BAA Radio Astronomy Group.

2016 JULY

	SS	srs	John Cook (23.4kHz/22.1kHz)				Robe	erto Batta	aiola (20.9kHz)	P	aul Hyde	(22.1kHz)		Mark Edv	wards (2	0.9 /24.0/18	.3kHz)	Colin Clements (23.4kHz/22.1kHz)				
	Xray cla	Observe	Tuned radio frequency receiver, 0.58m frame aerial.				Мос	VSO receiver.	Spectro	um Lab / ae	PC 1.5m f ial.	rame	Spectrur	n Lab / F	PC 2m loop	aerial.	AAVSO receiver, 0.76m screen loop aerial.					
DAY			START	PEAK	END (UT)		START	PEAK	END (UT)	START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		
7 9	C5.1 ?	4 1	07:53	07:58	08:26	2				07:53	08:03	08:44	2+	07:53 15:50	08:02 16:02	09:10 ?	2+ -					
9 15	C2.6	3	16:05 15:11	16:08 15:13	16:20 15:18	1- 1-				16:04 15:10	16:08 15:15	16:36 15:52	1+ 2	16:04 15:10	16:09 15:15	16:36 15:56	1+ 2+	15.00	15.13	15.36	1+	
16	C2.0	1	13.11	15.15	13.10	1-				05:44	05:46	06:22	2	13.10	15.15	15.50	27	13.03	15.15	10.00	17	
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-	10.00	10.00	11.00	2					
16	B9.3	2	12.58	13.00	13.09	1-				10:29	13.02	10:47	2	12:59	13:01	13.14	∠ 1-					
16	B6.9	2	12.00	10.00	10.00					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	^ C1 0	3								14:04	14:15	15:03	2+	14:05	14:12	14:35	1+	13:59	14:13	15:00	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	1- 2+	11.17	11.22	12.10	2 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	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	00.70	00.00	07.20	-				07:25	07:29	07:57	1+		00.02	002	•					
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-	40.40	40.50	10.10	0	
23	C1.8	3								12:52	13:00	13:21	1+	12:53	13:00	13:20	1+ 1	12:46	12:58	13:43	2+	
23	C2 4	2								17.41	17.49	18:53	2+	17:39	17:50	15.47	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	10 50							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 24	C2.5	4	12:20	12:28	? 13·13	- 1-				12:21	12:30	12:50	-	12:20	12:32	? ?	-	12:19	12:30	12:50	1+	
24	C3.5	4	13.00	13.05	13:36	1-				12:30	13.05	: ?	_	13:18	13:25	: ?	-	12:37	13.03	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	17.05		(0.00					17.05				15:52	15:57	16:18	1+			40.07		
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 26	01.8 B9.3	ວ 5	09:03 15:26	15.33	10:08 15:54	∠+ 1⊥				15.26	15:36	10:48	3 2∓	15.27	15:35	10:01	∠+ 2+	15:23	09:14 15:36	16:32	2+ 2+	
26	B4.5	1	10.20	10.00	10.04	17				10.20	10.00	10.00	21	17:14	17:18	17:25	1-	10.20	10.00	10.02	27	

BAA Radio Astronomy Group.

	SS	Stev	e Parkin	son (Variou	is)	Johr	n Wardle (19.6/23.4	4kHz)	Pł	nil Rourke	e (23.4kHz)			Jim Ba	rber		John Elliott (18.3kHz)						
	ay cla	Tuned radio frequency receiver,				PC soundcard, 0.7m frame aerial.					m Lab, 0	.6m frame aeri	rial. Sp	pectrum	Lab, 0.6	om frame a	erial.	Tuned radio frequency receiver, 0.5m						
	Xra		name	aenais.															ITame	aeriai.				
DAY		START	PEAK	END (UT)		START	PEAK	END (UT	Г)	START	PEAK	END (UT)	ST	TART	PEAK I	END (UT)	5	START	PEAK	END (UT)				
7	C5.1	07:51	08:03	08:56	2+																			
9	?																				ļ			
9	C2.6																							
15	C2.0																							
16 16	C2.0	07.02	07.09	07.49	21																			
16	C0.8	07.02	07.08	07.40	27																ļ			
16	C1.0																							
16	C1.1																				ļ			
16	B9.3																							
16	B6.9																							
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	C2.2	12.01	12.50	15.50	27																			
21	B6.0																							
21	C1.2																							
21	C1.2																							
21	B9.7																							
22	C1.2																							
22	C2.4																							
23	M7.6																							
23	M5.5																							
23 23	*																							
23	C2.4																							
24	M2.0	06:13	06:26	07:48	3																			
24	C1.5																							
24 24	C1.0 B0.2																							
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 26	C1.8	09:03	09:14 15:26	10:00 15:52	2+ 1																			
20 26	B4.5	10.20	10.00	10.00	1																			
													1											

VLF flare activity 2005/16.

C M X — Relative sunspot number



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.

