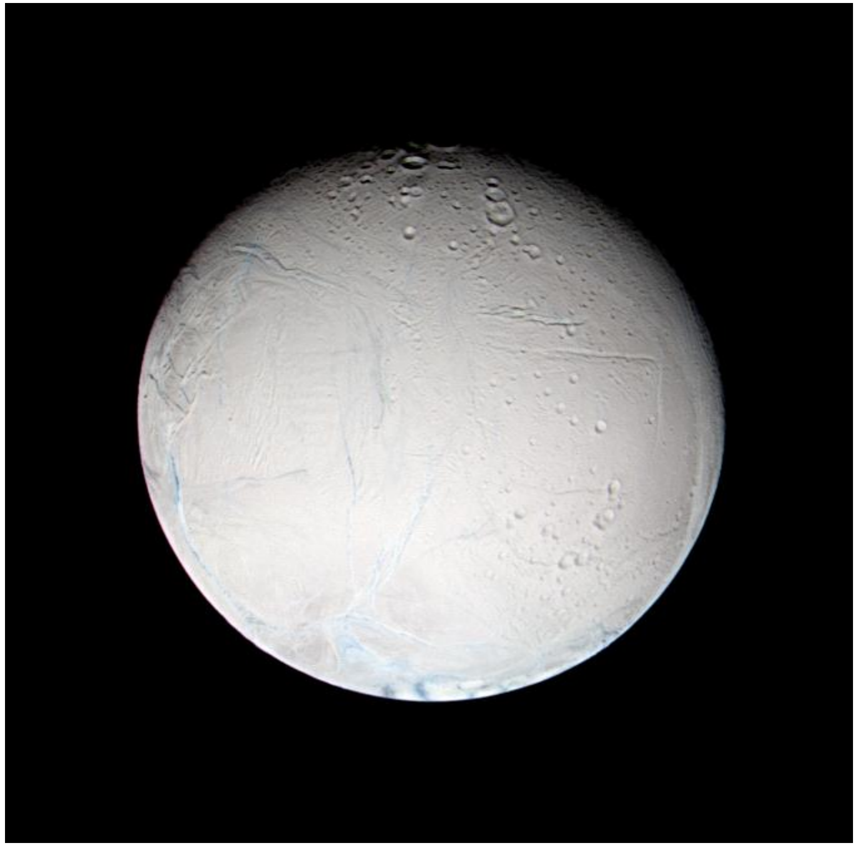
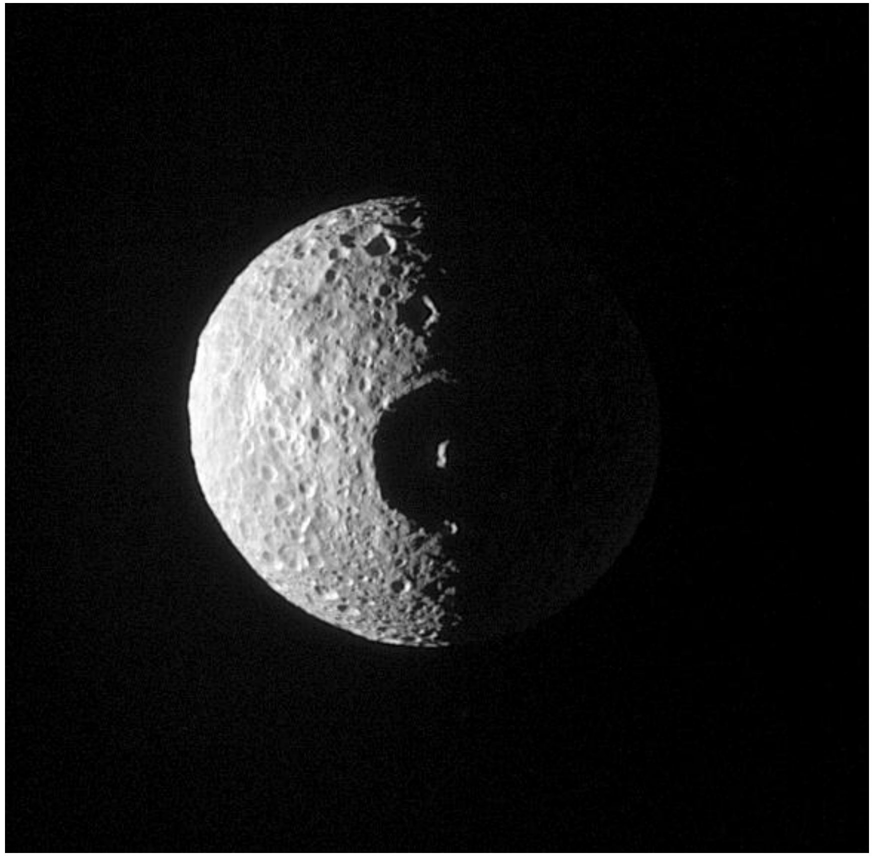
S13- Mimas and Enceladus

Enceladus (011EN) & Mimas (012MI) Preview Overview

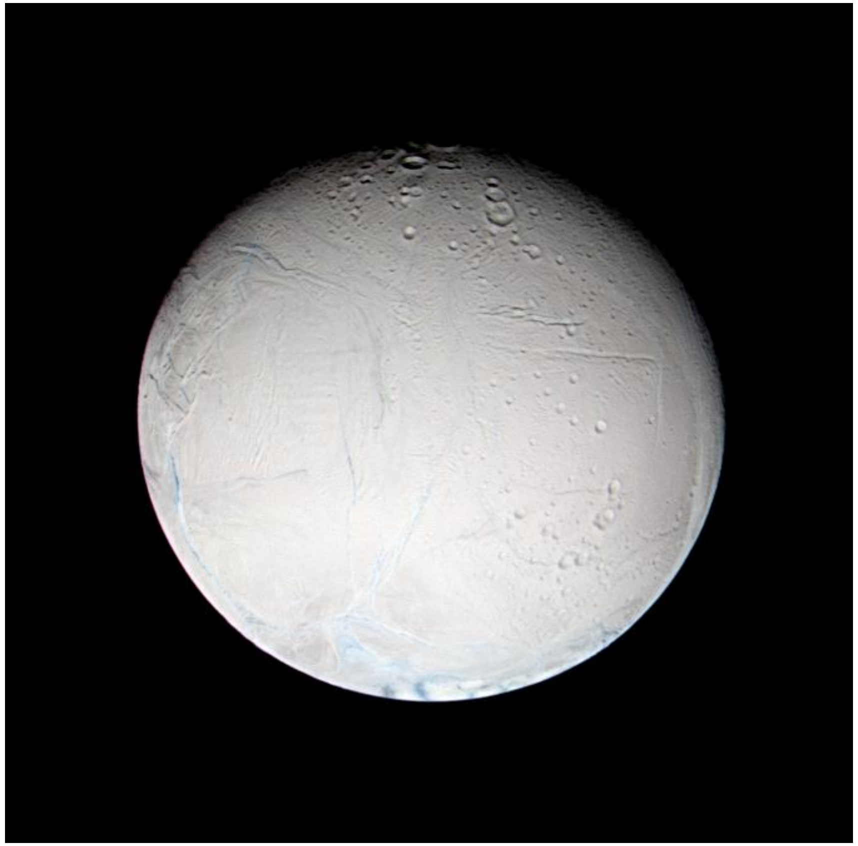


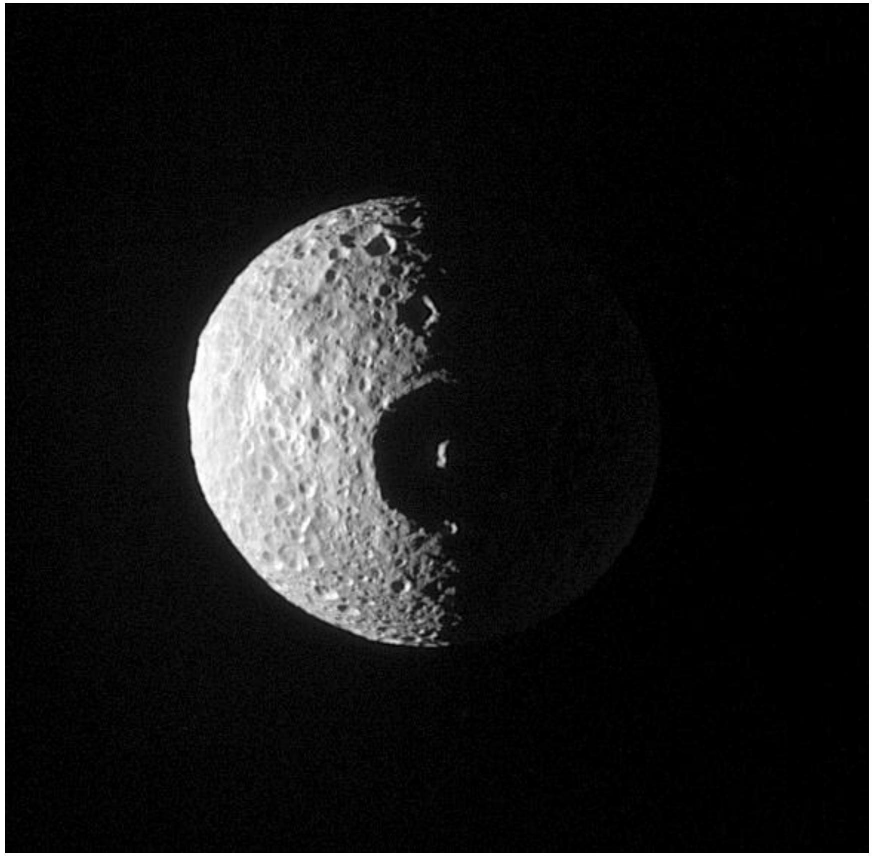


Amanda Hendrix, Bonnie Buratti, Rosaly Lopes

8 July 2005

Enceladus (011EN) & Mimas (012MI) Preview Overview





Amanda Hendrix, Bonnie Buratti, Rosaly Lopes

8 July 2005

011EN

summary

012MI

011EN

- Closest Approach:
  - 169.4 km (105.3 mi) altitude
  - July 14 2005 19:55:21 SCET (July 14 01:19 PM Pacific time)
  - 8.17 km/s
  - 63.4° phase at C/A (low phase inbound)
  - RWA control
- Data Return:
  - Short downlink outbound (~3 hr) (962 Mb)
  - Final Goldstone downlink (9 hr) (01:30 am -01:30 pm Fri. PDT) (3343 Mb)
- Science Highlights:
  - ORS inbound, outbound
  - Key MAPS measurements
  - UVIS stellar occ at C/A
  - Rhea observations (RADAR too)
  - Epimetheus observation

012MI

- Closest Approach:
  - 62,074 km (38,571 mi) altitude
  - Aug 2 2005 04:22:30 SCET (Aug 1 09:46 PM Pacific time)
  - 6.07 km/s
  - 58.4° phase at C/A (low phase inbound)
  - RWA control
- Data Return:
  - Short downlink inbound (~5 hr) (379 Mb)
  - Short downlink outbound (~5.5 hr) (2064 Mb)
  - Final Madrid downlink (9 hr) (2841 Mb)
- Science Highlights:
  - ORS inbound, outbound
  - Best Mimas opportunity in tour
  - Some coverage of terrain not seen by Voyager

Enceladus 011EN Flyby

- 2nd targeted Enceladus flyby
- Lowest flyby yet
  - Trajectory changed to 169 km altitude flyby from planned 1000 km distance
  - Excellent opportunity for MAPS instruments
  - High res observations of southern hemisphere
- Segment also includes
  - Rhea
  - Epimetheus
  - Stellar, solar ring and Saturn occs (UVIS, RSS)
  - Saturn, rings ORS observations

Mimas 012MI Flyby

- Quasi-targeted Mimas flyby - best opportunity
  - No targeted flybys in tour
- Segment also includes
  - Rhea
  - Dione
  - RSS rings, Saturn occultations

011EN Attitude Strategy

Saturn

RHEA

ENCELADUS

OCCS

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
SOST rev 11 Segment		2005-193T23:30:00		003T00:00:00	2005-196T23:30:00			
SP_011SA_WAYPTTURN193_PRIME		2005-193T23:30:00		000T00:30:00	2005-194T00:00:00	ISS_NAC to Saturn	POS_X to NSP	22.2 min turn (CTV)
NEW WAYPOINT		**2005-194T00:00:00**		**001T01:10:00**	**2005-195T01:10:00**	**ISS_NAC to Saturn**	**POS_X to NSP**	
CIRS_011RC_SHADLLP001_PRIME	C, M	2005-194T00:00:00		000T04:00:00	2005-194T04:00:00	CIRS_FP1 to Rings	POS_X to NSP	
CIRS_011RA_SHADLLP001_PRIME	C, M	2005-194T04:00:00		000T04:00:00	2005-194T08:00:00	CIRS_FP1 to Rings	POS_X to NSP	
VIMS_011RB_BMOVIE1001_PRIME	C, M	2005-194T08:00:00		000T03:30:00	2005-194T11:30:00	VIMS_IR to L_ANSA_B	POS_X to North_Pole_Dir	
ISS_011OT_RETMDRESA007_PRIME	M	2005-194T11:30:00		000T01:30:00	2005-194T13:00:00	ISS_NAC to Retargetable	POS_X to NSP	
VIMS_011SA_CYLMAP001_PRIME	C, M, R, U	2005-194T13:00:00		000T06:30:00	2005-194T19:30:00	VIMS_IR to Saturn	POS_X to NSP	
SP_011EA_DLTURN194_PRIME	M, R	2005-194T19:30:00		000T00:24:00	2005-194T19:54:00	XBAND to Earth	POS_X to NSP	20.3 min turn (CTV)
SP_011EA_G70METNON194_PRIME	M, R	2005-194T19:54:00		000T04:50:00	2005-195T00:44:00	XBAND to Earth	Rolling	
SP_011RH_WAYPTTURN195_PRIME	M	2005-195T00:44:00		000T00:26:00	2005-195T01:10:00	ISS_NAC to Rhea (0.0,0.0,20.0 deg. (	NEG_Z to NSP	
NEW WAYPOINT		**2005-195T01:10:00**		**000T11:13:00**	**2005-195T12:23:00**	**ISS_NAC to Rhea (0.0,0.0,20.0 de**	**NEG_Z to NSP**	
BEGIN CUSTOM PERIOD		**2005-195T01:10:00**		**000T00:01:00**	**2005-195T01:11:00**			
ISS_011RH_GLOCOL001_PRIME	C, M, U	2005-195T01:10:00		000T00:40:00	2005-195T01:50:00	ISS_NAC to Rhea	NEG_Z to North_Pole_Dir	Pick up at ISS_NAC to Rhea (0.0,0.0,20.0 deg. offset), NEG_Z to NSP; Hand off at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir.
UVIS_011RH_ICYLON002_PRIME	C, M	2005-195T01:50:00		000T00:24:00	2005-195T02:14:00	ISS_NAC to Rhea	NEG_Z to North_Pole_Dir	Pick up at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir; Hand off at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir.
VIMS_011RH_RHEA003_PRIME	C, M, U	2005-195T02:14:00		000T01:46:00	2005-195T04:00:00	ISS_NAC to Rhea	NEG_Z to North_Pole_Dir	Pick up at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir; Hand off at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir.
ISS_011RH_REGGEODB001_PRIME	C, M, U	2005-195T04:00:00		000T00:10:00	2005-195T04:10:00	ISS_NAC to Rhea	NEG_Z to North_Pole_Dir	Pick up at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir; Hand off at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir.
CIRS_011RH_FP3REGION020_PRIME	M, R, U	2005-195T04:10:00		000T01:00:00	2005-195T05:10:00	CIRS_FP3 to Rhea	NEG_Z to North_Pole_Dir	Pick up at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir; Hand off at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir.
VIMS_011RH_RHEA001_PRIME	C, M, R, U	2005-195T05:10:00		000T00:40:00	2005-195T05:50:00	ISS_NAC to Rhea	NEG_Z to North_Pole_Dir	Pick up at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir; Hand off at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir.
ISS_011RH_REGGEODC001_PRIME	C, M, R, U	2005-195T05:50:00		000T00:10:00	2005-195T06:00:00	ISS_NAC to Rhea	NEG_Z to North_Pole_Dir	Pick up at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir; Hand off at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir.
VIMS_011RH_RHEA002_PRIME	C, M, R, U	2005-195T06:00:00		000T01:50:00	2005-195T07:50:00	ISS_NAC to Rhea	NEG_Z to North_Pole_Dir	Pick up at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir; Hand off at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir.
ISS_011RH_REGGEODD001_PRIME	C, M, R, U	2005-195T07:50:00		000T00:10:00	2005-195T08:00:00	ISS_NAC to Rhea	NEG_Z to North_Pole_Dir	Pick up at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir; Hand off at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir.
RADAR_011RH_SCATTRADL001_PRIME	M	2005-195T08:00:00		000T02:00:00	2005-195T10:00:00	NEG_Z to Rhea	POS_X to North_Pole_Dir	Pick up at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir; Hand off at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir.
ISS_011RH_REGMAPE001_PRIME	U	2005-195T10:00:00		000T00:10:00	2005-195T10:10:00	ISS_NAC to Rhea	NEG_Z to North_Pole_Dir	Pick up at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir; Hand off at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir.
CIRS_011RH_FP1DAYNIT020_PRIME	U	2005-195T10:10:00		000T00:15:00	2005-195T10:25:00	CIRS_FP1 to Rhea	NEG_Z to North_Pole_Dir	Pick up at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir; Hand off at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir.
VIMS_011RH_RHEA004_PRIME	C, U	2005-195T10:25:00		000T00:55:00	2005-195T11:20:00	ISS_NAC to Rhea	NEG_Z to North_Pole_Dir	Pick up at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir; Hand off at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir.
ISS_011RH_REGGEODF001_PRIME	C, U	2005-195T11:20:00		000T00:10:00	2005-195T11:30:00	ISS_NAC to Rhea	NEG_Z to North_Pole_Dir	Pick up at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir; Hand off at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir.
CIRS_011RH_FP1GLOBAL020_PRIME	U	2005-195T11:30:00		000T00:20:00	2005-195T11:50:00	CIRS_FP1 to Rhea	NEG_Z to North_Pole_Dir	Pick up at ISS_NAC to Rhea, NEG_Z to North_Pole_Dir; Hand off at ISS_NAC to Rhea (0.0,0.0,20.0 deg. offset), NEG_Z to NSP.
END CUSTOM PERIOD		**2005-195T11:50:00**		**000T00:01:00**	**2005-195T11:51:00**			**new notation for custom periods**
SP_011EN_WAYPTTURN495_PRIME		2005-195T11:50:00		000T00:20:00	2005-195T12:10:00	ISS_NAC to Enceladus (0.0,-70.0,25.(	POS_X to 40.0/55.0	1st part of 2part turn to avoid SRU violatons
SP_011EN_WAYPTTURN595_PRIME		2005-195T12:10:00		000T00:13:00	2005-195T12:23:00	ISS_NAC to Enceladus	POS_X to 40.0/55.0	2nd part of 2part turn to avoid SRU violations
NEW WAYPOINT		**2005-195T12:23:00**		**000T07:28:52**	**2005-195T19:51:52**	**ISS_NAC to Enceladus**	**POS_X to 40.0/55.0**	
SP_011NA_DEADTIME195_PRIME		**2005-195T12:23:00**		**000T00:01:22**	**2005-195T12:24:22**	**ISS_NAC to Enceladus**	**POS_X to 40.0/55.0**	
CIRS_011EN_FP3MAP1001_PRIME	U, V	2005-195T12:24:22	GMB_E011_Enceladus-000T07:31:00	000T01:15:00	2005-195T13:39:22	CIRS_FP3 to Enceladus	POS_X to 40.0/55.0	
ISS_011EN_N3CPOL002_PRIME	C, U, V	2005-195T13:39:22	GMB_E011_Enceladus-000T06:16:00	000T00:15:00	2005-195T13:54:22	ISS_NAC to Enceladus	POS_X to 40.0/55.0	
CIRS_011EN_FP3GLOBAL020_PRIME	U, V	2005-195T13:54:22	GMB_E011_Enceladus-000T06:01:00	000T01:00:00	2005-195T14:54:22	CIRS_FP3 to Enceladus	POS_X to 40.0/55.0	
ISS_011EN_N4COLR003_PRIME	C, U, V	2005-195T14:54:22	GMB_E011_Enceladus-000T05:01:00	000T00:15:00	2005-195T15:09:22	ISS_NAC to Enceladus	POS_X to 40.0/55.0	
ISS_011EN_N3CPOL003_PRIME	C, U, V	2005-195T15:09:22	GMB_E011_Enceladus-000T04:46:00	000T00:15:00	2005-195T15:24:22	ISS_NAC to Enceladus	POS_X to 40.0/55.0	
CIRS_011EN_FP3REGION021_PRIME	U, V	2005-195T15:24:22	GMB_E011_Enceladus-000T04:31:00	000T00:50:00	2005-195T16:14:22	CIRS_FP3 to Enceladus	POS_X to 40.0/55.0	
ISS_011EN_N4COLR004_PRIME	C, U, V	2005-195T16:14:22	GMB_E011_Enceladus-000T03:41:00	000T00:10:00	2005-195T16:24:22	ISS_NAC to Enceladus	POS_X to 40.0/55.0	
ISS_011EN_N3CPOL004_PRIME	C, U, V	2005-195T16:24:22	GMB_E011_Enceladus-000T03:31:00	000T00:15:00	2005-195T16:39:22	ISS_NAC to Enceladus	POS_X to 40.0/55.0	
CIRS_011EN_FP3REGION020_PRIME	U, V	2005-195T16:39:22	GMB_E011_Enceladus-000T03:16:00	000T00:55:00	2005-195T17:34:22	CIRS_FP3 to Enceladus	POS_X to 40.0/55.0	
ISS_011EN_NGNPOL001_PRIME	C, U, V	2005-195T17:34:22	GMB_E011_Enceladus-000T02:21:00	000T00:20:00	2005-195T17:54:22	ISS_NAC to Enceladus	POS_X to 40.0/55.0	
ISS_011EN_N3COL001_PRIME	C, U, V	2005-195T17:54:22	GMB_E011_Enceladus-000T02:01:00	000T00:20:00	2005-195T18:14:22	ISS_NAC to Enceladus	POS_X to 40.0/55.0	
CIRS_011EN_FP1GLOBAL020_PRIME	U, V	2005-195T18:14:22	GMB_E011_Enceladus-000T01:41:00	000T00:20:00	2005-195T18:34:22	CIRS_FP1 to Enceladus	POS_X to 40.0/55.0	
ISS_011EN_REGEO002_PRIME	C, M, U, V	2005-195T18:34:22	GMB_E011_Enceladus-000T01:21:00	000T00:20:00	2005-195T18:54:22	ISS_NAC to Enceladus	POS_X to 40.0/55.0	
ISS_011EN_MORPH001_PRIME	C, M, U, V	2005-195T18:54:22	GMB_E011_Enceladus-000T01:01:00	000T00:08:00	2005-195T19:02:22	ISS_NAC to Enceladus	POS_X to 40.0/55.0	
ISS_011EN_N9COL001_PRIME	C, M, U, V	2005-195T19:02:22	GMB_E011_Enceladus-000T00:53:00	000T00:24:00	2005-195T19:26:22	ISS_NAC to Enceladus	POS_X to 40.0/55.0	
ISS_011EN_MORPH002_PRIME	C, M, U	2005-195T19:26:22	GMB_E011_Enceladus-000T00:29:00	000T00:08:00	2005-195T19:34:22	ISS_NAC to Enceladus	POS_X to 40.0/55.0	
SP_011ST_WAYPTTURN695_PRIME	M	2005-195T19:34:22	GMB_E011_Enceladus-000T00:21:00	000T00:17:30	2005-195T19:51:52	UVIS_FUV to 81.283/6.35	NEG_X to 330.0/70.0	
NEW WAYPOINT		**2005-195T19:51:52**		**000T00:34:38**	**2005-195T20:26:30**	**UVIS_FUV to 81.283/6.35**	**NEG_X to 330.0/70.0**	
UVIS_011EN_ICYEXO001_PRIME	C, I, M	2005-195T19:51:52	GMB_E011_Enceladus-000T00:03:30	000T00:06:08	2005-195T19:58:00	UVIS_FUV to 81.283/6.35	NEG_X to 330.0/70.0	
SP_011ST_WAYPTTURN795_PRIME	M	2005-195T19:58:00	GMB_E011_Enceladus+000T00:02:38	000T00:28:30	2005-195T20:26:30	ISS_NAC to Enceladus	POS_X to 40.0/55.0	16.2 min turn (CTV)
NEW WAYPOINT		**2005-195T20:26:30**		**000T07:19:52**	**2005-196T03:46:22**	**ISS_NAC to Enceladus**	**POS_X to 40.0/55.0**	
BEGIN CUSTOM PERIOD		**2005-195T20:26:30**	**GMB_E011_Enceladus+000T00:31:08**	**000T01:00:00**	**2005-195T21:26:30**			
CIRS_011EN_FP1NSSCAN020_PRIME	M, U	2005-195T20:26:30	GMB_E011_Enceladus+000T00:31:08	000T00:52:52	2005-195T21:19:22	CIRS_FP1 to Enceladus	POS_X to 40.0/55.0	Pick up at CIRS_FP1 to Enceladus, POS_X to 40.0/55.0; Hand off at ISS_NAC to Enceladus, POS_X to 125.0/-30.0.
ISS_011EN_NCPOL001_PRIME	C, M, U, V	2005-195T21:19:22	GMB_E011_Enceladus+000T01:24:00	000T00:10:00	2005-195T21:29:22	ISS_NAC to Enceladus	POS_X to 125.0/-30.0	Pick up at ISS_NAC to Enceladus, POS_X to 125.0/-30.0; Hand off at ISS_NAC to Enceladus, POS_X to 125.0/-30.0. "pick up at NAC to Enceladus, POS_X to 125/-30 hand-off at NAC to Enceladus, POS_X to 125/-30"
UVIS_011EN_ICYLON019_PRIME	C, M	2005-195T21:29:22	GMB_E011_Enceladus+000T01:34:00	000T00:20:00	2005-195T21:49:22	ISS_NAC to Enceladus	POS_X to 125.0/-30.0	Pick up at ISS_NAC to Enceladus, POS_X to 125.0/-30.0; Hand off at ISS_NAC to Enceladus, POS_X to 125.0/-30.0.
ISS_011EP_STEREO001_PRIME	C, M, U, V	2005-195T21:49:22	GMB_E011_Enceladus+000T01:54:00	000T00:45:00	2005-195T22:34:22	ISS_NAC to Epimetheus	POS_X to 100.0/-35.0	Pick up at ISS_NAC to Enceladus, POS_X to 125.0/-30.0; Hand off at ISS_NAC to Epimetheus, POS_X to 100.0/-35.0. "pick up at NAC to Enceladus, POS_X to 125/-30 hand-off at NAC to Epimetheus, POS_X to 100/-35"
Saturn periapse 011, r = 3....		2005-195T22:10:58		000T00:00:01	2005-195T22:10:59			
UVIS_011ST_URSIGSGR001_PRIME	C, M	2005-195T22:36:22	GMB_E011_Enceladus+000T02:41:00	000T01:50:00	2005-196T00:26:22	UVIS_FUV to 283.816/-26.297	POS_X to 100.0/-65.0	Pick up at ISS_NAC to Epimetheus, POS_X to 100.0/-35.0; Hand off at UVIS_FUV to 283.816/-26.297. POS_X to 100.0/-65.0.
UVIS_011SU_RINGSAT001_PRIME	M, R, V	2005-196T00:26:22	GMB_E011_Enceladus+000T04:31:00	000T01:37:00	2005-196T02:03:22	ISS_NAC to Sun (-20.0,0.0,0.0 deg. (	POS_X to 100.0/-65.0	Pick up at UVIS_FUV to 283.816/-26.297, POS_X to 100.0/-65.0; Hand off at ISS_NAC to Sun (-20.0,0.0,0.0 deg. offset), POS_X to 100.0/-65.0.
VIMS_011RI_HIPHASE001_PRIME	C, M, R, V	2005-196T02:03:22	GMB_E011_Enceladus+000T06:08:00	000T01:17:00	2005-196T03:20:22	VIMS_IR to L_ANSA_C	NEG_X to NSP	Pick up at ISS_NAC to Sun (-20.0,0.0,0.0 deg. offset), POS_X to 100.0/-65.0; Hand off at ISS_NAC to Enceladus, POS_X to 40.0/55.0. Pick up at UVIS_solar_port to sun, POS_X to 100/-65. Drop off at NAC to Enceladu
END CUSTOM PERIOD		**2005-196T03:20:22**	**GMB_E011_Enceladus+000T07:25:00**	**000T00:01:00**	**2005-196T03:21:22**			
SP_011EA_WAYPTTURN196_PRIME	R	2005-196T03:20:22	GMB_E011_Enceladus+000T07:25:00	000T00:26:00	2005-196T03:46:22	XBAND to Earth	NEG_X to 223.0/28.0	24.6 min turn (CTV)
NEW WAYPOINT		**2005-196T03:46:22**		**000T06:13:38**	**2005-196T10:00:00**	**XBAND to Earth**	**NEG_X to 223.0/28.0**	
RSS_011SA_OCC004_PRIME	R	2005-196T03:46:22	GMB_E011_Enceladus+000T07:51:00	000T00:44:39	2005-196T04:31:01	XBAND to Earth	NEG_X to 223.0/28.0	
RSS_011RI_OCC004_PRIME	R	2005-196T04:31:01	GMB_E011_Enceladus+000T08:35:39	000T02:05:21	2005-196T06:36:22	XBAND to Earth	NEG_X to 223.0/28.0	
SP_011NA_DEADTIME196_PRIME	**R**	**2005-196T06:40:00**		**000T00:10:00**	**2005-196T06:50:00**	**XBAND to Earth**	**NEG_X to 223.0/28.0**	
SP_011EA_M70METNON196_PRIME	R	2005-196T06:50:00		000T02:50:00	2005-196T09:40:00	XBAND to Earth	Rolling	
SP_011SA_WAYPTTURN596_PRIME		2005-196T09:40:00		000T00:20:00	2005-196T10:00:00	ISS_NAC to Saturn	POS_Z to NSP	
NEW WAYPOINT		**2005-196T10:00:00**		**000T14:00:00**	**2005-197T00:00:00**	**ISS_NAC to Saturn**	**POS_Z to NSP**	
CIRS_011SA_NADIROCC002_PRIME		2005-196T10:00:00		000T03:20:00	2005-196T13:20:00	CIRS_FP3 to Saturn	POS_Z to NSP	
VIMS_011SA_LIGHTNING003_PRIME	C	2005-196T13:20:00		000T00:50:00	2005-196T14:10:00	VIMS_IR to Saturn	POS_Z to NSP	
SP_011EA_DLTURN596_PRIME		2005-196T14:10:00		000T00:20:00	2005-196T14:30:00	XBAND to Earth	ISS_NAC to Saturn	
SP_011EA_G70METNON196_PRIME	C, R	2005-196T14:30:00		000T09:00:00	2005-196T23:30:00	XBAND to Earth	Rolling/SRU	This D/L has been modified by CDA to Rock

