BAA Radio Astronomy Group. **2016 JULY**

	Xray class	Observers	John Cook (23.4kHz/*22.1kHz*) Tuned radio frequency receiver, 0.58m frame aerial.				Roberto Battaiola (20.9kHz) Modified AAVSO receiver.			Paul Hyde (22.1kHz) Spectrum Lab / PC 1.5m frame aerial.				Mark Edwards (**20.9**/24.0/*18.3kHz*) Spectrum Lab / PC 2m loop aerial.				Colin Clements (23.4kHz/*22.1kHz*) AAVSO receiver, 0.76m screened loop aerial.			
DAY			START	PEAK	END (UT)		START	PEAK	END (UT)	START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)	
7	C5.1	4	*07:53*	*07:58*	*08:26*	*2*				07:53	08:03	08:44	2+	07:53	08:02	09:10	2+				
9	?	1												15:50	16:02	?	-				
9	C2.6	3	*16:05*	*16:08*	*16:20*	*1-*				16:04	16:08	16:36	1+	16:04	16:09	16:36	1+				
15	C2.0	4	15:11	15:13	15:18	1-				15:10	15:15	15:52	2	15:10	15:15	15:56	2+	15:09	15:13	15:36	1+
16	C2.0	1								05:44	05:46	06:22	2								
16	C6.8	4	*07:02*	*07:05*	*07:31*	*1+*				07:02	07:08	08:00	2+	07:03	07:06	07:13	1-				
16	C1.5	3	08:22	08:25	08:28	1-				08:20	08:26	08:58	2	08:21	08:28	08:47	1+				
16	C1.0	1								09:45	09:49	10:02	1-								
16	C1.1	2								10:29	10:36	10:47	1-	10:29	10:38	11:02	2				
16	B9.3	3	12:58	13:00	13:09	1-				12:57	13:02	13:34	2	12:59	13:01	13:14	1-				
16	B6.9	2								13:54	14:01	14:12	1-	13:56	14:00	14:21	1				
17	C1.0	1												17:03	17:08	17:27	1				
18	C4.4	5	08:16	08:22	09:08	2+				08:12	08:26	10:12	3	08:13	08:26	09:39	3	08:09	08:26	09:28	2+
19	C2.2	5	10:56	11:15	12:35	3				11:02	11:19	12:32	3	10:55	11:26	12:20	2+	09:47	11:27	13:03	3+
19	*	3								14:04	14:15	15:03	2+	14:05	14:12	14:35	1+	13:59	14:13	15:00	2+
21	C1.0	3								09:43	09:47	10:01	1-	09:44	09:49	09:55	1-	09:39	09:41	10:18	2
21	C7.2	5	11:18	11:19	11:58	2				11:16	11:22	11:51	2	11:17	11:21	12:30	2+	11:17	11:22	12:19	2+
21	C9.1	5	12:51	12:56	?	-				12:49	13:00	?	-	12:50	12:58	?	-	12:48	12:58	13:32	2
21	C2.2	4	13:33	13:35	14:03	1+				13:35	13:37	13:56	1	13:33	13:35	14:07	2	13:32	13:34	14:36	2+
21	B6.0	1												14:15	14:20	14:32	1-				
21	C1.2	4	*15:39*	*15:43*	*15:51*	*1-*				15:40	15:45	16:06	1+	15:41	15:46	15:58	1-	15:39	15:45	16:11	1+
21	C1.2	3	*17:03*	*17:06*	*17:13*	*1-*				17:03	17:07	17:39	2	17:02	17:10	17:23	1				
21	B9.7	1												17:41	17:42	17:58	1-				
22	C6.6	3	*06:46*	*06:53*	*07:25*	*2*				06:46	06:54	?	-	06:47	06:52	07:02	1-				
22	C1.2	1								07:25	07:29	07:57	1+								
22	C2.4	1												20:16	20:21	20:37	1				
23	**M7.6**	3	05:11	05:14	05:26	1-				05:11	05:21	?	-	**05:11**	**05:13**	**?**	**-**				
23	**M5.5**	2								05:31	05:34	07:25	3	**05:23**	**05:27**	**05:33**	**1-**				
23	C1.8	3								12:52	13:00	13:21	1+	12:53	13:00	13:20	1+	12:46	12:58	13:43	2+
23	*	1												15:30	15:36	15:47	1-				
23	C2.4	2								17:41	17:49	18:53	2+	17:39	17:50	18:20	2				
24	**M2.0**	4	*06:14*	*06:20*	*07:04*	*2+*				06:13	06:29	07:25	2+	**06:13**	**06:26**	**07:12**	**2+**				
24	C1.5	1								07:59	08:07	08:20	1								
24	C1.0	2								10:30	10:35	10:54	1					10:27	10:36	10:48	1
24	B9.2	3								11:39	11:45	11:54	1-	11:37	11:45	?	-	11:38	11:43	11:57	1
24	B9.6	4	12:59	12:04	?	-				11:58	12:05	12:20	1	11:57	12:03	?	-	11:57	12:03	12:19	1
24	C1.5	4	12:20	12:28	?	-				12:21	12:30	12:50	1+	12:20	12:32	?	-	12:19	12:30	12:50	1+
24	C2.5	4	13:00	13:03	13:13	1-				12:58	13:05	?	-	12:58	13:06	?	-	12:57	13:03	13:17	1
24	C3.5	4	13:18	13:25	13:36	1-				13:18	13:25	?	-	13:18	13:25	?	-	13:17	13:24	13:34	1-
24	?	2												13:36	13:44	?	-	13:34	13:45	13:49	1-
24	?	1												**13:52**	**13:53**	**?**	**-**				
24	C6.9	5	13:39	13:45	14:58	2+				13:36	13:44	14:29	2+	14:00	14:06	15:06	2+	13:49	13:53	15:47	3
24	?	1												15:52	15:57	16:18	1+				
24	**M1.9**	5	*17:35*	*17:39*	*18:39*	*2+*				17:32	17:46	19:04	3	17:20	17:38	18:54	3	17:31	17:46	18:37	2+
25	C1.8	5	09:03	09:09	10:08	2+				08:59	09:15	10:48	3	**09:03**	**09:11**	**10:01**	**2+**	09:01	09:14	09:56	2+
26	B9.3	5	*15:26*	*15:33*	*15:54*	*1+*				15:26	15:36	16:35	2+	15:27	15:35	16:43	2+	15:23	15:36	16:32	2+
26	B4.5	1												17:14	17:18	17:25	1-				

