Analysis of 28 MHz reports from the UK

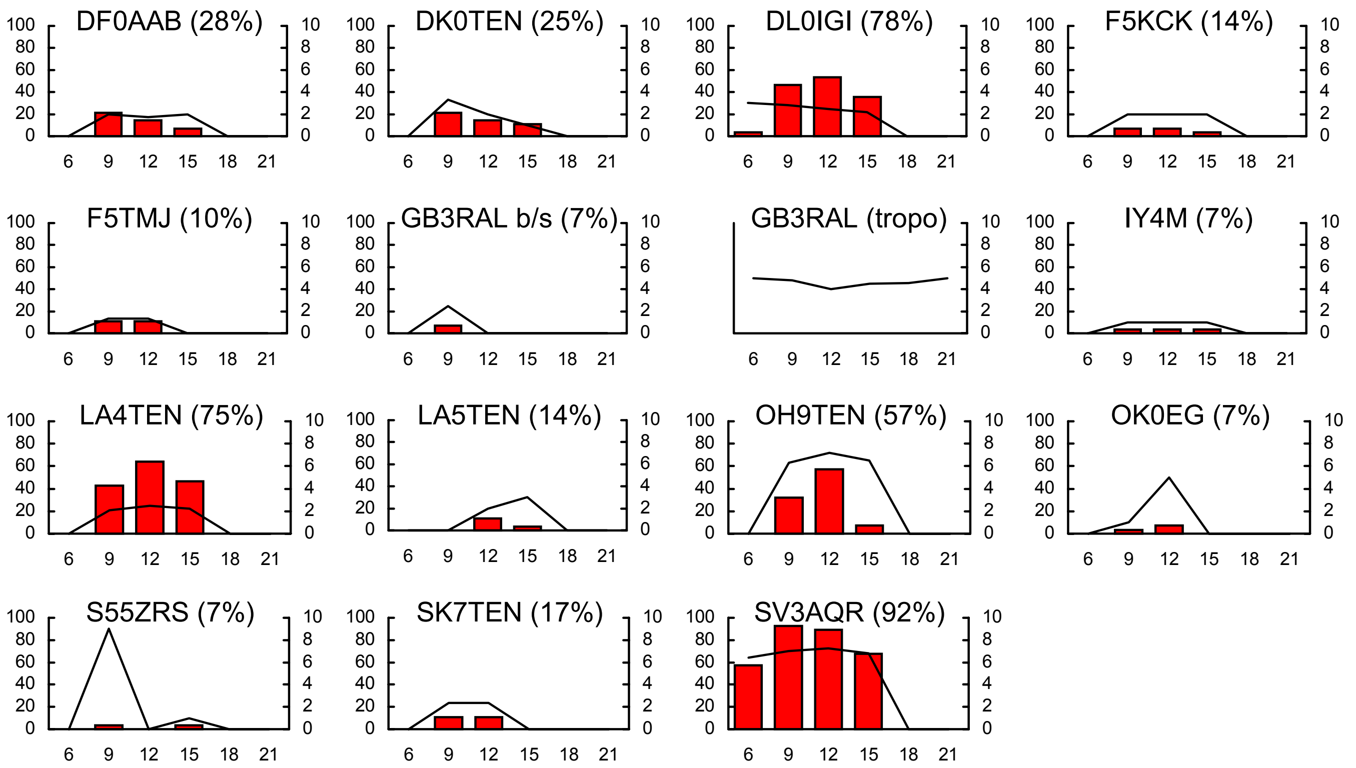
28 MHz reports and logs for February 2003 from G2AHU, G3IMW, G3USF, G4TMV, G4UPS, GM4WJA, G0AEV, G0IHF and from packet cluster reports. Compilation and commentary by G0AEV.

F-layer propagation conditions continued to decline (offset to some extent by seasonal improvements) but remained reasonably good on many circuits. 28 MHz is still capable of supporting world-wide openings, albeit at a reduced reliability as a consequence of lower levels of solar ionisation and more geomagnetic disturbances. Critical frequencies were, however, below those required for propagation at 50 MHz. All continents were available in February on the 10m band with only KH6 and the central Pacific absent from the list of areas heard/worked. Sporadic E was only identified on one day.

Beacon graphs legend

Legend for all beacon graphs in the following sections: - graph bars (left Y-axis): beacon reliability as the percentage of days a beacon was heard by any UK observer within each time band. Graph lines (right Y-axis): signal strength as the average of the daily maximum signal reported by any observer in each time band. Time band codes (X-axis): 6=0600-0900, 9=0900-1200, 12=1200-1500, etc. Callsigns are followed by daily reliability figures, the percentage of days per month when the beacon was reported.

