

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

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doi: <https://doi.org/10.2205/ESDB-SAD-P-007>

Legend:

Event name-(yyyyymmdd-doy-year month day-day of the year); also used as reference name for the according event;

To – onset time of the event in UT;

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.

We use the commonly accepted symbols for solar flare as follows:

CME – bold if CME is the only manifestation of a flare event-source of SPE, and plain font 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;

∅ – 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 – suddenly commencement of geomagnetic disturbance, is caused by arrival of an interplanetary shock wave which can bring in near-earth space charged particles from solar flare events;

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 –NOAA SWPC number of active region.

N	Particles enhancements						Solar flares or CME – the particle sources				
	Event name	To	Tmax	J _{max} pfu	γ	Eqm MeV	Source	To (UT) To (CME)	X-ray class, importance	Localization, CME data	AR
1	2010.08.03-215	10 ^h	19 ^h	2.7	3.0	70	CME	☐01d13 ^h 42 ^m		850/360/084	Flare activity behind E _L
2	2010.08.14-226	11 ^h	12 ^h	9.4	2.6	130	FL	☉14d09 ^h 38 ^m 14d 10 ^h 12 ^m	C4.4/SF	N17W52 1205/360/224	11099
3	2010.08.18-230	07 ^h	11 ^h	2.2	1.8	140	FL	☐18d04 ^h 45 ^m 18d05 ^h 48 ^m	C4.5/	n17w90 1471/184°/230°	11099 1.5 ^d behind W _L
4	2011.01.28-028	01 ^h	07 ^h	1.6	1.65	140	FL	☐<28d00 ^h 44 ^m 28d01 ^h 26 ^m	M1.3/..	n16w90 606/119°/290°	11149 5 ^d behind W _L
5	2011.02.15-046	05 ^h	12 ^h	1.9	2.1	80	FL	●15d01 ^h 44 ^m 15d02 ^h 24 ^m	X2.2/2B	S20W15 0669/360°/189°	11158
			18 ^h	1.4	2.1	70					
6	2011.03.07-066	22 ^h	08d05 ^h	45	3.0	140	FL	●07d19 ^h 43 ^m 07d20 ^h 00 ^m	M3.7/SF	S22W67 2125/360°/313°	11164
7	2011.03.21-080	04 ^h	11 ^h	6.8	3.0	130	CME	☐21d02 ^h 24 ^m		1341/360/274	Flare activity behind W _L
			20 ^h	11.1	2.25	170	FL	Ø21d11 ^h 45 ^m	C2.6/	N20W87	11176?
							FL	Ø21d15 ^h 31 ^m	C4.2/	S20E87	
8	2011.06.05-156	18 ^h	06d04 ^h	3.6	2.5	110	CME	☐ 04d22 ^h 05 ^m		2425/360/300	Flare activity behind W _L
9	20110607-158	07 ^h	12 ^h	40	2.0	450	FL	●07d06 ^h 16 ^m 07d19 ^h 16 ^m	M2.5/2N	S21W54 1255/360°/250°	11226
			19 ^h	62.5	1.7	450	CME	Ø 07d19 ^h 16 ^m		0738/360°/062°	Flare activity behind E _L
10	2011.06.11-162	13 ^h	20 ^h	2.4	2.6	60	Unknown				
11	2011.06.17-168	06 ^h	08 ^h	5.6	2.6	60	SC(FL486)	●17d02 ^h 39 ^m 14d21 ^h 36 ^m 14d22 ^h 36 ^m	M1.3/SF	N15E77 0441/028°/135°	11236
			16 ^h	2.7	2.4	70					
12	2011.08.02-214	07 ^h	02d11 ^h	2.2	2.6	80	FL	☉02d05 ^h 19 ^m 02d06 ^h 36 ^m	M1.4/1N	N14W15 0852/268°/285°	11261
			03d17 ^h	0.55	1.55	85	FL	Ø03d13 ^h 17 ^m 02d14 ^h 00 ^m	M6.0/2B	N16W30 0610//360°/307°/	

