



Founded in 1890

# The British Astronomical Association

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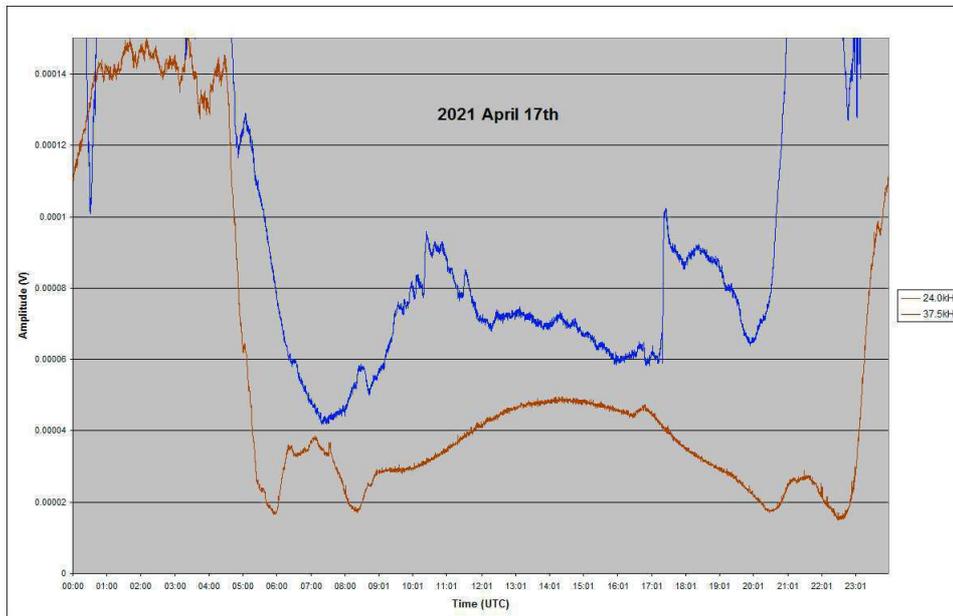


Please send all reports and observations to [jacook@jacook.plus.com](mailto:jacook@jacook.plus.com)

## BAA Radio Astronomy Section.

## 2021 APRIL.

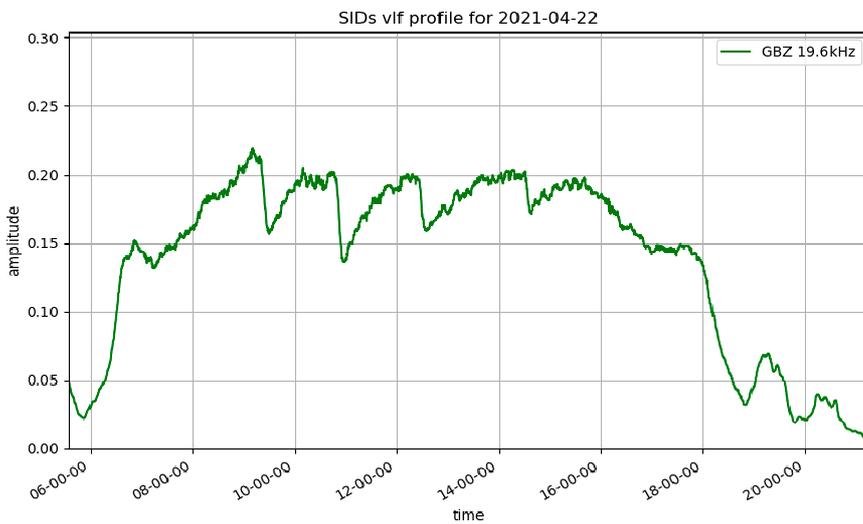
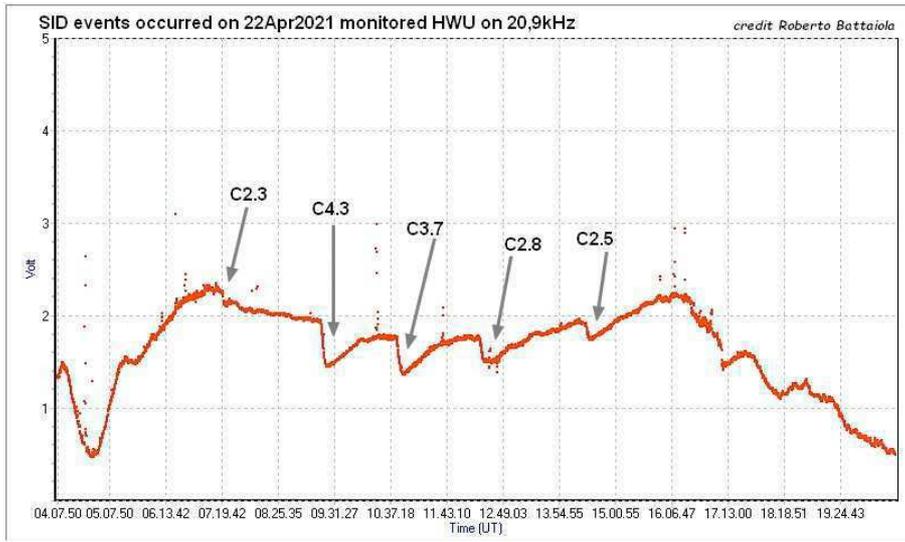
Solar activity increased in April with the appearance of several new sunspot regions. Most of these were either quiescent or produced only smaller B-class flares, but there was a small burst of C-class activity later in the month with eight flares being recorded as SIDs along with one B-class event. These events coincided with an extended period when both 23.4kHz and 22.1kHz signals were off-air. Luckily we have a good range of signals covered by our observers, and so all of the best events were recorded.



