Summary Table of Solar Proton Events in the 24 Cycle of Solar Activity (2009 – 2019)

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Legend:

N – is the sequence number of the event; □– sign highlighting "the small event"

Event name-(yyyymmdd-doy-year month day-day of the year);

To – the hour of the event beginning (UT), the event date coincides with the date in the event name;

Tmax – time of the first (second and third if any) peak intensity, UT;

Jmax – the flux of protons with energy ≥10 MeV in the first (second and third if any) maximum;

γ – power-law index of the integral spectrum ($J(>E) \sim E^{-\gamma}$);

Eqm – quasimaximal energy of proton in this event;

Legend for solar flares is commonly accepted;

CME – set to "Source" if CME is the only manifestation of a flare event-source of SPE (outlimb event), and isn't set, if CME is a constituent part of a flare event;

CME data – median velocity (km/s), angular width (degrees) principal angle, counterclockwise from North (degrees);

A symbol is placed indicative of confidence of the flare association to this event.

●, ■ – the flare event is a certain source of the observed protons: ● – on visible solar disk; ■– near or beyond solar limb;

⊙, ⊡– the flare event is a probable source of the observed protons: ⊙ – on visible solar disk; ⊡– near or beyond solar limb;

○ – the flare event is a possible but for some reason doubtful source of the observed protons;

Ø – the flare event is not the main source of the observed protons but contributed, or might have contributed to the proton flux.

The following symbols are used in the case when a flare was not identified:

□ – the flare event (or flare associated activity) beyond the western or eastern limb of the Sun

▲SC – a particle flux change associated with a the sudden commencement of geomagnetic disturbance, coincides with the arrival of an interplanetary shock wave to the Earth, which can bring charged particles from the solar flare event into near-Earth space; b/s – back side flare event;

W_L (E_L) -1d – 1 day behind the W (E)-limb;

DSF– Disappearance of solar filament = Solar filament ejection; (the length of the rejected filament in the degrees for class event);

AR – active region (NOAA SWPC number of active region)

N	Particles enhancements						Solar flares or CME – the particle sources				
	Event name	**To**	**Tmax**	**Jmax, pfu**	**γ**	**Eqm, MeV**	**Sour-ce**	**To (UT) To (CME)**	**X-ray class, importance**	**Localization, CME data**	**AR**
1	2010.08.03-215	10^h	19^h	2.7	3.1	60	DSF	●01d07^h50^m 01d13^h42^m	42°	N37W32 0850/360/084	
2	2010.08.14-226	11^h	12^h	9.4	2.25	200	FL	⊡14d10^h05^m 14d10^h12^m	C4.4/SF	N17W52 1205/360 /224	11099
3	2010.08.18-230	07^h	11^h	2.2	2.25	95	FL	⊡18d04^h45^m 18d05^h48^m	C4.5/	N18W88 1471/184/230	11099,1.5d behind W_L
4	2011.01.28-028	01^h	07^h 16^h	1.6 2.1	1.8 1.8	200 140	FL	⊡28d<00^h44^m 28d01^h26^m	M1.3/	N16W88 0606/119/290	11149, 1d behind W_L
5	2011.02.15-046	05^h	12^h 18^h	1.9 1.4	2.2 2.2	80 80	FL	●15d01^h44^m 15d02^h24^m	X2.2/2B	S20W15 0669/360/189	11158
6	2011.03.07-066	22^h	08d05^h	45	3.1	140	FL	●07d19^h43^m 07d20^h00^m	M3.7	S22W67 2125/360/313	11164
7	2011.03.21-080	04^h	11^h 20^h	6.8 11.1	2.4 2.8	250 140	FL CME FL	⊡21d<02^h24^m 21d02^h24^m Ø21d15^h31^m	C4.2/	1341/360/274 S20E87	unknown, behind W_L 11176
8	2011.06.05-156	18^h	06d04^h	3.6	3.25	160	FL CME	⊡04d<22^h05^m 04d22^h05^m		2425/360/300	11222, 3d behind W_L
9	2011.06.07-158	07^h	12^h 19^h	40 62.5	2.8 2.5	650 650	FL	●07d06^h16^m 07d06^h49^m	M2.5/2N	S21W54 1255/360/250	11226
10	2011.06.11-162	13^h	20^h	2.4	2.8	75	Unknown				
□11	2011.06.15-166	18^h	16d20^h	0.9	2.1	80	FL	⊙14d21^h36^m 14d22^h36^m	M1.3/SF	N15E77 0441/028/135	11236
12	2011.06.17-168	06^h	08^h 16^h	5.6 2.7	2.8 2.7	70 75	SC (FL 486)	17d02^h39^m ●14d21^h36^m 14d22^h36^m	M1.3/SF	N15E77 0441/028/135	11236
13	2011.08.02-214	07^h	02d11^h 03d17^h	2.2 0.55	2.2 2.1	120 70	FL FL	⊙02d05^h19^m 02d06^h36^m Ø03d13^h17^m 02d14^h00^m	M1.4/1N M6.0/2B	N14W15 0852/268/285 N16W30 0610//360/307	11261 11261

