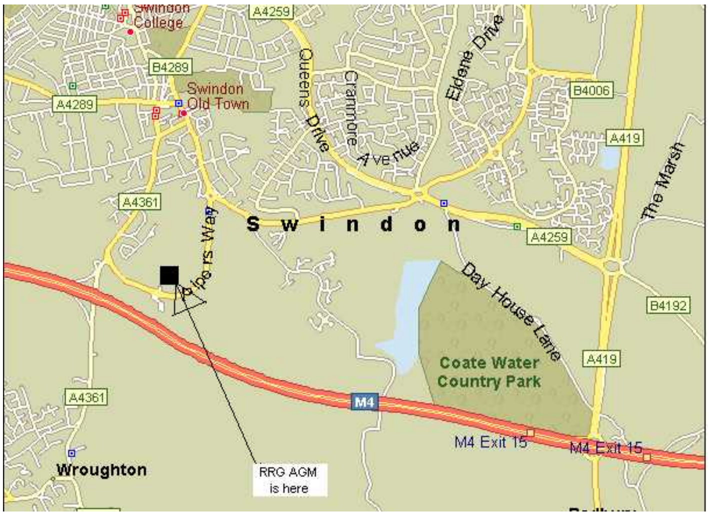
R.R.G NEWSLETTER-EXTRA

Reminder Notice of AGM

The AGM of the RRG will be held at Nationwide House, Pipers Way, Swindon, Wiltshire on Wednesday May 18th 2005 at 19.30.

Talk in on GB3WH and GB3TD



How to get there:

From M4 Junction 15, take the A419 north towards Cirencester.

At the next roundabout, take the 1st exit on the A4259 towards Swindon.

Travel along this road for about 1 mile over a mini roundabout and 2nd exit on the next roundabout until you approach a large roundabout.

Take the first exit towards Wroughton and the A4361(Devizes Road).

Travel down the hill for about ½ mile and at next roundabout turn right towards **Nationwide HQ**.

Follow signs for Car Parking and report to the main Reception and sign in.

We hope you have a good evening were you will be able to meet other members and guests.

Propagation on 70MHz

There are several modes of propagation possible, listed here with the heights of the reflecting layers involved:-

1. 'Line-of-sight' or 'tropo', zero to about 500 metres
2. E-layer ionospheric, i.e. 'sporadic-e' about 110 Km
3. Meteor scatter, about 110 Km
4. F2-layer ionospheric, about 300 Km

Line-of sight or 'Tropo'

Line-of-sight is not in fact straight-line because VHF and higher RF is curved slightly downwards, so, under average WX conditions it can 'see' about one-third further round the earth's curvature than the geometrical horizon. This is caused by the air's radio refractive index decreasing with height. A useful formula giving the distance, L in Km, that RF from a height (h) in metres can reach round a smooth earth is:-

$L=4.1\sqrt{h}$

Or, for L in nautical miles and h in feet:-

$L=1.22\sqrt{h}$

The radio refractive index (n) at sea level varies. An average for UK being 1.00035, which means that RF travels slower than in free space by a factor of 1/1.00035. (n) lessens gradually with height, reaching unity in outer space. The lower part of a horizontally travelling radio wave-front will therefore be more retarded than the part higher up, and since physical laws require the direction of travel to be always perpendicular to the wave-front, the RF must bend downwards.

It's more usual to replace a value like n=1.00035 with N, such that in this case:-

N=350 N-units.

The gradient of N (or n) with height is key to the radio wave's curvature and another unit, called M is used to factor-in the earth's curvature. It's done so that M normally increases upwards, and the rate of increase, which is in M units per Km of height, is dM/dh.

In calculus notation dM/dh=157

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If, in very rare cases, the RF travelled in straight lines, i.e. with no gradient of N or M across its path. dM/dh=120 approx under standard atmospheric conditions, i.e. temperature falling about 10 degrees C per Km of height, and with a corresponding fall in water vapour content with height.

A warm dry sunny afternoon with Cumulus clouds would give 'flat' conditions with dM/dh about 133. When dM/dh falls to zero, it signals that the RF's curvature has intensified to the point that it equals the earth's curvature. A negative value means even more curvature, and the RF can be led or ducted round the earth, with focussing and multipath effects occurring.
These low values of dM/dh happen when water vapour decreases, and the temperature increases, abruptly with height in the lowest few hundred metres of atmosphere. Classically, a warm dry airmass around an anticyclone will settle onto and trap a skin of damp cool air to produce vhf/uhf ducting. There are other types of WX situation that produce a duct.

A calculator program as listed below is given for Casio fx-4000P and fx-7000G machines.

```
"RADIO DUCT"◢
Lbl 1:"BARO":?→P
:"TEMP":?→T:"DP
DEP":?→Q:273.2→A
:S=0⇒P→S:S=0⇒T→F
:T−Q→D:A+T→T:F+A
→G:e(1.8099+(17.
27D÷(D+237.3)))→
E:(77.6÷T)(P+(48
10E÷T))→N:(G+T)÷
2→B:(287.1÷9.8)T
ln (S÷P)→H:N+.15
7H→M:H=0⇒M→O:"HT
="◢
H◢
"N="◢
N◢
"M="◢
M◢
"DM÷DH="◢
H>0⇒1000(M−O)÷H◢
Goto 1
```

Someone cleverer than me might translate this for PC use. The program displays height, N and M for each level, and mean dM/dh from the surface, from input of pressure, temperature and dew-point depression from radio-sonde

messages. If a listener notes signal strengths from day to day, the corresponding sonde data can be downloaded and inserted into the program to calculate dM/dh, thus providing an insight into what is causing the RF conditions.