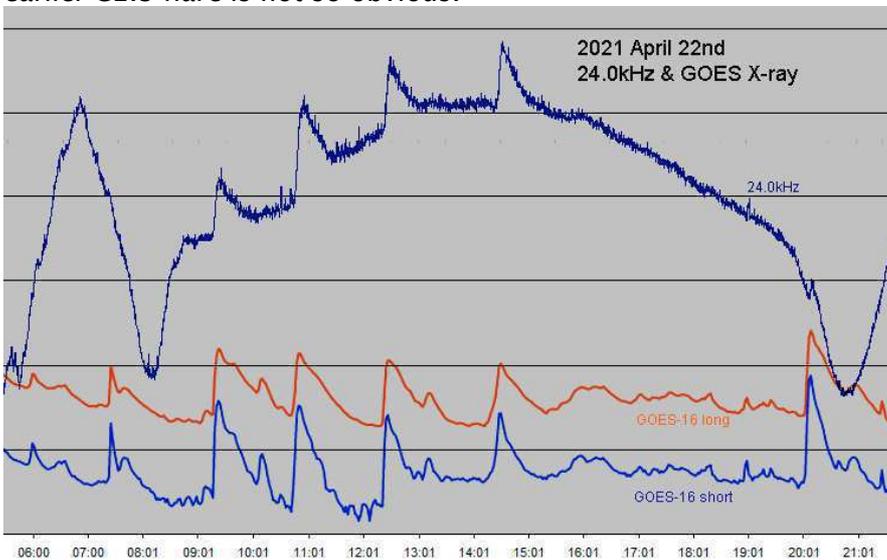
The B9.7 flare on the 17<sup>th</sup> was quite late in the afternoon, but does show well on the 24kHz signal (brown trace) in this recording by Mark Edwards. A small 'kink' is also visible at 37.5kHz (blue) just before the large magnetic induced transient. This was a very slow flare, lasting well into the sunset period of European signals. Mark noted that the peak timing listed in the SWPC bulletin was at 17:17UT, much later than the peak of the SID. Looking at the X-ray data shows that the shorter wavelength signal peaked well before the longer wavelength, much nearer to our timing. The shorter wavelength also showed a much faster decay time.

The C1.9 flare on the 20<sup>th</sup> is also odd in that the SWPC bulletin lists the peak at 11:45UT, compared with our SID observations around 12:15. The SID was only recorded by two observers, but their timings are very similar. Looking at the X-ray plot on the polarlicht website shows a flare matching our timings, starting well after the 11:45 peak listed. There is a few minutes delay between the short and long wavelength peaks, but neither match the 11:45 timing.

