GHz Bands? Contesting? You've got to be kidding!

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GHz Bands and Contesting

- What are the Microwave bands?
- Excuses for not contesting on them
  - Ah, but the QSO rate is so low
  - and you don't work any DX!
  - and it's very expensive!
  - and it's all too technical for me!
- Microwave contest operating
- Key technology drivers

GHz Bands and Contesting

- "Microwave"

- 1240 - 1325MHz (23cm) Secondary
- 2310 - 2450MHz (13cm) Secondary
- 3400 - 3475MHz (9cm) Secondary
- 5650 - 5680MHz (6cm) Secondary
- 5755 - 5765MHz Secondary
- 5820 - 5850MHz Secondary
- 10000 -10125MHz (3cm) Secondary
- 10225 -10475MHz Secondary
- 10475 -10500MHz Secondary satellite only

- "Millimetre wave"

- 24.000 - 24.050GHz (1.2cm) **Primary** shared with ISM
- 24.050 - 24.150GHz **Secondary** (with written permission)
- 24.150- 24.250GHz Secondary
- 47.000 - 47.200GHz Primary
- 75.500 - 81.000GHz Primary
- 122.25 - 123.00GHz Secondary
- 134.00 - 136.000GHz Primary
- 136.00 - 141.000GHz Secondary
- 241.00 - 248.00GHz Secondary
- 248.000 - 250.000 GHz Primary

GHz Bands and Contesting

Some GHz-Bands Contest statistics 2013

	1.3GHz		2.3GHz		3.4GHz		5.7GHz		10GHz		24GHz		47GHz		76GHz	
	entries	max QSOs	entries	max QSOs	entries	max QSOs	entries	max QSOs	entries	max QSOs	entries	max QSOs	entries	max QSOs	entries	max QSOs
Totals	551.0	642.0	176.0	224.0	71.0	49.0	52.0	56.0	99.0	118.0	16.0	18.0	1.0	1.0	1.0	1.0
Average	42.4	49.4	14.7	18.7	5.9	4.1	3.7	4.0	6.6	7.9	2.7	3.0	1.0	1.0	1.0	1.0
other totals	21.0	76.0	14.0	32.0	10.0	13.0	13.0	33.0	51.0	84.0	16.0	18.0	1.0	1.0	1.0	1.0
other average	5.3	19.0	4.7	10.7	3.3	4.3	2.6	6.6	8.5	14.0	2.7	3.0	1.0	1.0	1.0	1.0
UKAC totals	530.0	566.0	162.0	192.0	61.0	36.0	39.0	23.0	48.0	34.0						
UKAC averages	58.9	62.9	18.0	21.3	6.8	4.0	4.3	2.6	5.3	3.8						
other vs UKAC	8.92%	30.21%	25.93%	50.00%	49.18%	108.33%	60.00%	258.26%	159.38%	370.59%						

Source rsgbvhfcc and microwavers.org

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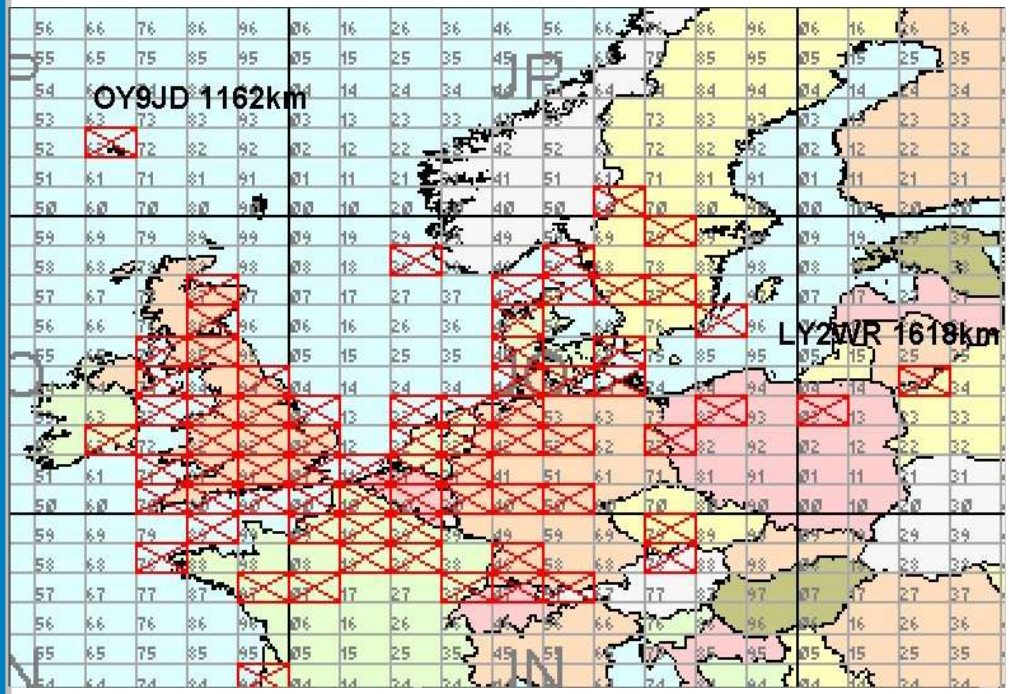
So what can be worked?

- Worked from home 23cms G4BAO



- 8 metres above sea level!
- Mainly with 35 Watts or less

UK terrestrial records October 2013

–	1.3GHz	2617km
–	2.3GHz	1329km
–	3.4GHz	1137km
–	5.7GHz	1244km
–	10GHz	1429km
–	24GHz	408km
–	47GHz	203km
–	76GHz	94km
–	134GHz	17.7km
–	145GHz	1.29km
–	Light (red)	129.1km

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#3 - But it's Really Expensive!

