

Cassini T124: Radio Science (RSS) Titan Bistatic Scattering Observation

November 13-14, 2016 (DOY 318-319)

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Activity	ERT UTC OWLT = 01:31:03	SCET UTC	PST ERT - 8 hrs 08:00:00	Comments
DOY 2016-318				
Spacecraft is not Earth Pointed				
RSSG: Load Predicts (Thermal Stabilization + Baseline)				
DSS-43: Start Pre-Cal	19:15:00	17:43:57	11:15:00	Keep antenna at stow after completing the set up activities
DSS-35: Start Pre-Cal	19:20:00	17:48:57	11:20:00	Keep antenna at stow after completing the set up activities
DSS-35: Switch 43 in B Position				When requested by Radio Science
DSS-35 & DSS-43: Start Pre-Cal Bistatic Calibrations				Guided by real-time instructions from Radio Science
RSSG: Begin 1 & 16 KHz Open-Loop Recording				
DSS-35 & DSS-43: Beginning Of Track	22:20:00	20:48:57	14:20:00	No S/X/Ka downlink detectable
RSSG: Begin Recording All Subchannels	22:20:00	20:48:57	14:20:00	
SNT Measurement (All Stations)	22:22:00	20:50:57	14:22:00	Must end before 22:30:00
S-Band ON	22:22:10	20:51:07	14:22:10	per PEF
Ka-Band ON	22:27:06	20:56:03	14:27:06	per PEF
Start Mini Cal 1	22:35:00	21:03:57	14:35:00	Radio Science to confirm start time. Must end by 22:47:00
Start T124 Observations at Custom Pick Up Attitude	22:43:59	21:12:56	14:43:59	S/C Attitude: NEG_Y to Titan, NEG_X to NTP
RNG OFF, TLM OFF	22:43:59	21:12:56	14:43:59	No downlink signals detectable
Start turn to Earth point (T1)	22:44:01	21:12:58	14:44:01	
Spacecraft is Earth Pointed; Start Inbound Baseline	22:48:53	21:17:50	14:48:53	S/X/Ka downlink detectable shortly before 22:48:53
DSS-43: Begin X- & S-Band 1-Way Acquisition	22:48:53	21:17:50	14:48:53	PC/N0 (X43, S43) = 54, 42 dB-Hz
DSS-35: Begin X- & Ka-Band 1-Way Acquisition	22:48:53	21:17:50	14:48:53	PC/N0 (X35, Ka35) = 48, 48 dB-Hz
RSSG: Enter Open-Loop 1-way Frequency Offsets as Needed				Based on real-time monitoring of open-loop frequency resid
DSS-35: Switch 43 in A Position	23:00:00	21:28:57	15:00:00	When requested by Radio Science
DSS-35: Enable Monopulse	TBD			When requested by Radio Science
DSS-35: Disable Monopulse	23:46:30	22:15:27	15:46:30	Keep or clear the offset decision before 23:46:30
DSS-35: Switch 43 in B Position	23:47:00	22:15:57	15:47:00	When requested by Radio Science
DOY 2016-319				
End Thermal Stabilization Period; End Inbound Baseline	00:26:09	22:55:06	16:26:09	PC/N0 (X35, Ka35, X43, S43) = 48, 48, 54, and 42 dB-Hz

