STEREO Science Operations Plan for the extended mission

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Science Operations Plan

- Revised STEREO Science Operations Plan is now complete, and has started the signature process.

Date Ahead	Date Behind	Downlink (kbps)	Pass duration (hrs)	Daily volume (Gbits)
Jan 2007	Jan 2007	720	4	5
Oct 2008	Sep 2008	480	5	5
May 2009	June 2009	360	6	5
Apr 2010	Dec 2009	240	7	4
Sep 2010	Sep 2010	160	8	2.7
Apr 2011	Nov 2010	120	8	2.1
Sep 2011	Sep 2011	96	8	1.7
Aug 2012	Aug 2012	30	10	0.6

Extended Mission Strategy

- Space weather beacon telemetry will be unaffected.
  - SECCHI SWx telemetry will ***not*** be downlinked from the SSR.
- Spacecraft housekeeping rates will drop proportionally to the overall rate.
- Instruments will only put (*enhanced*) housekeeping data in the realtime stream, with science data written to the SSR.
  - SECCHI already does this. The SECCHI housekeeping rate will drop from the current 3.6 kbps to 2.2 kbps. This will drop again to 1.2 kbps when the overall rate drops to 96 kbps.
  - Optional realtime modes for special instrument operations, *used rarely*
- All instruments, including the *in situ* instruments, will lower their science rates.

Realtime telemetry from SOP

Table 1.8: Realtime telemetry allocations during the extended science mission, in kbps, not including space weather telemetry.

May not be implemented

	IMPACT	PLASTIC	S/WAVES	SECCHI
Nominal	0.106	1.183	0.071	2.2[a]
IMPACT-prime	3.125	1.183	0.071	2.2[a]
PLASTIC-prime	0.106	3.274	0.071	2.2[a]
S/WAVES-prime	0.106	1.183	2.090	2.2[a]
All-full-rate	3.125	3.274	2.090	2.2[a]
SECCHI-emergency	0.106	1.183	0.071	16.0

[a]Will drop to 1.2 kbps for rates of 96 kbps and below.

Table 1.9: APIDs to be sent down in realtime during the extended mission for the nominal and full cases in Table 1.8. Space weather telemetry is also sent down in realtime, and consists of the range $x70$–$x7F$ for each instrument.

Instrument	Nominal	Full
IMPACT	200, 240, 241	200–26F
PLASTIC	313, 315, 316, 317	300–36F
SECCHI	400–43F	400–43F
S/WAVES	501	500–56F

Instrument rates from SOP

Table 1.10: Instrument telemetry allocations during the extended mission, not including space weather, for various total spacecraft telemetry rates. Both daily data volumes in megabits and average SSR write rates in kilobits per second are listed. The assumed pass duration in hours is also shown.

Rate	Dur	IMPACT		PLASTIC		S/WAVES		SECCHI	
(kbps)	(hrs)	Mbits	kbps	Mbits	kbps	Mbits	kbps	Mbits	kbps
240	7	264	3.13	276	3.27	176	2.09	3689	43.72
160	8	239	2.83	213	2.77	163	1.88	2763	32.75
120	8	203	2.40	180	2.46	145	1.67	1970	23.35
96	8	203	2.40	172	2.21	135	1.57	1560	18.48

IMPACT Strategy

- 160 kbps:
  - Eliminate STE-U
  - Eliminate SWEA onboard PADS
- 120 kbps:
  - Reduce burst data to one per day
  - Eliminate “Burst criteria”
- 96 kbps:
  - Same as 120 kbps
  - If additional reduction needed, then remove burst entirely

PLASTIC Strategy

- 160 kbps:
  - Delete high resolution matrix rates
- 120 kbps:
  - Reduce time resolution for ion species matrix rates from 5 (10) minutes to 20 (20) minutes.
- 96 kbps:
  - Examining two options:
    - Delete one of the solar wind alpha rates
    - Reduce the time resolution for ion species matrix rates to 30 (30) minutes.

SWAVES Strategy

- 160 kbps:
  - Reduce the frequency resolution in the high frequency band.
- 120 kbps:
  - Reduce time resolution to one sweep per minute (currently ~2/min)
- 96 kbps:
  - Reduce the number of time domain bursts

SECCHI Strategy

- EUVI:
  - Increase compression for most images
  - Reduce cadence to 2 hours for all but 1 wavelength
- COR1/COR2:
  - Bin to smaller images
  - Send down only total brightness
  - Reduce cadence
- HI1/HI2:
  - High resolution images only once/week (currently once/day)
  - Change HI1 cadence from 40 to 60 minutes
  - Send down only portion of image
  - Change HI2 cadence from 2 hours to 3 hours
  - Bin to smaller images

What happens next?

- The following changes are to be made for the drop to 240 kbps:
  - Stop downloading SECCHI space weather partition from the SSR
  - Start using the new lower realtime rates for all the instruments
  - Lower the spacecraft housekeeping rate
  - SECCHI will adjust their telemetry volume
  - The in-situ SSR telemetry volumes will be unchanged
- SECCHI *may* also request two new DFD entries:
  - One to downlink only SSR1, and not SSR2
  - One to downlink both SSR1 and SSR2, with more priority for SSR2 than currently used
- SECCHI team also discussing changing the relative sizes of SSR1 and SSR2