Analysis of 28 MHz beacon reports from the UK for 2004

These pages present a review of the 28 MHz propagation experienced in 2004 based upon monitoring of 10m beacons by UK listeners. Colour-coded tables are used to summarise a large body of beacon monitoring data in a format allowing the display of both numerical and graphical information. Colour coding of the tables (which I hope will also work if printed in black and white) is used to highlight trends and patterns in the data. The data comprise 15,932 reports of beacons heard (or periods of listening when no beacons were heard) from G2AHU, G3HBR, G3IMW, G3USF, G3YBT, G4TMV, G0AEV, G0DVY and G0IHF, plus a small number of beacon spots from the UK packet cluster network.

Summary tables – an explanation

The following tables show the relative performance of beacons from each continent by time of day and for each month in 2004. The quantities in the "cells" in each table are the number of beacons heard presented as a proportion of the total number of beacon reports for each time period. A beacon report comprises a log from an observer covering a one-hour period. Any number of beacons (including zero) may be logged in a single beacon report. The number of beacons is the sum of the number of beacons from a single continental area reported in all the beacon reports for the period. For example, in May 2004 there were 42 beacon logs for the 13z hour (13.00-13.59 UTC) period and these logs contained 84 references to European beacons. The value of the May 13z cell for the European beacons is (84/42) = 2. The values in the tables are multiplied by 100 to avoid the need to display decimals.

The reason for this approach is to take into account variable numbers of reports and reporters at different times – for example, there are more reports from more observers during the middle of the day than late in the evening. In the tables each cell value has approximately equal weighting regardless of how many reporters were active.

The colour coding in the tables is designed to show the relative importance of each cell as a proportion of all the data for the continent. The darkest shading (red) indicates a cell that is 1% or more of the sum of all the cells in the table, medium (orange) shading is for 0 5 – 1%, pale (yellow) shading for 0.2 – 0.5% and no shading for less than 0.2%. The distribution of shaded cells gives a visual guide to the relative numbers of beacons and, by inference, the number and geographical spread of openings to each continent. Each continental table has the same proportion of different shades – so dark (red) shading identifies the best times for propagation to a continental area independent of the total number of beacon reports. So – what do these data show?

European Beacons

2004 Relative Number of European Beacons

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6				50	114	136	143	143	18	25		
7		25			91	72	133	109	8	10	15	25
8	12	40	6	2	126	118	210	163	23	29	22	
9	43	36	4	13	151	142	225	129	15	53	48	22
10	86	68	4	3	171	136	175	155	9	82	42	45
11	69	52	17	17	188	133	132	158		95	54	28
12	59	38	13	26	135	138	185	139	20	84	30	29
13	33	18		20	200	91	200	79	3	42	37	
14	16	18		47	85	107	244	79		40	32	13
15	6	29	3	10	90	95	203	58		34	36	2
16	10	5	2	18	73	141	218	50	20	9	22	29
17	18	13	7	7	138	171	120	112	9	15	32	11
18	17		3	9	146	242	195	111	7	8	26	
19				6	129	230	309	138	8	6	30	18
20	33		9		78	124	150	38	4		56	43
21	75			29	108	131	213	68				
22				100	129	44	250	35			33	
23					114	75	157	267			50	

The most obvious feature in the table of European beacons is the strong (red) shading in the months of May, June, July and August. There is little difficulty in interpretation here: the pattern reflects the dominance of summer time sporadic E. Highest cell numbers are between 09 and 12z and between 17 and 19z – the peak times of day for Es - but summer month openings occurred throughout the day.

The winter months of October through to February include a little sporadic E but most of the propagation here is via backscatter or is direct F2 to SV3AQR, etc.. The evening data in November is due to "aurora-related" E-layer propagation.

African Beacons

2004 Relative Number of African Beacons

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6					7	14	10	14	9	13		
7		38	38		6	4	3	16		19	38	25
8	3	71	13	15	18	13	19	22	9	67	19	5
9	63	52	49	28	25	23	38	40	6	88	63	21
10	97	65	107	69	41	25	14	61	59	113	79	50
11	117	96	124	43	33		20	55	43	116	102	87
12	96	72	61	50	32	6	22	7	12	100	88	76
13	70	43	47	76	40	17	31	30	24	123	84	35
14	45	33	85	88	82	10	13	21	42	71	80	49
15	47	68	129	102	66	21	36	21	50	82	49	32
16	33	70	71	67	27	24	14	24	64	96	35	9
17	3	51	67	41	13	8	20	12	68	26	9	
18		11	20	34	31	9	18	28	48	14		
19	33		5	3	54	24	29	33	33	3		
20					15	12	14	22	4			
21					23	12	13	18				
22					29							
23					14		43	33				

Only 5 beacons contribute to the view of propagation from Africa: 5Z4B, CS3B, Z21ANB, ZS1J and ZS6DN. However as the paths to Africa are generally reliable there were more than enough reports (~3,000) to provide a good representation of the propagation.