012MI Attitude Strategy

Rhea, Dione

<--- MIMAS--->

occs, other

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
Sequence S013, length = 30 ...		2005-212T22:00:00	E012_SEQUENCE_013+000T00:00:00	029T23:43:00	2005-242T21:43:00			
SOST rev 12 Segment		2005-212T22:00:00		002T16:50:00	2005-215T14:50:00			
SP_012EA_S13IVP212_PRIME	M	2005-212T22:00:00	E012_SEQUENCE_013+000T00:00:00	000T00:06:00	2005-212T22:06:00	XBAND to Earth	NEG_X to Sun	
SP_012RH_WAYPTTURN212_PRIME	M	2005-212T22:06:00		000T00:21:30	2005-212T22:27:30	ISS_NAC to Rhea	POS_Z to 200.0/40.0	SP Turn to Waypoint
SP_012RH_WAYPTTURN412_PRIME	M	2005-212T22:27:30		000T00:12:30	2005-212T22:40:00	ISS_NAC to Rhea	POS_Z to NEP	SP Turn to Waypoint
NEW WAYPOINT		**2005-212T22:40:00**		**000T13:42:00**	**2005-213T12:22:00**	**ISS_NAC to Rhea**	**POS_Z to NEP**	
CIRS_012RH_FP3GLOBAL020_PRIME	M, U	2005-212T22:40:00		000T01:50:00	2005-213T00:30:00	CIRS_FP3 to Rhea	POS_Z to NEP	
ISS_012OT_RETMDRESA011_PRIME	M, V	2005-213T00:30:00		000T01:40:00	2005-213T02:10:00	ISS_NAC to Retargetable	POS_Z to NEP	
ISS_012MI_PHOTOM004_PRIME	C, M, U	2005-213T02:10:00		000T00:30:00	2005-213T02:40:00	ISS_NAC to Mimas	POS_Z to NEP	
ISS_012OT_RETMDRESA013_PRIME	M, V	2005-213T02:40:00		000T01:54:00	2005-213T04:34:00	ISS_NAC to Retargetable	POS_Z to NEP	
CIRS_012RH_FP3REGION020_PRIME	M, R, U	2005-213T04:34:00		000T02:08:00	2005-213T06:42:00	CIRS_FP3 to Rhea	POS_Z to NEP	
SP_012EA_DLTURN213_PRIME	M, R	2005-213T06:42:00		000T00:22:00	2005-213T07:04:00	XBAND to Earth	NEG_X to NSP	SP Turn to Earth
SP_012EA_M34BWGNON213_PRIME	M, R	2005-213T07:04:00		000T05:00:00	2005-213T12:04:00	XBAND to Earth	Rolling	
SP_012DI_WAYPTTURN213_PRIME	M, R	2005-213T12:04:00		000T00:18:00	2005-213T12:22:00	ISS_NAC to Dione	NEG_X to NSP	SP Turn to Waypoint
NEW WAYPOINT		**2005-213T12:22:00**		**000T09:08:00**	**2005-213T21:30:00**	**ISS_NAC to Dione**	**NEG_X to NSP**	
Begin Custom		**2005-213T12:22:00**		**000T00:01:00**	**2005-213T12:23:00**			
VIMS_012RH_RHEA001_PRIME	C, I, M, U	2005-213T12:40:00		000T01:30:00	2005-213T14:10:00	ISS_NAC to Rhea	NEG_X to NSP	Pick up at ISS_NAC to Dione, NEG_X to NSP; Hand off at ISS_NAC to Rhea, NEG_X to NSP. Pick up at ISS_NAC to Dione, -X to NSP Leave off at ISS_NAC to Rhea, -X to NSP
ISS_012RH_REGGEODC001_PRIME	C, M, U, V	2005-213T14:10:00		000T00:10:00	2005-213T14:20:00	ISS_NAC to Rhea	NEG_X to NSP	Pick up at ISS_NAC to Rhea, NEG_X to NSP; Hand off at ISS_NAC to Rhea, NEG_X to NSP. "direct handoff (leave at ISS_NAC to Rhea, POS_Z to Rhea NP)"
CIRS_012RH_FP1GLOBAL020_PRIME	M, U, V	2005-213T14:20:00		000T01:40:00	2005-213T16:00:00	CIRS_FP1 to Rhea	NEG_X to NSP	Pick up at ISS_NAC to Rhea, NEG_X to NSP; Hand off at ISS_NAC to Dione, NEG_X to NSP.
End Custom		**2005-213T16:00:00**		**000T00:01:00**	**2005-213T16:01:00**			
UVIS_012DI_ICYLON007_PRIME	C, I, M, V	2005-213T16:00:00		000T00:40:00	2005-213T16:40:00	ISS_NAC to Dione	NEG_X to NSP	
VIMS_012RH_RHEA004_PRIME	C, I, M, U	2005-213T16:40:00		000T00:40:00	2005-213T17:20:00	ISS_NAC to Rhea	NEG_X to NSP	
ISS_012DI_PHOTOM010_PRIME	C, M, U, V	2005-213T17:20:00		000T00:35:00	2005-213T17:55:00	ISS_NAC to Dione	NEG_X to NSP	
UVIS_012DI_ICYLON010_PRIME	C, I, M, V	2005-213T17:55:00		000T00:45:00	2005-213T18:40:00	ISS_NAC to Dione	NEG_X to NSP	
VIMS_012RH_RHEA003_PRIME	C, I, M, U	2005-213T18:40:00		000T01:20:00	2005-213T20:00:00	ISS_NAC to Rhea	NEG_X to NSP	
UVIS_012DI_ICYLON012_PRIME	C, I, M, V	2005-213T20:00:00		000T00:25:00	2005-213T20:25:00	ISS_NAC to Dione	NEG_X to NSP	
VIMS_012RH_RHEA005_PRIME	C, I, M, U	2005-213T20:25:00		000T00:40:00	2005-213T21:05:00	ISS_NAC to Rhea	NEG_X to NSP	
SP_012EA_WAYPTTURN213_PRIME	M	2005-213T21:05:00		000T00:25:00	2005-213T21:30:00	XBAND to Earth	POS_X to NSP	SP Turn to Waypoint
NEW WAYPOINT		**2005-213T21:30:00**		**000T23:36:00**	**2005-214T21:06:00**	**XBAND to Earth**	**POS_X to NSP**	
Begin Custom		**2005-213T21:30:00**		**000T00:01:00**	**2005-213T21:31:00**			
CIRS_012MI_FP1FP3MAP666_PRIME	I, M, U	2005-213T21:30:00	E012_Peri_for_Mimas-000T07:51:02	000T00:40:00	2005-213T22:10:00	CIRS_FP3 to Mimas	POS_X to NSP	Pick up at XBAND to Earth, POS_X to NSP; Hand off at ISS_NAC to Mimas, POS_X to NSP.
VIMS_012MI_MIMAS005_PRIME	C, I, M, U	2005-213T22:10:00	E012_Peri_for_Mimas-000T07:11:02	000T00:46:02	2005-213T22:56:02	ISS_NAC to Mimas	POS_X to NSP	Pick up at ISS_NAC to Mimas, POS_X to NSP; Hand off at ISS_NAC to Mimas, POS_X to NSP. Pick up at ISS_NAC to Mimas, +X to NSP Leave off at ISS_NAC to Mimas, +X to NSP
CIRS_012MI_FP3REGION022_PRIME	I, M, U, V	2005-213T22:56:02	E012_Peri_for_Mimas-000T06:25:00	000T00:50:00	2005-213T23:46:02	CIRS_FP3 to Mimas	POS_X to NSP	Pick up at ISS_NAC to Mimas, POS_X to NSP; Hand off at ISS_NAC to Mimas, POS_X to NSP.
VIMS_012MI_MIMAS006_PRIME	C, I, M, U	2005-213T23:46:02	E012_Peri_for_Mimas-000T05:35:00	000T00:45:00	2005-214T00:31:02	ISS_NAC to Mimas	POS_X to NSP	Pick up at ISS_NAC to Mimas, POS_X to NSP; Hand off at ISS_NAC to Mimas, POS_X to NSP. Pick up at ISS_NAC to Mimas, +X to NSP Leave off at ISS_NAC to Mimas, +X to NSP
ISS_012MI_LIMTOP001_PRIME	C, M, U, V	2005-214T00:31:02	E012_Peri_for_Mimas-000T04:50:00	000T00:19:00	2005-214T00:50:02	ISS_NAC to Mimas	POS_X to NSP	Pick up at ISS_NAC to Mimas, POS_X to NSP; Hand off at ISS_NAC to Mimas, POS_X to NSP.
CIRS_012MI_FP3REGION020_PRIME	I, M, U, V	2005-214T00:50:02	E012_Peri_for_Mimas-000T04:31:00	000T00:30:00	2005-214T01:20:02	CIRS_FP3 to Mimas	POS_X to NSP	Pick up at ISS_NAC to Mimas, POS_X to NSP; Hand off at ISS_NAC to Mimas, POS_X to NSP.
ISS_012MI_COLORF004_PRIME	C, M, U, V	2005-214T01:20:02	E012_Peri_for_Mimas-000T04:01:00	000T00:22:00	2005-214T01:42:02	ISS_NAC to Mimas	POS_X to NSP	Pick up at ISS_NAC to Mimas, POS_X to NSP; Hand off at ISS_NAC to Mimas, POS_X to NSP. direct handoff
CIRS_012MI_FP3REGION024_PRIME	I, M, U, V	2005-214T01:42:02	E012_Peri_for_Mimas-000T03:39:00	000T00:29:00	2005-214T02:11:02	CIRS_FP3 to Mimas	POS_X to NSP	Pick up at ISS_NAC to Mimas, POS_X to NSP; Hand off at ISS_NAC to Mimas, POS_X to NSP.
VIMS_012MI_MIMAS001_PRIME	C, I, M, U	2005-214T02:11:02	E012_Peri_for_Mimas-000T03:10:00	000T01:04:00	2005-214T03:15:02	ISS_NAC to Mimas	POS_X to NSP	Pick up at ISS_NAC to Mimas, POS_X to NSP; Hand off at ISS_NAC to Mimas, POS_X to NSP. Pick up at ISS_NAC to Mimas, +X to NSP Leave off at ISS_NAC to Mimas, -X to NEP
CIRS_012MI_FP1MAP023_PRIME	I, M, U, V	2005-214T03:15:02	E012_Peri_for_Mimas-000T02:06:00	000T00:20:00	2005-214T03:35:02	CIRS_FP1 to Mimas	NEG_X to NEP	Pick up at ISS_NAC to Mimas, NEG_X to NEP; Hand off at ISS_NAC to Mimas (0.0,12.0,0.0 deg. offset), NEG_X to NEP.
ISS_012MI_STEREO005_PRIME	C, M, U, V	2005-214T03:35:02	E012_Peri_for_Mimas-000T01:46:00	000T00:16:00	2005-214T03:51:02	ISS_NAC to Mimas (0.0,12.0,0.0 deg. offset)	NEG_X to NEP	Pick up at ISS_NAC to Mimas, NEG_X to NEP; Hand off at ISS_NAC to Mimas, NEG_X to NEP. direct handoff
UVIS_012MI_ICYLON008_PRIME	C, I, M, V	2005-214T03:51:02	E012_Peri_for_Mimas-000T01:30:00	000T00:20:00	2005-214T04:11:02	ISS_NAC to Mimas (0.027,12.0,0.23 deg. offset)	NEG_X to NEP	Pick up at ISS_NAC to Mimas (0.0,12.0,0.0 deg. offset), NEG_X to NEP; Hand off at ISS_NAC to Mimas (0.0,12.0,0.0 deg. offset), NEG_X to NEP.
ISS_012MI_STEREO007_PRIME	C, M, R, U	2005-214T04:11:02	E012_Peri_for_Mimas-000T01:10:00	000T00:57:00	2005-214T05:08:02	ISS_NAC to Mimas (0.0,12.0,0.0 deg. offset)	NEG_X to NEP	Pick up at ISS_NAC to Mimas, NEG_X to NEP; Hand off at ISS_NAC to Mimas, NEG_X to NEP.
CIRS_012MI_FP1REGION021_PRIME	M, R, U, V	2005-214T05:08:02	E012_Peri_for_Mimas-000T00:13:00	000T00:25:00	2005-214T05:33:02	CIRS_FP1 to Mimas (0.0,12.0,0.0 deg. offset)	NEG_X to NEP	Pick up at ISS_NAC to Mimas (0.0,12.0,0.0 deg. offset), NEG_X to NEP; Hand off at ISS_NAC to Mimas (0.0,12.0,0.0 deg. offset), NEG_X to NEP.
Saturn periapse 012, r = 3....		2005-214T05:15:28		000T00:00:01	2005-214T05:15:29			
UVIS_012MI_ICYLON011_PRIME	C, I, M, R, V	2005-214T05:33:02	E012_Peri_for_Mimas+000T00:12:00	000T00:10:00	2005-214T05:43:02	ISS_NAC to Mimas (0.027,12.0,0.258 deg. offset)	NEG_X to NEP	Pick up at ISS_NAC to Mimas (0.0,12.0,0.0 deg. offset), NEG_X to NEP; Hand off at ISS_NAC to Mimas (0.0,12.0,0.0 deg. offset), NEG_X to NEP.
CIRS_012DI_FP1REGION020_PRIME	I, M, R, U, V	2005-214T05:43:02	E012_Peri_for_Mimas+000T00:22:00	000T01:13:58	2005-214T06:57:00	ISS_NAC to Dione	NEG_X to NEP	Pick up at ISS_NAC to Mimas (0.0,12.0,0.0 deg. offset), NEG_X to NEP; Hand off at XBAND to Earth, POS_X to NSP.
End Custom		**2005-214T06:57:00**		**000T00:01:00**	**2005-214T06:58:00**			
SP_012MI_DEADTIME213_PRIME	**M, R**	**2005-214T06:57:00**		**000T00:35:34**	**2005-214T07:32:34**	**XBAND to Earth**	**POS_X to NSP**	
RSS_012RI_OCC003_PRIME	M	2005-214T07:33:38	LMB_E012_RSS_Sat_Occ_Ingr-000T02:0	000T02:01:02	2005-214T09:34:40	XBAND to Earth	POS_X to NSP	
RSS_012SA_OCC003_PRIME	M	2005-214T09:34:40	LMB_E012_RSS_Sat_Occ_Ingr-000T00:0	000T00:35:58	2005-214T10:10:38	XBAND to Earth	POS_X to NSP	
VIMS_012RI_HIPHASE001_PRIME	C, R	2005-214T10:10:38	LMB_E012_RSS_Sat_Occ_Ingr+000T00:3	000T01:30:00	2005-214T11:40:38	VIMS_IR to L_ANSA_D	POS_X to NSP	
RSS_012SA_OCC004_PRIME	R	2005-214T11:40:38	LMB_E012_RSS_Sat_Occ_Ingr+000T02:0	000T00:44:00	2005-214T12:24:38	XBAND to Earth	POS_X to NSP	
RSS_012RI_OCC004_PRIME	R	2005-214T12:24:38	LMB_E012_RSS_Sat_Occ_Ingr+000T02:4	000T02:07:00	2005-214T14:31:38	XBAND to Earth	POS_X to NSP	
SP_012MI_DEADTIME214_PRIME	**R**	**2005-214T14:31:38**	**LMB_E012_RSS_Sat_Occ_Ingr+000T**	**000T00:35:26**	**2005-214T15:07:04**	**XBAND to Earth**	**POS_X to NSP**	
SP_012EA_G70METNON214_PRIME	C, R	2005-214T15:06:00		000T05:30:00	2005-214T20:36:00	XBAND to Earth	Rolling	
SP_012SA_WAYPTTURN214_PRIME		2005-214T20:36:00		000T00:30:00	2005-214T21:06:00	ISS_NAC to Saturn	POS_Z to NSP	SP Turn to Waypoint
NEW WAYPOINT		**2005-214T21:06:00**		**000T18:22:00**	**2005-215T15:28:00**	**ISS_NAC to Saturn**	**POS_Z to NSP**	
ISS_012OT_RETHIEQPL001_PRIME		2005-214T21:06:00		000T00:54:00	2005-214T22:00:00	ISS_NAC to Retargetable	POS_Z to NSP	
CIRS_012SA_NADIROCC003_PRIME		2005-214T22:00:00		000T03:00:00	2005-215T01:00:00	CIRS_FP3 to Saturn	POS_Z to NSP	
ISS_012TE_310W144PH001_PRIME	U	2005-215T01:00:00		000T00:30:00	2005-215T01:30:00	ISS_NAC to Tethys	POS_Z to NSP	
CIRS_012RI_TEMPU05HP001_PRIME	C	2005-215T01:30:00		000T03:50:00	2005-215T05:20:00	CIRS_FP1 to Rings	POS_Z to NSP	
SP_012EA_DLTURN215_PRIME		2005-215T05:20:00		000T00:30:00	2005-215T05:50:00	XBAND to Earth	POS_X to NEP	SP Turn to Earth
SP_012EA_M70METOTP215_PRIME	N	2005-215T05:50:00		000T09:00:00	2005-215T14:50:00	XBAND to Earth	POS_X to NEP	

011EN Flyby Geometry

Tour Data Generator, Version 20030113, written by John Smith JPL. File Creation Date (YYMMDD.HHMMSS): 50705.155502
DUT = ET - UTC, (sec) = 64.18523, ET Julian Date of Epoch J2000 = 2451545.0

Event Name: 11EN, Targeted_Enceladus, Central Body: Enceladus 050505 Reference Trajectory, Altitude Based on Fixed Body Radius of 253 km

Event Name at Event Time Only	SCET Date (YYYY-DOYTHH:MM:SS.FF) UTC	Hours wrt Event Epoch	Minutes wrt Event Epoch	S/C Range (km)	S/C Altitude (km)	S/C North Latitude (deg)	S/C West Longitude SMEQPM Date (deg)	S/C Inertial Velocity (km/s)	S/C Radial Inertial Velocity (km/s)	S/C Tangential Inertial Velocity (km/s)	Central Body Angular Diameter (mrad)	Phase = Sun-Central_Body-S/C Angle (deg)	Sun-S/C-Central_Body Angle (deg)	S/C Local True Solar Time wrt Central Body (hh:mm)	Sub-solar Latitude wrt Central Body (deg)	Sub-solar West Longitude wrt Central Body SMEQPM Date (deg)
	2005-194T19:55:20.99	-24	-1440	1,087,356.0	1,087,103.0	-17.2	9.5	18.908	-7.861	17.197	0.5	15.5	164.5	10.56	-21.1	-6.4
	2005-194T23:55:20.99	-20	-1200	935,437.9	935,184.9	-17.9	38.9	20.752	-12.943	16.221	0.5	3.5	176.5	11.53	-21.1	37.4
	2005-195T01:55:20.99	-18	-1080	835,586.0	835,333.0	-18.7	53.3	20.877	-14.689	14.835	0.6	6.1	173.8	12.24	-21.1	59.3
	2005-195T03:55:20.99	-16	-960	725,526.4	725,273.4	-20.0	67.5	20.444	-15.766	13.015	0.7	12.9	167.1	12.54	-21.1	81.2
	2005-195T05:55:20.99	-14	-840	610,295.0	610,042.0	-21.8	81.7	19.464	-16.120	10.909	0.8	19.9	160.1	13.25	-21.1	103.1
	2005-195T07:55:20.99	-12	-720	495,156.9	494,903.9	-24.2	96.1	17.980	-15.744	8.684	1.0	26.8	153.2	13.55	-21.1	125.0
	2005-195T09:55:20.99	-10	-600	385,219.6	384,966.6	-27.4	110.9	16.070	-14.690	6.516	1.3	33.3	146.7	14.23	-21.1	146.9
	2005-195T11:55:20.99	-8	-480	284,926.0	284,673.0	-31.6	126.6	13.870	-13.096	4.568	1.8	38.9	141.1	14.48	-21.1	168.8
	2005-195T13:55:20.99	-6	-360	197,330.2	197,077.2	-36.6	143.9	11.596	-11.219	2.936	2.6	43.3	136.7	15.07	-21.1	-169.3
	2005-195T14:55:20.99	-5	-300	158,618.9	158,365.9	-39.4	153.3	10.538	-10.298	2.235	3.2	44.9	135.1	15.13	-21.1	-158.4
	2005-195T15:55:20.99	-4	-240	123,062.0	122,809.0	-42.1	163.5	9.611	-9.478	1.596	4.2	46.0	134.0	15.16	-21.1	-147.4
	2005-195T16:55:20.99	-3	-180	90,175.4	89,922.4	-44.6	174.4	8.885	-8.826	1.021	5.7	46.5	133.4	15.16	-21.1	-136.5
	2005-195T17:55:20.99	-2	-120	59,247.7	58,994.7	-46.7	-174.0	8.413	-8.396	0.539	8.7	46.7	133.3	15.13	-21.1	-125.5
	2005-195T18:55:20.99	-1	-60	29,442.5	29,189.5	-48.2	-161.8	8.202	-8.198	0.243	17.4	46.3	133.7	15.08	-21.1	-114.6
	2005-195T19:25:20.99	-1	-30	14,717.4	14,464.4	-48.9	-155.1	8.172	-8.168	0.266	34.8	45.8	134.2	15.03	-21.1	-109.1
	2005-195T19:40:20.99	0	-15	7,370.9	7,117.9	-49.9	-150.1	8.169	-8.155	0.476	69.6	44.8	135.2	14.54	-21.1	-106.4
	2005-195T19:50:20.99	0	-5	2,493.6	2,240.6	-53.0	-139.1	8.169	-8.051	1.385	205.9	41.4	138.6	14.18	-21.1	-104.6
E2_11EN	2005-195T19:55:20.99	0	0	422.4	169.4	-23.2	-34.6	8.172	-0.129	8.170	1304.2	63.4	116.6	07.23	-21.1	-103.7
	2005-195T20:00:20.99	0	5	2,480.7	2,227.7	42.0	18.6	8.170	8.051	1.390	207.0	127.0	53.0	03.54	-21.1	-102.7
	2005-195T20:10:20.99	0	15	7,359.1	7,106.1	46.1	27.3	8.171	8.158	0.460	69.7	131.3	48.7	03.27	-21.1	-100.9
	2005-195T20:25:20.99	1	30	14,707.1	14,454.1	47.1	31.9	8.169	8.167	0.200	34.9	132.2	47.8	03.19	-21.1	-98.2
	2005-195T20:55:20.99	1	60	29,394.5	29,141.5	47.3	37.9	8.145	8.145	0.034	17.4	132.6	47.4	03.17	-21.1	-92.7
	2005-195T21:55:20.99	2	120	58,386.8	58,133.8	46.6	47.9	7.921	7.909	0.447	8.8	132.1	47.9	03.21	-21.1	-81.8
	2005-195T22:55:20.99	3	180	85,880.9	85,627.9	45.4	56.6	7.349	7.298	0.863	6.0	130.9	49.1	03.30	-21.1	-70.8
	2005-195T23:55:20.99	4	240	110,487.9	110,234.9	44.3	65.1	6.411	6.322	1.065	4.6	129.3	50.7	03.40	-21.1	-59.9
	2005-196T00:55:20.99	5	300	131,151.6	130,898.6	43.4	74.0	5.222	5.142	0.908	3.9	128.0	52.0	03.48	-21.1	-48.9
	2005-196T01:55:20.99	6	360	147,532.0	147,279.0	42.8	83.9	4.002	3.978	0.440	3.5	127.3	52.7	03.52	-21.1	-38.0
	2005-196T03:55:20.99	8	480	169,853.7	169,600.7	41.8	108.3	3.156	2.487	1.942	3.0	129.2	50.8	03.42	-21.1	-16.1
	2005-196T05:55:20.99	10	600	188,536.1	188,283.1	39.3	139.5	5.515	3.129	4.541	2.7	136.6	43.4	03.05	-21.1	5.8
	2005-196T07:55:20.99	12	720	220,811.8	220,558.8	33.3	173.0	8.679	6.159	6.115	2.3	147.0	33.0	02.18	-21.1	27.7
	2005-196T09:55:20.99	14	840	279,581.1	279,328.1	25.5	-157.5	11.769	10.170	5.922	1.8	154.8	25.2	01.48	-21.1	49.6
	2005-196T11:55:20.99	16	960	365,778.2	365,525.2	18.7	-133.4	14.549	13.605	5.154	1.4	156.5	23.5	01.39	-21.1	71.5
	2005-196T13:55:20.99	18	1080	472,767.0	472,514.0	13.9	-113.1	16.898	15.919	5.666	1.1	153.8	26.2	01.45	-21.1	93.3
	2005-196T15:55:20.99	20	1200	592,279.4	592,026.4	10.5	-95.1	18.735	17.095	7.665	0.9	149.0	31.0	02.01	-21.1	115.2
	2005-196T19:55:20.99	24	1440	837,847.4	837,594.4	6.5	-62.4	20.670	16.370	12.620	0.6	137.4	42.5	02.45	-21.1	159.0

Enceladus Image Viewing (at JPL)

- Friday, July 15, 280A
  - Noon - ~2 pm
- Shall we have goodies and invite all Cassini folks?
  - To thank everyone for late trajectory change

Mimas Image Viewing

- Stay tuned for announcements

Enceladus Press Activities

- Telecon to discuss initial results next week?
- Possible press conference?
- ICYFEST in August?

CIRS Icy Observations on Revs. 11 and 12

John Spencer
Southwest Research Institute
Boulder, CO

John Pearl, Marcia Segura

and the CIRS Team

Goddard Spaceflight Center

Greenbelt, MD

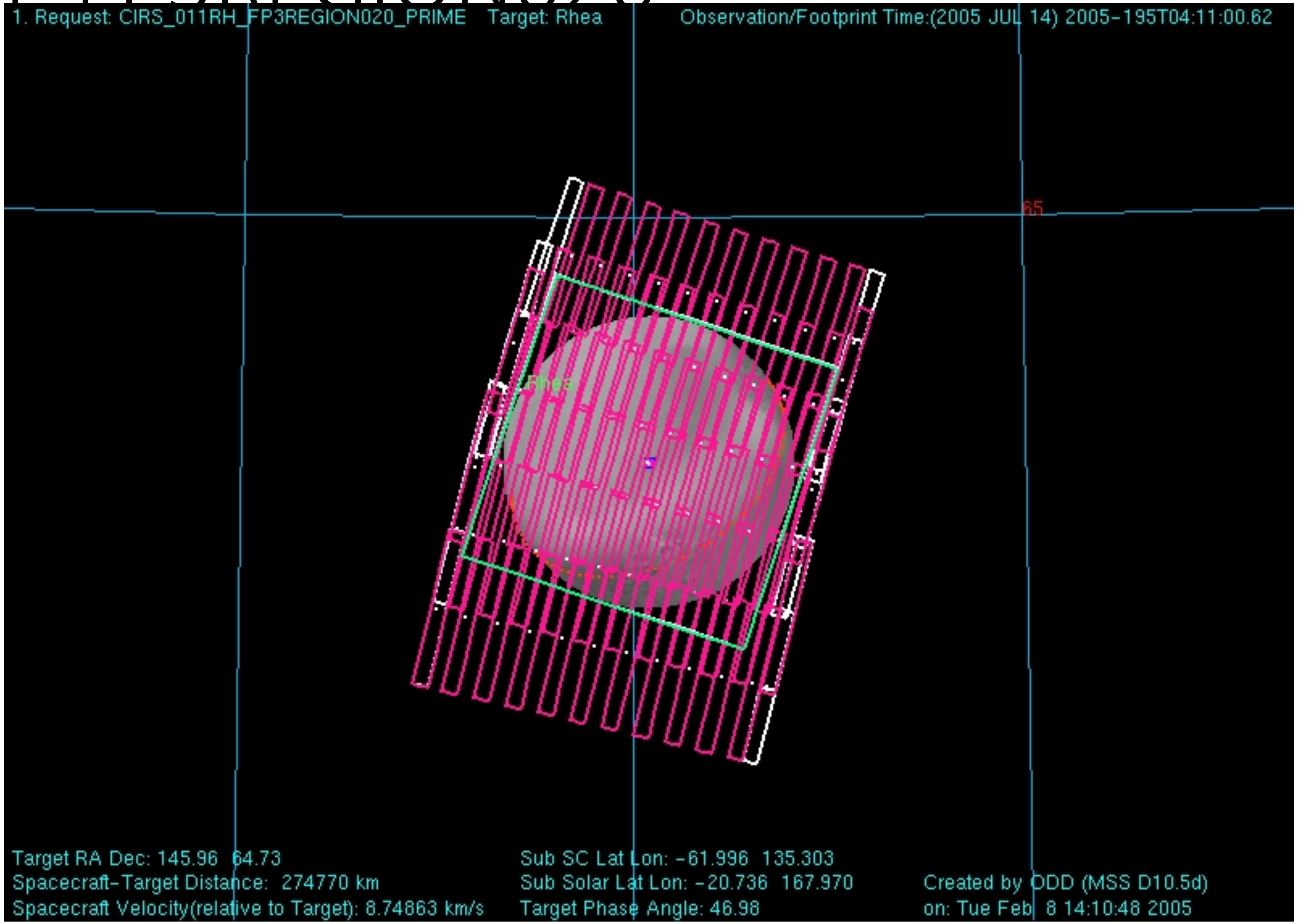
Enceladus Preview Meeting

July 8th 2005

Rev. 11/12 Goals

- Daytime temperature mapping of Rhea
- Daytime and nighttime temperature mapping of Enceladus
  - Look for hot spots
  - Try to get north polar winter temperature: one of the few opportunities during the tour
- Daytime temperature mapping of Mimas
- Opportunistic observations of Dione

011RH_FP3REGION020



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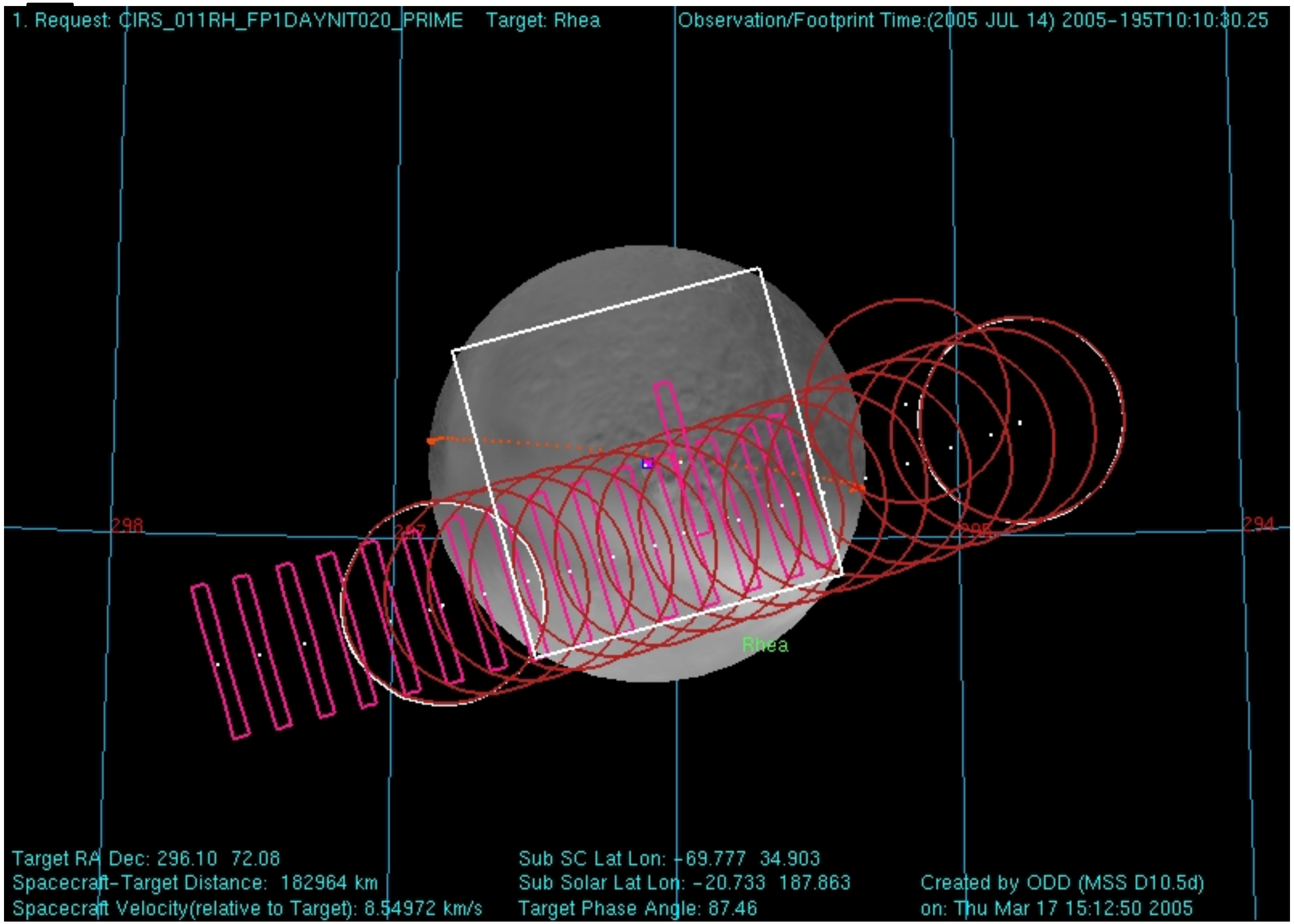

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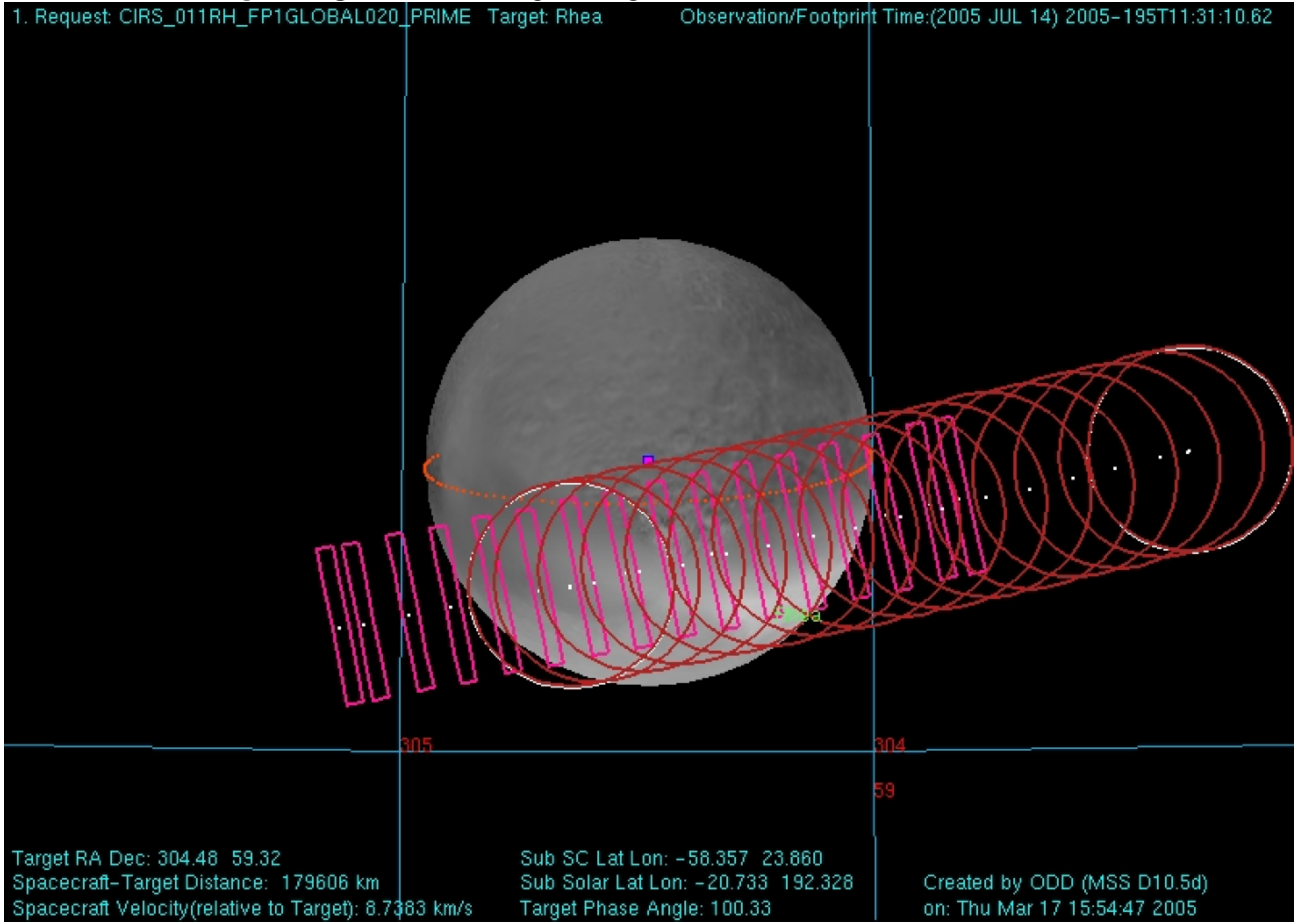

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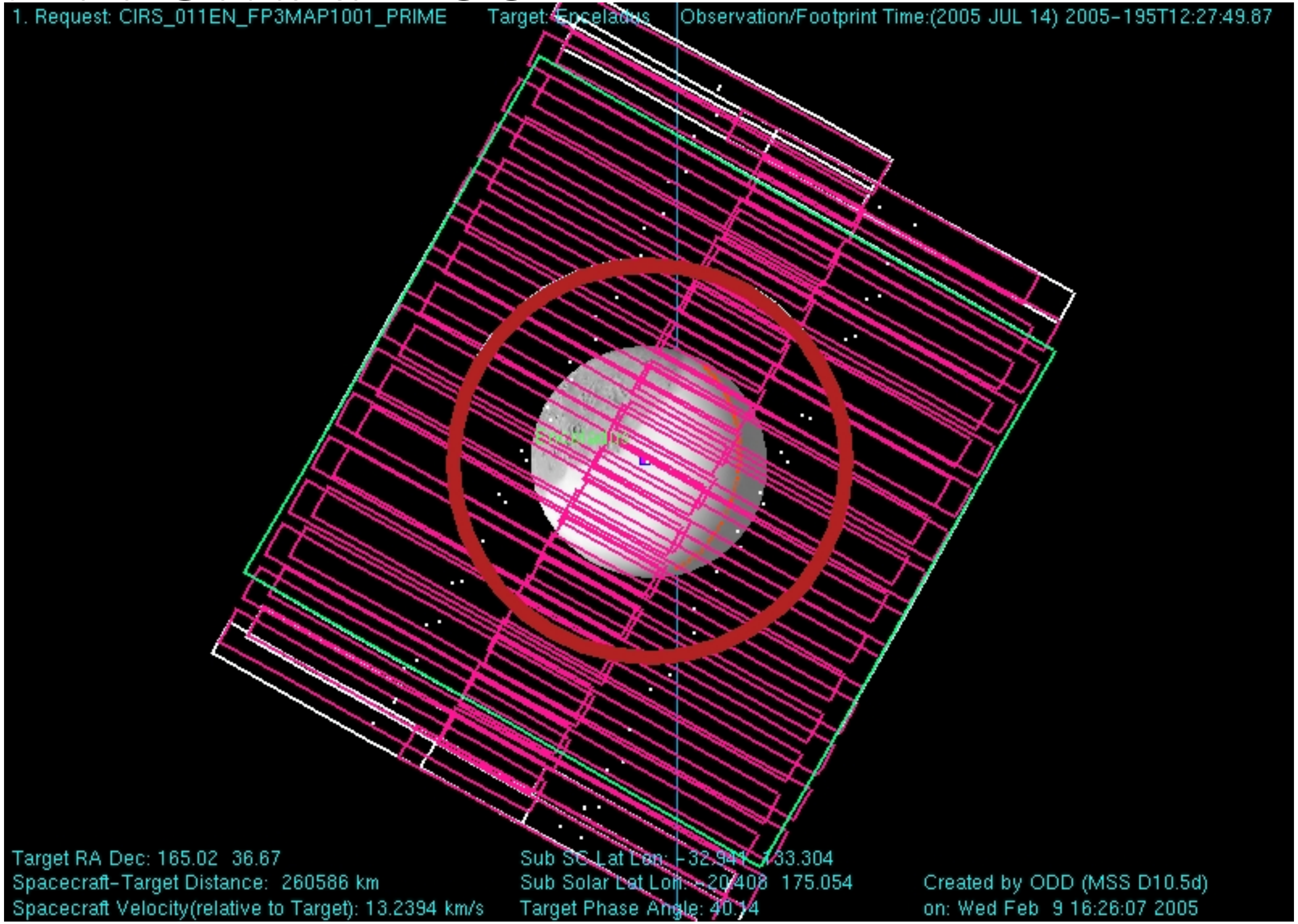

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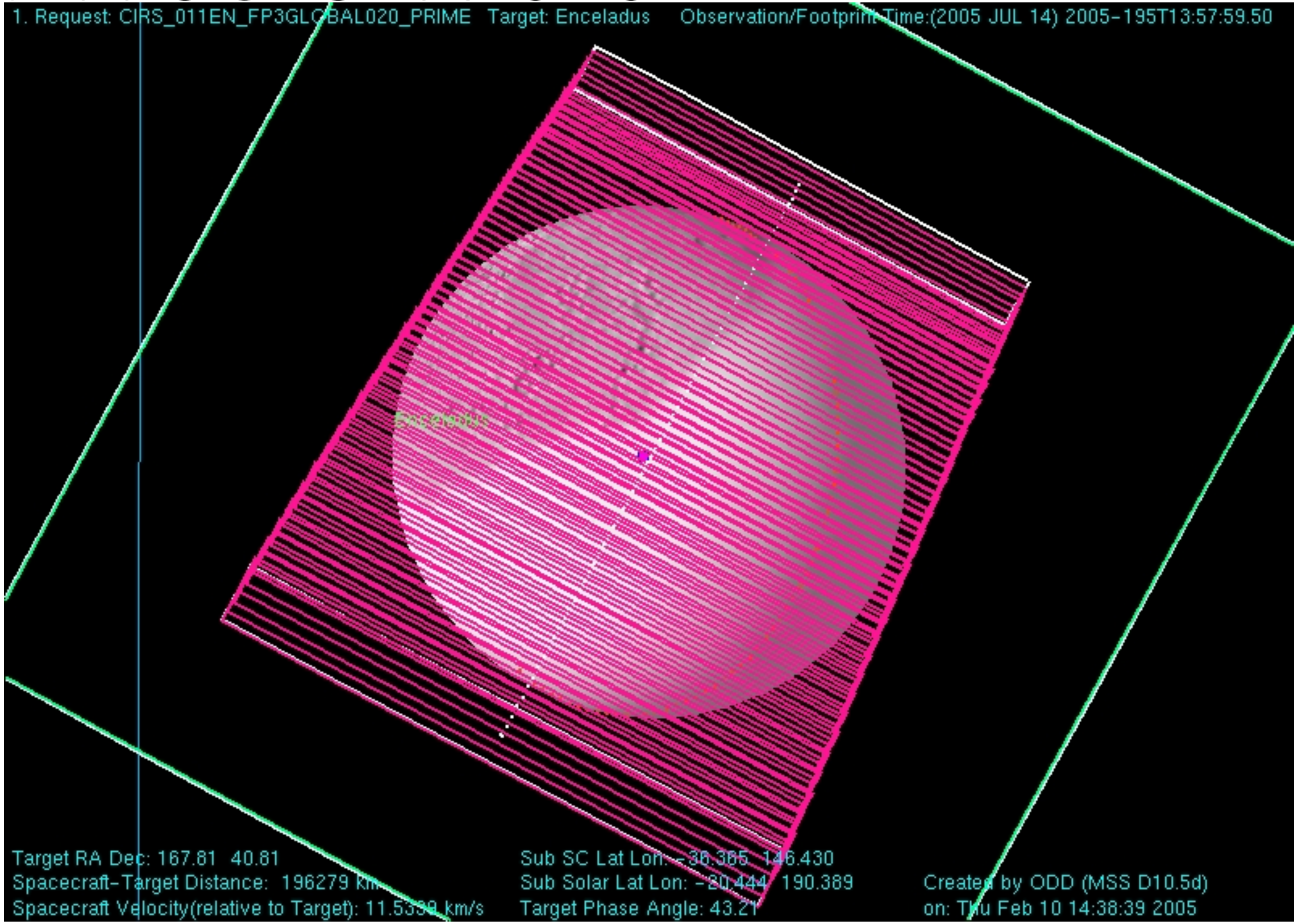

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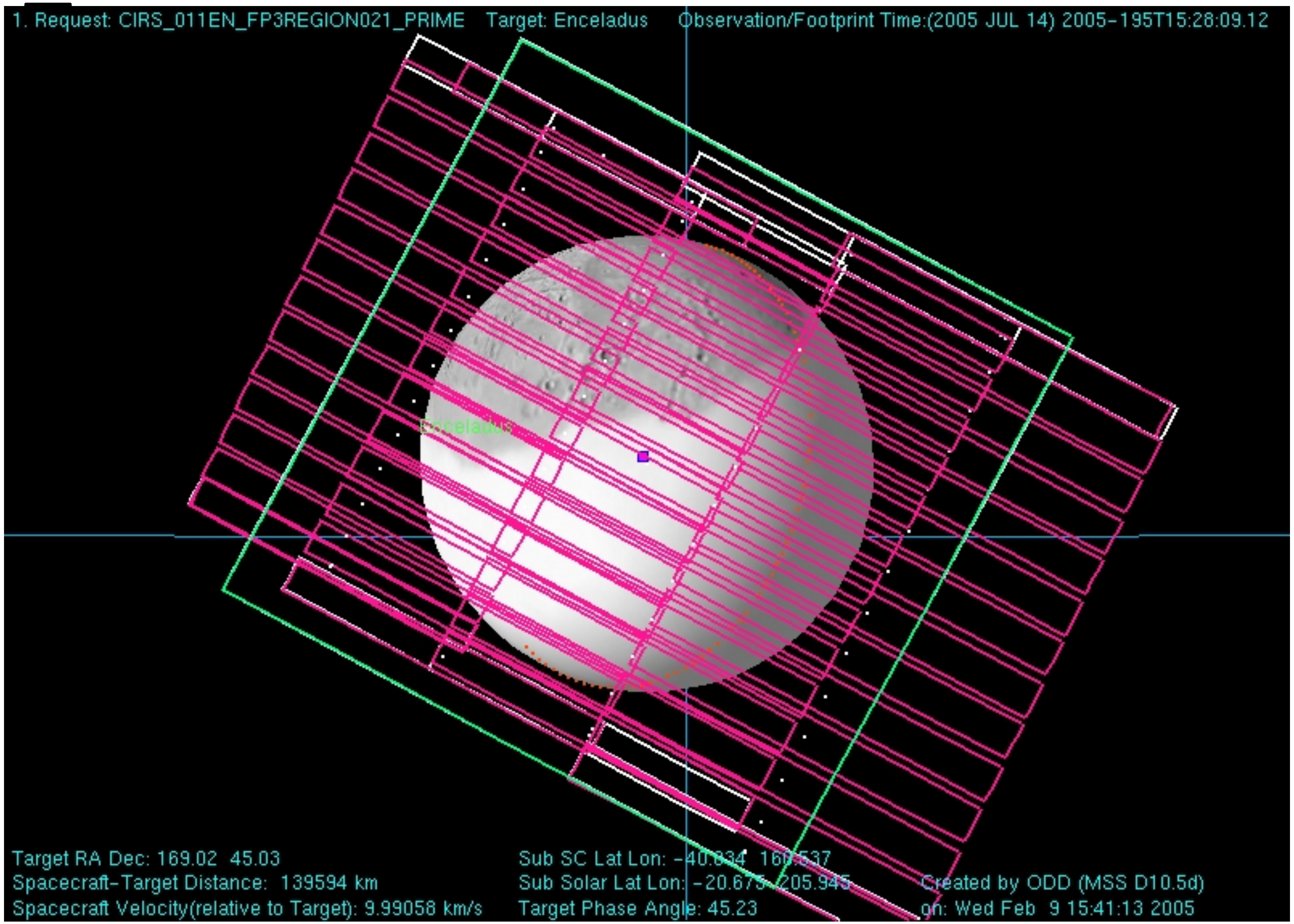

