
- It's attended by over 100 microwavers from all over the UK and also from Europe and the USA
- It's the main amateur microwave gathering in the UK

# Recognise these two ?





And this one ..... ?





Martlesham  
Lectures, dinner and  
socialising



# Martlesham

Lots of microwave "goodies" available at the "bring and buy" tables



# Martlesham Round Table Meeting

## ANTENNA TEST RANGE





# Noise Figure measurement at Martlesham



# R.A.L – the Rutherford Appleton Laboratories



- A microwave roundtable is usually held here in the Spring and is well attended
- A wide range of test equipment is available
- High quality lectures are provided, as at Martlesham
- Bring and Buy is very popular



R.A.L

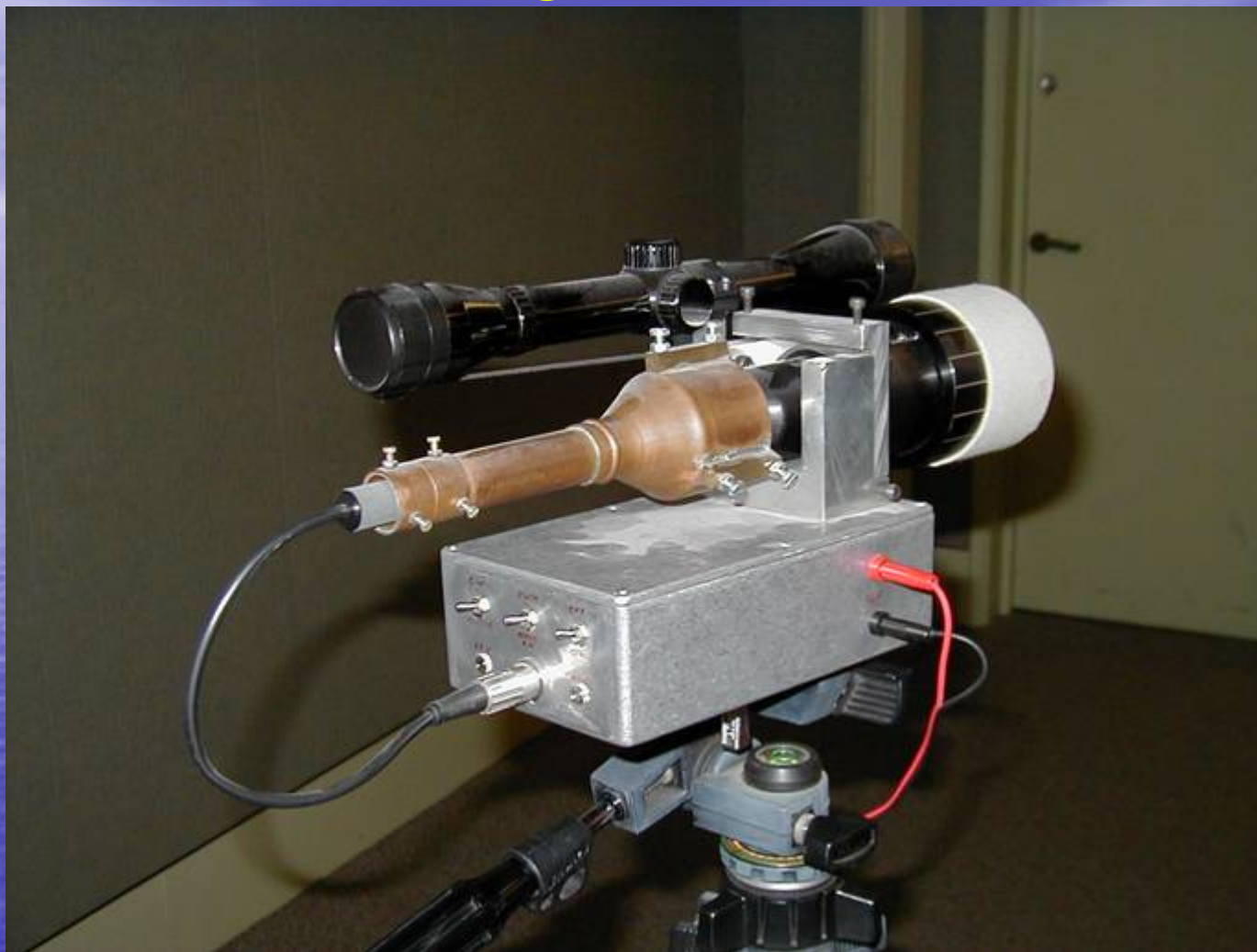


## David Bowman, G0MRF gives a talk at RAL on amateur lightwave communications





## An amateur lightwave transceiver



At these ultra high frequencies (THz not GHz !), no amateur licence is required ... anyone can use them!

