

NVIS & the 5MHz Experiment

John Gould, G3WKL
Chairman RSGB 5MHz Working Group

<http://www.rsgb-spectrumforum.org.uk/5MHz.htm>

5MHz in the UK

- Amateur access to 5MHz channels from mid-2002 to mid-2006
- Purpose to conduct experiments in
 - Emergency comms
 - Aerials
 - Propagation
- 5MHz Working Group (5WG) formed in Nov 2002.

5WG Membership

J W Gould, G3WKL, Chairman(Acting RSGB HF Manager)

G L Adams, G3LEQ (IARU Emergency Communications Region 1 Coordinator)

L W Barclay, G3HTF

P Gaskell, G4MWO (RSGB RCVS National Coordinator)

P Martinez, G3PLX

G Mossop, G0DUB (RAYNET representative)

C Thomas, G3PSM (Board Member, RSGB Spectrum Forum Manager, Acting IARU Region 1 HF Manager)

M Wood, G7VRT (Cadet Representative & Liaison)

5WG Remit

To deal with all matters concerning the temporary 5 MHz spot frequencies allocated to the Amateur Radio Service within the United Kingdom on a Notice of Variation basis.

The Group will formulate and monitor experiments and communications exercises in line with the terms of the Notice of Variation, and at periods to be agreed, report relevant findings to the Primary User via the Radiocommunications Agency.

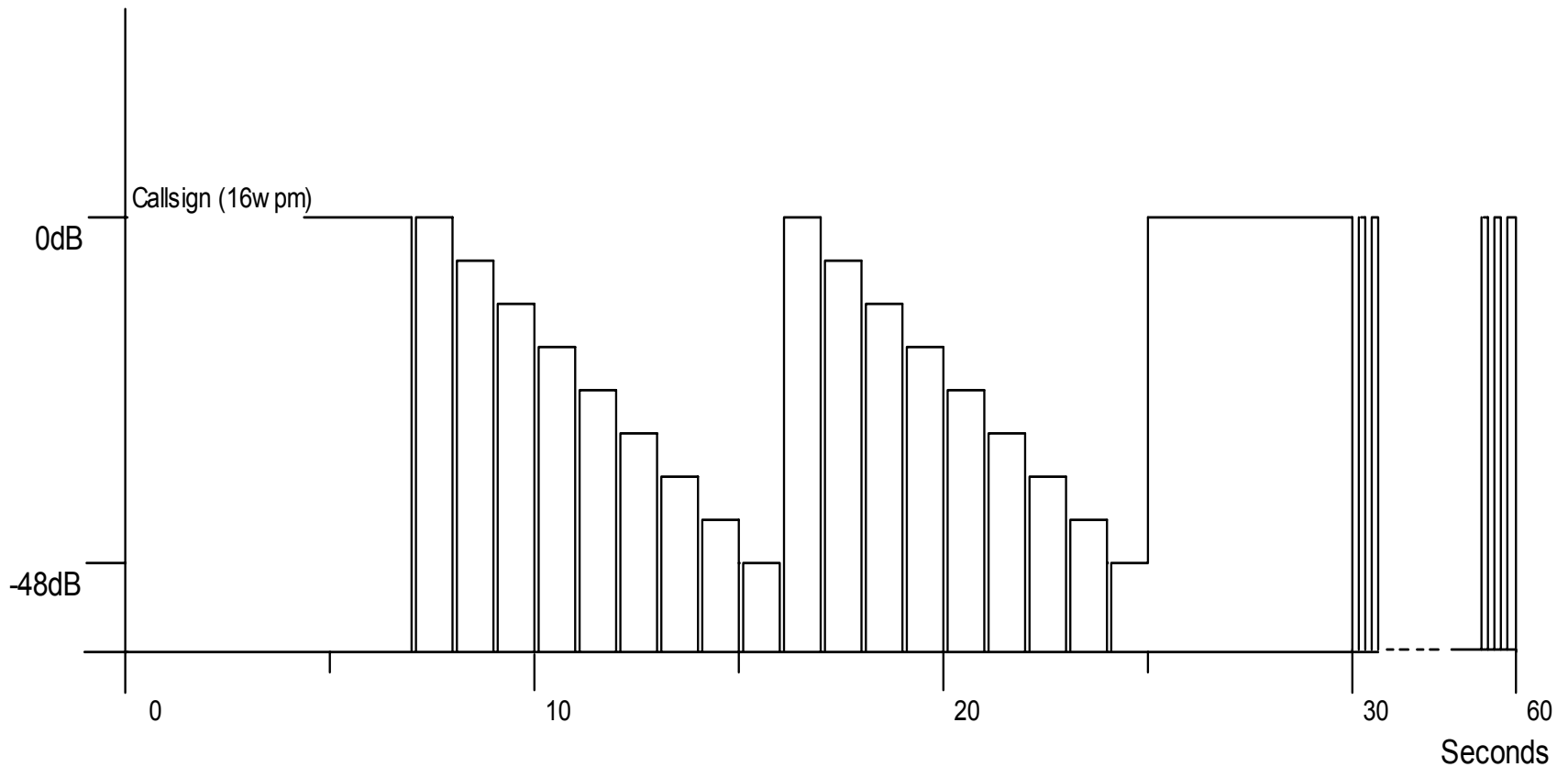
5WG achievements

- Coordinated scientific and emergency comms activities, reporting twice to RSGB Board, RA/Ofcom and MoD.
- Assess and make recommendations to Ofcom re NoV applications.
- Liaised and support given to individuals on their own experiments.
- Defined and coordinated a centrally run task, termed the “5MHz Experiment”
 - Installed three propagation beacons:
 - GB3RAL, IO90IN, 30th April 2004
 - GB3WES, IO84QN, 30th October 2004
 - GB3ORK, IO89JA, 3rd December 2004
 - G3PLX provided “freeware” to automatically monitor the beacons

5MHz Expt: Overview

- An data collection task run by the 5WG to allow later analysis
- Data is restricted to certain broad categories to keep the number of variables down
- A strict reporting format is specified
- Goals:
 - Creation of an empirical equation for 5MHz propagation
 - Creation of a large database that anyone can subsequently analyse to research things that might include
 - Effects of different categories of aerial type
 - Long-term noise-floor changes

5MHz Expt: Beacon sequence



5MHz Expt: Log database

- 11,922 records in the Station Log & 64,430 in the automatic beacon monitoring log
- 382 different calls in the log
 - 4435 reports of GB3RAL
 - 1646 reports of GB3WES
 - 1345 reports of GB3ORK
- Current issues
 - Data cleanup, e.g. typing & logging errors
 - Missing data, e.g. QTH Locator data