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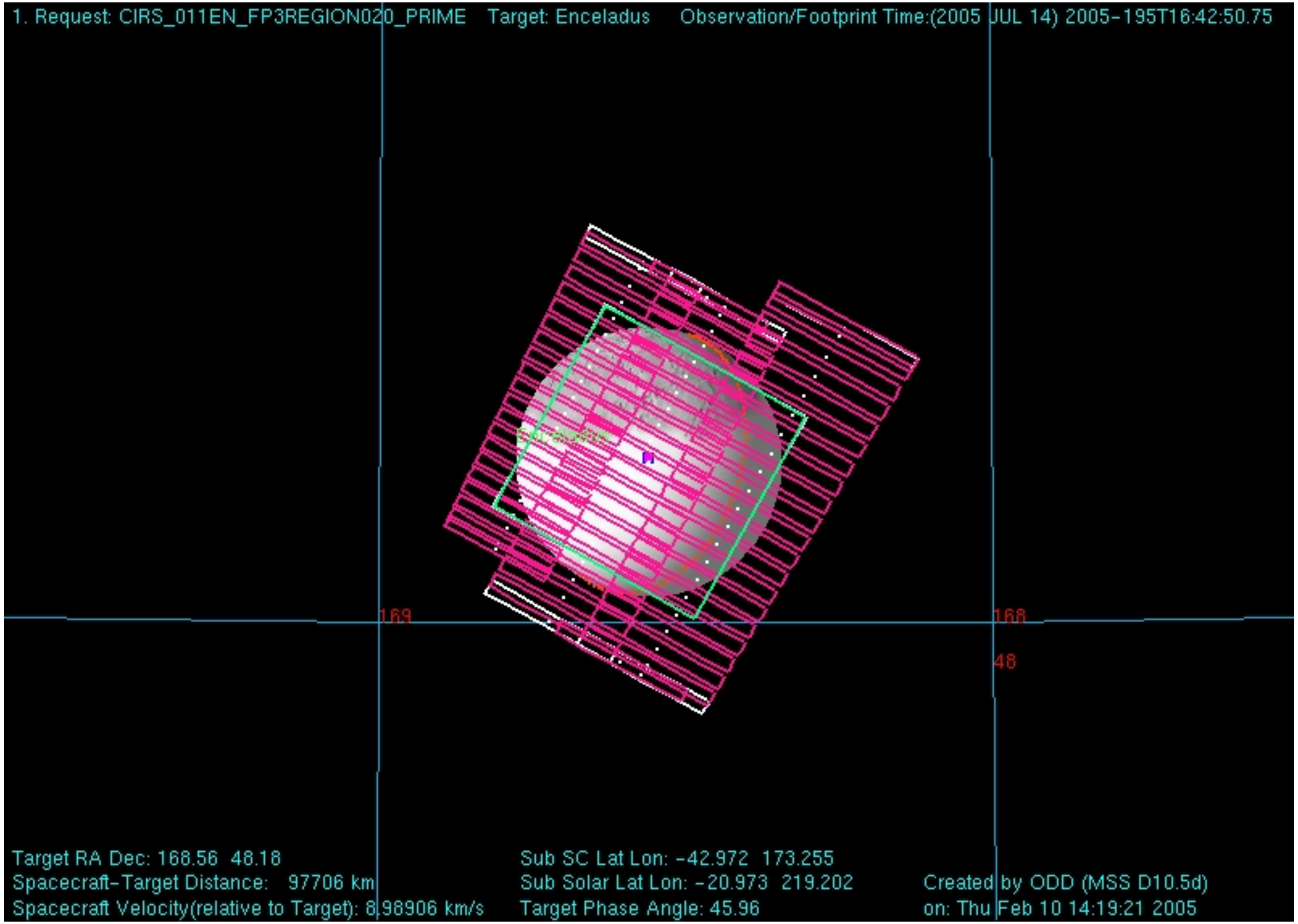

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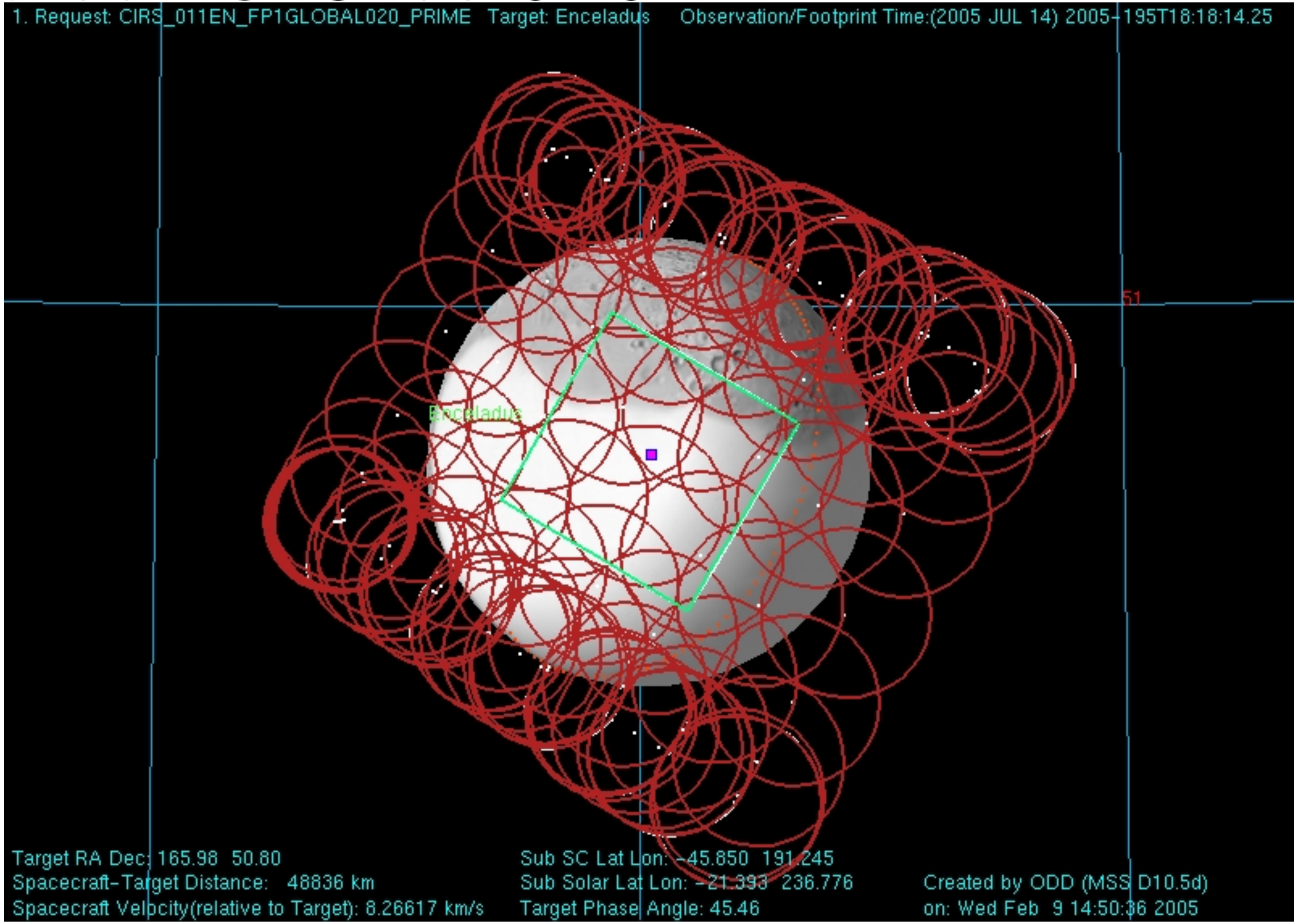

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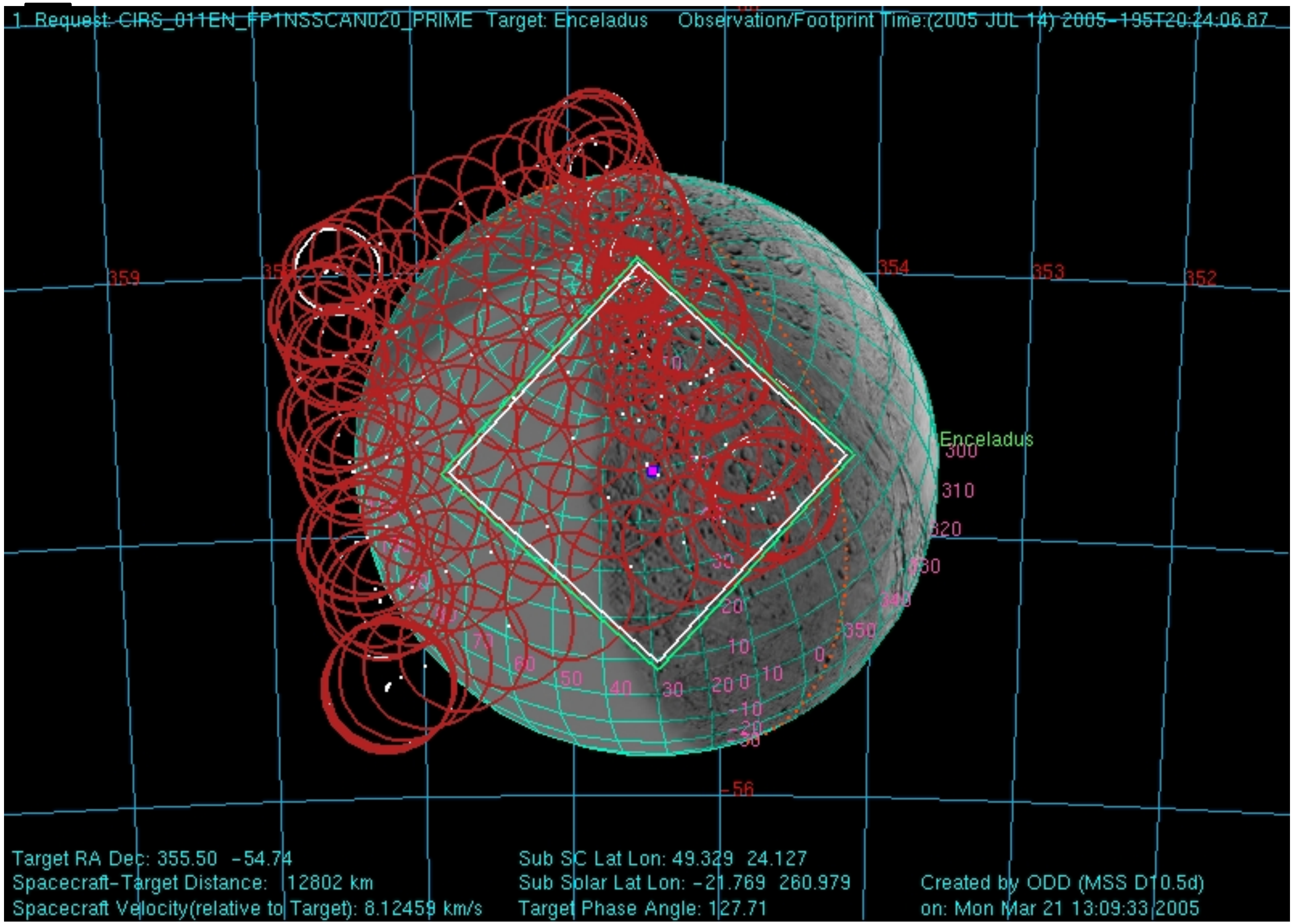

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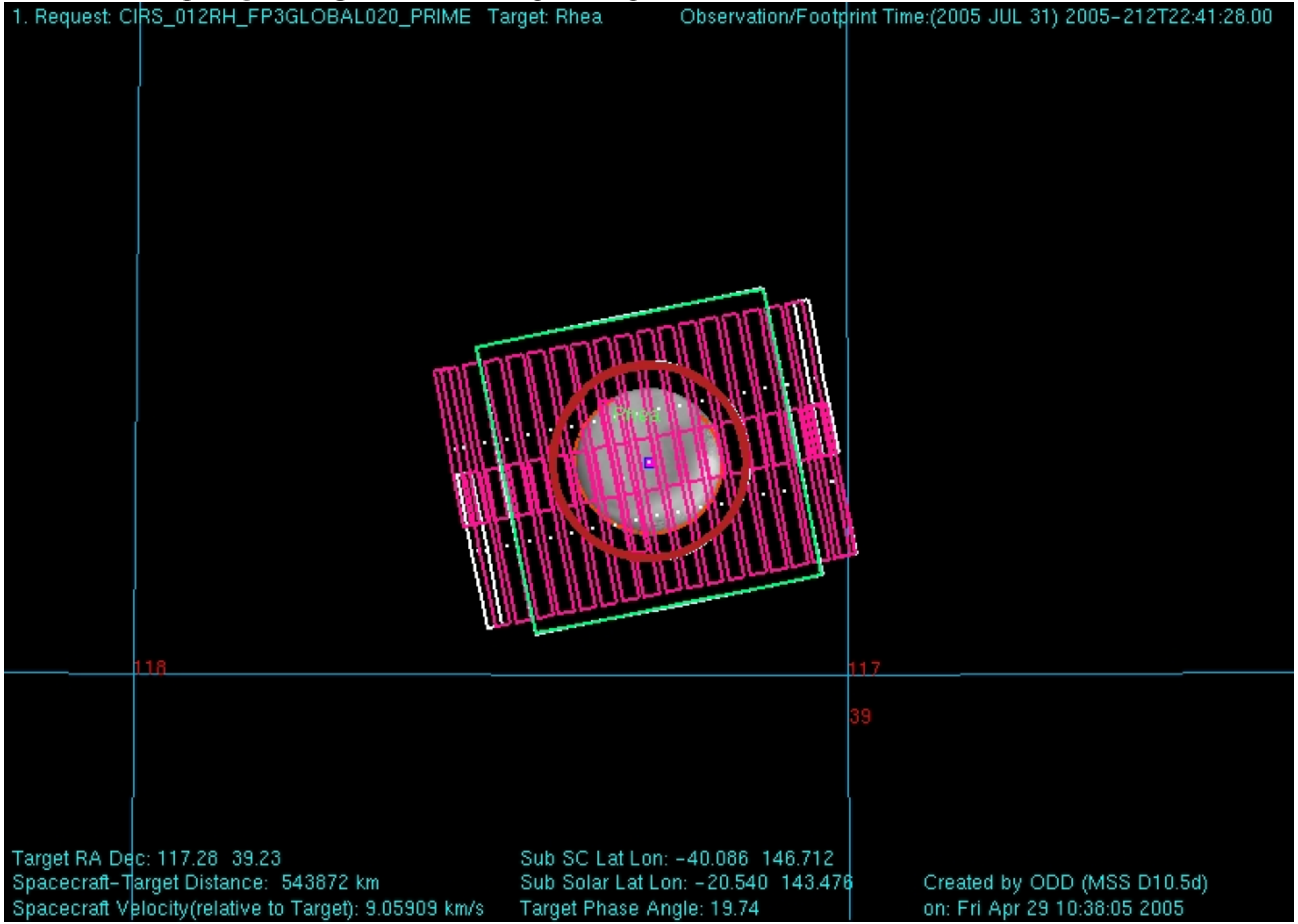

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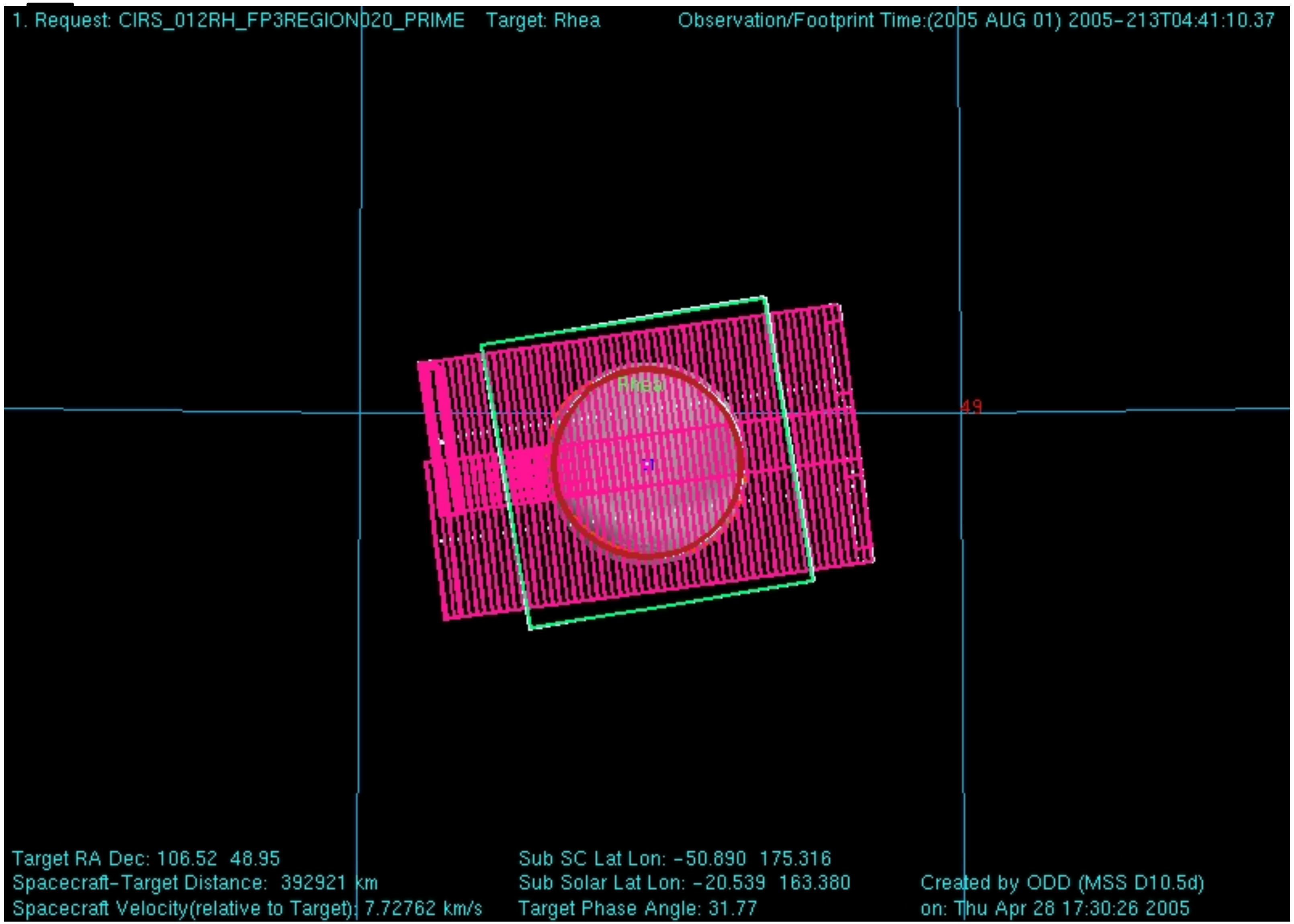
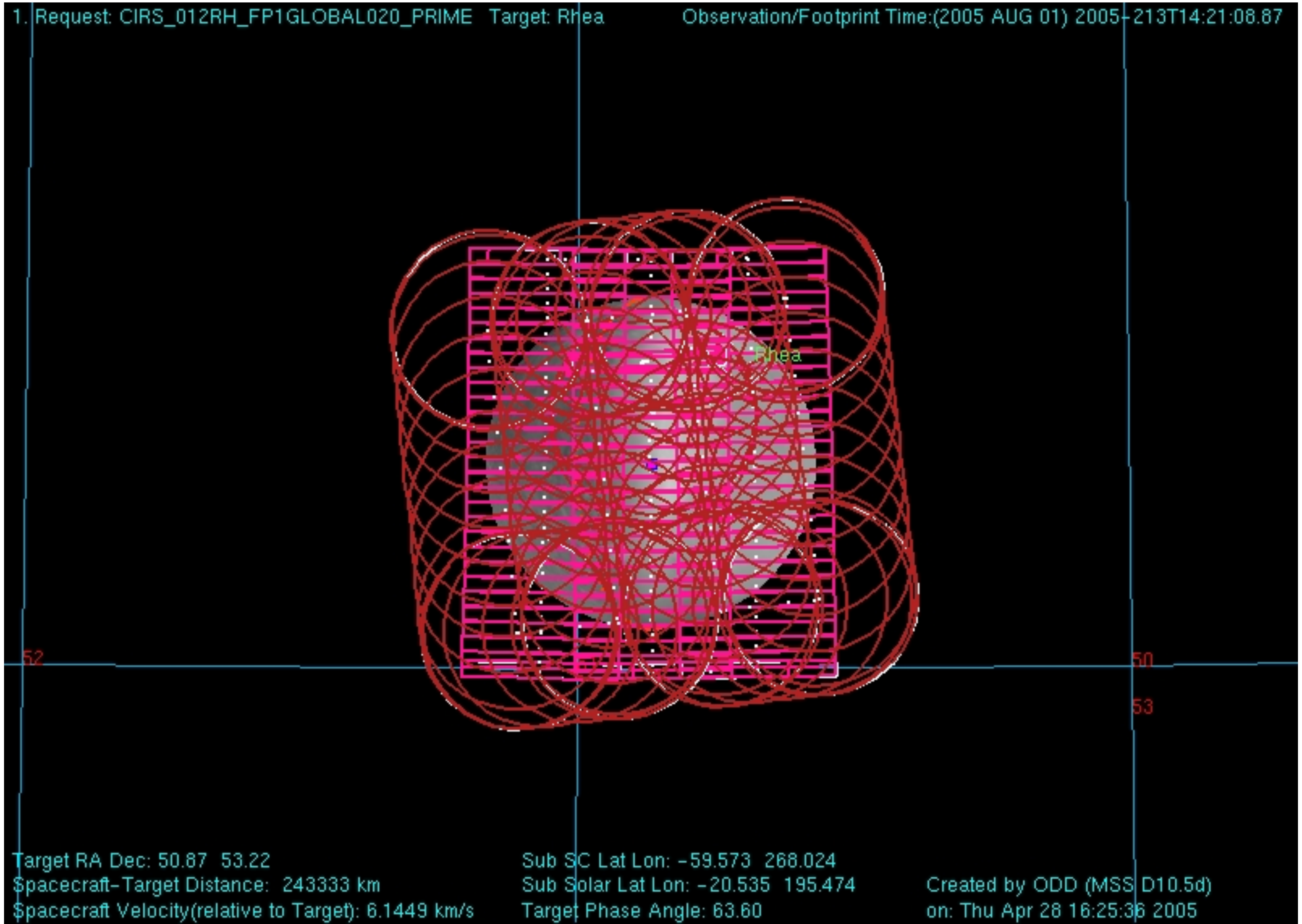


012RH_FP1GLOBAL020

S. polar / morning terminator



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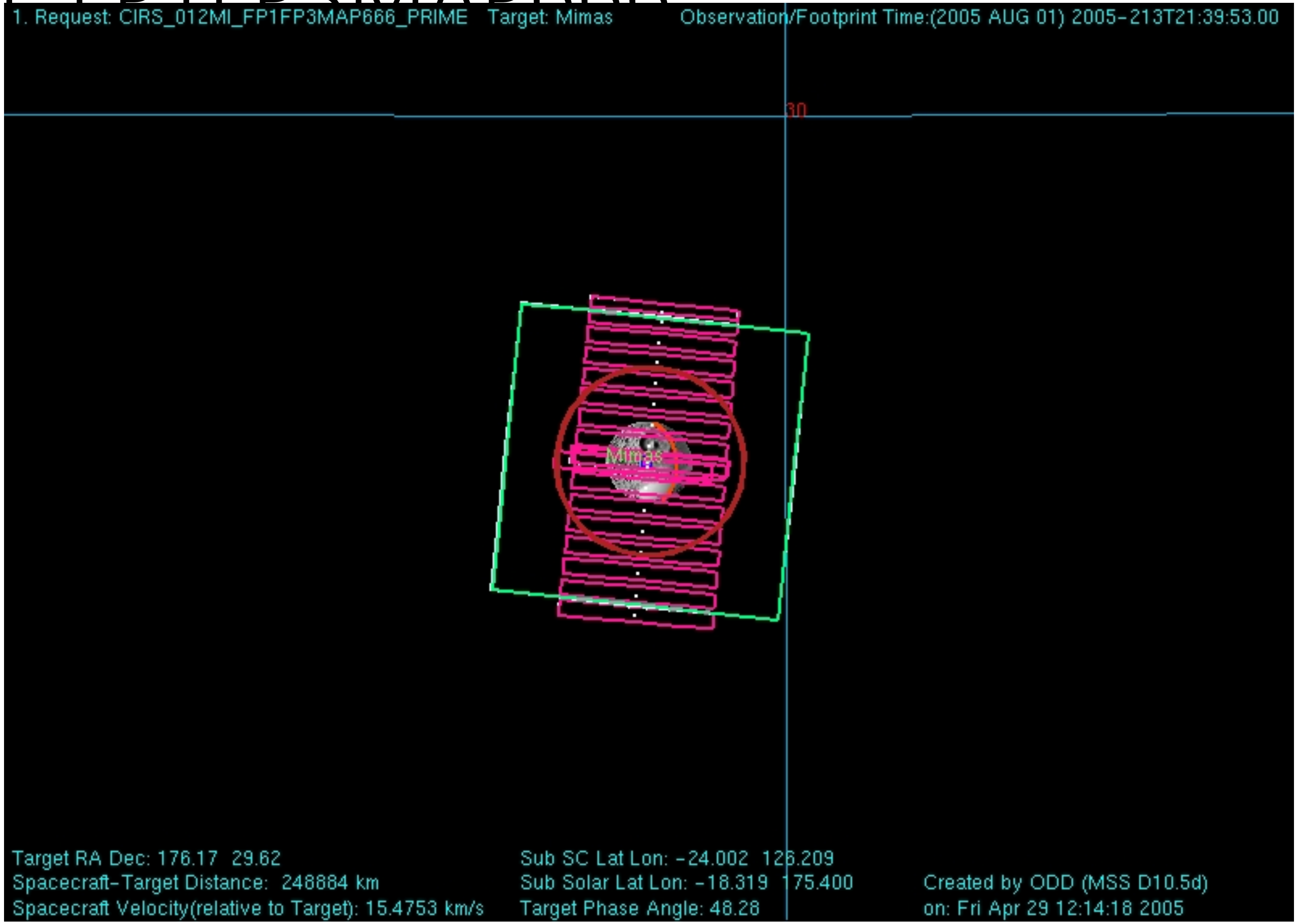

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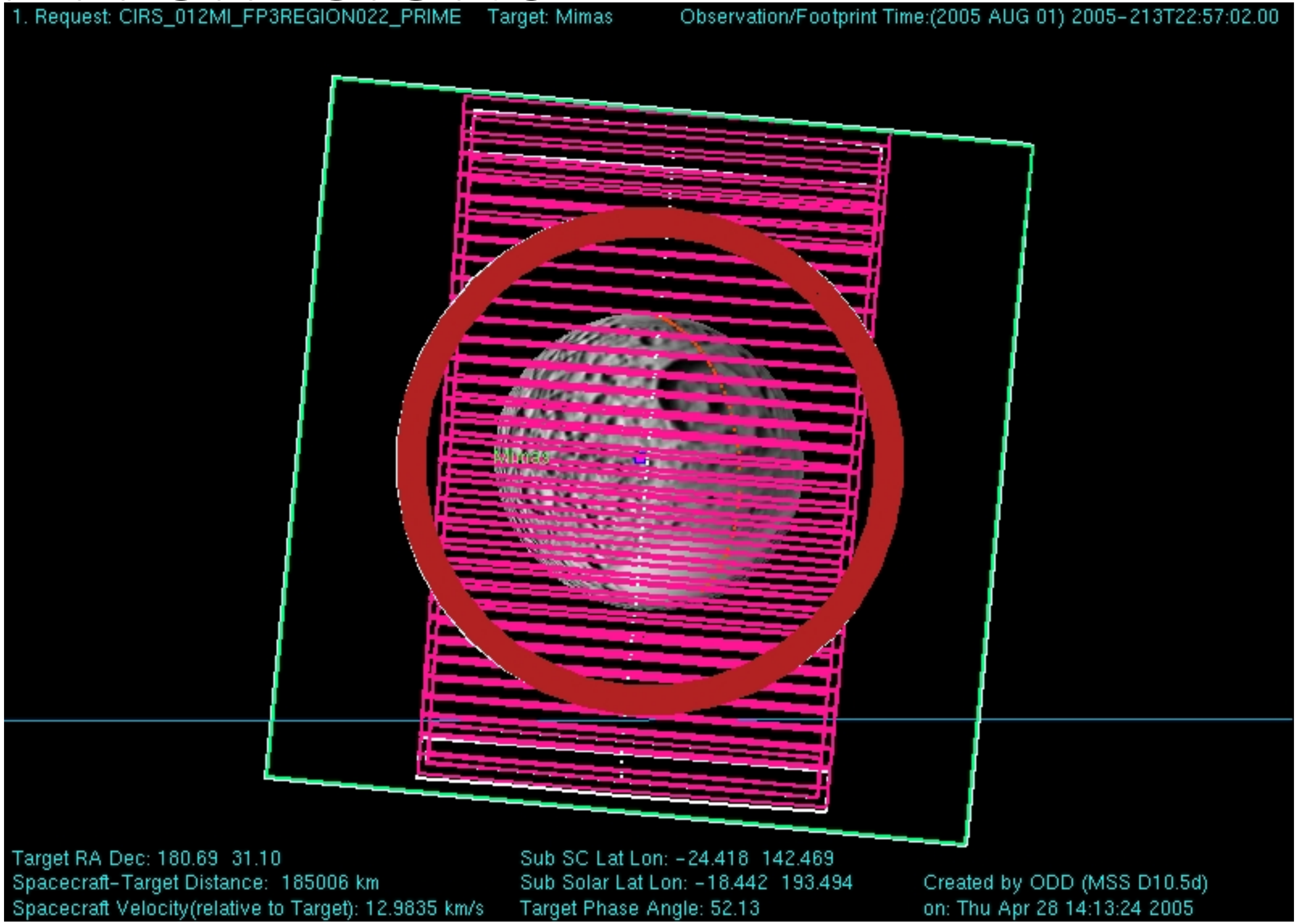

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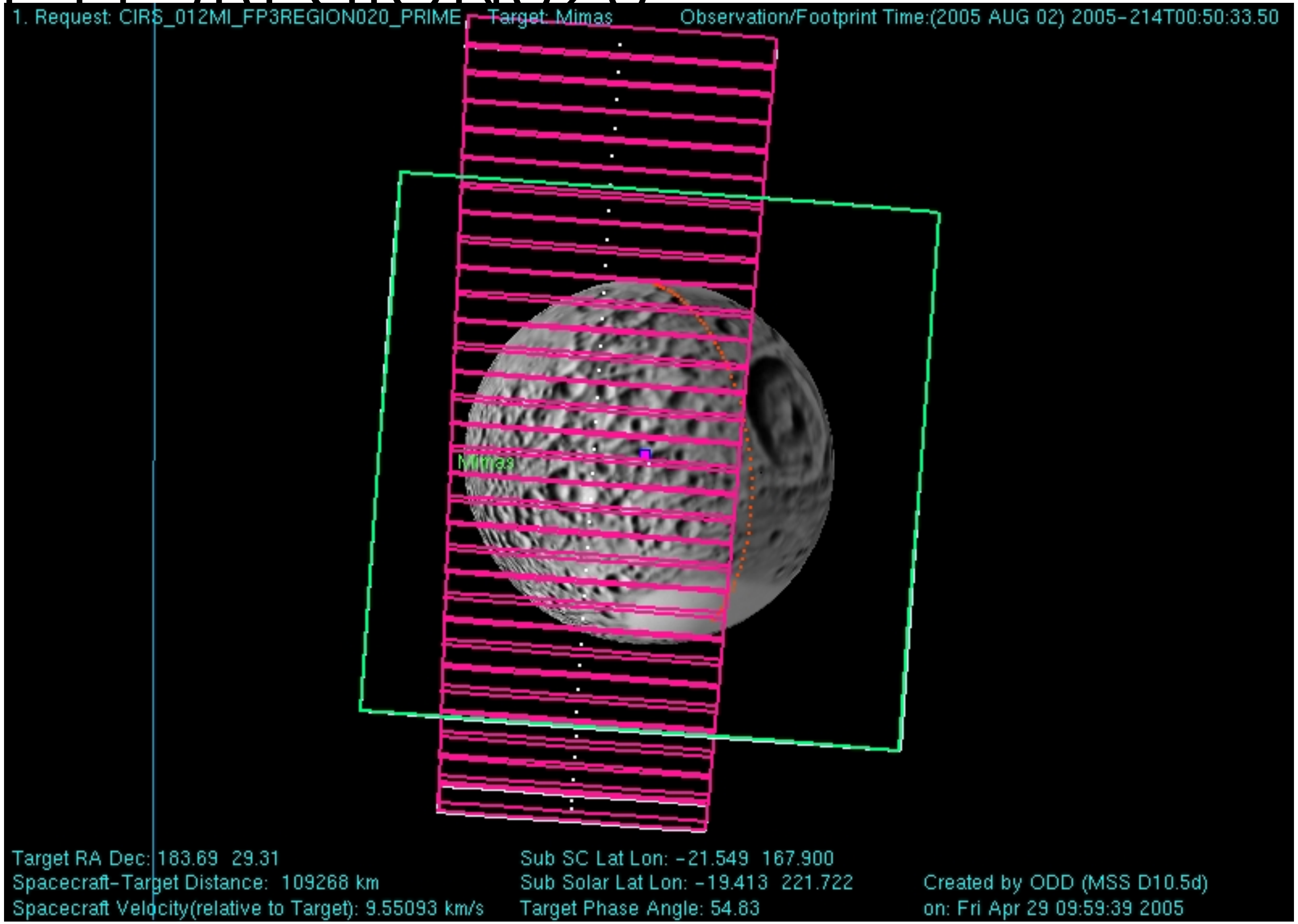

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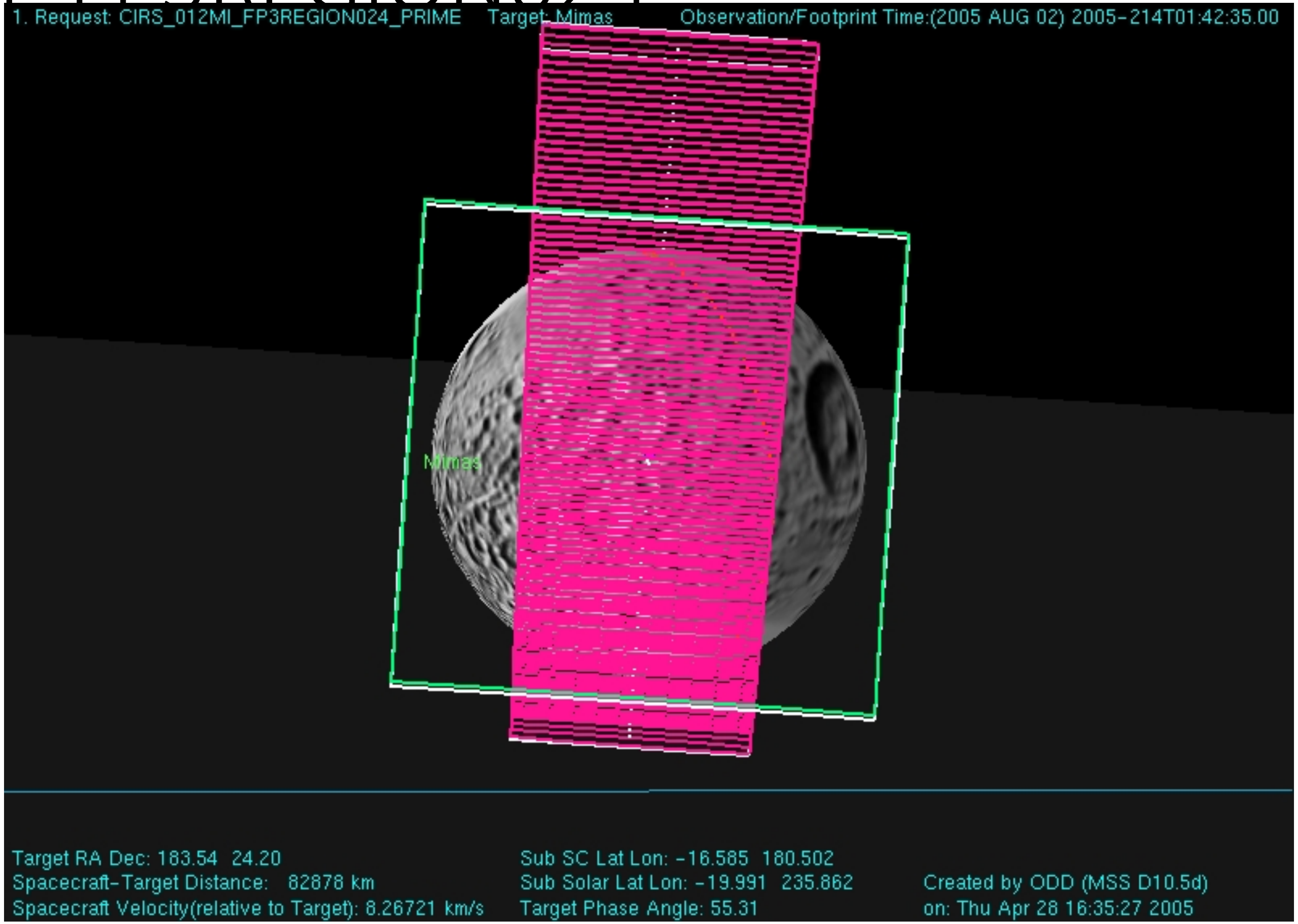