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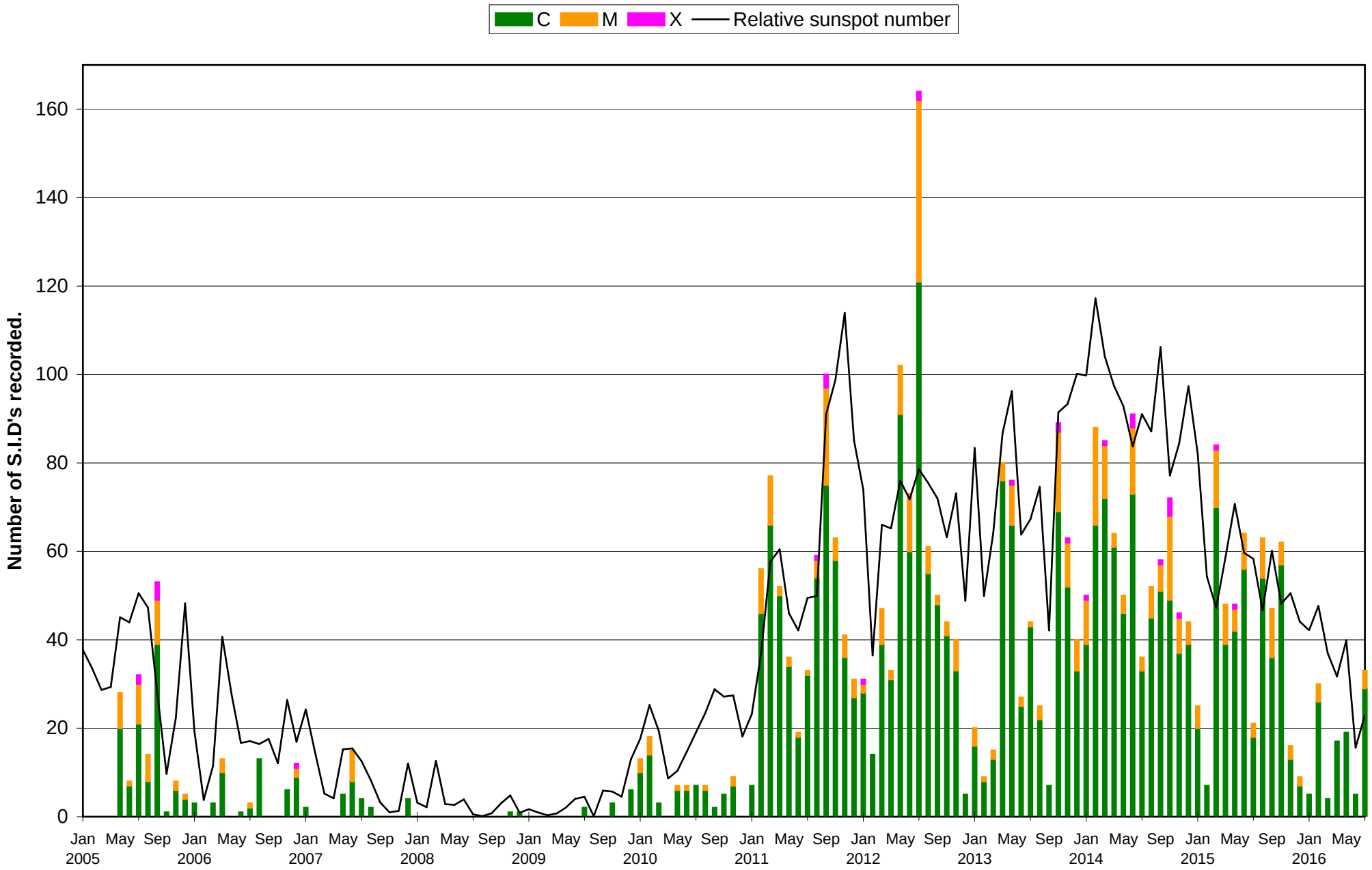
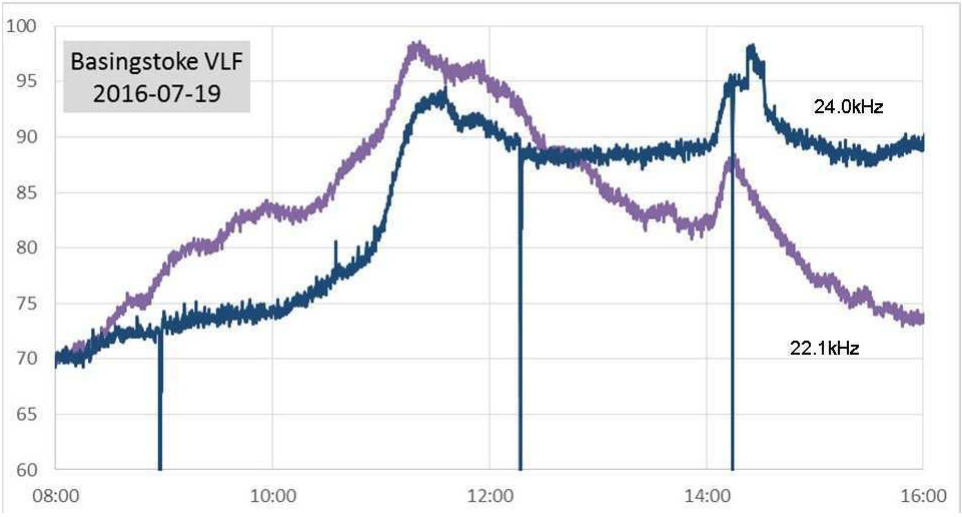
	Xray class		Steve Parkinson (Various)				John Wardle (19.6/23.4kHz)			Phil Rourke (23.4kHz)			Jim Barber			John Elliott (18.3kHz)		
			Tuned radio frequency receiver, frame aerials.				PC soundcard, 0.7m frame aerial.			Spectrum Lab, 0.6m frame aerial.			Spectrum Lab, 0.6m frame aerial.			Tuned radio frequency receiver, 0.5m frame aerial.		
DAY			START	PEAK	END (UT)		START	PEAK	END (UT)	START	PEAK	END (UT)	START	PEAK	END (UT)	START	PEAK	END (UT)
7	C5.1		07:51	08:03	08:56	2+												
9	?																	
9	C2.6																	
15	C2.0																	
16	C2.0																	
16	C6.8		07:02	07:08	07:48	2+												
16	C1.5																	
16	C1.0																	
16	C1.1																	
16	B9.3																	
16	B6.9																	
17	C1.0																	
18	C4.4		08:13	08:26	09:03	2+												
19	C2.2		?	?	?	-												
19	*																	
21	C1.0																	
21	C7.2		11:18	11:20	11:50	1+												
21	C9.1		12:51	12:58	13:50	2+												
21	C2.2																	
21	B6.0																	
21	C1.2																	
21	C1.2																	
21	B9.7																	
22	C6.6																	
22	C1.2																	
22	C2.4																	
23	**M7.6**																	
23	**M5.5**																	
23	C1.8																	
23	*																	
23	C2.4																	
24	**M2.0**		06:13	06:26	07:48	3												
24	C1.5																	
24	C1.0																	
24	B9.2																	
24	B9.6																	
24	C1.5																	
24	C2.5																	
24	C3.5																	
24	?																	
24	?																	
24	C6.9		?	?	?	-												
24	?																	
24	**M1.9**		17:34	17:45	18:47	2+												
25	C1.8		09:03	09:14	10:00	2+												
26	B9.3		15:28	15:36	15:53	1												
26	B4.5																	