# FIRST ATTEMPTS AT LIGHTWAVES BY G8AGN and G3PHO



First time out: 0.6km



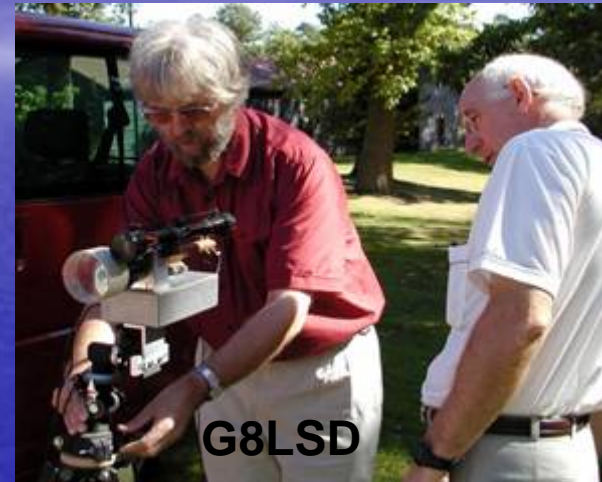
3<sup>rd</sup> time out: 20km



# The Southern Lightwave Group



G8LSD/P and G0MRF/P are the UK record holders and have worked 3 countries!



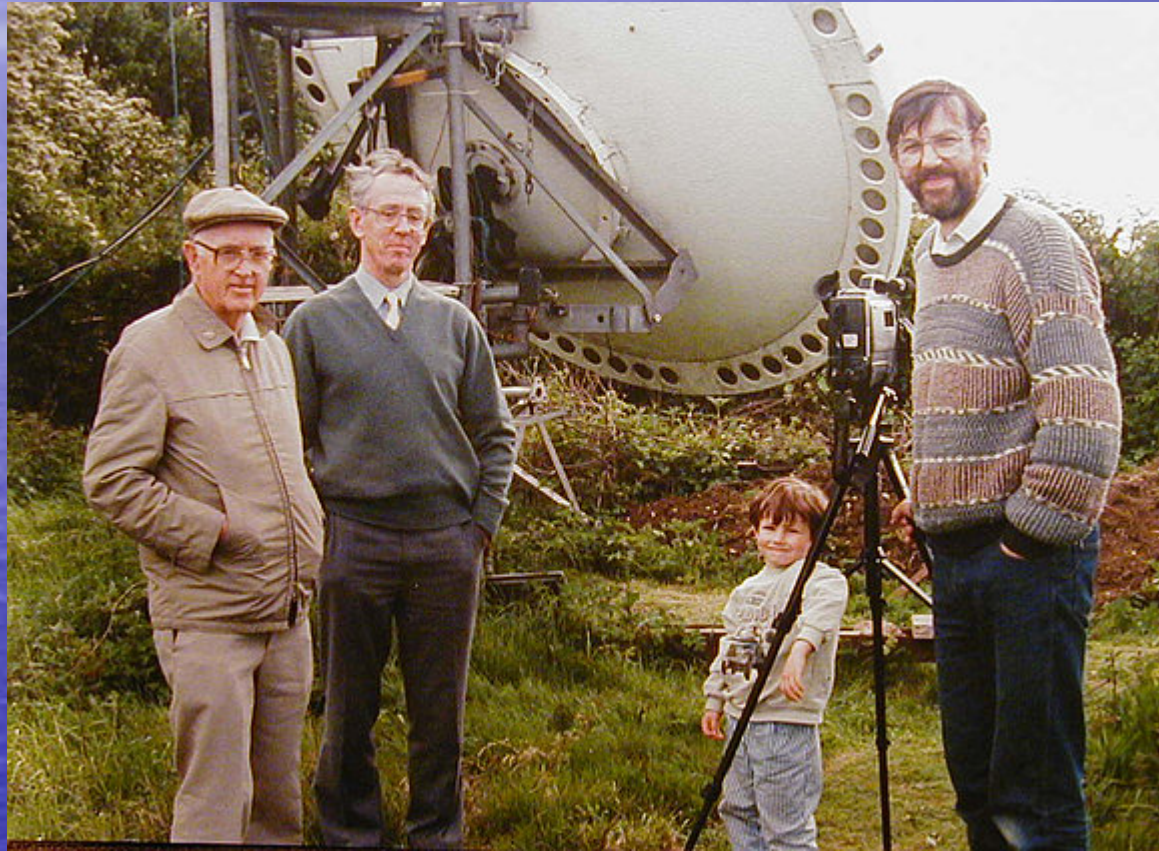


# MOONBOUNCE



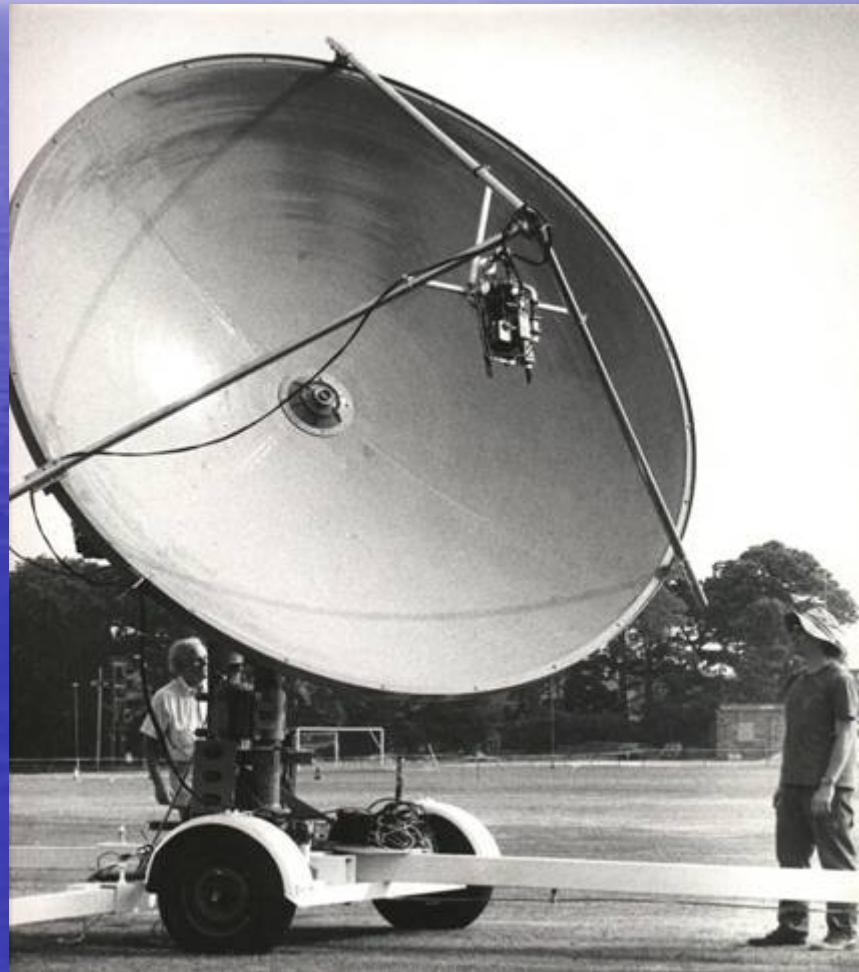
# Charlie G3WDG

## IO92 Northamptonshire



G3WDG (right) made the first G to VK EME contact on 10GHz with  
Lyle, VK2ALU (left)

G4RFR setting up the big dish to  
make their first QSO with WA7CJO







Brian  
G4NNS  
IO91FF

Brian is one of the  
leading UK 10GHz  
moonbouncers

Nesting birds stop G4NNS EME !





# Simon G3LQR JO02 Suffolk



# Howard G4CCH IO93 Lincolnshire





# Sam G4DDK JO02 Suffolk



# And we mustn't forget

- Peter, G3LTF
- David, GM4JJJ
- Mark, GM4ISM
- Chris, GW4DGU
- Ian, G4FUF
- And several others



# MICROWAVE BEACONS

- The UK has a wide range of unattended beacons on all bands from 1296MHz to 47GHz
- All unattended beacons have to be licensed by the government radio authority
- Licence applications can take many months, even years, to be processed!
- Attended personal beacons are allowed without extra formalities but must be switched off if the owner leaves the premises



# EMLEY MOOR BEACONS

Located in IO93 on the edge of the "microwave wilderness"!