- **Microwave equipment - New**
- (approx. prices November 2011 assuming you have a 2m multimode driver)

1296/144 MHz 25W DEMI transverter	£480
23 element Tonna yagi + coax	£80
Total cost	**£560**
DB6NT 10GHz transverter	£450
Surplus coax relay	£10
Waterproof Box to put it all in	£10
Surplus Sky dish and homemade feed	£10
Total cost	**£480**

GHz Bands and Contesting

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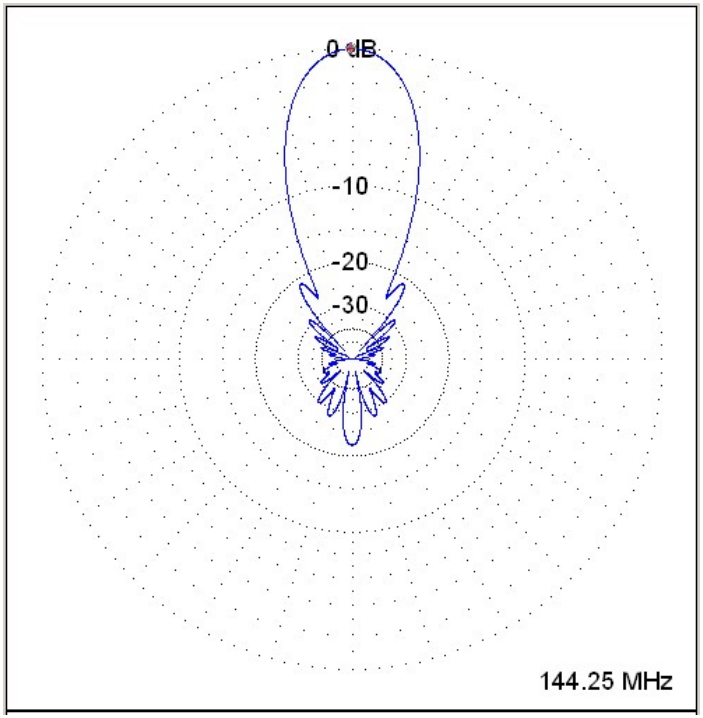
A new D - STAR Setup?	
Icom IC-E2820	£486
Comet GP-1 antenna	£70
Total cost	**£556**
A decent WARC Bands setup?	
Cushcraft A3WS beam	**£500**
Wideband Scanning?	
AOR 8200mk III	£470
MyDel Discone antenna	£73
Total cost	**£543**

GHz Bands and Contesting

Contest operating – The VHF approach

- **VHF and below contests**
  - **Big station, high EIRP, call CQ towards main activity centres.**
  - **Maybe use a second wide beam RX antenna and multiple receivers**
  - **“Search and pounce”**



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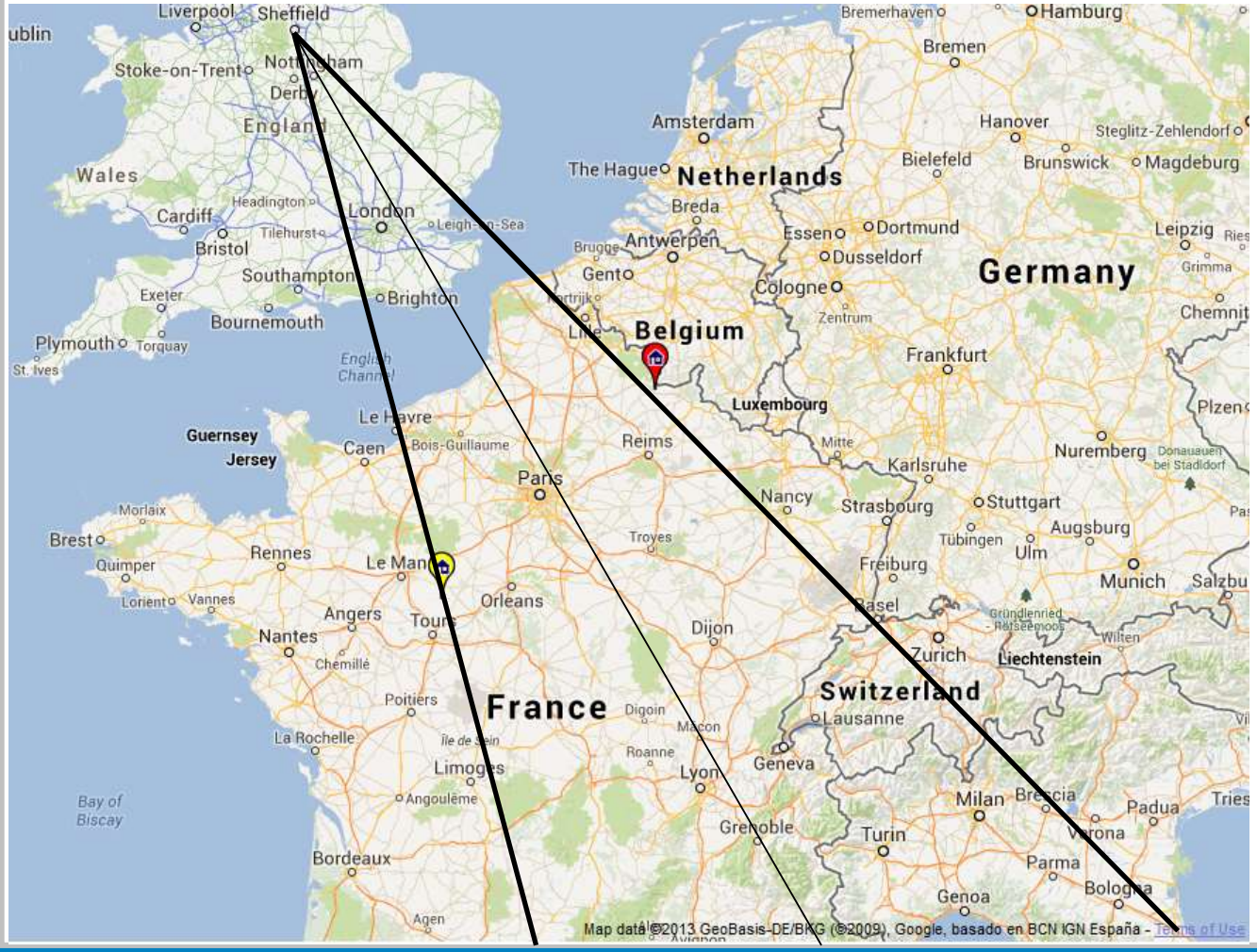
Contest operating – The Microwaver approach



