

BAA Radio Astronomy Group.

2011 DECEMBER

	Colin Clements (23.4kHz)	Peter Meadows (23.4kHz)	Mike King (20.9kHz)	John Wardle (19.6/23.4kHz)	Peter King (18.3kHz)
	AAVSO receiver, 0.76m screened loop aerial.	Tuned radio frequency receiver, 0.58m frame aerial.	AAVSO receiver. Tuned loop aerial.	PC soundcard, long wire aerial.	Own designed receiver, 1.4m loop aerial.
DAY	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)
1	C1.4				
5	C3.7				
9	C3.1				
12	B8.0				
13	C1.4				
14	C2.3				
14	C5.8				
14	C7.5				
18	B7.0				
20	C2.1				
21	C2.5				
21	C2.1				
21	C2.0				
21	C2.5				
23	C1.5				
25	C5.5				
25	C8.4				
25	M4.0				
26	C2.8				
26	C5.7				
27	C4.0				
27	C6.2				
28	C1.1				
28	C2.0				
28	?				
28	C7.2				
28	C3.1				
28	C6.4				
29	M1.9				
30	C1.6				
30	C8.4				
30	?				
30	C1.8				
30	?				
31	M2.4	13:12 13:13 13:56 2			
31	B7.2				
31	M1.5				

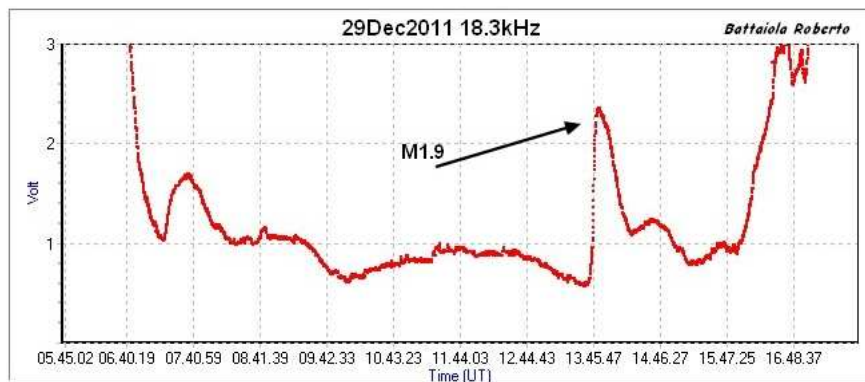
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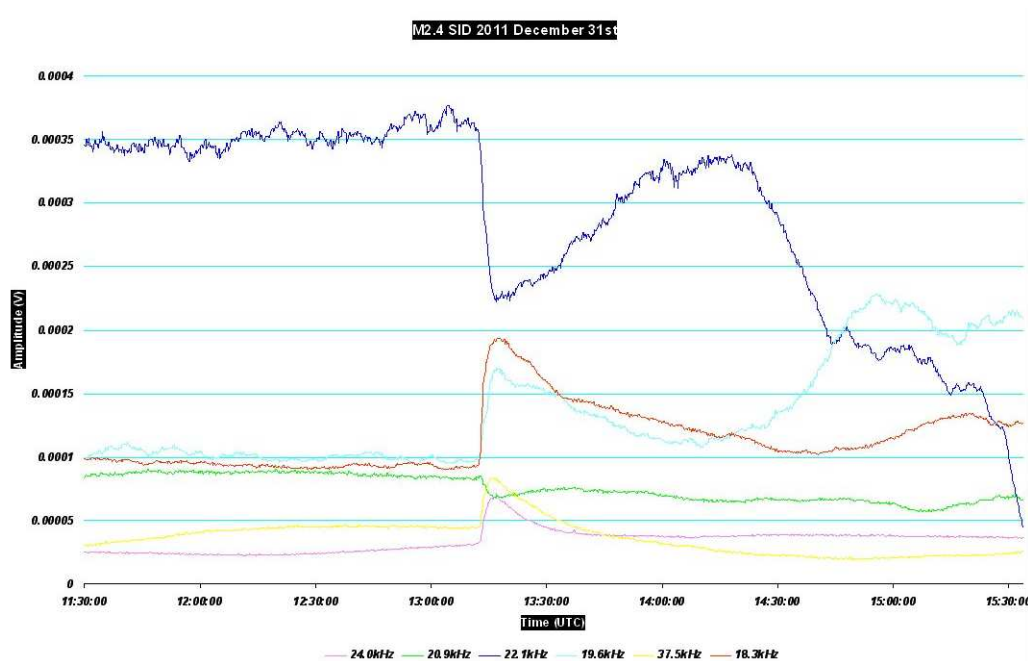
	Steve Parkinson (23.4kHz) Tuned radio frequency receiver, 0.58m frame aerial.	Simon Dawes (various) PC soundcard and TRF receiver with 1m loop aerial.	Gonzalo Vargas (Various) Spectrum Lab.		
DAY	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)
1	C1.4				
5	C3.7				
9	C3.1				
12	B8.0				
13	C1.4				
14	C2.3				
14	C5.8				
14	C7.5				
18	B7.0				
20	C2.1				
21	C2.5				
21	C2.1				
21	C2.0				
21	C2.5				
23	C1.5				
25	C5.5				
25	C8.4				
25	M4.0				
26	C2.8				
26	C5.7				
27	C4.0				
27	C6.2				
28	C1.1				
28	C2.0				
28	?				
28	C7.2				
28	C3.1				
28	C6.4				
29	M1.9				
30	C1.6				
30	C8.4				
30	?				
30	C1.8				
30	?				
31	M2.4				
31	B7.2				
31	M1.5				