5MHz Expt: Stations Heard/Worked

G3ENI	355
G3ZUN	288
G3ENO	237
G3GHS	199
G0HNW	99
G3KTH	97
G3DVK	94
GW0VMZ	91
G4JNT	71
G0MRL	66
G0UOO	60
G5BM	55

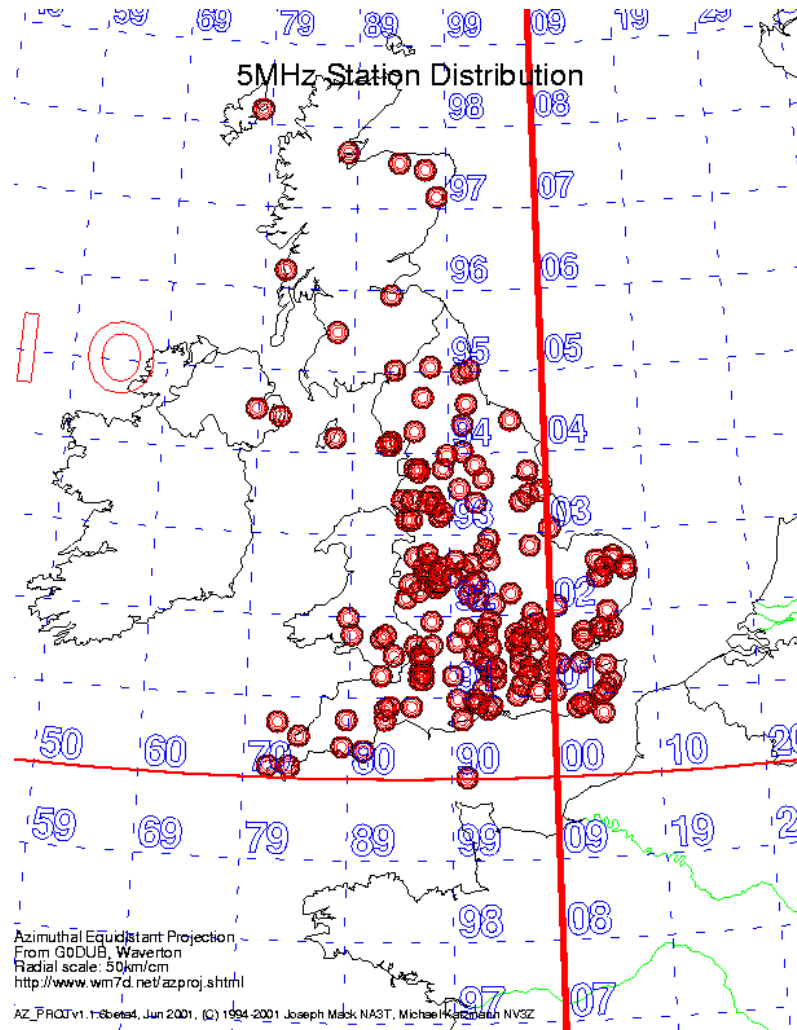
G8ABB	53
G3JFS	52
G4KUJ	44
G3JKD	43
M0AFJ	42
G3SET	42
G3LEQ	40
G8OJQ	36
G0DUB	36
GI4VIV	36
G3SHK	34
G3PLX	34

5MHz Expt: Stations submitting logs

2E0RGO	4684
G3ZUN	772
M3RGO	753
G3ENI	724
G3JNB	508
G3ENO	361
G3DVK	345
GM3IBU	340
G0WTV	300
G3BPM	291
G4FKH	291
G8ABB	258
G0DUB	208
G8SAU	166
G3GHS	160
G3NPF	160
G3SET	137

G4Zfq	13400
G4IRX	13022
G3WKL	11701
G4JNT	11236
G3LNM	10513
GM4WMM	1618
G3LWM	1473
W1/G6DHU	761
DJ7KG	263
SV1XV	225
G4AKU	159
G3YYD	59

5MHz Expt: Station Distribution



SINPO reporting

All stations
Apr-03

Sent SINPO Correlation

	S	I	N	P	O
S	1.00	0.33	0.51	0.50	0.82
I		1.00	0.51	0.47	0.46
N			1.00	0.59	0.62
P				1.00	0.60
O					1.00

Apr-03

Received SINPO Correlation

	S	I	N	P	O
S	1.00	0.42	0.50	0.52	0.79
I		1.00	0.55	0.48	0.53
N			1.00	0.61	0.61
P				1.00	0.64
O					1.00

Sample of 491 records

All Stations
Apr-05

Sent SINPO Correlation

	S	I	N	P	O
S	1.00	0.28	0.39	0.40	0.83
I		1.00	0.29	0.32	0.29
N			1.00	0.39	0.46
P				1.00	0.48
O					1.00

Apr-05

Received SINPO Correlation

	S	I	N	P	O
S	1.00	0.30	0.35	0.50	0.81
I		1.00	0.43	0.39	0.35
N			1.00	0.33	0.44
P				1.00	0.51
O					1.00

Sample of 4450 records

G3ENI, G3GHS & G3ZUN QSOs
Apr-05

Sent SINPO Correlation

	S	I	N	P	O
S	1.00	0.18	0.35	0.38	0.89
I		1.00	0.40	0.47	0.18
N			1.00	0.27	0.32
P				1.00	0.37
O					1.00

Apr-05

Received SINPO Correlation

	S	I	N	P	O
S	1.00	0.28	0.36	0.45	0.93
I		1.00	0.44	0.60	0.31
N			1.00	0.35	0.36
P				1.00	0.46
O					1.00

Sample of 800 records

Aerial Types

	Sent				
	S	I	N	P	O
RD	4.43	4.71	4.37	4.41	4.44
NRD	3.91	4.57	4.06	4.30	4.07
V	3.89	4.55	3.83	4.05	3.85
O	4.11	4.79	3.98	4.22	4.26

Received	
S	O
4.50	4.54
4.43	4.49
4.12	4.04
4.06	4.29

- Dipoles “best” for reception and transmitted signal & overall reports
- Verticals more susceptible to noise than dipoles

Dipole height (m) AGL

Sent

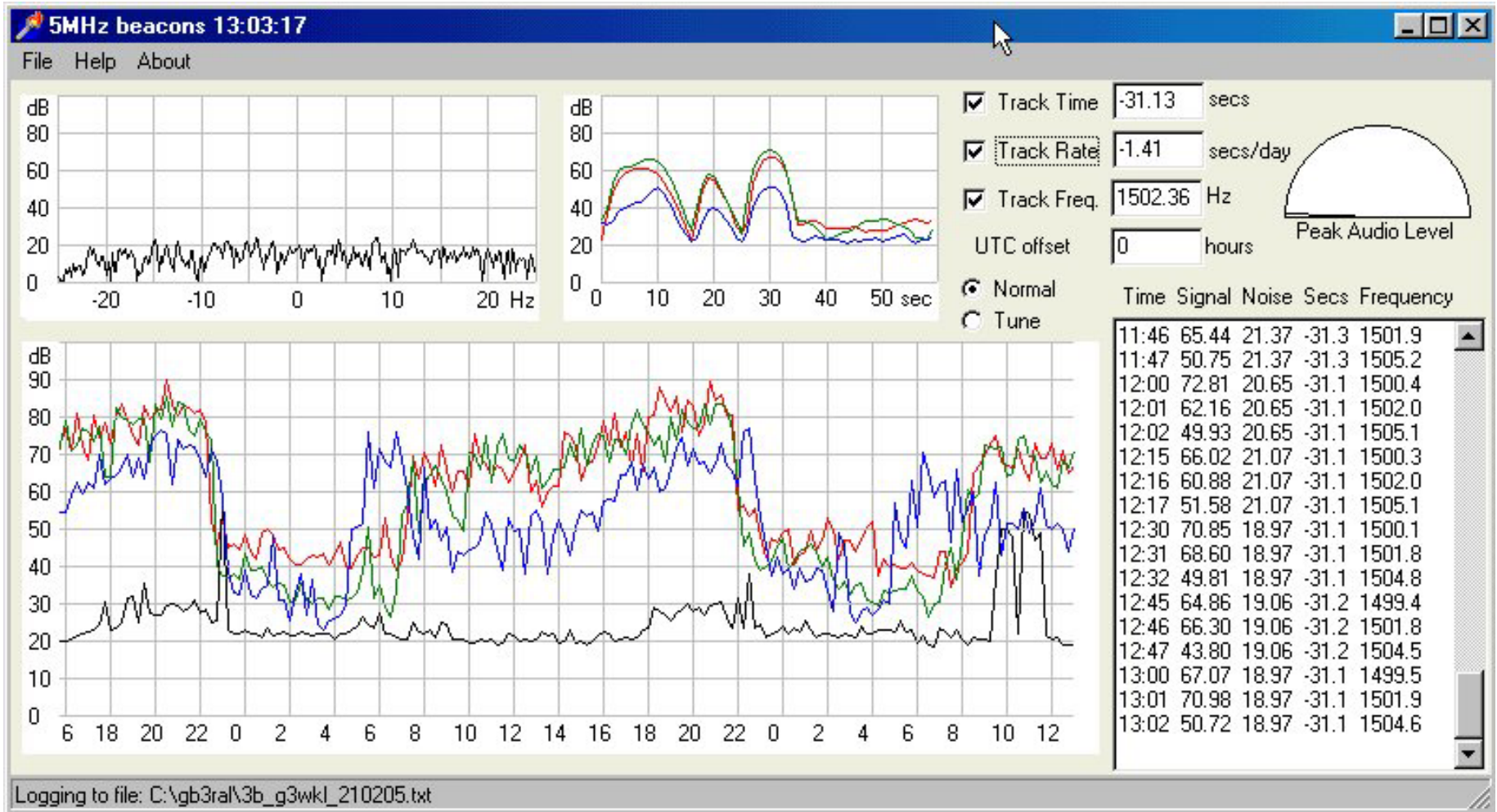
	Sample size	S	I	N	P	O
4	189	4.01	4.64	3.74	4.07	3.89
5	209	4.41	4.62	4.22	4.42	4.46
6	18	4.58	4.95	4.84	4.63	4.74
7	253	4.12	4.63	4.49	4.28	4.21
8	482	4.06	4.32	4.19	4.35	4.28
9	339	4.34	4.96	4.60	4.83	4.53
10	472	4.12	4.75	3.97	4.32	4.12