Antenna beamwidth

17 el Yu7ef for 2m
26 degrees beamwidth

Wide area coverage, - makes sense to call CQ and search

From the North, your cover most of UK and the continent on 4 beam headings

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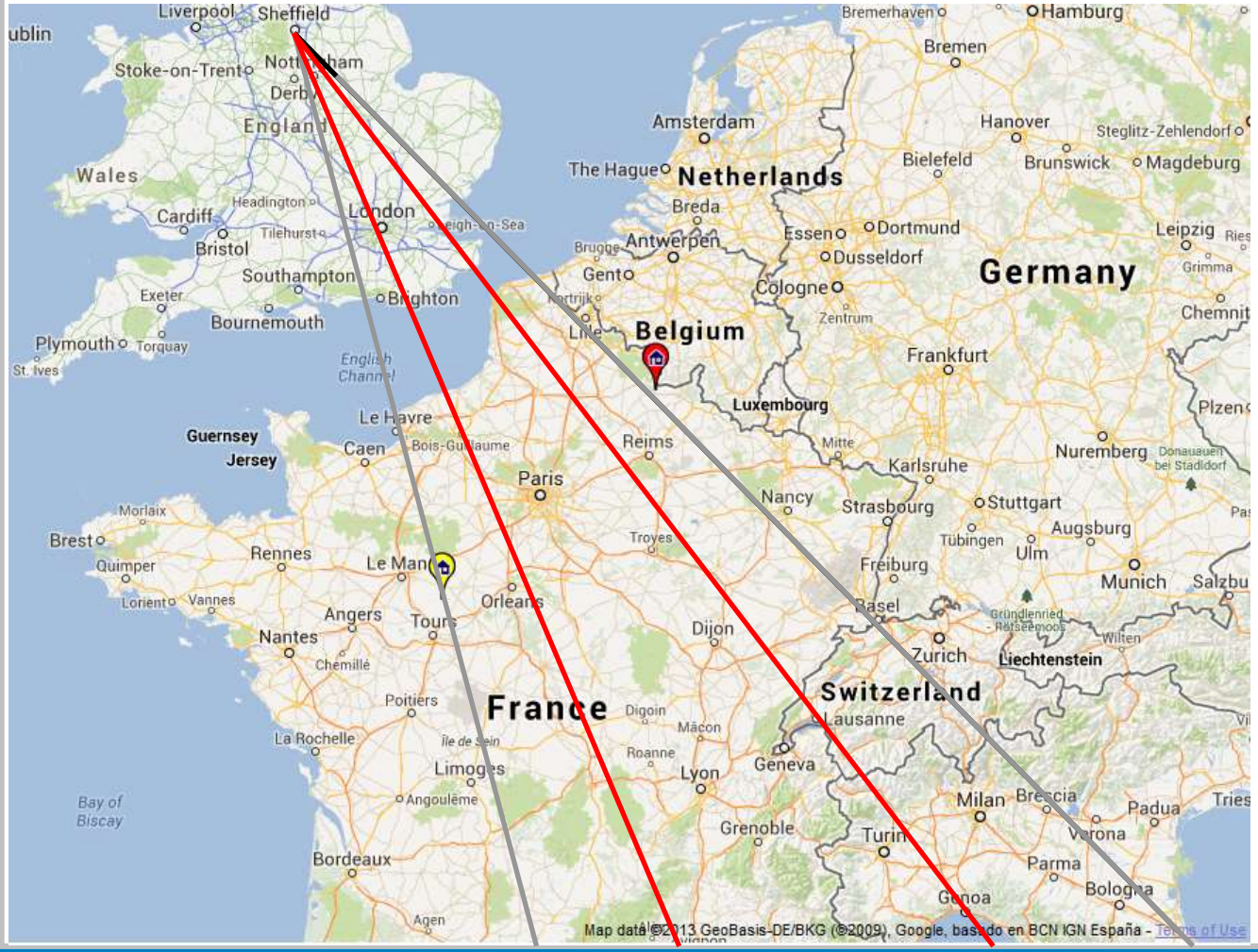
Contest operating – The Microwaver approach



Antenna beamwidth

17 el Yu7ef for 2m
26 degrees beamwidth

55element Tonna for 23cms 13 degrees

Still a reasonable area coverage but you need to make more calls with smaller direction increments – more time consuming

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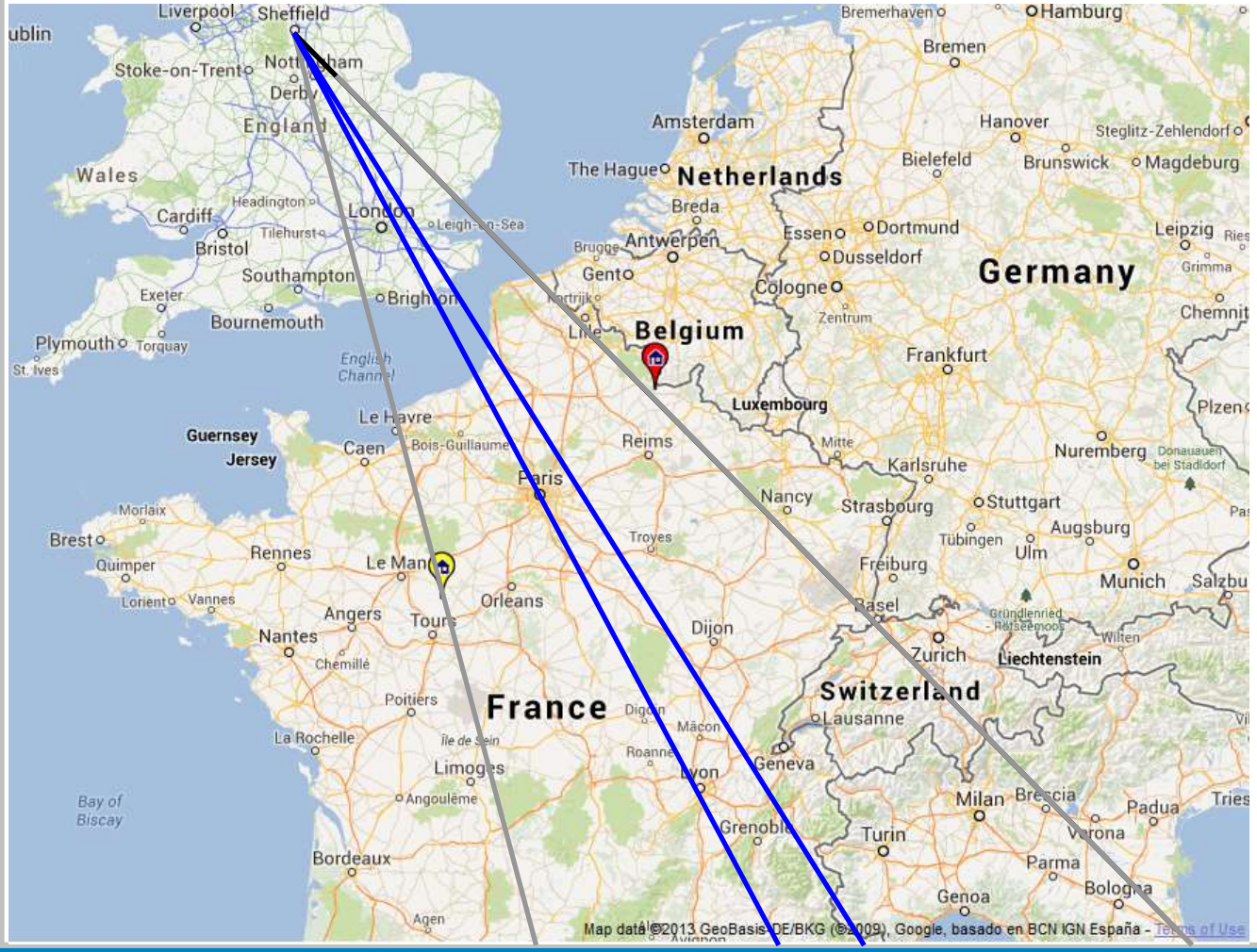
Contest operating – The Microwaver approach