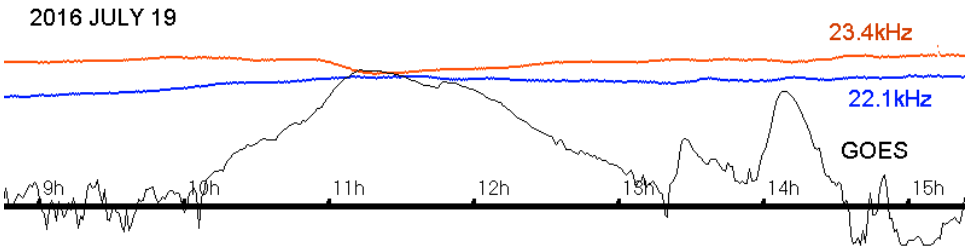

VLF flare activity 2005/16.
C
M
X
Relative sunspot number
Number of S.I.D's recorded.
0
20
40
60
80
100
120
140
160
Jan 2005
May
Sep
Jan 2006
May
Sep
Jan 2007
May
Sep
Jan 2008
May
Sep
Jan 2009
May
Sep
Jan 2010
May
Sep
Jan 2011
May
Sep
Jan 2012
May
Sep
Jan 2013
May
Sep
Jan 2014
May
Sep
Jan 2015
May
Sep
Jan 2016
May