European Propagation / Beacons

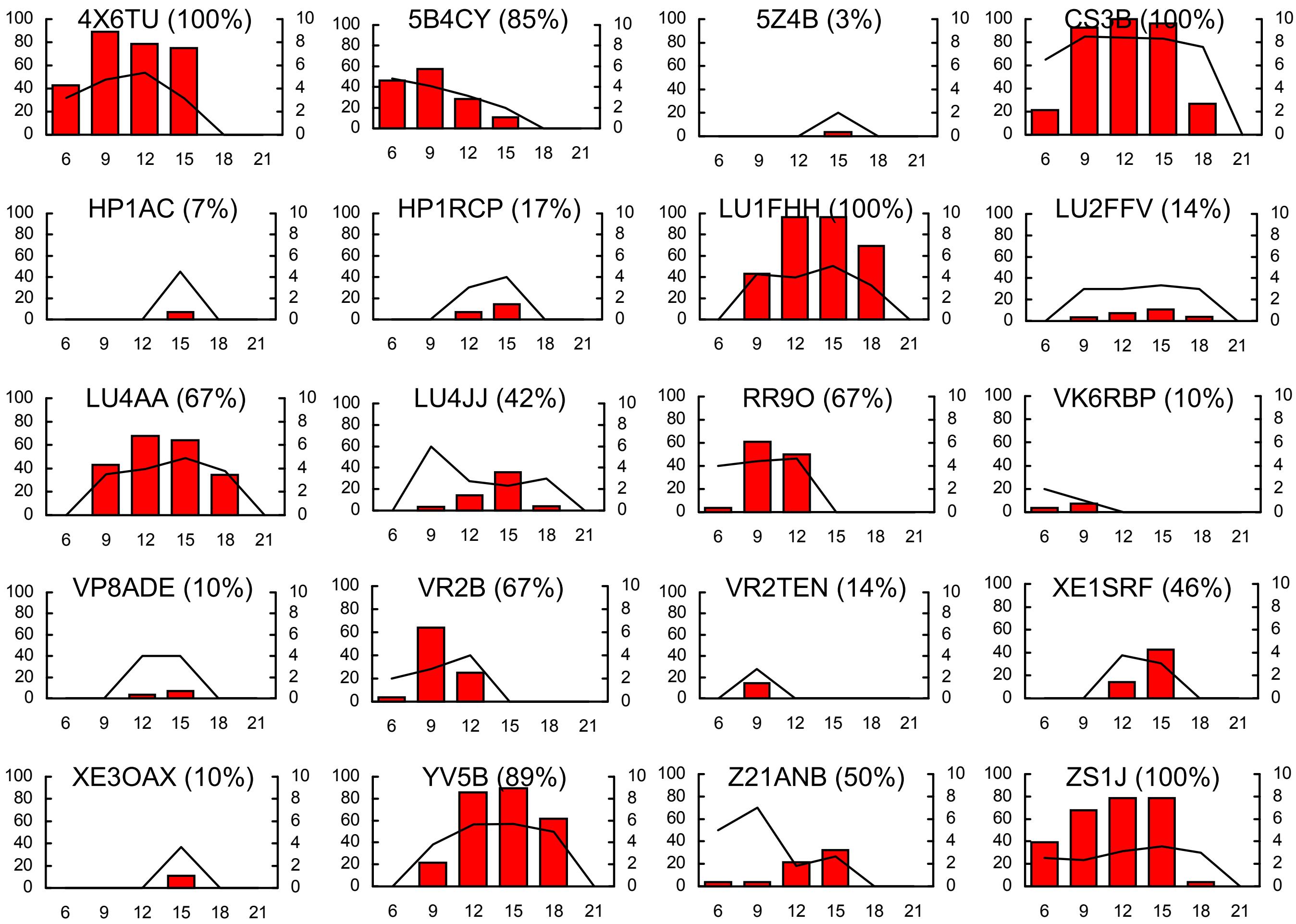


Suggested propagation modes for European beacons. Backscatter from the F-layer continued to provide the most reliable means of inter-European communications. The only exceptions to this being single hop direct F- propagation with SV3AQR and OH9TEN, and an instance of sporadic E detected by the DL beacons and S55ZRS (and the cause of the 09z peak in signal strength on the graphs of these beacons). "GB3RAL tropo" are the results of this beacon at G0AEV.

Backscatter levels (both reliability and signal strength) are distinctly lower that those encountered just a few months ago. On a few days no backscatter was recorded at all and on others only signals from the stronger beacons DL0IGI and LA4TEN were reported. Both DL0IGI and LA4TEN were report by backscatter on three-quarters of days in February.

Beacon Notes. There was sufficient backscatter propagation to provide, in the absence of sporadic E, a reasonable view of beacon activity. Results and reports indicate no outages of the principal European beacons with the exception of NCDXF beacon OH2B. OK0EG is operating on low power. SK7TEN appears to be the only Swedish beacon currently on the air.

<u>Propagation to Asia, Africa, Oceania, South and Central America</u>:



Suggested propagation modes. All the beacons were heard by normal short-path F-layer propagation. Single hop (e.g. to the Middle East and North Africa) and multi- hop north-south paths (e.g. to southern Africa) were operational on all days, including magnetically disturbed days – 4 beacons (4X6TU, CS3B, LU1FHH and ZS1J produced 100% daily reliability figures. No long path, TEP or sporadic E propagation was reported.

Beacon Notes. No signs in Europe of the 4S7B beacon, reported earlier this year in South Africa and Australia –if active it would have been heard I'm sure. OA4B, ZS6DN and 5Z4B (as well as OH2B) were QRT. 5Z4B was reported once, perhaps a mistaken identification – if it were fully active one would expect reports of this beacon under the prevailing conditions on around 50% of days. Both ZS6DN and 5Z4B returned to full service in March. LU4AA had significantly lower reliability than LU1FHH indicating a possible problem. VK6RBP reliability is still weaker than expected and the RR9O transmission remains garbled. A47RB was a one-day wonder in January – it has not been heard since

JA and VK amateur stations were worked (see the following section) but the absence of reports from JA and KH6 beacons and of any VK beacons except for a weak response from VK6RBP are indicative of the reduced ability of the band to carry long distance traffic

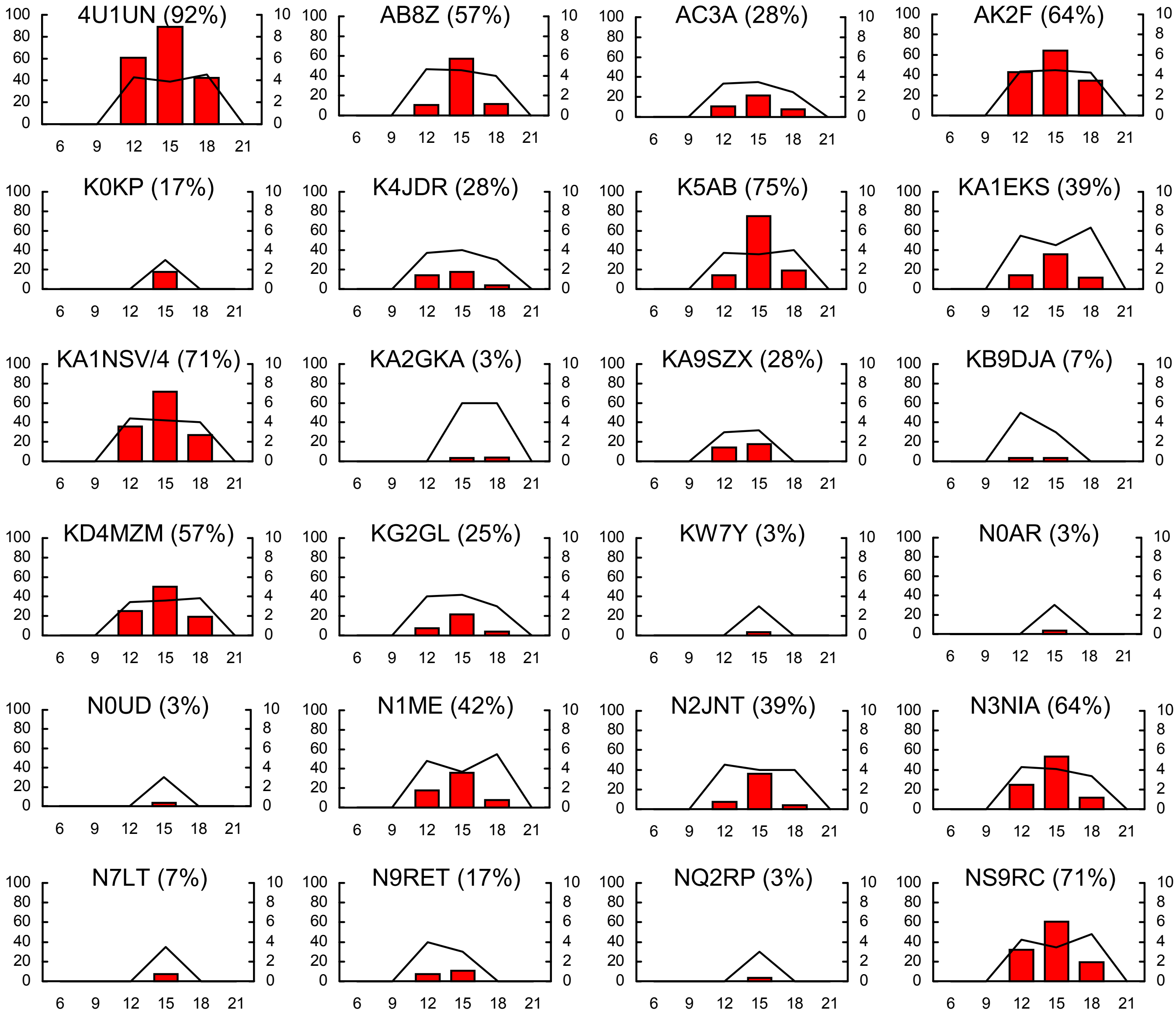
10m DX in February 2003.

