SECCHI Concept of Operations

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Heliocentric Operations Concept

- During normal operations, POC will be located at NRL.
- POC sends commands to and receives telemetry from the instrument via the MOC.
  - Automated processing of telemetry as it is received.
  - Automated instrument health and safety checks, with 24/7 availability of staff to respond in case of emergency.
- Identical synoptic observing program coordinated between two spacecraft, with additional special observing programs as needed.
  - Light travel time difference between spacecraft handled by an adjustable constant on each spacecraft.
- Daily command loads to both spacecraft, communicated to MOC at least 8 hours in advance of the pass.
- In case of problems at NRL or if proximity to MOC is required, POC will relocate temporarily from NRL to APL.

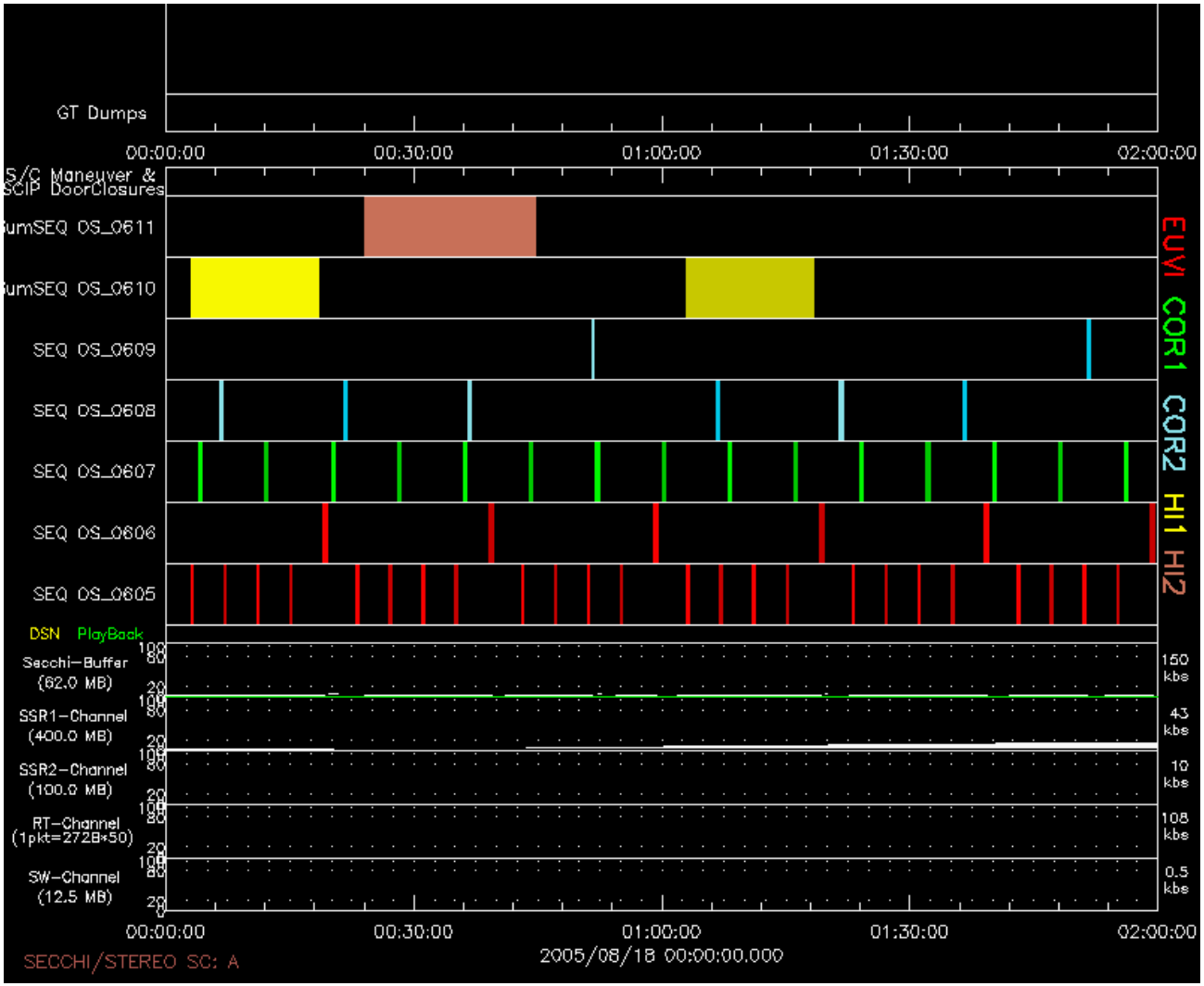
Observation Planning

- **Planning cycle has multiple stages, with more detailed plans established at each stage:**
  - **Broad science goals are established semi-annually.**
  - **Tentative plans are established at monthly planning meetings.**
  - **Specific targets and observing programs are established weekly but can be “tweaked” daily.**
- **Similar observing plan will be carried out every day in any given week:**
  - **Structures take about two weeks to cross solar disk.**
  - **STEREO spacecraft separate at about 1 degree/week.**
- **Observing plan for one or more days is generated by the operator using the SECCHI planning tool and will be uploaded daily to both spacecraft:**
  - **Default observing program will be executed by flight software in case plan cannot be uploaded.**