Antenna beamwidth

17 el Yu7ef for 2m
26 degrees beamwidth

60cm dish for 10GHz
3.3 degrees

Very limited area coverage. CQs don't really work!

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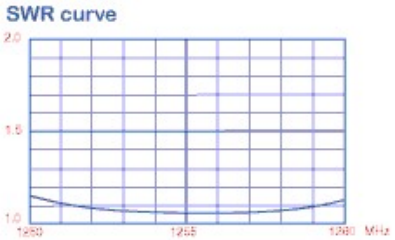
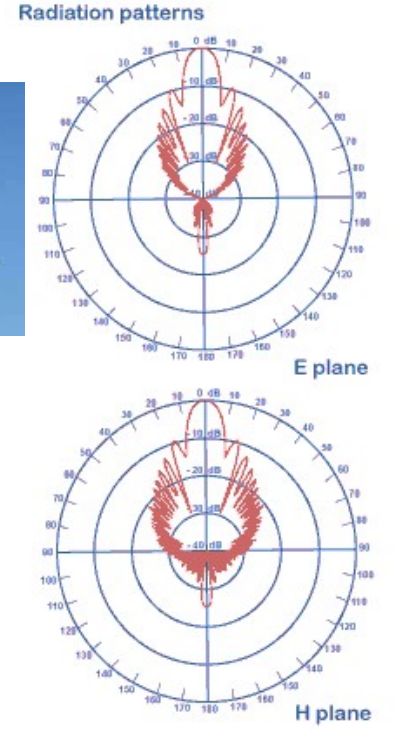
Contest operating – The Microwaver approach

- **VHF and below contests**
  - Big station, high EIRP, call CQ towards main activity centres.
  - Maybe use a second wide beam RX antenna and multiple receivers
  - "Search and pounce"

- **Microwave contests**
  - Very sharp antennas,
    - <7 degrees for Yagis, <4 degrees for a dish.
    - calling CQ and search and pounce are less effective and ineffective on high bands.
  - Skeds are allowed
  - ON4KST internet chat used to "call CQ" and set up skeds in real time
  - Call CQ for talkback on Lower bands 144.175
    - Requires a secondary big 144MHz station



55 el Tonna



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Contest operating – The Microwaver approach

- **Searching**
  - Use an SDR to look at the band
  - Watch activity on ON4KST.info
    - See who is operational and where they are
    - Pick off the “low lying fruit” as soon as you see them
      - they may be only on for an hour or so
  - Announce your band, frequency, bearing on KST
    - run a “CW CQ loop”

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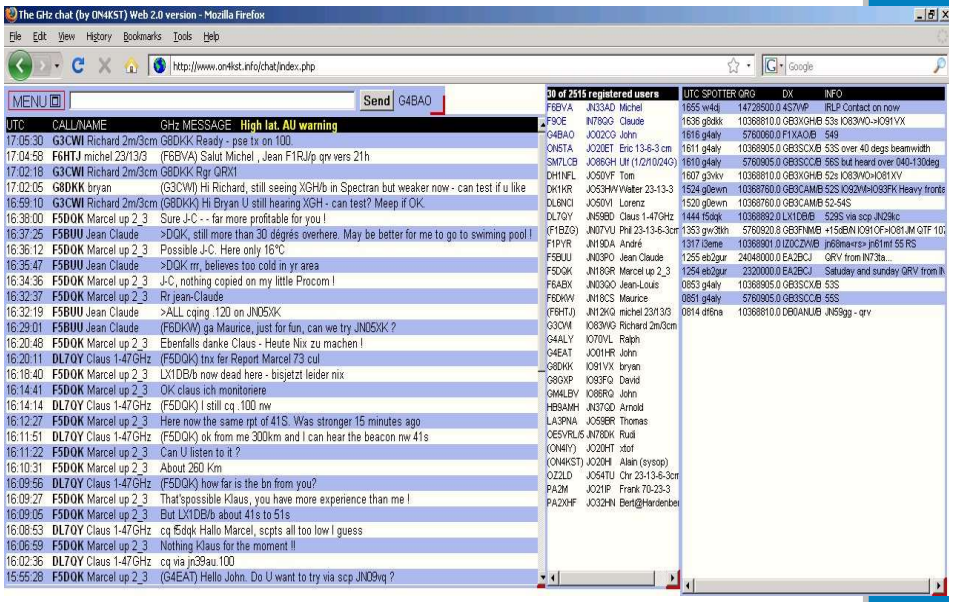
Contest operating – The Microwaver approach

- **Making a QSO using KST**
  - "meep" the stations you want to work and ask politely for sked
    - Be patient, they may have a queue
  - Above 2.3GHz ask if they are "locked" or free running
  - Calculate their bearing and point
  - Agree who will call first
  - Give a long call
    - frequent breaks to allow them to find you and peak up
    - or wait until they give you a "got U"on KST
    - or ask if you are received
  - Exchange QSO details as normal



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Contest operating – The Microwaver approach

- **Talkback**
  - The efficient use of talkback doesn't come naturally to some.
  - In the days before KST when it was all on 2m then there could be a bit of a free for all on 144.175 at times.
  - With ON4KST its possible to have lots of separate conversations at once.
    - tools such as KST2ME help to filter out your conversations
  - You can “talk” to several stations at once, but
    - It’s bad etiquette to try and set up large numbers of immediate skeds and expect stations to wait patiently while you finish a previous QSO.
  - Don’t get frustrated when requests for a sched on KST seem to be ignored
    - it might be because the other station is in QSO or has simply missed your request. Try again later.
  - Good keyboard skills are important now
  - KST requires operating indoors or in a shaded environment to see the screen.