BAA Radio Astronomy Group. **2016 JULY.**

After the low levels of activity in June, the SID count for July has bounced back again to more interesting levels. Most of this occurred in the second half of the month as AR12567 rotated into view. It produced several M-class flares, the most energetic being the M7.6 recorded at 05:15UT on the 23rd. Although the flares were allocated to AR12567, its activity was largely due to the proximity of AR12565, a slightly smaller sunspot group less than 10 degrees away. The STCE newsletter for July 20th includes some excellent pictures of this unusual 'solar conjunction' and the magnetic barrier between them.

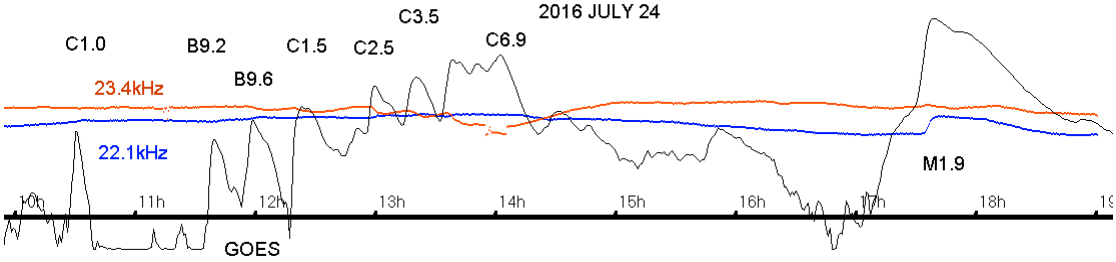


This chart by Paul Hyde shows activity on the 19th. The C2.2 flare peaking at 11:19UT shows a good SID, as does the unclassified flare at 14:15. The spikes present on the 24kHz signal appear to be due to the transmitter. The C2.2 flare was very slow, lasting over three hours. I have added the GOES data to my own recording:

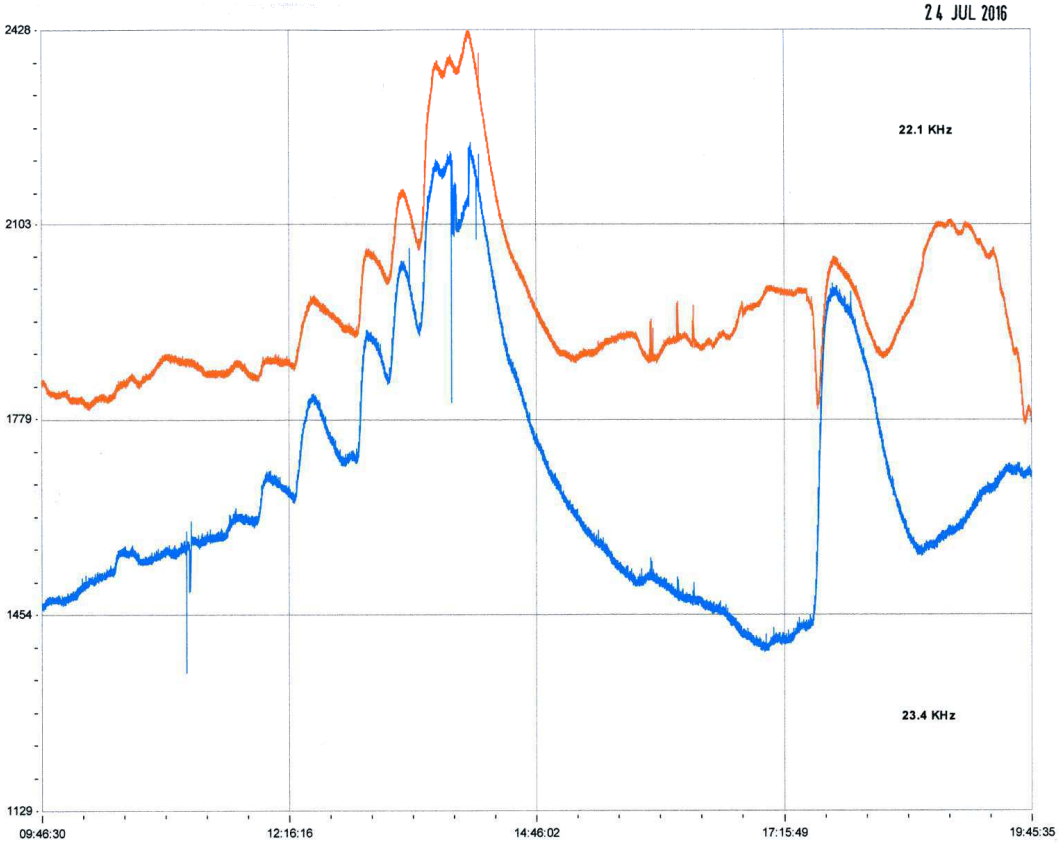


Compared to the SIDs recorded by Paul, mine are quite small and indistinct. Steve Parkinson also found it impossible to accurately define start, peak, and end times for this one.