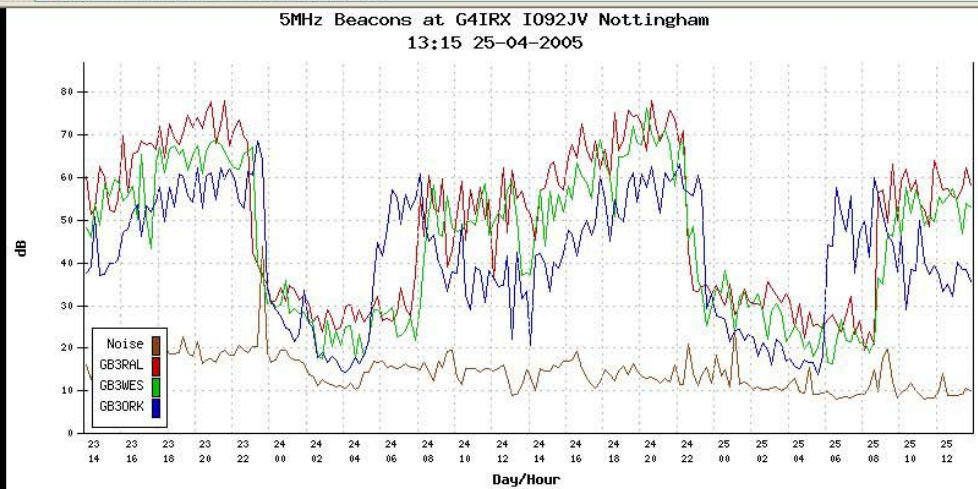
Received

	S	O
4	3.86	3.81
5	4.61	4.69
6	3.92	4.17
7	4.28	4.39
8	4.57	4.63
9	4.42	4.54
10	4.70	4.65

- No clear relationship with height, results probably not statistically significant, but
 - possible optimum around 5m
 - poor reciprocity between sent and received reports
- Sample sizes quite small and of poor diversity at some heights (9m data mostly from one station)
- Possible problems with interpreting height

