

STEREO MOC Status Report  
Time Period: 2017:191 - 2017:197

STEREO Ahead (STA) Status:

1. The following Ground System anomalies/events occurred during this reporting period:

- On day 191, during the DSS-63 support, turbo decoder lock was lost briefly at 1349z. This anomaly resulted in the loss of one frame of real-time telemetry.
- On day 196, during the DSS-63 support, turbo decoder lock was lost briefly at 1153z. This anomaly resulted in the loss of one frame of real-time telemetry.

2. The following spacecraft/instrument events occurred during this week. The Ahead observatory operated nominally during this week.

- On day 193, the PLASTIC instrument team increased the MCP voltage level to approximately 3060V.
- The average daily science data return for Ahead was 5.8 Gbits during this week.

STEREO Behind (STB) Status:

1. Detailed status of the recovery activities this week to restore operations is listed below.

- On day 191, during a 4 hour support with DSS-63, the command SLE bind was lost at 0453z due to a link issue at GSFC. The command bind was restored at 0507z. This anomaly resulted in the loss of 2 segments of commanding. A total of 400 commands were transmitted during the support. No carrier was detected by either the DSN station or the radio science receiver team after attempting to power on the TWTA for 30 minutes. Transitioned to battery recovery operations for the remainder of the support which consists of repeatedly sweeping a 4 kHz uplink range and sending commands for IEM switched power and PDU 1553 interface bus off. See DR #M110102 for more information.

- On day 194, during a 4 hour support with DSS-43, 420 commands were transmitted during the support. No carrier was detected by either the DSN station or the radio science receiver team after attempting to power on the TWTA for 30 minutes. Transitioned to battery recovery operations for the remainder of the support which consists of repeatedly sweeping a 4 kHz uplink range and sending commands for IEM switched power and PDU 1553 interface bus off.
- On day 196, during a 4 hour support with DSS-43, BOT was delayed due to an antenna cooling issue. This anomaly resulted in the loss of 1.37 hours of command capability. A total of 280 commands were transmitted during the support. No carrier was detected by either the DSN station or the radio science receiver team after attempting to power on the TWTA for 30 minutes. Transitioned to battery recovery operations for the remainder of the support which consists of repeatedly sweeping a 4 kHz uplink range and sending commands for IEM switched power and PDU 1553 interface bus off. See DR #C112799 for more information.

2. The Behind loss of communication anomaly occurred on October 1, 2014. Post superior solar conjunction, recovery operations resumed on November 30, 2015. By implementing the NASA Failure Review Board recommendations, the first recovery attempt began with carrier detection by the DSN on August 21<sup>st</sup>, through September 23, 2016. At a spacecraft range of ~2 AU, the observatory was found to be rotating slowly about its principal axis of inertia for which the uncontrolled attitude allowed some solar array input and continuous uplink and downlink communications on the LGA at emergency data rates. Over the next 22 continuous days, significant obstacles to recovery were overcome with a collaborative effort of the JHU/APL engineering team, NASA GSFC, DSN, FDF, SSMO scheduling, and Mission Operations teams. This consisted of:

- Reliably commanding a rotating spacecraft with uncontrolled attitude at a distance of 2 AU
- How to power on the spacecraft that was never designed to be off without collapsing the battery voltage
- Acquiring telemetry at 35 bps from a spacecraft that is rotating with an uncontrolled attitude
- Warming a frozen propulsion subsystem with a degraded battery and limited solar array input with an uncontrolled attitude

- Configuring, loading, and verifying EA, C&DH, and G&C parameters and macros with very limited telemetry
- Conducting an autonomous momentum dump in the blind and transitioning to C&DH standby mode and successfully receiving telemetry on the HGA indicating star tracker lock and decreasing system momentum.

However, system momentum level remained above the threshold for re-establishing attitude control with the reaction wheels. Due to the uncontrolled attitude, communication degraded and the last detection of the carrier was on September 23<sup>rd</sup>.

Behind Observatory Status - From the last telemetry received on September 18<sup>th</sup> and the telemetry assessment review held on February 24<sup>th</sup>, main bus voltage is low, 3 out of 11 battery cells are bypassed, attitude remains uncontrolled, rotating about its principal axis of maximum moment of inertia. While likely all ~42 kg of hydrazine remains and is frozen, both pressure transducers are not functioning. EA mode is enabled and autonomy is disabled. The battery charge rate is C/10. RF is configured for the +Z LGA at emergency data rates and the range of the expected best lock frequency is known. Necessary macro sequences have been tested to allow the peak power tracker in C&DH standby mode to protect the battery. These macro sequences will be loaded to EEPROM when the communications supports longer commands.

Weekly recovery efforts utilizing a 70m track every 3 days consists of attempting to power on the transmitter for 30 minutes. If no carrier signal is detected, battery recovery operations will commence which consist of repeatedly sweeping a 4 kHz uplink range and sending commands for IEM switched power and PDU 1553 interface bus off. Recovery tracks occur every 3 days to prevent the hard command loss timer from firing.

To evaluate the readiness of the project for recovering the observatory upon the next signal detection, a STEREO Behind Recovery Readiness Review will be held on Friday, August 11<sup>th</sup>, at 9 AM EDT at JHU/APL.