INBOUND BISTATIC OBSERVATION				
Start Turn to to LAT/LNG Preposition (T2a)	00:27:01	22:55:58	16:27:01	Quick loss of S/X/Ka signals
RSSG: Load Bistatic Predicts	00:27:10	00:27:10	16:27:10	
Start Bistatic Mini Cal 2	00:28:00	22:56:57	16:28:00	Radio Science to confirm start time. Must end by 00:35:00
End Turn to LAT/LNG Preposition	00:34:51	23:03:48	16:34:51	
Start turn to Bistatic IVD (T2b)	00:35:18	23:04:15	16:35:18	
End Turn to Bistatic IVD	00:35:24	23:04:21	16:35:24	HGA boresight is pointed to Titan's surface
Start Bistatic Observations	00:35:59	23:04:56	16:35:59	Potential surface echoes; LAT=1.23°S /LNG =49.19°W
at approx LAT=0.31°S /LNG =50.95°W	00:45:00	23:13:57	16:45:00	
at approx LAT= 1.37°N /LNG =53.86°W	00:55:00	23:23:57	16:55:00	
at approx LAT= 4.68°N /LNG =58.78°W	01:05:00	23:33:57	17:05:00	
at approx LAT= 12.91°N/LNG=68.38°W	01:15:00	23:43:57	17:15:00	Rapidly changing LAT/LNG in the vicinity of C/A
Titan Closest Approach (C/A)	01:26:59	23:55:56	17:26:59	T124 epoch; LAT=42.92°N/LNG =91.01°W
OUTBOUND BISTATIC OBSERVATION				
at a: Crossing Small Lake; See Attached Ground Track	01:39:01	00:07:58	17:39:01	LAT = 77.64°N / LNG = 96.18°W
at b: Grazing Small Lake	01:44:01	00:12:58	17:44:01	LAT = 84.74°N / LNG = 69.60°W
at c: Entering Punga Mare	01:48:01	00:16:58	17:48:01	LAT = 85.82°N / LNG = 12.38°W
at d: Exiting Punga Mare	01:52:01	00:20:58	17:52:01	LAT = 83.65°N / LNG = 340.77°W
at e: Entering Medium Size Lake	01:57:01	00:25:58	17:57:01	LAT = 80.68°N / LNG = 328.71°W
at f: Entering Kraken Mrae West Shore	02:20:01	00:48:58	18:20:01	LAT = 72.66°N / LNG = 320.39°W
at g: Crossing Wet/Dry Land then Entering Kraken Mare	02:57:01	01:25:58	18:57:01	LAT = 67.76°N / LNG = 319.97°W
at h: Ending in Kraken Mare	03:16:01	01:44:58	19:16:01	LAT = 66.49°N / LNG = 320.22°W
End Outbound Bistatic Observations	03:16:29	01:45:26	19:16:29	In Kraken
Start Turn to Outbound Baseline (T3)	03:16:31	01:45:28	19:16:31	
RSSG: Load Predicts (Baseline)	03:18:30	01:47:27	19:18:30	
End Turn to Outbound Baseline	03:21:27	01:50:24	19:21:27	
DSS-43: Begin X- and S-Band 1-Way Acquisition	03:21:28	01:50:25	19:21:28	
DSS-35: Begin X- and Ka-Band 1-Way Acquisition	03:21:28	01:50:25	19:21:28	
Start 15 Minutes Outbound Baseline	03:21:59	01:50:56	19:21:59	PC/N0 ~ 54, 48, & 42 dB-Hz for X-, Ka-, S-Band
DSS-35: Switch 43 in A Position	03:34:50	02:03:47	19:34:50	When requested by Radio Science
DSS-35: Enable Monopulse	03:35:50	02:04:47	19:35:50	Allows assessment of Ka-band pointing quality
TLM ON/RNG ON	03:36:53	02:05:50	19:36:53	per PEF
End 15 Minutes Outbound Baseline	03:36:59	02:05:56	19:36:59	PC/N0 ~ 54, 48, & 42 dB-Hz for X-, Ka-, S-Band
End of T124 RSS Observations Period at Hand-Off Attitude	03:36:59	02:05:56	19:36:59	Handoff Orientation: X-Band to Earth, NEG_Y to Titan

DSS-35: Disable Monopulse	TBD			At loss of Ka-band Signal
S-Band OFF	03:36:59	02:05:56	19:36:59	per PEF
Ka-Band OFF	03:37:01	02:05:58	19:37:01	per PEF
DSS-35: Switch 43 in B Position				When requested by Radio Science
Start Bistatic Mini Cal 3	03:40:00	02:08:57	19:40:00	Radio Science to confirm start time. Must end by 03:55:00
SNT Measurement (All Stations)	04:00:00	02:28:57	20:00:00	Must end by 04:20:00
DSS-35 & 43: End-of-Track	04:20:00	02:48:57	20:20:00	
DSS-35 & 43: Start of Post-Cal Bistatic Calibrations	04:20:00	02:48:57	20:20:00	Guided by Real-Time Instructions from RSS Ops-Room
RSSG: Continue Recording 1 & 16 KHz Only				Disable recording of all other subchannels on all receivers
DSS-43: End of Post-Cal	05:50:00	04:18:57	21:50:00	
DSS-35: End of Post-Cal	06:20:00	04:48:57	22:20:00	
RSSG: End 1 & 16 kHz Open-Loop Recordings				