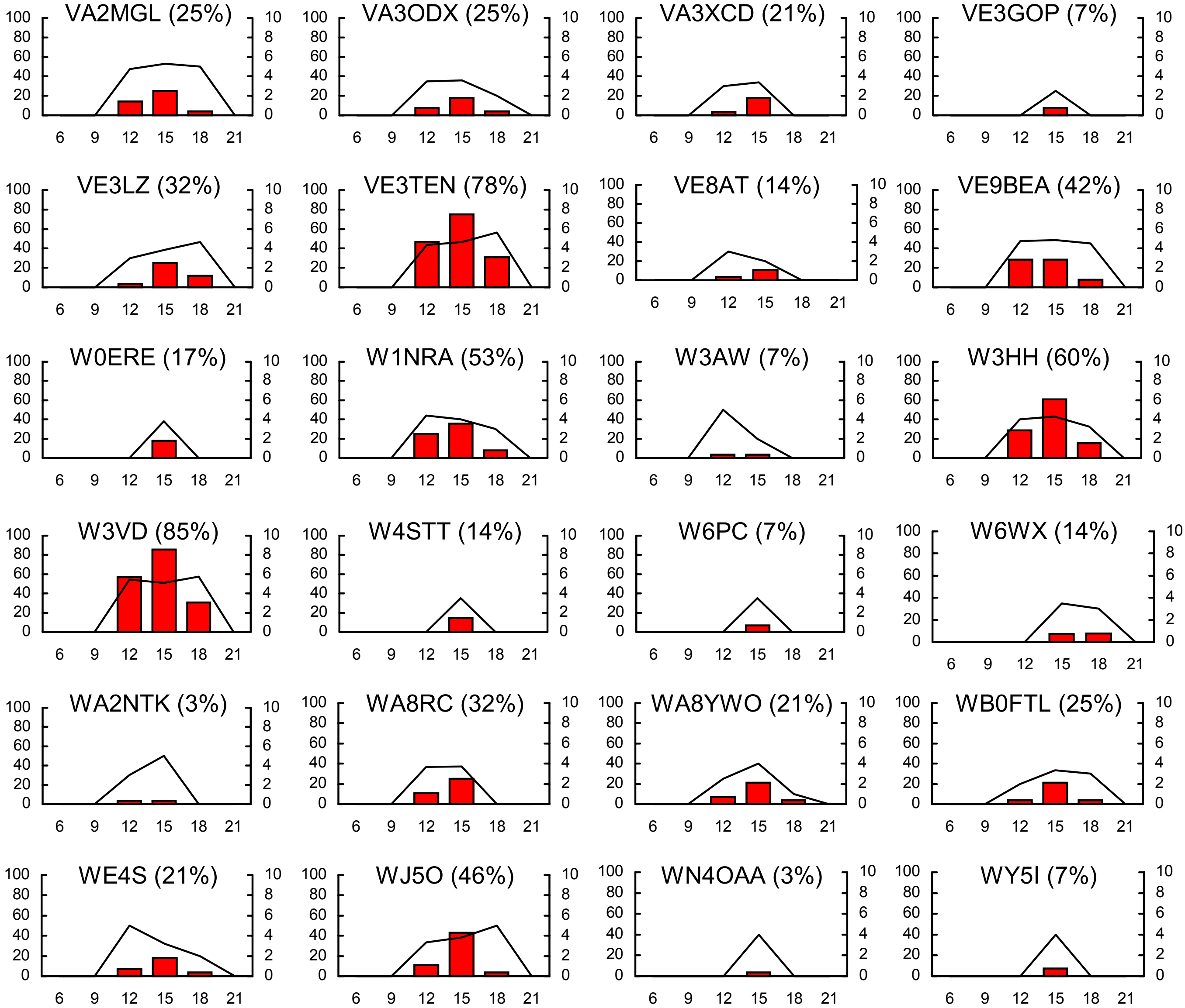
A reasonable list this time representing around a 25% increase in countries worked/heard compared to last month. I believe this is largely due to improved seasonal effects on DX circuits. The list is derived from packet cluster reports by UK stations and from the logs of GM4WJA and others. As always, not all countries worked get reported – I find it hard to believe that no one worked ZS!

3B8, 3B9, 3DA0, 3G, 4K, 4S, 4X, 5B, 5N, 5R, 5U, 5X, 5Z, 6W, 7Q, 7X, 8P, 8Q, 9G, 9K, 9M2, 9N, 9Y, A6, A7, AP, BV, BY, C6, CE, CN, CO, CT3, CX, D4, DU, E2, EA8, EX, EY, EZ, FG, FM, FR, FY, HC, HH, HI, HK, HL, HP, HR, HS, J3, J6, JA, KP2, KP4, LU, OA, OD, P4, PJ2, PJ7, PY, PY0Z, PZ, S0, S2, ST, SU, TA, TI, TJ, TR, TT, TU, UA9/0, V3, V5, V7, VE, VK, VP5, VP9, VQ, VR, VU, W, XE, XT, XV, YA, YB, YI, YS, YV, Z2, ZF, ZP.

Propagation to North America:

In February 48 different North American beacons were heard – the numbers were 58 in January and 64 in December. As suggested in the last Report, this trend is a sign of real decline in conditions. Only the stronger East Coast beacons exhibited high reliabilities (heard on more than 50% of days). 4U1UN, for example, was reported on all but two days in February. Central and West Coast beacons were heard only infrequently. Note that W6WX returned to service during the month after a prolonged outage.





Over-the-Pole Propagation

Conditions have been considerably depressed compared with this time last year so it was encouraging to hear that GM4WJA experienced one late evening over-the-pole opening to North America. On 13th John worked W5 worked and heard W7 over the North Pole all with flutter.

Analysis of 50 MHz reports from the UK

UK 50 MHz reports for February 2003 from G2ADR, G3HBR, G3IMW, G4UPS and via packet cluster spots. Compilation and commentary by G0AEV.

Last month we were unable to report any 6m DX. This month there is a distinct improvement with one DX report! G2ADR heard a D4 station (*D44TD presumably? G0AEV*) at S9 plus on 20th February in the 09z period. Eric writes, "it will be interesting to find out just how many people heard this solitary burst in the propagation wilderness, and how widespread or otherwise its arrival was." As far as I can tell, this opening appears to have been very restrictive – Eric's was the only report. There were no DX cluster reports of D4 at the time, although D44TD features on 21st and subsequently in spots from southern Europeans. In January Eric wrote "I think that this may be the first time that I have had to submit a completely nil report … will try to do better in February". Eric's perseverance has paid off – and showed that sometimes the more northerly placed counties can get the better propagation!

Sporadic E

There was no unequivocal sporadic E on 6m in February, and the only probable opening on 10m was on the 28th when there appeared to be no corresponding 6m event. Candidates for 6m Es are described below. In most cases auroral E is the most likely alternative explanation.

7th	15z	15.22 G3HBR reported I5IAR (529) – Es? Guess it could have been MS
9th	09z	10.12 G3FPQ > LY2BAW CQ, 10.51 G0PQO > LY2BAW "just above noise". K-indices were slightly unsettled and later in the day aurora and auroral E was identified. Auroral E is a probable explanation for these reports
10th	16z	16.55 GM8LFB > OH9SIX/B 519. Magnetic field weakly unsettled: possible auroral E
16th	09z	10.25 M0BCG > LY2BAW. 10.59 MW1MFY > SK3SIX 589. Possible Es
23rd	12z	13.30 M0CTP > LY2BAW 319 – weak signal: not indicative of Es. Ionospheric scatter?
	15z	17.39 2E1GOR (IO90) > EH3LL "heard 3/5. Reasonable candidate for weak Es
25th	18z	18.44 MW1MFY (IO81) > OZ9KY 54 plus other OZs and LA. Geomagnetic field settled and sporadic E is more probable than other modes.