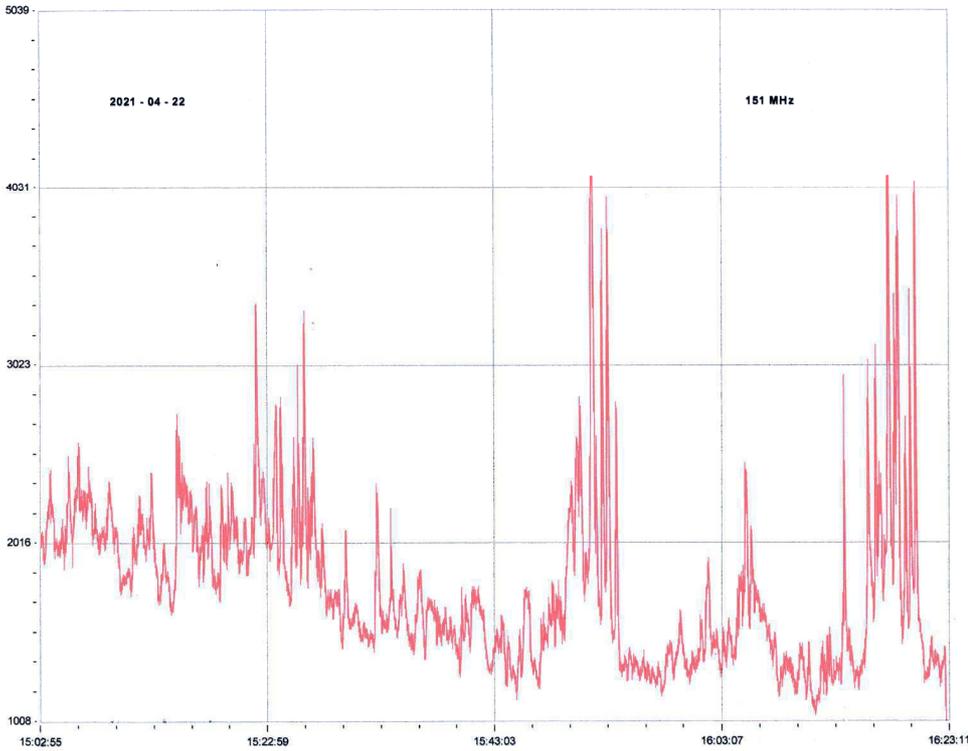
The most active day recorded so far in 2021 was on the 22<sup>nd</sup>, with a total of seven SIDs recorded, all of C-class. Roberto Battaola shows the first five in his recording at 20.9kHz:



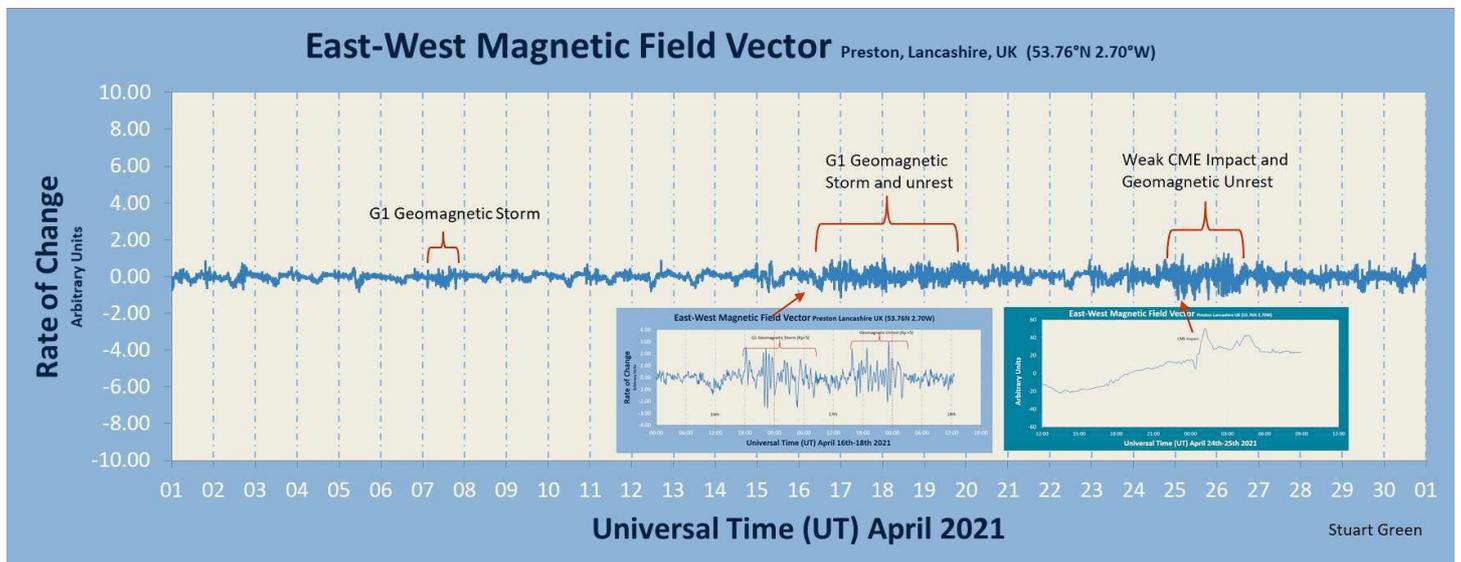
This recording by John Prescott at 19.6kHz is also very clear, although with a later sunrise time the earlier C2.3 flare is not so obvious.



