

# **Techniques and software for auroral communications**

By Dave Edwards – G7RAU

# ***Aurora (Borealis / Australis)***

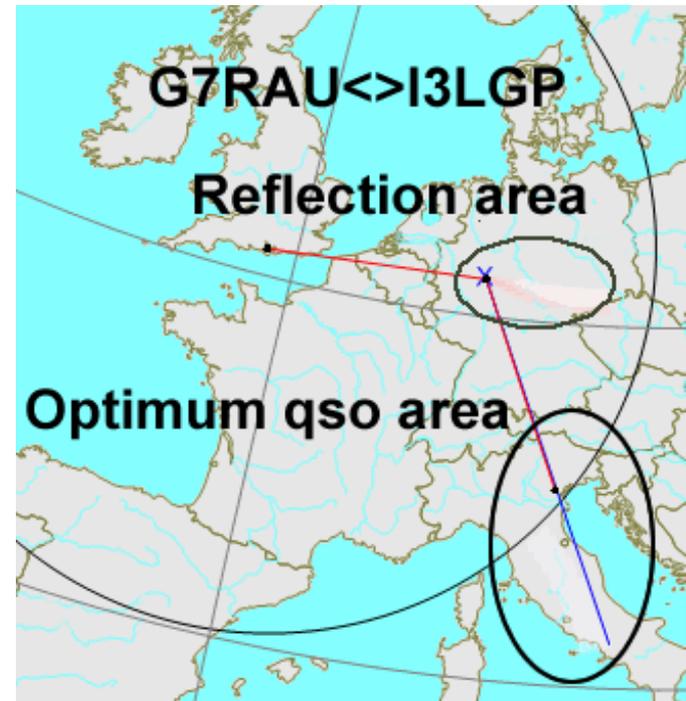
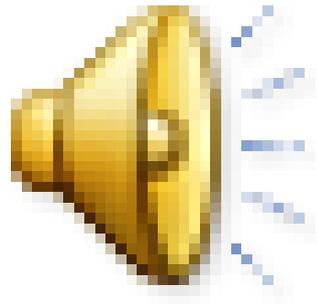
- Solar events (flares and coronal holes) spark auroras (depends mostly on the slant of interplanetary magnetic field (IMF) towards the south)
- Visual auroras result from emissions of photons in the Earth's upper atmosphere, above ~80 km
- They are ionized or excited by the collision of solar wind and magnetosphere particles being funnelled down and accelerated along the Earth's magnetic field lines.

# Aurora backscatter

- Radio contacts are possible with backscatter off the auroral “curtain” (2 stations reflecting their signals from a common reflection point).
- Optimum area of reflection based on ion density and field alignment.
- Activity and distance from the ionised areas are crucial factors whether you are “in” the aurora.

- Auroral signals are very scattered and distorted, cw sounds like keyed “white noise”
- Auroral distortion and Doppler effect increase with frequency.
- SSB Qso’s are possible but are hard work due to distortion.
- Optimum areas can move or appear quite rapidly. Beam direction can be anywhere from 270 degrees through north to 90 degrees.

- 144MHz Qso example between G7RAU IO90IR and I3LGP JN55WJ from a cw auroral qso 31/03/2001 17:21



# Operating – Be ready

- Solar events take 2 to 3 days to arrive so there is time to prepare
- Keep an eye on the national news
- Watch HF for SIDs (sudden ionospheric disturbances)
- Keep an eye on the internet, [www.spaceweather.com](http://www.spaceweather.com) is a great site.
- Watch the DX Cluster for announcements on solar events

# Operating – Waiting for the action to start!

- Signals often appear on 6m first. Listen for 6m cw AU qso's and check on 49.739 to 49.760 for auroral video signals (QTF 0 to 60).
- Are stations close to you working stations? If so find out where the hotspot is by swinging your beam NW>>N>>NE and peaking up on their contacts.
- Look on the DX-Cluster and see who is working aurora (look for spots with QTF in and reports like 59A and <AU>)