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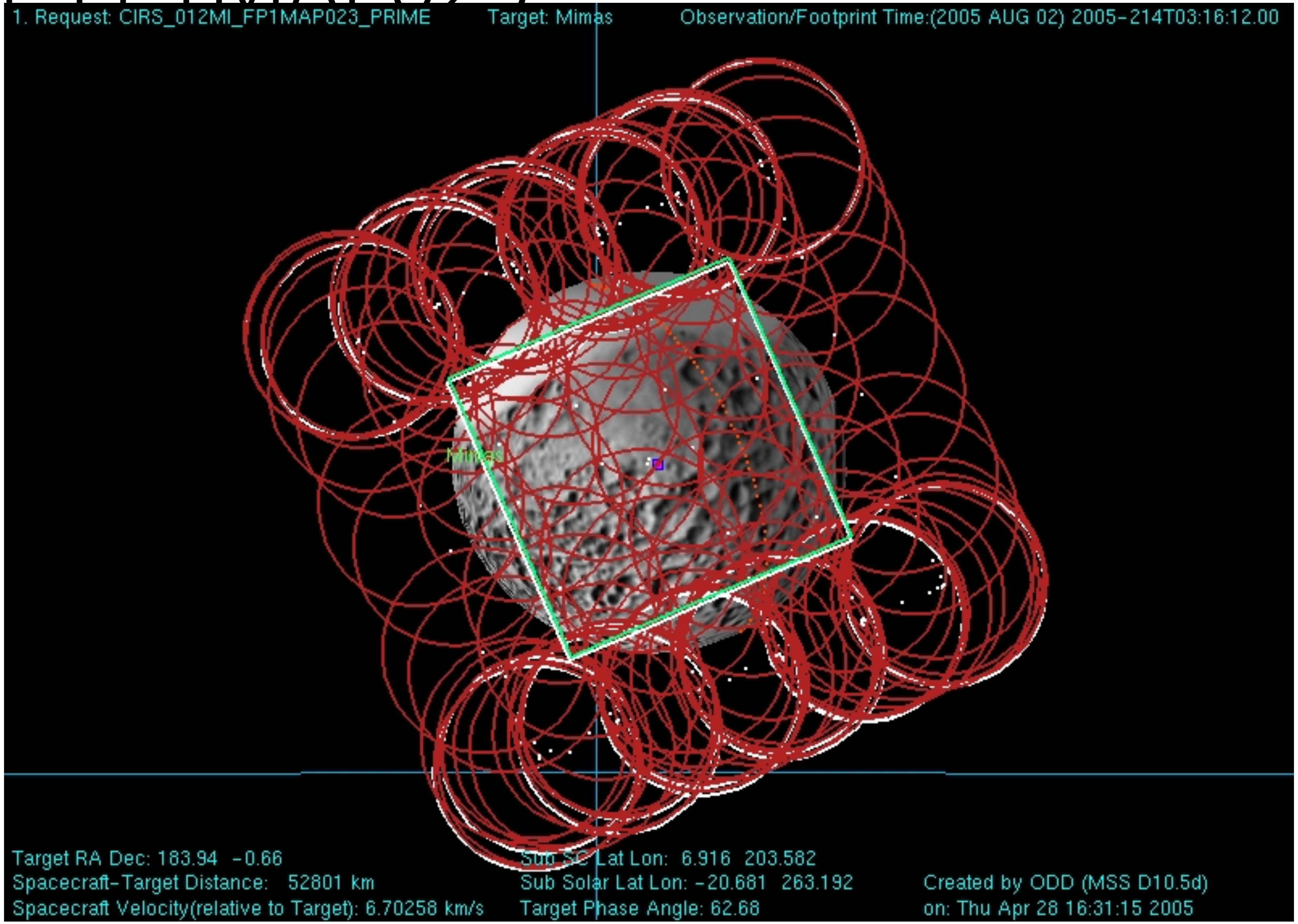

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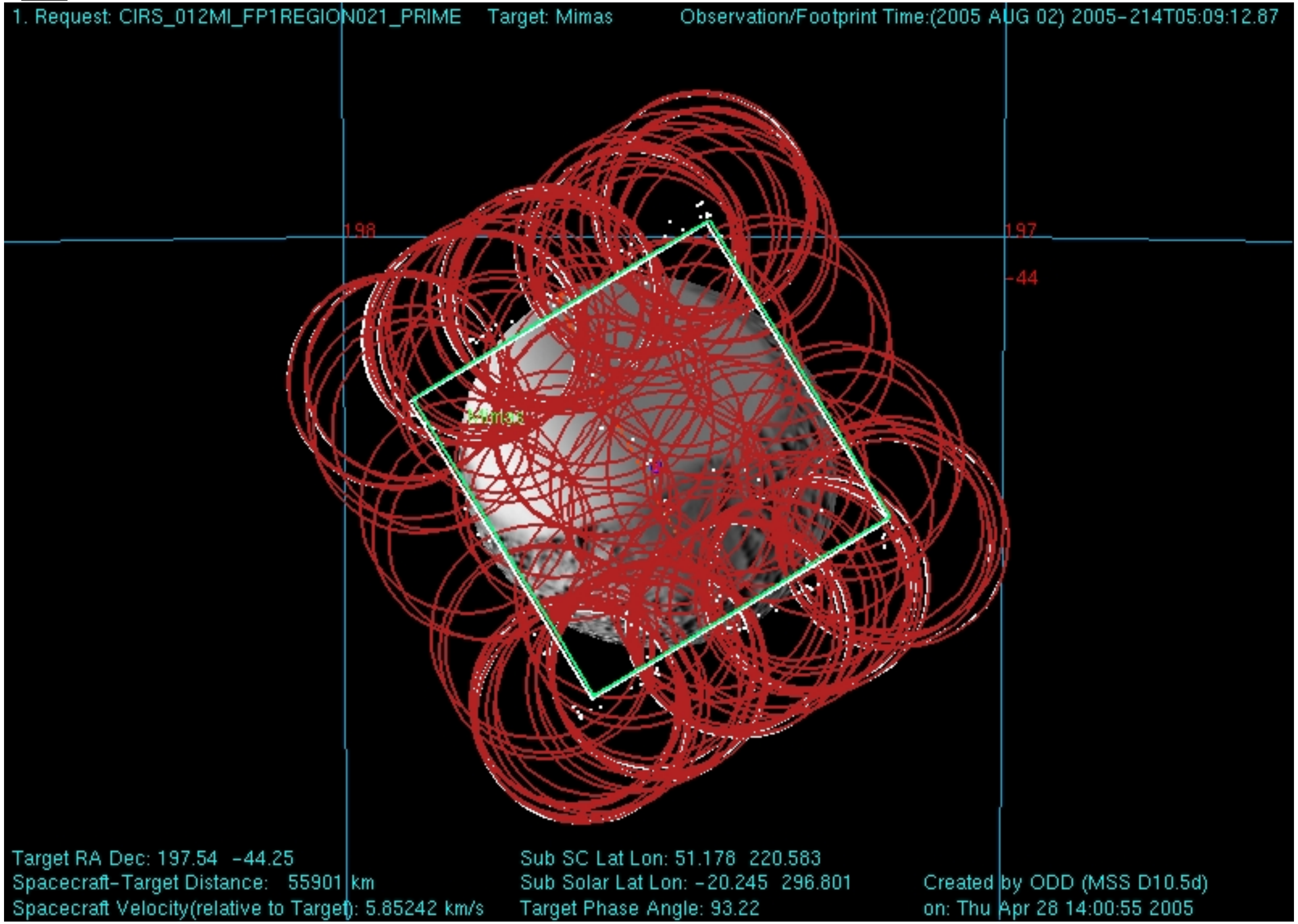

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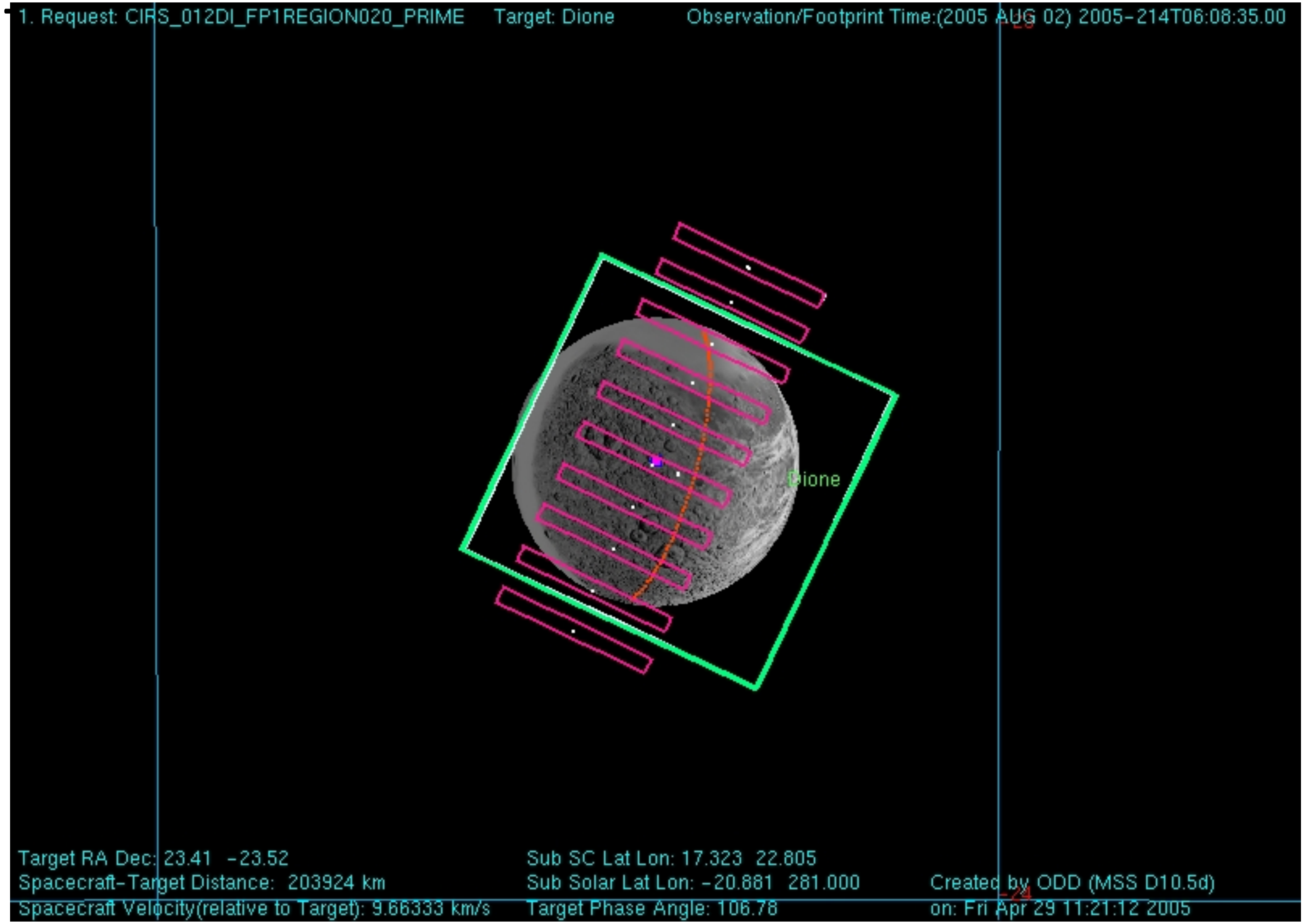


Rev 11

UVIS Science at Mimas and Enceladus

C. J. Hansen, A. Hendrix

8 July 2005

Science Objectives

- UVIS Icy Satellite Science Objectives are to Investigate

· Surface age and evolution

· Surface composition and chemistry

· Tenuous atmospheres / exospheres

Surface Age and Evolution

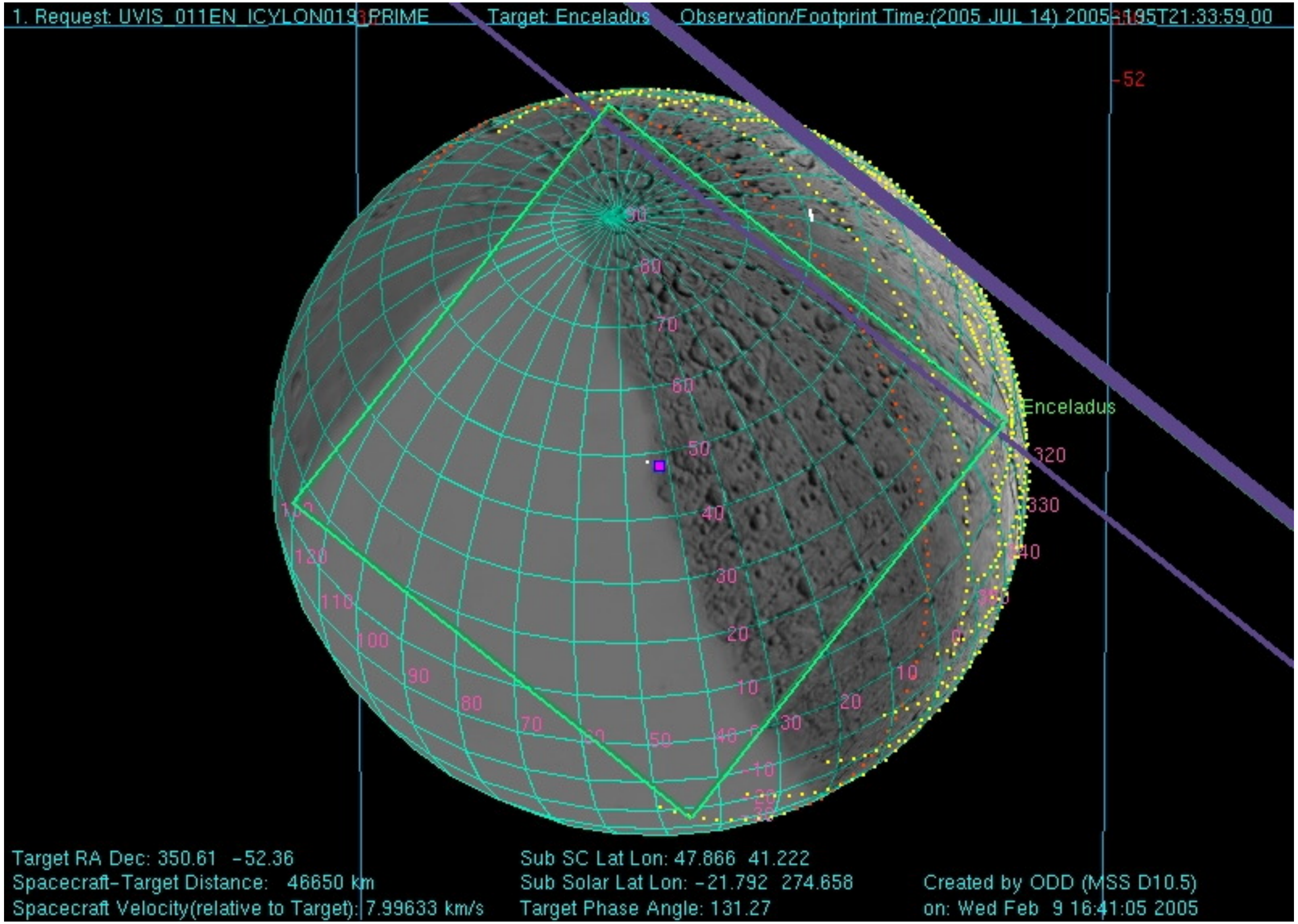
General

- The surface albedo of Saturn's icy satellites is affected by radiation and surface chemistry, and thus will vary with the amount of time a surface unit has been exposed to the magnetosphere's radiation and high energy particles. Leading / trailing side asymmetries are expected.
  - Also determined by nature of interactions (e.g. Ganymede radiation exposure affected by its own internal magnetic field)
- Moderate to high resolution global maps of the satellites orbiting in Saturn's magnetosphere will be used to analyze surface exposure, thus age. These global maps will be compared to Iapetus, Phoebe and Hyperion, which all orbit outside the magnetosphere.
- Surface microstructure will be investigated via the phase function. For example Voyager results on the albedo, color and photometric function properties of Enceladus show a degree of uniformity, regardless of surface age, that suggests the possibility of a thin ubiquitous layer of geologically fresh frost.

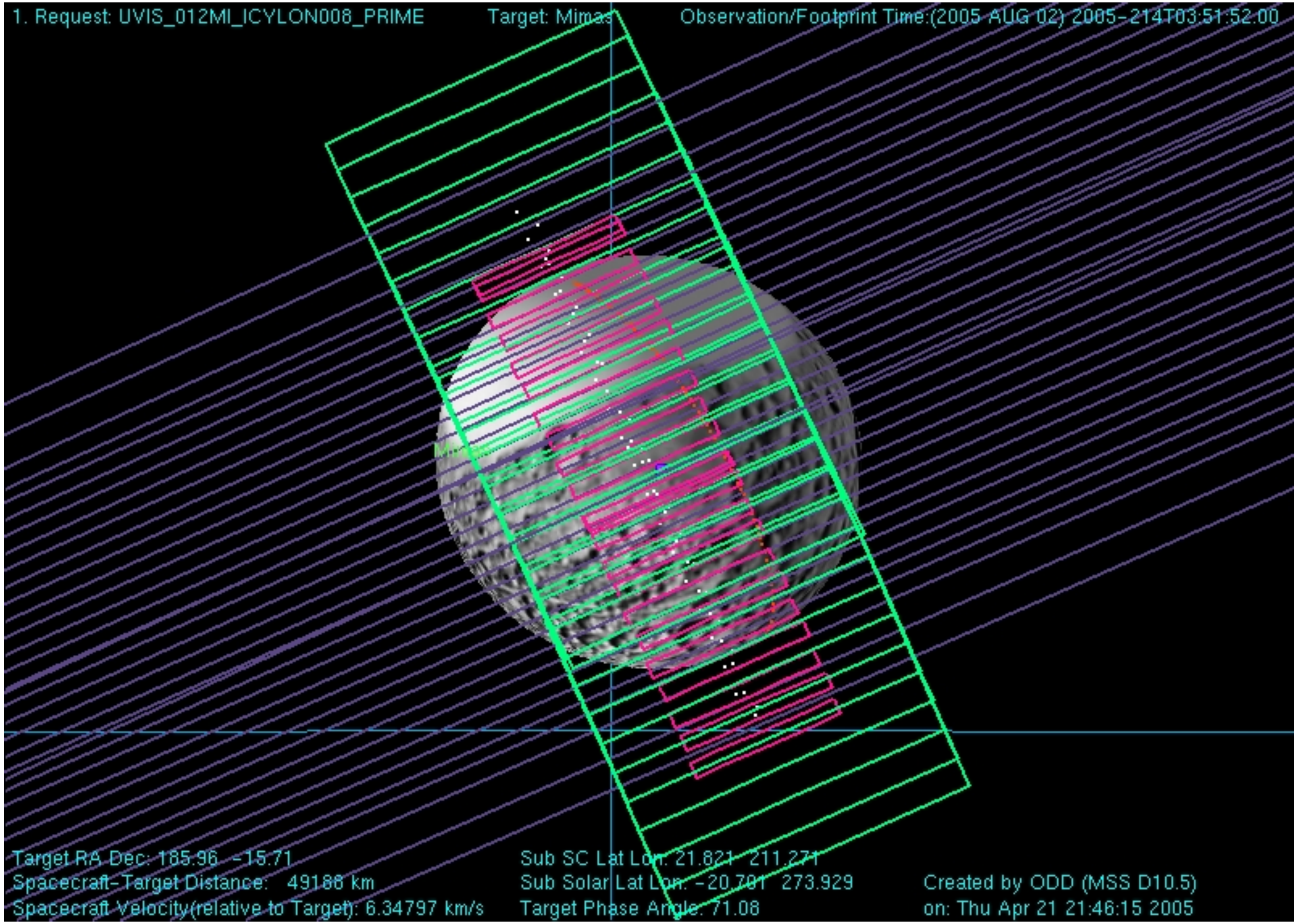
Enceladus and Mimas

- Images of Enceladus suggest an extreme level of surface modification regionally. Regions of very young and very old terrain will be compared. UVIS uv albedo maps will be produced. We will look for uv albedo differences that correlate to geologic ages derived from the imaging data. Mimas appears very ancient, but we will map it for comparison to the other satellites
- Albedo and phase function should give us insight into Mimas' and Enceladus' interaction with Saturn's E ring.

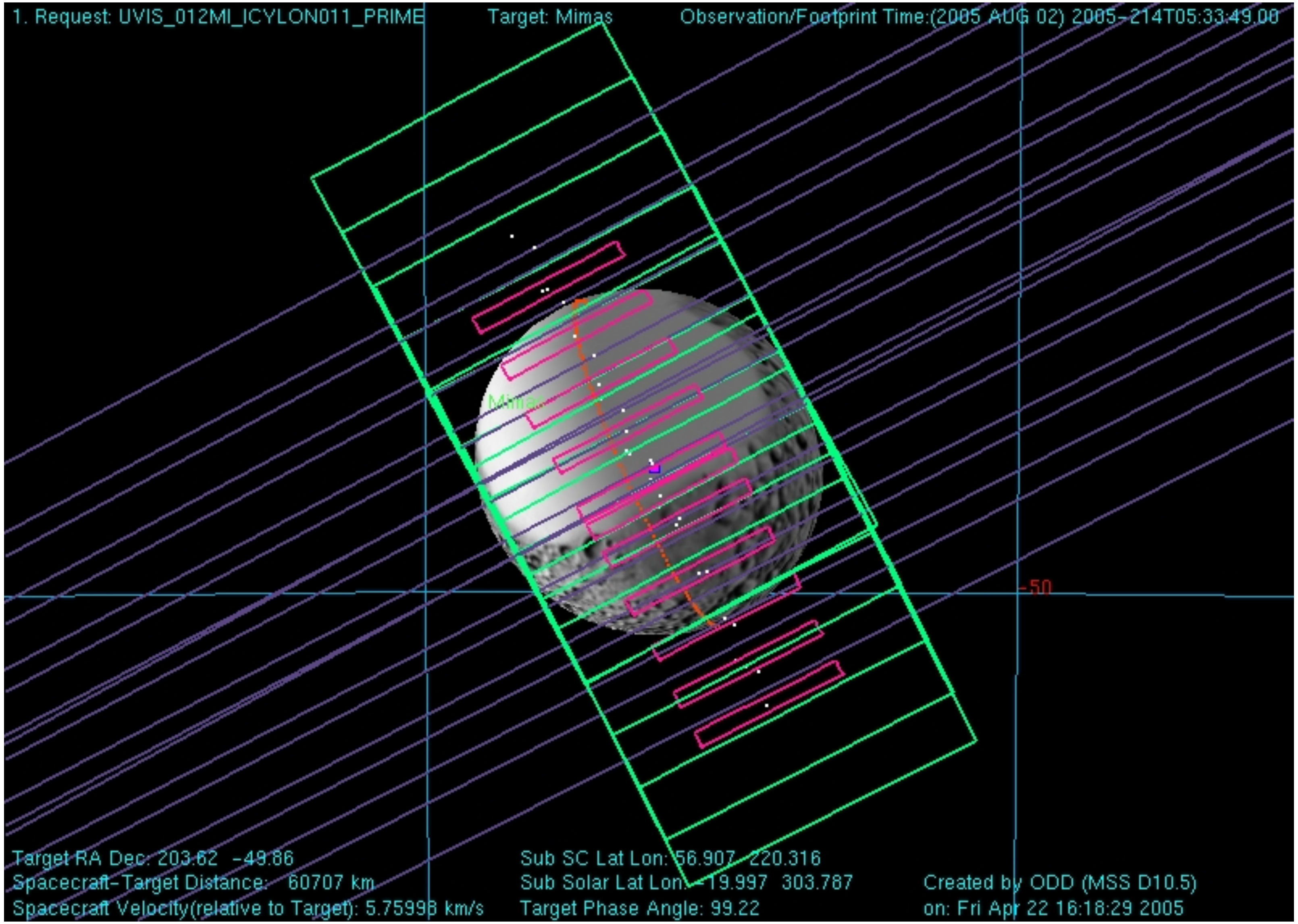
Enceladus Phase Function Example



Mimas Map Example



Mimas Map at higher phase



Surface Composition and Chemistry

General

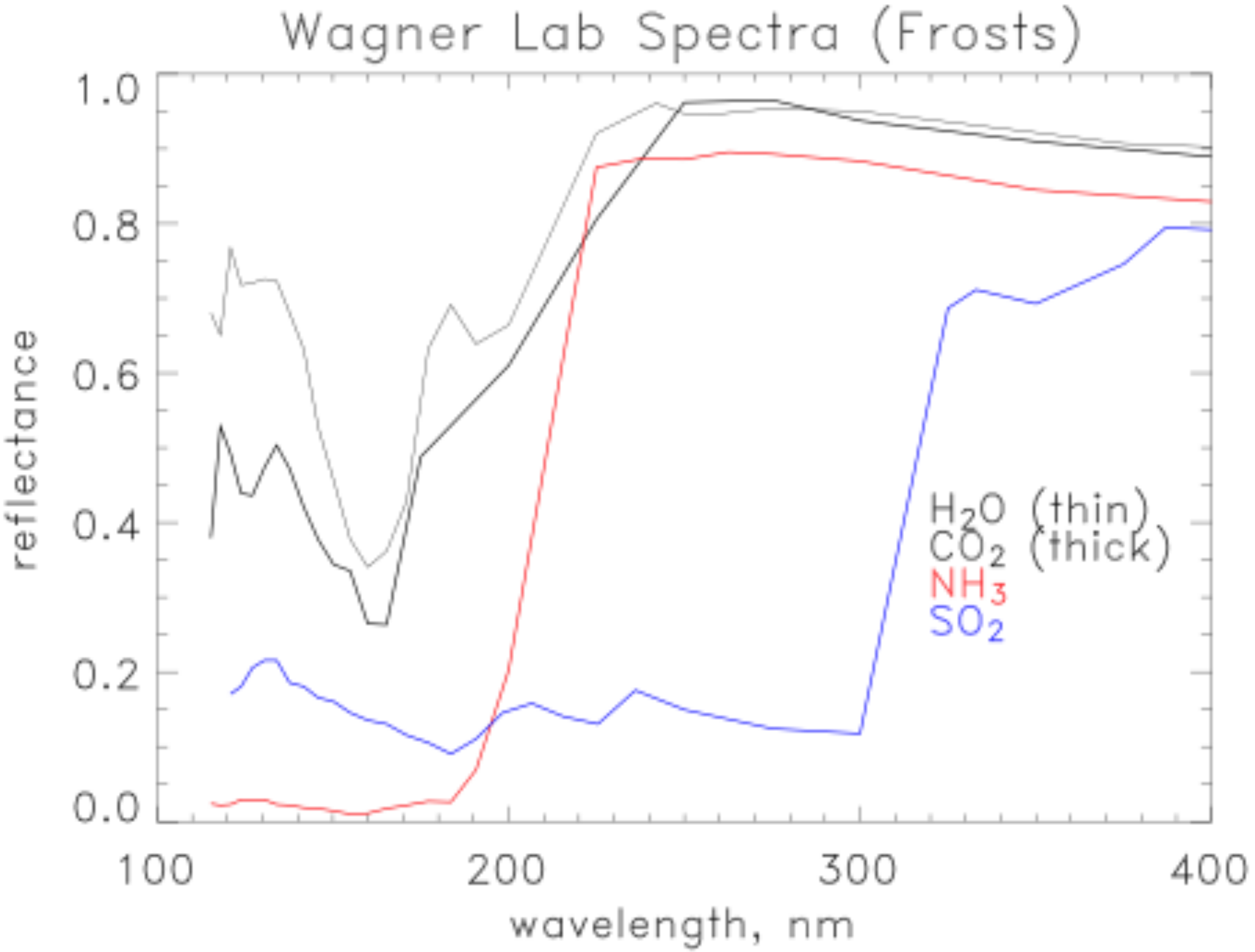
- Investigation of photolysis and radiolysis of water ice is currently a very active area of research, propelled by recent Galileo results, earth-based observations and laboratory work. UV radiation dissociates H_2O producing H, OH, H_2, O, and O_2. H and H_2 are quickly lost to thermal escape.
    - Surface composition and the existence of an atmosphere are affected by sputtering processes. Hydrogen peroxide was identified in the surface ice of Europa. Condensed O_2 has been detected at Ganymede. Spectral absorption suggestive of ozone has been detected by the Galileo UVS on Ganymede, and by HST on Ganymede, Rhea, and Dione. (Note however that these features are at longer uv wavelengths than the UVIS FUV channel.)
    - Cassini offers the opportunity to compare a suite of icy satellites even further from the sun than Jupiter's moons, in a different magnetospheric environment. Being able to compare surface ice oxygen chemistry at a variety of temperatures and radiation environments will help to investigate the process of evolution of surface composition.
- Theoretical and laboratory spectra of various ices are available (e.g. J. Wagner, G. Hansen, S. Warren) and can be compared to UVIS data to map surface composition. Water ice has been detected on all Saturnian satellites - we will show how the amount, distribution, and grain size varies.

Enceladus and Mimas

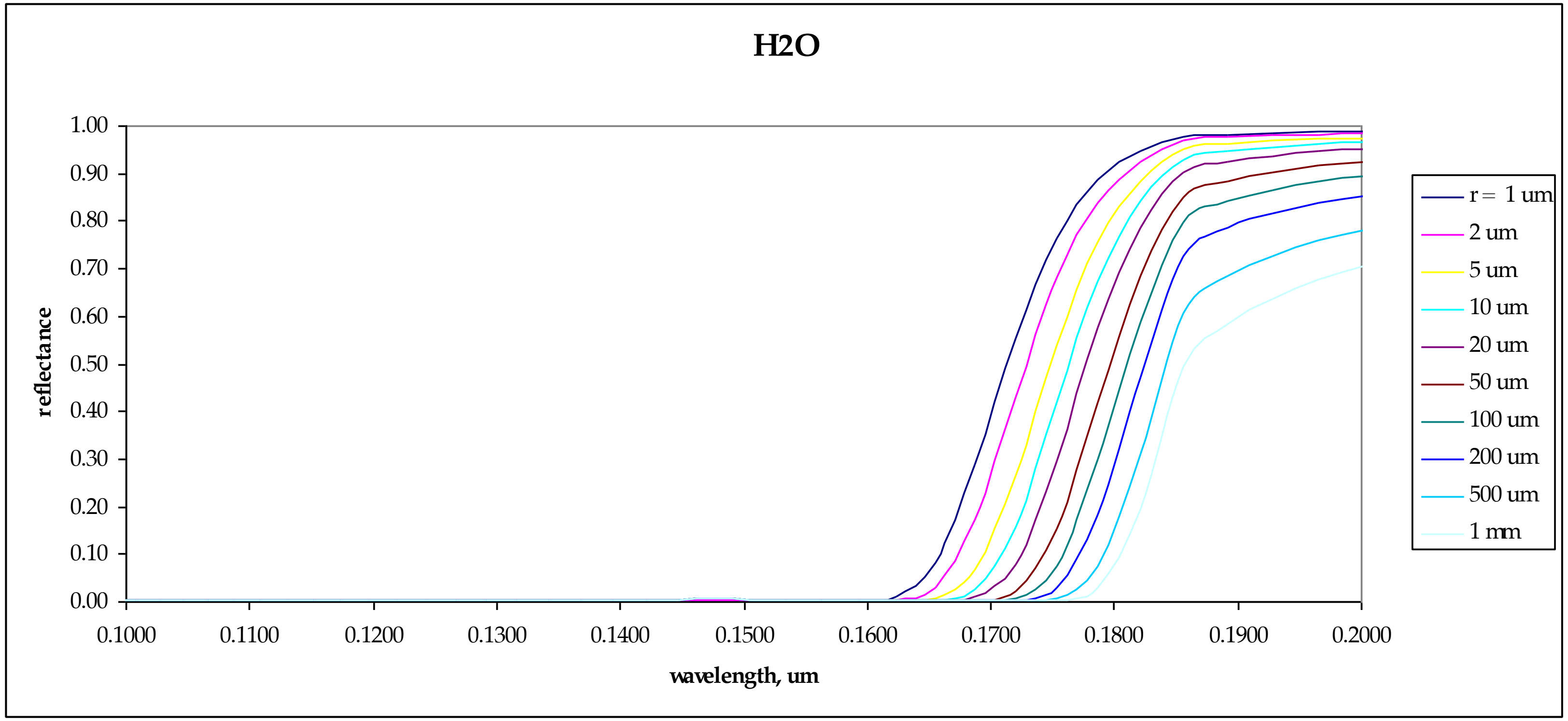
- Enceladus and Mimas are known to have a predominantly water-ice surfaces. The water spectrum has a distinct upturn at FUV wavelengths, at a wavelength determined by the ice grain size. Predominant grain size will give us insight into surface modification processes.
- UVIS reflectance spectra are at shorter wavelengths than the Galileo UVS so we will be searching for somewhat different constituents. UVIS spectra may show evidence of CO_2, ammonia, or other interesting species.

UV Spectra of Candidate Materials

(Wagner, Hapke, Wells, 1987)

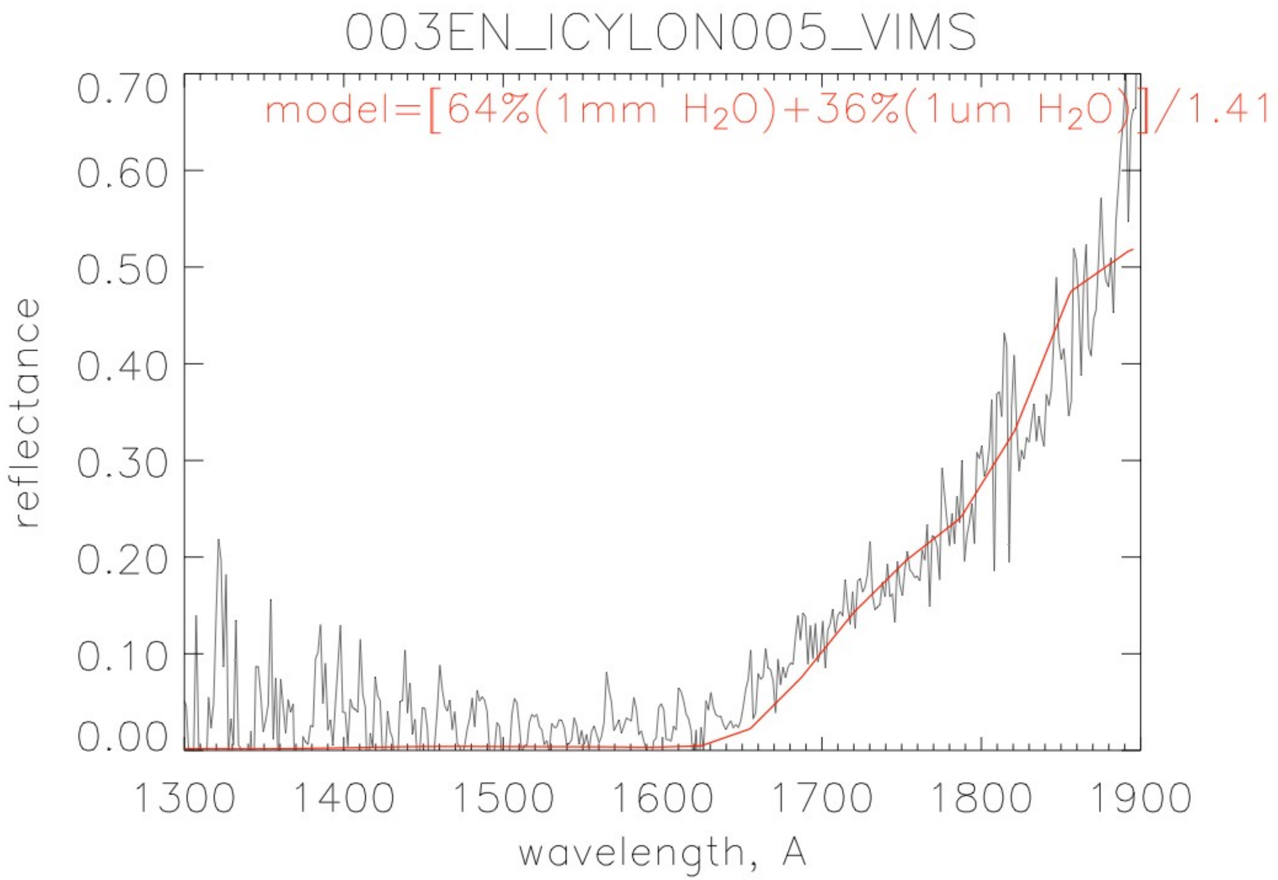


Water Ice Spectra, used for grain size discrimination

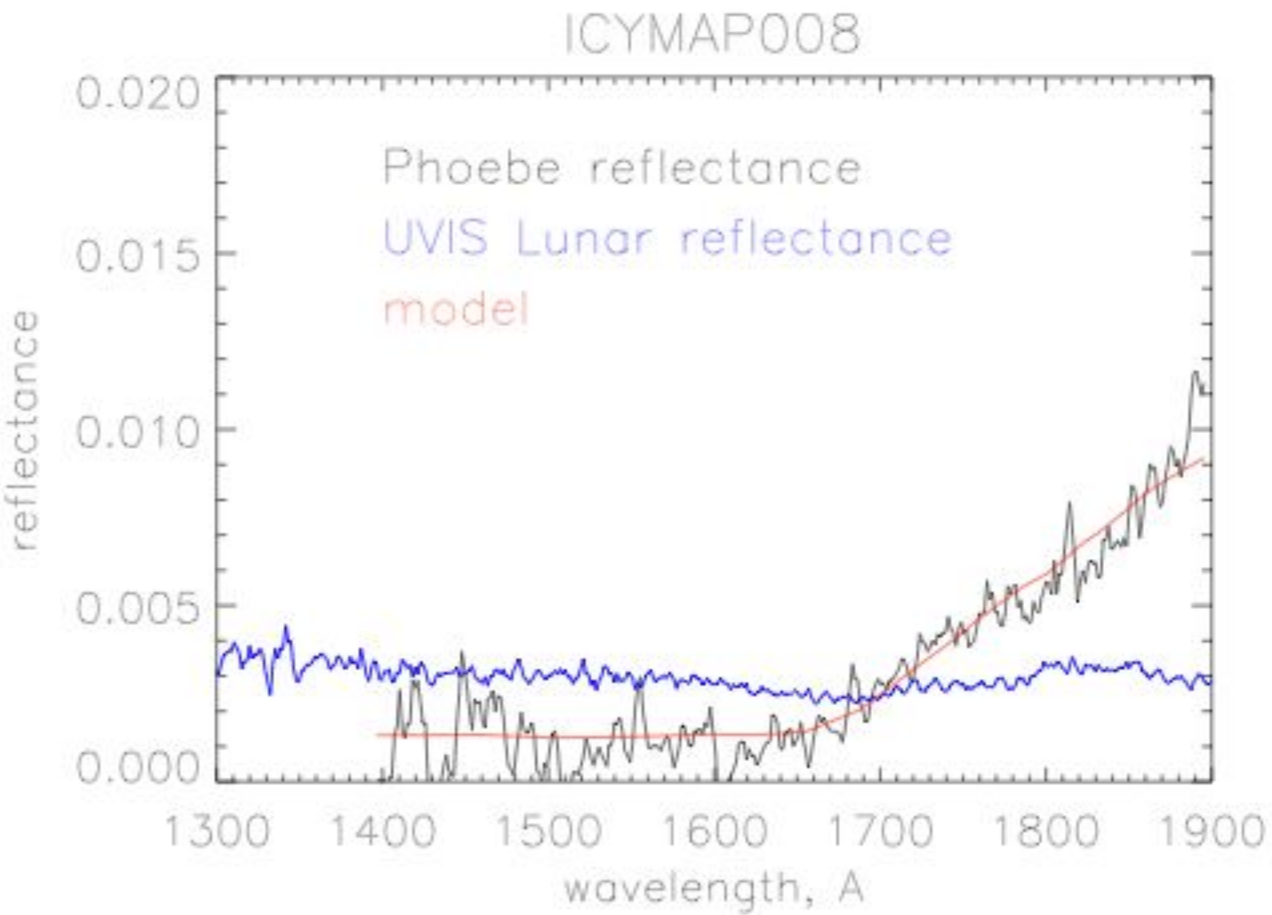


Spectra provided by Gary Hansen, combination of lab work and theoretical constraints