Mark has added the GOES X-ray data to his recording that also includes the later C8.5 flare caught on the 24kHz signal. Colin Clements noted several radio bursts at 151MHz, shown below. They are all following the C2.5 flare, although a connection is not clear. They were not detected at 408MHz.

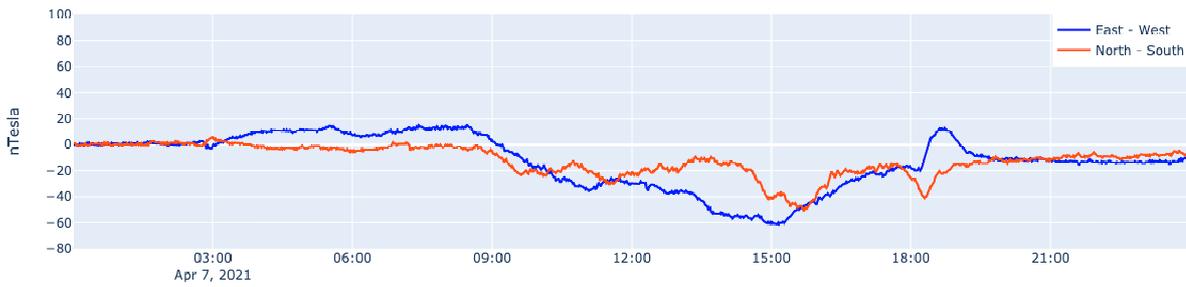


**MAGNETIC OBSERVATIONS.**



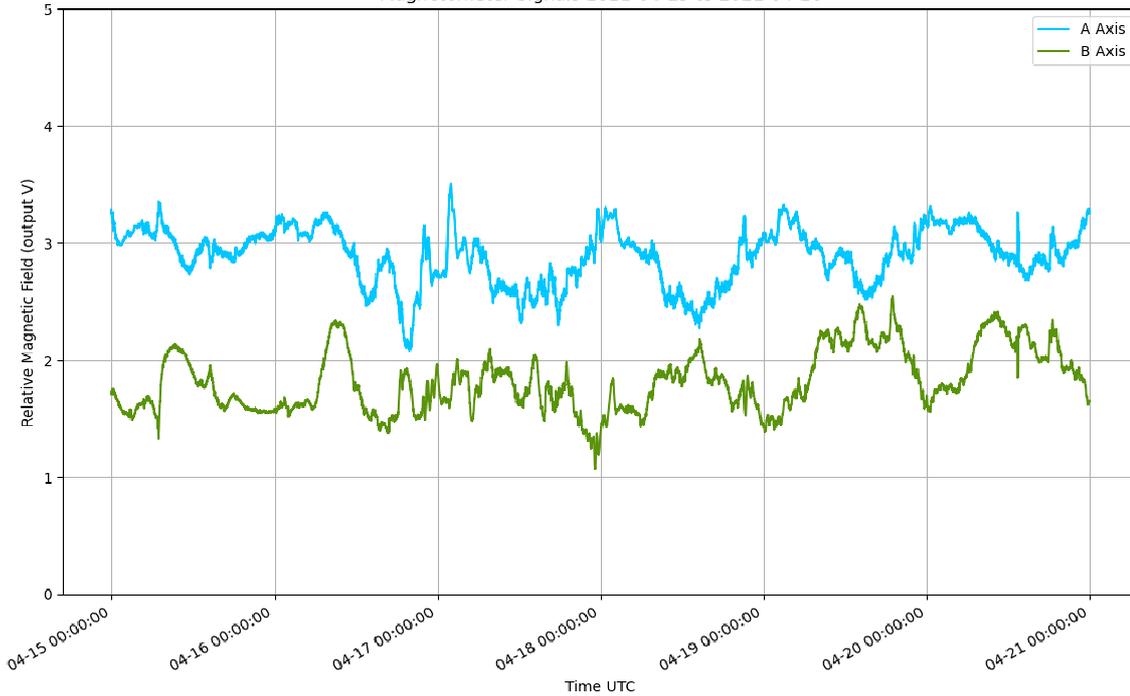
Magnetic disturbances in April were all very mild, shown in the month's summary by Stuart Green. The coronal holes seen over previous months seem to have broken up, resulting in lower solar wind