Meteor Scatter

6th	09z	10.19	GM8LFB notes hearing G1YI? Calling CQ in a MS burst
8th	00z	00.12	GM7PBB (IO68) > LC3? 52 in bursts
22nd	18z	18.51	ON1VS said he heard MW1MFY in a "small burst"
23rd	18z	19.18	SP6MLK > MW1MFY 53 in short burst
28th	18z	18.14	GM8LFB spotted OH9SIX in bursts

SM7AED Morning Skeds.

Ted G4UPS has been having skeds with Arne SM7AED for some time (as we reported regularly here in previous years). Ted writes "we have had proper m/s skeds for the first time. I transmit at 07.50 and Arne at 07.51 utc. I continue on even minutes and Arne on the odd ones". Ted says he has been very surprised at the excellent results over the 1200 km path with about 80% of signals audible during the minute. On several occasions the QSO was over in 1 minute, and they had contact on every day in February. This shows the efficiency of random meteors at the peak time of day for this mode. (*I am sorry but I can't believe, as Ted suggests, that there is any "strong extended tropo" involved! Scatter from remnant meteor trails would get my vote for the "continuous" component of signals. G0AEV*)

Tropospheric Propagation

Hardly any tropospheric propagation of note was brought to my notice. Here's a token offering

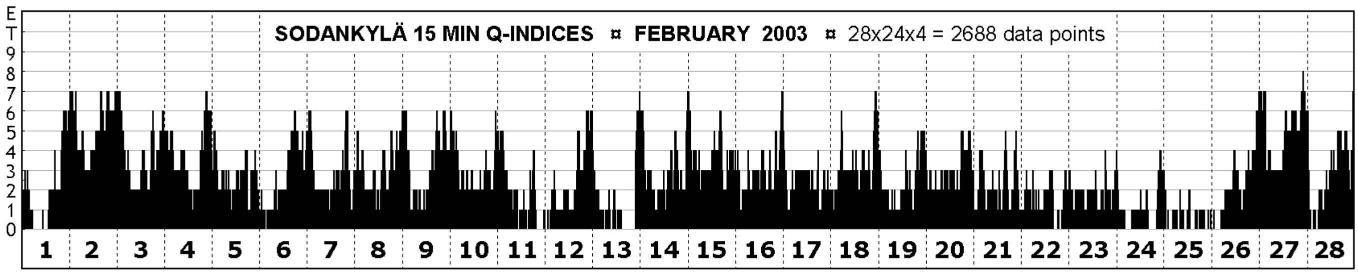
24th	08.20	F4THE reported the GB3BUX beacon at 51 in IN98
25th	20.59	GM8OEG in IO86 hears G3RLE 319.

Aurora and Auroral E

The event on the 2nd was clearly the best of the month and much better than the half dozen or so other events. GM4WJA describes aurora as very strong at times in mid afternoon to late evening with plenty of activity on 6m. John heard only beacons on10m, but the haul of LA4TEN, LA5TEN, OH9TEN, DF0AAB, SK0CT, and GB3RAL shows the event was extensive on both bands. This aurora was the first of the year for G4UPS on the south coast. Ted says he had phone call from G3HBR alerting him at 15.10 but nothing was heard at his QTH until 15.47. Stations in GM had weak aurora as early as 14.00 however. An apparent Harang Discontinuity starting at around 19.30 was marked by auroral E to Scandinavia but the late evening second phase didn't amount to much.

1st	21z	21.55-22.10	GM4WJA > OY6SMC 41A, GM8LFB > GB3RMK 54A
2nd	00z	00.39	GM8LFB (IO88) hears OH0SIX 599 via auroral E
		00.58-01.15	GM8LFB reports GB3RMK 59A (still in at 02.44) and OY6SMC 55A
	09z	10.34	G3FPQ spots LY2BAW peaking S8, probably auroral E
	12z	13.59	GM8LFB noted GB3RMK going auroral, and (14.28) OY6SMC 52A
	15z	15.00-15.00	Very many G<>GM and G./GM <>GI/EI aurora QSOs/reports. Also: 15.02 LA8AV (JO59) > GM0TGE (IO87) 55A, 15.21 GM0TGE >LA8AV 59A at 030deg, 15.57 DD3DJ hears GM3WOJ 59A QTF 000.
		16.00-16.45	More G <> GM/EI aurora QSOs. At 16.42 PA1SIX spots GM3WOJ 53A
		17.21	ON4ANT > GM3WKZ 57A (IO88). Only report in the period 16.45-18.40
	18z	18.40-19.45	Fewer reports (= less activity?): G <> GM, EI <> GM, ON4ANT <> GM.
		19.25-20.15	Auroral E: 19.28 GM8LFB > LA7SIX 599, 19.46 GM8LFB >OH9SIX 599, 1951 ON4ANT > GM4SFW, 20.12 GM8LFB > LB1AF (JP64) 56.
	21z	2310-23.30	GM8LFB > SK3SIX 52A, and GM0EWX >JW7SIX 419 "Auroral E"
3rd	21z	22.08	GM8LFB spots GB3RMK 53A "just starting"
4th	18z	18.32	GM8LFB hears GB3RMK 52A "aurora starting here"
6th	15z	16.36	GM3WOJ reports 48.25 video aurora. 17.38 GM4WJA > OY6SMC 52A
9th	15z	17.15	GM8LFB > OY6SMC 52a. 17.28 GM8LFB > GB3RMK/B 55a "building"
	18z	20.45	GM8LFB spots auroral E from OH9SIX (559) and LA7SIX (569)
26th	21z	22.43-22.56	GM4WJA > OY6SMC 41A, EI7IX > GB3LER 51A, PA0OOS > GB3LER 51a
27th	15z	17.05-17.13	GM8OEG > GB3LER 53A, EI7IX > GB3LER 41A
28th	15z	16.22	GM0EWX reported 48250 video via aurora
	18z	18.46	GM3WOJ > GB3LER/B 55A, and at 18.56 LA7VH (JO59) >GB3LER 53A

Q-Indices from Sodankylä, Finland (tnx Väinö, OH2LX)



Väinö notes that radio aurora were reported on 11 days, and the most disturbed days were 2nd (Sodankyla Ak = 78, Nurmijarvi Ak = 71) and 27th (Sodankyla Ak = 71, Nurmijarvi Ak = 27)

Solar and Geomagnetic Data for February 2003

Data supplied by G0CAS (Sun Mag) and from Internet sources. Compilation by G0AEV.

Sunspot numbers (SEC)	Mean 87.9	Max 194 (9th)	Min 16 (17th)
Solar Flux (28 MHz)	Mean 124.6	Max 150 (6th)	Min 102 (24-25th)

Solar data for February 2003 are presented in the table on the following page. Numbers in the 28 and 50 MHz columns are the total daily "areas" worked/heard from the UK, a summary of the data presented in the first sections of this Report. On 28 MHz "areas" refer to the number of beacons reported via Es and F-layer, on 50 MHz the number of countries via Es, F-layer and Aurora. F2 critical frequencies are from Chilton in Oxfordshire, SIDC spots from SIDC, and other solar data from the joint USAF/NOAA daily summaries or directly from SEC.

Energetic Events. Flares of M and X class.