The Wyoming University website gives the data required.

http://weather.uwyo.edu/

After entering, click on upper air observations, then soundings, and then select Europe from the menu. Then click on the sonde station on the map for the area of propagation interest. The data can be in graphical form (e.g. Gif skew-T) of temperature and dew-point against height, for examining the overall profile, but the option 'Text-List' should be selected for getting the data for the calculator. Archive data can be got by editing the date/time menu, so you can go back to a period of heard VHF enhancement from several months previously, etc.

Assuming you have written the program to your calculator, clear all memories (Mcl), and run the program. It will ask in turn for pressure, temperature and dew-point depression, for each ascending level recorded by the sonde balloon.

Working down the list, insert the first (ground) level set of data, then the next one etc. Dew-point depression=air temperature minus dew point which harks back to the raw coded sonde messages from my days in the Met Office! You can make a table of all the values calculated for each level. dM/dh is calculated as the mean value from the surface to the current level. A duct's top is where mean dM/dh returns to positive values above a negative layer.

There is no need to deal with higher levels. If mean dM/dh gets low but stays positive there may be an elevated duct, which can be spotted by looking for any decline in M from the table. An elevated duct is important if tx and rx are higher than the sonde's base level, such as on masts, hills or aircraft so as to be situated within the duct. If relevant, run the program again using the duct's base as the starting level. If the one of the tx/rx are above the duct's top, then a 'RF' black hole' may occur.
Acting like a waveguide, the duct's thickness and intensity governs the longest wavelength which can be trapped within the duct.

If you have logged the calculations above you can calculate this. The formula is:-

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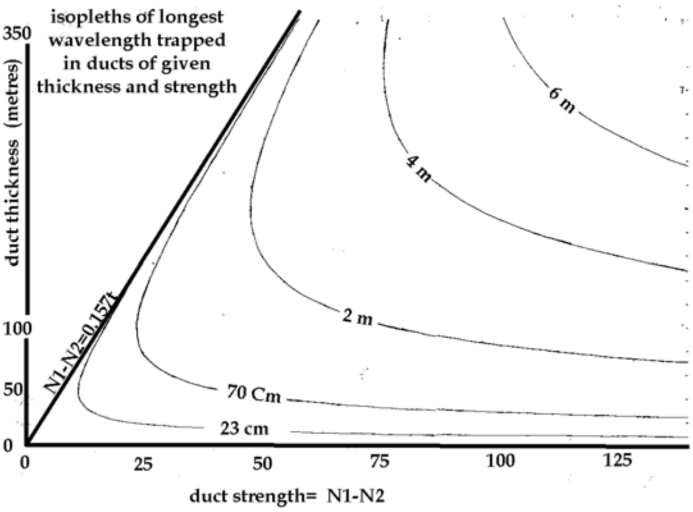
"$\lambda = 2.5 \times 10^{-3} \times \sqrt{((N1-N2)-0.157)t}$"

where **λ** is the longest wavelength, N1 and N2 are the N-values at the base and top of the duct respectively, and **t** is the duct's thickness in metres. Ducts are sometimes too thin for 70 MHz, but 144 and 430 MHz fair better, as does UHF TV etc. Nevertheless it's worth studying 70MHz and 50MHz propagation changes, even without a true duct being present.



On the attached graph above, a plot to the left of the sloping line means it cannot be calculated.

Later in part two I will deal with the other propagation modes affecting 70 MHz.

73

Richard Gosnell, G4MUF

Radios / Equipment for sale

New stock of radios available to members

A new stock of radios is now available to members and local amateurs.

Kit consists of:-

Ascom SE550 4m FM radios (70MHz) – Modified

Phillips MX296 UHF FM radios – Unmodified

Thorcom RLC220 Packet radio controllers (anyone got any info on the Thorcoms ???)

Ascom base station transceivers, aerial filters, etc

19" 42u racking

Pye T412/R412 UHF base equipment

Contact Andy G0BEQ or Rob G4XUT to ascertain stock availability and price.

Dates for your Diaries

The West *of* England Radio Rally

26 June 2004, Frome, Somerset

Shaun, G8VPG, 01225 873 003

www.westrally.org.uk

Or call G8YMM on GB3WH

Useful Links

www.nbarc.org.uk

www.rrg.org.uk

www.westrally.org.uk

www.swindonradioclub.org.uk

www.g8ymm.org.uk

EchoLink Gateway for Swindon, Wiltshire.

GB3TD-R (Repeater Gateway) Frequency	**Input 434.675**
	Output 433.075
Echolink Node No.	**43307**
M1EFY-L Simplex Frequency (used when GB3TD unavailable)	**434.500**
Echolink Node No.	**98700**

Operator Email: sysop@m1efy.com

RRG News Editor

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