speeds. There were a number of CMEs associated with the increased flare activity, they were mostly not aimed towards Earth. A small CME from March 31<sup>st</sup> arrived on April 5<sup>th</sup>, with some minor disturbance on the 7<sup>th</sup>. Although classified as a G1 geomagnetic storm, its effects were very mild as shown in the recording by Nick Quinn:

Steyning Magnetometer (50.8 North, 0.3 West)

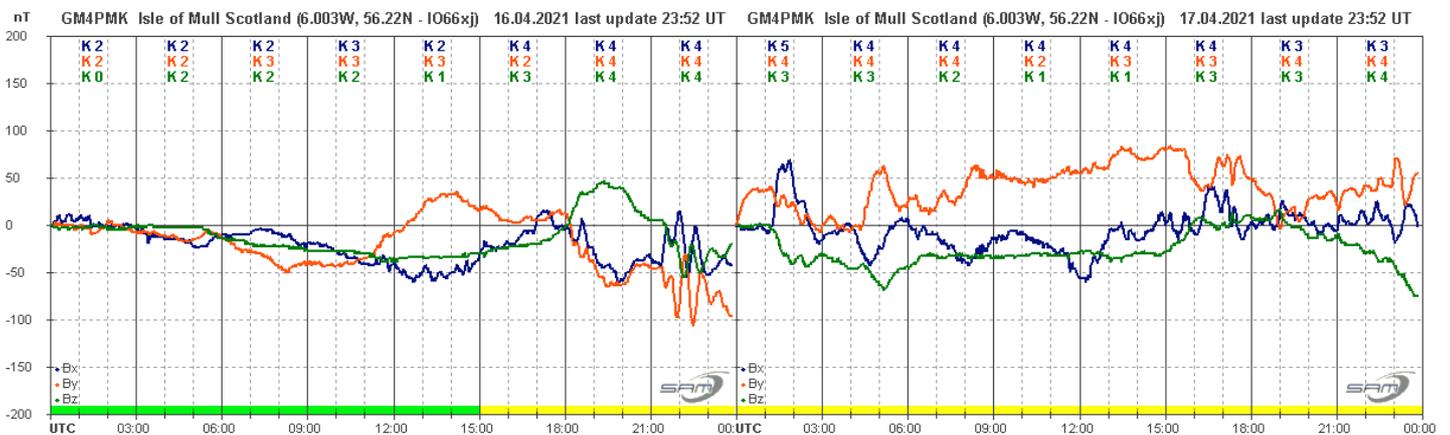


A combination of CMEs and coronal holes produced several days of activity starting on the 16<sup>th</sup>, shown in this recording by Andrew Thomas:

Magnetometer Signals 2021-04-15 to 2021-04-20



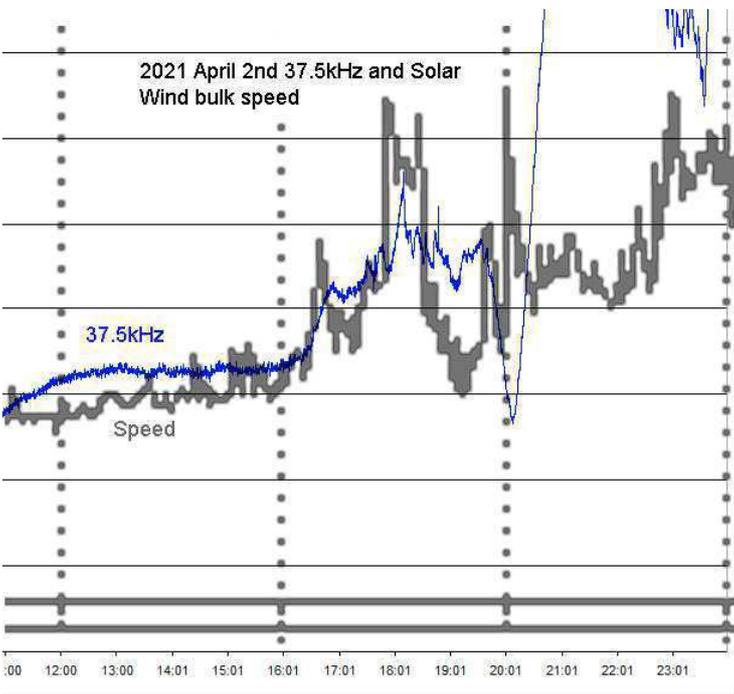
Rapid variations of 100nT were recorded in the evening of the 16<sup>th</sup>, continuing all day on the 17<sup>th</sup> as shown in Roger Blackwell's recording:



The discontinuity at midnight is due a reset of the sensor.

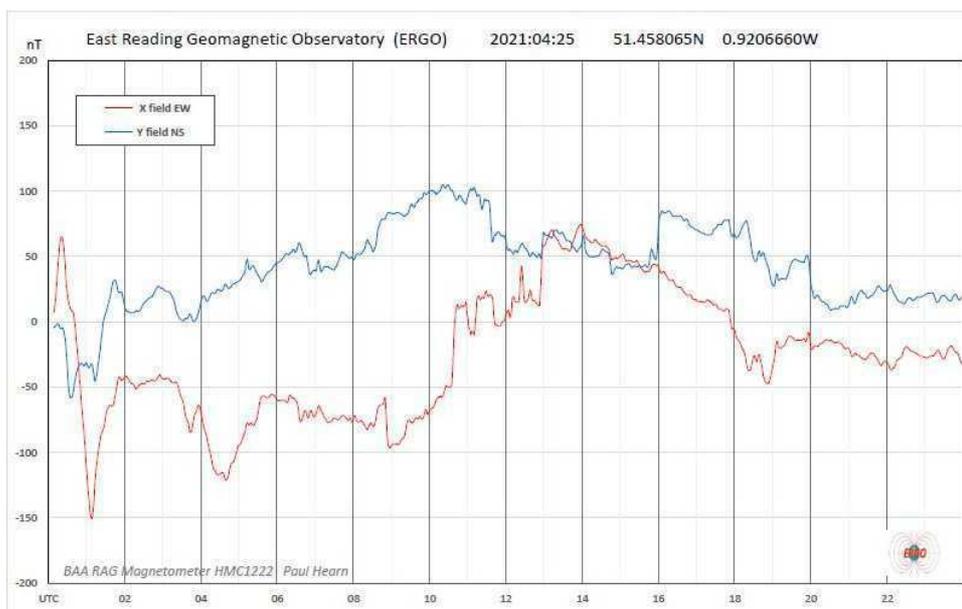


Mark Edwards has overlaid Roger's magnetic data from the 17<sup>th</sup> onto the 37.5kHz (blue) and 24kHz (brown) signals, showing the effects that the magnetic disturbance has had on the VLF signal. Mark also has an interesting observation from April 2<sup>nd</sup>:



The 37.5kHz signal is shown overlaid on the Soho solar wind monitor signal, showing a possible link between the solar wind speed and the VLF signal in the hours before the sunset effect takes over. There were no matching magnetic disturbances at that time. This is an interesting connection, and open to debate.

A CME recorded in Soho data from the 22<sup>nd</sup> arrived late in the evening of the 24<sup>th</sup>, close to midnight, with a period of stronger magnetic disturbance recorded on the 25<sup>th</sup>.