1st	0848-0938	M1.2
6th	0330-0401	M1.2
14th	0907-0923	M1.2 SF

K-indices. February K indices for Hartland are presented below (tnx British Geological Survey)

1	3	2	0	0	1	2	5	5	18
2	5	4	4	4	4	5	5	5	36
3	4	3	2	2	3	4	4	4	26
4	4	4	5	4	2	3	4	4	30
5	3	2	2	3	3	4	2	3	22
6	2	1	2	3	4	3	4	3	22
7	3	3	3	2	3	2	4	3	23
8	3	3	2	3	3	2	3	4	23
9	3	3	3	2	4	4	3	3	25
10	3	4	3	1	2	1	3	4	21
11	4	2	2	2	1	1	1	1	14
12	1	2	1	2	2	4	4	4	20
13	2	1	1	2	1	1	2	4	14
14	3	3	2	3	3	3	4	4	25
15	4	4	3	4	3	4	2	3	27
16	3	3	2	2	3	3	4	4	24
17	3	1	3	3	2	2	2	3	19
18	2	4	3	3	3	2	3	4	24
19	2	2	1	2	3	3	2	4	19
20	2	2	3	4	3	3	4	3	24
21	1	3	3	2	1	4	4	3	21
22	2	3	2	2	3	3	1	3	19
23	3	2	2	2	3	2	3	2	19
24	2	0	1	2	2	1	2	3	13
25	2	1	1	2	2	1	1	1	11
26	1	3	3	3	2	3	3	4	22
27	4	4	3	3	4	4	4	4	30
28	3	1	2	4	3	4	3	4	24

The UK or planetary K indices reach 5 or higher (i.e. at least minor storm) on 5 days (down considerably from the 10 days in January)

	1st February									2nd February									4th February								
Kp	3	2	1	2	2	2	**5**	4	21	**5**	**5**	**5**	**5**	**6**	**5**	4	4	39	3	4	**5**	**5**	3	3	3	3	29
Lerwick	2	1	0	0	1	2	**5**	4	15	**5**	4	3	3	3	**7**	**7**	**5**	37	4	4	4	3	1	2	3	4	25
Eskdale	3	1	0	0	1	2	**5**	4	16	**5**	4	4	4	4	**6**	**5**	**5**	37	4	4	4	4	2	2	4	4	28
Hartland	3	2	0	0	1	2	**5**	**5**	18	**5**	4	4	4	4	**5**	**5**	**5**	36	4	4	5	4	2	3	4	4	30

	26th February									27th February								
Kp	1	2	4	4	3	3	3	4	24	4	4	3	3	4	4	3	4	29
Lerwick	1	2	2	2	2	2	2	**5**	18	**5**	4	2	2	3	3	4	**5**	28
Eskdale	1	2	3	3	3	3	2	4	21	4	3	3	3	3	3	4	4	27
Hartland	1	3	3	3	2	3	3	4	22	4	4	3	3	4	4	4	4	30

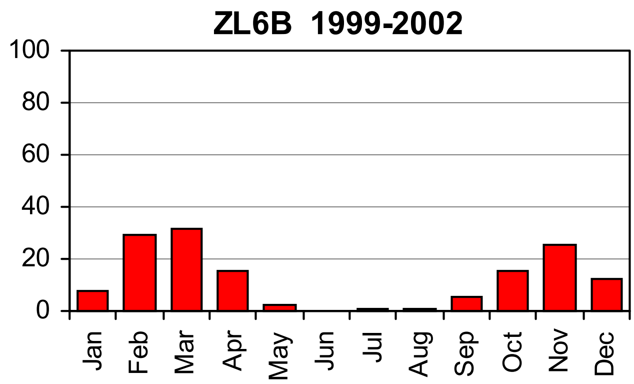
February	28 Areas		-- 50 Areas --			2800	- Spots -		Max			X-ray	Max foF2		Min foF2		-- Particle Fluences --		
2003	Es	F	Es	DX	A	Flux	SEC	SIDC	Kp	Ap	Aa	b.gnd	MHz	Hour	MHz	Hour	2MEV Elec	1MEV Prot	10MEV Prot
01-Feb	0	28	0	0	0	126	75	40	5	13	28	B4.5	9.4	13	2.1	06	1.8E+08	1.9E+05	1.3E+04
02-Feb	0	9	0	0	0	127	61	43	6	45	80	B4.2	12.0	13	2.1	05	1.4E+07	1.0E+06	1.3E+04
03-Feb	0	9	0	0	0	133	69	36	4	19	35	B3.9	6.9	13	2.0	04	2.4E+07	3.9E+05	1.3E+04
04-Feb	0	10	0	0	0	135	77	35	5	24	52	B3.9	10.0	11	2.0	01	2.6E+07	4.8E+05	1.4E+04
05-Feb	0	28	0	0	0	140	89	54	4	12	27	B4.0	9.8	14	2.4	04	1.2E+08	3.4E+05	1.5E+04
06-Feb	0	24	0	0	0	150	135	68	4	16	32	B5.9	9.7	12	2.1	05	1.4E+08	4.0E+05	1.4E+04
07-Feb	0	26	0	0	0	147	153	82	4	13	27	B3.8	11.1	14	3.1	06	4.7E+07	1.4E+05	1.5E+04
08-Feb	0	44	0	0	0	139	162	87	4	13	30	B3.1	11.0	12	2.1	06	6.3E+07	1.8E+05	1.5E+04
09-Feb	0	43	0	0	0	141	194	93	4	15	33	B3.2	11.4	12	2.5	06	1.0E+08	3.0E+05	1.3E+04
10-Feb	0	10	0	0	0	136	163	73	4	16	29	B3.1	7.4	15	2.3	04	6.1E+07	1.3E+05	1.3E+04
11-Feb	0	32	0	0	0	135	134	73	4	12	18	B3.1	9.3	15	2.5	06	3.8E+07	8.2E+04	1.4E+04
12-Feb	0	42	0	0	0	132	119	71	4	12	26	B2.9	10.6	12	1.9	05	4.0E+07	2.3E+05	1.3E+04
13-Feb	0	37	0	0	0	131	113	59	3	8	14	B2.7	11.1	11	2.3	06	4.5E+06	5.1E+04	1.3E+04
14-Feb	0	31	0	0	0	131	113	45	4	19	37	B4.1	11.6	14	2.3	06	1.3E+07	9.1E+05	1.3E+04
15-Feb	0	42	0	0	0	124	96	31	4	18	39	B4.7	11.6	12	3.4	06	1.6E+07	5.9E+05	1.3E+04
16-Feb	0	46	0	0	0	119	41	22	4	15	32	B2.8	11.6	12	3.5	06	3.4E+07	7.4E+05	1.3E+04
17-Feb	0	45	0	0	0	112	16	10	3	11	23	B2.3	10.9	13	2.3	06	5.2E+07	9.1E+05	1.3E+04
18-Feb	0	17	0	0	0	110	51	20	4	17	46	B1.4	9.5	13	3.1	07	7.7E+06	5.6E+05	1.1E+04
19-Feb	0	40	0	0	0	116	57	33	3	12	24	B1.9	9.7	14	2.7	06	5.3E+06	4.7E+05	1.1E+04
20-Feb	0	22	0	0	0	118	66	44	4	16	32	B2.8	9.5	14	2.5	06	5.5E+06	6.6E+05	1.1E+04
21-Feb	0	24	0	0	0	120	87	46	4	13	25	B4.5	9.0	14	3.1	06	1.8E+07	3.7E+05	1.0E+04
22-Feb	0	27	0	0	0	107	53	34	4	11	22	B2.2	9.4	13	3.0	06	4.2E+07	5.0E+05	1.0E+04
23-Feb	0	28	0	0	0	104	41	28	4	11	22	B1.0	8.4	12	3.1	22	4.1E+07	2.9E+05	1.1E+04
24-Feb	0	10	0	0	0	102	44	28	3	6	14	A8.0	8.5	13	3.0	06	4.1E+07	2.0E+05	1.2E+04
25-Feb	0	19	0	0	0	102	48	32	2	5	10	A9.4	8.8	13	2.7	06	3.3E+07	3.4E+05	1.3E+04
26-Feb	0	21	0	0	0	109	45	30	4	16	30	B2.2	9.9	13	3.1	06	5.2E+06	5.0E+05	1.3E+04
27-Feb	0	13	0	0	0	118	82	43	4	22	52	B4.1	10.3	13	2.9	04	3.4E+06	6.1E+05	1.2E+04
28-Feb	3	20	0	0	0	125	77	34	4	17	37	B4.5	10.9	11	3.0	05	3.5E+07	3.8E+05	1.2E+04
Sum	3	747	0	0	0														
Average	0.1	26.7	0.0	0.0	0.0	124.6	87.9	46.2	3.9	15.3	31.3	B4.8	10.0	13	2.6	05	4.3E+07	4.3E+05	1.3E+04
Maximum	3	46	0	0	0	150	194	93	6	45	80	C1.1	12.0	15	3.5	07	1.8E+08	1.0E+06	1.5E+04
Minimum	0	9	0	0	0	102	16	10	2	5	10	B1.7	6.9	11	1.9	22	3.4E+06	5.1E+04	1.0E+04