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Contest operating – The Microwaver approach

- **Rotators / antenna pointing**
  - Accurate rotor setting is needed for the higher bands.
  - Digital bearing readout and settability to +/- 1 degree are important
  - Computer control – type in locator and the antenna turns
  - Choose a rotator carefully, many have very non-linear readouts.
    - Variable speed rotor helps
    - 180 degrees in 20 seconds or less
    - whilst retaining accuracy
    - and without overstressing the antennas or rotator.

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Contest operating – The Microwaver approach

- **Aircraft Scatter**
  - Much of the DX worked on 23/13cm is by aircraft scatter
  - Tools such as AirScout and Planeplotter are essential to get good results.
  - Go to G3XDY's talk about Air Scout on Sunday talking to get the full story!

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Contest operating – The Microwaver approach

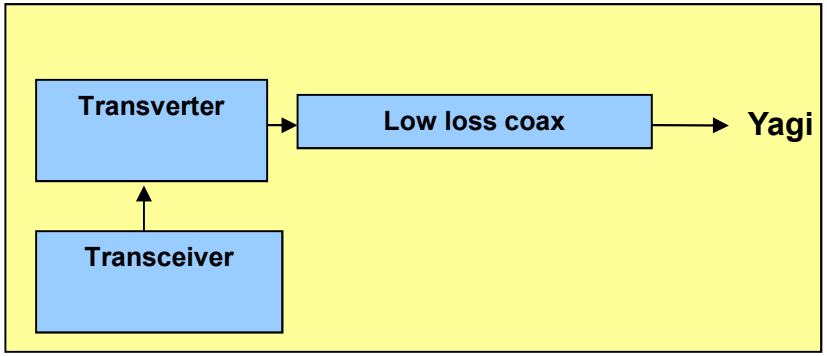
- **Technical skills**
  - To reduce cost, turn your hand to modifying or building your own.
  - System design is where you can differentiate from other stations.
  - Use technical skills to build a station optimised for contest working
    - hard to do with entirely off the shelf kit.
  - Every aspect of the station needs careful optimisation
    - just buying the lowest NF preamp, highest power PA and lowest loss coax does not mean that you will win
  - system integration is the key
  - Site and demography play a very large role too.

GHz Bands and Contesting

#4 - But its Too Technical for me!

- **Beginners setups**

- **23cms and 13cms**
  - **JUST the same as 2m as far as equipment is concerned.**
  - **A transceiver, (a transverter) and a Yagi**



Key technology drivers – history

PCBs and Microstrip

- In the early 1990s, Charlie Suckling, G3WDG, developed modules based on PCB circuitry.

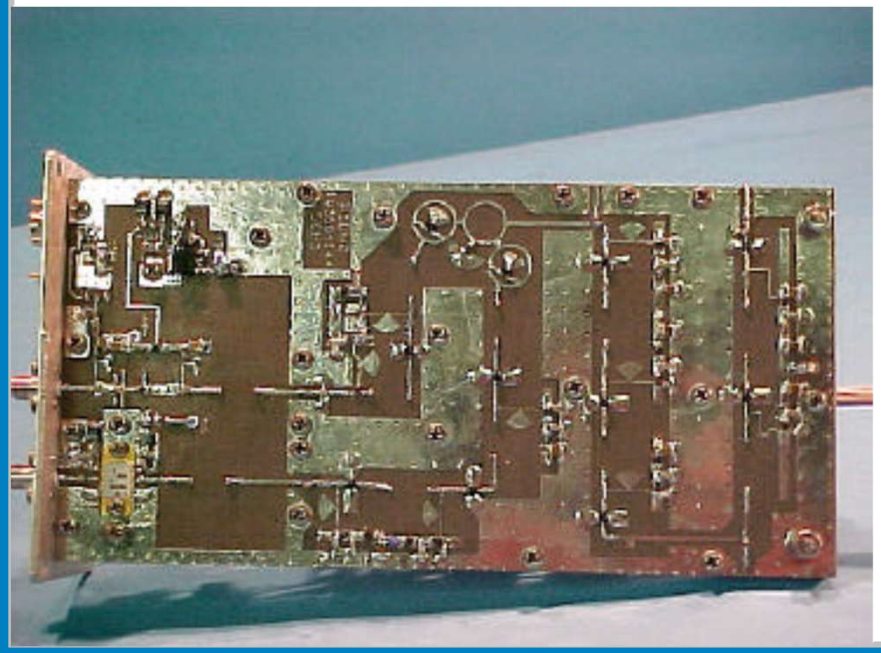
- These were made available in kit form and revolutionised UK 10GHz operating!

Key technology drivers – history

And now

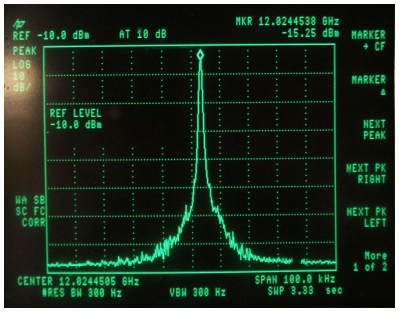
Not **black boxes**, but “silver boxes”

- DB6NT transverter range
- DEMI – Down East Microwave



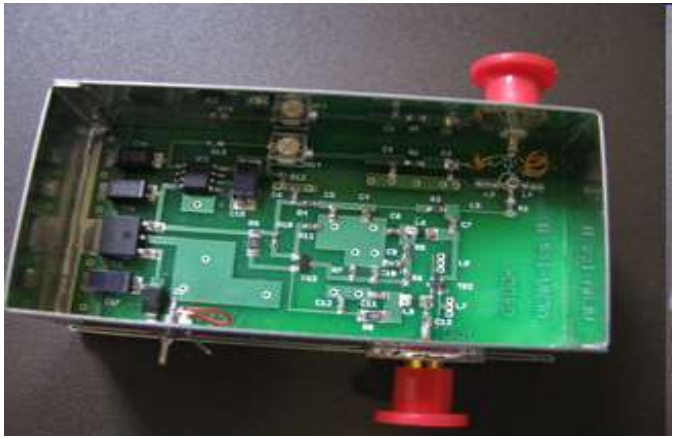
Key Technology Drivers

- Narrowband!!
- Low phase noise references
  - G4DDK Butler Oscillator/Multiplier
  - G8ACE OCXO
  - – Frequency locking
    - Many cheap surplus 10MHz sources available
      - – OCXO, GPSDO, Rubidium
  - – Reflock board
    - Luis Cupido CT1DMK
  - – “Reverse DDS”
    - Andy Talbot G4JNT, John Hazell G8ACE
  - – GW4DGU “Plug and Play”
    - 10GHz transverter boards