ROTATION		KEY: DISTURBED.					ACTIVE SFE				B, C, M, X = FLARE MAGNITUDE.						Synodic rotation start (carrington's).											
2470		16	17	18	19	20	21	2154 22	23	24	25	26	27	28	29	30	31	2014 Se 1	eptembei 2	3	4	5	6	7	8	9	10	11
i	F	C		С		0000	CMCC	MCCC 2155	0000	CMC	MM	С		СВ	С	CCB	0000	CC	CC	CCM	CCCC 2014 Oc	CC ctober	CCMC	000	С	С	CCX	CCM
2471	FC	12 0000	13 CC	14	15	16 CC	17	18 CMC	19 C	20 CC	21 CCC	22	23	24 CC	25 C	26 CCC	27 M	28 CCMM	29 C	30	1	2 MM	3 CCC	4	5	6	7	8 C
2472	E N	9 4000	10	11	12	13	14	15	16 CCM	17	18 MCCC	19	20 MCMM	21 CCCM	22 CCXM	23 MCC	24 MCC	25 CCCX	26 XCCM	27 CCMX	28 CCM	29 MMMM	30	31	2014 N	ovember 2	3 M	4 MM
2473		5	6	7	8	9	10	2157 11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1
	F 21	MC 014 De	C cember	MCCX		ССМ	CC	С	C 2158	с	CC	М	сссм	С					С	С	С			CCC	С	CCCC	CC	
2474	F	2 CCC	3 CCCC	4 MCM	5 CCM	6 C	7	8	9 CCCC	10	11 C	12 C	13 CCC	14 CC	15	16 CCC	17 CC	18 CCC	19 MC	20 C	21 M	22 C	23	24	25 C	26 C	27	28 C
2475	_	29 C	30	31	2015 Ja 1	anuary 2	3 M	4 M	2159 5	6	7	8	9	10	11	12	13	14 CM	15	16	17	18	19	20	21	22	23	24
2476		25	26	27	28	29	30	31	2015 Fe	bruary 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	F			CC	С	MC	М		C	- 2015 M	CC arch	c	-	-			-											c
2477	F	21	22	23	24	25	26	27	28 CC	1 C	2 CMCCM	3 CC	4 CC	5 CM	6 MCCC	7	8 C	9 CCMC	10 CCCC	11 MMCX	12 CMMM	13 C	14 CCCC	15 MCCC	16 CCMC	17	18 CCCC	19 C
2478		20	21	22	23	24	25	26	27	2162 28	29	30	31	2015 A 1	pril 2	3	4	5	6	7	8	9	10	11	12	13	14	15
2479	F	16	17	18	19	20	21	22	23	2163	25	26	27	28	29	30	2015 M	lay 2	3	4	5	6	7		q	10	11	12
	FC	2000	С	000			MMMM	CCMC	CMCC	C	C 2164	C			20			~	C	ccc	MMMX 2015Jur	CCMC Ie	0000	cc	cc	000		cc
2480	FC	13 0000	14 CCCC	15	16	17 B	18	19 C	20 C	21	22	23 CC	24	25	26	27	28	29	30	31	1	2 C	3	4 CC	5 CC	6	7 CC	8
2481		9	10	11	12	13	14	15	16	17	2165 18	19	20	21	22	23	24	25	26	27	28	29	30	2015 Ju 1	ly 2	3	4	5
2482		6	7	8	9	10	11	12	13	14	2166 15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1
	F N 21	4CCM 015 Au	C igust	-	-	C				С		2167		C		20				CC	20	c						C
2483	F	2	3	4	5	6 C	7 CBCC	8 CC	9 C	10	11	12	13	14	15 C	16	17	18	19	20 CC	21 MCM	22 MCCM	23 CCCC	24 MCCM	25 CCCC	26 CC	27 M	28 CMCM
2484	_	29	30	31	2015 S 1	eptembe 2	er 3	4	5	6	2168	8	9	10	11	12	13	14	15	16	17 CMCC	18	19	20 COM	21	22	23	24
2485		25	26	27	28	29	30	2015 Oc	tober 2	3	2169 4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	F		C	CMCC	MCMM	MMCM	I CMCM	CCM	CCMM	0000		2015 N	ovember		-	_				CC	CC	0000	MCCC	0000		CCC	С	CCC
2486	F	22	23	24	25	26 C	27	28 C	29 CC	30 CCCC	31 CCCM	1 <u>cccc</u>	2 CCCC	3	4 CMM	5	6	7	8	9 M	10 CC	11	12	13	14	15	16	17
2487	_	18	19	20	21	22	23	24	25	26	27	2171 28	29	30	2015 De	cember 2	З	4	5	6	7	8	9	10	11	12	13	14
2488		15	16	17	18	19	20	21	22	23	24	2172 25	26	27	28	29	30	31	2016 Ja	nuary 2	3	4	5	6	7	8	9	10
	F							М	С				2173		М	С							2016 Fe	C ebruary				
2489	F	11	12	13	14	15 C	16	17	18	19	20	21	22	23	24	25	26	27 C	28 C	29 C	30	31	1	2 C	3 <u>CC</u>	4 CCC	5	6
2490	_	7	8	9	10	11	12 MC	13 CMCM	14	15 CMCC	16	17	2174 18	19	20	21	22	23	24	25	26	27	28	29	2016 M	arch 2	3	4
2491		5	6	7	8	9	10	11	12	13	14	15	2175 16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	F 21	016 Ap	ril		СВ	C						CC		2176								В		BB				
2492	F	1	2	3	4	5	6 CC	7 CBCB	8 BC	9 CC	10	11 B	12 C	13	14 CC	15 BC	16 C	17 BC	18	19 BB	20	21	22	23	24	25	26 BC	27
2493	_	28	29	30	2016 M	ay 2	3	4	5	6	7	8	9	2177 10	11	12	13	14 CCCP	15 0080	16	17	18	19	20	21	22	23	24
2494	1	25	26	27	28	29	30	31	2016 Ju 1	ne 2	3	4	5	2178 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	F		cċ	CC								2016 Ju	ıly	2179			BCC	-	В	С	С			-		-	Ċ	-
2495	F	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7 C	8	9 C	10	11	12	13	14	15 C	16 CCCB	17 C
2496	F	18 C	19 C	20	21 CBCB	22 <u>C</u> CC	23 <u>MM</u> CC	24 <u>MB</u> CM	25 C	26 <u>B</u> B	27	28	29	30	31	2016 AL	2 2	3	4	5	6	7	8	9	10	11	12	13

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