

# About the Experiment

- S88 Rev209 T106 Titan Bistatic Observations
  - Bistatic inbound and outbound: 1-way mode
  - Telemetry OFF, Ranging OFF
  - Covered by Canberra

## Science Highlights (from Essam Marouf)

The T106 Titan bistatic observation is one of only two RSS opportunities during the Cassini Solstice Mission that observe Titan surface scattering over a time period that includes closest approach (to enhance chances of detecting weak echoes). A short (~50 m) inbound part of the observation captures a broad range of latitudes, from about (6S, 4W) to about (33N, 323W) degrees. A longer (~112 m) outbound part of the observation, which is the main part of the T106 observation, captures potential mirror-like (quasi-specular) surface reflection from the northern lakes region. The ground track crosses the eastern region of the Kraken Mare, roughly from about (60N, 305W) to about (71N, 295W) degrees. It captures scattering angles increasing from about 50 to 60 degrees, close to the Brewster angle range for likely liquid hydrocarbons composition. In general, measurements of the absolute strength of detectable bistatic echoes and their polarization properties close to the Brewster angle yield important information about the surface status (liquid/solid), surface reflectivity, surface dielectric constant and implied composition, and surface roughness (waves, in case of liquids).

# DSN Antennas

- DSN Coverage

	Pre	BOT	EOT	Post									
14 296	2140	0045	0705	0905	DSS-34	CAS	RSS	T106	BIST	6235	0681	1A1	
14 296	2145	0045	0705	0905	DSS-43	CAS	RSS	T106	BIST	6235	1645	1A1	

- No uplink

- Receivers scheduled

- 2 closed-loop receivers per antenna
- Open-loop receivers (RSRs, WVSRs, PRSR). VSR is red
- Open-loop data are prime. Closed-loop data are backup
- RCP and LCP will be recorded
  - 1-way mode

# S86 T106 Open-Loop Receivers Assignment

DSS	Operator	Station	Open-loop Receiver	Channels	Subchannels	Bandwidths KHz
43	Dustin	rsops1	RSR1	RSR1A -> XRCP RSR1B -> XLCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100
43	Elias	rsops2	RSR2	RSR2A -> SRCP RSR2B -> SLCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100
34	Danny	rsops4	WVSR1	WVSR1A -> KRCP WVSR1B -> KLCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100

RSSG will be in Ops Room at 1:30 pm on Thursday, Oct 23 (296/2030)

WVSR and PRSR backup

Do we need narrower Ka-band bandwidths?

Aseel – VOCA

Dustin - Ops Room Displays

Danny – Check WVSR availability & RSR/WVSR/PRSR disk space

# Bistatic Calibrations

- Calibrations will be performed during
  - Pre-cal (antennas at stow)
    - 3-hr pre-cal periods are scheduled
  - Observation (mini-cals)
    - Pre-determined and carefully selected times (during turns)
    - Must be completed within 6-8 minutes
  - SNT Measurements
    - Completed within 3-4 minutes
  - Post-Cal (antennas at stow)
    - 2-hr post-cal periods are scheduled
- Pre-cal calibrations are the longest
- Will be using same version of bistatic calibrations procedure as the one used during T102 (Rev 6)

# ORTs

1. ORT on DOY 279-280 (Oct 6 PDT) over DSS-34, X- and Ka-band Completed  
14 279 2350 0120 0845 1120 DSS-34 CAS TP RS AUX/BIORT 6218 N750 1A1