This recording by Paul Hearn shows a short period of strong activity up to 02UT, followed by a milder disturbance over the next few hours. Unfortunately local interference has affected the recording from 12 to 16UT, but the CME can still be seen through the rest of the day. Disturbance continued during the morning of the 26<sup>th</sup>, gently fading out.

2546	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
2547	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
2548	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
2549	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2550	15	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
2551	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6
2552	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3
2553	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
2554	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	25	26
2555	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
2556	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
2557	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
2558	16	17	18	19	20	21	22	23	24	25	26	27	28	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2559	15	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
2560	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7

Magnetic observations received from Roger Blackwell, Colin Clements, Paul Hearn, Andrew Thomas, Nick Quinn and John Cook.

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DAY	Xray class	Observers	John Cook (23.4kHz/22.1kHz)	Roberto Battaiola 20.9kHz	Paul Hyde (Various)	Mark Edwards (24.0kHz/19.6kHz)	Colin Clements (23.4kHz/18.3kHz)
			Tuned radio frequency receiver, 0.58m frame aerial.	Modified AAVSO receiver.	Spectrum Lab / PC 1.5m frame aerial.	Spectrum Lab / PC 2m loop aerial.	Tuned Radio Frequency receivers, 0.76m screened loop aerial.
			START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)
17	B9.7	2			16:27 16:38 17:15 2+	16:29 16:49 17:27 2+	
20	C1.9	2			11:59 12:11 12:32 2	11:57 12:20 12:26 1+	
22	C2.3	2		07:18 07:22 07:28 1-			
22	C4.3	7			09:15 09:24 10:04 2+	09:18 09:25 09:56 2	09:18 09:25 10:00 2
22	C1.4	1				10:07 10:10 10:16 1-	
22	C3.7	7			10:45 10:55 11:26 2	10:45 10:55 11:26 2	10:45 10:55 11:52 2+
22	C2.8	7			12:22 12:29 13:05 2	12:23 12:30 13:00 2	12:25 12:32 14:26 3
22	C2.5	7			14:26 14:32 15:18 2+	14:26 14:33 15:11 2	14:26 14:34 17:13 3+
22	C8.5	2				20:09 20:11 20:21 1-	

DAY	Xray class	Observers	Steve Parkinson (Various)	Andrew Thomas (19.6kHz)	Phil Rourke (23.4kHz)	John Wardle	Chrostopher Bailey
			Tuned radio frequency receiver, frame aerials.	Tuned radio frequency receiver, 0.6m frame aerial.	Spectrum Lab, 0.6m frame aerial.	SpetrumLab/Starbase, mini-whip aerial. Active	Spectrum Lab
			START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)
17	B9.7						
20	C1.9						
22	C2.3						
22	C4.3		09:17 09:23 09:57 2	09:16 09:45 10:09 2+			09:20 09:25 10:04 2
22	C1.4						
22	C3.7		10:44 10:53 11:24 2	10:44 10:54 11:55 2+			10:47 10:53 12:05 2+
22	C2.8		12:23 12:30 ? -	12:22 12:27 13:28 2+			12:24 12:28 13:00 2
22	C2.5		14:27 14:33 15:00 2	14:26 14:32 14:57 1+			14:28 14:33 14:58 1+
22	C8.5			20:01 20:08 20:16 1-			

DAY	Xray class	Observers	Colin Briden (22.1kHz)	Andrew Lutley (23.4kHz)	Peter Meadows (23.4kHz)	John Elliott (18.3kHz)	Mark Prescott (19.6kHz)
			Spectrum Lab / PC, 1.2m frame aerial.	Tuned radio frequency receiver, 0.6m frame aerial.	Tuned radio frequency receiver, 0.6m frame aerial.	Tuned radio frequency receiver, 0.5m frame aerial.	
			START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)
17	B9.7						
20	C1.9						
22	C2.3						? 07:14 08:14
22	C4.3						09:21 09:30 10:05 2
22	C1.4						
22	C3.7						10:47 10:58 11:06 1
22	C2.8						12:27 12:34 12:43 1-
22	C2.5						14:30 14:35 14:42 1-
22	C8.5						