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Apart from the generally lower levels of activity, a feature of December has been some very noisy periods. It has been very difficult to pick out genuine SIDs from the background signal variations. Some of the VLF transmitters take a break and go off-air over the holiday period just to make life a little more difficult. Looking through the X-ray flux recorded in the GOES record shows very little flare activity during the first 3 weeks, with mainly B- and small C-class flares. The M4.0 flare on the 25th was the first M-class of the month, marking the start of a week of higher activity. There were no X-class flares. Our SID recordings seem to be a good sample of the month's activity.



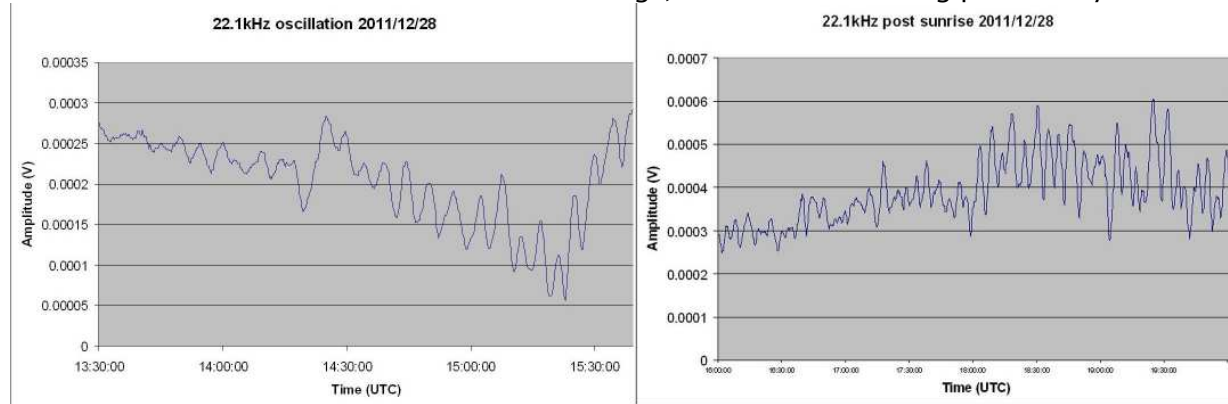
This recording by Roberto Battaiola shows the M1.9 flare on the 29th, well timed in the early afternoon for recording during the shorter winter days.



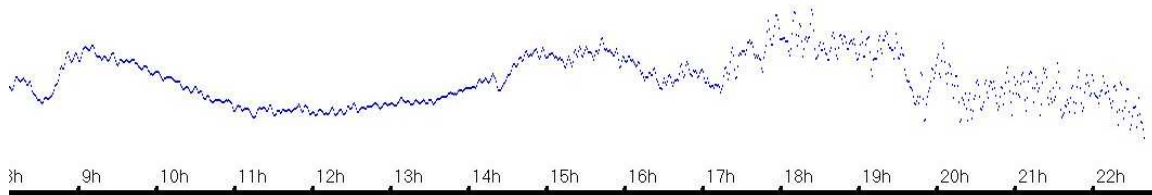
The M2.4 flare on the 31st, recorded here by Mark Edwards, was also well timed in the early afternoon.

Noisy recordings.