Times are based on the 140114 reference trajectory

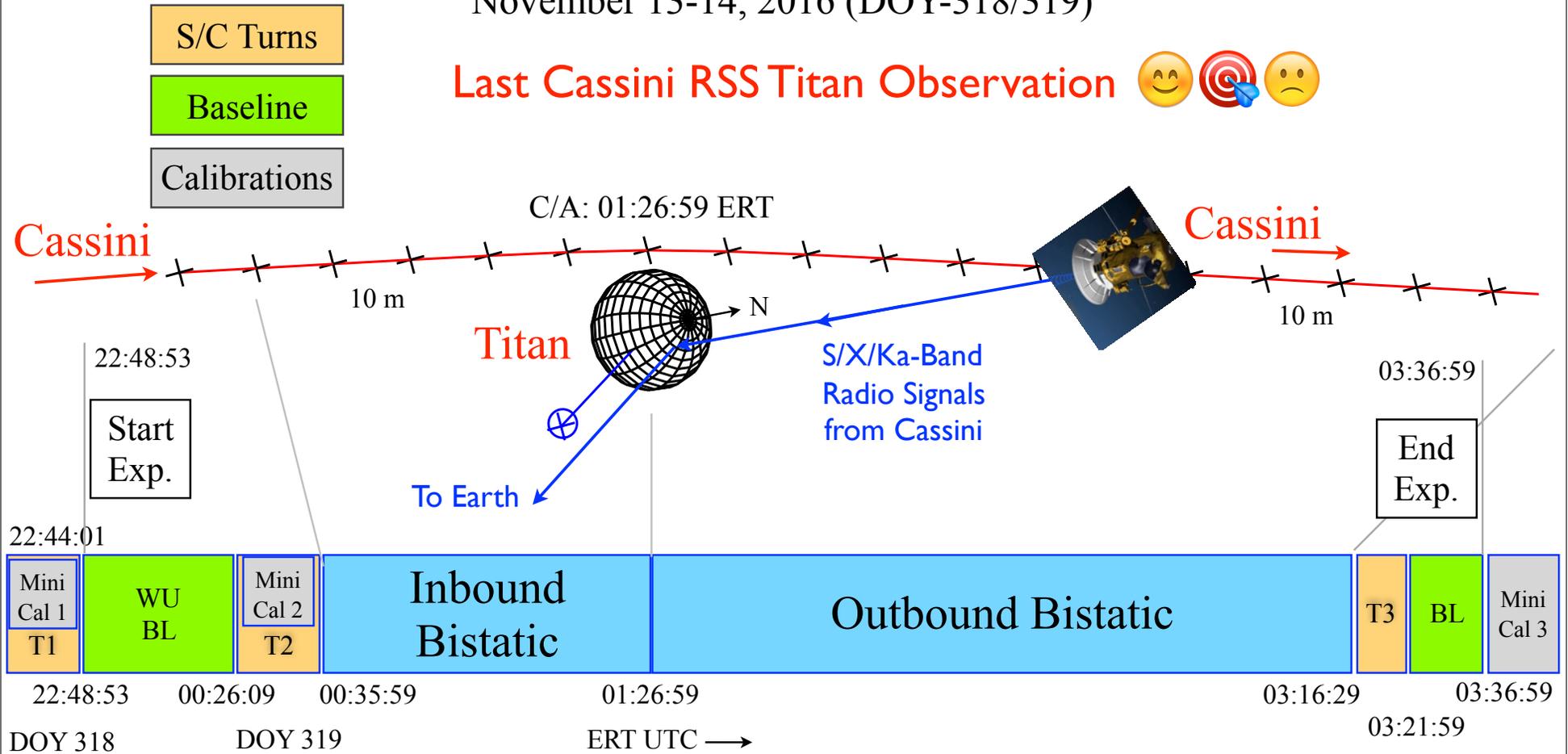
Canberra DSS-35 & 43 Related Activities

Mini Calibration; SNT Measurements

Cassini T124: RSS Titan Bistatic Scattering Observation

November 13-14, 2016 (DOY-318/319)