N	Particles enhancements						Solar flares or CME – the particle sources				
	Event name	To	Tmax	Jmax, pfu	γ	Eqm, MeV	Sour-ce	To (UT) To (CME)	X-ray class, importance	Localization, CME data	AR
14	2011.08.04-216	04^h	08^h	60	2.5	500	FL	●$04d03^h41^m$ $04d04^h12^m$	M9.3/2B	N19W36 1315/360/298	11261
15	2011.08.08-220	19^h	20^h	2.6	2.3	100	FL	●$08d18^h00^m$ $18d18^h12^m$	M3.5/1B	N16W61 1343/237/281	11263
16	2011.08.09-221	08^h	10^h	21.3	2.3	650	FL	●$09d07^h48^m$ $09d08^h12^m$	X6.9/2B	N17W69 1610/360/279	11263
17	2011.09.06-249	02^h	09^h	1.4	2.2	200	FL	●$06d01^h35^m$ $06d02^h24^m$	M5.3/1B	N14W07 0782/360/070	11283
18	2011.09.07-250	02^h	05^h	6	2.1	420	FL	●$06d22^h12^m$ $06d23^h05^m$	X2.1/2B	N14W18 0575/360/300	11283
19	2011.09.22-265	13^h	$23d09^h$ $23d21^h$	5.4 9.7	2.2 3.2	200 140	FL	●$22d10^h29^m$ $22d10^h48^m$	X1.4/2N	N13E78 1905/360/072	11302
20	2011.10.22-295	12^h	23^h	3.3	2.8	75	FL	●$22d10^h00^m$ $22d10^h24^m$	M1.3/SF	N25W77 1005/360/311	11314
21	2011.11.04-308	00^h	09^h	2.6	2.3	190	FL	●$03d20^h16^m$ $03d23^h10^m$	X1.9/2B	N22E63 0991/360/090	11339
22	2011.11.26-330	08^h	17^h	40	3.2	120	FL	⊙$26d06^h09^m$ $26d07^h12^m$	C1.2/DSF	N08W49 0933/360/327	11353
23	2011.12.25-359	19^h	$26d01^h$	2.5	2.3	100	FL	●$25d18^h11^m$ $25d18^h48^m$	M4.0/1N	S22W26 0366/125/235	11387
□24	2012.01.02-002	19^h	22^h $03d06^h$	0.4 0.5	1.6 1.6	120 90	FL	⊡$02d14^h31^m$ $02d15^h13^m$	C2.4/EPL	N07W89 1138/360/244	11384, 1.5d behind W_L
25	2012.01.20-020	01^h	20^h $21d01^h$	2.4 1.9	2.2 2.2	100 80	FL	●$19d13^h44^m$ $19d14^h36^m$	M3.2/SF	N30E30 1120/360/020	11402
26	2012.01.21-021	18^h	22^h	1.4	1.8	140	FL	⊡$21d13^h35^m$ $21d14^h00^m$	C2.4/BSL	N25W82 0377/048/266	11396
27	2012.01.22-022	01^h	10^h	2.5	2.4	80	FL	⊙$22d02^h32^m$ $22d06^h00^m$	C7.1/	N17W13 0367/085/248	11401
28	2012.01.23-023	04^h	14^h $24d17^h$	2700 3900	3.55 4.1	450 250	FL SC	●$23d03^h38^m$ $23d04^h00^m$ $24d15^h03^m$	M8.7/2B	N28W21 2175/360/326	11402