13	2011.08.04-216	04 ^h	04d08 ^h 05d22 ^h	60 96	2.5	380	FL SC	●04d03 ^h 41 ^m 04d04 ^h 12 ^m Ø05d 17 ^h 51 ^m	M9.3/2B	N19W36 1315/360°/298°	11261
14	2011.08.08-220	19 ^h	20 ^h	2.6	2.0	100	FL	●08d18 ^h 00 ^m 18d18 ^h 12 ^m	M3.5/1B	N16W61 1343/237°/281°	11263
15	2011.08.09-221	08 ^h	10 ^h	21.3	2.0	700	FL	●09d07 ^h 48 ^m 09d08 ^h 12 ^m	X6.9/2B	N17W69 1610/360°/279°	11263
16	2011.09.06-249	02 ^h	06d09 ^h	1.4	2.2	200	FL	●06d01 ^h 35 ^m 06d02 ^h 24 ^m	M5.3/1B	N14W07 0782/360°/070°	11283
17	2011.09.07-250	02 ^h	07d05 ^h	6	2.1	420	FL	●06d22 ^h 12 ^m 06d23 ^h 05 ^m	X2.1/2B	N14W18 0575/360°/300°	11283
18	2011.09.22-265	13 ^h	23d09 ^h 23d21 ^h	5.4 9.7	2.05 2.4	200 120	FL	●22d10 ^h 29 ^m 22d10 ^h 48 ^m	X1.4/2N	N13E78 1095/360°/072°	11302
19	2011.10.22-295	12 ^h	23 ^h	3.3	2.65	60	FL	●22d10 ^h 00 ^m 22d10 ^h 24 ^m	M1.3/SF	N25W77 1005/360°/311°	11314
20	2011.11.04-308	00 ^h	09 ^h	2.6	2.1	130	FL FL	●03d20 ^h 16 ^m 03d23 ^h 10 ^m Ø03d23 ^h 28 ^m 04d01 ^h 25 ^m	X1.9/2B M2.1/	N22E63 0991/360°/090° N22E63 0756/360°/084°	11339
21	2011.11.26-330	08 ^h	17 ^h	40	3.05	110	FL	⊙26d06 ^h 09 ^m 26d07 ^h 12 ^m	C1.2/	N08W49 0933/360°/327°	11353
22	2011.12.25-358	19 ^h	26d01 ^h	2.5	5.1	50	FL	●25d18 ^h 11 ^m 25d18 ^h 48 ^m	M4.0/1N	S22W26 0366/125°/235°	11387
23	2012.01.20-020	01 ^h	20d20 ^h 21d01 ^h	2.4 1.9	2.8 2.7	45 60	FL	●19d13 ^h 44 ^m 19d17 ^h 00 ^m	M3.2/SF	N30E30 0846/083°/332°	11402
24	2012.01.21-021	18 ^h	22d10 ^h	2.5	2.5	60	FL	○21d13 ^h 35 ^m 21d14 ^h 00 ^m	C2.4/BSL	N25W82 0377/048°/266°	11396
25	2012.01.22-022	01 ^h	10 ^h	2.5	3.2	50	SC (FL) FL	▲22d06 ^h 12 ^m (19d13 ^h 44 ^m) Ø22d02 ^h 32 ^m 22d06 ^h 00 ^m	(M3.2/2N) C7.1/-	(N30E30) N17W13 0367/085°/248°	(11402) 11401
26	2012.01.23-023	04 ^h	23d14 ^h 24d17 ^h	2700 3900	3.5 3.8	420 250	FL SC	●23d03 ^h 38 ^m 23d04 ^h 00 ^m 24d15 ^h 03 ^m	M8.7/2B	N28W21 2175/360°/326°	11402
27	2012.01.27-027	18 ^h	28d02 ^h 28d12 ^h	740 680	3.3 3.1	700 400	FL	●27d17 ^h 37 ^m 27d18 ^h 28 ^m	X1.7/1F	N27W71 2508/360°/296°	11402