Last Cassini RSS Titan Observation 🤔🎯😞



X Earth X Titan Surface Titan Surface X Earth X

S/C HGA Pointing

BOT: 22:20:00

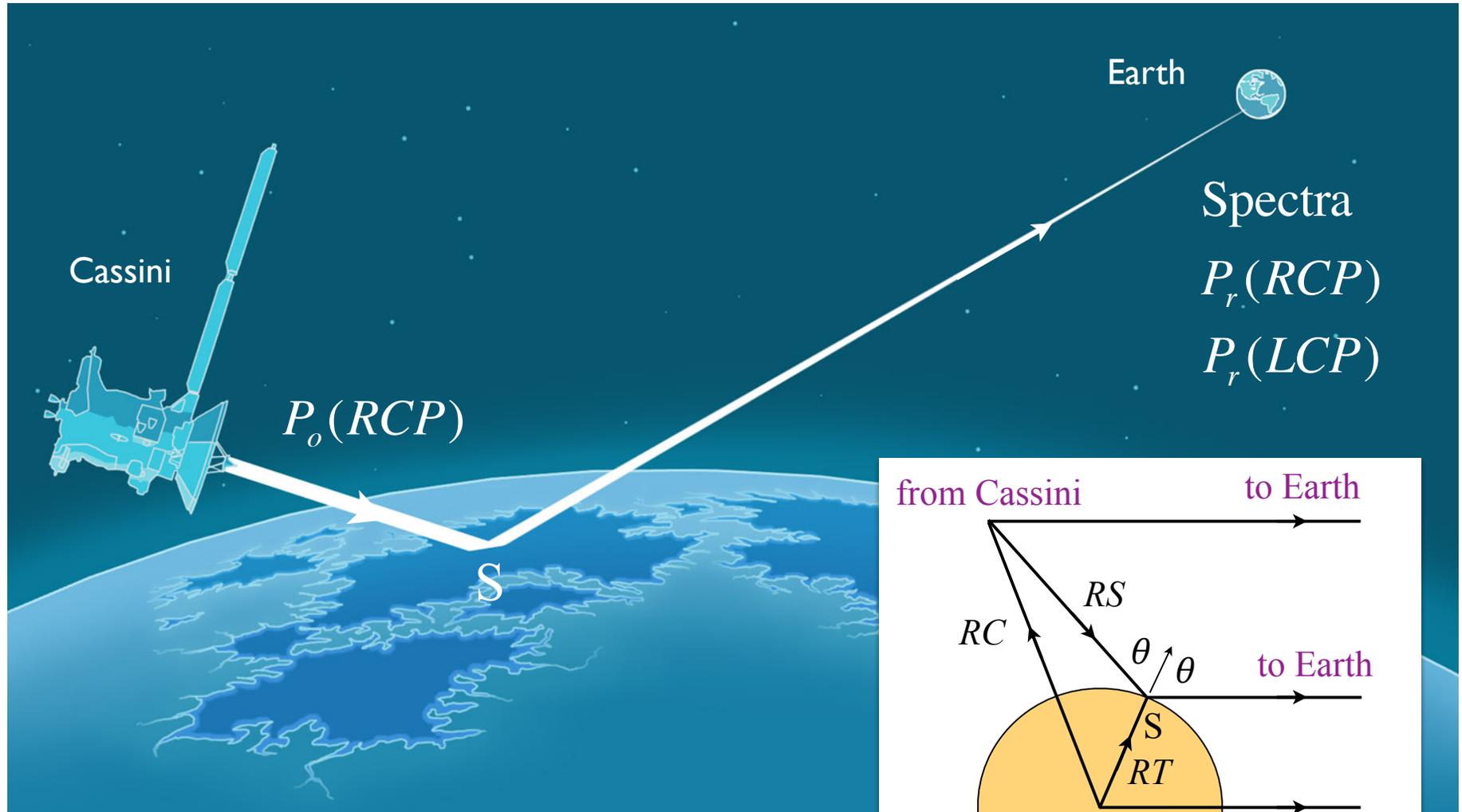
Canberra: DSS-35 & DSS-43