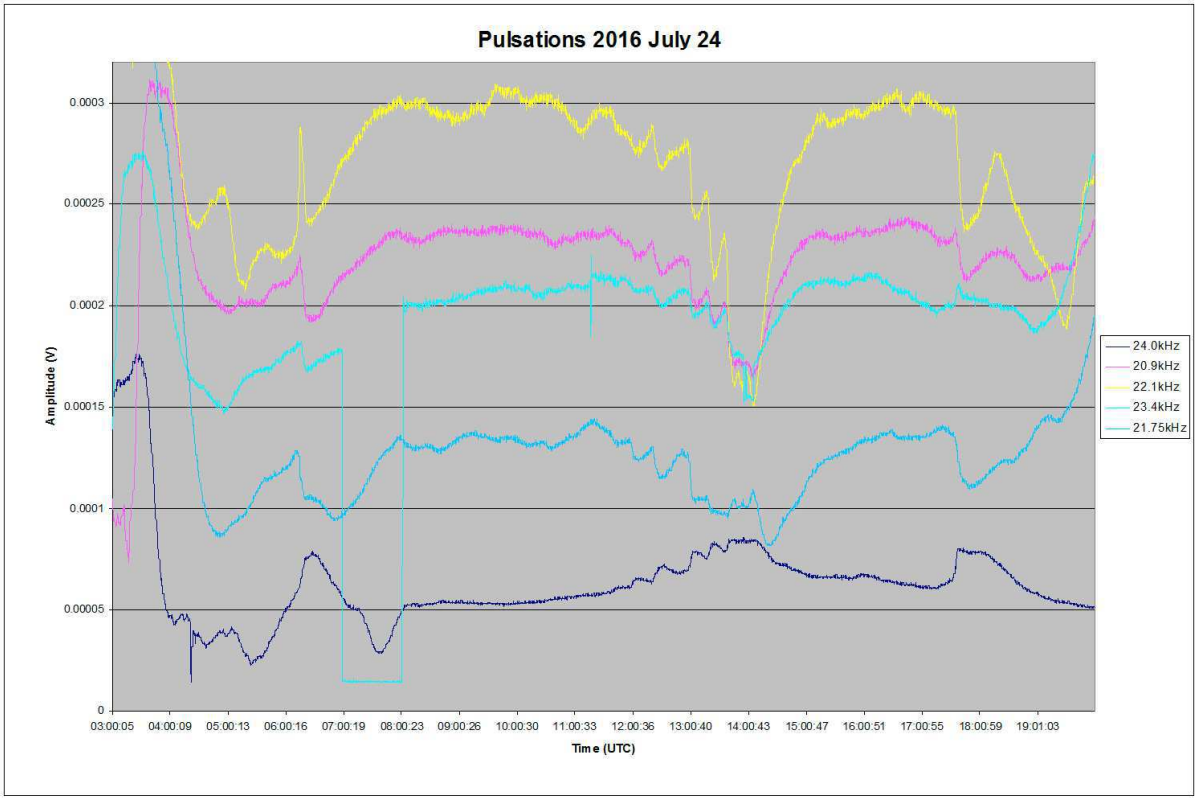
Another very slow flare included five major peaks ranging from B9.2 to C6.9 as shown below:



Starting at 11:30UT on the 24th, the flare subsided after 16:00 and was then followed by an M1.9 flare peaking about 17:40. Once again the SIDs on my recording are not very clear, but show much better on the recordings by Colin Clements and Mark Edwards shown on the next page.