28	2012.02.24-055	23 ^h	26d01 ^h 27d00 ^h	3.5 2.3	3.3 3.7	50 35	DFS SC	Ø24d02 ^h 25 ^m ▲SC 26d21 ^h 40 ^m	26°	N32E38	
29	2012.03.04-064	21 ^h	05d16 ^h	3.2	2.2	75	FL	●04d10 ^h 29 ^m 04d11 ^h 00 ^m	M2.0/1N	N19E61 1306/360°/052°	11429
30	2012.03.07-067	02 ^h	07d17 ^h	1440	3.1	1400	FL	●07d00 ^h 00 ^m 07d00 ^h 24 ^m	X5.4/3B	N17E27 2684/360°/057°	11429
			08d13 ^h	4340	2.9	1200	FL	Ø07d01 ^h 05 ^m 07d01 ^h 30 ^m	X1.3/SF	N22E12 1825//360°/082°	11430
							FL	Ø09d03 ^h 22 ^m	M6.3/SF	N15W02	11429
							FL	Ø10d17 ^h 15 ^m	M8.4/	N17W24	11429
31	2012.03.13-073	17 ^h	21 ^h	390	3.0	480	FL	●13d16 ^h 35 ^m 13d17 ^h 36 ^m	1B/M7.9	N19W59 1884/360°/286°	11429
32	2012.05.17-138	01 ^h	17d04 ^h	180	2.15	3000	FL	●17d01 ^h 25 ^m 17d01 ^h 48 ^m	M5.1/1F	N11W76 1582/360°/261°	11476
			18d02 ^h	30	2.0	550					
33	2012.05.26-147	23 ^h	27d06 ^h 27d11 ^h	11.9 12.5	2.6 3.1	70 60	CME	☐26d20 ^h 57 ^m		1966/360°/291°	Flare activity behind W _L
34	2012.06.15-167	18 ^h	16d21 ^h	11	3.0	70	FL	●14d12 ^h 52 ^m 14d14 ^h 12 ^m	M2.1/1B	S17E06 0987/360°/144°	11504
							SC SC	▲16d20 ^h 20 ^m ▲16d21 ^h 15 ^m			
35	2012.07.06-188	23 ^h	07d08 ^h	23	2.6	210	FL	●05d11 ^h 38 ^m 05d13 ^h 24 ^m	M6.2/1B	S20W32 0741/098°/223°	11515
36	2012.07.08-190	16 ^h	09d05 ^h	17	2.15	400	FL	●08d16 ^h 23 ^m 08d16 ^h 54 ^m	M6.9/1N	S17W74 1495/157°/234°	11515
37	2012.07.12-194	16 ^h	12d22 ^h	80	3.7	110	FL	●12d15 ^h 18 ^m 12d16 ^h 48 ^m	2B/X1.4	S14W01 0885/360°/158°	11520
38	2012.07.17-199	15 ^h	18d00 ^h	93	4.0	90	FL	●17d12 ^h 03 ^m 17d13 ^h 48 ^m	M1.7/1F	S28W65 0958/176°/241°	11520
			18d06 ^h	116	3.6	120					
39	2012.07.19-201	06 ^h	19d15 ^h	75	2.5	350	FL	●19d04 ^h 17 ^m 19d05 ^h 24 ^m	M7.7/SF	S16W90 1631/360°/275°	11520
			20d03 ^h	72	3.6	120	SC	▲20d04 ^h 49 ^m			
40	2012.07.23-205	06 ^h	22 ^h	11	2.15	500	CME	☐23d02 ^h 36 ^m		2003/360°/286	11520, 4d behind W _L
41	2012.09.01-245	01 ^h	01d15 ^h 02d10 ^h	24 47	2.5 4.1	80 50	FL	●31d19 ^h 45 ^m 31d20 ^h 00 ^m	C8.4/2F	S19E42 1442/360°/090°	11562

