

STEREO MOC Status Report  
Time Period: 2015:208 - 2015:214

STEREO Ahead (STA) Status:

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

- On day 210, during the DSS-45 support, turbo decoder lock was lost intermittently between 0615z and 0616z due to the effects of solar scintillation. This anomaly resulted in the loss of seven frames of real-time data. Also, the command system was aborted at 0541z when the exciter went unlocked temporarily. This anomaly caused the failed transmission of a SECCHI command at 0558z because manual intervention at the MOC is required to clear this condition. See DR #C111277 for more information.
- On day 210, during the DSS-14 support, turbo decoder lock was lost intermittently between 211-0017z and 0049z, dropping lock entirely from 0049z through EOT due to heavy rain at the station. This anomaly resulted in the loss of 248 frames of SSR data during the intermittent period and 66 minutes of data loss during the outage period. See DR #G116468 for more information.
- On day 211, during the DSS-43 support, turbo decoder lock was lost briefly at 0612z due to the effects of solar scintillation. This anomaly resulted in the loss of one frame of SSR data.
- On day 212, during the DSS-54 support, turbo decoder lock was lost intermittently between 1759z and 1817z due to the effects of solar scintillation. This anomaly resulted in the loss of 16 frames of real-time data.
- On day 212, during the DSS-43 support, turbo decoder lock was lost intermittently between 2308z and 213-0601z due to the effects of solar scintillation. This anomaly resulted in the loss of one frame of SSR data.
- On day 213, during the DSS-65 support, turbo decoder lock was lost intermittently between 0926z and 0947z due to the effects of solar scintillation. This anomaly resulted in the loss of two frames of real-time data.

- On day 213, during the DSS-14 support, turbo decoder lock was lost intermittently between 2337z and 214-0143z due to the effects of solar scintillation. This anomaly resulted in the loss of two frames of SSR data.
- On day 214, during the DSS-35 support, turbo decoder lock was lost intermittently between 0318z and 0611z due to the effects of solar scintillation. This anomaly resulted in the loss of 27 frames of real-time data.
- On day 214, during the DSS-14 support, turbo decoder lock was lost briefly at 0126z due to the effects of solar scintillation. This anomaly resulted in the loss of one frames of SSR data.

2. The following spacecraft/instrument events occurred during this week.

- 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 109 degrees C and decreasing with the HGA angle at 9.1 degrees and increasing, with respect to the spacecraft-Sun line.
- The average daily science data return for Ahead, while operating on the second side lobe on the HGA, was 57.4 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.