N	Particles enhancements						Solar flares or CME – the particle sources				
	Event name	To	Tmax	Jmax, pfu	γ	Eqm, MeV	Sour-ce	To (UT) To (CME)	X-ray class, importance	Localization, CME data	AR
29	2012.01.27-027	18^h	$28d02^h$ $28d12^h$	740 680	3.1 2.9	900 600	FL	●$27d17^h37^m$ $27d18^h28^m$	X1.7/1F	N27W71 2508/360/296	11402
30	2012.02.24-055	23^h	$26d01^h$ $27d00^h$	3.5 2.3	3.5 4.0	55 45	DFS SC	⊙$24d02^h25^m$ $24d03^h46^m$ ▲$26d21^h40^m$	26^o	N32E38 0800/189/001	
31	2012.03.04-064	21^h	$05d16^h$	3.2	2.25	90	FL	●$04d10^h29^m$ $04d11^h00^m$	M2.0/1N	N19E61 1306/360/052	11429
32	2012.03.07-067	02^h	17^h $08d13^h$	1440 4340	2.9 4.0	1200 650	FL FL	●$07d00^h00^m$ $07d00^h24^m$ Ø$07d01^h05^m$	X5.4/3B X1.3/SF	N17E27 2684/360/057 N22E12	11429 11430
33	2012.03.13-073	17^h	21^h	390	2.8	650	FL	●$13d16^h35^m$ $13d17^h36^m$	1B/M7.9	N19W59 1884/360/286	11429
34	2012.05.17-138	01^h	04^h $18d02^h$	180 30	2.15 (4.2) 2.05	5000 (1800) 650	FL	●$17d01^h25^m$ $17d01^h48^m$	M5.1/1F	N11W76 1582/360/261	11476
35	2012.05.26-147	23^h	$27d06^h$ $27d11^h$	11.9 12.5	3.2 3.2	70 70	FL CME	⊡$26d<20^h57^m$ $26d20^h57^m$		1966/360/291	Flare activity behind W_L
36	2012.06.14-166	18^h	$16d21^h$	11	3.0	90	FL SC SC	●$14d12^h52^m$ $14d14^h12^m$ ▲$16d20^h20^m$ ▲$16d21^h15^m$	M1.9/1N	S17E06 0987/360/144	11504
37	2012.07.06-188	23^h	$07d08^h$	23	3.0	220	FL	●$06d23^h01^m$ $06d23^h24^m$	X1.1/	S13W59 1828/360/233	11515
38	2012.07.08-190	16^h	$09d05^h$	17	2.2	550	FL	■$08d16^h23^m$ $08d16^h54^m$	M6.9/1N	S14W83 1495/157/234	11515
39	2012.07.12-194	16^h	22^h	80	3.7	110	FL	●$12d15^h18^m$ $12d16^h48^m$	X1.4/2B	S14W01 0885/360/158	11520
40	2012.07.17-199	15^h	$18d00^h$ $18d06^h$	93 116	3.2 3.2	150 140	FL	●$17d12^h03^m$ $17d13^h48^m$	M1.7/1F	S28W75 0958/176/241	11520
41	2012.07.19-201	06^h	15^h $20d03^h$	75 72	3.5 4.4	280 120	FL SC	■$19d04^h17^m$ $19d05^h24^m$ ▲$20d04^h49^m$	M7.7/	S16W90 1631/360/275	11520, 0.5d behind W_L