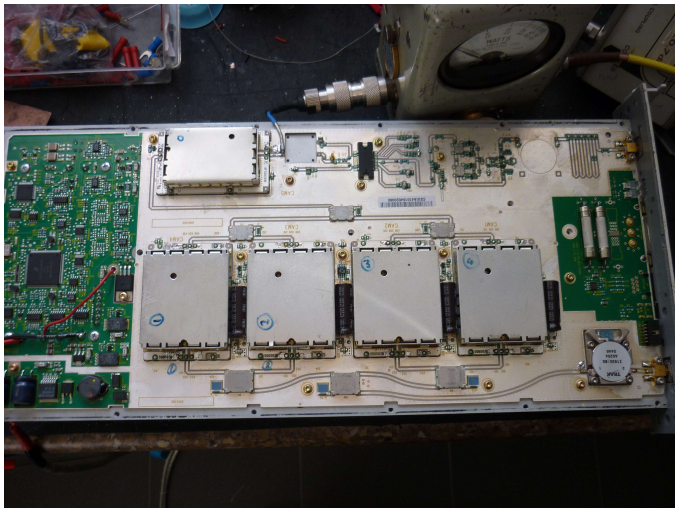


Key Technology Drivers

- Low noise Amplifier kits
  - G4DDK VLNA2 sub-£50 kit
    - < 0.3dB noise figure on 1296MHz
    - < 0.3dB noise figure on 2320MHz
    - < 0.45dB noise figure on 3400MHz



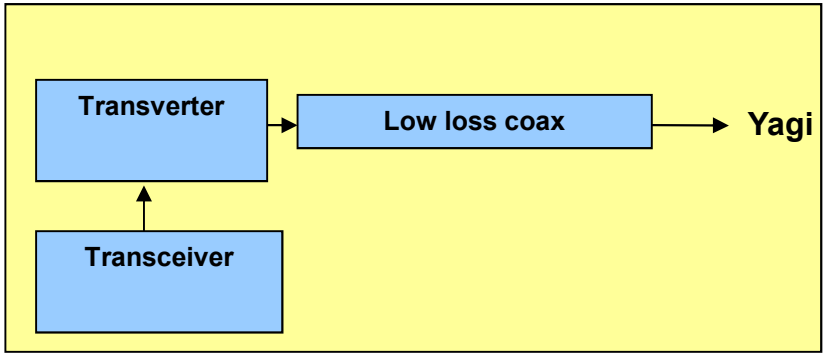
- Surplus Solid State PAs
  - Andrew ILAM/IPAM
    - 200 Watts+ on 2320MHz
  - Ionica PA module
    - 18W on 3400MHz
  - Ferranti “TWT replacement”
    - 12 Watts on 5760MHz

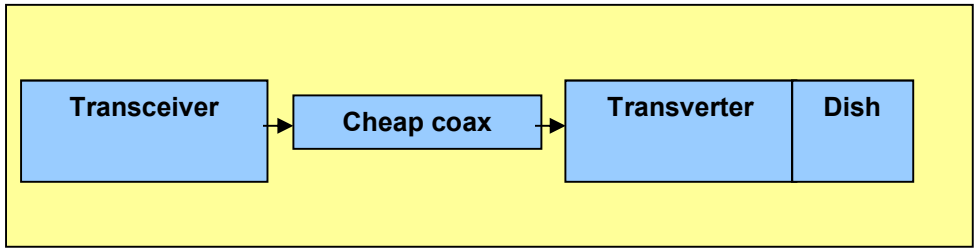


GHz Bands and Contesting

#4 - But its Too Technical for me!

- **Beginners setups**
- **23cms and 13cms**
  - **JUST the same as 2m as far as equipment is concerned.**
  - **A transceiver, (a transverter) and a Yagi**
- **Higher bands**
  - **Difference is that transverter needs to be close to the antenna.**
    - **Waterproof box and power feed**
    - **Small dish antenna**





Propagation

- Optical
  - 24/7
    - Line of sight – hilltop to hilltop
- Tropospheric enhancement and Ducting
  - Weather–dependent
    - Enhanced range up to 2500km
  - BIG ADVANTAGE NEAR THE COAST
- Tropo Scatter
  - 24/7
    - Over the horizon up to 500km
- Rain Scatter
  - Weather–dependent
    - Over the horizon up to 800km
- Aircraft Scatter
  - 24/7
    - Over the horizon up to 800km

