

STEREO MOC Status Report  
Time Period: 2015:201 - 2015:207

STEREO Ahead (STA) Status:

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

- On day 201, during the DSS-14 support, turbo decoder lock was lost intermittently between 1408z and 1926z due to the effects of solar scintillation. This anomaly resulted in the loss of 17 frames of spacecraft SSR playback and real-time data.
- On day 202, during the DSS-45 support, turbo decoder lock was lost briefly at 0413z due to the effects of solar scintillation. This anomaly resulted in the loss of one frame of spacecraft real-time data.
- On day 202, during the DSS-14 support, turbo decoder lock was lost intermittently between 2227z and 203-0116z due to the effects of solar scintillation. This anomaly resulted in the loss of 18 frames of spacecraft SSR playback and real-time data.
- On day 203, during the DSS-55 support, turbo decoder lock was lost intermittently between 1133z and 1140z due to the effects of solar scintillation. This anomaly resulted in the loss of 23 frames of spacecraft real-time data.
- On day 206, during the DSS-14 support, turbo decoder lock was lost intermittently between 2052z and 207-0056z due to the effects of solar scintillation. This anomaly resulted in the loss of 10 frames of spacecraft SSR playback and real-time data.

2. The following spacecraft/instrument events occurred during this week. The Ahead observatory has successfully exited the 3 month long solar conjunction and on July 20<sup>th</sup>, day 201, all instruments are once again returning science for side lobe operations. The Ahead observatory is operating nominally on the 2nd side lobe of the HGA to prevent overheating of the HGA feed assembly which is currently at 110 degrees C and decreasing with the HGA angle at 8.9 degrees and increasing, with respect to the spacecraft-Sun line.

- On day 201, PLASTIC completed configuring from solar conjunction and returned to science mode.
- On day 202, the G&C routine SSR partition (#9) read pointer was re-positioned back to the pre-solar conjunction value, day 083, March 24th. The read pointer was moved on day 191, July 10th, to retrieve the data faster from anomalies that occurred during solar conjunction.
- On day 204, the 78<sup>th</sup> momentum dump was executed successfully at 2100z, which imparted a delta V of 0.068 m/sec. IMU2 was used for 1.1 hours and the momentum target was set to the nominal 15 Nms.
- The average daily science data return for Ahead, while operating on the second side lobe on the HGA, was 56.2 Mbits during this week.

STEREO Behind (STB) Status:

1. The following Ground System anomalies/events occurred during this reporting period:
  - None.
2. Detailed status of the activities that occurred on the Behind loss of communication anomaly, which occurred on day 274, are listed below.
  - The Behind observatory entered superior solar conjunction at the 2.0 degree SPE angle on day 022. Recovery efforts resumed post solar conjunction on day 124, May 4<sup>th</sup> through day 178, June 27<sup>th</sup>, as the spacecraft had cleared solar interference for LGA communications. The Failure Review Board recommendations were implemented consisting of battery state of charge recovery and powering on the downlink carrier. The Green Bank Radio Telescope and the Arecibo Observatory also observed the carrier recovery tracks. To date, no downlink signal has been detected from the Behind observatory. Due to Behind's retrograde motion causing it to re-enter the region of solar interference, recovery operations will be suspended from July through November. The Failure Review Board's recommended faster

frequency segmented acquisition sequence will be tested with the Ahead observatory in September. The DSN uplink arraying capability will be tested again with the Ahead observatory in October and November, and when it is ready, it will be used to increase the spacecraft received signal power to assist with Behind recovery commanding. With time the spacecraft range improves RF communications and the ability for other assets to acquire data on Behind. LGA uplink margin returns to 6 dB for the 7.8 bps rate in March 2016 and 125 bps in December 2019 and the LGA downlink margin returns to 3 dB for the 12 bps rate in December 2016 and 35 bps in March 2018.

Significant findings to date:

1. Analysis of the three DSN extracted telemetry frames from the carrier signal just before the planned observatory reset/anomaly occurred on day 2014-274, October 1<sup>st</sup>, showed nominal performance of the spacecraft, i.e., no anomalies, IMU off, and the star tracker providing an attitude solution.
2. Post reset, from the very limited telemetry, three packets, extracted from the carrier signal by the DSN, the X-axis gyro on IMU-A had failed. Unfortunately, this telemetry contained only G&C anomaly data and no spacecraft summary data, i.e., the state of the RF, G&C, fault protection and other subsystems is not known at the time of the anomaly. With a failed IMU and the star tracker being off-line for an undetermined duration, the sun sensors will keep the observatory pointed at the Sun, though the G&C will not have any roll knowledge, and cannot roll the observatory as part of the safing configuration to re-establish communications on the LGAs. From analysis of this telemetry and initial G&C simulations, it is highly suspected that the observatory is rotating about the principal axis of inertia due to an autonomous momentum dump initiated by biased gyro data flagged good by the IMU, but this has not yet been confirmed.
3. At least two anomalies occurred post reset, the star tracker not promoting to AAD mode and the X-axis gyro failure. Unfortunately, due to the number of possible combinations, the STEREO fault protection system is not designed for simultaneous failures.

Once communications are restored and the anomaly resolved, the Behind observatory will be returned to nominal science data collection as soon as it is safely possible.