N	Particles enhancements						Solar flares or CME – the particle sources				
	Event name	To	Tmax	Jmax, pfu	γ	Eqm, MeV	Sour-ce	To (UT) To (CME)	X-ray class, importance	Localization, CME data	AR
42	2012.07.23-205	06^h	22^h	11	3.6	250	FL CME	⊡23d<02^h36^m $23d02^h36^m$		 2003/360/286	11520, 4d behind W_L
43	2012.08.02-215	10^h	21^h	0.6	2.2	50	FL SC	02d12^h10^m $02d13^h26^m$ ▲$02d10^h50^m$	C1.5/	S20W87 0563/108/234	11529
44	2012.09.01-245	01^h	15^h $02d10^h$	24 47	3.4 4.1	80 65	FL	●$31d19^h45^m$ $31d20^h00^m$	C8.4/2F	S19E42 1442/360/090	11562
45	2012.09.28-272	00^h	05^h	23.8	3.0	200	FL	●$27d23^h36^m$ $28d00^h12^m$	C3.7/1F	N06W34 0947/360/251	11577
46	2012.11.08-313	12^h	$09d04^h$	1.4	2.0	170	FL	■$08d02^h08^m$ $28d02^h36^m$	M1.7/	N13E89 0855/360/046	11611
47	2012.12.14-349	08^h	$15d02^h$	6.5	4.1	50	FL CME	⊡14d<02^h00^m $14d02^h00^m$		 0763/149/232	unknown, behind W_L
48	2013.01.16-016	22^h	$17d07^h$ $17d13^h$	1.1 1.25	2.2 2.8	70 50	FL	■$16d19^h18^m$ $16d19^h00^m$	C2.2/	S32W87 0648/250/236	11650
49	2013.03.15-074	18^h	22^h $16d12^h$	0.9 6.2	2.3 2.5	70 75	FL	●$15d05^h$ 46^m $15d07^h12^m$	M1.1/1F	N09E06 1063/360/112	11692
50	2013.04.11-101	07^h	17^h	100	3.2	500	FL	●$11d06^h55^m$ $11d07^h24^m$	M6.5/3B	N09E12 0861/360/085	11719
51	2013.04.21-111	09^h	12^h 22d02	2 1.2	2.3 2.2	110 70	FL CME FL CME	⊡21d<07^h24^m $21d07^h24^m$ Ø 21d<20^h36^m $21d20^h36^m$		 0919/360/269 0561/212/260	11719, 2d behind W_L
52	2013.04.24-114	23^h	$25d05^h$	1.3	2.6	140	FL CME	⊡24d<22^h12^m $24d22^h12^m$		 0784/360/241	11719, 6d behind W_L
53	2013.05.13-133	18^h	$14d09^h$	1	2.2	70	FL	■$13d15^h48^m$ $13d16^h08^m$	X2.8/1N	N14E85 1850/360/063	11748
54	2013.05.15-135	10^h	21^h	20.5	3.5	110	FL	● $15d01^h24^m$ $15d01^h48^m$	2N/X1.2	N12E64 1366/360/093	11748
55	2013.05.22-142	13^h	15^h	83.5	3.0	500	FL	●$22d12^h35^m$ $22d13^h26^m$	3N/M5.0	N15W70 1466/360/287	11745

N	Particles enhancements						Solar flares or CME – the particle sources				
	Event name	To	Tmax	Jmax, pfu	γ	Eqm, MeV	Sour-ce	To (UT) To (CME)	X-ray class, importance	Localization, CME data	AR
56	2013.06.21-172	14^h	22d10^h	6	2.3	100	FL	●21d02^h30^m 21d03^h12^m	M2.9/1F	S16E73 1900/207/107	11777
57	2013.06.23-174	07^h	11^h 20^h	3.7 9.7	2.6 4.0	70 60	FL SC FL	●21d02^h30^m ●23d04^h26^m Ø23d20^h48^m 23d21^h24^m	M2.9/1F M2.9/1N	S16E73 S15E66 0339/101/133	11777 11778
□58	2013.08.17-229	20^h	18d06^h	0.3	1.8	60	FL	●17d18^h16^m 17d19^h12^m	2B/ M3.3,M1.4	S07W30 1202/360/274	11818
59	2013.08.20-232	16^h	21d14^h	1	2.15	80	FL	⊡20d04^h54^m 20d08^h12^m	C1.3,C1.1/	S18W87 0784/360/210	11817, 1d behind W_L
60	2013.09.30-273	00^h	17^h	102	3.0	220	DSF FL	●29d21^h45^m ●29d21^h43^m 29d22^h12^m	35° C1.2/	N15W40 N15W33 1179/360/343	spotless AR
61	2013.10.28-301	06^h	11^h 29d02^h	2.3 3.5	2.35 1.7	100 300	FL	●28d01^h41^m 28d02^h24^m	X1.0/2N	N04W66 0695/360/296	11875
62	2013.10.30-303	02^h	05^h	4.2	2.4	130	FL	■29d21^h42^m 29d22^h00^m	X2.3/	N05W89 1001/360/249	11875
63	2013.11.02-306	07^h	16^h	1.6	2.2	300	FL CME	⊡ 02d<04^h48^m 02d04^h48^m		 0828/360/239	11875, 3d behind W_L
64	2013.11.07-311	01^h	05^h	5.5	3.0	90	FL	■06d23^h35^m 07d00^h00^m	M1.9,M1.8/ SPY	S11W88 1033/360/233	11882, 1d behind W_L
□65	2013.11.08-312	02^h	09d11^h	0.6	2.7	40	FL FL	⊙08d04^h20^m Ø07d14h15m	X1.1/2B M2.4/1N	S14E15 S13E23	11890 11890
□66	2013.11.10-314	08^h	11d02^h	0.5	2.0	60	FL	●10d05^h08^m 10d05^h36^m	X1.1/2B	S14W13 0682/262/198	11890
67	2013.11.19-323	12^h	19^h	3.4	2.3	130	FL	●19d10^h14^m 19d10^h36^m	X1.0/SF	S13W69 0740/360/222	11893
68	2013.12.14-348	06^h	15d01^h	1.1	2.3	60	FL CME CME	⊡14d<06^h36^m 14d06^h36^m Ø14d21^h24^m		 0611/121/112 0611/360/169	Flare activity behind E_L
69	2013.12.26-360	08^h	27d03^h	2	2.3	90	FL CME	⊡26d<03^h24^m 26d03^h24^m		 1336/360/036	Flare activity behind E_L
70	2013.12.28-362	18^h	23^h	26.5	2.6	240	FL CME	⊡28d<17^h36^m 28d17^h36^m		 1118/360/284	Flare activity behind W_L