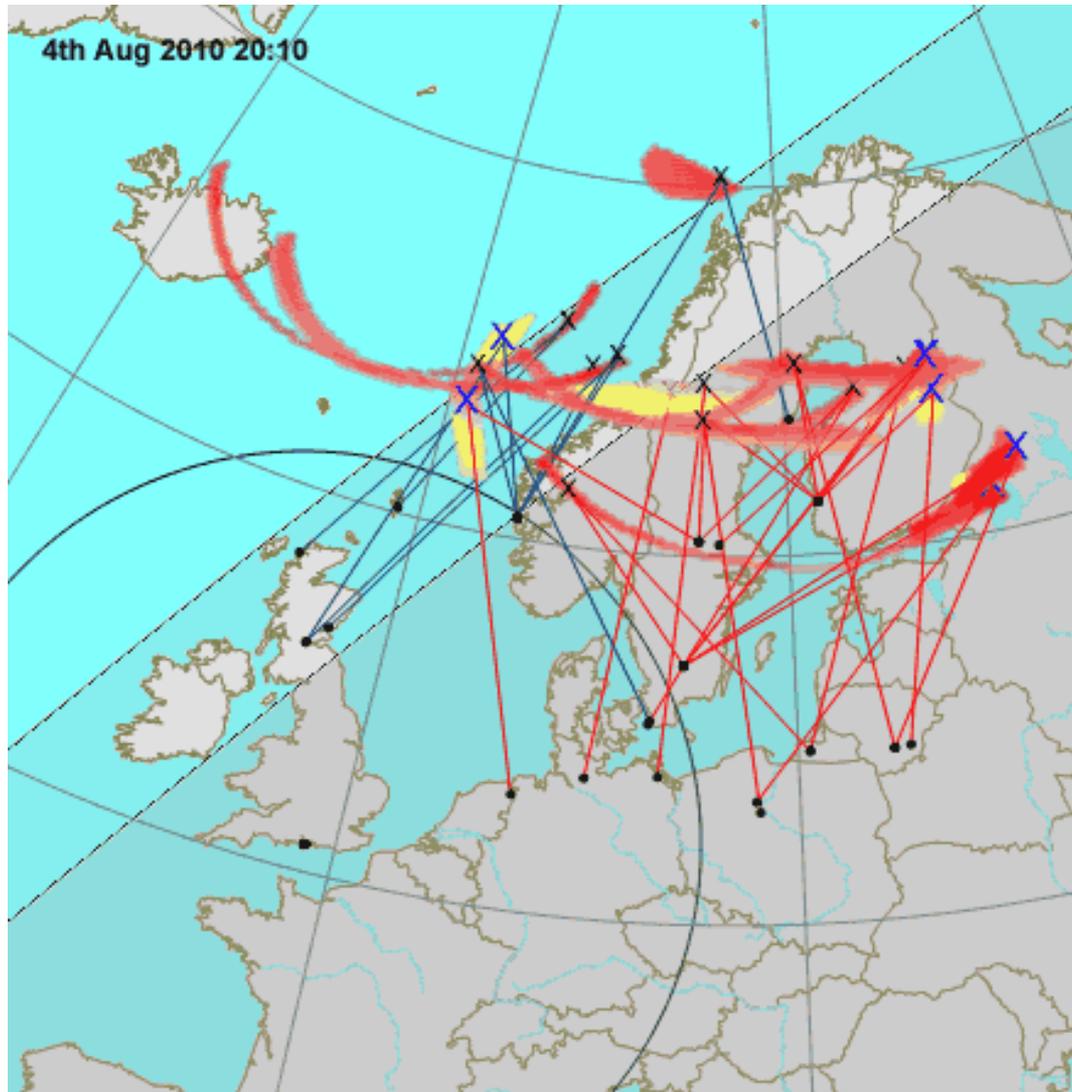
# Operating – Now open on 2m

- Now you are in it, you hear a GM qtf 000.
- Either search and pounce or find a clear frequency, don't sit close to a local otherwise it will become messy if the Doppler is large.
- Don't forget you can go 144.030 to 144.150, spreading out is important.
- Can't do cw? Then learn, nearly all the DX is weak and you need cw.