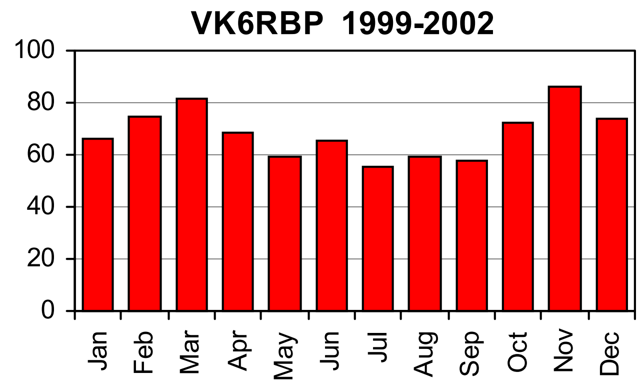
Analysis of IARU/NCDXF 28 MHz Beacons 1999-2002

Last month we looked at the performance of 6m paths in the period January 1999 to December 2002, the years that encompass the peaks in solar activity of cycle 23. This month it is the turn of 10m. Our 28MHz analysis is based on compilations of reports of the IARU/NCDXF beacons as heard in the UK and reported in the *Six and Ten Report*.

The following pages show charts of each beacon (in transmission time order) showing average daily beacon reliability for each month. Daily reliability here is defined as the percentage of days each month when the beacon was heard. The values for January, for example, are the average of the daily reliability for January 1999, 2000, 2001 and 2002.

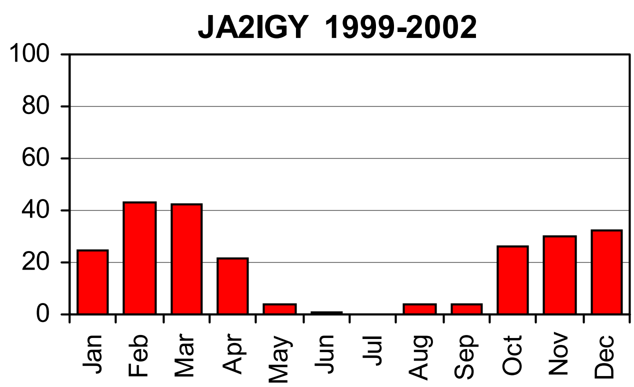
Nearly all the beacons suffered from breaks in transmissions at some time or other. Many of these outages were long enough to be obvious from the absence of reports (some were many months in duration), others were reported by NCDXF or beacon operators. Data for periods of known or strongly suspected outages have been excluded from the graphs and the analysis (as noted below for each beacon). Shorter breaks in transmission have not been tracked or taken into account

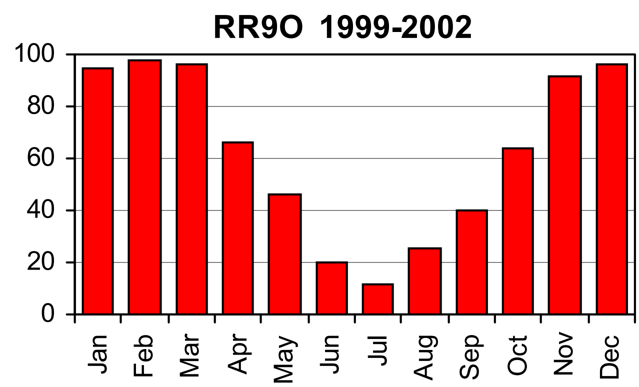




ZL6B: *(No significant outages known, but no data for January 1999).* The results include both long and short path openings, with winter openings predominantly short path and summer openings long path. The pattern is one of best propagation during the spring and summer equinoxes, skewed slightly towards the winter reflecting the efficacy of the north polar regions on the short path during the winter.

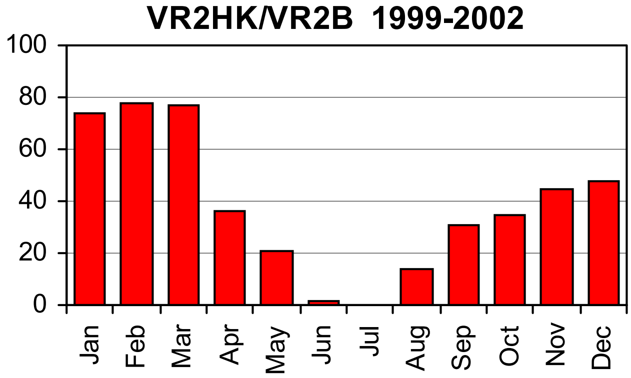
VK6RBP: *(The results suffer from outages and problems including low power output in November 1999 – January 2000, August-December 2001, and June-December 2002).* As befits a path that has a large north-south component, propagation is shown to be present all year, though with best opportunities at the equinoxes. Winter is slightly better than summer because more of the G-VK6 path lies in the Northern Hemisphere than the Southern.

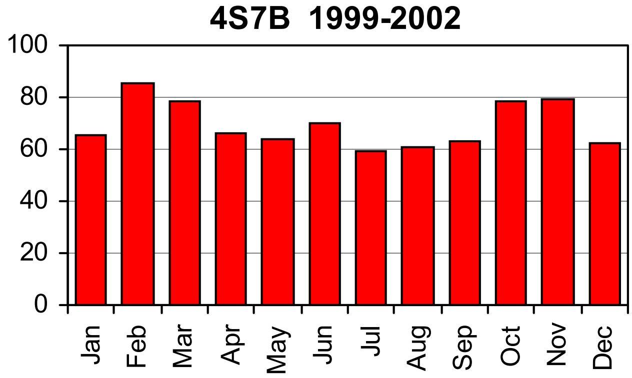




JA2IGY: *(No exclusions for outages. There were one or two odd variations in the data perhaps indicating outages we were unaware of).* The chart pattern is similar to that for ZL6B – the path orientations are similar (crossing polar latitudes). JA2IGY short path is predominant over long path at all times, and as fewer hops are required for JA short path, reliability is higher than for ZL6B.