N	Particles enhancements						Solar flares or CME – the particle sources				
	Event name	To	Tmax	Jmax, pfu	γ	Eqm, MeV	Sour-ce	To (UT) To (CME)	X-ray class, importance	Localization, CME data	AR
71*	2014.01.06-006	07^h	14^h	38	2.1	1350	FL	■$06d07^h30^m$ $06d08^h00^m$	C2.1/EPL	S15W89 1402/360/274	11936, ~1.5d behind W_L
72	2014.01.07-007	18^h	$08d12^h$	1000	3.8	400	FL	●$07d18^h04^m$ $07d18^h24^m$	X1.2/2N	S15W11 1830/360/231	11944
□73	2014.02.18-049	08^h	14^h	0.4	3.1	50	FL	⊙$18d01^h27^m$ $18d01^h36^m$	C4.7/SF	S16W42 0779/360/044	11976
74	2014.02.19-050	09^h	15^h $20d03^h$	2 2.8	3.3 2.4	45 90	FL CME SC	⊡$19d<04^h48^m$ $19d04^h48^m$ ▲$20d03^h20^m$		0612/360/090	11990, 3d behind E_L
75	2014.02.20-051	08^h	10^h 13^h	17.7 9.2	2.7 3.2	250 110	FL	●$20d07^h26^m$ $20d08^h00^m$	M3.0/SN	S15W73 0948/360/268	11976
76	2014.02.25-056	04^h	16^h	13.6	2.3	500	FL	●$25d00^h39^m$ $25d01^h25^m$	X4.9/2B	S12E82 2147/360/073	11990
77	2014.02.28-059	02^h	10^h	97	3.2	180	FL	⊙$27d21^h33^m$	C4.2/SF	S11W63	11982
□78	2014.03.25-084	04^h	11^h $26d00^h$	0.4 0.2	3.2 4.0	35 25	FL CME	⊡$25d<05^h36^m$ $25d05^h36^m$		0651/223/269	Flare activity behind W_L
79	2014.03.29-088	18^h	22^h	1.4	2.3	130	FL	●$29d17^h35^m$ $29d18^h12^m$	X1.0/2B	N11W32 0528/360/325	12017
80	2014.04.18-108	14^h	16^h	11.8	2.3	500	FL	●$18d12^h31^m$ $18d13^h25^m$	M7.3/	S20W34 1203/360/238	12036
81	2014.08.25-237	18^h	$26d00^h$	1.3	2.3	75	FL	●$25d14^h46^m$ $25d15^h36^m$	M2.0/1B	N05W36 0555/360/270	12146
82**	2014.09.01-244	18^h	$03d08^h$	2.5	2.2	700	FL	■$01d10^h55^m$ $01d11^h12^m$	B6.2/(~X2.4)	N14E126 1901/360/065	12158, 3d behind E_L
83	2014.09.10-253	21^h	$11d07^h$ $12d16^h$	25 67.5	2.8 3.1	400 160	FL SC	●$10d16^h59^m$ $10d18^h00^m$ ▲$12d15^h53^m$	2B/X1.6	N14E02 1267/360/175	12158
84	2014.11.01-305	14^h	20^h $02d22^h$	3.2 7	3.7 2.7	50 120	FL	●$01d04^h44^m$ $01d05^h00^m$	C2.7/DSF	S08E52 1628/159/125	Spotless AR***
85	2014.12.13-347	16^h	$14d11^h$	1.7	2.3	130	FL CME	⊡$13d<14^h24^m$ $13d14^h24^m$		2222/360/265	12222, 3d behind W_L