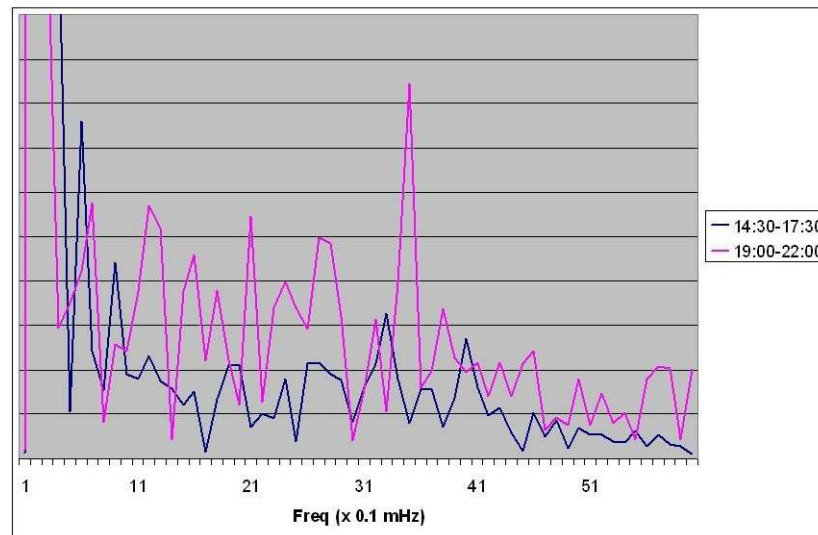
It has been my experience over the years that signals recorded during the winter can often be very noisy and difficult to interpret, but I have never done any research to find out why. Mark Edwards noticed the same effect on his recordings, December 28th being particularly bad.



22.1kHz 2011 Dec 28th.

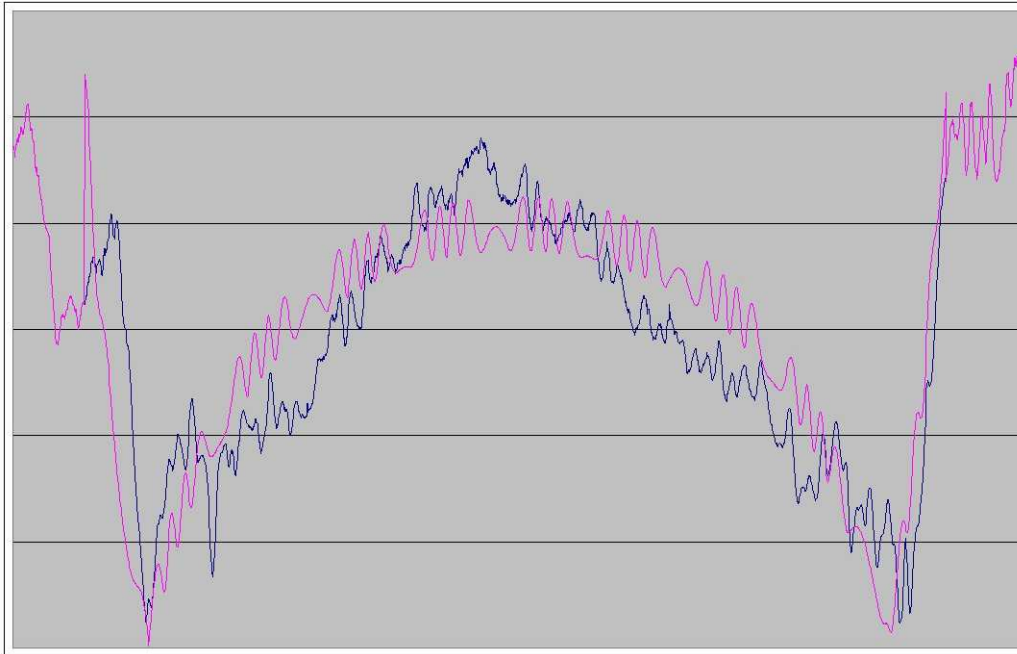


The top panel is Mark's recording, the lower panel being my own. The C7.2 flare is only just visible in my recording, surrounded by a continuous oscillation. Nighttime signals are usually chaotic, but the fast oscillations seen here are not what we normally see. This pattern was seen on several days over the holiday period, continuing into the new year.



Mark has done some analysis of his data, producing a spectrum of the oscillations as shown above. The pink trace represents the period after sunset, and shows a pronounced peak at

3.5mHz (286 seconds). The daytime (blue trace) is less well defined, but does have small peaks at similar periods. I have done a similar Fourier analysis on my own data, but my sampling period is probably too long (10 seconds) to be useful. I do see peaks around the 5 minute period, but they are not as clear as in Mark's data. Mark has modeled this effect as a sine wave ionospheric disturbance of 25km amplitude at 100km altitude on a signal at 22.1kHz over 24 hours.