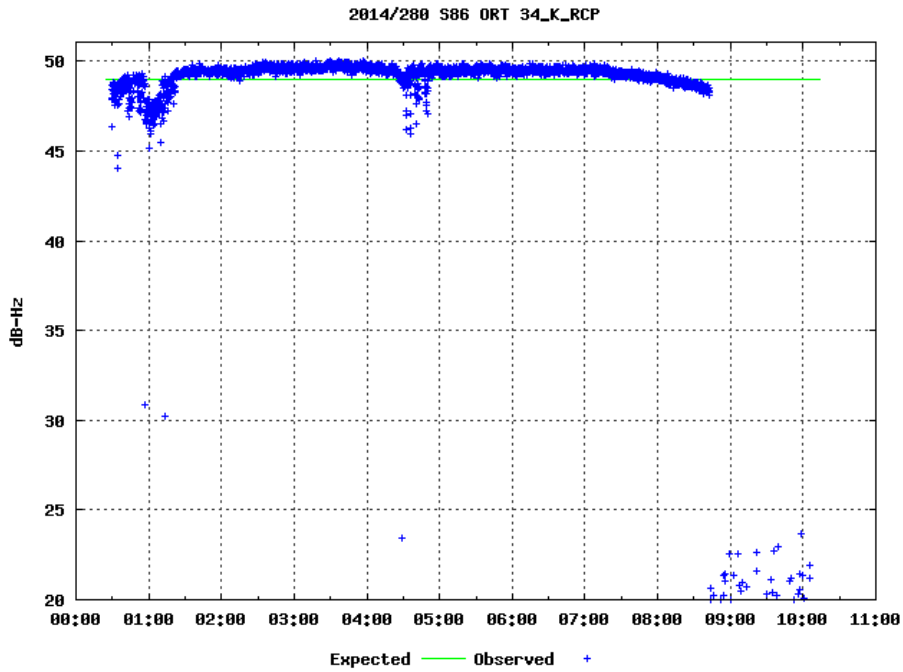
- Also prime TP
- Station performed Monopulse on-point phase cals in 1-way and 2-way modes
- Monopulse data acquired and sent to David
- Verified KLCP signal
- Ka-band 1-way signal was drifting faster than usual
  - Multiple frequency offsets were needed to keep Ka-band in 1 KHz bandwidth
  - X-band TWTA was in sleep mode then powered ON the day before
- Practiced bistatic calibrations during post-cal
  - Team A supporting
  - Station completed calibrations nominally without any problems
- KRCP Spurs (DR C110614)
  - More on this later

# ORTs cont'd

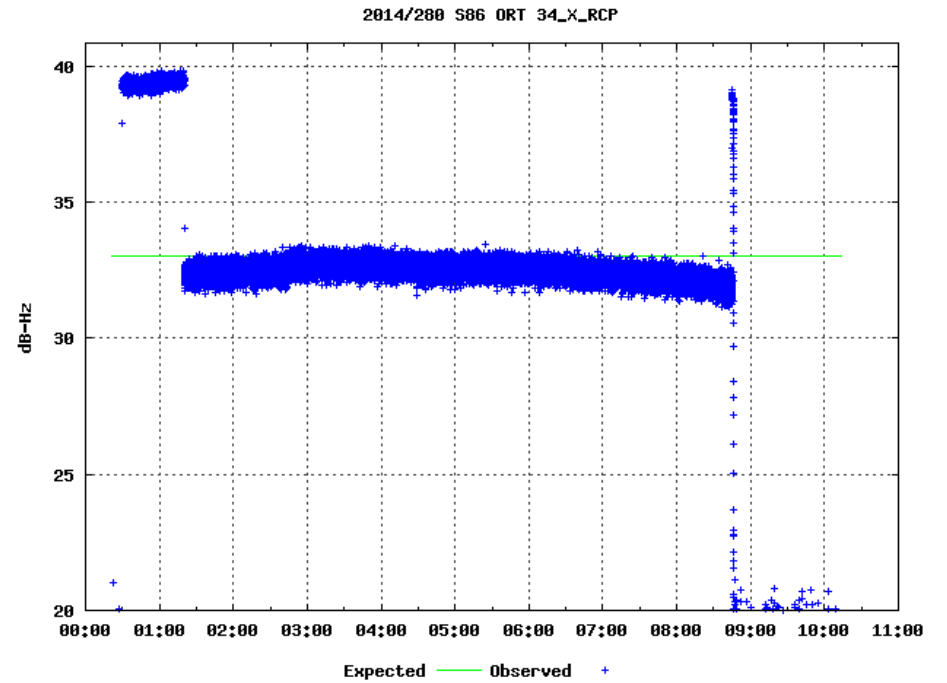
ORT on DOY 279-280 (Oct 6 PDT) over DSS-34, X- and Ka-band continued

- Post-pass power plots

Ka-band



X-band



# ORTs cont'd

## Upcoming

2. ORT on DOY 291-292 (Oct 18-19 PDT) over DSS-34, X- and Ka-band

14 291 2000 2300 0800 1000 DSS-34 CAS TP RS BISTORT MC 6230 N750 1A1

- Also prime TP
- Will practice bistatic calibrations during 3-hr Pre-cal and 2-hr Post-cal
- Acquire Monopulse data
- Verify KLCP signal

3. ORT on DOY 291-296 (Oct 22-23 PDT) over DSS-43, X- and S-band

14 295 2305 0005 0745 1015 DSS-43 CAS TP RS BISTORT 6234 1647 1A1

- Also prime TP
- Will practice bistatic calibrations during 2hr30min Post-cal
  - Night before T106!