# Live MUF for Auroras

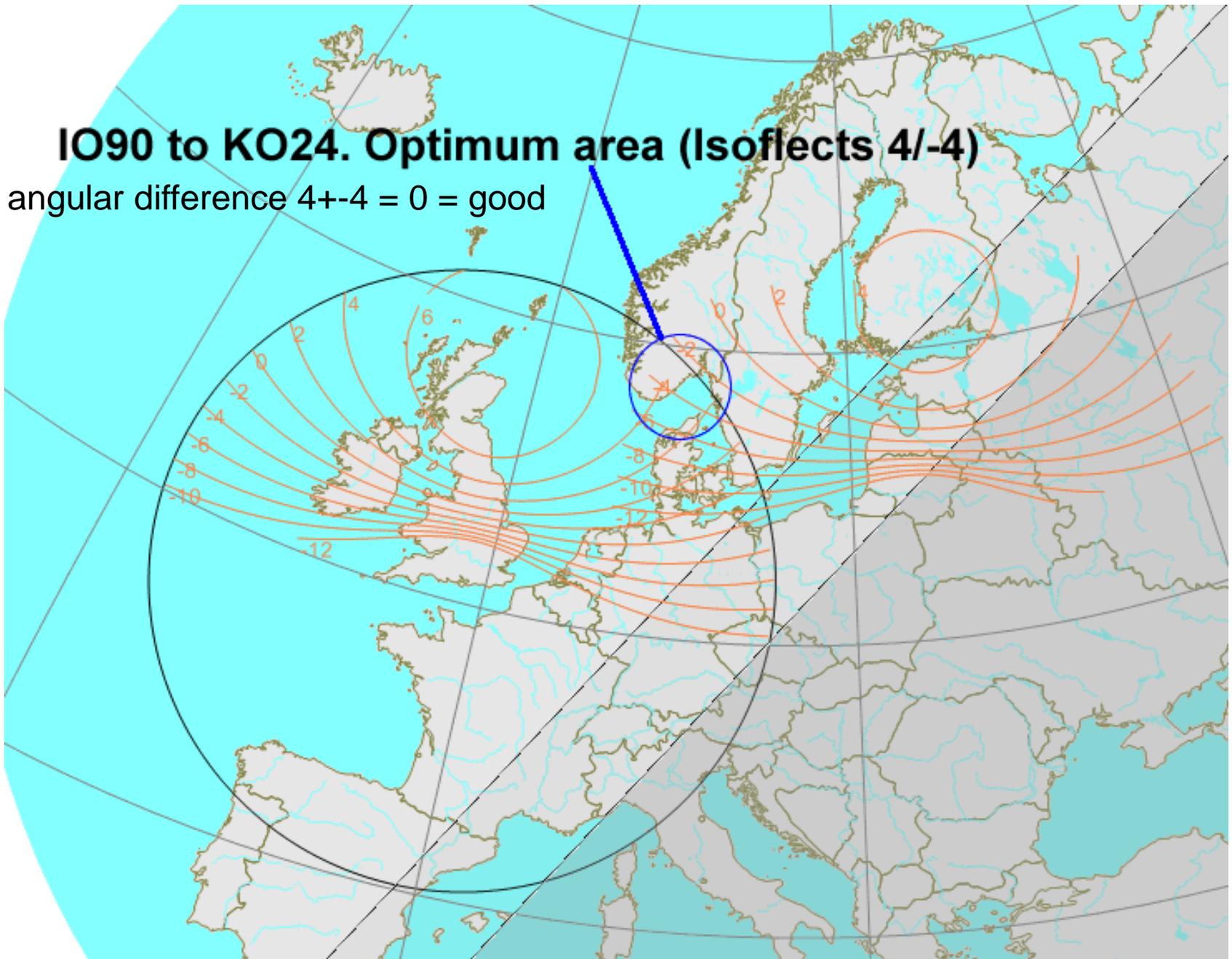
- Model and base routines by G3NAQ – Dr Geoff Grayer. Isoflectional, isoflection and isoflect are words created by Geoff to explain the optimal lines of reflection in aurora and field aligned modes of propagation.
- Supporting maths and aurora extension (for big auroras) by G4FUF – Keith Naylor
- Routines, live processing, mapping and other calculations by G7RAU-Dave
- Model is well tested now over 40 years, there are no surprises (so far at least!).

# Map screenshots



# IO90 to KO24. Optimum area (Isofects 4/-4)

angular difference  $4+-4 = 0 = \text{good}$



# Spotting tool for AU qso's

## Method 1:

<input type="text"/>	qt f : 50 (1248km)						
<b>DX Callsign?</b>	<b>Freq?</b>	<b>DX Loc?</b>	<b>Prop?</b>	<b>RST / Info?</b>	<b>Add Spot</b>		
SM7GVF	144045	JO77GA	cfm?	AU	QTF005 55A		

## Method 2:

<input type="text"/>	<b>Add Spot</b>					
<b>DX Callsign?</b>	<b>Freq?</b>	<b>DX Loc?</b>	<b>Prop?</b>	<b>RST / Info?</b>		
SM7GVF	144066	JO77GA	cfm?	AU	AZ5/292	