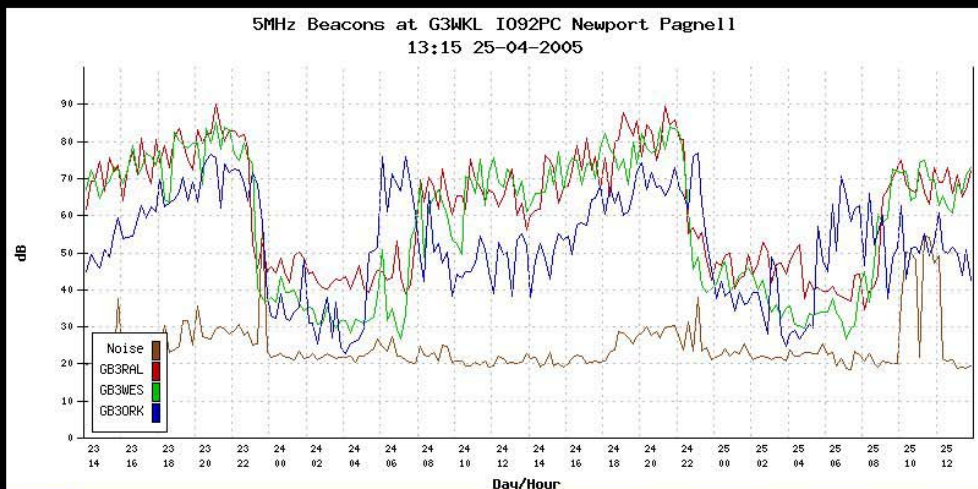
5MHz auto-monitoring





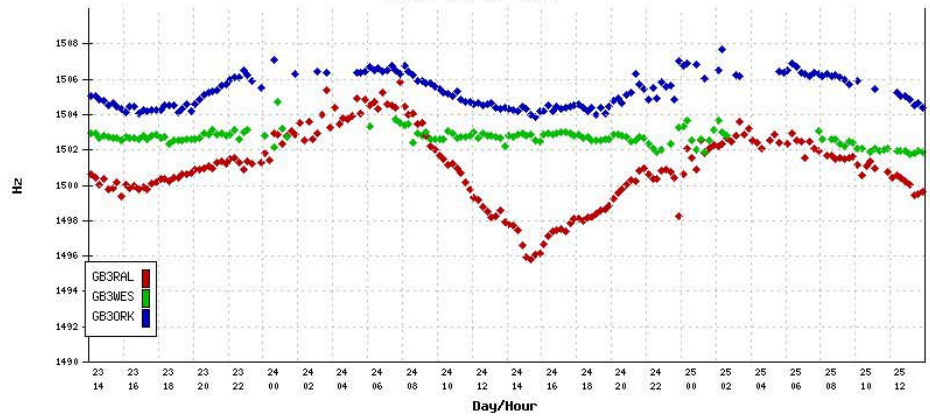
G3WKL IO92PC

G3WKL Logfile

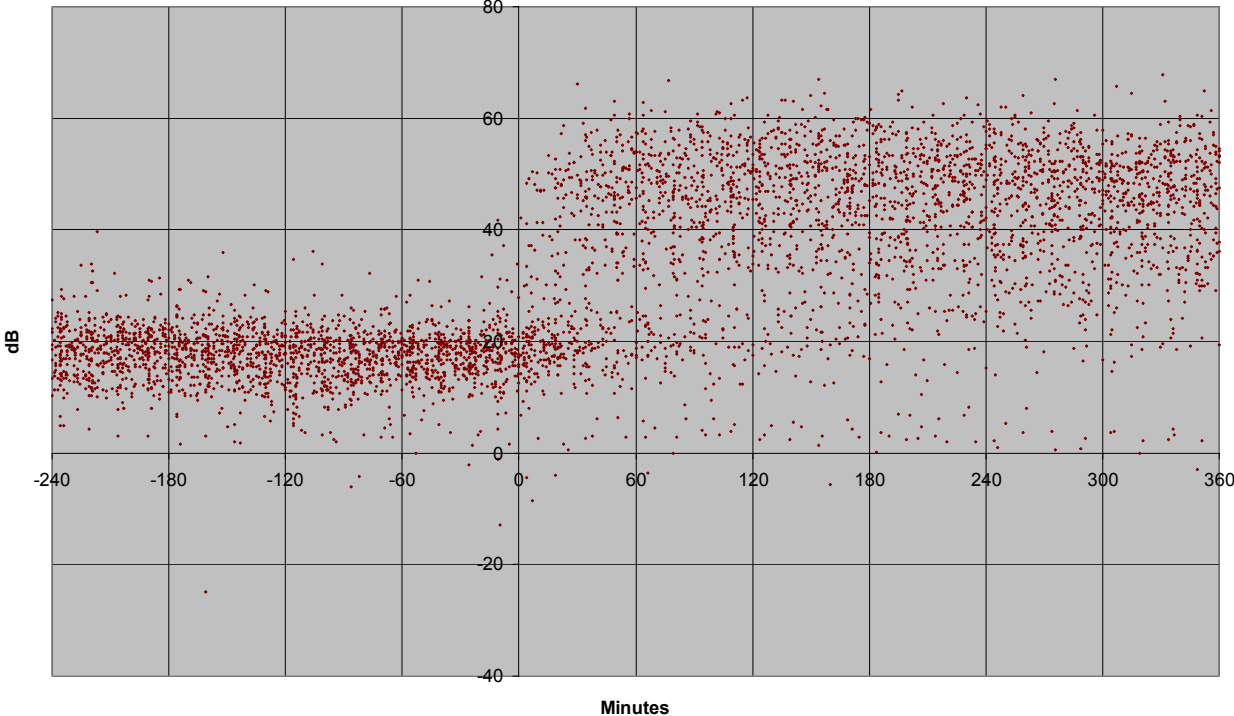


<http://g4irx.nowindows.net/fivemegs/comparison.php>

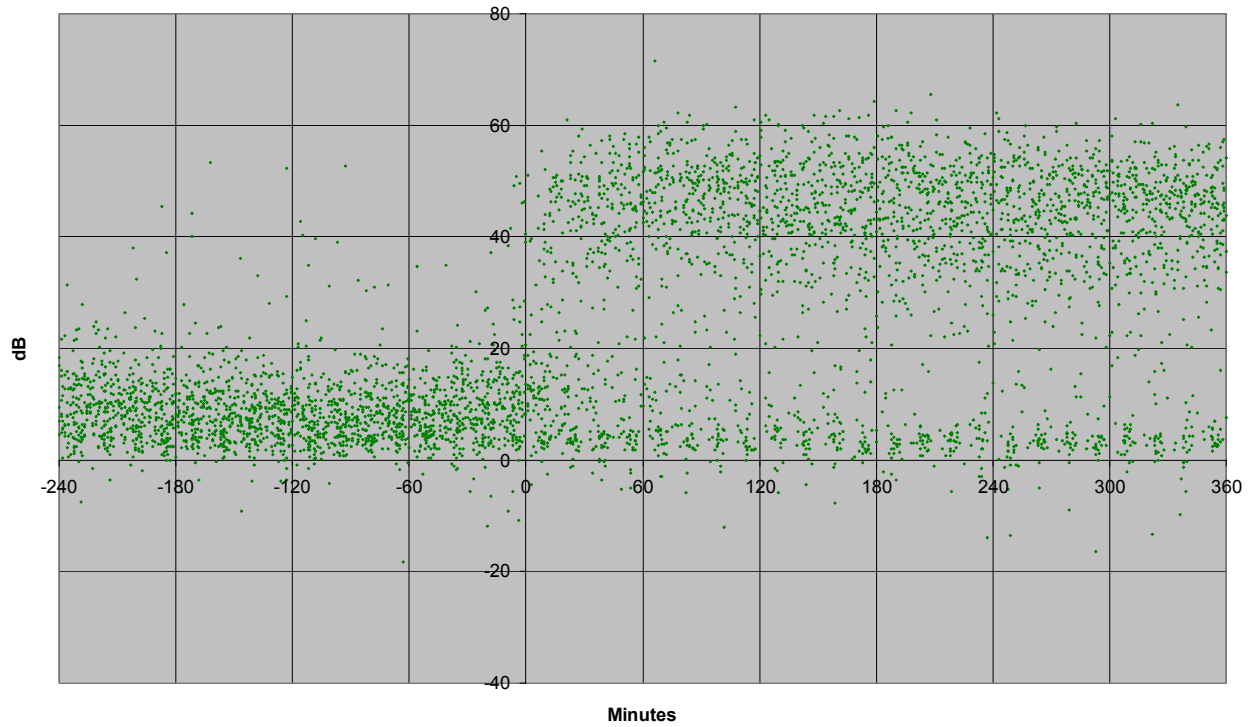
5MHz Beacon Frequencies at G3WKL 13:15 25-04-2005