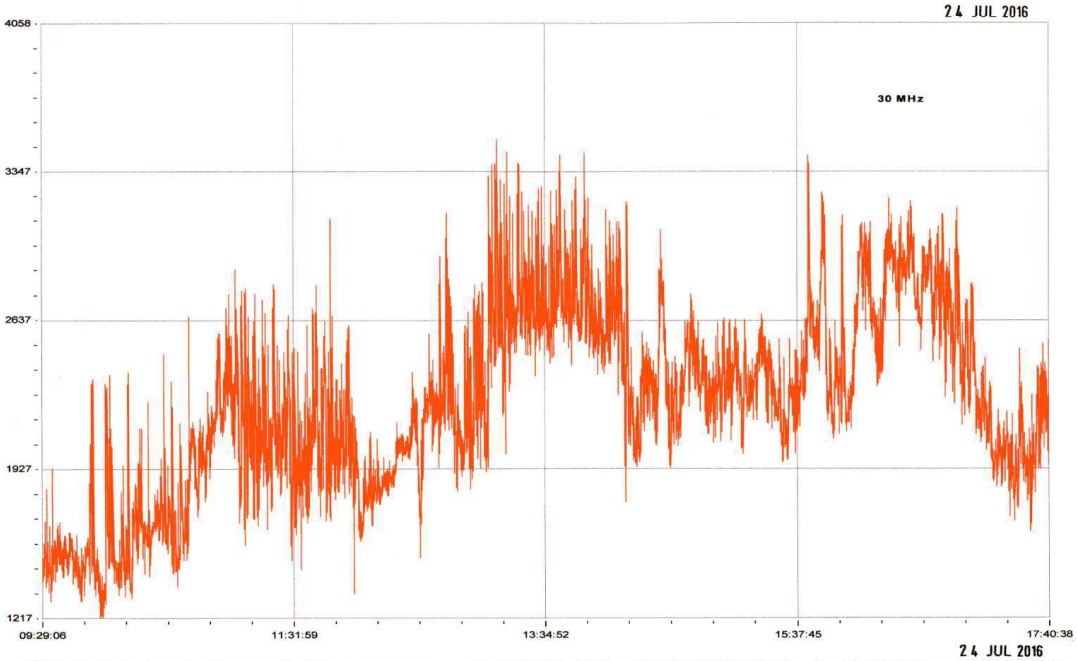


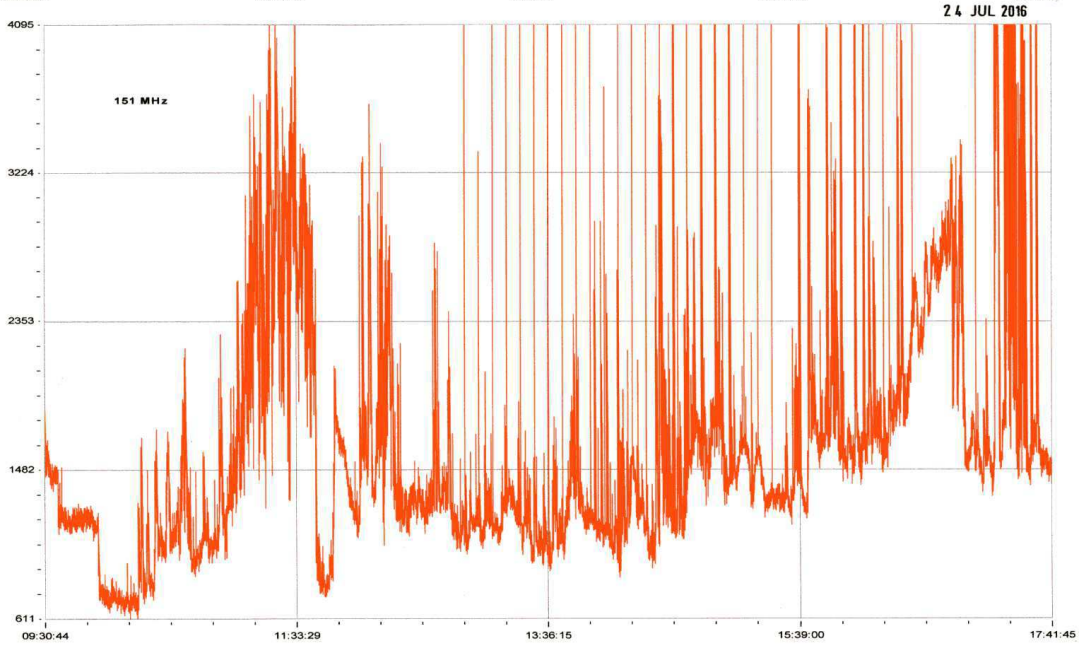
Colin Clements.



Mark Edwards.

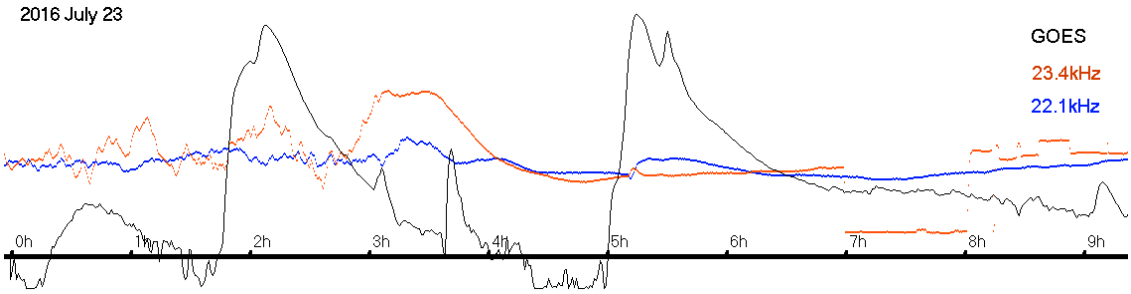
Both Colin and Mark noted how unusual this flare was. Colin also included his 30MHz and 151MHz recordings, shown on the next page.