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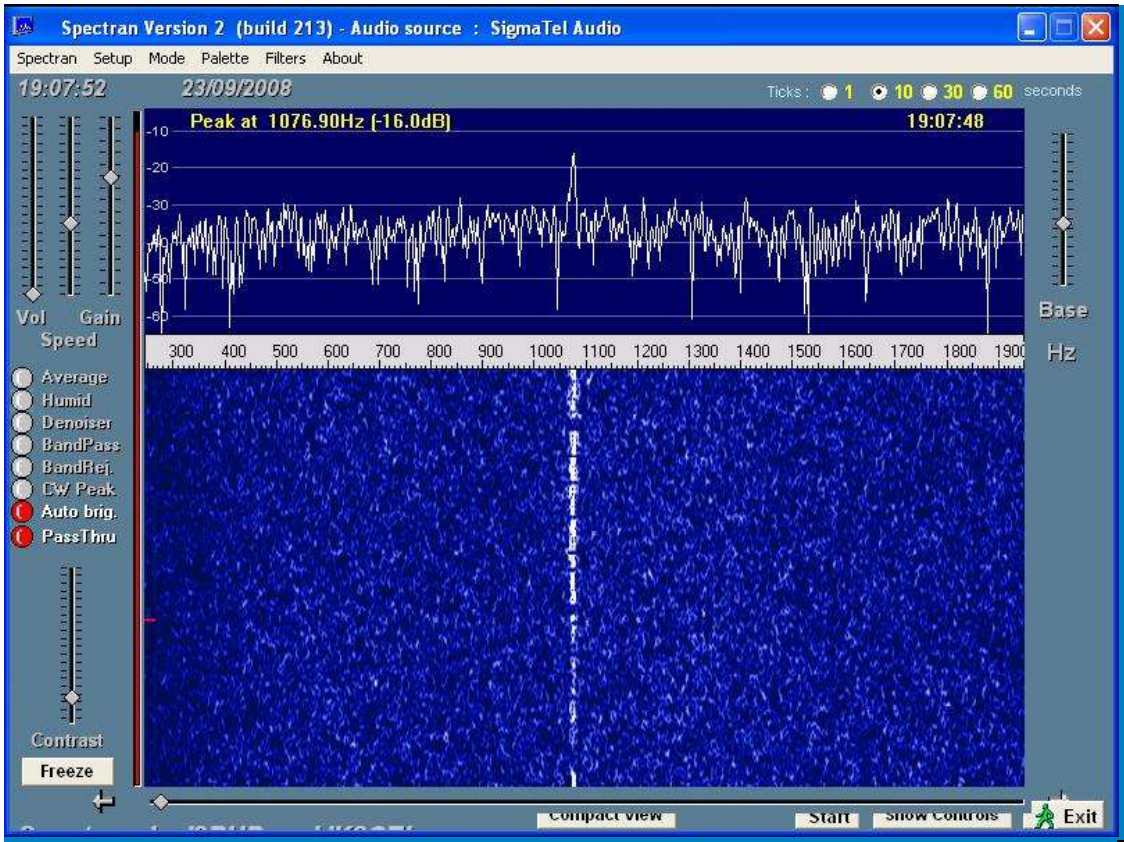
Tropo



LY2WR on 23cms via Tropo

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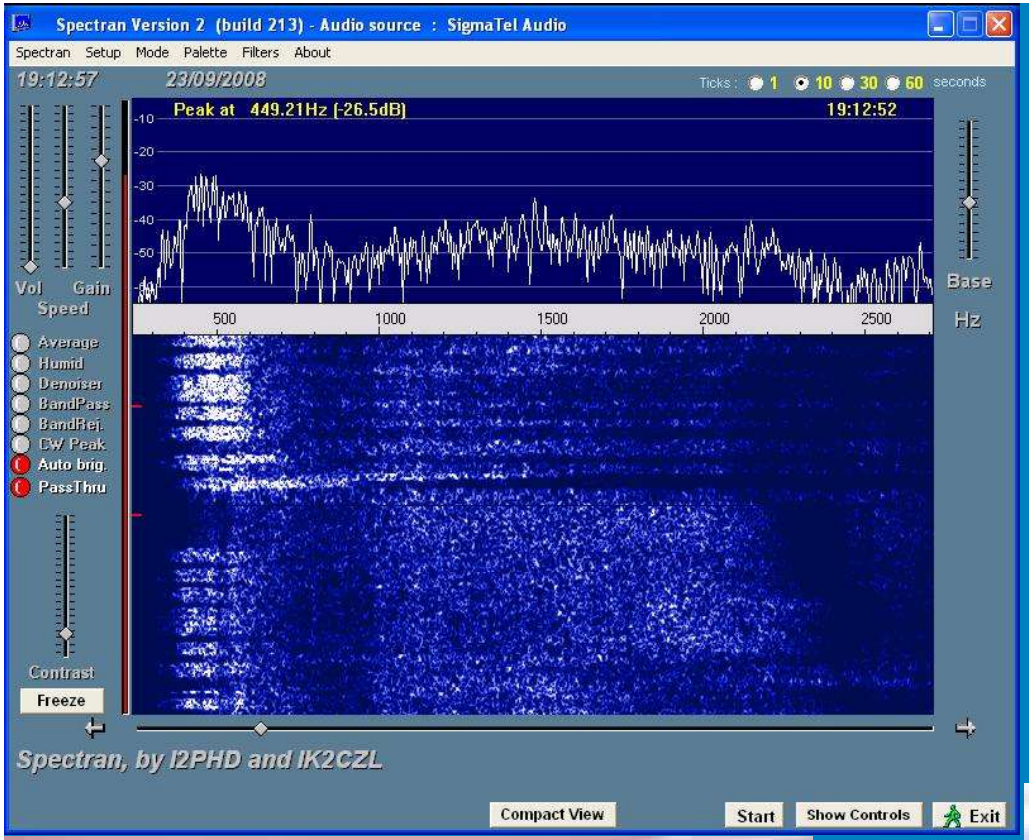
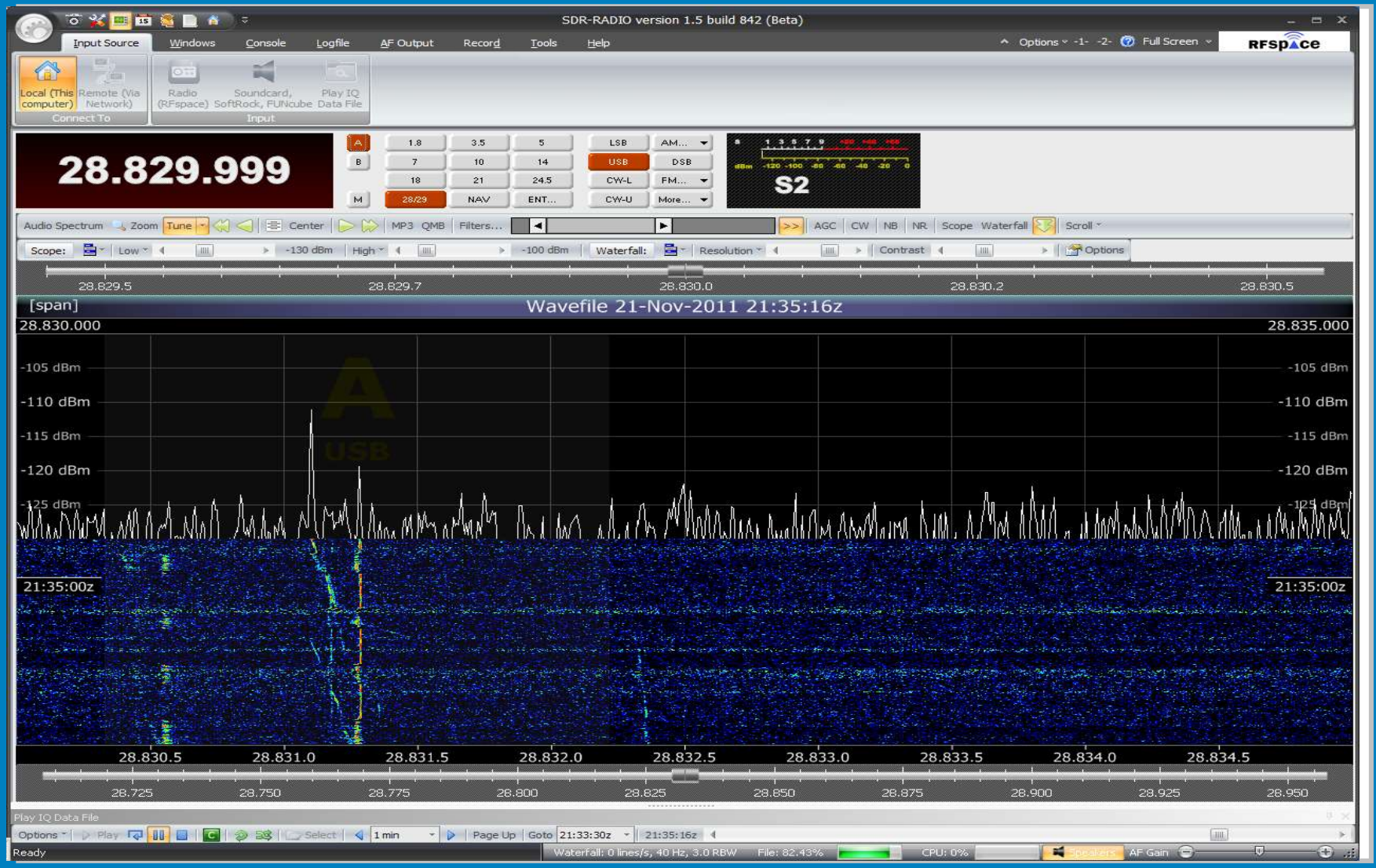
Rain scatter