Enceladus Grain Size

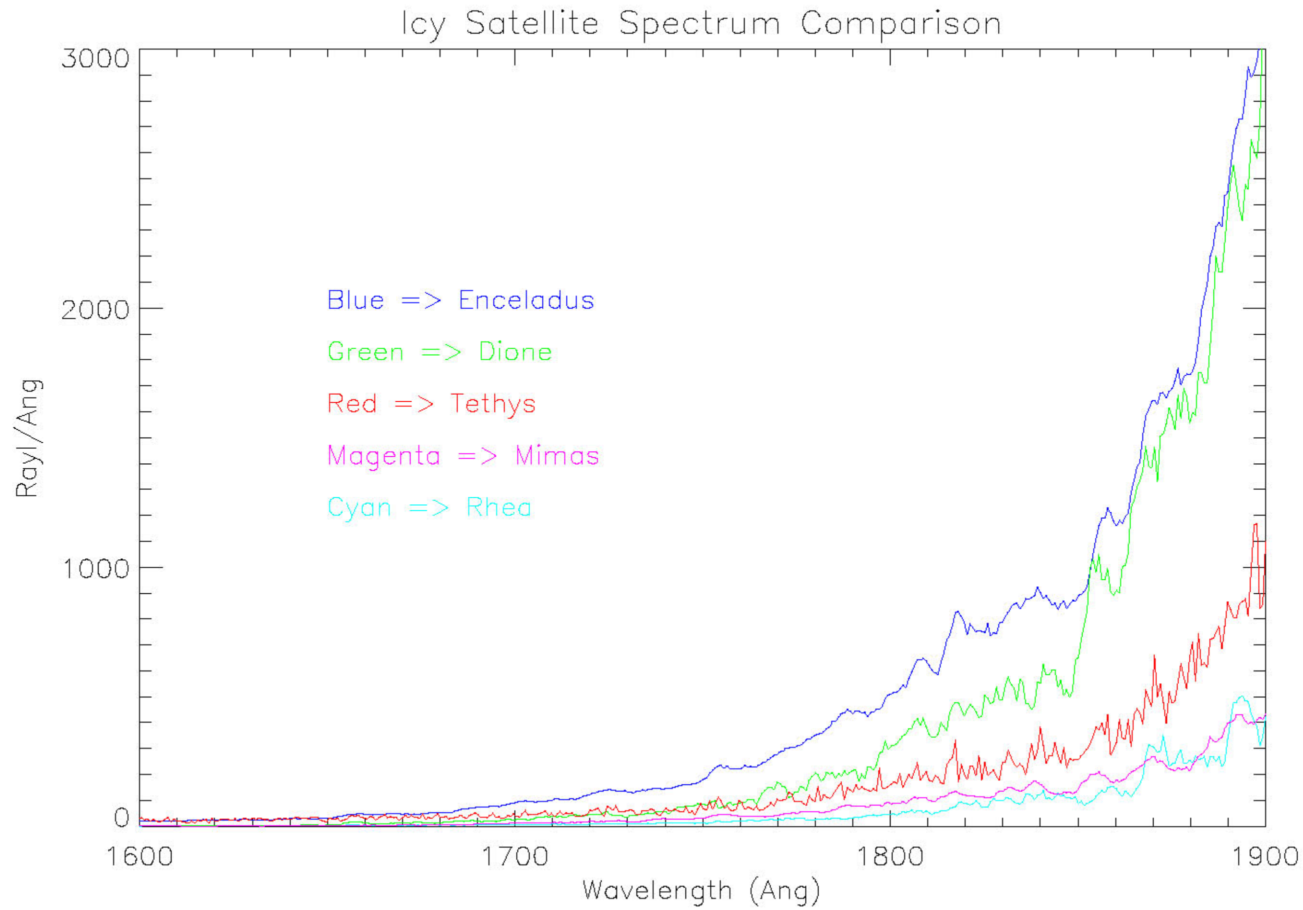


Phoebe's Disk-Integrated FUV reflectance spectrum



H_2O frost (2 different grain sizes) contributes to Phoebe's FUV spectrum; other (dark) material is similar to carbonaceous chondrite

Icy Satellite Spectrum Comparison



Tenuous Atmospheres / Exospheres

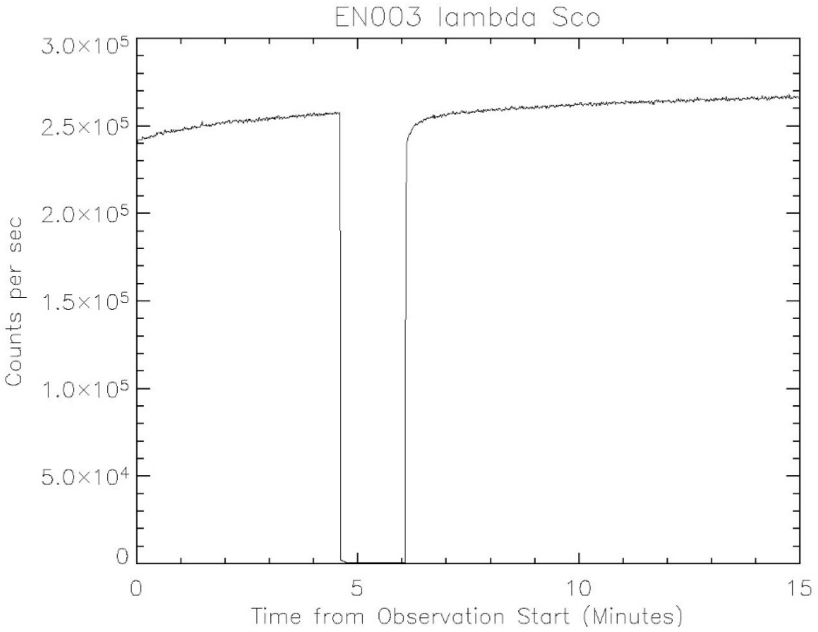
General

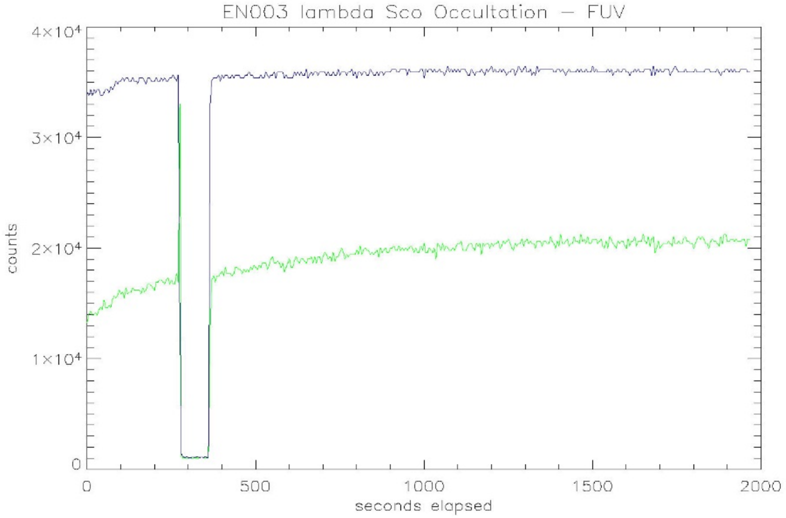
- Molecules are sputtered and sublimated from the surfaces of the icy satellites. Molecules sputtered from the surface are a source of neutrals in and influencing the magnetosphere. Determination of atmospheric density, and source and loss rates of atmospheric molecules feeds into models of the magnetospheric interaction. By determining the composition of these exospheres we may determine surface composition. Of particular interest are trace constituents such as NH_3. For example, an ammonia-water ice composition has been proposed to explain the young geology on Enceladus. The existence of an atmosphere may be indicative of active surface processes, such as the volcanoes on Io or the geysers on Triton (sputtering models indicate that only Rhea has the potential to retain a sputtered atmosphere, thus detection of an atmosphere will lead us to suspect eruptive activity).

Enceladus

- Enceladus' position at the peak of Saturn's E ring has always been a "smoking gun" as a potential source of the E ring. Its regionally young geology is also a tantalizing reason to link potential active geologic phenomena to the E ring. Sputtering is not a likely source for a detectable oxygen atmosphere - theoretical yields suggest that this process is not sufficient to be an important source of volatiles.
- The UVIS stellar occultation on Rev 3 was analyzed for evidence of the existence of a tenuous atmosphere, which would then be a strong indicator of eruptive activity (nothing obvious). The occultation of gamma Orionis on Rev 11 will be a much more sensitive probe of Enceladus' atmosphere and may tell us its composition
- UVIS spectra will be examined for emission features such as 130.4 and 135.6 nm (atomic and molecular oxygen), 149.3 nm (atomic nitrogen), etc.

Lamda Sco Occultation from EN003



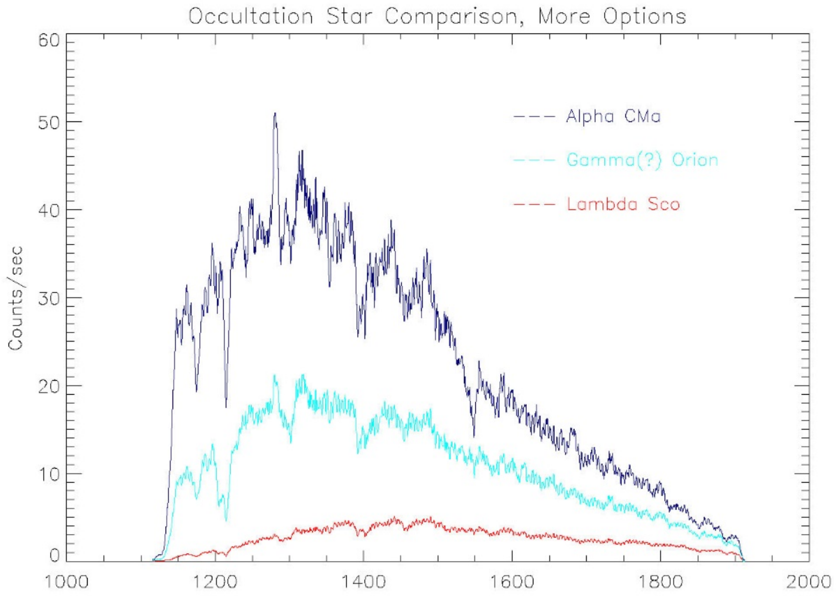


- No obvious atmosphere detected (though we know now from magnetometer that a very tenuous atmosphere must exist)
- Overall change in slope due to lambda Sco variability
- Upper limit of density from our non-detection is

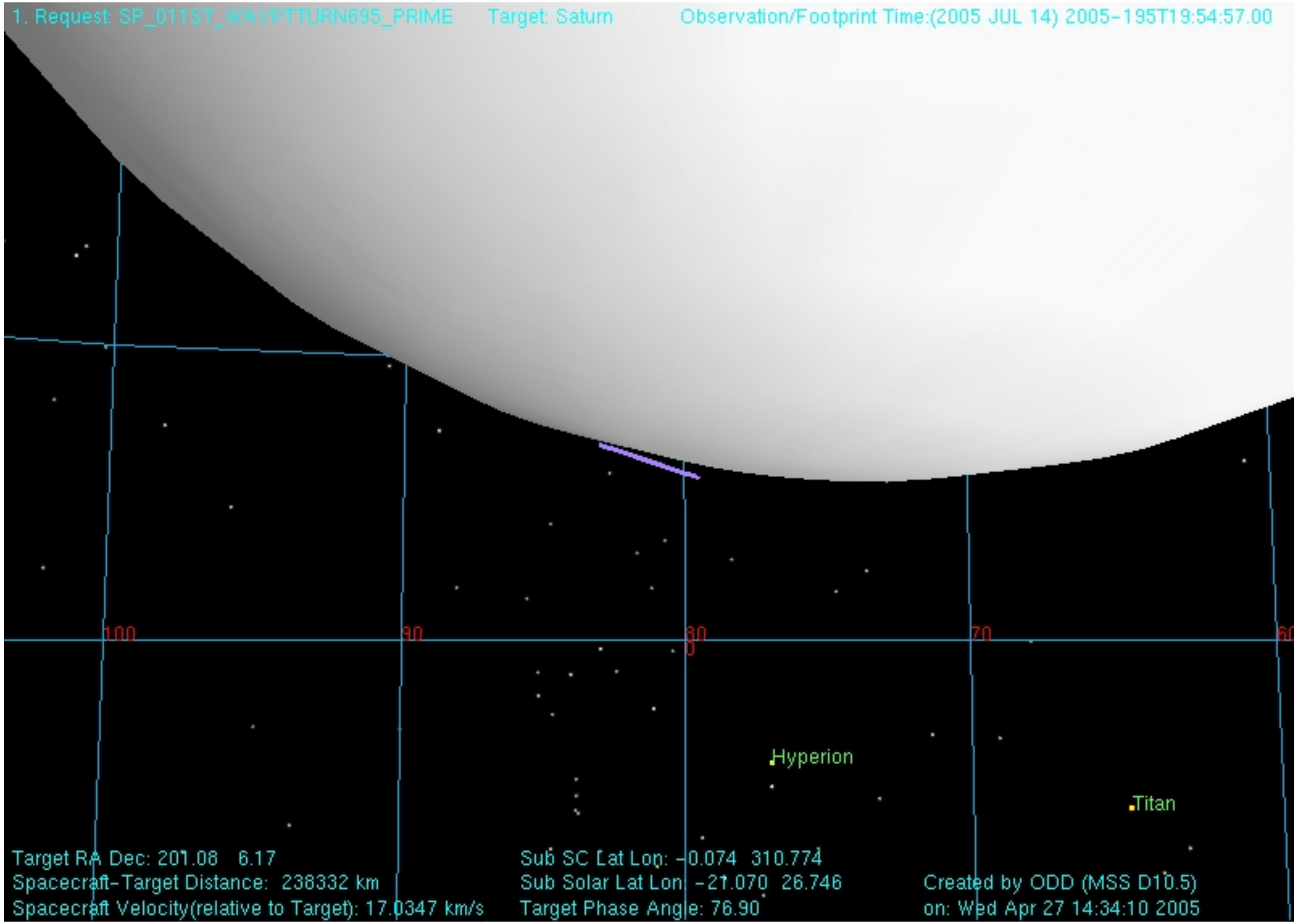
  $N(O_2) = 5 \times 10^7$ molecule/cm^3

Rev 11 Gamma Orionis Occultation

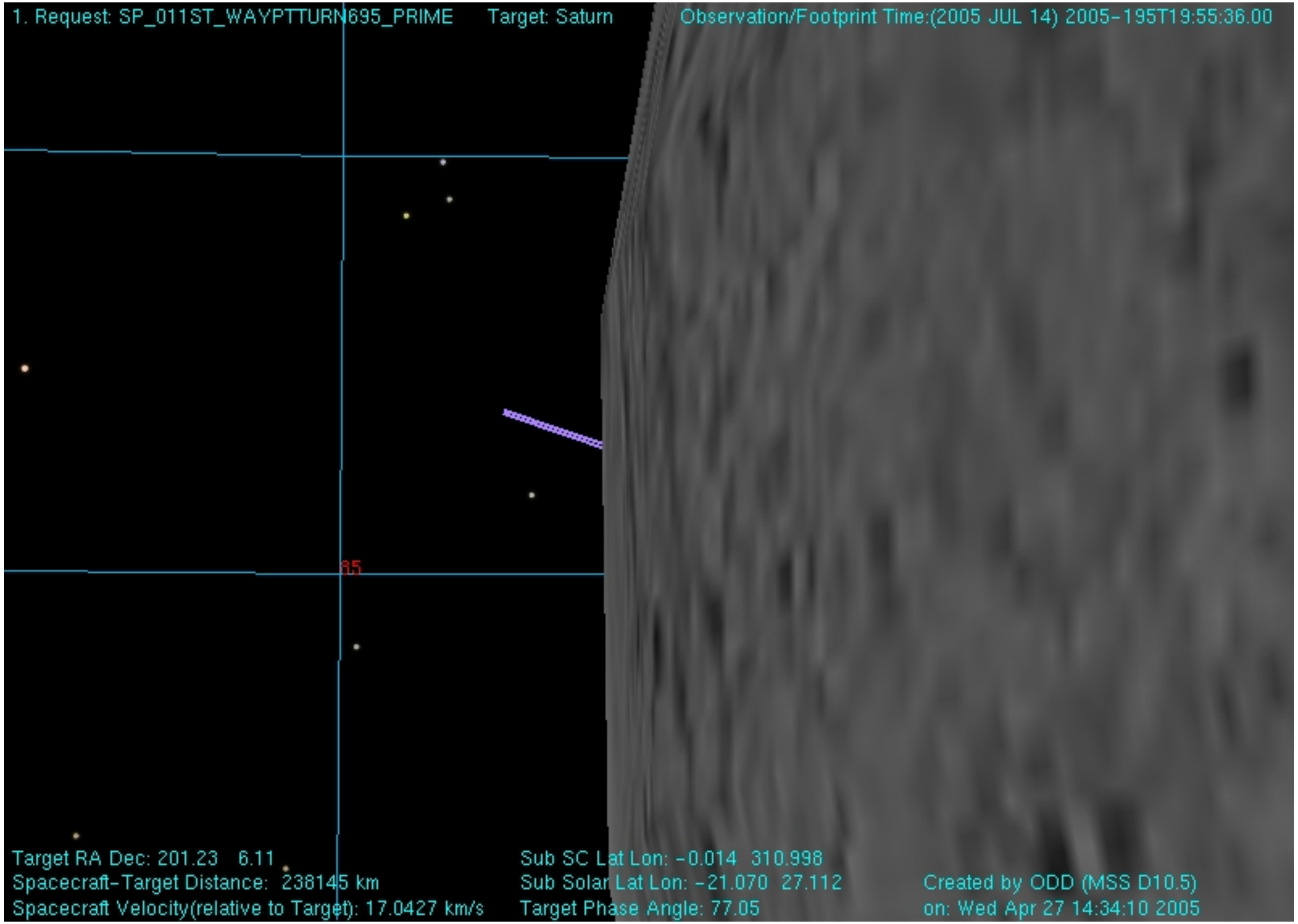
- The original Rev 11 trajectory occulted alpha Cma
- The new (closer) flyby occults gamma Orionis
- Gamma Orionis is substantially brighter than lambda Sco
- The ingress is at a high southerly latitude near the ambiguous plume seen in ISS images (which has been attributed to scattered light in the optics)



Gamma Orionis Ingress at high southern latitude



Gamma Orionis Egress



Rev 11

UVIS Science at Mimas and Enceladus

C. J. Hansen, A. Hendrix

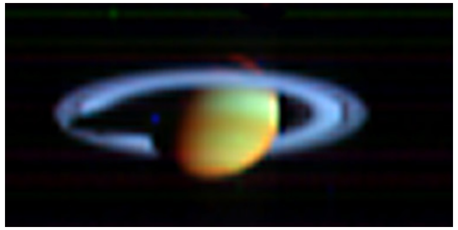
8 July 2005

Cassini

VIMS

S12 Enceladus

Roger N. Clark
VIMS Team
July 7, 2005



VIMS

Visual and Infrared Mapping Spectrometer

- 0.35 to 5.2 microns in 352 wavelengths
- IFOV: 0.5 x 0.5 mrad (standard)
- High resolution IR: 0.5 x 0.25 mrad
- High resolution VIS: 0.17 x 0.17 mrad
- Images up to 64 x 64 pixels square.

VIMS Enceladus Science

Identification of minerals and other materials
 on the surface.

Mapping the abundance, and grain sizes of
 surficial materials.

Grain-Size Mapping

Reflectance from 0.35 to 5.2 microns

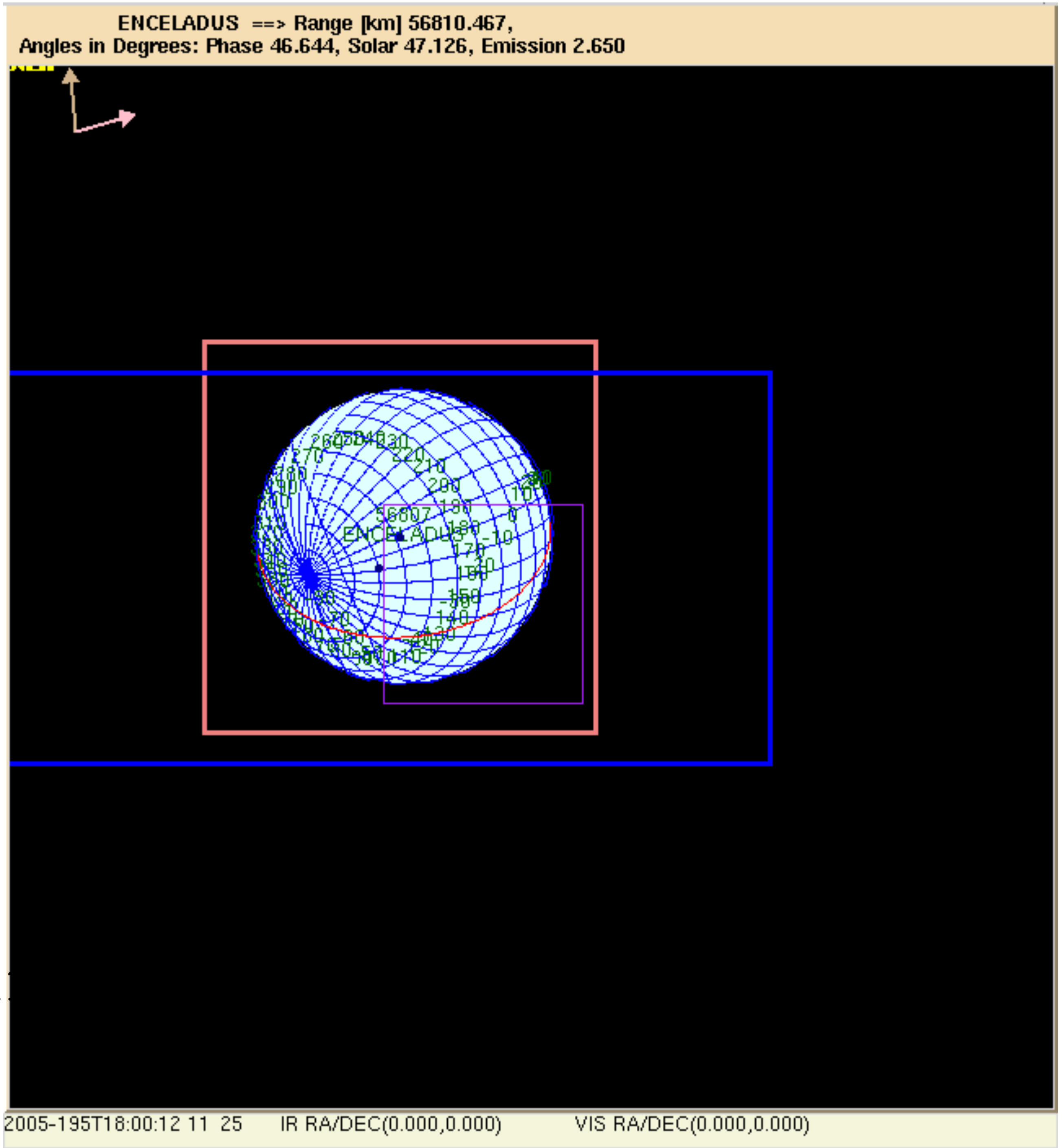
Phase function

surface microstructure

Bond albedo

Temperatures > 120K

vims_01



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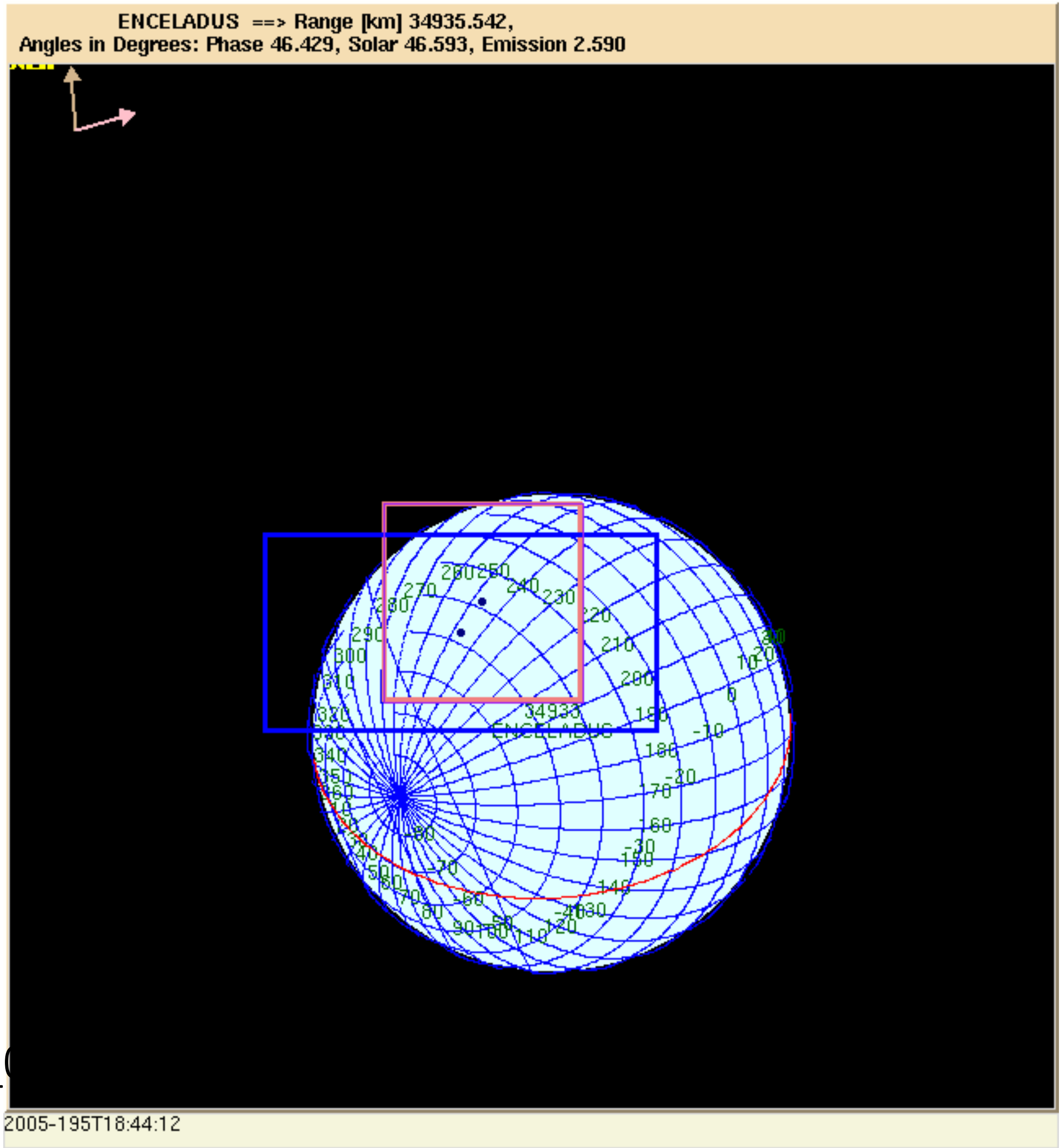
IR RA/DEC(0.000,0.000)
VIS RA/DEC(0.000,0.000)



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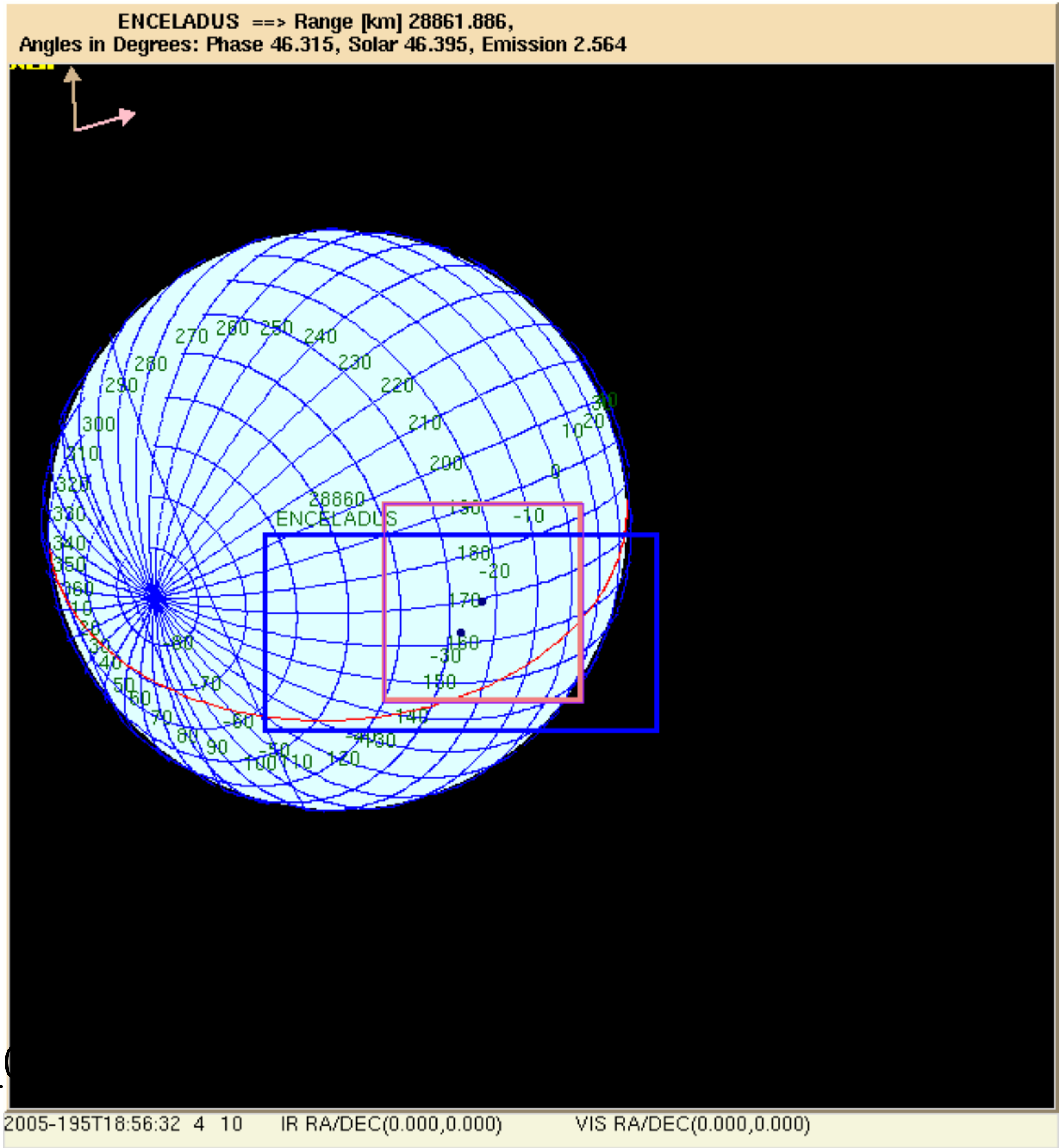
2005-195T18:44:12

vims_(

vims_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28860
ENCELADUS
2005-195T18:56:32 4 10
IR RA/DEC(0.000,0.000)
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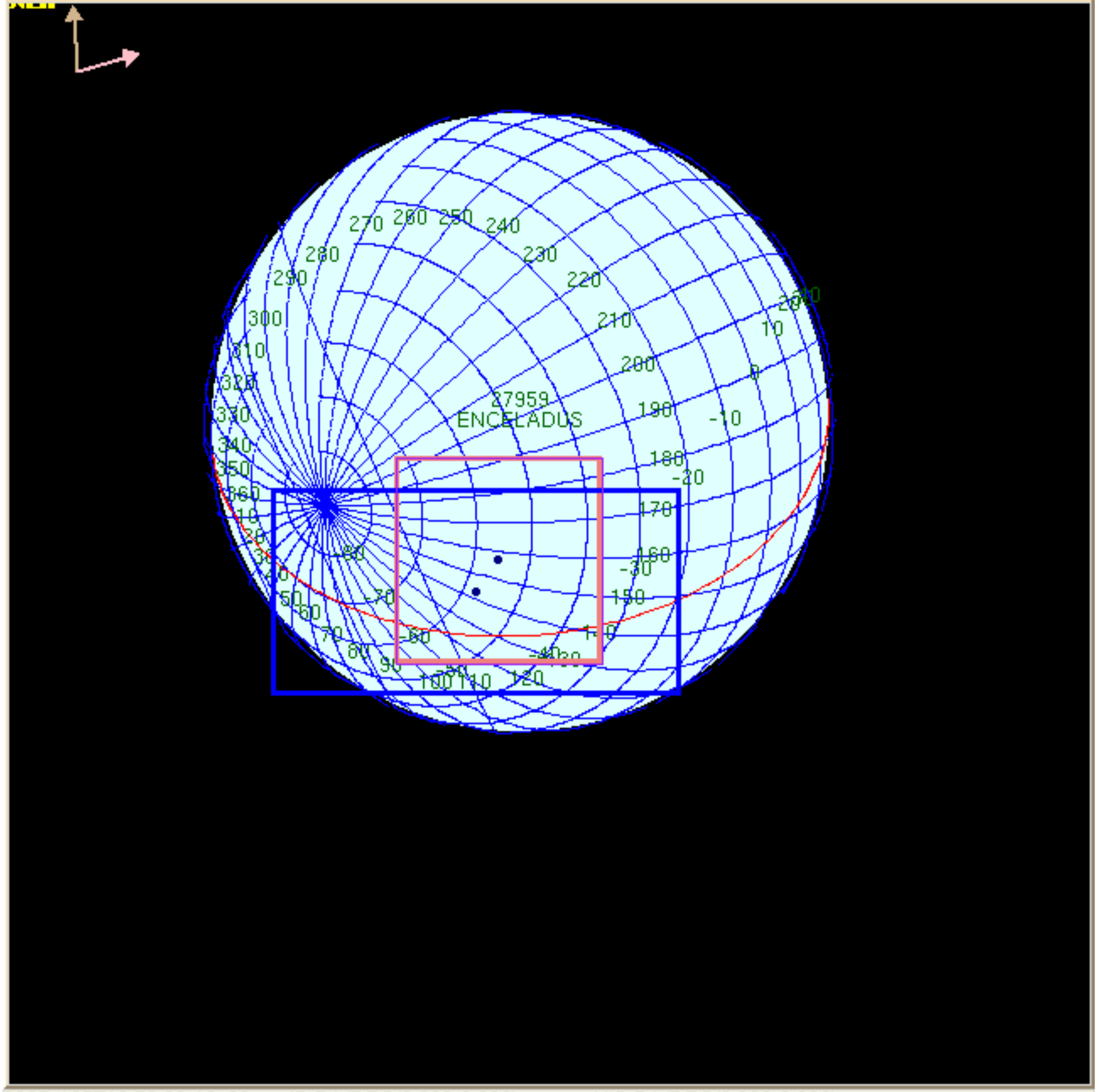

2005-195T18:58:22 12 30 IR RA/DEC(0.000,0.000) VIS RA/DEC(0.000,0.000)

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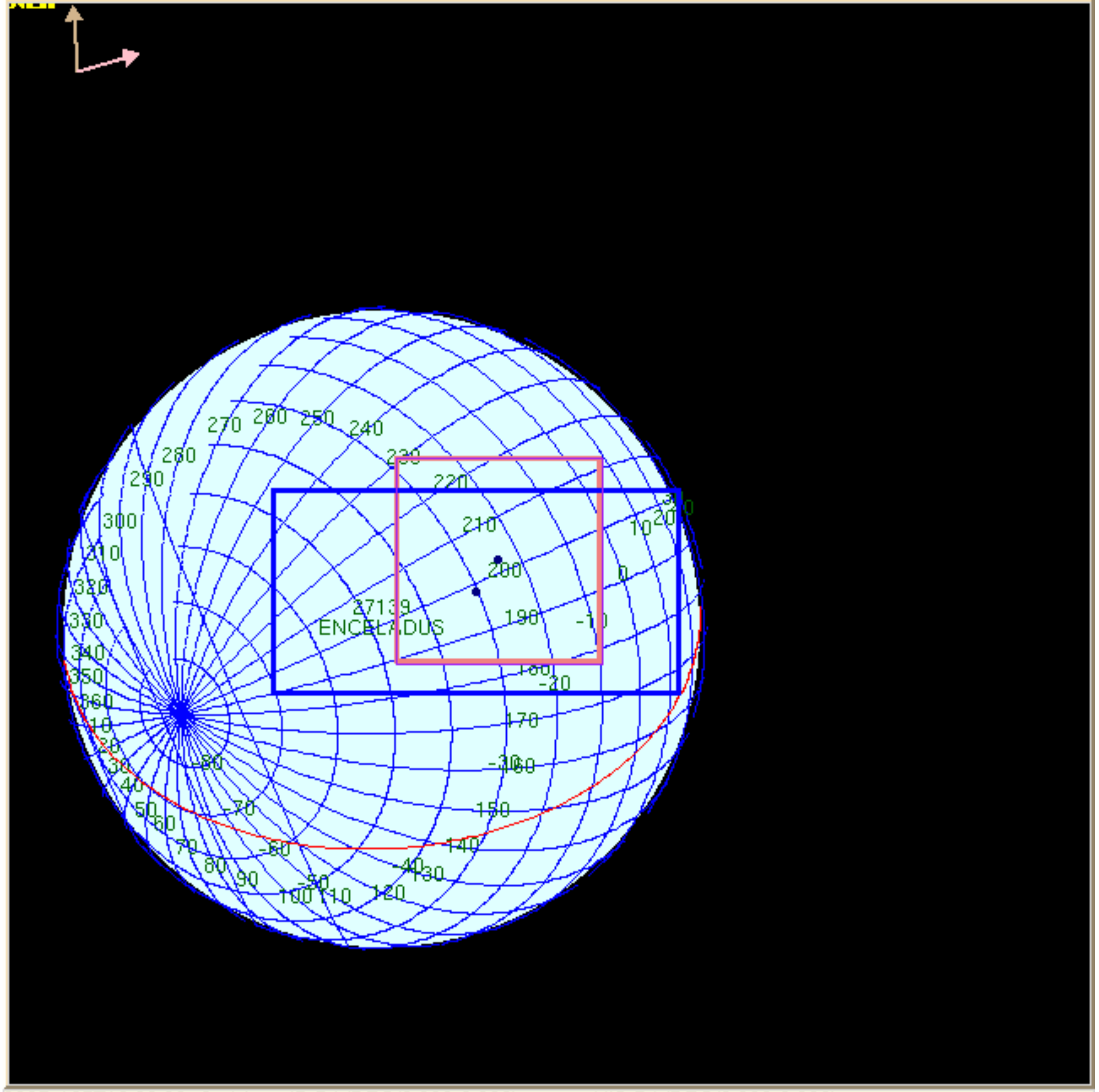