42	2012.09.28-272	00 ^h	05 ^h	23.8	2.7	140	FL	●27d23 ^h 36 ^m 28d00 ^h 12 ^m	C3.7/1F	N06W34 0947/360°/251°	11577
43	2012.11.08-313	12 ^h	09d04 ^h	1.4	3.1	80	FL	●08d02 ^h 08 ^m 28d02 ^h 36 ^m	M1.7/	N13E89 0855/360°/046°	11611
44	2012.12.14-349	08 ^h	15d02 ^h	6.5	4.2	40	CME	☐14d02 ^h 00 ^m		0763/149°/232°	b/s W ₁
45	2013.01.16-016	22 ^h	17d07 17d13	1.1 1.25	2.2 2.8	70 50	FL	☐16d19 ^h 18 ^m 16d19 ^h 00 ^m	C2.2	S32W87 0648/250°/236°	11650
46	2013.03.15-074	18 ^h	15d22 ^h 16d12 ^h	0.9 6.2	2.3 2.5	70 75	FL	●15d05 ^h 46 ^m 15d07 ^h 12 ^m	M1.1/1F	N11E12 1063/360°/112°	11692
47	2013.04.11-101	07 ^h	17	100	3.2	500	FL	●11d06 ^h 55 ^m 11d07 ^h 24 ^m	M6.5/3B	N09E12 0861/360°/085°	11719
48	2013.04.21-111	09 ^h	21d12 ^h 22d02	2 1.2	2.3 2.2	110 70	CME CME	☐21d07 ^h 24 ^m Ø 21d20 ^h 36 ^m		0919/360°/269° 0561/212°/260°	11719, 2d behind W _L
49	2013.05.13-133	18 ^h	14d12 ^h 15d21 ^h	0.6 20.5	3.0 3.5	40 110	FL FL FL	●13d15 ^h 48 ^m 13d16 ^h 08 ^m Ø13d23 ^h 59 ^m 14d01 ^h 26 ^m Ø 15d01 ^h 24 ^m 15d01 ^h 48 ^m	X2.8/1N X3.2/2B 2N/X3.2	N14E85 1850/360/063 N12E77 2625/360/089 N12E64 1366/360/093	11748 11748 11748
50	2013.05.22-142	13 ^h	23d05 ^h	150	3.2	500	FL	●22d12 ^h 35 ^m 22d13 ^h 26 ^m	3N/M5.0	N15W70 1466/360/287	11745
51	2013.06.21-172	14 ^h	22d10 ^h	6	2.3	100	FL	●21d02 ^h 30 ^m 21d03 ^h 12 ^m	M2.9/1F	S16E73 1900/207/107	11777
52	2013.06.23-174	07 ^h	23d11 ^h 23d20 ^h	3.7 10.7	2.6 4.0	70 70	unknown FL	Ø23d20 ^h 48 ^m 23d21 ^h 24 ^m	M2.9/1N	S15E66 0339/101/133	11778
53	2013.08.20-232	17 ^h	21d14 ^h	1	2.2	70	CME	☐20d08 ^h 12 ^m		784/360/210	Flare activity behind W _L
54	2013.09.30-273	00 ^h	17 ^h	102	3.0	220	FL	⊙29d22 ^h 59 ^m 29d22 ^h 12 ^m	C1.2/	N15W40 1179/360/343	DSF/35°
55	2013.10.28-301	06 ^h	28d11 ^h 29d02 ^h	2.3 3.5	2.35 1.17	100 290	FL	●28d01 ^h 41 ^m 28d02 ^h 24 ^m	X1.0/2N	N04W66 0695/360/296	11875
56	2013.11.02-306	07 ^h	16 ^h	1.6	2.1	250	CME FI	☐02d04 ^h 48 ^m Ø01d19 ^h 46 ^m	M6.3/1B	828/360/239 S11E01	11875 3d behind W _L