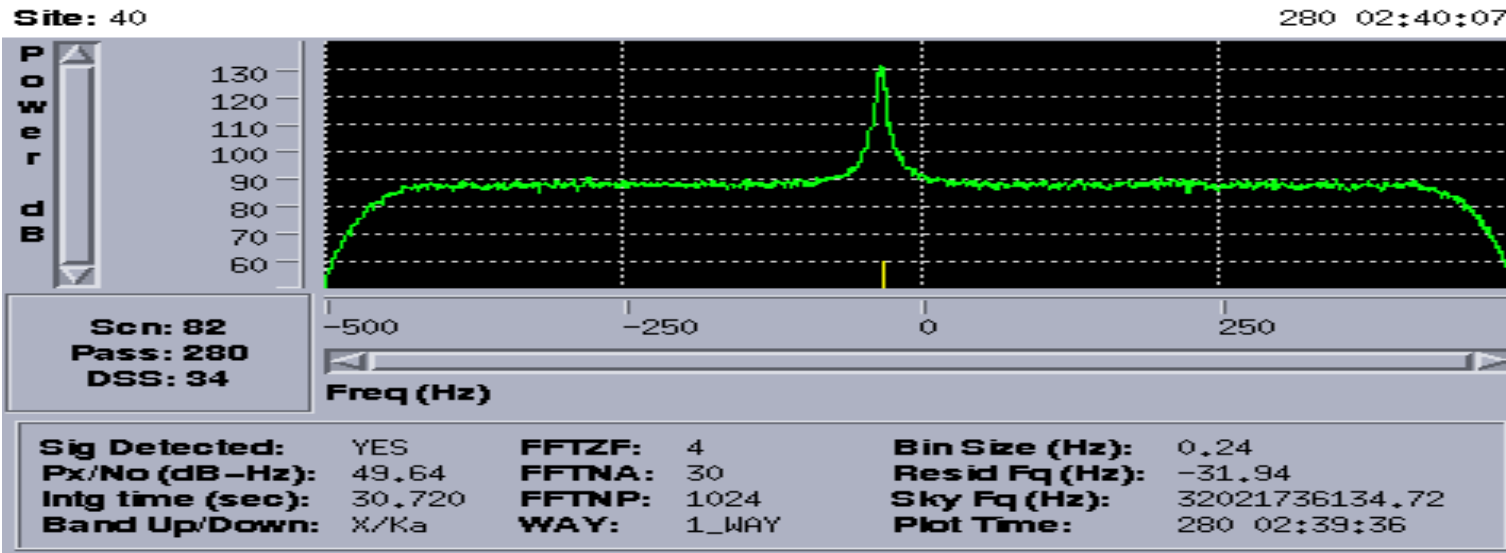
# Canberra Spurs

- RSS has been observing DSS-34 Ka-band spurs at +/- 180 Hz and +/- 240 Hz, and DSS-43 X-band spurs only when telemetry is off
- Canberra recently reported that they fixed what they thought was the cause of the spur problem
- DOY 279-280 ORT first opportunity to check if problem was fixed
- No Ka-band spurs were visible in real-time in 1-way mode
  - Post pass analysis confirmed that +/- 180 Hz spurs are gone
  - However, +/- 246 Hz, not +/- 240 Hz, were present but very weak and difficult to see in real-time
  - 2-way Ka-band spurs were visible in real-time at +/- 246 Hz
- Analysis of old data showed that +/- 240 Hz spurs were at +/- 246 Hz all along
- No DSS-34 X-band spurs were present
  - No opportunity to verify DSS-43 X-band spurs before T106

