

# Observation Playbook

\*Observations coming down between  
June 23<sup>rd</sup> and July 20<sup>th</sup>

LORRI and MVIC

# Table of Contents and Downlink Schedule

Page	Request ID	Imaging Start [s/c, UTC]	Time to Closest Approach	Res. [km/px]	Estimated Initial Playback END [GRT, EDT]
	PC_VISUV_MAP_B_0 (MVIC Color TDI)	176_05:03:20	P-019/07:02	459	June 26 <sup>th</sup> , 8:12 am
	PC_Multi_Map_A7 (MVIC Color TDI)	184_23:02:03	P-010/12:37	250	July 6 <sup>th</sup> , 6:49 am
	PC_MULTI_MAP_B_18_02 (Charon)	194_06:36:57		7.2	July 13 <sup>th</sup> , 12:25 pm
	PC_Multi_Map_B_18 (MVIC Color TDI)	194_07:37:55	P-001/04:21	28.3	P: July 13 <sup>th</sup> , 12:05 pm C: July 13 <sup>th</sup> , 12:19 pm
	PC_AIRGLOW_FILL_2_08 (Pluto)	194_20:02:43		3.9	July 15 <sup>th</sup> , 6:47 am
	P_LORRI_FULLFRAME	194_20:17:28		3.9	July 13 <sup>th</sup> , 11:07 pm
	H_LORRI_APPR_1d2	194_23:16:11		3.2	July 15 <sup>th</sup> , 6:55 am
	N_LORRI_APPR_1d2	194_23:19:16		3.0	July 15 <sup>th</sup> , 11:31 am
	P_LORRI_TIMERES_3	195_02:49:47		2.2	July 17 <sup>th</sup> , 11:42 am
	C_LORRI_FULLFRAME_1	195_02:41:49		2.3	July 15 <sup>th</sup> , 6:22 am
	PC_Color_1 (MVIC Color TDI)	195_06:49:08		5.0	July 16 <sup>th</sup> , 9:05 am
	H_LORRI_BEST	195_07:39:28		1.2	July 17 <sup>th</sup> , 11:42 am
	N_Color_2 (MVIC Color TDI)	195_08:02:39	P-000/03:46	172	July 18 <sup>th</sup> , 5:37 am
	P_LORRI_STEREO_MO SAIC – 3 images	195_10:10:15		0.39	July 15 <sup>th</sup> , 12:31 pm
	P_LORRI_STEREO_Ma OSAIC – 4 images				July 18 <sup>th</sup> , 4:08 am
	C_LEISA_HIRES – 3 images	195_10:23:47		0.39	July 16 <sup>th</sup> , 2:49 am
	PC_MULTI_DEP_LONG_2_01	195_19:06:24		1.8	July 20 <sup>th</sup> , 10:26 am

# Notes

## Dates

Approach Hi Speed Playback – Before July 12<sup>th</sup>, 2015 (Before DOY 193)

Fail Safe – July 12-13<sup>th</sup>, 2015 (DOY 193-194)

E\_HEALTH\_1 & Phone Home – July 14<sup>th</sup>, 2015 (DOY 195)

1<sup>st</sup> Look Playback – July 15-16<sup>th</sup>, 2015 (NYTimes datasets) (DOY 196-197)

Early High Priority – July 17-20<sup>th</sup>, 2015 (DOY 198-201)

Browse Playback (lossy) – all high speed data sent back Sept. 14<sup>th</sup>-Nov. 18<sup>th</sup>, 2015 (DOY 257-332)

Full Playback (lossless) – all data sent back between Nov. 18<sup>th</sup>, 2015 and Oct. 2016

Note: EDT runs March 8<sup>th</sup>-Nov. 1<sup>st</sup>, 2015 (DOY 67-305 – switches half way through Browse)