- GB3MLE on 1296.930MHz
- GB3MLE on 10368.925MHz



# Bell HILL BEACONS

IO80UU South Coast of England



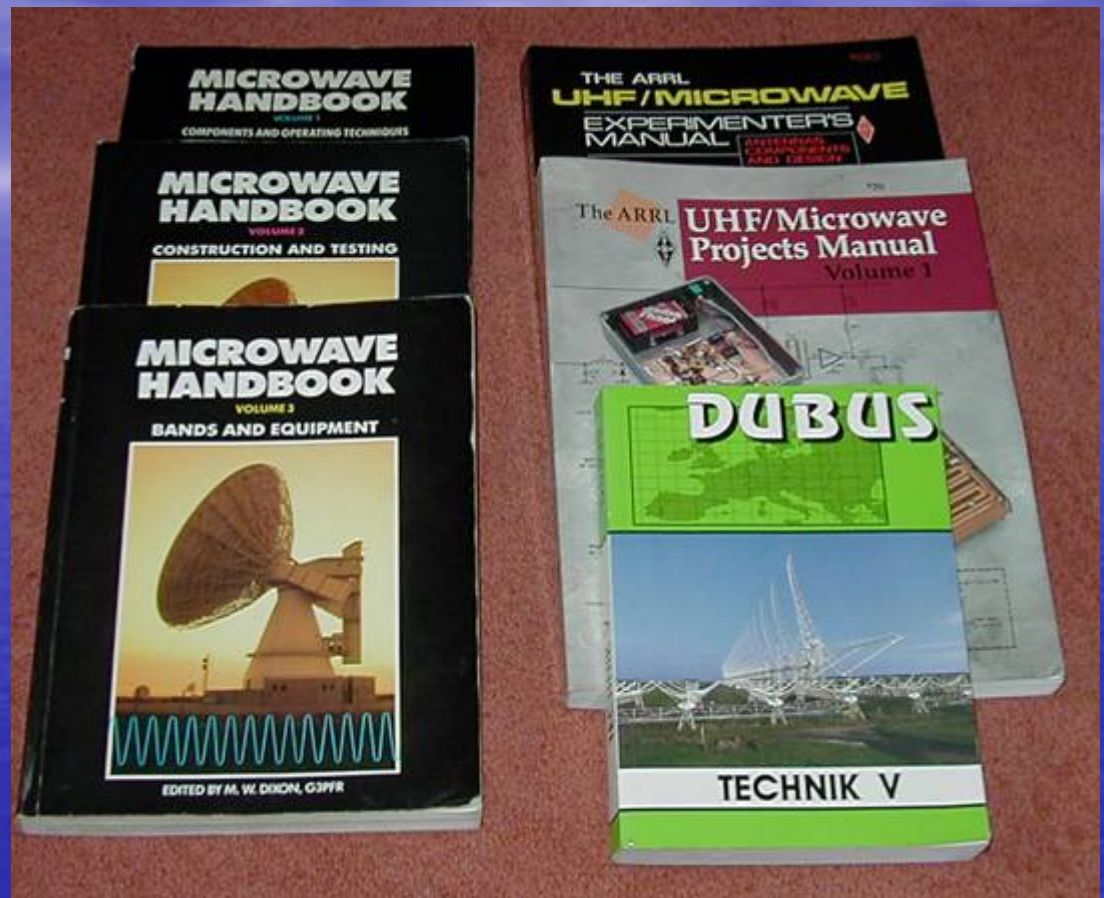
- Beacons on all bands from 2.3GHz to 47GHz inclusive!
- The beacons are highly accurate and stable in frequency
- GB3S## series callsigns

# Microwavers' "bibles"!

The RSGB  
Microwave  
Handbook

ARRL Microwave  
Manuals

Dubus Technik  
volumes 1 to 6





# An open invitation ...

## Why don't you ...

- Come to the UK one summer and operate /portable and/or
- Visit the Martlesham Microwave Round Table in November ?
- You're certain to get a warm welcome !

For more information visit:

[www.g3pho.org.uk](http://www.g3pho.org.uk)