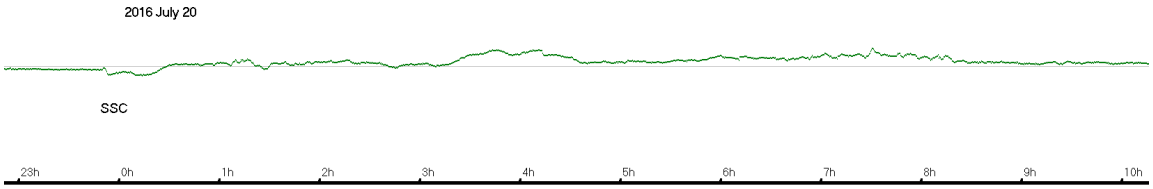
I have compressed the charts slightly in order to display them together. There is some interference present at 151Mhz, but the initial noise burst from the B9.2 flare is clear as is another burst from the later M1.9 flare.

Activity on the 23rd started with a dual M7.6-M5.5 flare shortly after local sunrise. There are some excellent images of this event in the STCE bulletin mentioned earlier. With peaks just 15 minutes apart, they were not easy to separate as SIDs.



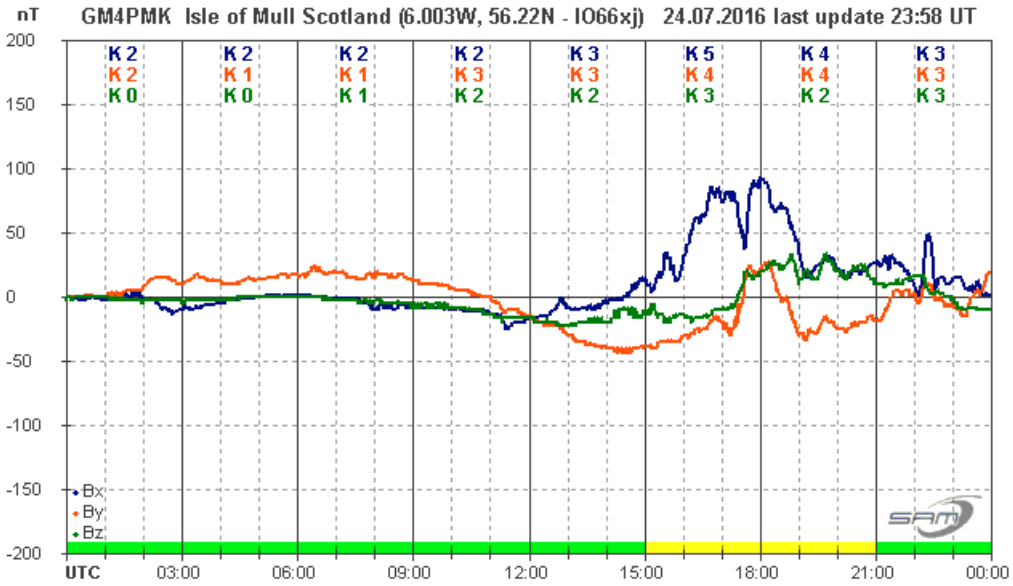
MAGNETIC OBSERVATIONS.

The interaction of AR12565 and AR12567 produced several small flares overnight on the 16th and 17th. These combined to form a CME that arrived at 23:50UT on the 19th, shown in my recording:



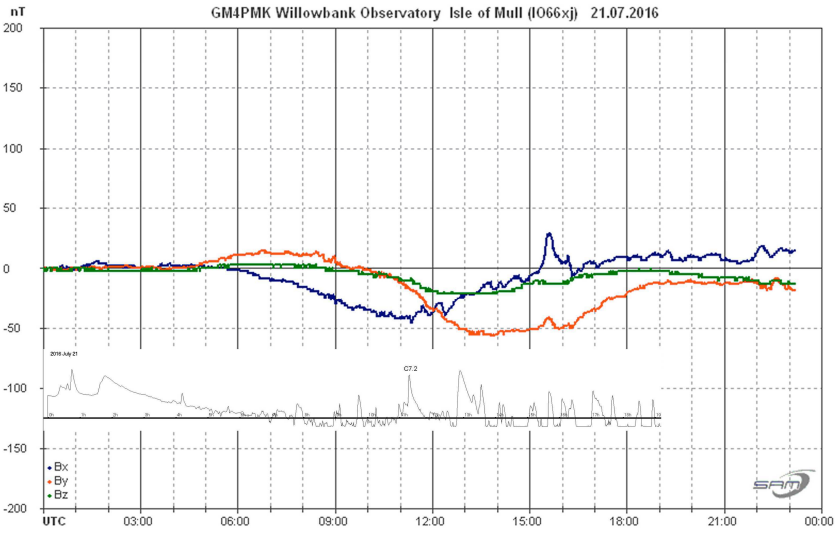
The SSC measures about 20nT, with a disturbance of about 50nT later in the morning of the 20th.