## Method 3 Spotting manually :

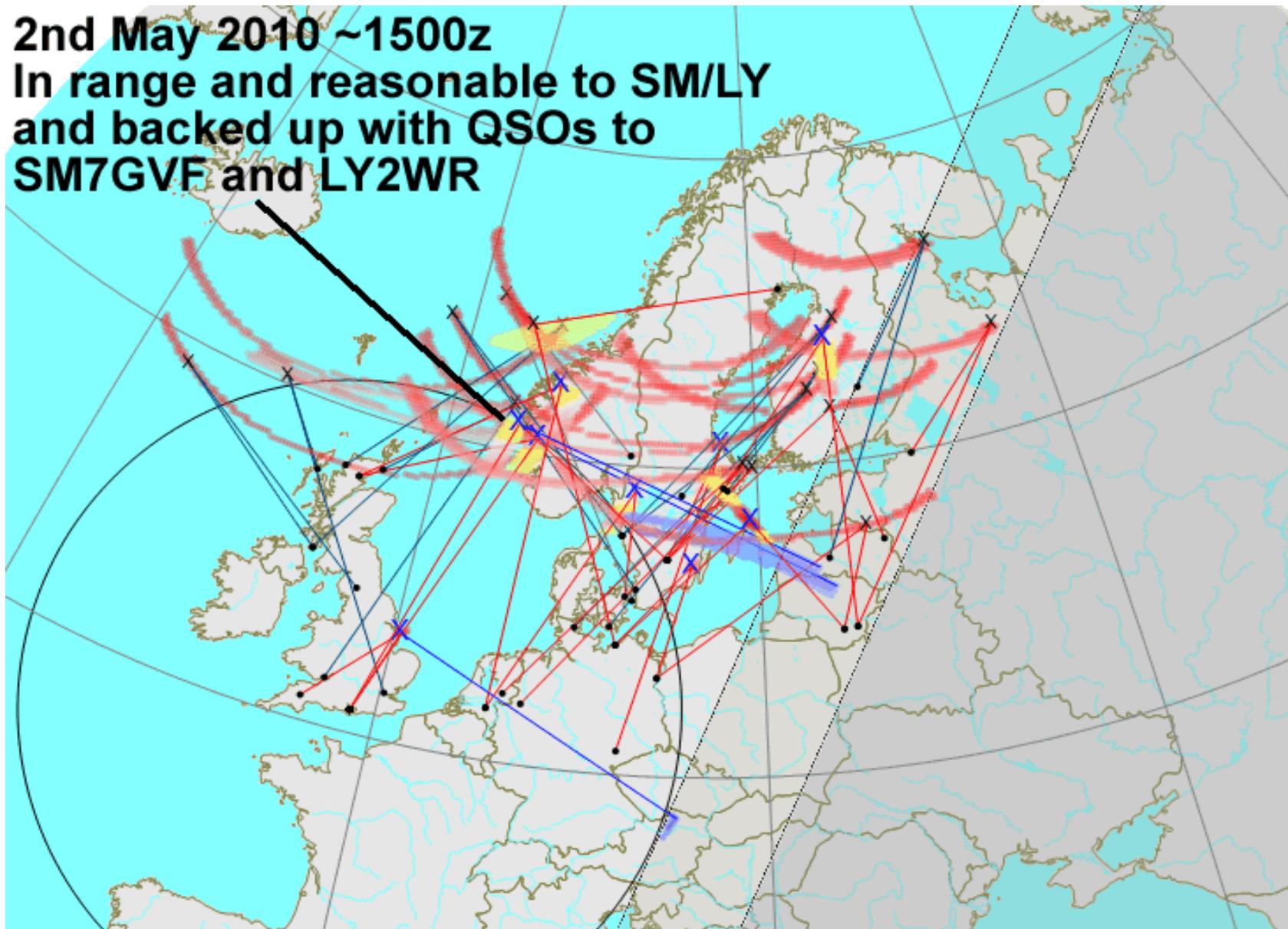
<input type="text"/>	DX SM7GVF 144066 IO90IR<AU>JO77GA qtf5 55A					
<b>DX Callsign?</b>	<b>Freq?</b>	<b>DX Loc?</b>	<b>Prop?</b>	<b>RST / Info?</b>	<b>Add Spot</b>	
			cfm?	UNKNOWN		

Using a standard spotting method will enable all users to have pretty accurate data on aurora possibilities from their location. In “Live MUF mapping” only the aurora spots with QTF info are really useful as often the possibilities can be endless so the QTF helps to narrow things down.

# Key points

- Reflection point must be less than 1200km and 270 to 90 degrees through north.
- Field alignment with the stations you want to work is critical. Angular difference as close to zero and isoflects as low as possible is the optimal scenario.
- Range out to around 2300km (on a **BIG** aurora). Range for G7RAU to KO63/KO64 ~2300km, RA3LE etc heard in big auroras. Map is very useful for these extreme events.

**2nd May 2010 ~1500z**  
**In range and reasonable to SM/LY**  
**and backed up with QSOs to**  
**SM7GVF and LY2WR**



# Other things it can do

- ES backscatter (FAI).
- F2 Mapping.
- Astronomy maps.
- Very basic logging.
- Sporadic e calculations.
- Animated models for all propagation modes.

# Questions and Links

- [http://en.wikipedia.org/wiki/Aurora %28astronomy%29](http://en.wikipedia.org/wiki/Aurora_%28astronomy%29)
- <http://spaceweather.com/>
- <http://g7rau.demon.co.uk/>
- Further reading: RSGB VHF/UHF DX book and Radio Auroras By Charlie Newton, G2FKZ

Thanks to all contributors to Live MUF and a big thanks to Dirk Koopman for DX-Spider, the backbone of the DX Cluster.