African DX was available at all times of year but winter, spring and autumn were superior to the summer. However, the longer summer days extended the number of hours per day when propagation is possible –note the 23z events. Some of these openings may have been via TEP.

Asian Beacons

2004 Relative Number of Asian Beacons

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6						14	14	14	9	25		
7	100	75	38	2	2	4	5	3	4	28	54	
8	21	43	21	11	5	9	8	8	9	67	48	11
9	28	33	49	10	6	13	4	5	3	43	63	20
10	41	32	59	31		8	11	4	12	50	47	17
11	61	52	69	17	8		4	5	4	37	46	13
12	26	55	61	24	2	2	4	2	2	18	23	5
13	27	28	42	20	2	6	4		5	21	30	2
14	16	39	18	15	3	3	13		8	17	11	
15		21	29	8		8	9		10	16	8	
16			6	11		6	7	2	13	2	2	2
17			7	7	8	4	10	8	3		2	
18				5	12	9	7	13	7			
19					5	17	14	5				
20						8						
21						8	7					
22						6	13					
23												

Asia includes both “easy” single F-layer hops to 4X and 5B, and considerably more difficult DX paths to JA, VR, etc. Peaks in propagation are on the winter side of the equinoxes.

Spring propagation appears to have been better than autumn – in particular January looks much better than December, but this is probably a refection of a difference in levels of solar activity.

During the summer only single hop F2 paths are open but are supplemented by 2 x Es paths – and it is probably the latter that is responsible for the events seen in the evenings in June and July

Oceania Beacons

2004 Relative Number of Oceania Beacons

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6										25		
7		13								2	31	
8			4	2	2					24	8	2
9		3	10	10						18	27	14
10			30	6						31	12	5
11		7	21	3						12	32	17
12										4	5	2
13											3	
14											2	
15												
16												
17												
18												
19												
20												
21												
22												
23												

The table for Oceania (VK and ZL) beacons shows that propagation is concentrated around the equinoxes and that openings are apparently absent during the summer. However this view is dominated by one just beacon: VK6RBP.

Unfortunately VK6RBP was not operating at full capability until the autumn of 2004, and it this that best explains the skewed pattern of spring activity apparently lower than autumn activity. Data from previous years suggests that there should be some propagation from VK6 throughout the year including a few openings during the summer, even at current low levels of solar activity.

North America Beacons

2004 Relative Number of North American Beacons

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6												
7												
8	2											
9												
10	3						4					
11	8	4				4						
12	26	3			2	2				55	25	
13	33	17			2		4			103	39	26
14	95	70	6		3					220	184	57
15	132	41	11	2	2					473	111	77
16	85	65	4							116	45	18
17	21	62	11							79	27	3
18		5	3	5						24		8
19						7				9		
20			9			40					11	
21						19	7					
22							88					
23						50						

Propagation to North America has been much weaker this year than last with openings restricted to a few days per month. However when the band opens to North America a large number of beacons can be heard, providing a wealth of data for the representation opposite.

Two styles of propagation are apparent. Openings via F2 are almost entirely limited to periods between the hours of 12 and 18z in January-March and October-December.

During the summer months, paths to North America opened via multi-hop sporadic E and these openings occurred most frequently in the late evenings. A few beacons were also heard via Es in the mornings.

South America Beacons

2004 Relative Number of South American Beacons

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6								7				
7			31									
8		6								1	3	
9			3							2	10	
10	5		15	3					3	9	9	
11	36	15	48						11	47	23	2
12	56	38	48	17	3	2	2	2	2	78	50	17
13	46	65	56	49	5		8		11	127	89	23
14	61	64	100	59	45	10	6	3	85	154	86	32
15	79	141	111	86	24	18	24	6	71	160	117	53
16	82	142	102	131	42	41	18	24	78	182	83	33
17	61	166	116	89	36	33		12	62	181	84	3
18	17	121	123	70	48	21	9	13	82	86	22	
19			71	128	107	74	66	70	135	47		
20			18	56	119	40	93	75	46			
21				29	54	23		50	9			
22								4				
23												

The South American beacons (mostly located in LU but with contributing beacons from PY, YV and HP) show a clear pattern of propagation extending throughout the year. The best time to work South America was in the mid-afternoon in the winter months, the best time becoming progressively later in the day until mid-summer when the best times were in mid-evening. Openings were more extensive (occurring over more hours per day) in the months around the equinoxes than at other times of the year.

For those who use (listen to) 10m on a regular basis, none of the patterns described here will come as much of a surprise. However, it's nice to see confirmation!

G0AEV