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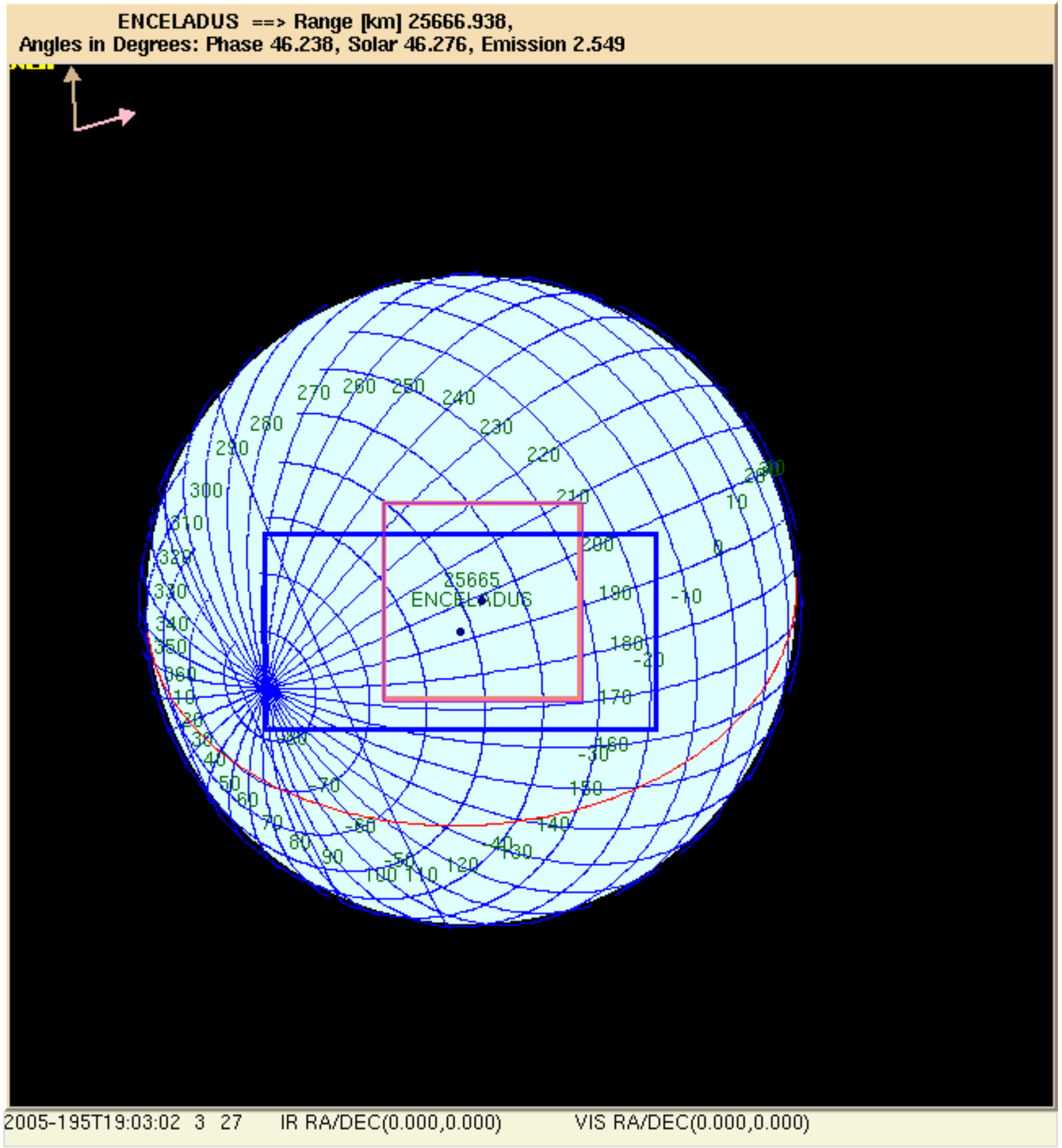
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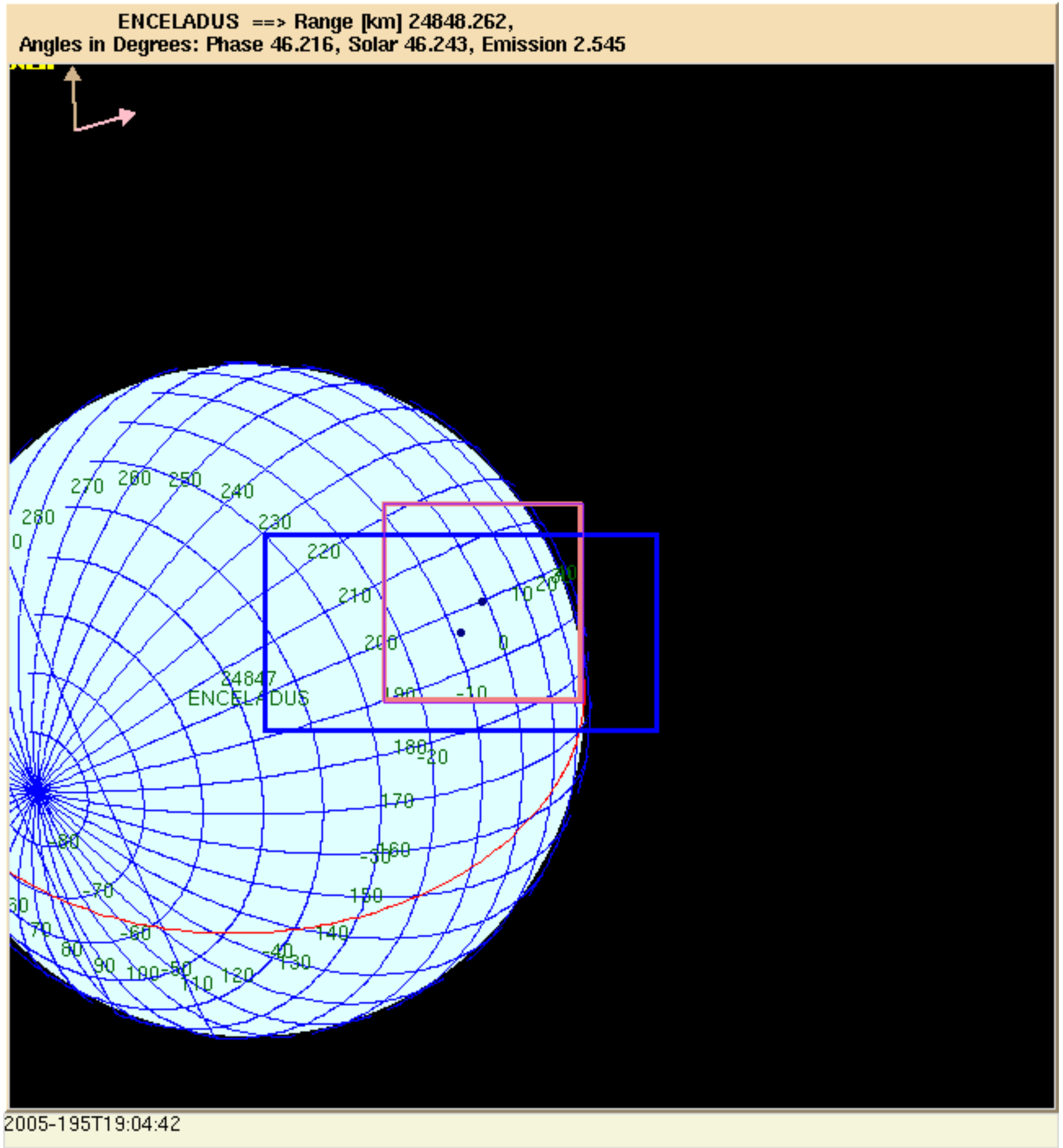
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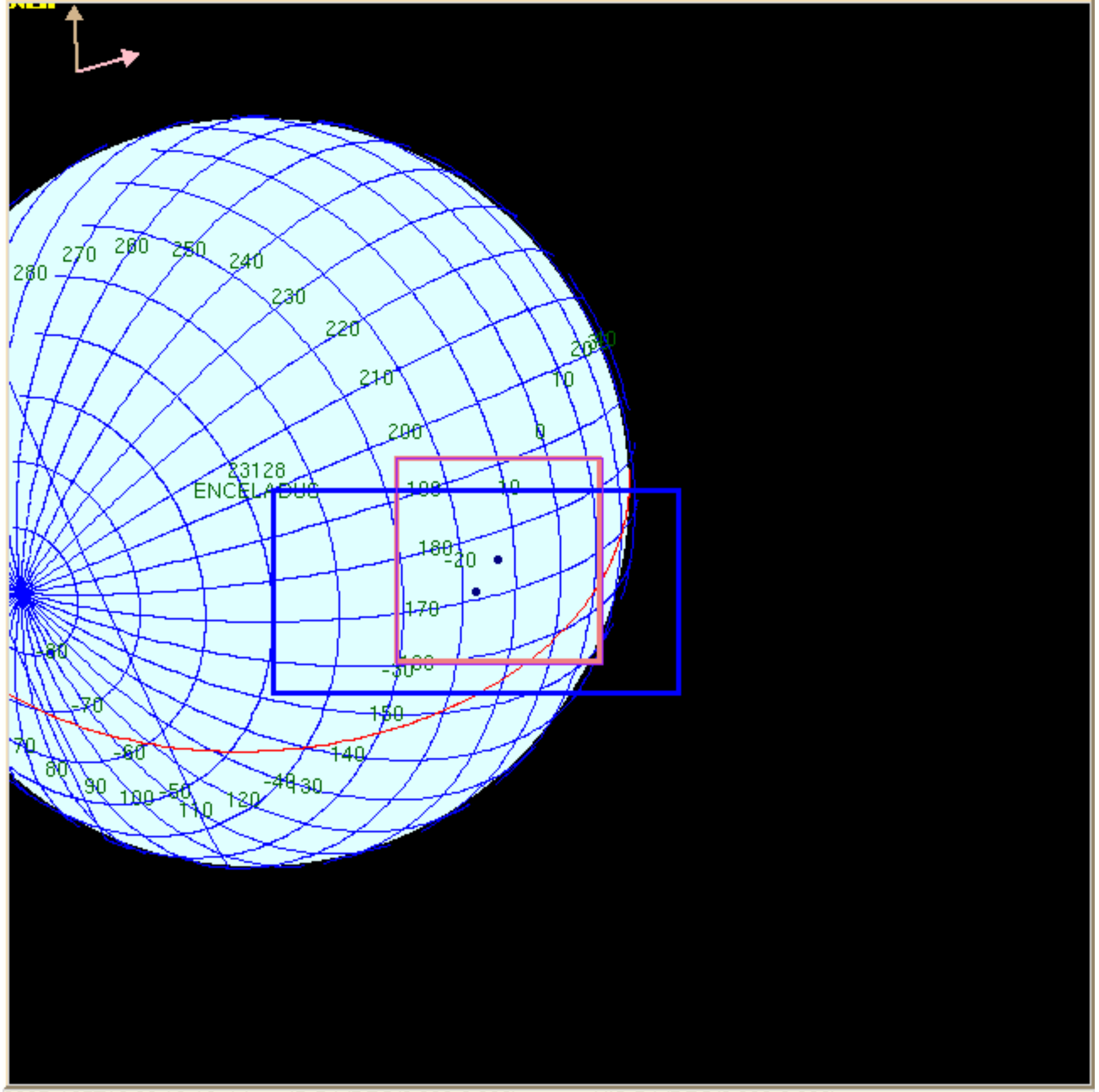

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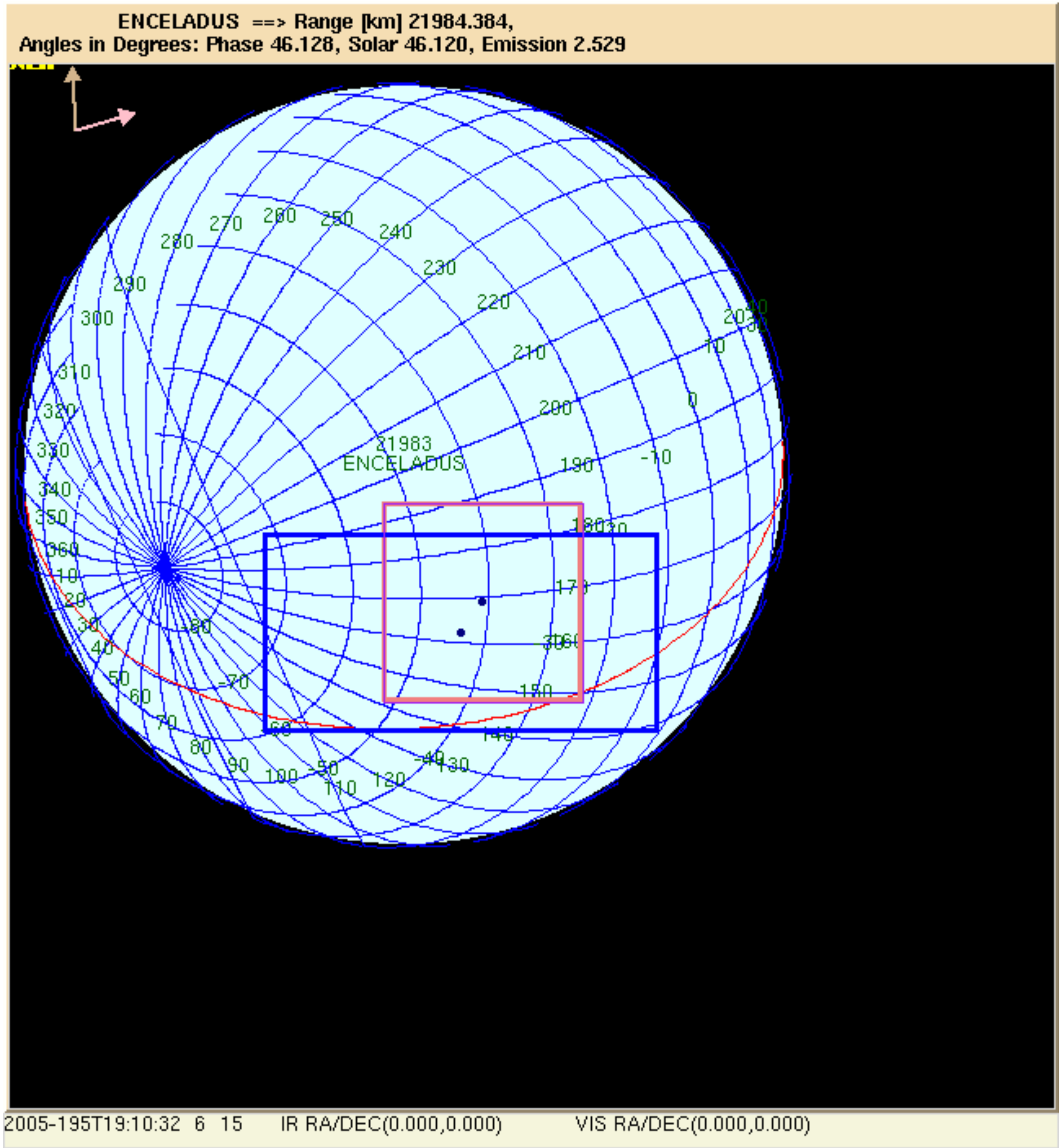
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21983
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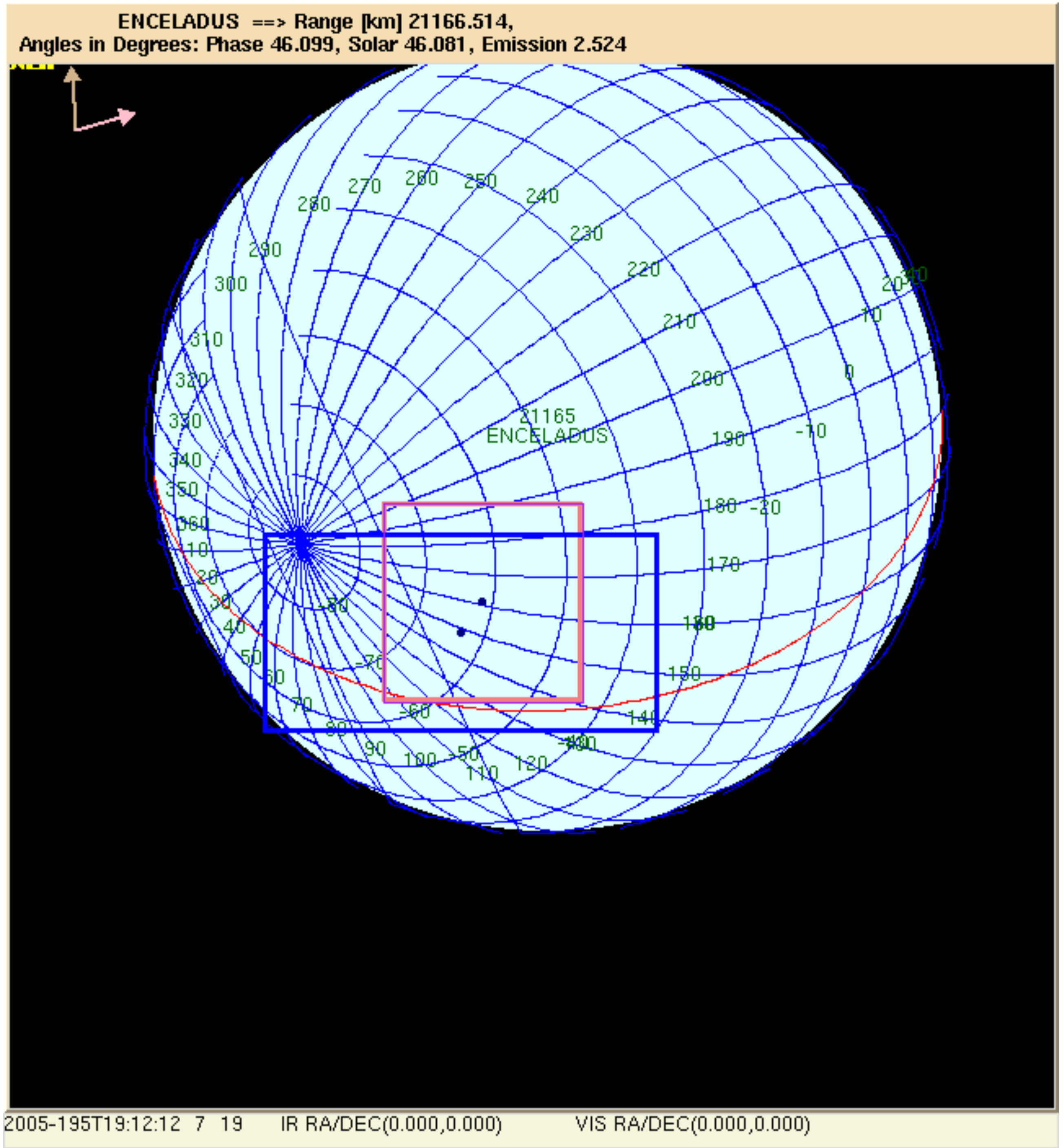
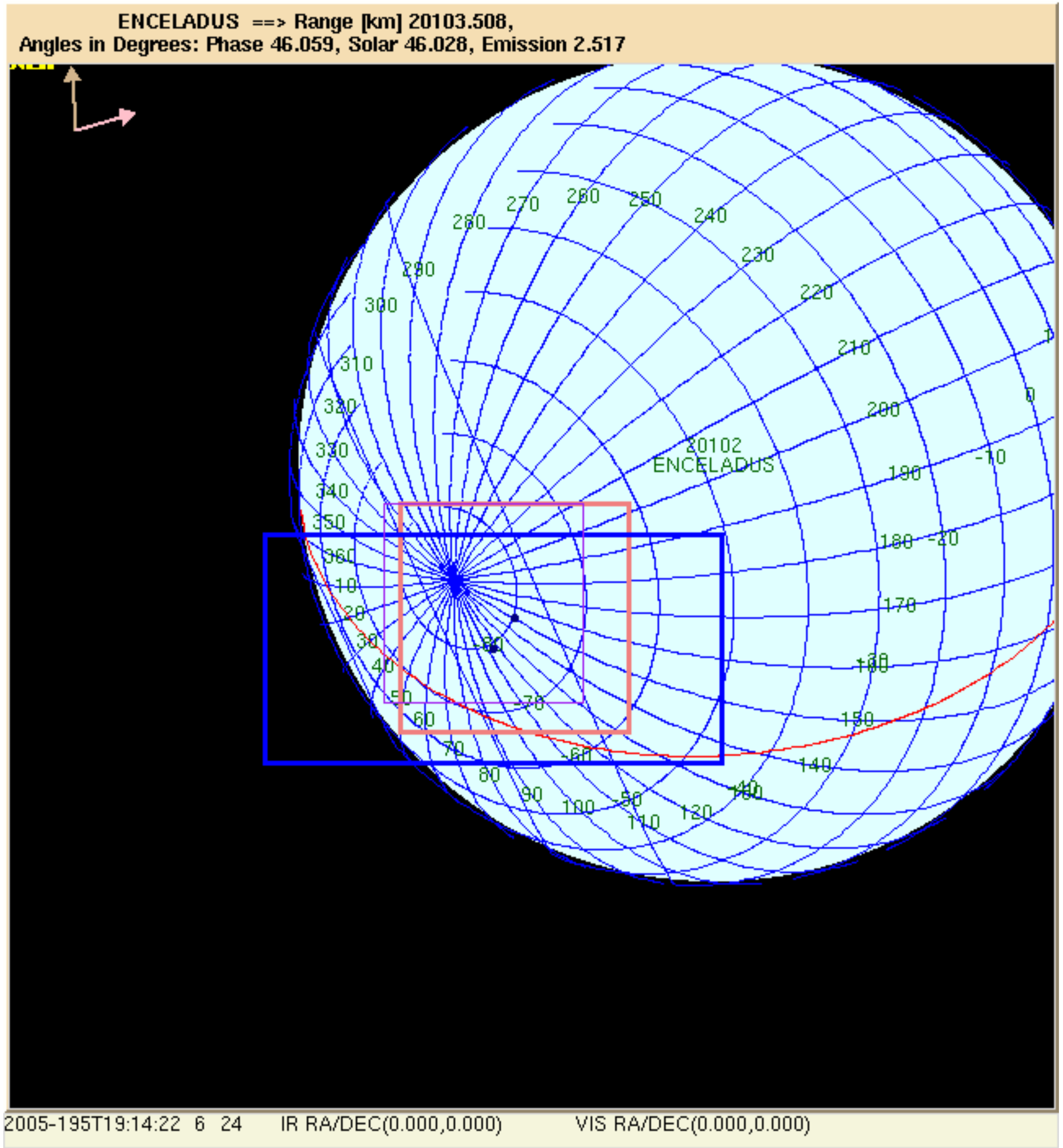
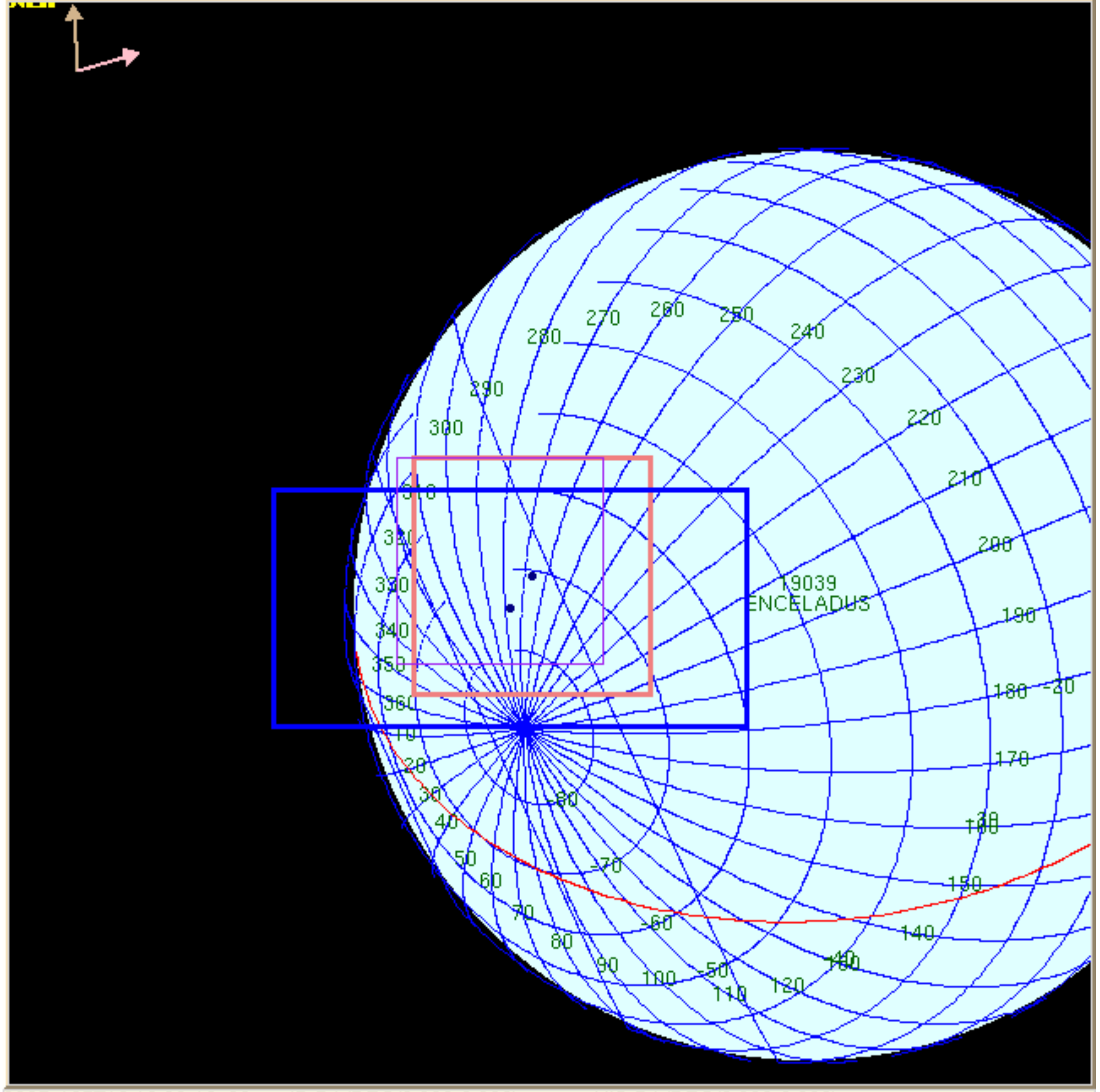
IR RA/DEC(0.000,0.000)
VIS RA/DEC(0.000,0.000)


ENCELADUS ==> Range [km] 21166.514,
Angles in Degrees: Phase 46.099, Solar 46.081, Emission 2.524
21165
ENCELADUS
2005-195T19:12:12 7 19
IR RA/DEC(0.000,0.000)
VIS RA/DEC(0.000,0.000)

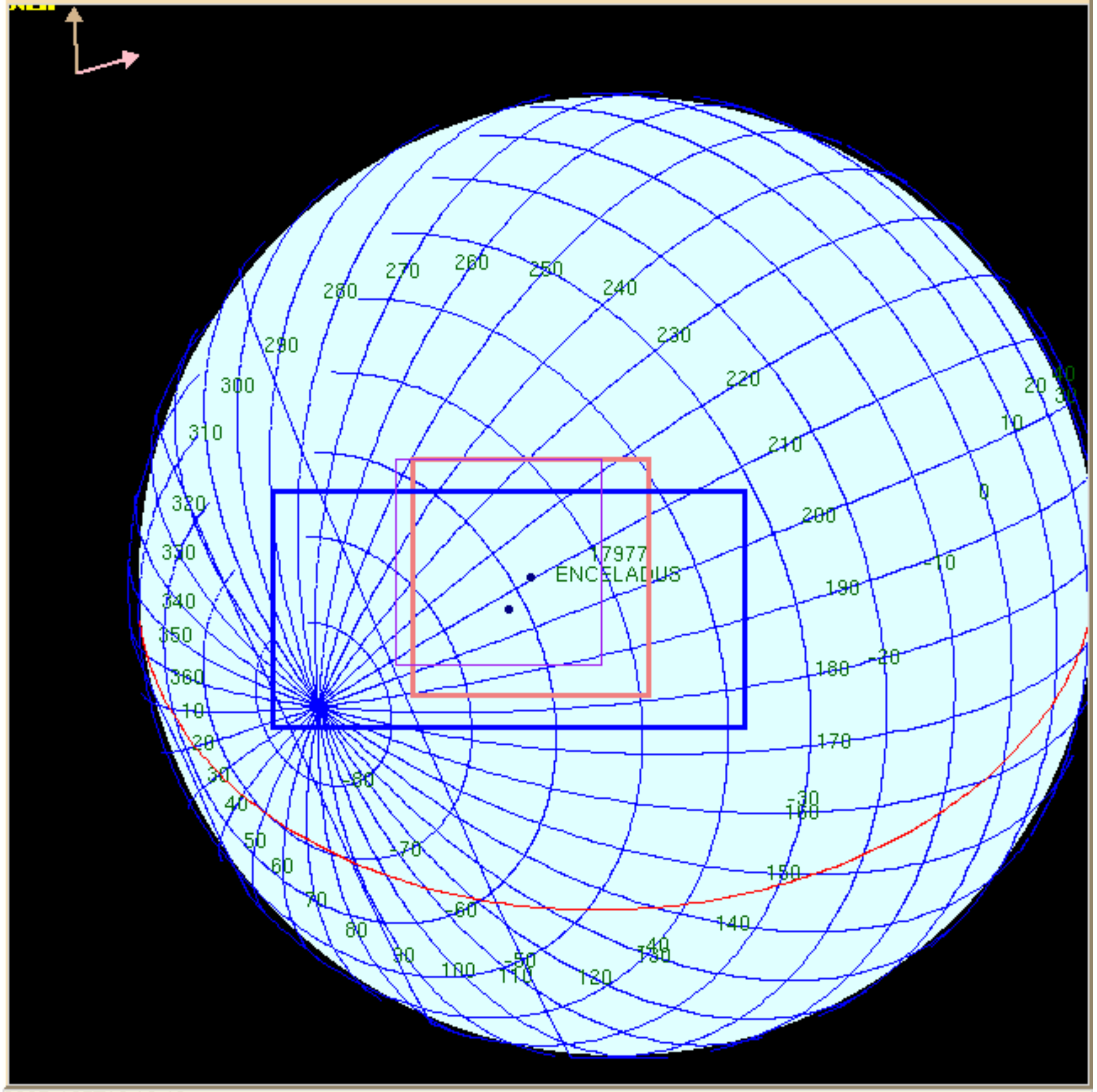

ENCELADUS ==> Range [km] 20103.508,
Angles in Degrees: Phase 46.059, Solar 46.028, Emission 2.517
20102
ENCELADUS
2005-195T19:14:22 6 24
IR RA/DEC(0.000,0.000)
VIS RA/DEC(0.000,0.000)

ENCELADUS ==> Range [km] 19040.737,
Angles in Degrees: Phase 46.015, Solar 45.972, Emission 2.510



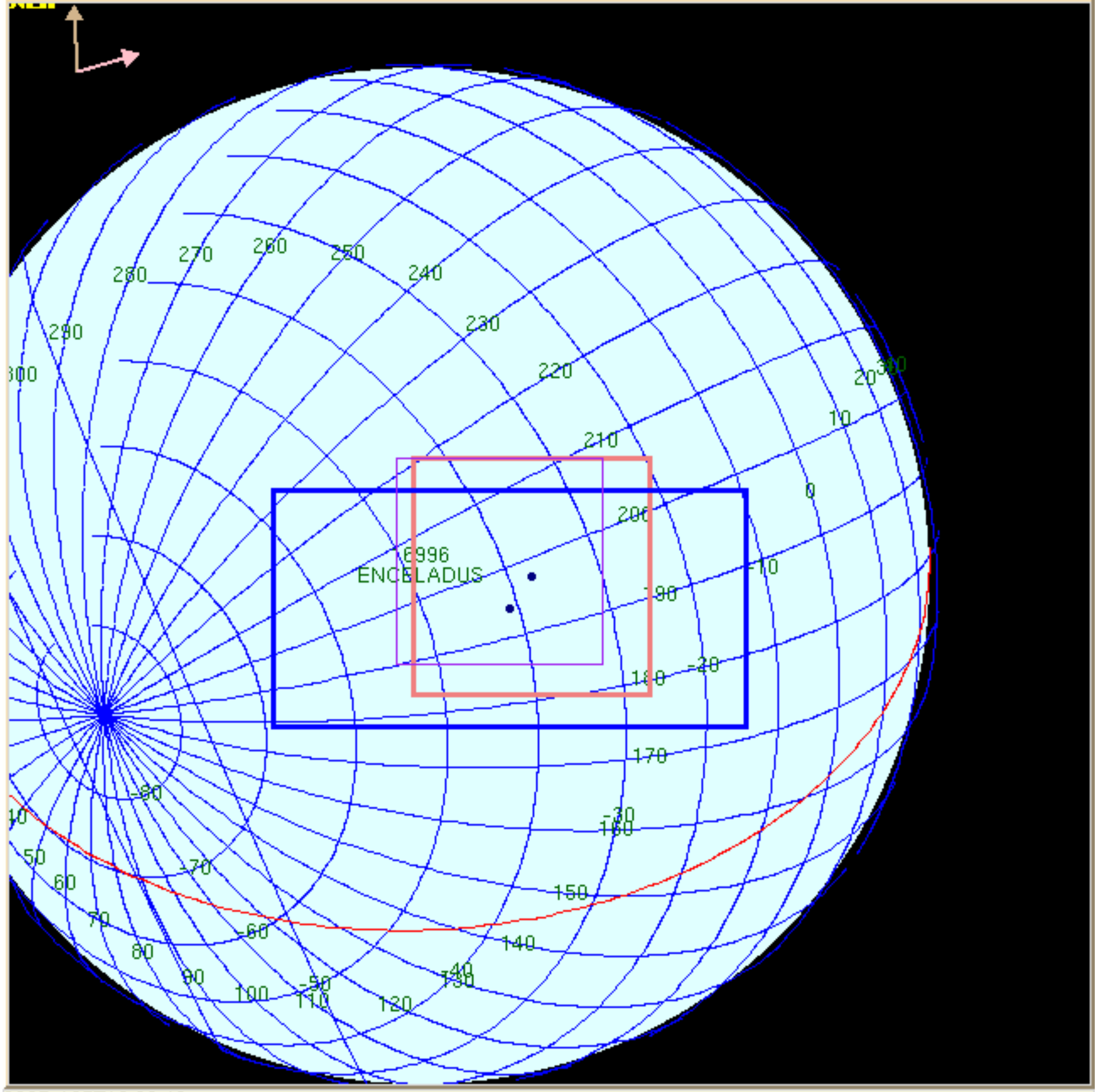
2005-195T19:16:32 10 28 IR RA/DEC(0.000,0.000) VIS RA/DEC(0.000,0.000)

ENCELADUS ==> Range [km] 17978.184,
Angles in Degrees: Phase 45.966, Solar 45.912, Emission 2.503

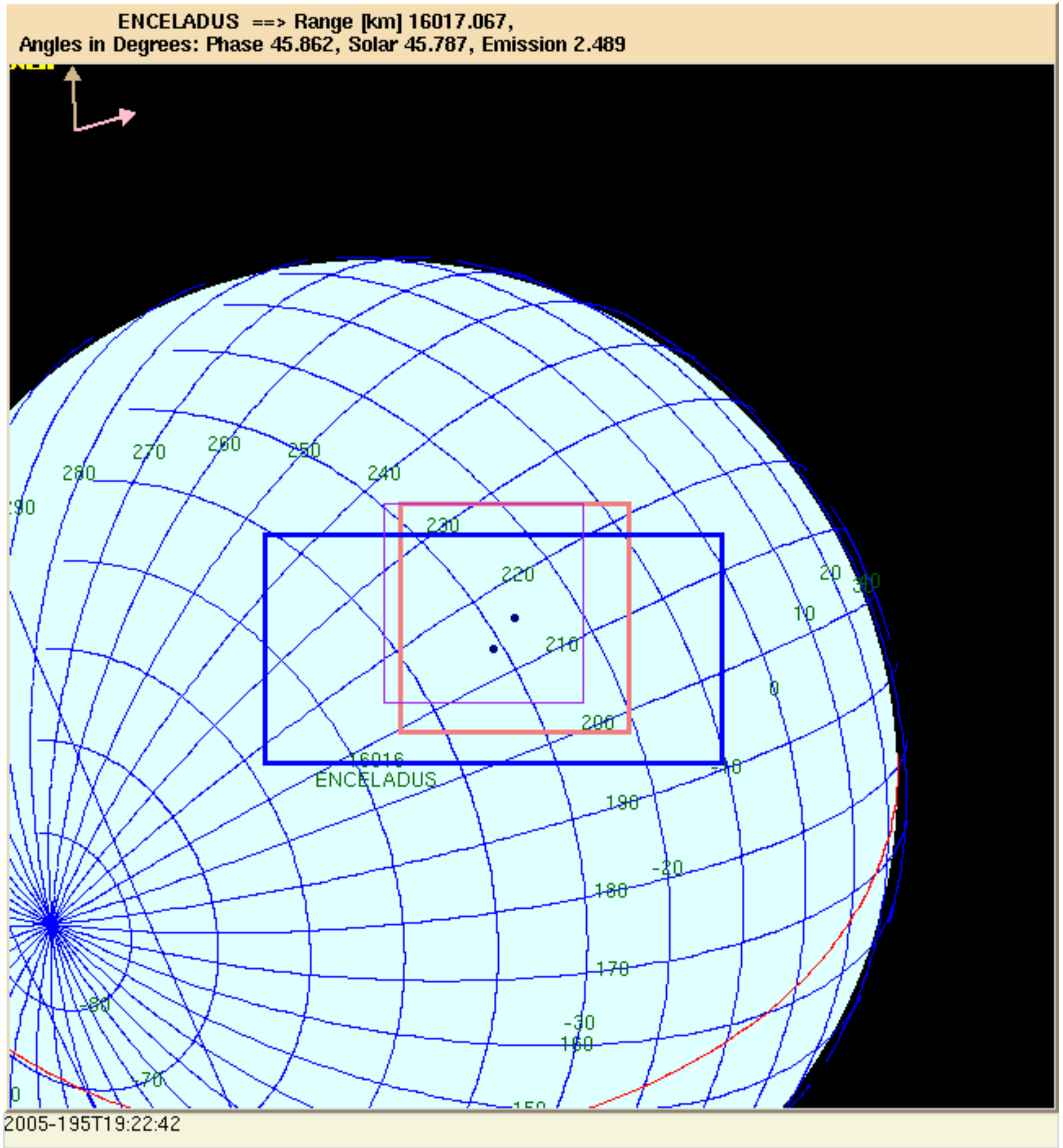


2005-195T19:18:42

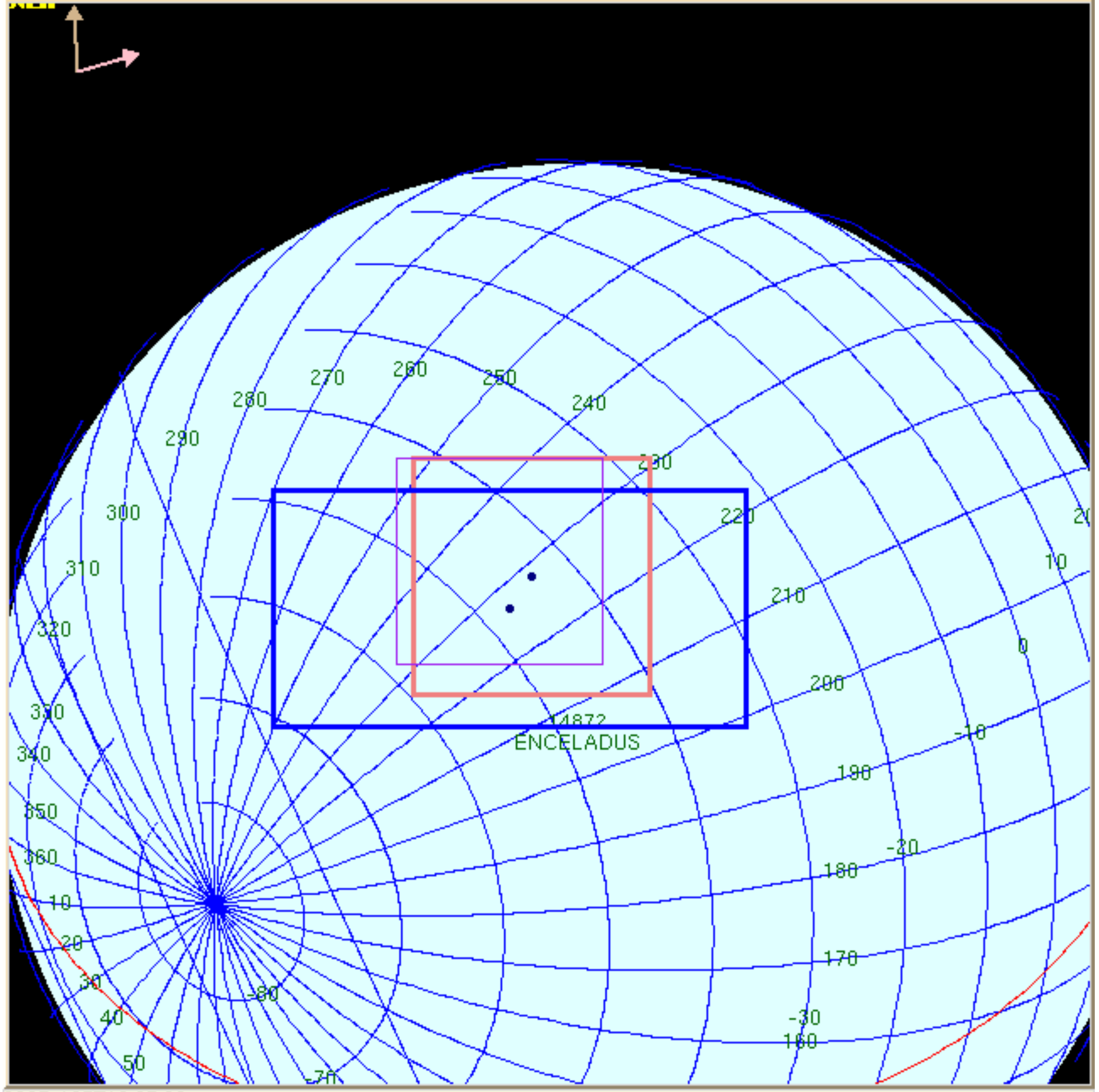
ENCELADUS ==> Range [km] 16997.545,
Angles in Degrees: Phase 45.917, Solar 45.852, Emission 2.496