57	2013.11.07-311	01 ^h	05 ^h	5.5	3.0	90	FL	■06d23 ^h 44 ^m 07d00 ^h 00 ^m	M1.8/SPY	S11W88 1033/360/233	11882
58	2013.11.19-323	12 ^h	19d19 ^h	3.4	2.3	130	FL	●19d10 ^h 14 ^m 19d10 ^h 36 ^m	X1.0/SF	S11W70 0740/360/222	11893
59	2013.12.14-348	06 ^h	15d01 ^h	1.1	2.3	60	CME	☐14d06 ^h 36 ^m		0611/121/112	Flare activity behind E _L
60	2013.12.26-360	08 ^h	27d03 ^h	2	2.3	90	CME	☐26d03 ^h 24 ^m		1336/360/036	Flare activity behind E _L
61	2013.12.28-362	18 ^h	28d23 ^h	26.5	3.0	220	CME	☐28/17 ^h 36 ^m		1118/360/284	Flare activity behind E _L
62	2014.01.06-006	07 ^h	06d14 ^h	38	2.1	1400	FL	☐06d07 ^h 55 ^m 06d08 ^h 00 ^m	C2.1/DFS	06d07 ^h 30 ^m 1402/360/274	11936 2d behind W _L
63	2014.01.07-007	18 ^h	07d12 ^h	1000	3.8	400	FL	●07d18 ^h 04 ^m 07d18 ^h 24 ^m	X1.2/2N	S15W11 1830/360/231	11944
64	2014.02.19-050	09 ^h	19d15 20d03	2 2.8	3.6 2.3	45 80	CME SC	☐19d04 ^h 48 ^m ▲20d03 ^h 20 ^m		0612/360/090	Flare activity behind E _L
65	2014.02.20-	08 ^h	20d10 ^h 20d13 ^h	17.7 9.2	2.7 3.2	300 110	FL	●20d07 ^h 26 ^m 20d08 ^h 00 ^m	M3.0/SN	S15W73 0948/360/2268	11976
66	2014.02.25-056	04 ^h	16 ^h	13.6	2.3	500	FL	●25d00 ^h 39 ^m 25d01 ^h 25 ^m	X4.9/2B	S12E82 2147/360/073	11990
67	2014.02.28-059	02 ^h	10 ^h	97	3.2	180	FL	◎28d00 ^h 44 ^m	M1.1/SN	S24E53	11991
68	2014.03.29-088	18 ^h	29d22 ^h	1.4	2.3	130	FL	●29d17 ^h 35 ^m 29d18 ^h 12 ^m	X1.0/2B	N11W32 0528/360/325	12017
69	2014.04.18-108	14 ^h	16 ^h	11.6	2.5	450	FL	●18d12 ^h 31 ^m 18d13 ^h 25 ^m	M7.3/	S18W33 1203/360/238	12036
70	2014.09.01-244	18 ^h	03d08 ^h	2.5	2.2	700	CME	☐01d11 ^h 12 ^m		1901/360/065	Flare activity behind E _L
71	2014.09.10-253	21 ^h	11d07 ^h 12d16 ^h	24.9 67.5	2.5 3.1	450 160	FL SC	●10d16 ^h 59 ^m 10d18 ^h 00 ^m 12d15 ^h 53 ^m	2B/X1.6	N14E02 1267/360/175	12158
72	2014.11.01-305	14 ^h	01d20 ^h 02d22 ^h	3.2 7	3.7 2.7	50 120	FL	01d04 ^h 44 ^m 01d05 ^h 00 ^m	C2.7/DSF	S08E52 1628/159/125	12201?
73	2014.12.13-347	16 ^h	14d11 ^h	1.7	2.3	130	CME	☐13d14 ^h 24 ^m		2222/360/265	12222, 3d behind W _L
74	2014.12.21-355	08 ^h	21d21 ^h	2.4	3.1	55	FL	◎20d00 ^h 11 ^m 20d01 ^h 26 ^m	X1.8/3B	S21W24 0830/257/197	12242