A smaller SSC was recorded on the 24th, shortly after 15:00UT by Roger Blackwell:



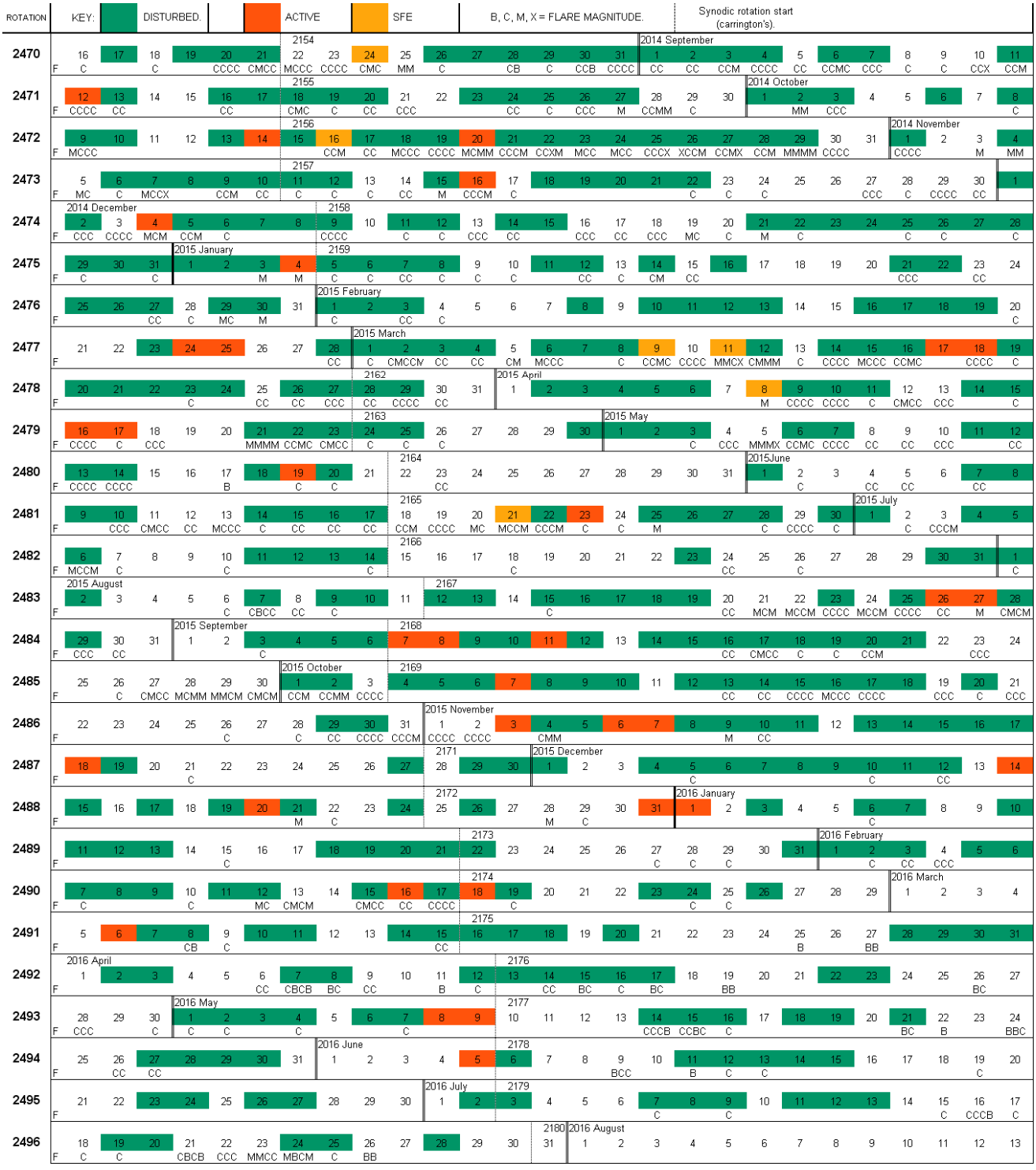
A series of flares from C4 to M1 overnight on the 20th/21st combined to create a small CME, the exact timing being difficult to determine due to its multiple sources. The disturbance that followed was stronger than that from the previous CME, and lasted into mid-morning on the 25th.

The BGS bulletin lists a small (4.8nT) SFE with the C7.2 flare peaking around 11:20 on the 21st.



I have added the GOES data to Roger's recording to indicate the C7.2 flare. A very small dip in the Bx (blue) trace is just visible. It does not appear in my own recording, and was not noted by other observers.

The remainder of the magnetic activity was from Coronal Hole effects. A particularly large hole was present early in the month, opening to nearly half of the northern hemisphere including polar and equatorial regions. Despite its size the disturbance was mild, lasting from the 11th to 13th. Smaller holes were present towards the end of the month with another mild disturbance over the 28th and 29th.



Magnetic observations received from Roger Blackwell, Colin Clements, Gonzalo Vargas, John Cook.