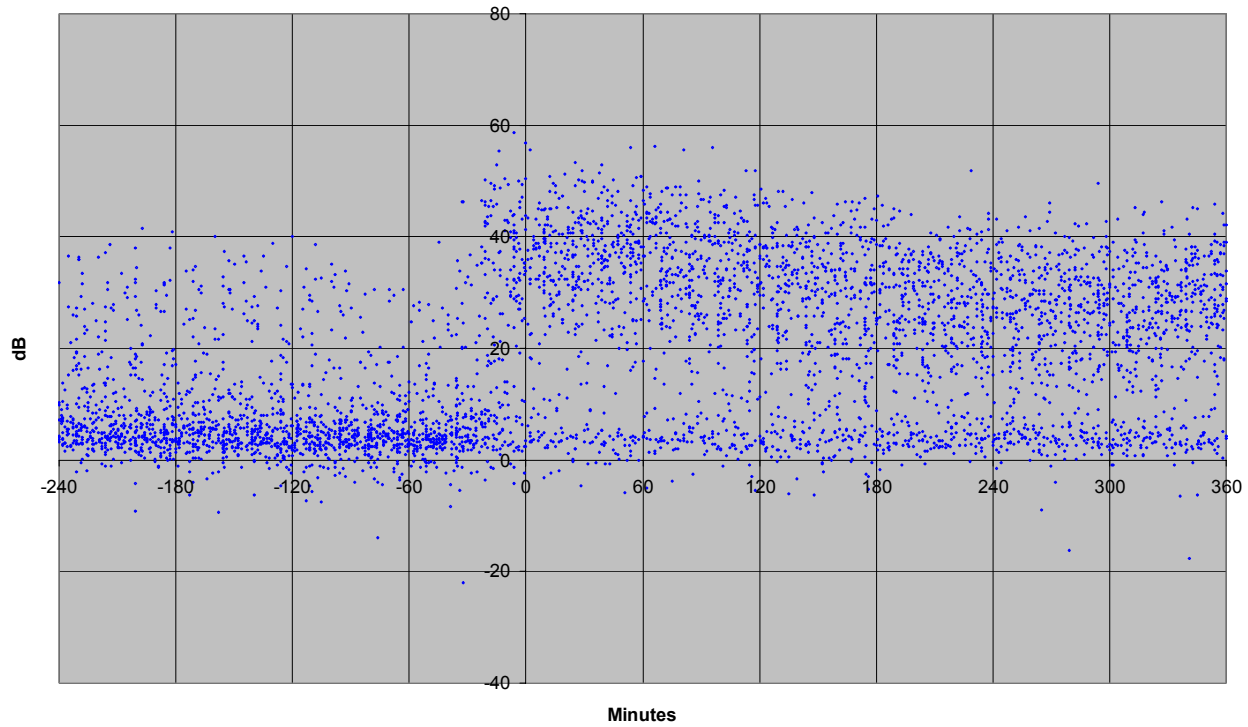
GB3RAL S+N/N Sunrise



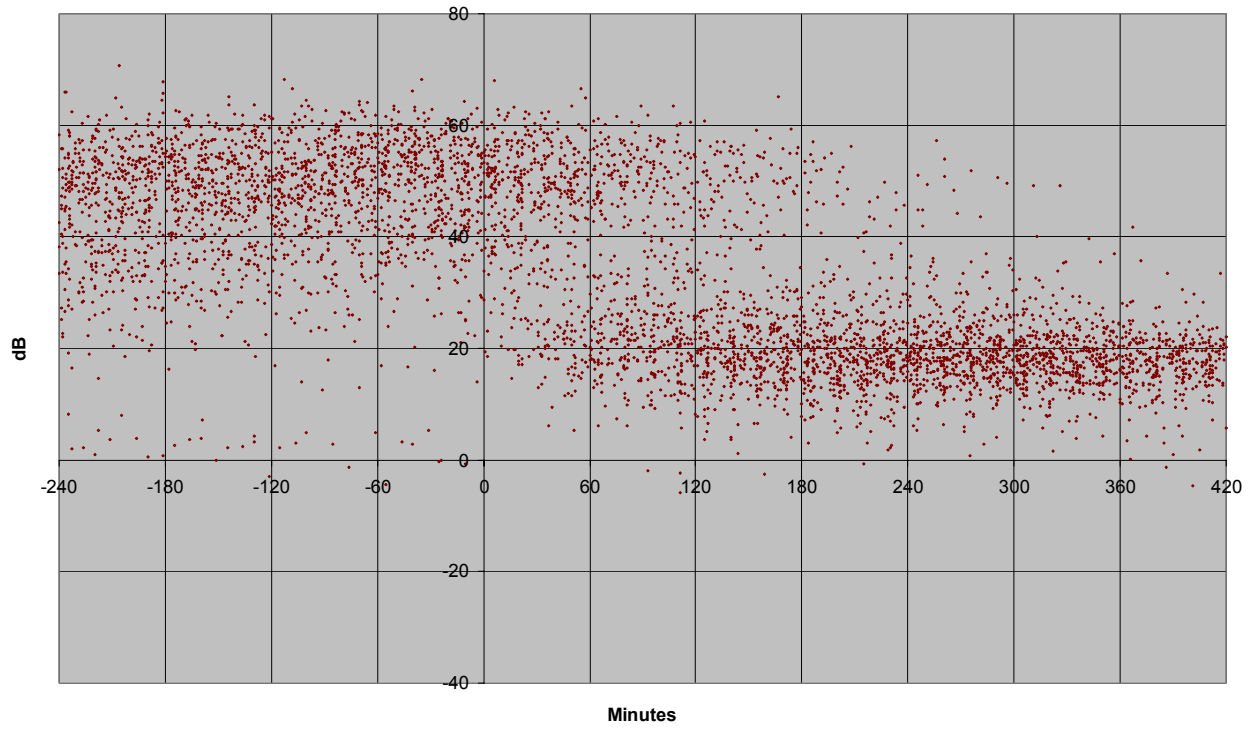
GB3WES S+N/N Sunrise



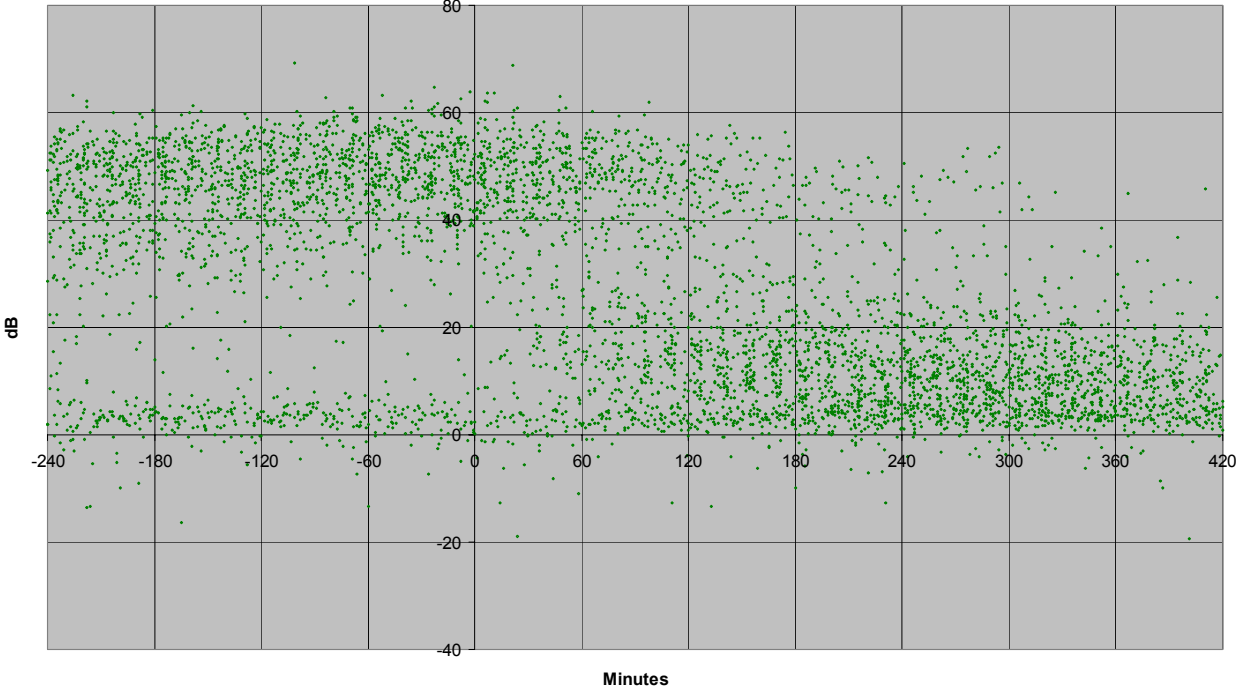
GB3ORK S+N/N Sunrise



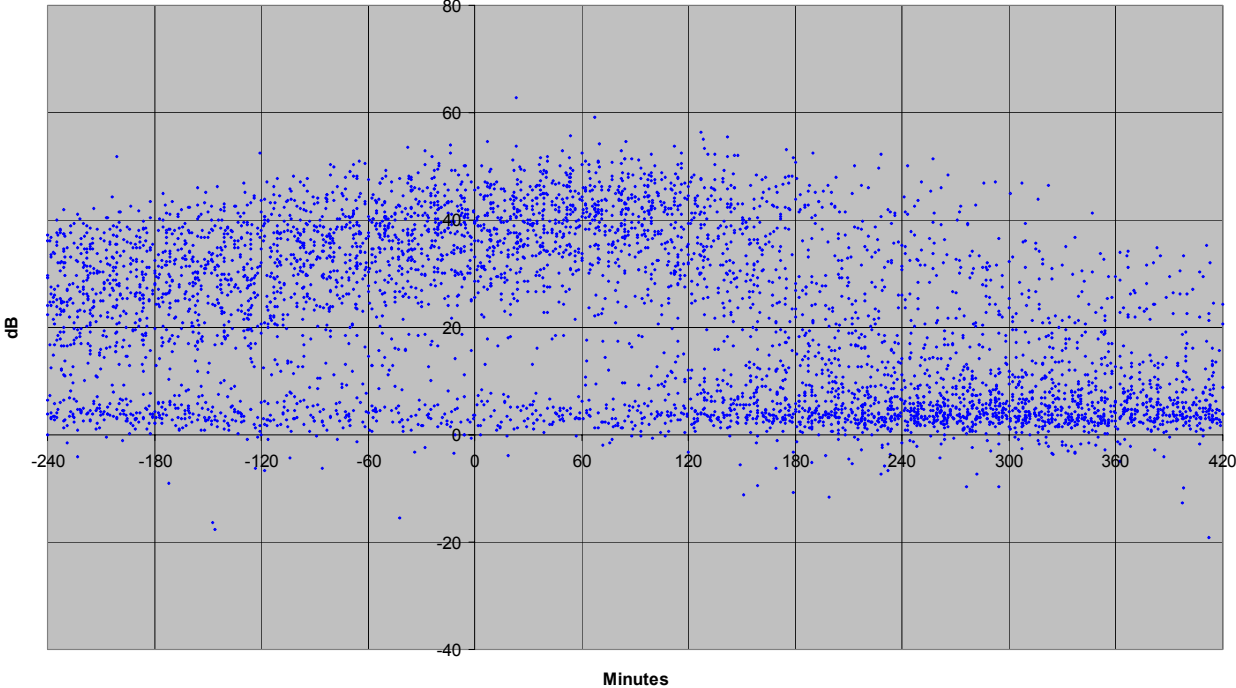
GB3RAL S+N/N Sunset



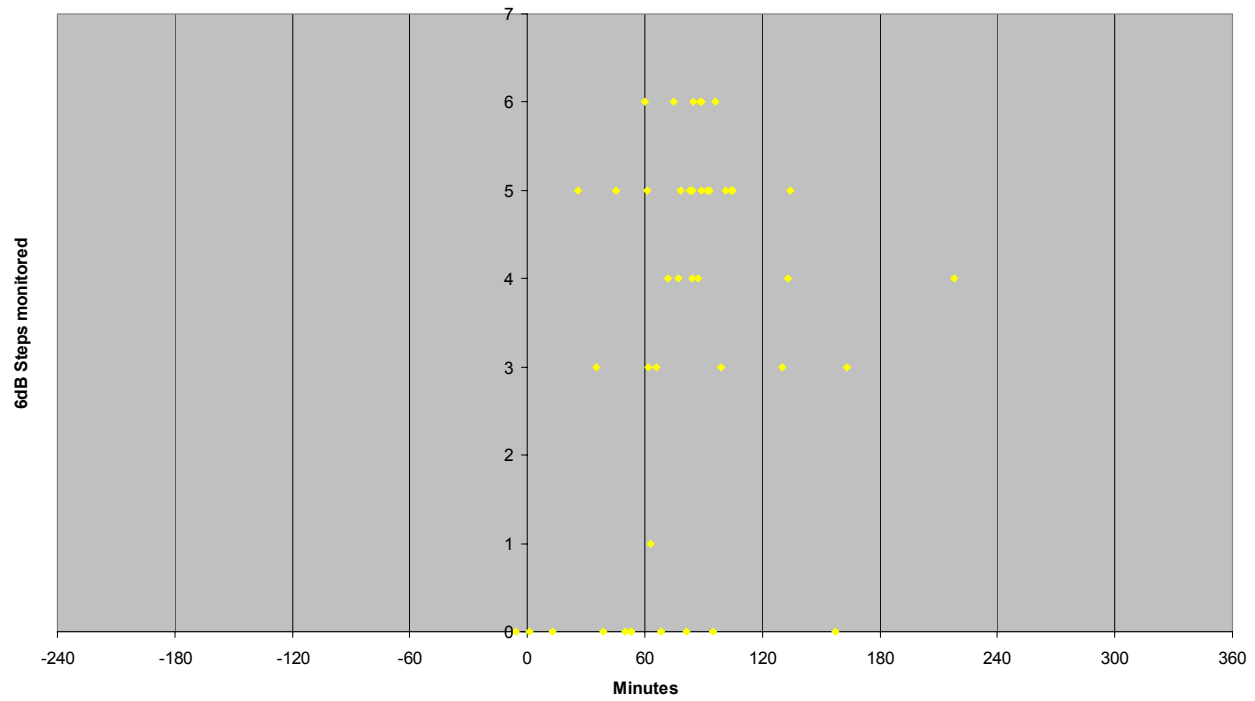
GB3WES S+N/N Sunset



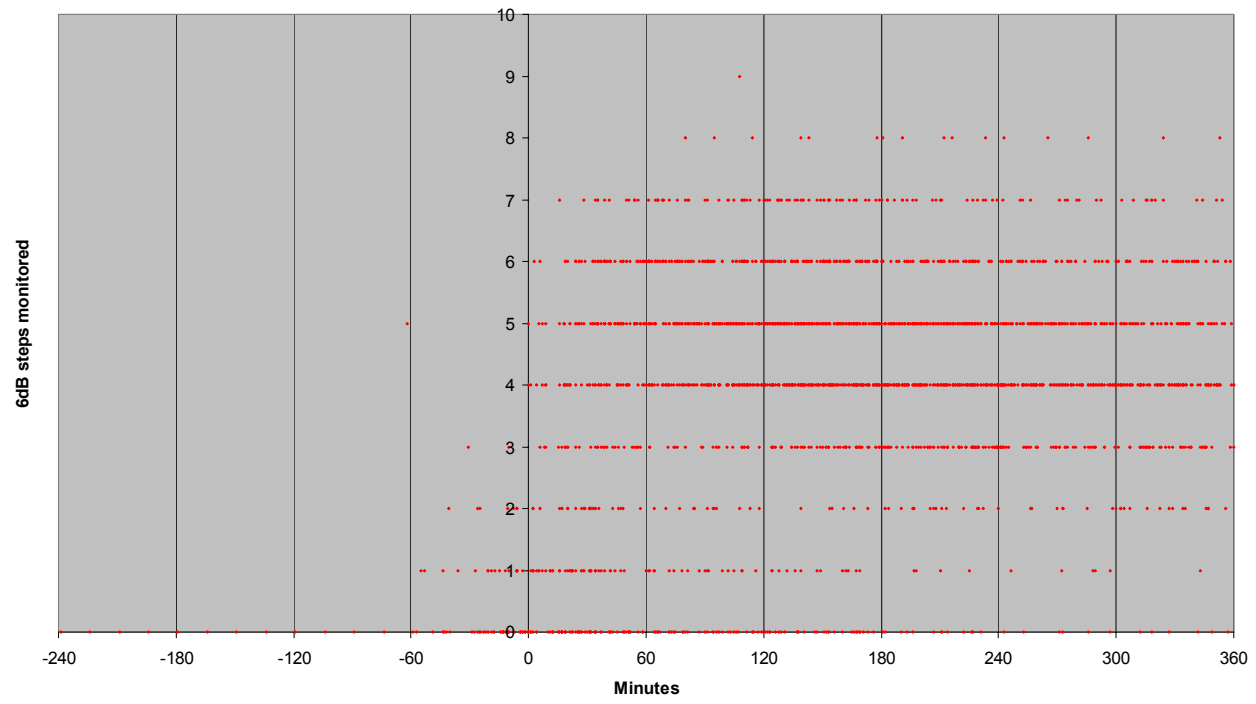
GB3ORK S+N/N Sunset



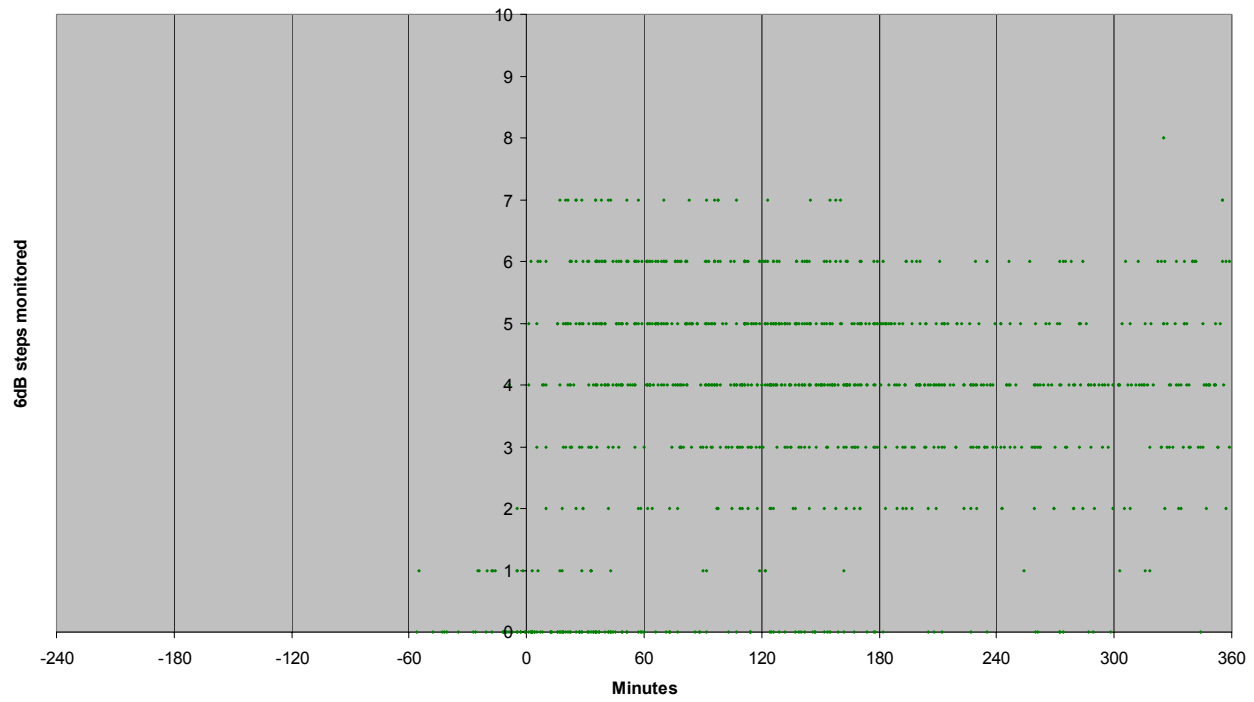
G4JNT Sunrise