75	2014.12.23-357	00 ^h	12 ^h	5	3.4	60	SC max SC	▲22d15 ^h 11 ^m ▲23d11 ^h 15 ^m			
76	2015.03.15-074	02 ^h	15d10 ^h	2	2.2	80	FL+DSF	●15d01 ^h 15 ^m 15d01 ^h 48 ^m	C9.1/1F	S22W25 0719/360/240	12297
77	2015.03.16-075	01 ^h	16d09 ^h 16d14 ^h 17d00 ^h	5.2 4 1.28	3.5 4.2	50 35	FL	☉15d22 ^h 42 ^m	M1.2/	S19W32 0284/015/290	12297
78	20150512-132	04 ^h	07 ^h	4.4	2.4	120	CME	☐12d02 ^h 48 ^m		0772/250/283	Flare activity behind W _L
79	2015.06.18-169	02 ^h	14 ^h	15.4	3.2	100	FL	●18d00 ^h 33 ^m	M1.2/	S16W81	12365
80	2015.06.21-172	16 ^h	22d10 ^h 22d19 ^h	230 600	4.2 4.3	90 110	FL FL+ SC	●21d01 ^h 02 ^m 21d02 ^h 36 ^m Ø22d17 ^h 23 ^m 22d18 ^h 36 ^m ▲22d18 ^h 33 ^m	M2.0,M2.6/1N 2B/M6.5	N12E13 1366/360/072 N12W08 1209/360/358	12371 12371
81	2015.06.25-176	09 ^h	26d10 ^h	13.5	3.3	80	FL	●25d08 ^h 02 ^m 25d08 ^h 36 ^m	M7.9/3B	N09W42 1627/360/330	12371
82	2015.07.01-182	18 ^h	01d20 ^h 02d01 ^h	2.8 4.5	2.0 2.2	140 110	CME	☐01d14 ^h 36 ^m		1435/360/311	Flare activity behind W _L
83	2015.09.20-263	18 ^h	20d22 ^h	2.2	2.2	80	FL	●20d17 ^h 30 ^m 20d18 ^h 12 ^m	2N/M2.1	S20W24	12415
84	2015.09.30-273	20 ^h	30d23 ^h 01d02 ^h	0.9 06	3.0 3.1	40 25	FL FL	☉30d10 ^h 49 ^m Ø30d13 ^h 18 ^m	M1.3/1N 1N/M1.1	S22W46 S23W59	12422 11422
85	2015.10.29-302	02 ^h	07 ^h	19	3.0	280	CME	☐29d02 ^h 36 ^m		0530/202/251	Flare activity behind W _L
86	2015.11.09-313	16 ^h	10d02 ^h	2.7	2.2	120	FL	●09d12 ^h 49 ^m 09d13 ^h 25 ^m	M3.9/2B, 1F	S11E41 1041/273/137	12449
87	2015.12.28-362	14 ^h	29d02 ^h	1.4	2.3	80	FL	●28d11 ^h 20 ^m 28d12 ^h 12 ^m	M1.8/	S23W11 1212/360/163	12473
88	2016.01.01-001	23 ^h	02d01 ^h 02d04 ^h	4.7 12.4	2.3 2.5	130 140	FL	●01d23 ^h 10 ^m 01d23 ^h 24 ^m unknown	M2.3/	S25W82 1730/360/227	12473
89	2016.05.15-136	17 ^h	17d21 ^h	1.6	2.2	90	FL	☉15d15 ^h 19 ^m 15d15 ^h 12 ^m	C3.2/SF	N10W62 1118/176/309	12542
90	2017.07.14-195	03 ^h	14d10 ^h 14d23 ^h	11.2 20.4	2.6 2.7	120 130	FL	●14d01 ^h 07 ^m 14d01 ^h 26 ^m	M2.4/1N	S06W29 1200/360/230	12665

91	2017.09.04- 247	21 ^h	05d07 ^h	99	3.5	100	FL	●04d18 ^h 05 ^m 04d20 ^h 12 ^m	3B/M5.5(M1.0; M1.7;M1.5)	S11W16 1418/360/184	12673
			05d19 ^h	167	4.1	90					
92	2017.09.07- 250	20 ^h	08d00 ^h	575	5.1	140	FL	●07d14 ^h 20 ^m 07d15 ^h 12 ^m Ø08d07 ^h 40 ^m	X1.3/2B M8.1/2B	S11W49 0433/058/246 S10W57	12673
			08d20 ^h	14.3	2.5	130					12673
93	2017.09.10- 253	16 ^h	10d19 ^h	848	4.1	400	FL	●10d15 ^h 35 ^m 10d16 ^h 00 ^m	X8.2/	S08W88 3163/360/262	12673
			10d22 ^h	953	4.05	600					

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http://www.wdcb.ru/stp/solar/solar_proton_events.ru.html