

STEREO MOC Status Report  
Time Period: 2015:215 - 2015:221

STEREO Ahead (STA) Status:

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

- On day 215, during the DSS-34 support, turbo decoder lock was lost intermittently for the 3.4 hour duration of the track due to the effects of solar scintillation. A second downlink receiver was added which displayed the same performance. This anomaly resulted in the loss of 607 frames (70% of expected telemetry) of real-time data. See DR# C111289 for more information.
- On day 215, during the DSS-14 support, turbo decoder lock was lost briefly at 1456z due to the effects of solar scintillation. This anomaly resulted in the loss of one frame of real-time data.
- On day 216, during the DSS-34 support, turbo decoder lock was lost intermittently between 0254z through 0555z due to the effects of solar scintillation. At 0349z the command uplink was lost when the transmitter tripped off-line due to a loss of 480V power at the station. The support remained downlink only for the duration. This anomaly resulted in the loss of 24 frames of real-time data. See DR# C111293 for more information.
- On day 216, during the DSS-65 support, turbo decoder lock was lost intermittently between 0745z through 1322z due to the effects of solar scintillation. This anomaly resulted in the loss of 14 frames of real-time data.
- On day 216, during the DSS-14 support, turbo decoder lock was lost intermittently between 1527z through 1538z due to the effects of solar scintillation. This anomaly resulted in the loss of 4 frames of real-time data and spacecraft SSR playback data.
- On day 217, during the DSS-14 support, turbo decoder lock was lost briefly at 1508z due to the effects of solar scintillation. This anomaly resulted in the loss of 2 frames of real-time data.

- On day 218, during the DSS-25 support, the SSR playback timetags were deleted for the next support with DSS-43 as the MOC was notified that DSS-43 was declared red.
  - On day 218, during the DSS-43 support, the antenna was returned to operational status and telemetry was received at 219-0017z. The spacecraft SSR playback was started at 0100z. This anomaly resulted in the loss of 107 minutes of telemetry, tracking, and commanding support. See DR# C111303 for more information.
  - On day 219, during the DSS-43 support, turbo decoder lock was lost intermittently between 220-0211z through 0227z due to the effects of solar scintillation. This anomaly resulted in the loss of 232 frames of real-time data and spacecraft SSR playback data.
  - On day 220, initial acquisition of telemetry for the DSS-54 support occurred at 1300z due to a complex wide power outage. This anomaly resulted in the loss of 5 hours of telemetry, tracking, and commanding support. See DR# M108930 for more information.
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 2<sup>nd</sup> side lobe of the HGA to prevent overheating of the HGA feed assembly which is currently at 108 degrees C and decreasing with the HGA angle at 9.4 degrees and increasing, with respect to the spacecraft-Sun line.
- The average daily science data return for Ahead, while operating on the 2<sup>nd</sup> side lobe on the HGA, was 44 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 2014-274, 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.