EOT: 04:20:00

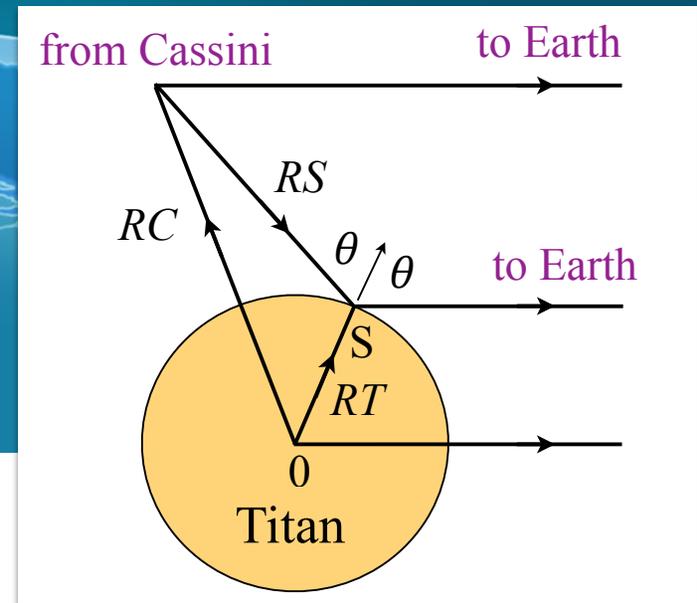
CASSINI RSS

EAM: 10/24/2016 (v1)

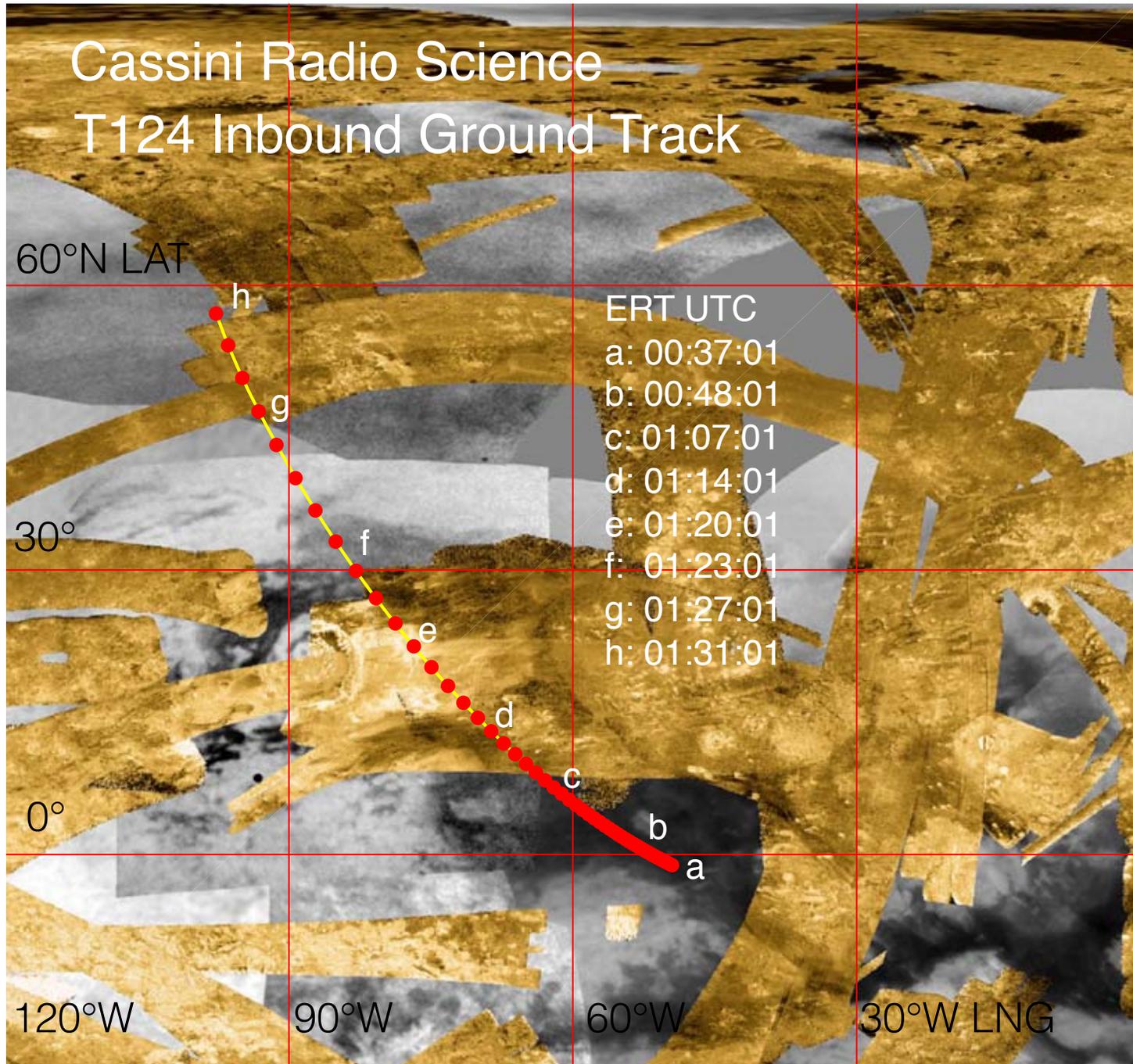
Cassini Radio Science: Bistatic Observation Geometry