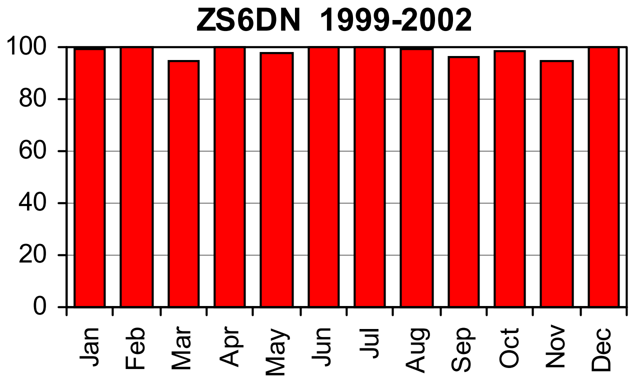
RR9O: *(Graph is from December 1999, the first month of full service. Data for March 2001 is missing).* RR9O shows a strong pattern of winter (intra Northern Hemisphere) propagation with reliability close to 100% during the winter months. Recent problems with garbled signals have not affected reliability data.

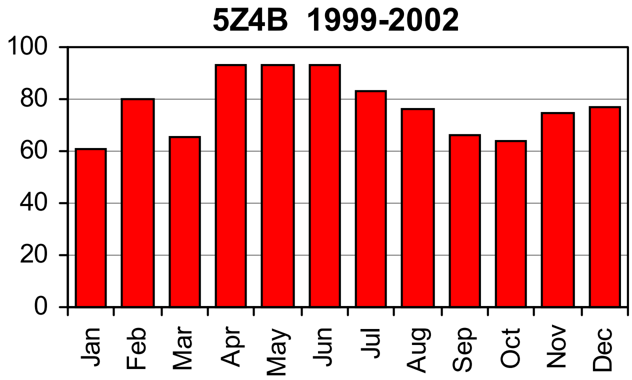




VR2B: (*VR2B started transmitting in March 2000 as VR2HK and there was a long outage for most of 2001. The data graphed are for April-December 2000 and January-December 2002)*. Data for this beacon is less reliable than some others because of extensive off-air periods and this seems to be the reason for the discrepancy between spring and autumn results. However the pattern, which is intermediate between that of RR9O and JA2IGY, is perhaps as one might expect.

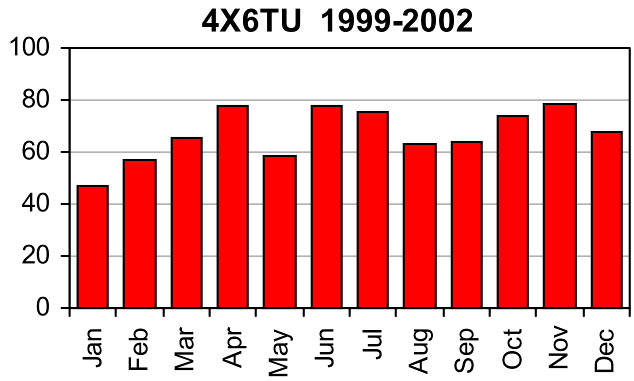
4S7B. (April 2000 appears to have been the first full month of operation. All of 2001 has also been excluded from the analysis). The graph shows a similar, though slightly flatter, pattern to VK6RBP. Paths to 4S7 and VK6 lie further south than to VR2 and this is the reason for the difference seen in summer time propagation.

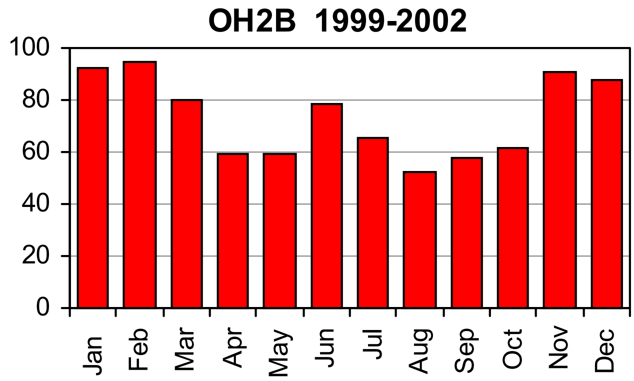




ZS6DN: *(Minor outages are known to have occurred and the graph excludes March-April 2000, October 2002 and December 2002)*. This beacon was heard on virtually every day throughout the period with no discernible seasonal variation. The circuit is effectively north-south. 50 MHz data show mid-winter to be the poorest month, but MUFs were high enough for this effect not to be detected in this analysis.

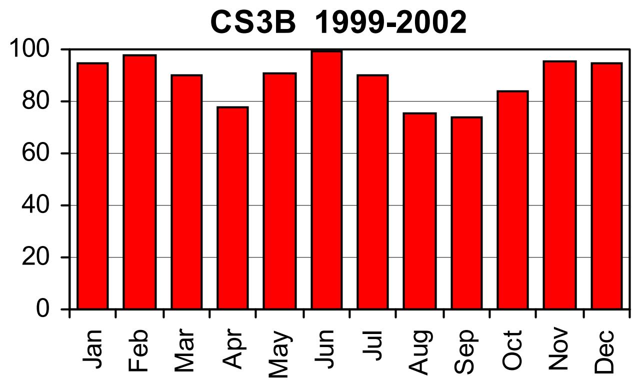
5Z4B: (*June 2000 to August 2001 and October 2001 to July 2002 had to be excluded from the graph because of outages and intermittent operation).* The somewhat irregular pattern of the chart bars reflects the relatively poor data available for this beacon. There is a suggestion that better propagation occurred during the summer than the winter but the reasons why this might be are unclear.

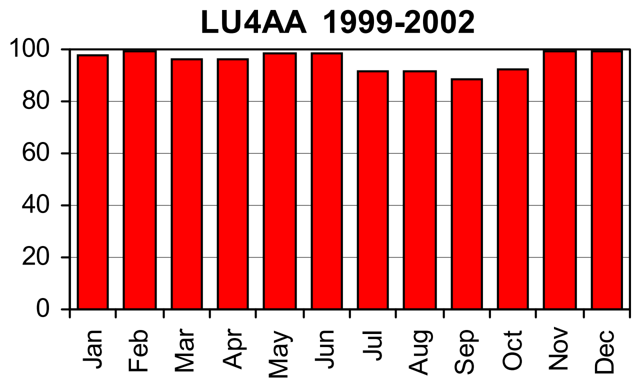




<u>4X6TU</u>: (*October 200m – April 2001 and December 2001 not included because of beacon outages).* The propagation pattern is unclear but may be indicating small enhancements at the equinoxes with the addition of a summertime sporadic E component (4X is one F layer hop from G but 2 E-layer hops)

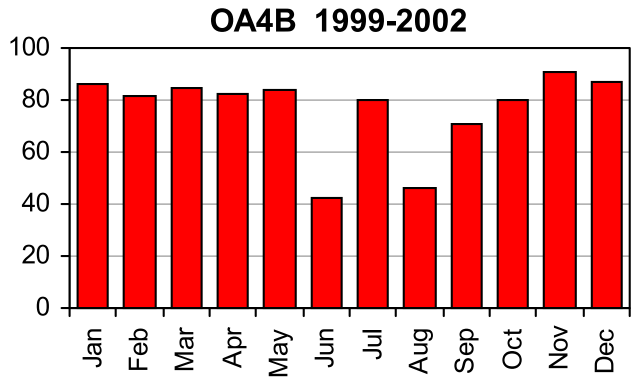
<u>OH2B</u>: (*Until the theft of the beacon transmitter, OH2B had an excellent reliability record and only September 1999 and December 2002 are not included in the analysis).* There are three components to this chart. (1) Single hop direct F-layer propagation with little or no summertime propagation and a pattern like that of RR9O. (2) F-layer backscatter present when direct path skip distances can not be attained – this has the same distribution as for the direct path. (3) Strong single hop sporadic E during the summer which overlaps with the F-layer modes in late spring and early autumn.