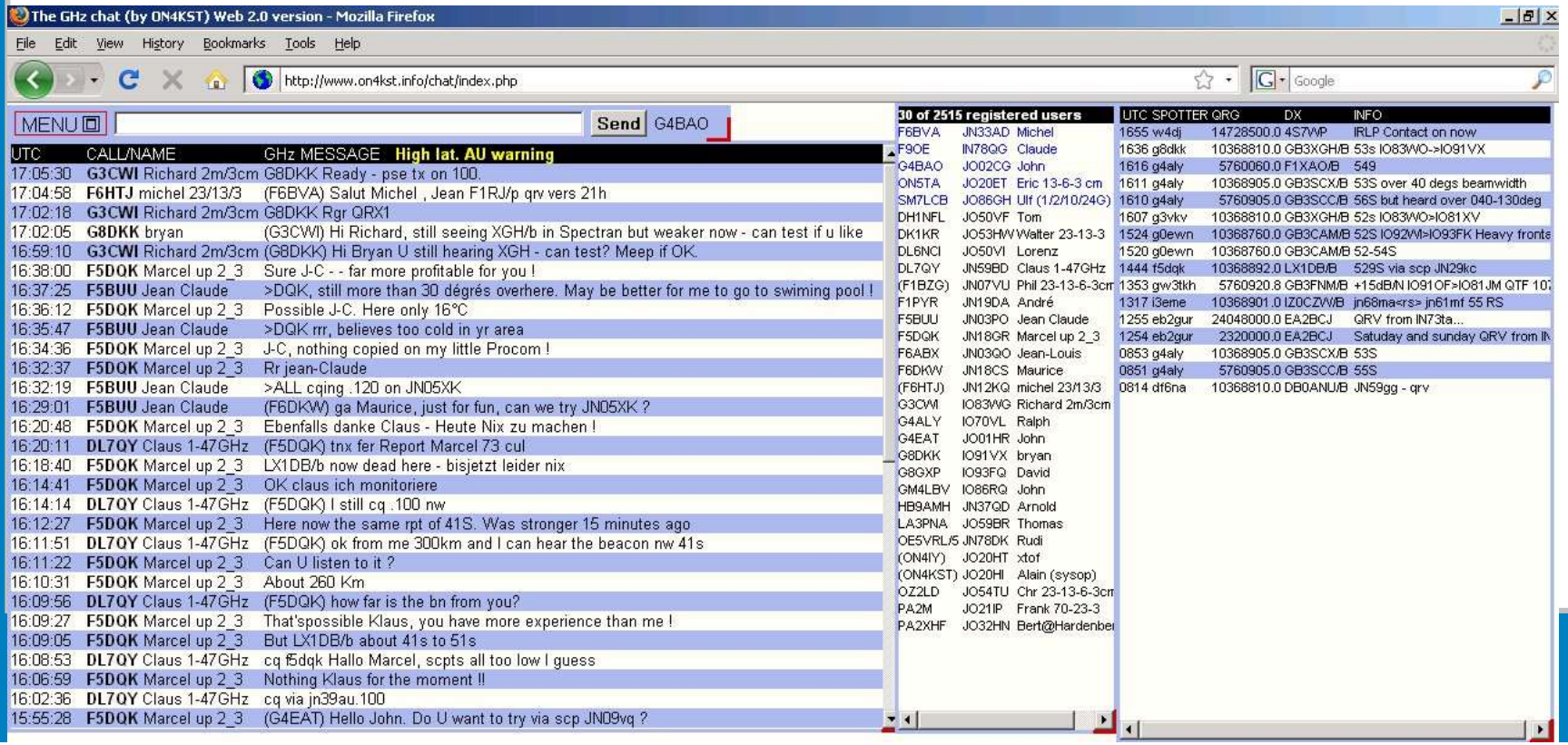


Aircraft Scatter



Things that help

- **Low band talkback**
  - 144.175 is popular
- All these things should only be used for co-ordination, not for confirming QSO details!
- **ON4KST Chat**
  - **www.on4kst.info**
- **Know your frequency**
- **know the beam heading**
- **Local beacons**
  - **GB3CAM 3cm & 24GHz**
  - **GB3PS 23cms**
  - **GB3ANT 13cm**
  - **www.beaconspot.eu**



Acknowledgements and References

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UK Microwave Group

www.microwavers.org

Beaconspot

www.beaconspot.eu

G4HJW's site

http://www.g4hjw.metahusky.net

RadCom August 2007

- *"Getting started on 3cm"*