Observation Programs

- **Observation programs are controlled by the SECCHI planning tool, which does constraint checking based on instrument performance and other restrictions.**
- **Synoptic observing program:**
  - **Identical programs always maintained in both spacecraft.**
  - **Permits stereoscopic observations of active and quiescent Sun to observe fundamental processes.**
  - **Based on SECCHI science objectives and data rate at various stages of the mission.**
- **Special observing programs:**
  - **Not necessarily on both spacecraft (e.g. higher cadence observations from EUVI on STEREO-A).**
  - **Special observations from on-board CME detection capability.**
- **Nominal SSR partition sizes are set to 80% for synoptic and 20% for an autonomous or special event buffer.**

Planning Tool Graphical Interface



Data Volume and Telemetry Rates

Data Rate	Mission Time (months)	Mbits/day
High	0-14	4668.56
Medium	14-18	4309.00
Low	18-24	3921.26

- Real-time channel provides immediate downlink of data during the daily ground contact:
  - Nominal real-time data rate for SECCHI is 3.6 kbps.
  - Only useful for housekeeping data.
- Most instrument data are stored on-board in the solid-state recorder (SSR) for downlink during the daily real-time passes.

SSR Partition Management

- **SECCHI solid-state recorder allocation is 6553 Mb (819 MB), divided into two partitions plus space weather beacon data.**
- **SSR allocation for space weather beacon data is 100 Mb.**
- **SSR1 is 80% of the total science allocation (5162 Mb):**
  - **SSR1 is intended to be used for the synoptic observing program.**
  - **SSR1 stops accepting data when full; additional data sent to this partition will be lost.**
  - **SSR1 is nominally dumped once every day during the scheduled ground contact.**
- **SSR2 is 20% of the total science allocation (1291 Mb):**
  - **SSR2 is a circulating buffer, set to overwrite the oldest data when full, unless an event trigger is set.**
  - **SSR2 is nominally dumped 20% every day during the scheduled ground contact $\Rightarrow$ 5 days required to downlink the full contents of SSR2.**
- **All data are written to the SSR for later downlink (including real-time and space weather data).**

Sample Daily Synoptic Program (Months 0-14)

Telescope	# Images and Size (pixels)	Cadence (minutes)	Total Images/Day	Compression Factor (*)	Fraction Transmitted	Total Mbits/Day
EUVI	2 1k x 1k 4 2k x 2k	4 20	576 288	10.0 10.0	1.0 1.0	845.6 1691.1
COR1	3 1k x 1k	8	540	10.0	1.0	792.7
COR2	3 2k x 2k 3 1k x 1k	60 15	72 216	10.0 10.0	1.0 1.0	422.8 317.1
HI1	1 1k x 1k	60	24	2.5	1.0	211.4
HI2	1 1k x 1k	120	12	2.5	1.0	105.7
Total			1728			4386.4

* Assumes ICER compression for SCIP images.

SECCHI Campaigns

- **SECCHI Campaign periods consist of an additional DSN track lasting 1.75 hours each day, beginning 12 hours after the start of the normal daily track, for a total of 4 weeks during the nominal mission.**
- **This will enable downlink of additional SECCHI data (approximately twice the nominal daily data volume), and will enable high-cadence observations targeted to specific science objectives.**
- **Other instruments continue to receive their normal daily data volumes.**
- **SECCHI has planned to schedule the 4 weeks as two periods of 2 weeks each:**
  - **Campaign periods will be based on spacecraft separation angles desired for specific science objectives.**
  - **First campaign period is requested to be scheduled when the spacecraft are separated by 10 degrees (occurs in February 2007, assuming July 2006 launch).**
  - **Campaign periods will be finalized at least 6 months in advance, to allow time for scheduling of extra DSN tracks.**

Space Weather Beacon

- **SECCHI space weather beacon will be broadcast continuously at a rate of 504 bps.**
- **SECCHI has provided software to SSC to process this telemetry into data files.**
- **Image sequences and compression factors to be used for beacon are still being defined, and can be modified after launch if required.**
- **Current plan is to downlink the equivalent of 7 images per hour binned to 256×256 pixels:**
  - **COR2 images at ~15 minute intervals.**
  - **HI1 and HI2 images each every other hour.**
  - **One EUVI and COR1 image per hour.**
  - **EUVI images binned to 64×64 pixels.**
  - **Subset of event messages.**

Calibration Maneuvers

- **Calibration maneuvers include spacecraft rolls and offpoints:**
  - **GT gain calibration, and COR1/COR2 stray light optimization, require SEB commanded offpoints up to ±40 arc seconds in both pitch and yaw.**
  - **EUVI flat-fielding (and initial post-launch GT calibration) requires spacecraft-driven offpoints up to ±12 arc minutes in both pitch and yaw.**
  - **Polarization and stray light calibrations require a 360° stepped roll, with step sizes of 30° to 60°.**
- **Offpoint maneuvers are anticipated to occur every 2-3 months, and roll maneuvers every 6 months.**
- **Calibration (and other) maneuvers will be coordinated at least 2 weeks in advance.**