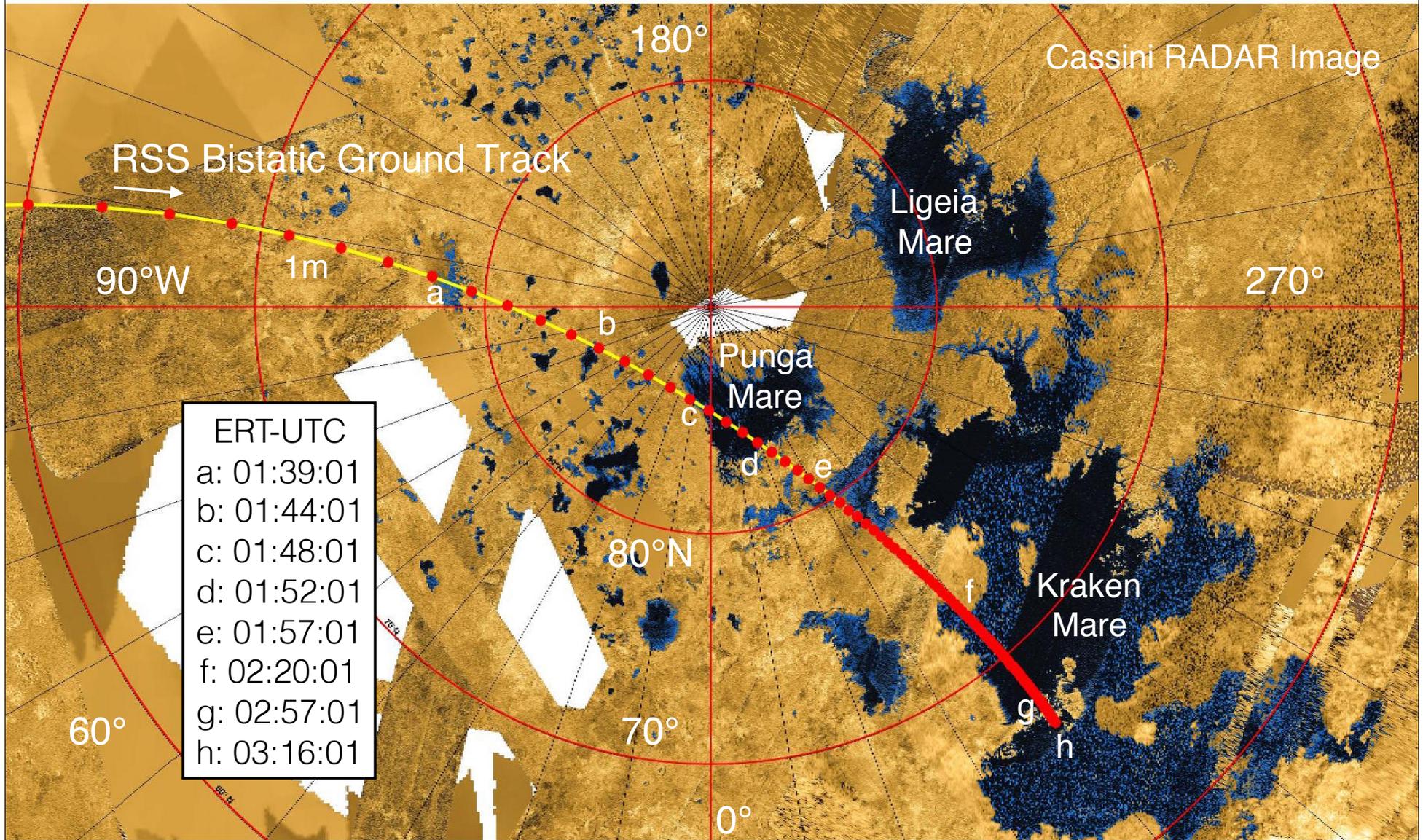
Credit: NASA/JPL

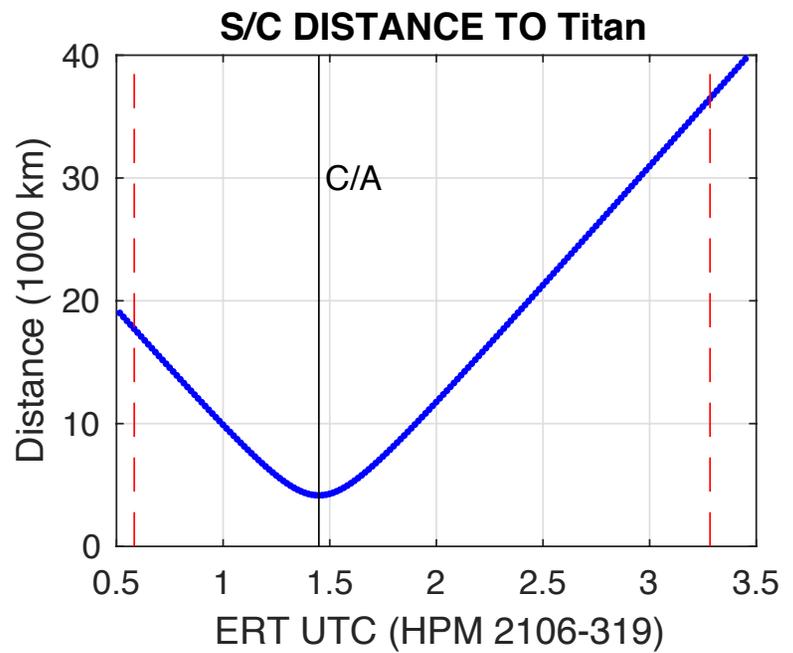
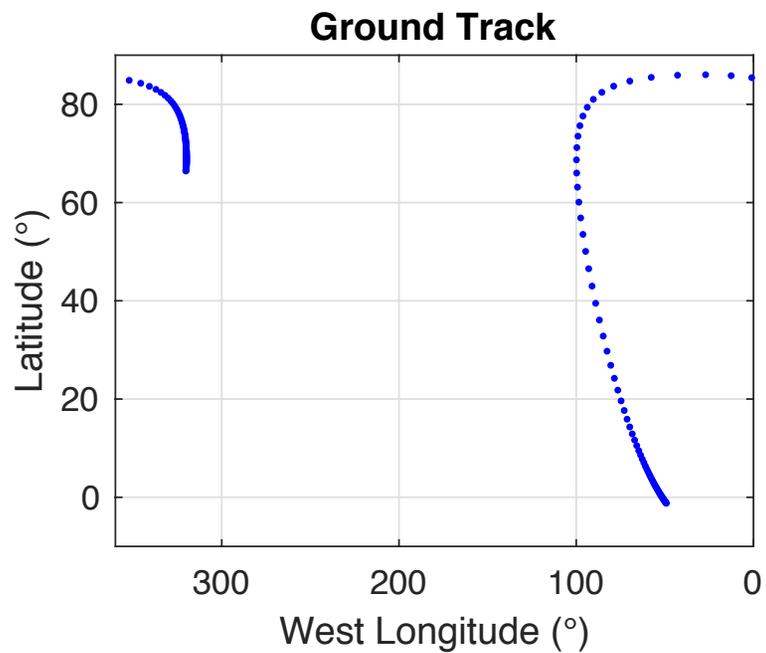
