About the T51 Titan Bistatic Observatuib

- S49 Rev107 T51 Titan Bistatic Experiment
  - Telemetry OFF, 1-way mode
  - Covered by Goldstone

- About the science – From Essam Marouf

  The T51 RSS bistatic scattering observation of the surface of Titan is an outbound only observation. It probes the mid-northern latitude surface region (~30-40 deg North latitude; ~190-200 deg West longitude). Cassini transmits right circularly polarized (RCP) signal and both the right and left circularly polarized components (RCP and LCP) of potential surface echoes are observed at the ground receiving stations of the DSN. If detectable, the relative power in each echo component provides unique information about the dielectric constant and physical state of the surface region probed. The spectral shape characterizes the surface roughness. The T51 observation geometry was optimized to maximize chances of detecting both polarized echo components.

Antennas Supporting T51

Yr	DOY	Pre-	BOT	EOT	Post-	DSS				
09	086	0230	0530	0800	0900	DSS-25 CAS	TP RS107-BISTAT	4192	N748	1A1
09	086	0315	0515	0800	0900	DSS-14 CAS	TP RS107-BISTAT	4192	1639	1A1

Originally requested DSS-26 as well, but had to release to Kepler

DSS-14 pre-cal is 2-hrs instead of the usual 3-hrs for bistatic experiment. Shortened to give time to Spitzer

Equipment Scheduled

- Two close-loop receivers per antenna
- All RSRs, and some WVSRs/VSR
- Open-loop data are prime. Closed-loop are backup

RSR/VSR/WVSR Assignment

DSS	Operator	Station	Open-loop Receiver	RSR Assignment
14	John	rsops2	RSR2	RSR2A -> XRCP RSR2B -> XLCP
14	Danny	rsops3	RSR3	RSR3A -> SRCP RSR3B -> SLCP
25	Elias	rsops1	RSR1	RSR1A -> XRCP RSR1B -> KRCP VSR1A -> XLCP

-WVSRs at Goldstone available as backup
-RSSG will be in Ops room at 6:30 pm on Thursday March 26 (DOY 086/0130)

Bistatic Calibrations

- Calibrations will be performed during
  - Pre-cal (antennas at stow)
    - 3-hr pre-cal periods are scheduled at 25, 2-hr at 14
  - Observation (mini-cals)
    - Pre-determined and carefully selected times (during turns)
  - SNT Measurements
  - Post-Cal (antennas at stow)
    - 1-hr post-cal preriods are scheduled
    - Will likely start shortly after observation is over and before post-cal
- Pre-cal calibrations are the longest

ORTs

ORT#1: DOY 070 (Tue, Mar 10 local) over DSS-25, X- and Ka-band:
09 070 0145 0315 1215 1230 DSS-25 CAS RSR105-BISTATORT 4176 N748 1A1

- Also prime pass
- Collected pointing data (monopulse) to update the 4th order pointing model

ORT on DOY 072 (Fri, Mar 13) was cancelled due to spacecraft thruster swap and de-activation of background sequence and Ka-band ON commands

ORT#2: DOY 076-077 (Tue, Mar 17 local) over DSS-14 and DSS-63, X- and S-band:
09 076 1815 1915 0415 0615 DSS-63 CAS RSR106-BISTATORT 4183 1639 1A1
09 076 2325 0135 0255 0310 DSS-14 CAS RSR106-BISTATORT 4183 1639 1A1

- DSS-63 prime pass
- No S-band signal (became an OTM pass, can't power ON S-band), but practice S-band calibrations
- Practiced bistatic calibrations during DSS-14 pre-cal and DSS-63 post-cal
- DSS-14
  - Took about an hour and half for station to configure and start bistatic calibrations
  - Slight confusion about X-band configuration
    - First had XRCP to low noise and XLCP to diplexer, then both to low noise
  - S-band values inconsistent with expected values. XM interference?
  - Minical completed in allotted time, but error made during first run in X-band dioe. Repeated and was more efficient
- DSS-63
  - Minical and SNT measurement successful
  - Bistatic calibrations very rushed
  - First attempt at SLCP ambient load resulted in loss of IF source to RSR. Station switched to "A1" ambient load in place of "A2" which resolved the problem

ORTs continued

Remaining ORTs:

ORT#3: DOY 077 (Wed, Mar 18 local) over DSS-25, X- and Ka-band:
09 077 2345 0245 1145 1200 DSS-25 CAS RSR106-BISTATORT 4184 N748 1A1

- Also prime pass
- Collect pointing data (monopulse) to update the 4th order pointing model
- Practice bistatic calibrations during pre-cal
  - Include XLCP?

ORT#4: DOY 079 (Thu, Mar 19 local) over DSS-25, X- and Ka-band:
09 079 0045 0245 1145 1200 DSS-25 CAS TP ARRAY-S RSORT 4185 N748 1A1 A
09 079 0445 0545 1145 1200 DSS-14 CAS T/P ARRAY-R D/L 4185 0508 1A1 A

- Array with DSS-14
- Collect more pointing data (monopulse) to update the 4th order pointing model

GSE: DOY 085 (Wed, Mar 25 local) over DSS-25 and DSS-55, X- and Ka-band:
09 085 0045 0215 1115 1130 DSS-25 CAS TP RSR106-KADWN 4191 N748 1A1
09 085 0045 0215 0500 0515 DSS-55 CAS TP RSR106-KADWN 4191 N750 1A1

- DSS-25 prime
- Can use DSS-25 to test pointing model or acquire more pointing data
- DSS-55 in prep for T52

Misc

- Plans to update 4th order pointing models at DSS-25

- Don’t expect closed-loop receivers to be in lock during bistatic part

- Clarify 70-m antenna X-band configuration
- Fix comments about antennas used in the detailed procedure
- Clarify antenna position/tracking during bistatic calibrations – can track in AZ

- Shorter pre-cal at DSS-14. Not much time for errors

- RSR1B at Goldstone is down