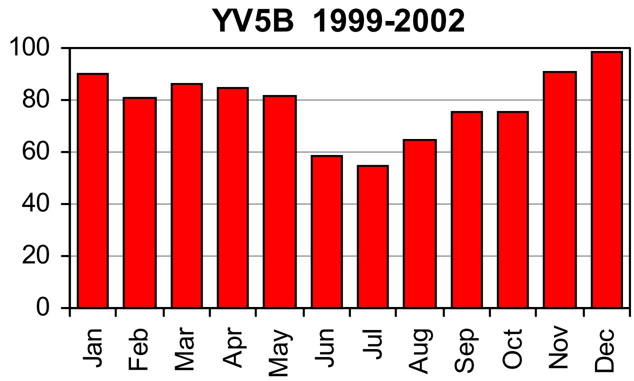




<u>CS3B:</u> (*This beacons was out of service for most of the period November 2000 to May 2001 and data for these months have not been included in the analysis).* The pattern for CS3B is similar to that for OH2B, I believe for similar reasons. The F-layer modes (direct path rather than backscatter) peak in the winter but unlike OH2B are present all year - this is because CS3B is further from the UK than OH2B. Sporadic E (usually a long single hop but sometimes possibly 2 short hops) adds to the reliability of the circuit during the summer – though the 100% reliability in June is a surprise.

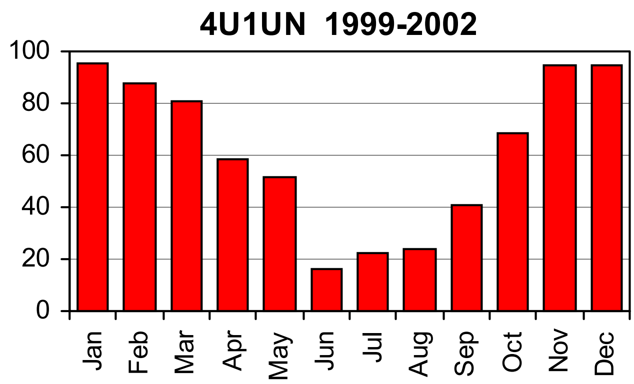
<u>LU4AA:</u> (*Unlike other Argentine beacons, LU4AA has had a good record of continuous operation. Only June 2001 has been left out of the graph because of a two-week outage*). 50MHz data shows F-layer propagation on this circuit is most effective around the equinoxes and also suggests that E-layer links are required on 6m during the summer. At 28 MHz, path MUFs were normally exceeded at some point every day. This means that, as with the other "north-south DX" beacon ZS6DN, propagation trends are not easily discernible in the 28 MHz data.

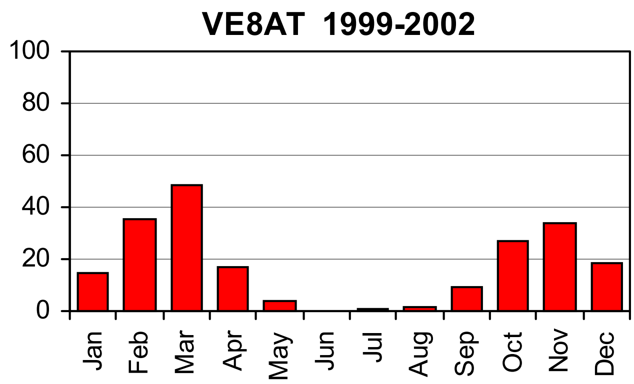




<u>OA4B:</u> (*Outages occurred in the periods July-September 2000, June-July 2001 and July-December 2002, and the beacon is still off air as of March 2003)*. There is rather poor information for the summer months for OA4B as this beacon seems to fail often and preferentially during the summer. There is a suggestion that propagation dips in the summer. The propagation patterns appear fall somewhere in a continuum between those of LU4AA and YV5B.

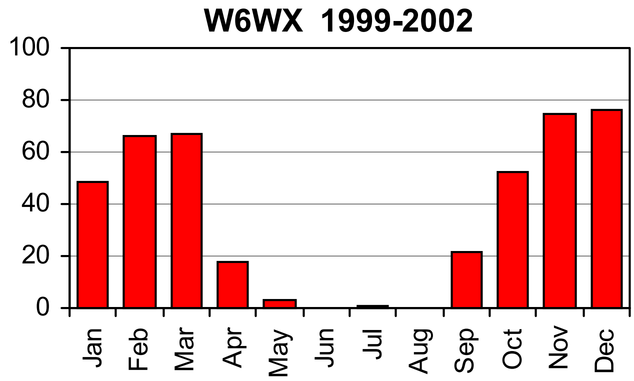
<u>YV5B:</u> There was n*o or poor data for out-of-service periods September-October 1999 and December 2000 and these months are excluded from the graph.* The pattern shown by YV5B is not particularly smooth but clearly shows that winter propagation was more reliable than summer. The trend of greater dominance of winter over summer propagation the further north the circuit lies is seen nicely in the sequence LU4AA – OA4B – YV5B – 4U1UN.

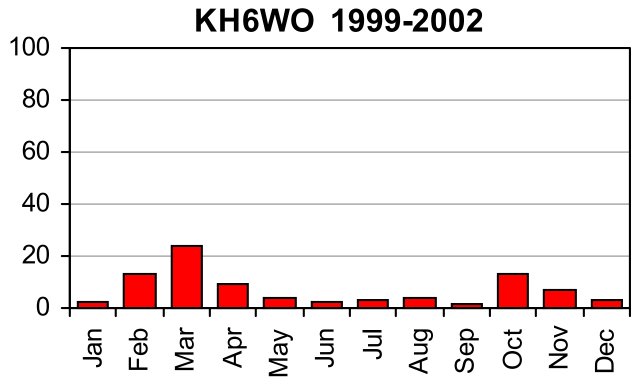




4U1UN: (*No major outages but 4U1UN suffered from reduced reliability in January and February 2002 and these two months are omitted from the study results).* The New York beacon exhibits a pattern typical of paths lying entirely within the Northern Hemisphere and is very similar to that for RR9O. Winter reliability regularly exceeds 90% of days. The summer null would have been even more pronounced but for the presence of multi-hop sporadic E. In June and July the 20% daily reliability is almost entirely due to Es, and it is likely that multi-hop Es was also responsible for some of the mid summer propagation to RR9O.

VE8AT: (*It is not clear from the results if outages occurred so data for all months have been incorporated in the results)*. The results for VE8AT are interesting as they match closely the patterns shown by JA2IGY and other beacons where the path passes high latitudes. I am not sure why there should be such pronounced peaks close to the equinoxes in these cases. Paths at slightly lower latitudes (as exhibited by RR9O and 4U1UN) show a distinctly different circumstance with a peak in mid-winter





W6WX: (Un*til recent storms. W6WX had an excellent service record. Only November and December 2002 are excluded from the graphs because of non-operation)*. The monthly patterns for the path to California resemble those for New York but at reduced reliability. The low relaibility for the month of January hints at the feature described for VE8AT for near-polar paths

KH6WO: (*No significant outages are known and all months are included in the analysis).* Of all the NCDXF beacon locations, Hawaii is the most difficult to achieve on 28 MHz from the UK. Daily reliabilities only approached 20% in March and October. The pattern of peaks at the equinoxes resembles the VE8AT pattern rather than that for JA2IGY and ZL6B. Both long and short path are represented in the graph with morning long path responsible for the low reliability propagation seen in the summer months and late afternoon and early evening short path for the relatively high reliability propagation between October and April

The challenge now is to produce an equivalent set of graphs for the solar minimum years. I hope we can call upon some dedicated listening from Six and Ten club members!