[www.microwavers.org](http://www.microwavers.org)

with links to other sites such as G4DDK, G8ACE, G8BKE and G4NNS



The End



0-50dB  
10GHz  
attenuator

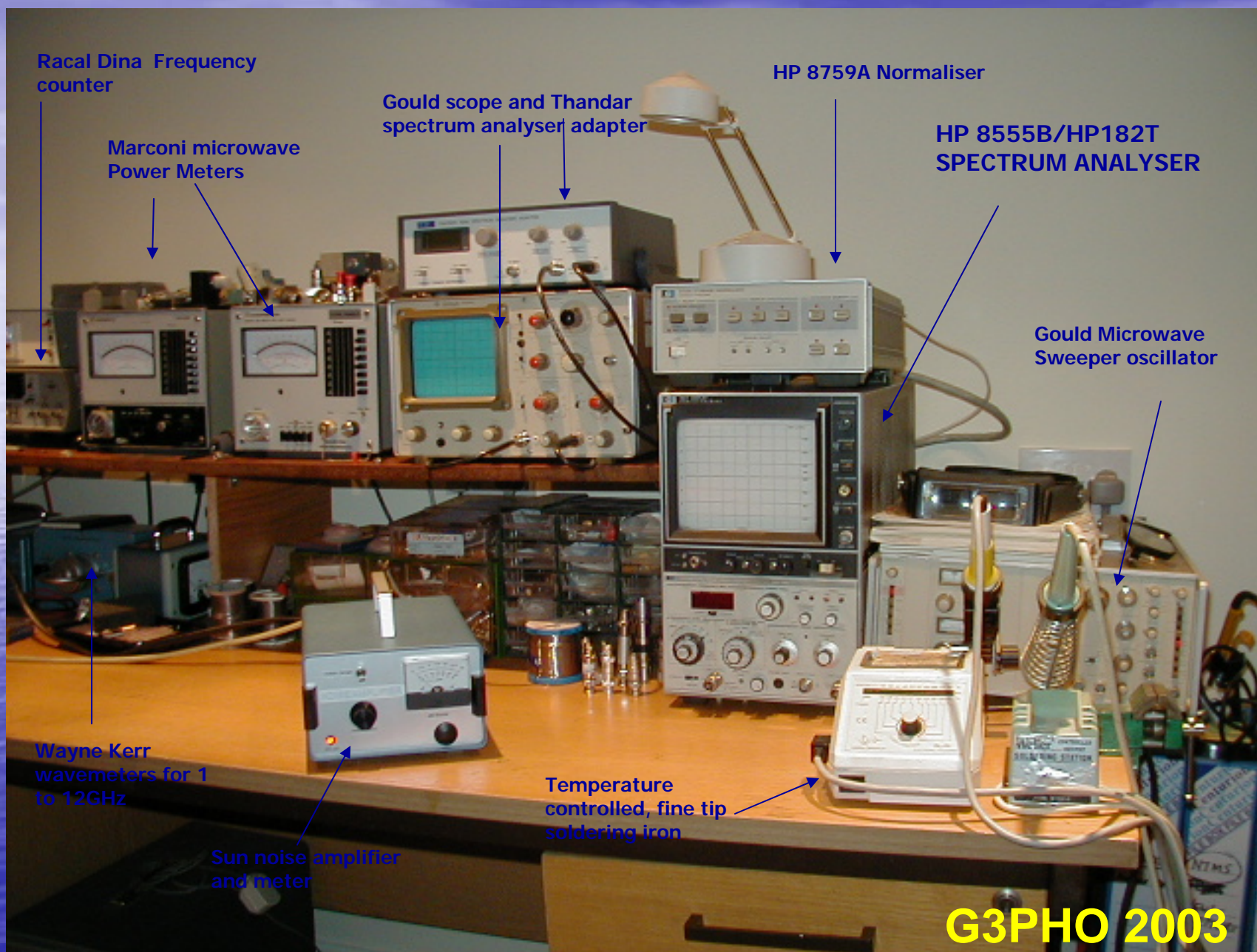
Adret 90-120MHz  
synthesized oscillators  
locked to highly accurate  
frequency standard

Multiplier  
to give  
markers on  
all  
microwave  
bands to  
47GHz.  
Accurate to  
within a  
part of  
1kHz

Hi-stability frequency standard  
giving outputs at 10MHz, 5MHz and  
1MHz. Accurate to 0.03Hz at 10MHz

**FREQUENCY MEASURING AT G3PHO**





Racal Dina Frequency counter

Marconi microwave Power Meters

Gould scope and Thandar spectrum analyser adapter

HP 8759A Normaliser

HP 8555B/HP182T SPECTRUM ANALYSER

Gould Microwave Sweeper oscillator

Wayne Kerr wavemeters for 1 to 12GHz

Sun noise amplifier and meter

Temperature controlled, fine tip soldering iron

G3PHO 2003







The ex Outside Broadcast tripod makes a really strong base for the four foot diameter dish at G3PHO/P.

One set up the dish can be quickly set to any bearing with a 1 degree accuracy ... essential for dishes of this size at 10GHz.