N	Particles enhancements						Solar flares or CME – the particle sources				
	Event name	To	Tmax	Jmax, pfu	γ	Eqm, MeV	Sour-ce	To (UT) To (CME)	X-ray class, importance	Localization, CME data	AR
86	2014.12.21-355	08^h	21^h	2.4	3.1	55	FL	●$21d11^h24^m$ $21d12^h12^m$	M1.0/	S13W25 0669/360/189	12241
87	2014.12.23-357	00^h	12^h	5	3.4	50	FL	⊙ $22d21^h15^m$	C5.7	S19W71	12242
□88	2015.01.27-027	19^h	$29d01^h$ $30d19^h$	0.5 1.0	4.8 2.4	20 60	FL	⊡$27d07^h13^m$ $27d08^h23^m$	C2.1/	N07E89 0332/009/119	12277, 1d behind E_L
89	2015.02.21-052	10^h	19^h $22d07^h$	1.2 0.7	2.3 2.5	60 70	DSF CME	⊡$21d<09^h24^m$ $21d09^h24^m$	>15°	1120/360/215	backside event on SW_L
90	2015.03.15-074	02^h	10^h	2	2.2	80	FL	⊙$15d01^h15^m$ $15d01^h48^m$	C9.1/1F	S22W25 0719/360/240	12297
91	2015.03.16-075	01^h	09^h 14^h	5.2 4	3.5 4.2	50 35	FL	⊙$15d22^h42^m$ $15d23^h24^m$	M1.2/	S19W32 0284/015/290	12297
□92	2015.04.22-112	06^h	$23d07^h$ $23d21^h$	0.55 0.6	1.6 2.0	80 75	FL	⊡$21d21^h39^m$	M1.8, M1.2/	N10W80	12322
93	2015.05.12-132	04^h	07^h	5.4	2.4	120	FL DSF	■$12d02^h15^m$ $12d02^h48^m$ $12d02^h26^m$	C2.6/DSF 22°	S21W83 772/250/283 S21W83	12335
94	2015.06.18-169	02^h	14^h	15.4	3.2	100	FL	■$18d00^h33^m$ $18d01^h26^m$	M1.3/	S16W81 1714/195/270	12365
95	2015.06.21 - 172	16^h	$22d10^h$ $22d19^h$	230 600	4.15 4.3	100 110	FL SC	●$21d01^h02^m$ $21d02^h36^m$ ▲$22d18^h33^m$	M2.0,M2.7/1N	N12E13 1366/360/072	12371
96	2015.06.25-176	09^h	$26d10^h$	13.5	3.3	80	FL	●$25d08^h02^m$ $25d08^h36^m$	M7.9/3B	N09W42 1627/360/330	12371
97	2015.07.01-182	18^h	20^h $02d01^h$	2.8 4.5	2.0 2.3	130 90	FL CME	⊡$01d<14^h36^m$ $01d14^h36^m$		1435/360/311	12731, 2.5d behind W_L
98	2015.09.20-263	18^h	22^h	2.2	2.2	80	FL	●$20d17^h30^m$ $20d18^h12^m$	2N/M2.1	S20W24 1239/360/219	12415
□99	2015.09.30-273	20^h	23^h $01d02^h$	0.9 0.6	3.0 3.1	40 35	FL	⊙$30d07^h36^m$ $30d10^h00^m$	1N/M1.3	S22W46 0602/128/304	12422