The pink trace is the calculated signal strength, superimposed on actual data from 27th December. While not an exact match in all details, there is a striking similarity in the daytime signal behaviour. The 100km altitude used in the modeling could indicate some E-layer involvement. Similar effects were noted on other VLF signals, the oscillation period decreasing with increasing signal frequency. This analysis is based on Mark's location in Coventry.

I hope to include more on this subject in the next summary, so if anyone else has observations to add to the data, please send them in. In particular, it would be interesting to know whether radio amateurs noted any unusual propagation at VHF

Magnetic data.

Geomagnetic disturbances were generally very weak in December, with no extended storms recorded. Although the Bartels chart shows many disturbed days, these disturbances mostly lasted an hour or two, and were of low amplitude. The largest that I have recorded was a 40nT shift (K index of 3) at around 01:30 on the 10th. Paul Hyde commented on this event, and it also appears in recordings from Colin Clements. SWPC data indicates that this was due to a coronal hole high speed stream. It also indicates that there was a weak CME on the 25th/26th, leading to some disturbance on the 29th. This shows as no more than 12nT (K = 2) on my recordings, but it was also recorded by Paul and Colin.

The BGS Hartland observatory indicates sudden storm commencements on the 2nd and 18th of December, but of very low amplitude. They do not appear in my recordings as distinct events

ROTATION	KEY:	DISTURBED	ACTIVE	SFE	B, C, M, X = FLARE MAGNITUDE.	Synodic rotation start (carrington's).
2407	F	18 19 20 21 22 23 24 25 26 27 28 29 30 31			2010 January 1 2 3	2092 4 5 6 7 8 9 10 11 12 13
2408	F	14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30			2010 January 1 2 3 2010 February 1 2 3 4 5 6 7 8 9	2093 31 2094 1 2 3 4 5 6 7 8 9
2409	F	10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27			2010 February 1 2 3 4 5 6 7 8	2094 28 2010 March 1 2 3 4 5 6 7 8
2410	F	9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26			2010 March 1 2 3 4 5 6 7 8 9	2095 27 2010 April 1 2 3 4
2411	F	5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22			2010 April 1 2 3 4 5 6 7 8 9	2096 23 May 1
2412	F	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20			2010 May 1 2 3 4 5 6 7 8 9	2097 20 21 22 23 24 25 26 27 28
2413	F	29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14			2010 June 1 2 3 4 5 6 7 8 9 10 11 12 13 14	2098 15 16 17 18 19 20 21 22 23 24
2414	F	25 26 27 28 29 30 1 2 3 4 5 6 7 8 9 10 11 12 13			2010 July 1 2 3 4 5 6 7 8 9 10 11 12 13	2099 14 15 16 17 18 19 20 21
2415	F	22 23 24 25 26 27 28 29 30 1 2 3 4 5 6 7 8 9 10			2010 August 1 2 3 4 5 6 7 8 9 10	2100 10 11 12 13 14 15 16 17 18
2416	F	19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5			2010 September 1 2 3 4 5 6 7 8 9 10	2101 6 7 8 9 10 11 12 13 14
2417	F	15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31			2010 October 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2102 4 5 6 7 8 9 10 11
2418	F	12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30			2010 November 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	2103 31 2010 December 1 2 3 4 5 6 7
2419	F	8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26			2010 December 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	2104 27 2011 January 1 2 3 4
2420	F	5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24			2011 January 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27	2105 25 26 27 28 29 30 31
2421	F	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27			2011 February 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27	2106 20 21 22 23 24 25 26 27
2422	F	28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23			2011 February 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	2107 16 17 18 19 20 21 22 23
2423	F	24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22			2011 March 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2108 16 17 18 19 20 21 22 23
2424	F	23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18			2011 April 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2109 16 17 18 19 20 21 22 23
2425	F	19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15			2011 May 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2110 9 10 11 12 13 14 15
2426	F	16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11			2011 June 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2111 4 5 6 7 8 9 10 11
2427	F	12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31			2011 July 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2112 1 2 3 4 5 6 7 8
2428	F	9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31			2011 August 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2113 30 31 2011 September 1 2 3 4
2429	F	5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31			2011 September 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2114 22 23 24 25 26 27 28 29 30 31
2430	F	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27			2011 October 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2115 23 24 25 26 27
2431	F	28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24			2011 October 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2116 20 21 22 23 24
2432	F	25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20			2011 November 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2117 17 18 19 20
2433	F	21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17			2011 December 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2118 14 15 16 17
2434	F	18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13			2012 January 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2119 10 11 12 13

Magnetic data supplied by Colin Clements. Paul Hyde and John Cook.