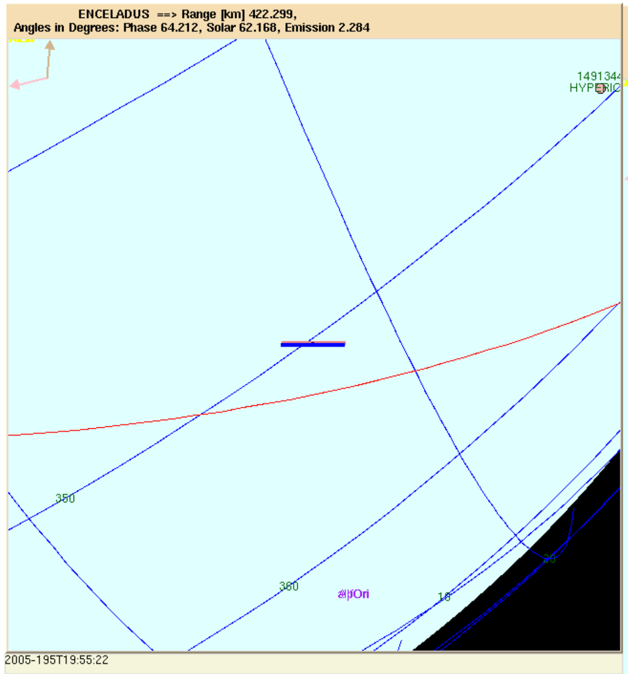
2005-195T19:20:42


ENCELADUS ==> Range [km] 16017.067,
Angles in Degrees: Phase 45.862, Solar 45.787, Emission 2.489
270
260
250
240
280
230
220
210
200
20
10
0
16016
ENCELADUS
190
-20
180
170
-30
160
-80
-70
2005-195T19:22:42

ENCELADUS ==> Range [km] 14873.368,
Angles in Degrees: Phase 45.790, Solar 45.704, Emission 2.479



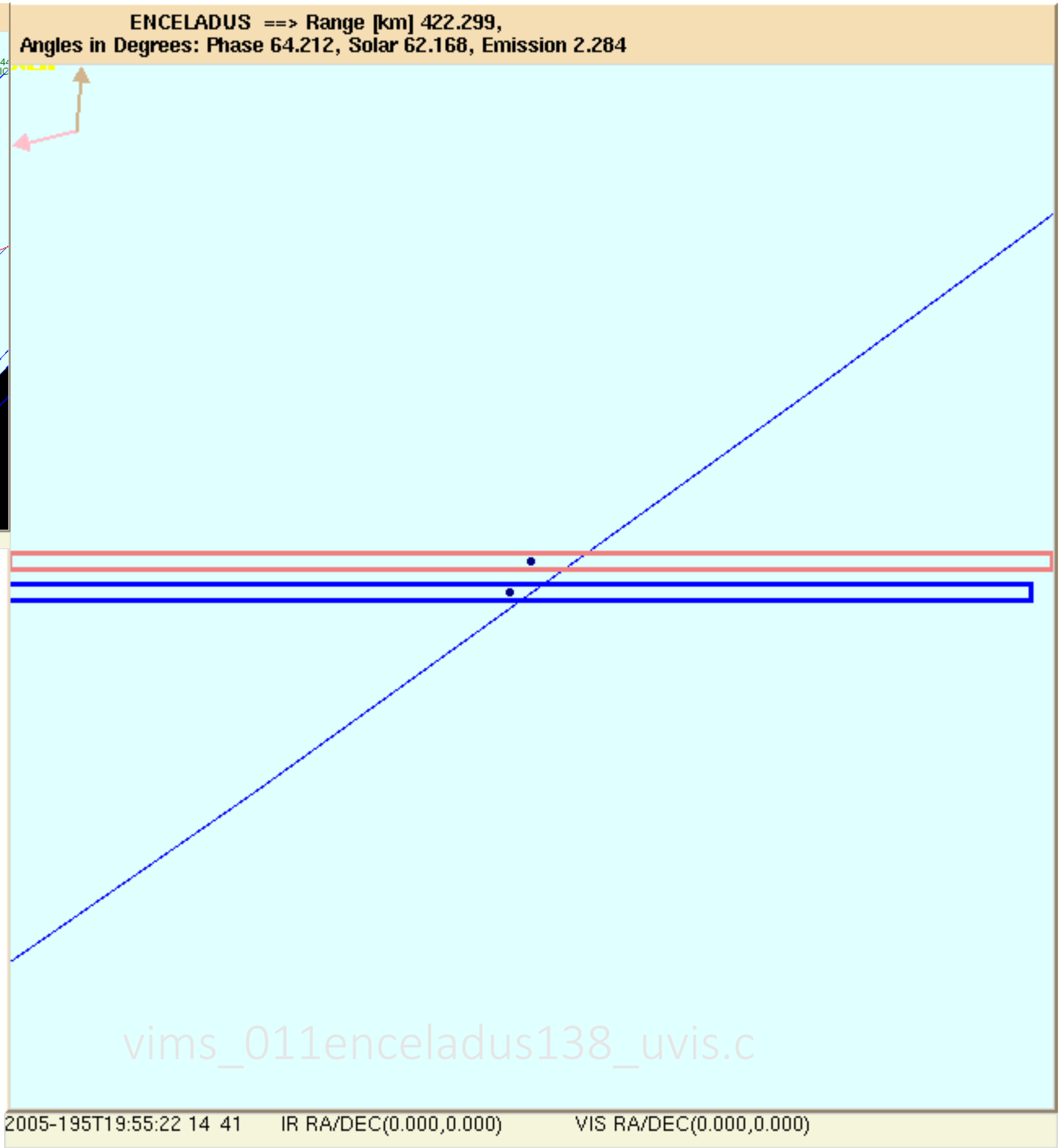
2005-195T19:25:02



Around closest approach, VIMS does profiles.

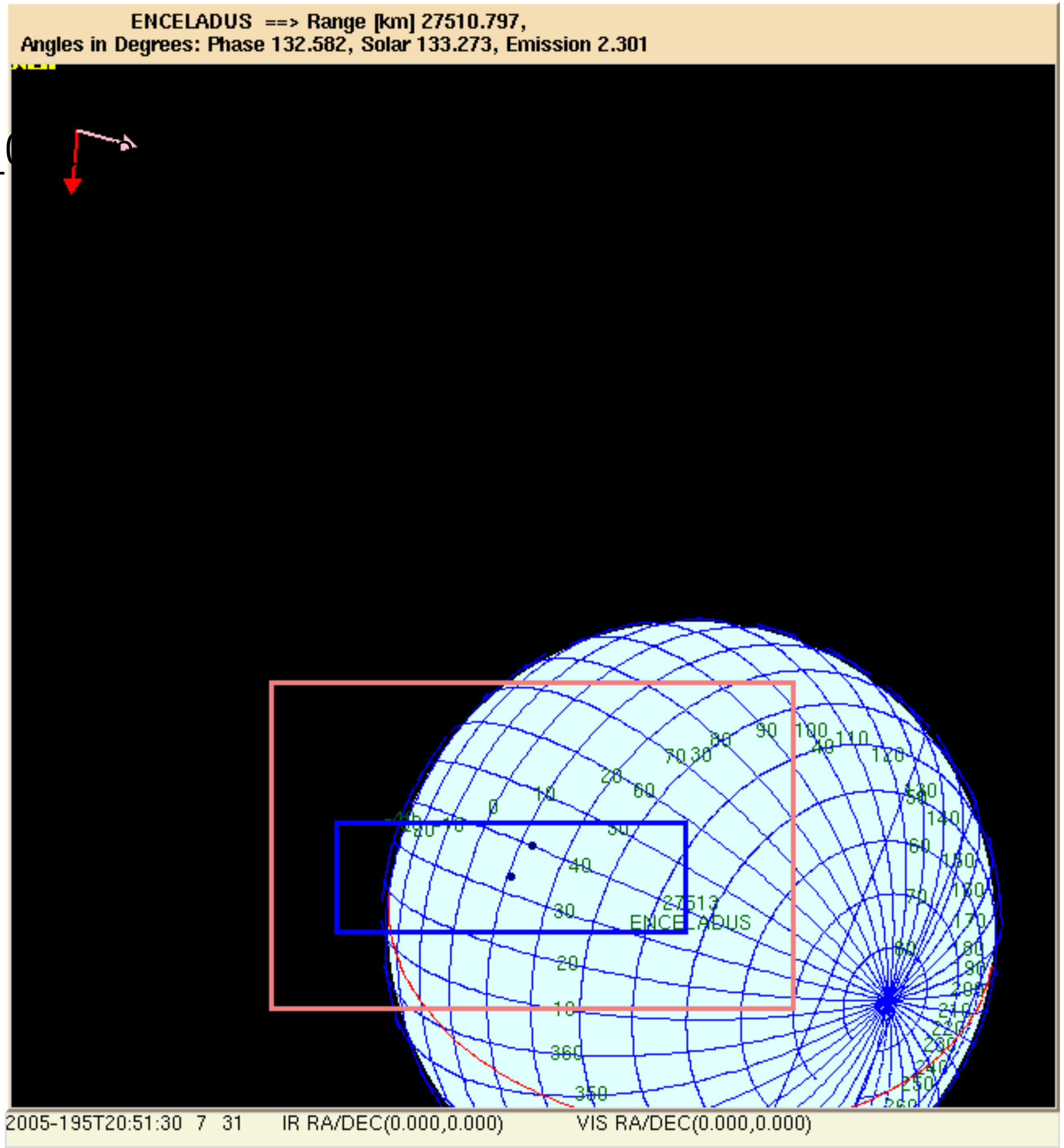
Above: ~25x larger field of view.

~210 meter resolution!

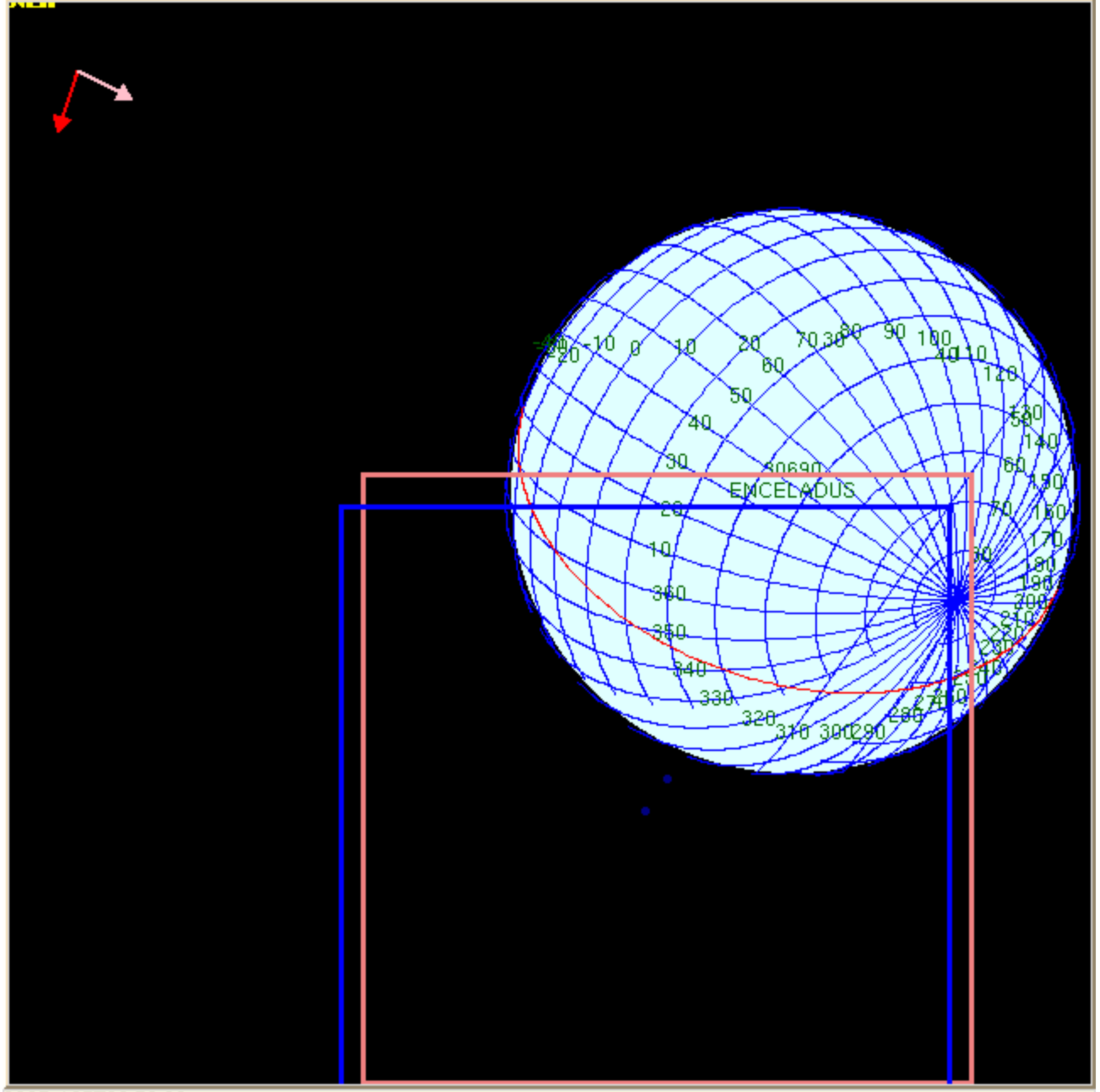


vims_(

Outbound

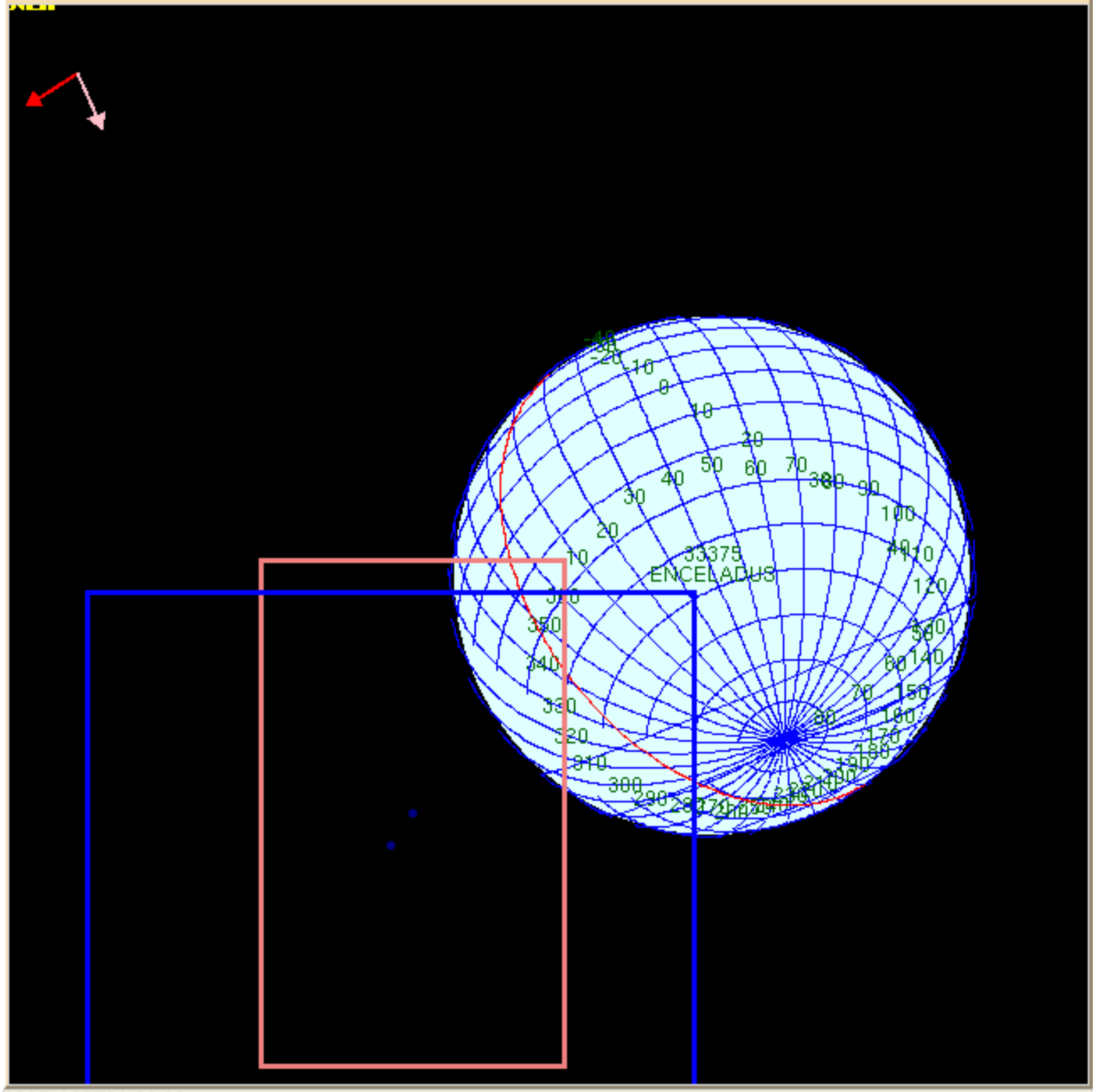


ENCELADUS ==> Range [km] 30687.441,
Angles in Degrees: Phase 132.589, Solar 133.307, Emission 2.275



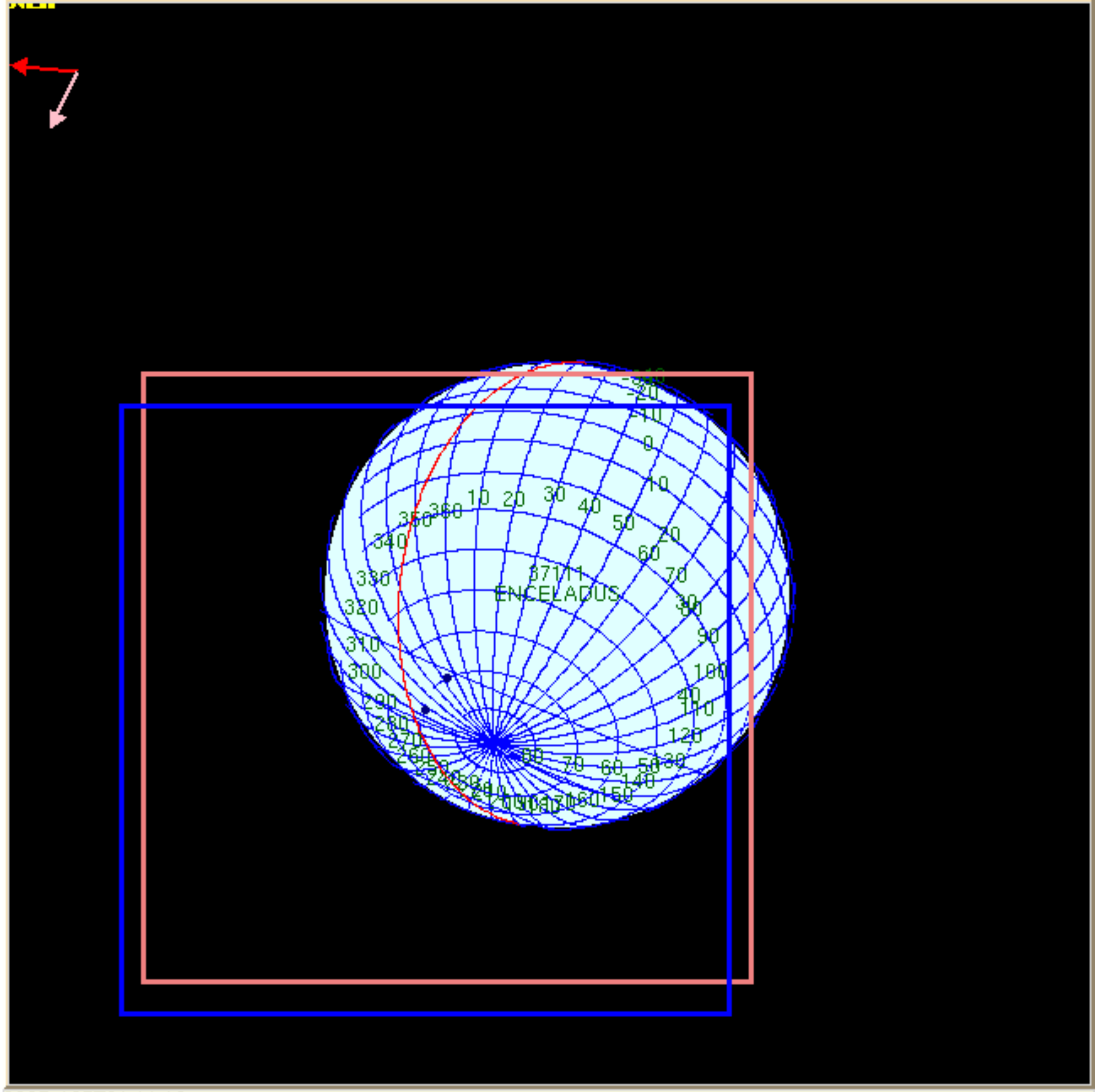
2005-195T20:58:00

ENCELADUS ==> Range [km] 33372.036,
Angles in Degrees: Phase 132.581, Solar 133.321, Emission 2.254

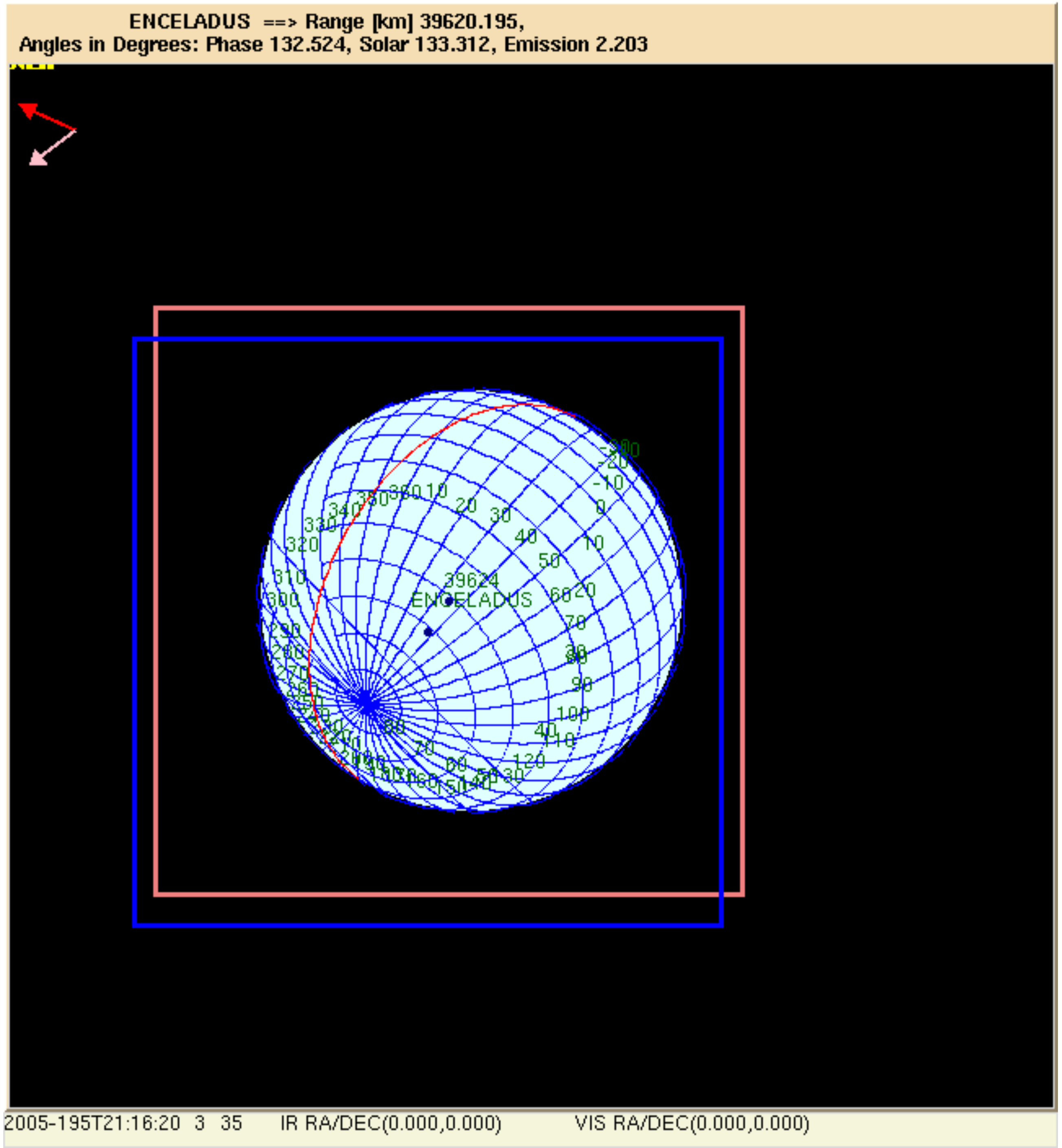


2005-195T21:03:30

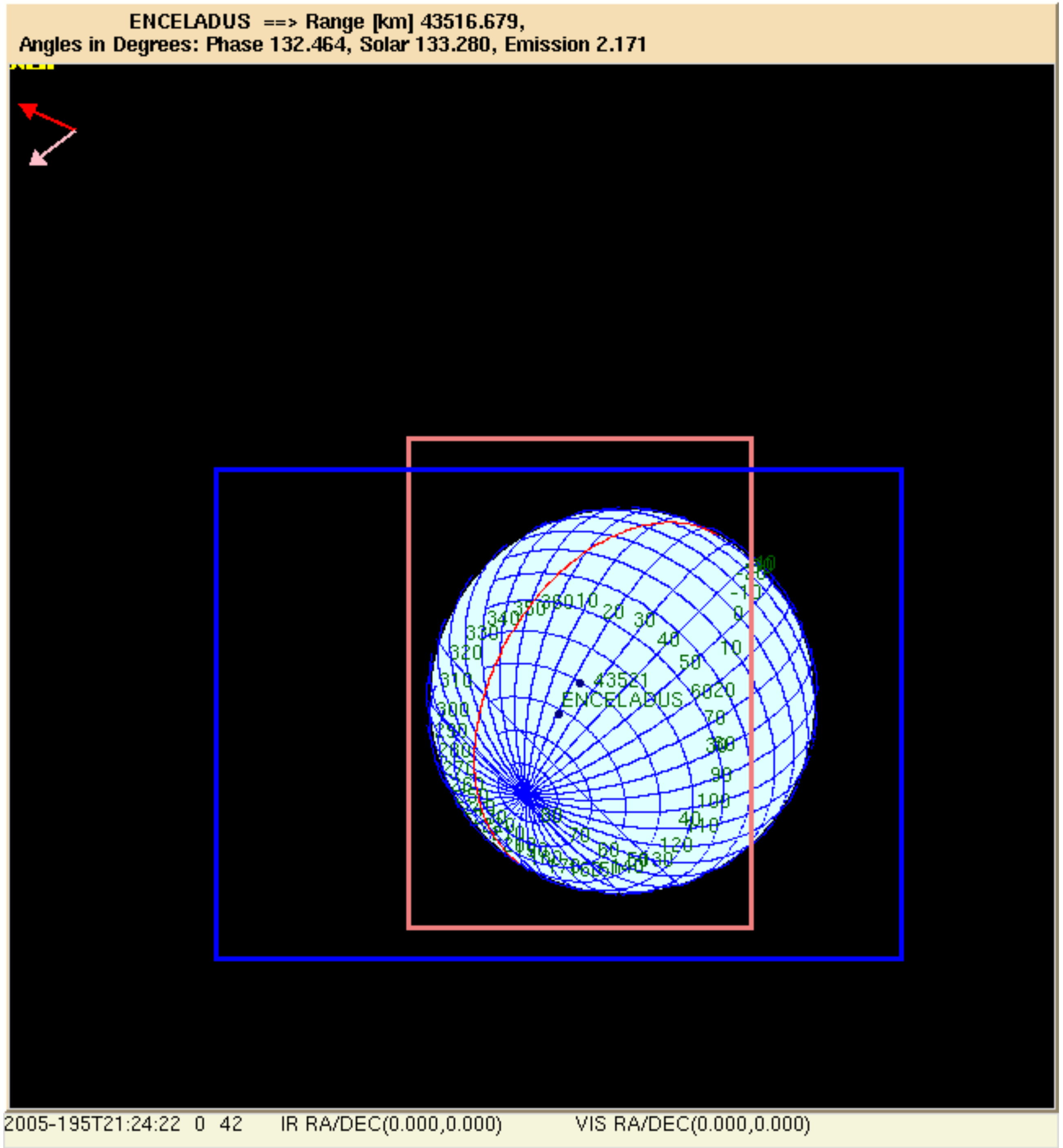
ENCELADUS ==> Range [km] 37107.761,
Angles in Degrees: Phase 132.553, Solar 133.322, Emission 2.223



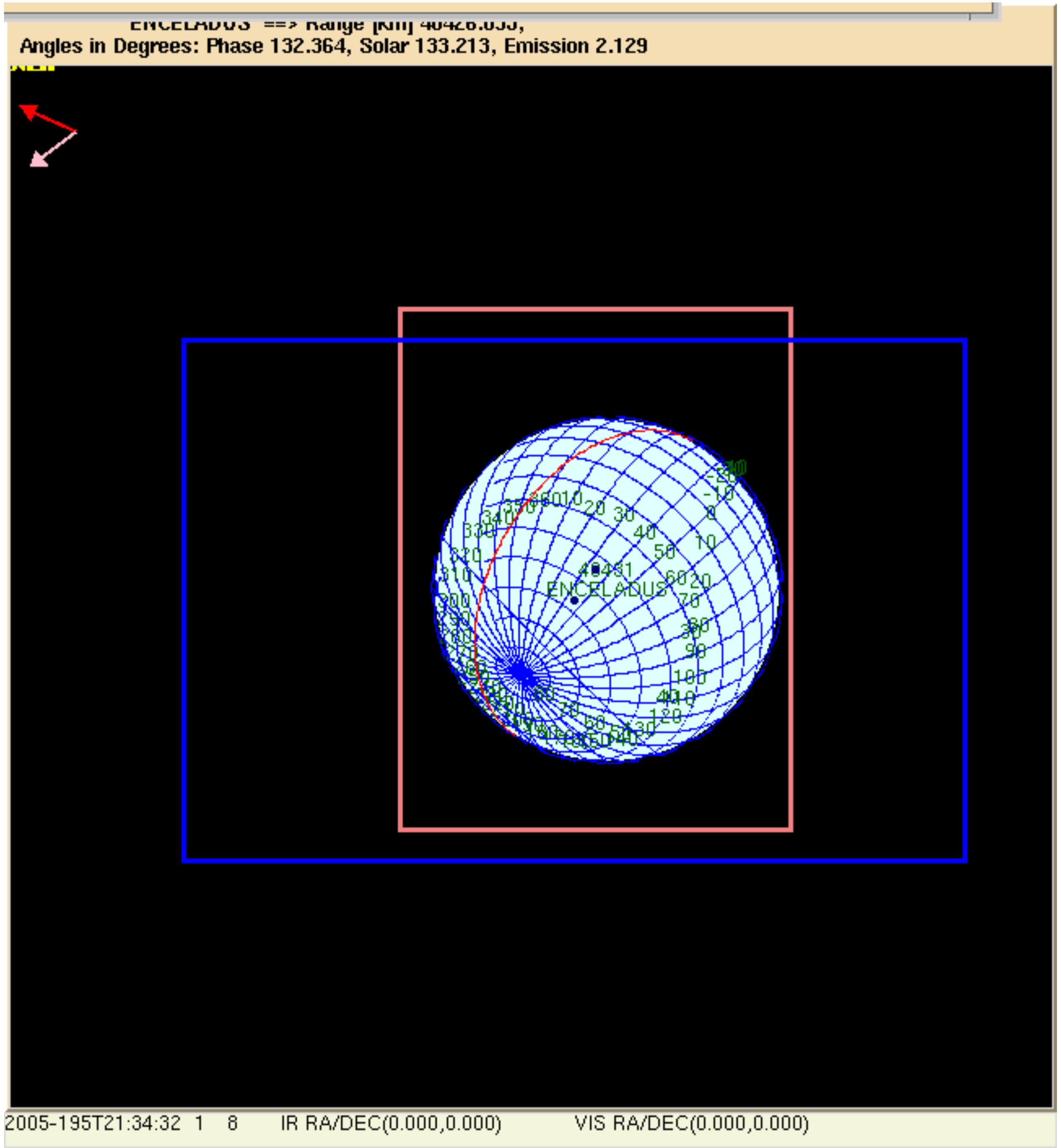
2005-195T21:11:10


ENCELADUS ==> Range [km] 39620.195,
Angles in Degrees: Phase 132.524, Solar 133.312, Emission 2.203
ENCELADUS
2005-195T21:16:20 3 35
IR RA/DEC(0.000,0.000)
VIS RA/DEC(0.000,0.000)

ISS prime


ENCELADUS ==> Range [km] 43516.679,
Angles in Degrees: Phase 132.464, Solar 133.280, Emission 2.171
ENCELADUS
2005-195T21:24:22 0 42
IR RA/DEC(0.000,0.000)
VIS RA/DEC(0.000,0.000)

UVIS
prime


ENCELADUS ==> Range [Km] 40426.055,
Angles in Degrees: Phase 132.364, Solar 133.213, Emission 2.129
ENCELADUS
2005-195T21:34:32 1 8 IR RA/DEC(0.000,0.000) VIS RA/DEC(0.000,0.000)

11EN-E2 RPWS Preview

W. Kurth

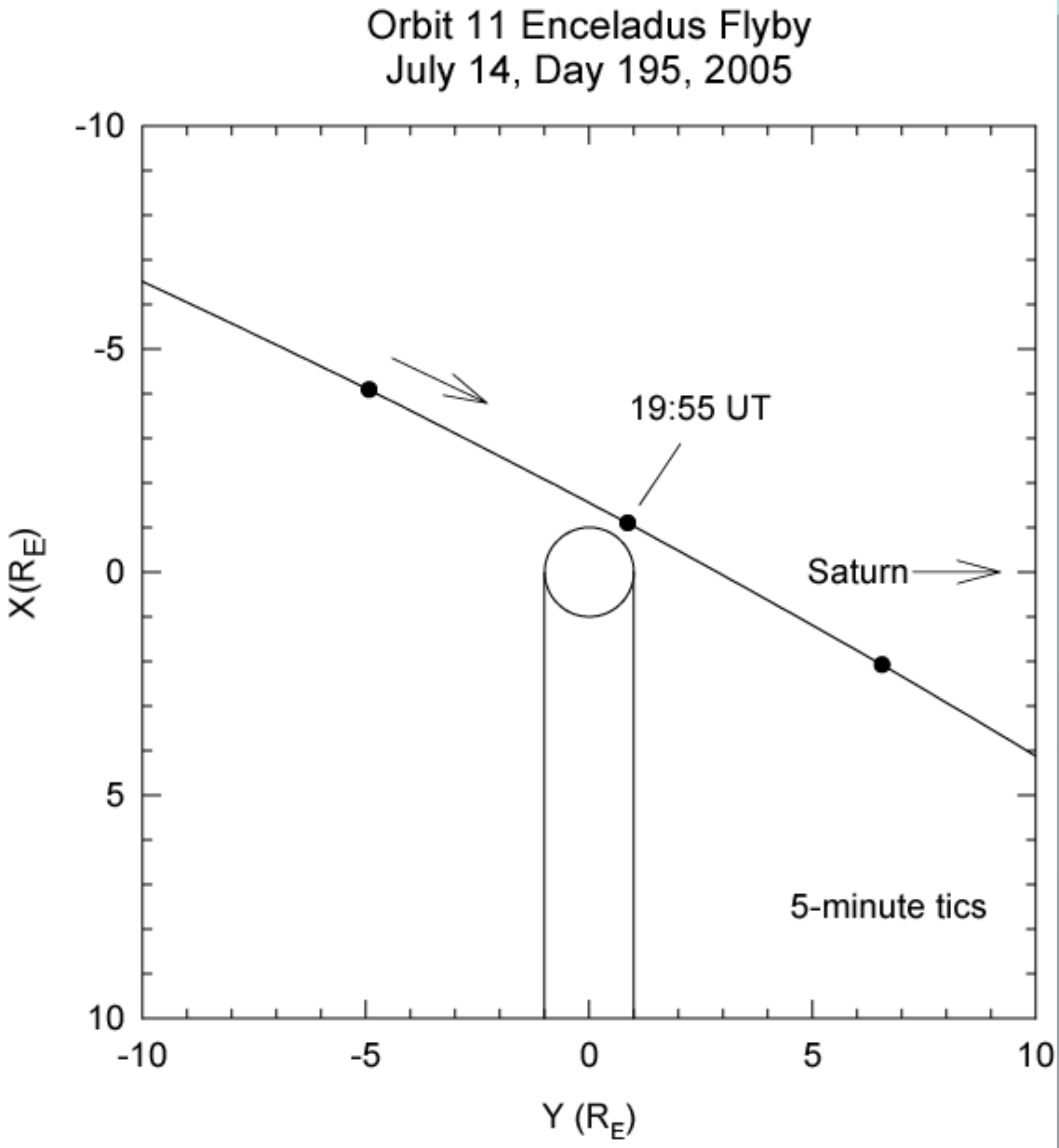
8 July 2005

RPWS Icy Satellite Objectives

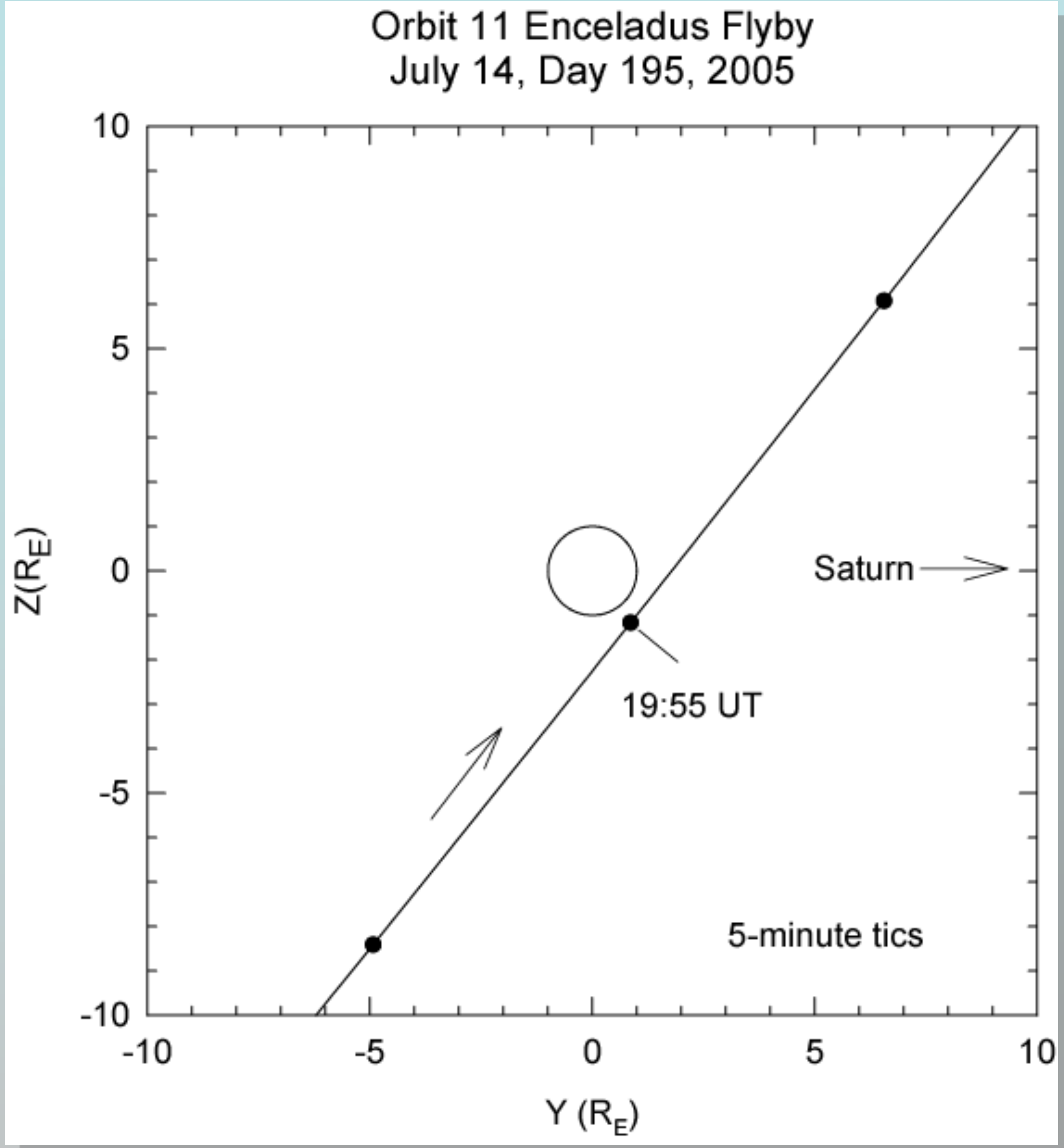
- Establish the spectrum and types of plasma waves associated with gaseous emissions from … the icy satellites.
- Determine the electron density in the magnetosphere of Saturn, near the icy moons…
- Determine the spatial distribution of micron-sized dust particles through out the Saturnian system.
- Measure the mass distribution of the impacting particles from pulse height analyses of the impact waveforms.