N	Particles enhancements						Solar flares or CME – the particle sources				
	Event name	To	Tmax	Jmax, pfu	γ	Eqm, MeV	Sour-ce	To (UT) To (CME)	X-ray class, importance	Localization, CME data	AR
□100	2015.10.22-295	13^h	23^h $23d05^h$	0.5 0.2	3.0 3.0	40 40	FL	●$22d02^h13^m$ $22d03^h12^m$	C4.4/SF	S11W27 0817/360/206	12434
101	2015.10.29-302	02^h	07^h	19	2.3	900	FL CME	⊡$29d<02^h36^m$ $29d02^h36^m$		0530/202/251	12434, 2d behind W_L
102	2015.11.09-313	16^h	$10d02^h$	2.7	2.2	120	FL	●$09d12^h49^m$ $09d13^h25^m$	M3.9/2B, 1F	S11E41 1041/273/137	12449
103	2015.12.28-362	14^h	$29d02^h$	1.4	2.3	80	FL	●$28d11^h20^m$ $28d12^h12^m$	M1.8/	S23W11 1212/360/163	12473
104	2016.01.01-001	23^h	$02d01^h$ $02d04^h$	4.7 12.4	2.6 2.5	120 140	FL	■$01d23^h10^m$ $01d23^h24^m$	M2.3/	S25W82 1730/360/227	12473
105	2016.03.16-076	07^h	11^h 17^h	1.1 0.8	1.5 1.7	120 80	DSF FL	■$16d06^h34^m$ ■$16d06^h34^m$ $16d07^h00^m$	10° C2.2/DSF	N20W86 N12W88 0592/154/265	12522
□106	2016.04.18-109	07^h	15^h	0.3	2.1	55	FL	●$18d00^h14^m$ $18d00^h48^m$	M6.7/1F	N12W62 1084/162/291	12529
107	2016.05.15-136	17^h	$17d21^h$	1.6	2.1	90	DSF FL	●$15d15^h00^m$ ●$15d15^h19^m$ $15d15^h12^m$	>10° C3.2/SF	NW N10W62 1118/176/309	12542
□108	2016.07.23-205	04^h	07^h	0.4	1.5	100	FL	●$23d05^h00^m$ $23d05^h24^m$	M7.6,M5.5/3B	N02W74 0835/117/271	12567
109	2017.07.14-195	03^h	10^h 23^h	11.2 20.4	2.6 2.7	120 130	FL	●$14d01^h07^m$ $14d01^h26^m$	M2.4/1N	S06W29 1200/360/230	12665
110	2017.07.25-206	03^h	20^h	1.0	1.8	9	unknown				
111	2017.09.04-247	21^h	$05d07^h$ $05d19^h$	99 167	3.5 4.1	100 90	FL	●$04d13^h45^m$ $04d20^h12^m$	3B/M1.5; M1.0; M1.7; M1.5; M5.5; M2.1/	S11W16 1418/360/184	12673
112	2017.09.06-249	11^h	15^h $07d04^h$	39 334	2.1 3.8	450 140	FL	●$06d08^h52^m$ $06d12^h24^m$	2B/X2.2, X9.3	S07W33 1571/360/201	12673

N	Particles enhancements						Solar flares or CME – the particle sources				
	Event name	**To**	**Tmax**	**Jmax, pfu**	**γ**	**Eqm, MeV**	**Sour-ce**	**To (UT) To (CME)**	**X-ray class, importance**	**Localization, CME data**	**AR**
113	2017.09.07-250	20^h	$08d00^h$ $08d20^h$	575 14.3	4.0 2.5	150 130	FL	●$07d14^h20^m$ $07d15^h12^m$	X1.3/2B	S11W49 0433/058/246	12673
114	2017.09.10-253	16^h	19^h	850	2.1 (4.2)	1200	FL	■$10d15^h35^m$ $10d16^h00^m$	X8.2/	S08W88 3163/360/262	12673

*** – C2.1 perhaps an echo solar flare X~3.5 on AR11936 located S8W110, 1.5^d behind E_L**

**** – the likely source of a class X2.1 solar flare in an AR12158 located N14E126, 2.5^d behind E_L**

***** – Spotless AR on SE-quadrant** according [Pesce-Rollins, M, Omodei, N. Petrosian, V at al. Fermi Large Area Telescope observations of high-energy gamma-ray emission from behind-the-limb solar flare, The 34th International Cosmic Ray Conference, 30 July- 6 August, 2015 The Hague, The Netherlands, https://arxiv.org/pdf/1507.04303v2.pdf].