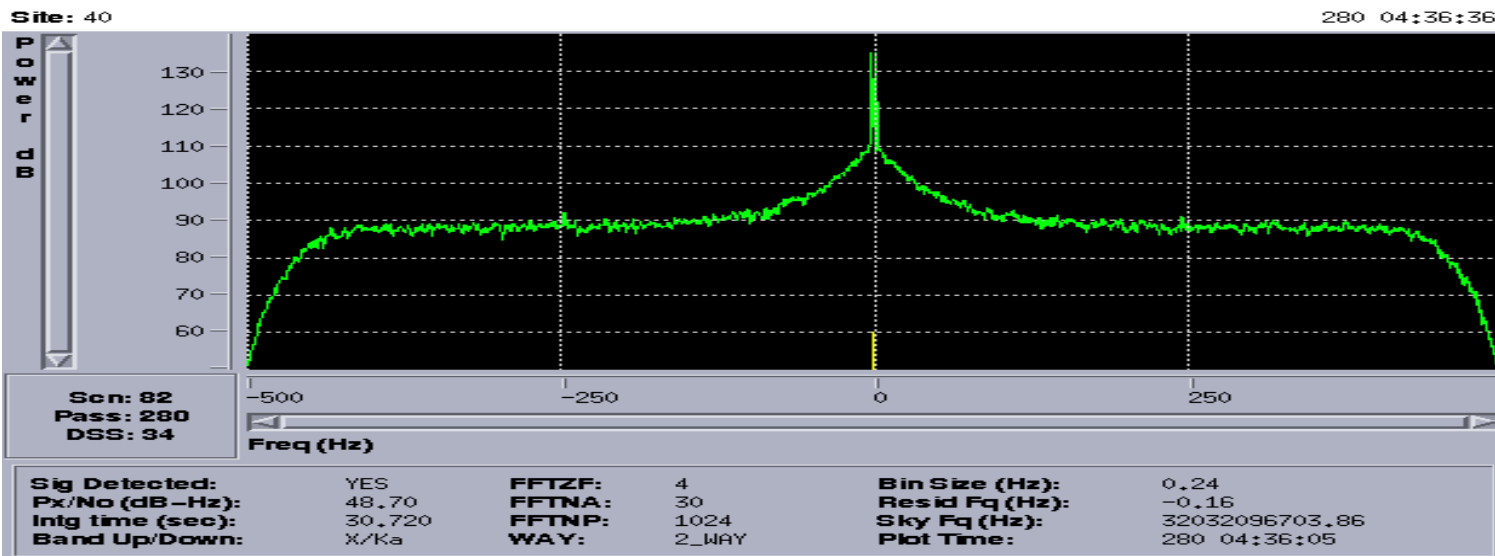


# Canberra Spurs Cont'd

Real-time FFTs



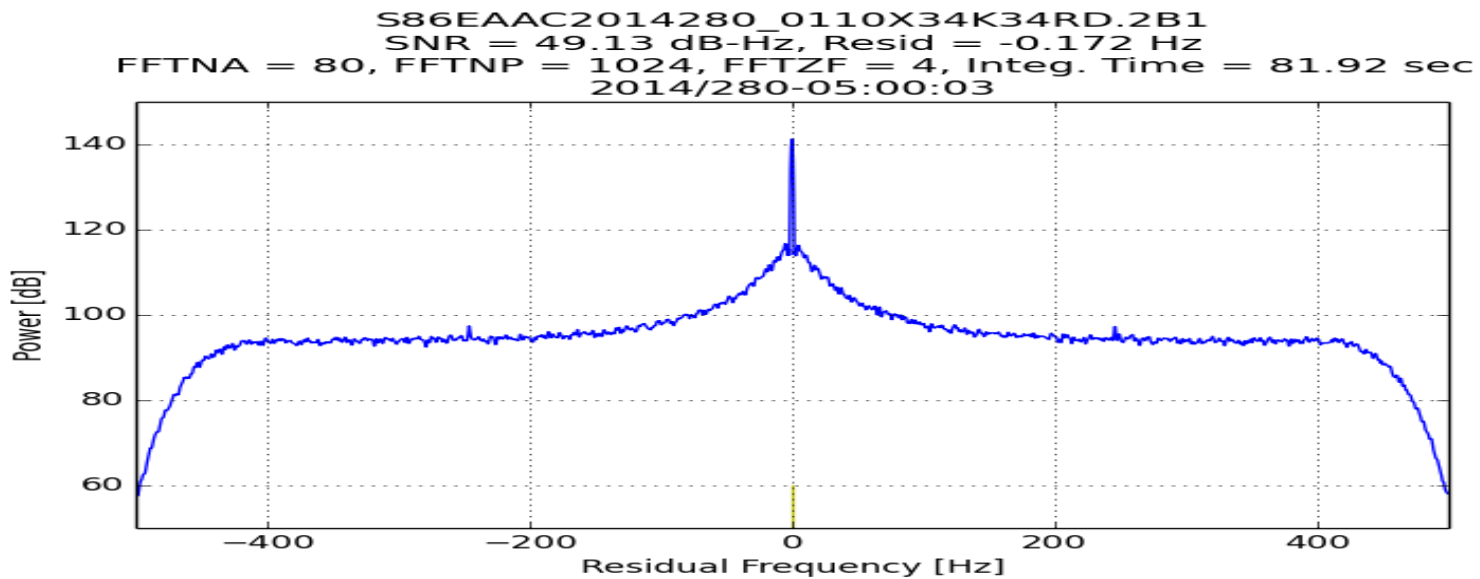
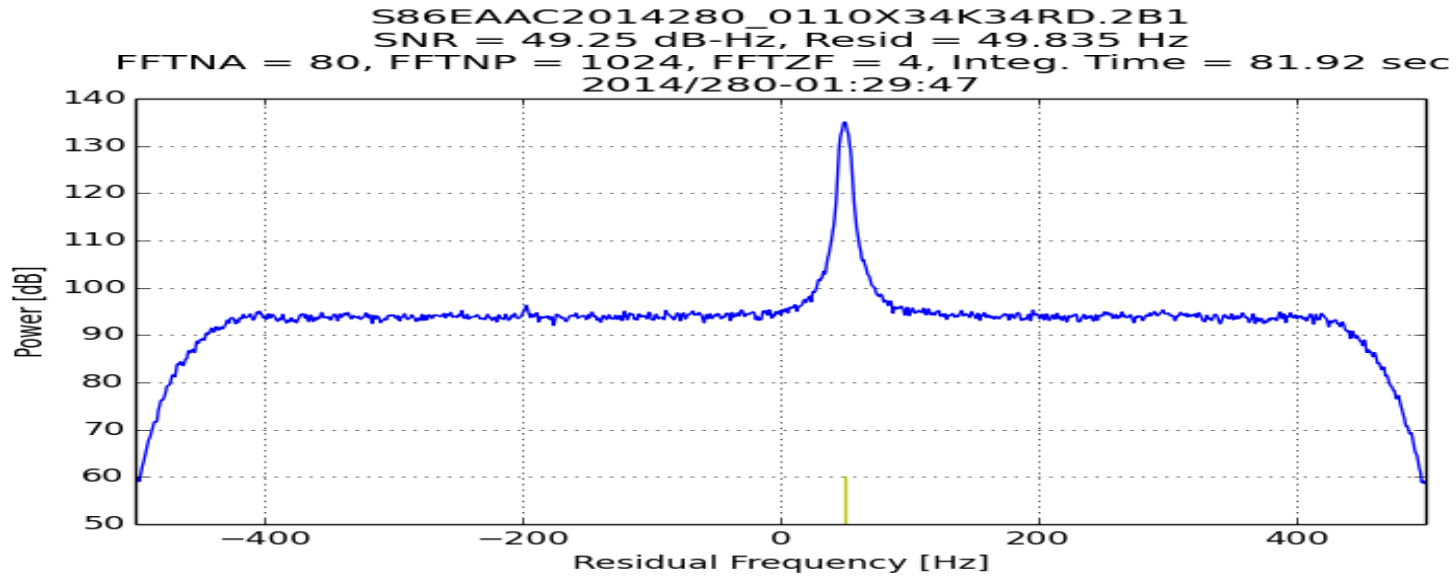
1-way



2-way

# Canberra Spurs Cont'd

## Post-Pass Analysis



# Predicts

- No modification to uplink predicts required
- NAV's last OD delivery prior to the occultation is on Monday, Oct 20?
- Elias, Dustin and Danny will start predicts work on Monday

# Misc

No uplink

DKF – Does not have the correct uplink or AOS/LOS times. Use times in RSS timeline

Don't expect closed-loop receivers to lock up during bistatic experiments

Plan for DSS-34 Cassini Specific 4th Order Pointing Model?

- Crucial to have good pointing models since we can't utilize monopulse during the bistatic experiments
  - Monopulse will be off for ~3hr20min
- David has data from DOY 279-280 DSS-34
- Dustin will send data from DOY 291-292 soon after the ORT completes

Canberra noise diodes require calibration

- Canberra is aware
- Lu is checking if it's been completed

T106 Live Update Today

- NAV said they'll have to do OTM-394

Jeff Boyer's displays in ops room?

# Misc cont'd

Potential impact to 70-m coverage due to STB s/c emergency

- STB requirements are: 3 hour 70M passes every 21 hours beginning DOY 293, Monday, October 20<sup>th</sup> through DOY 313, Sunday, November 9<sup>th</sup> elevation
- Ops Chief will make changes through the end of week 43
  - T106 is in week 43
- T106 is DSN Level 3 support

No Backup simultaneous XRCP and XLCP data

- DSS-43 will provide only data set
- DSS-35 has capability, but could not schedule both DSS-34 and DSS-35

Problems with eDMD displays freezing

- Have workaround, but eDMD is most convenient

Open-loop receivers status

- VSR is red

NOPE/NOAs - Equipment Status?

T106 video will be coming out soon