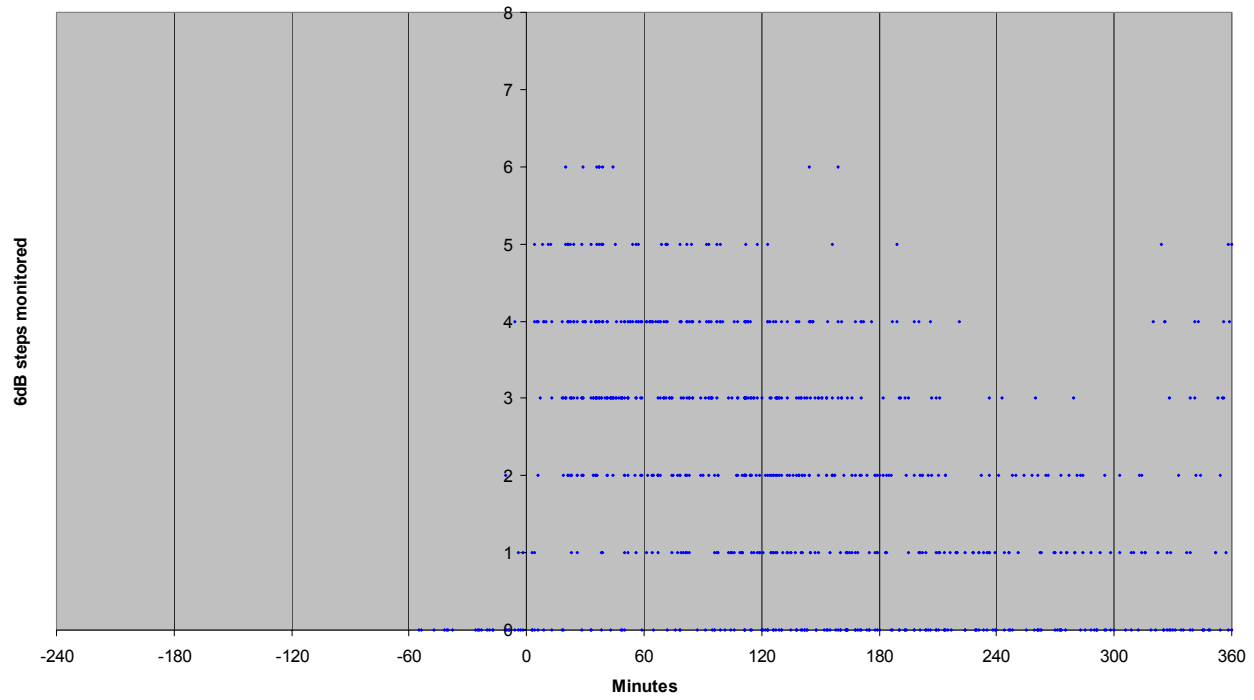
Gb3RAL Sunrise



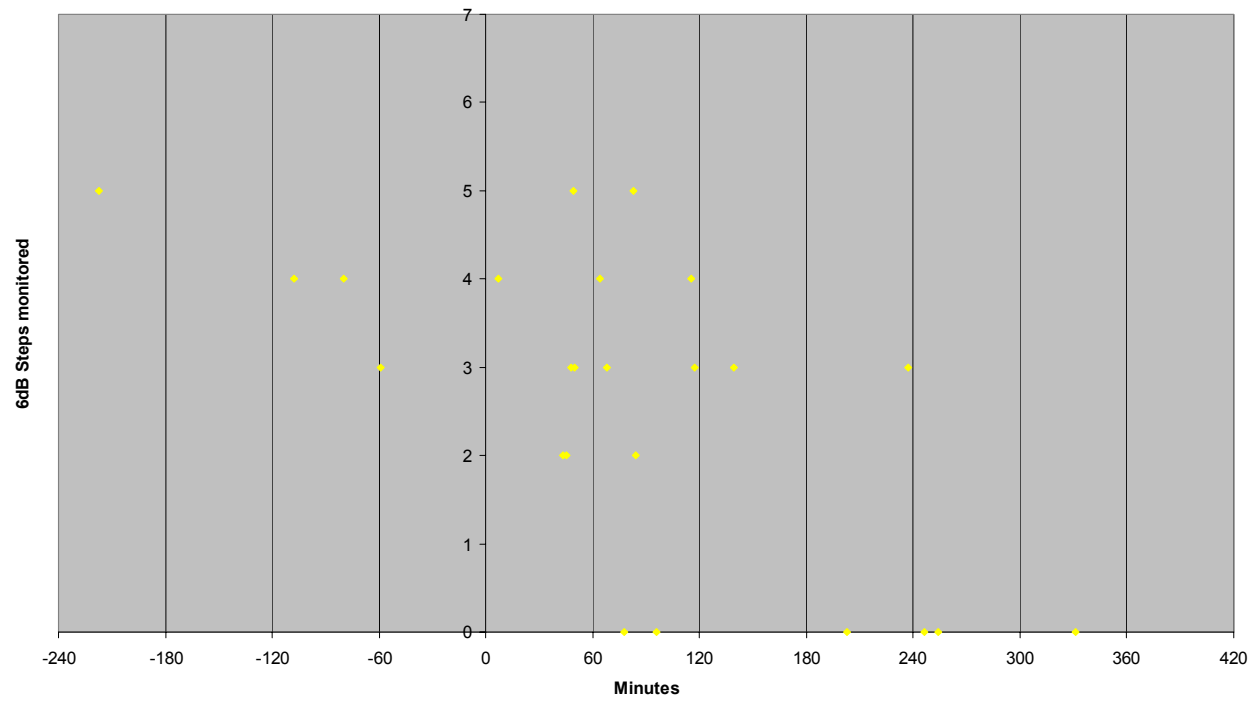
GB3WES Sunrise



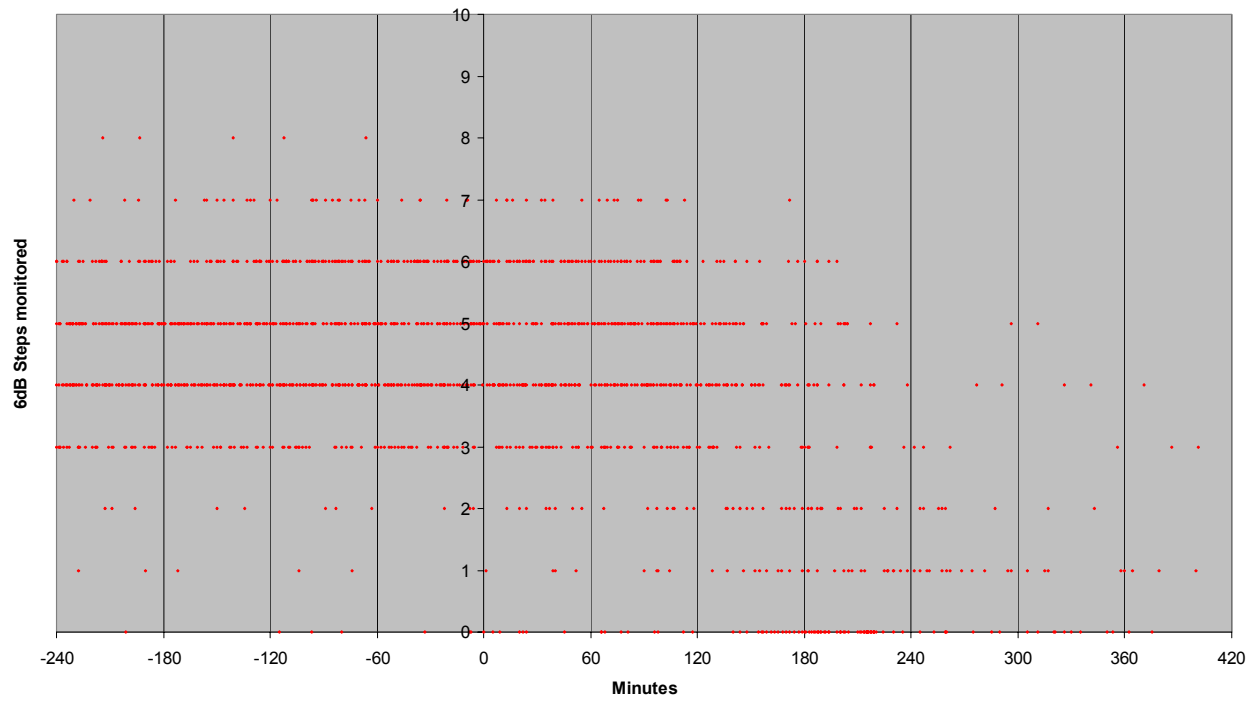
GB3ORK Sunrise



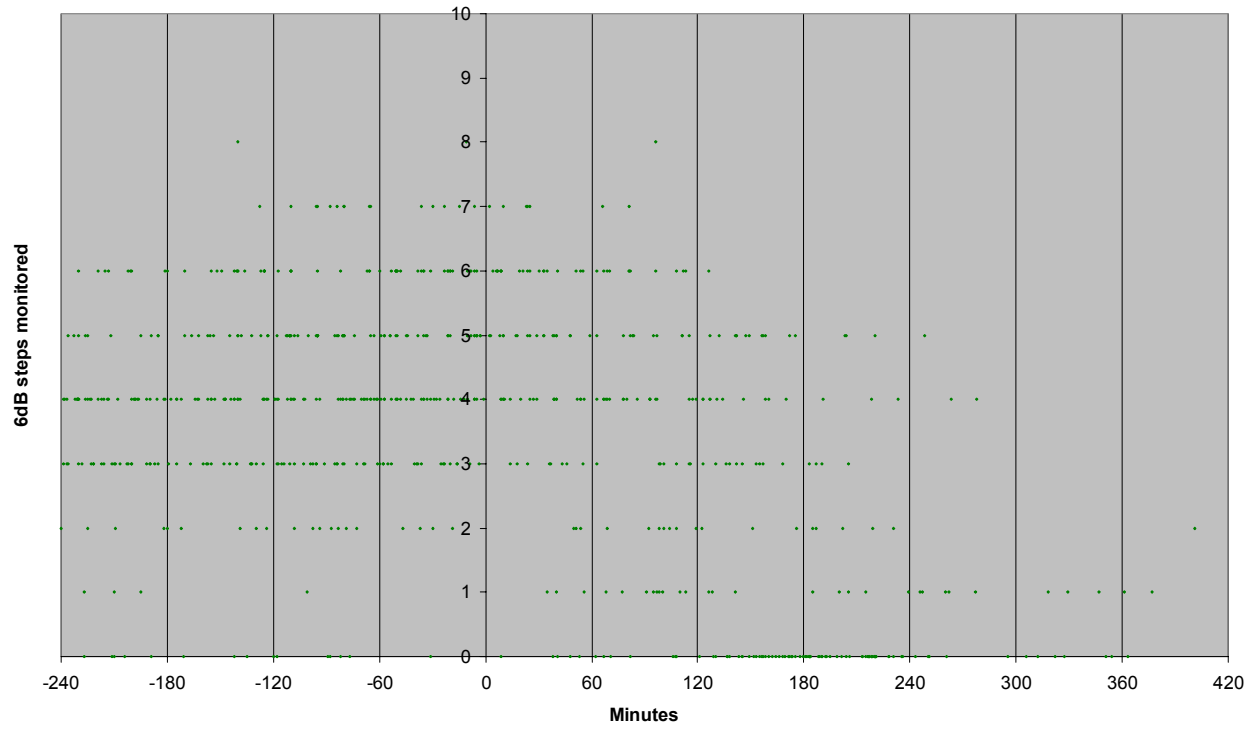
G4JNT Sunset



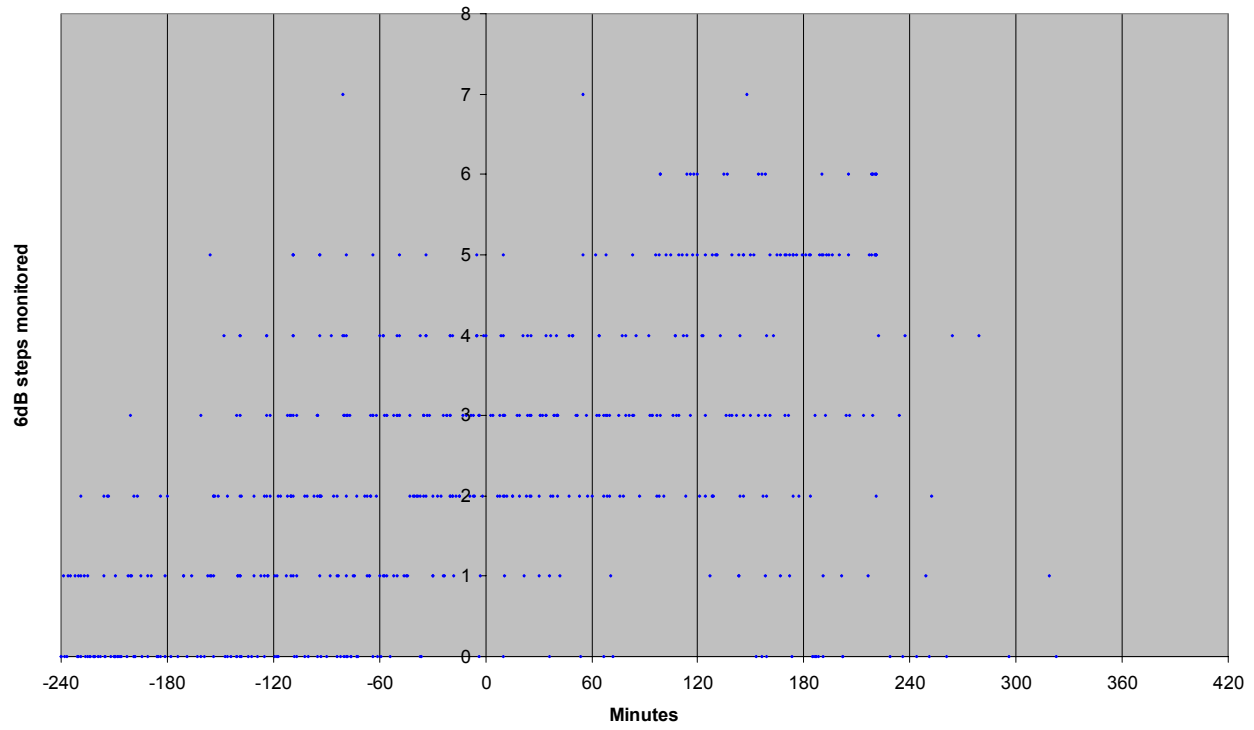
GB3RAL Sunset



GB3WES Sunset



GB3ORK Sunset



5MHz Expt: Propagation model

Imagine a “mathematical” model that might contains the

$$\text{Quality of link} = \text{function} \{A(\text{Date})+B(\text{Time}) + C(\text{Solar Flux})+ \\ D(\text{distance})+E(\text{aerial})+ F(\text{orientation}) +G(\text{SINPO})+ \\ H(\text{Power})+I(\text{mode})\}$$

The “problem” is to represent the coefficients (A, B, C etc) in the right way, and then solve for their numerical values by comparing the “model” with the data in the log database.

Final Comments

Last year the MoD reminded us that we need to be careful to use our access to 5MHz for the conduct of experiments, and not merely to use the channels for general amateur usage.

You are all therefore encouraged to do just that by

- Creating your own experiments and publishing the results.
- Making sure that your logs are of use to someone.
- Participating with the 5MHz Experiment, either by collecting data and/or later carrying out some detailed analysis.

<http://www.rsgb-spectrumforum.org.uk/5MHz.htm>