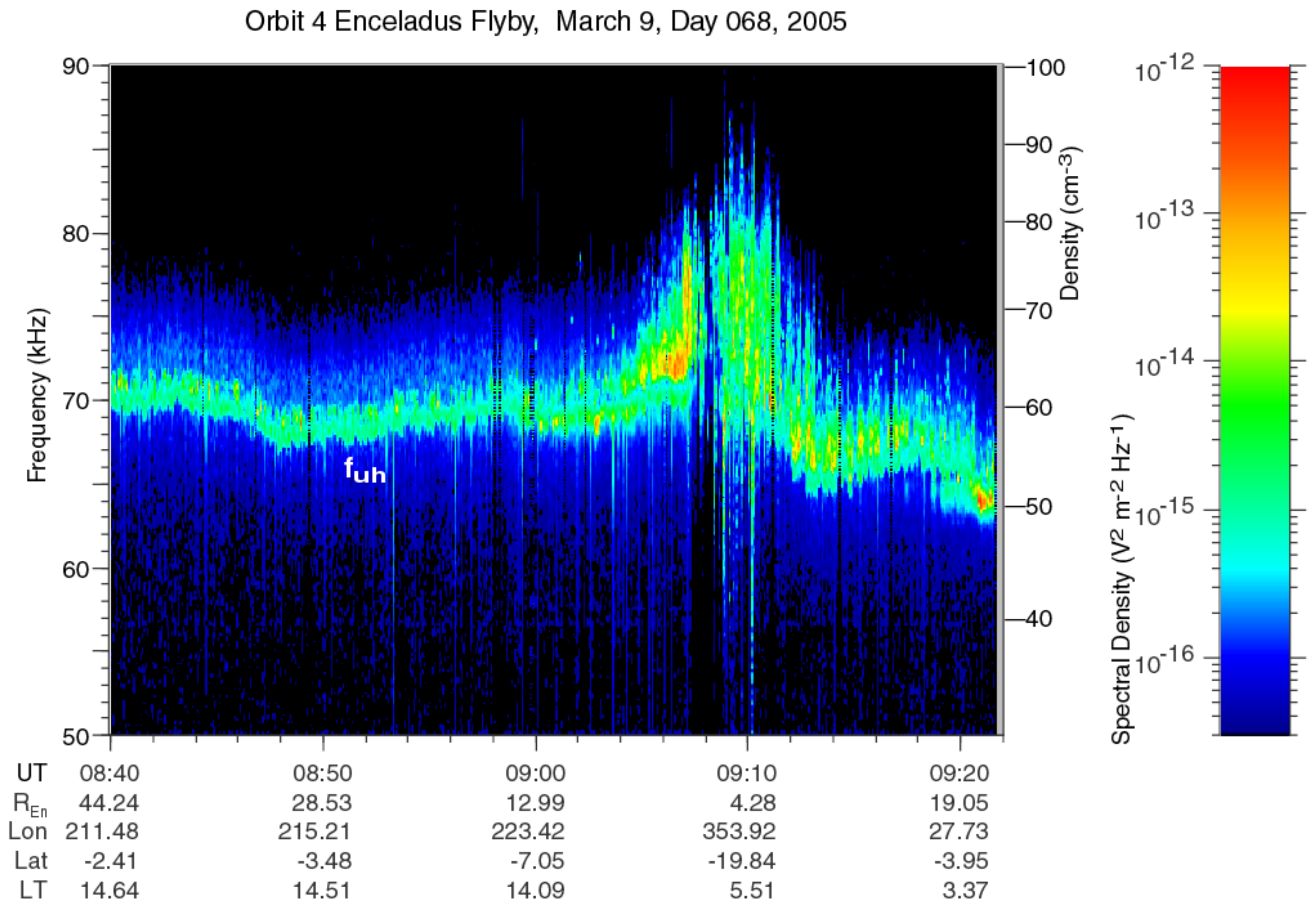
Orbit 11 Enceladus Opportunities for RPWS

- Close flyby will allow RPWS to measure the local plasma density; Orbit 4 observations suggested a local source near Enceladus, hence, we expect to see a much stronger effect during the Orbit 11 flyby.
- RPWS should be sensitive to any dust in the vicinity of Enceladus and will complement CDA/HRD observations.

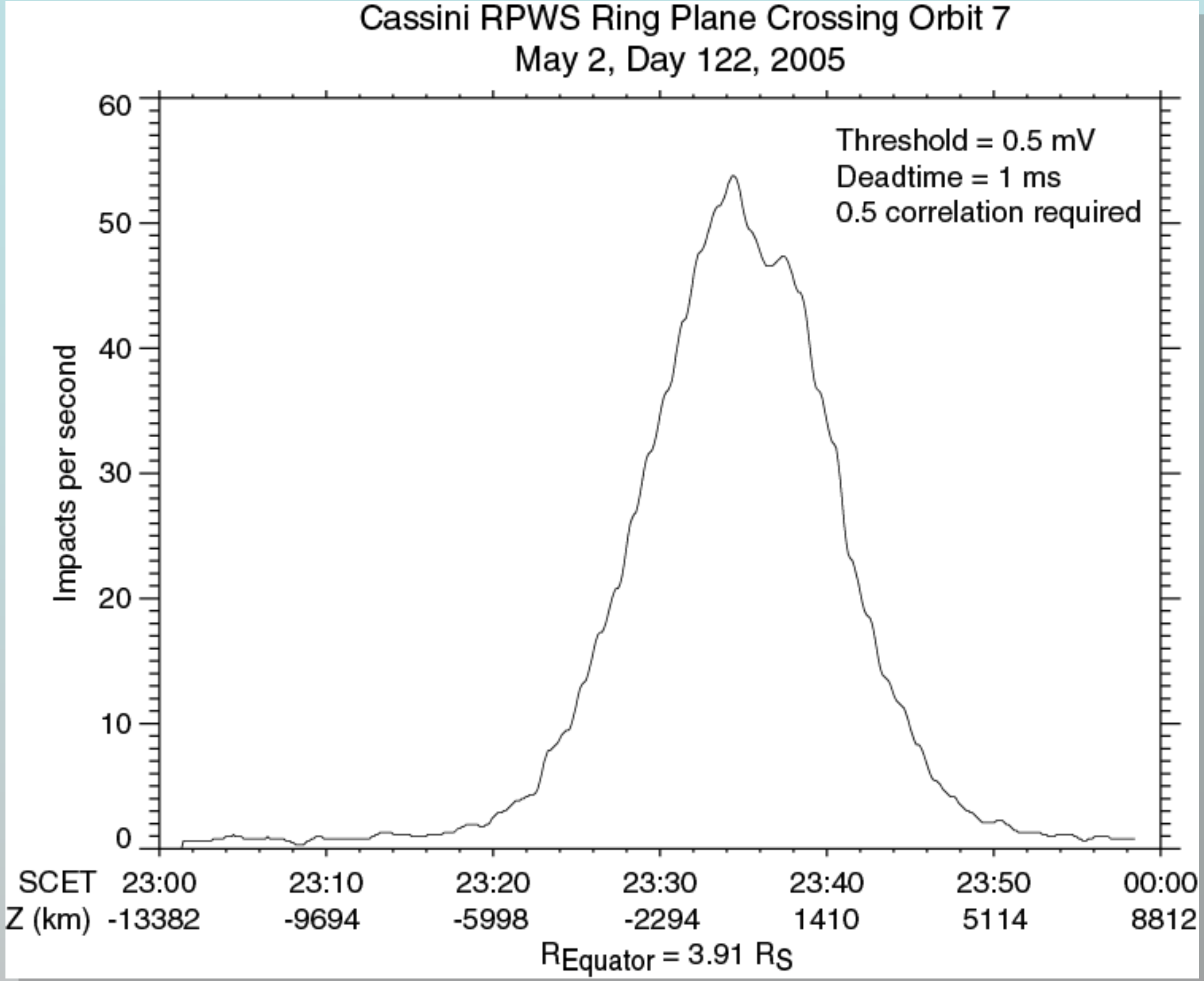


Orbit 11 Enceladus Flyby
July 14, Day 195, 2005
-10
-5
0
5
10
X(R_E)
19:55 UT
Saturn
5-minute tics
-10
-5
0
5
10
Y (R_E)


Orbit 11 Enceladus Flyby
July 14, Day 195, 2005
Z(RE)
Y (RE)
10
5
0
-5
-10
-10
-5
0
5
10
Saturn
19:55 UT
5-minute tics


Orbit 4 Enceladus Flyby, March 9, Day 068, 2005
Frequency (kHz)
90
80
70
60
50
Density (cm-3)
100
90
80
70
60
50
40
f uh
Spectral Density (V2 m-2 Hz-1)
10-12
10-13
10-14
10-15
10-16
UT 08:40 08:50 09:00 09:10 09:20
R En 44.24 28.53 12.99 4.28 19.05
Lon 211.48 215.21 223.42 353.92 27.73
Lat -2.41 -3.48 -7.05 -19.84 -3.95
LT 14.64 14.51 14.09 5.51 3.37

E-ring crossing near the orbit of Enceladus ($R = 3.91\ R_S$)



Preview of Cassini RADAR Observations of Rhea

Steve Ostro

(for the Cassini RADAR Science and Instrument Operations Teams)

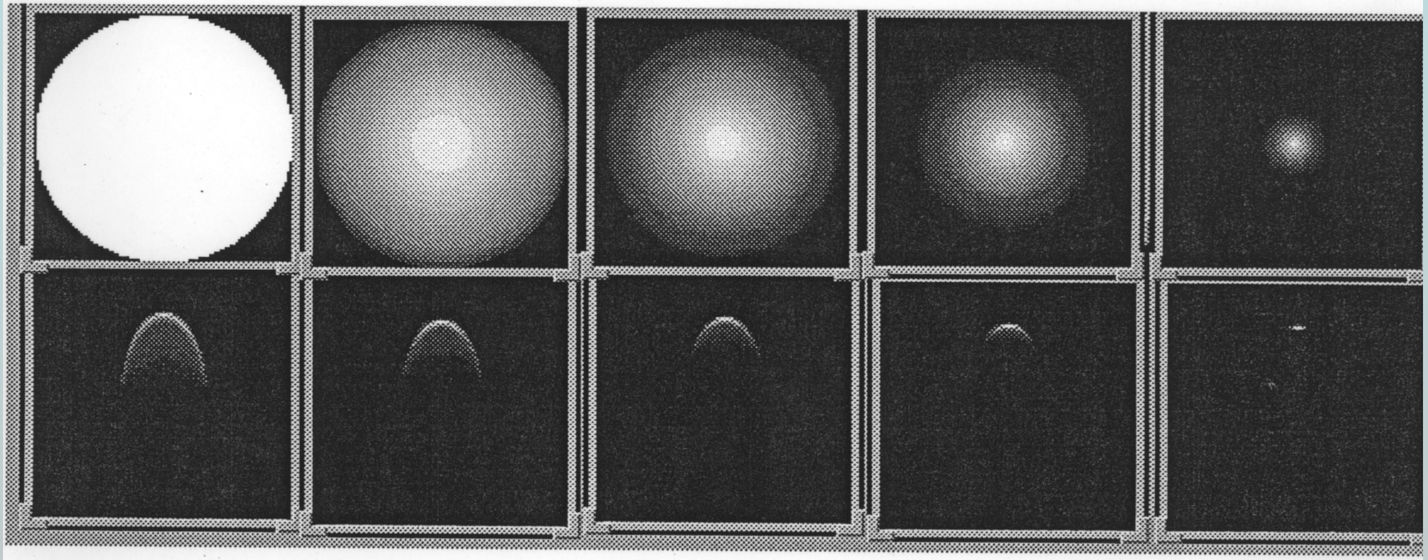
JPL, July 8, 2005

The RADAR Instrument

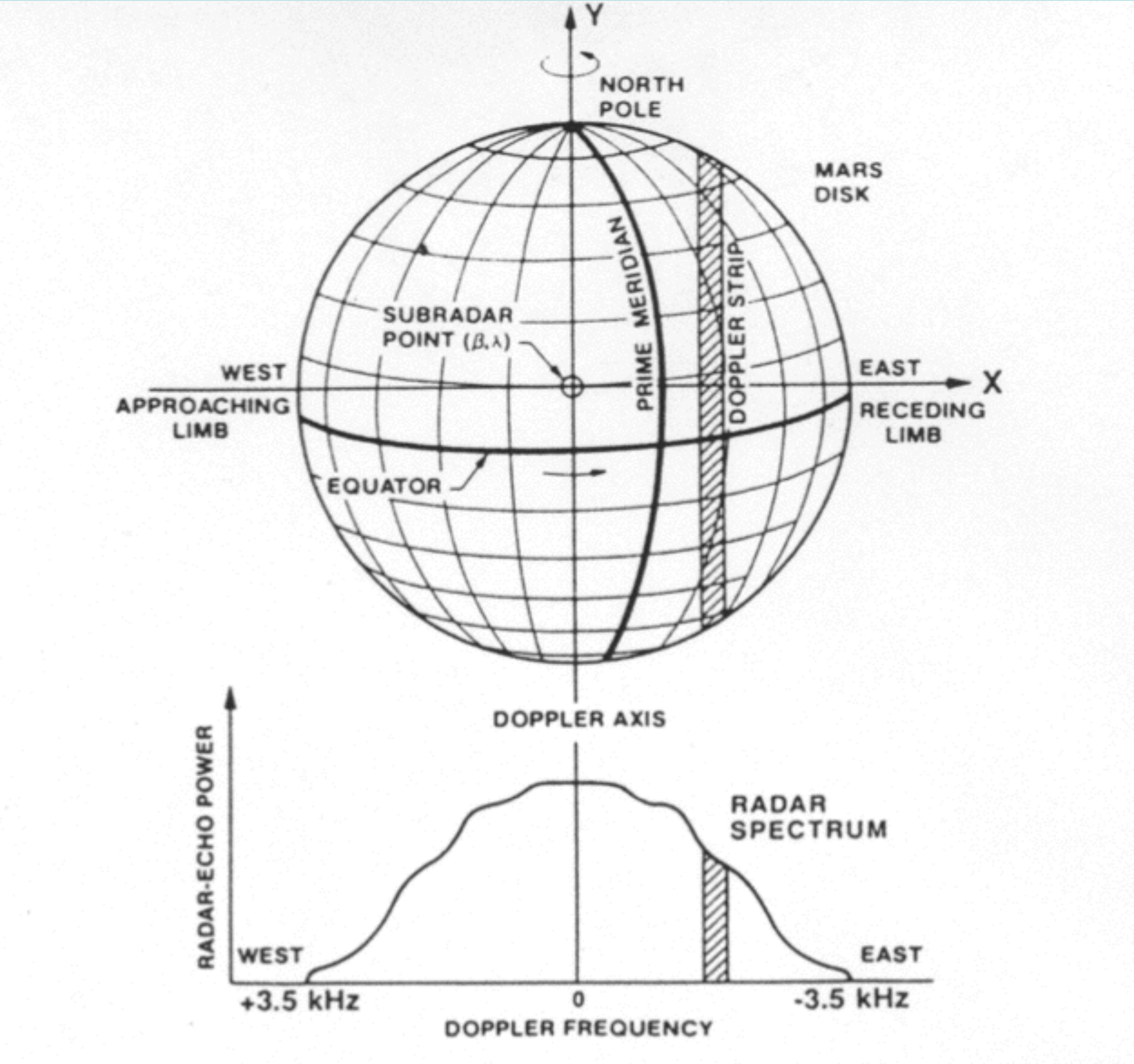
- 13.78 GHz
- 2.176 cm
- 46 watts
- “SL” polarization

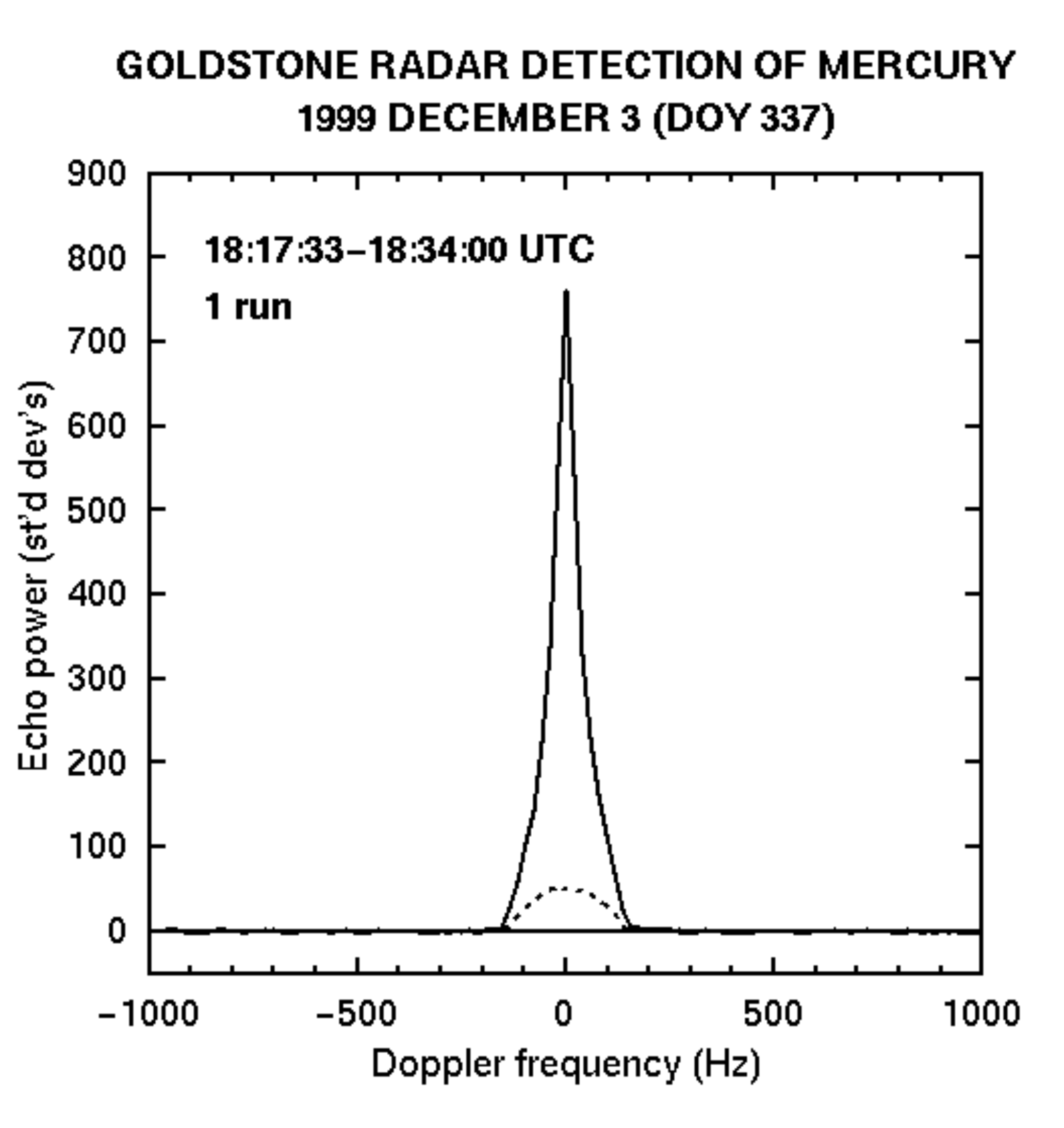
$\sigma_0(\theta) \sim \cos^n \theta$

n=1 2 4 10 100

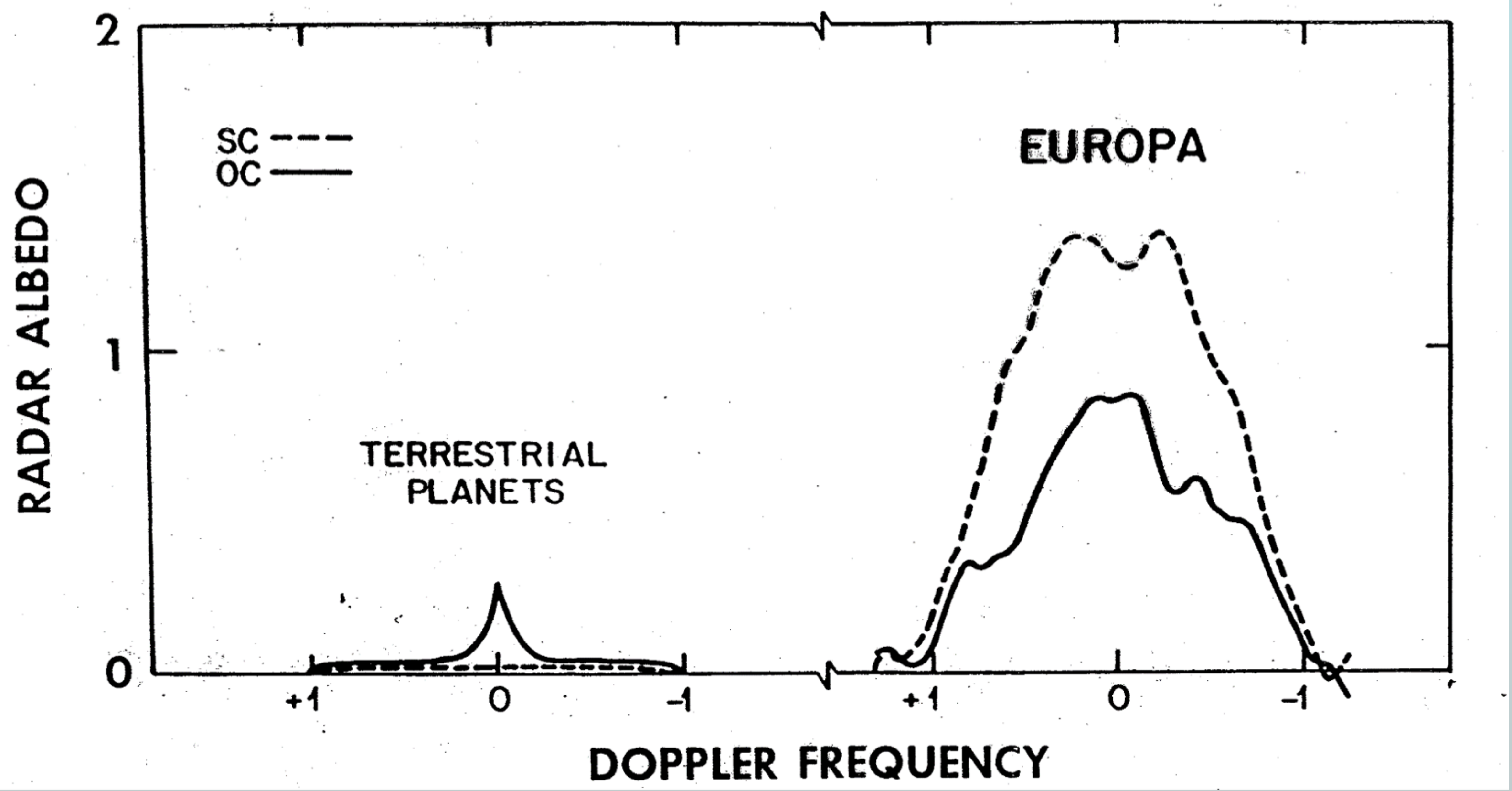


55° 45° 35° 24° 8°


Y
NORTH POLE
MARS DISK
PRIME MERIDIAN
DOPPLER STRIP
SUBRADAR POINT (β,λ)
WEST
APPROACHING LIMB
EAST
X
RECEDING LIMB
EQUATOR
DOPPLER AXIS
RADAR-ECHO POWER
RADAR SPECTRUM
WEST
EAST
+3.5 kHz
0
-3.5 kHz
DOPPLER FREQUENCY

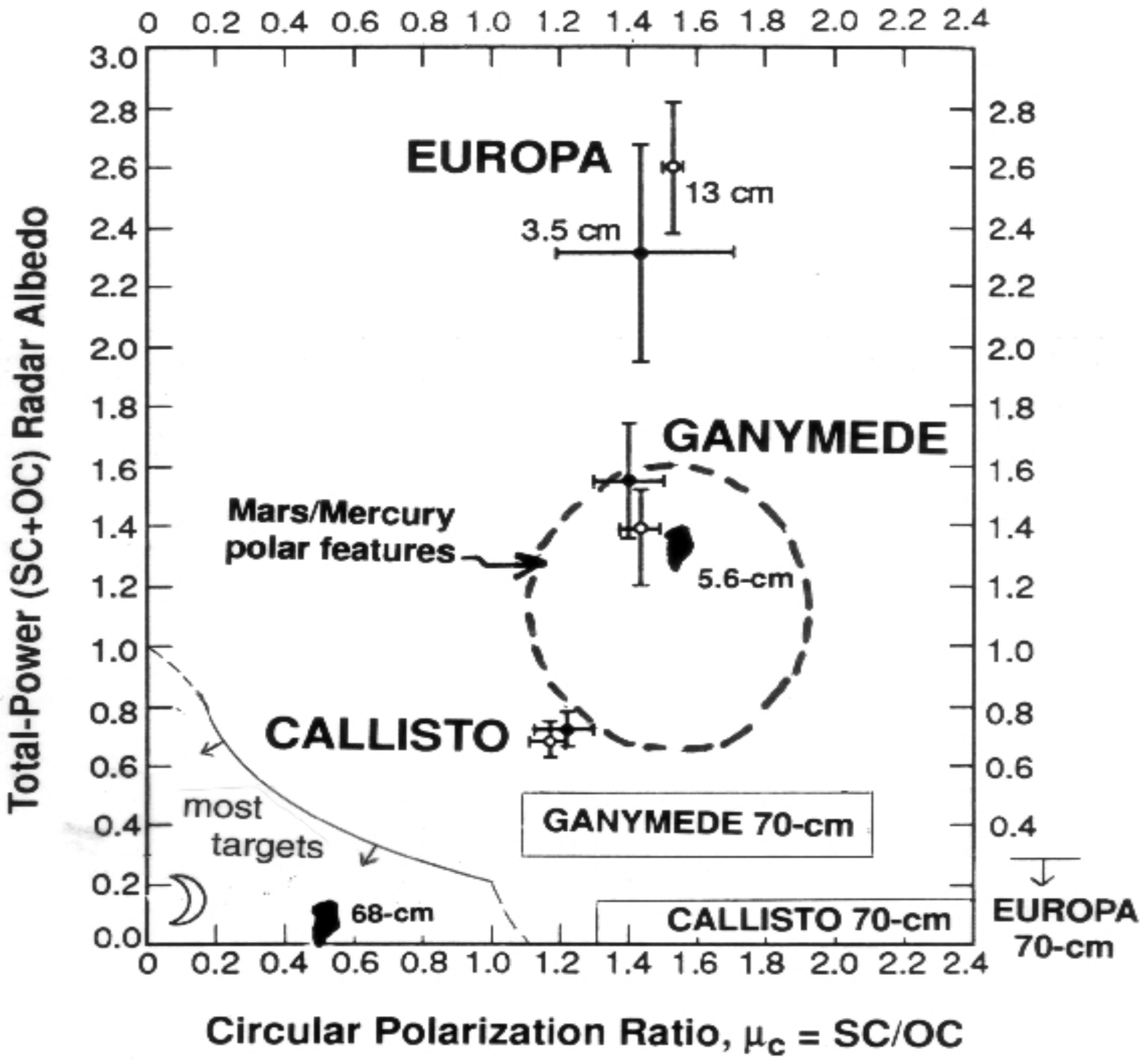


GOLDSTONE RADAR DETECTION OF MERCURY
1999 DECEMBER 3 (DOY 337)
18:17:33–18:34:00 UTC
1 run
Echo power (st'd dev's)
900
800
700
600
500
400
300
200
100
0
–1000
–500
0
500
1000
Doppler frequency (Hz)



2
1
0
RADAR ALBEDO
SC
OC
EUROPA
TERRESTRIAL
PLANETS
+1
0
-1
+1
0
-1
DOPPLER FREQUENCY

RADAR PROPERTIES



Radar Albedo and Polarization

- Total Power = SL + OL = SC + OC
- Smooth mirror: Total Power = SL = OC
- Rough targets: OL/SL ~ (SC/OC)/3
- For all radar-detected solar system targets,

  SL < SL+OL ≤ 1.6*SL

So plausible total-power albedos range from SL to 1.6*SL.

- Phoebe (AUG 2004 calibration): SL = 0.16 ±10%, so we can assume that the total-power albedo is between ~0.14 and ~0.28.
- Iapetus and Enceladus calibrations are underway.

Total-Power Radar Albedos

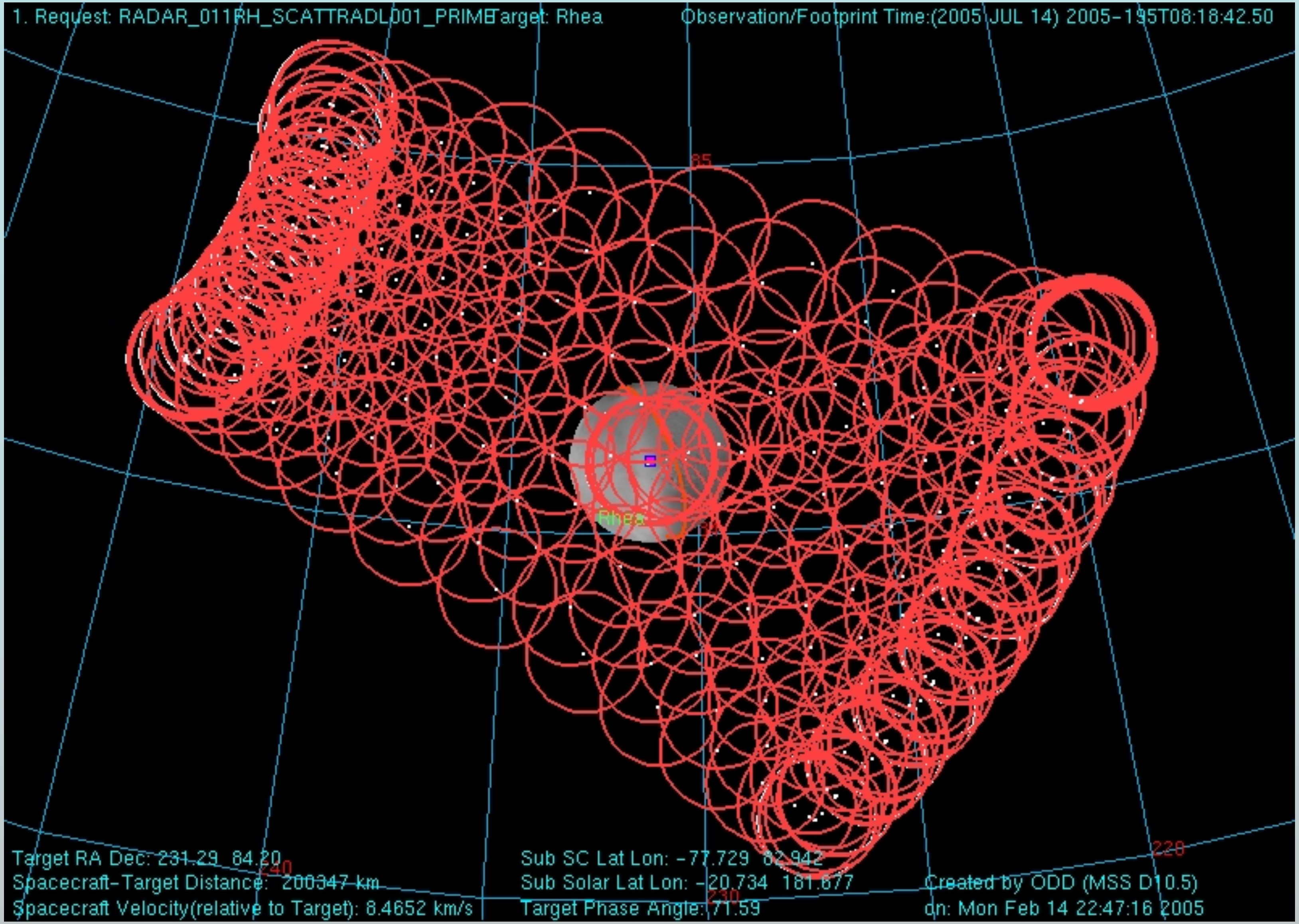
2.30	**Europa**	
1.55	**Ganymede**	
1.32	**Rhea** (Black and Campbell 2004, *BAAS* **36**, 1123)	
0.72	**Callisto**	
0.28		**PHOEBE**
0.22	**Titan**	**PHOEBE**
0.17	**Iapetus trailing**	**PHOEBE**
0.17	**NEA average and S MBAs**	**PHOEBE**
0.16	**C MBAs**	**PHOEBE**
0.14		**PHOEBE**
0.13	**Iapetus leading**	
0.13	**smooth ice sphere w/ 30% ammonia**	
0.09	**BGFPD MBAs**	
0.08	**Moon**	
0.08	**smooth ice sphere**	
0.06	**comets**	
0.04	**smooth sphere of complex organics**	

RHE11

Date 2005 July 14

	Division	Duration	
a	distant warmup	04:00	Warmup
b	distant radiometer	00:10	Radiometer during initial turn to target
c	scat compressed	00:05	Scatterometer off-target receive only compressed
d	distant radiometer	00:19	Radiometer between receive only measurements
e	scat compressed	00:05	Scatterometer on-target receive only compressed
f	**distant scatterometer**	**00:18**	**Scatterometer target-center stare with tone**
g	distant radiometer	01:03	Radiometer during raster scan

Detection Time	0.1 min
Distance, km	195,000
Beam/Diameter	0.83


1. Request: RADAR_011RH_SCATTRADL001_PRIME Target: Rhea
Observation/Footprint Time:(2005 JUL 14) 2005-195T08:18:42.50
85
Rhea
240
230
220
Target RA Dec: 231.29 84.20
Spacecraft-Target Distance: 200347 km
Spacecraft Velocity(relative to Target): 8.4652 km/s
Sub SC Lat Lon: -77.729 82.942
Sub Solar Lat Lon: -20.734 181.677
Target Phase Angle: 71.59
Created by ODD (MSS D10.5)
on: Mon Feb 14 22:47:16 2005

Cassini RADAR Observations of "Icy Satellites"

Rhea	7
Enceladus	6 (E3,E4 successful)
Dione	5 (D0 failed)
Mimas	4 (M0 failed)
Iapetus	3 (IAP 0B/C successful)
Tethys	2
Hyperion	2
Phoebe	1 (P0 successful)
	30 ("four for six" so far)