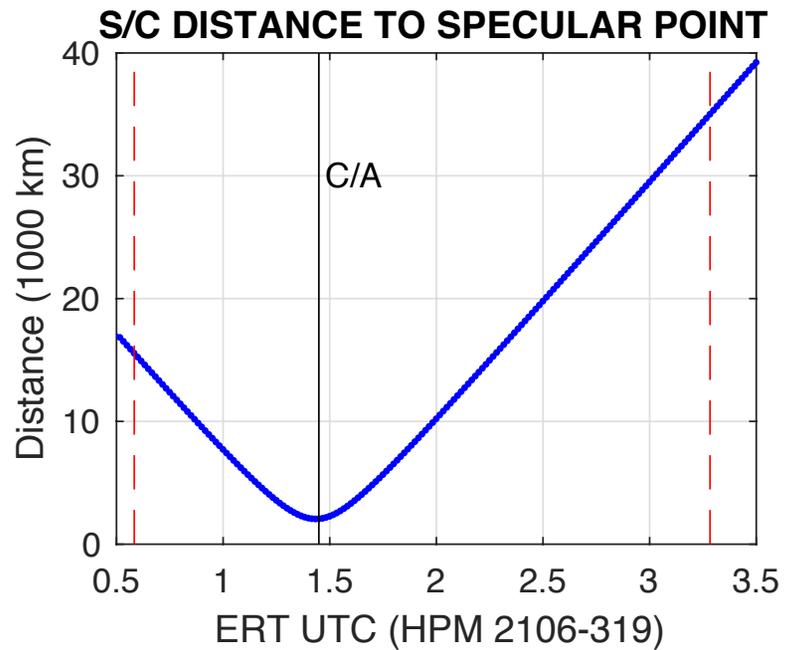
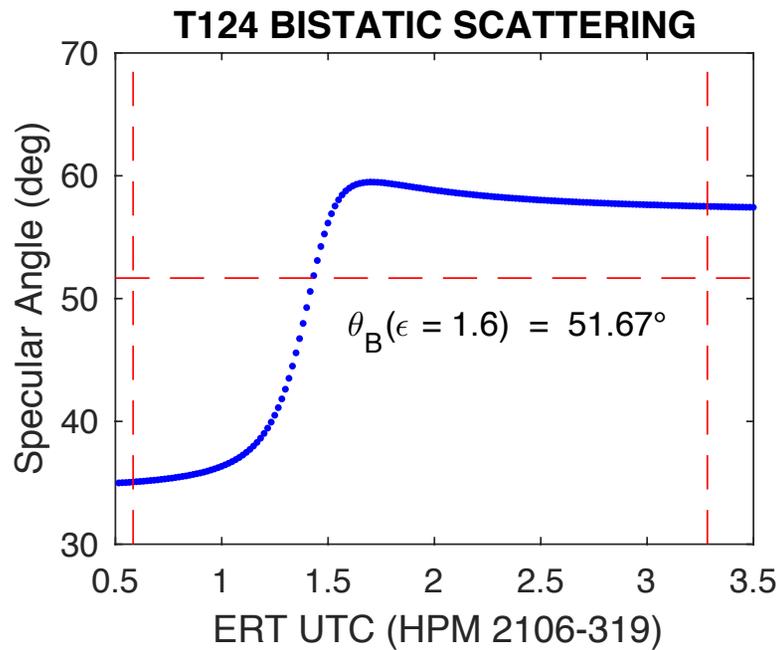


Cassini Radio Science T124 Inbound Ground Track



Cassini Radio Science: T124 Bistatic Ground Track Outbound





RSS Bistatic Scattering Ground Tracks