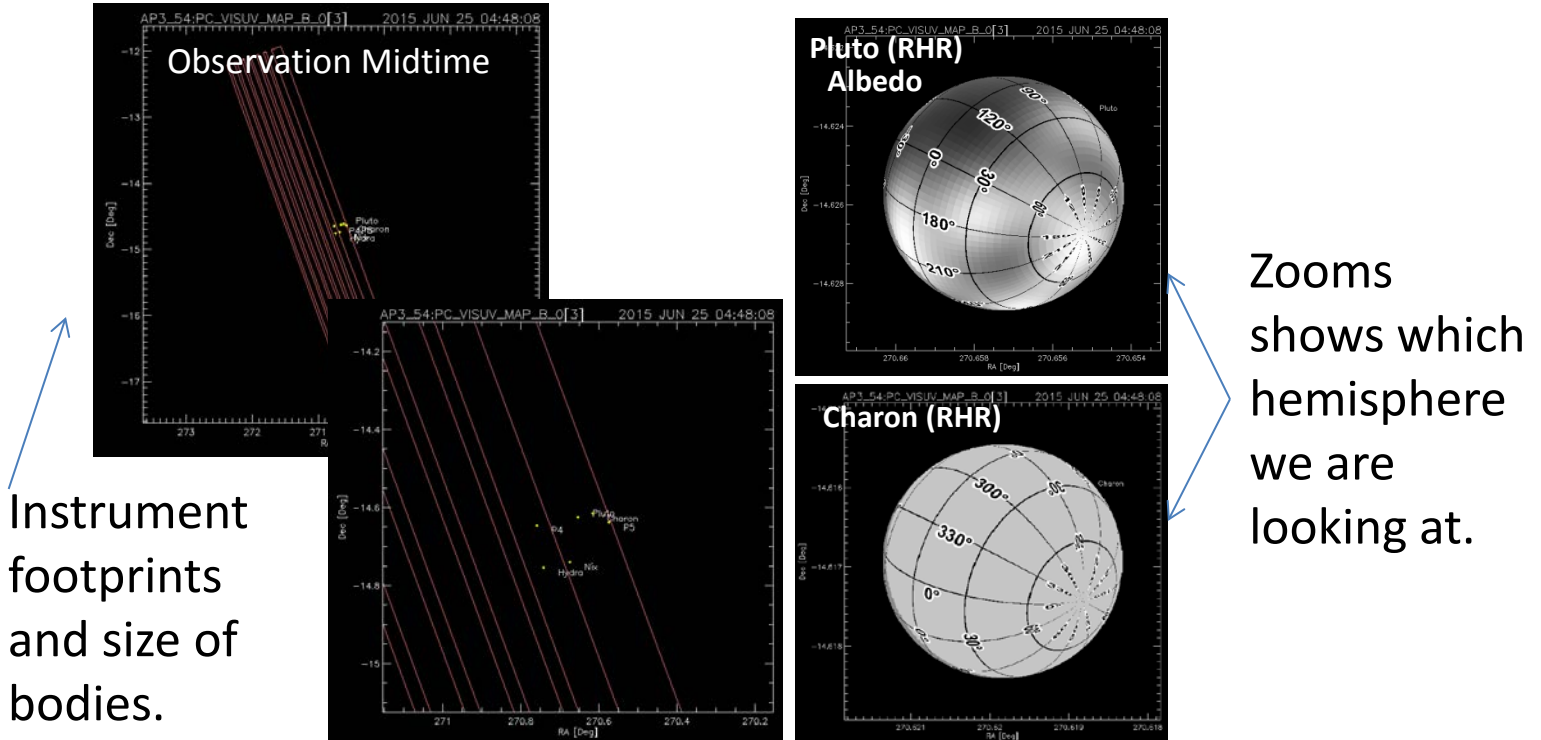
## Additional Info

- Because of the error in where Pluto is the observation times may change by as much as +/- ~450 seconds.
- The downlink “end” times are when the data has been completely downlinked to the DSN. Nominally the data will be processed at the SOC and available ~1 hr after the downlink end time, might be as much as 2 hours for a larger chunk. The SOC will also be posting to the public website, fairly quickly, but I don’t know the exact timescales for that.

Load 15174  
Approach Phase 3

PC\_VISUV\_MAP\_B\_0  
(MVIC Color TDI)

459 km/px



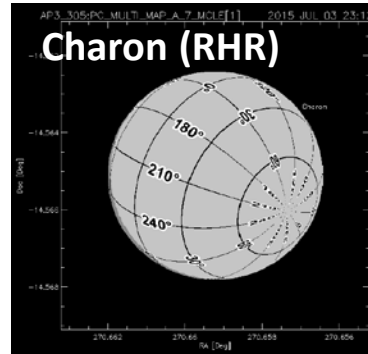
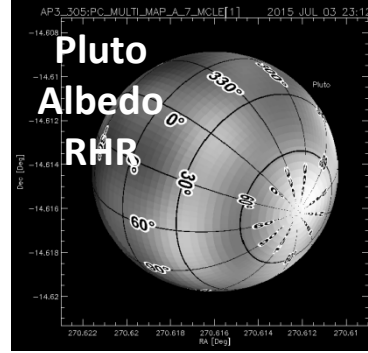
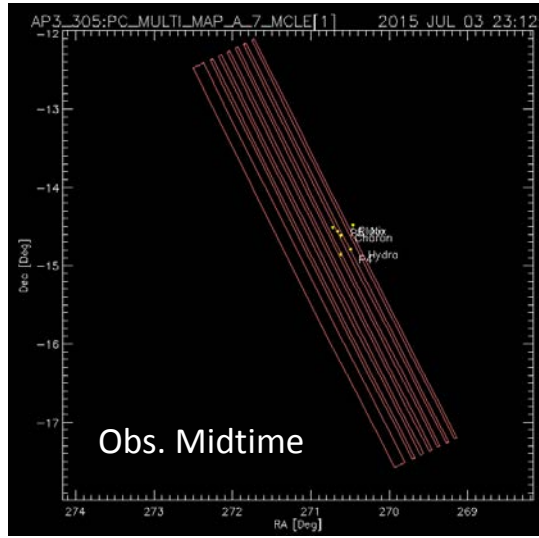
Event	Time (UTC)	Time (EDT)	Compress.
Imaging (s/c, start)	2015-176_05:03:20	176_01:03:20	
Approach Hi Speed Playback (GRT, queue start)	No longer in datatrack		Lossless Subframes
Approach Hi Speed Playback (GRT, end)	2015-177_12:12:49	June 26 <sup>th</sup> , 8:12 am 177_08:12:49	Lossless Subframes
Browse Playback	2015-	-	-
Full Playback	-	-	-

Body	Range [km]	Ang Diam [urad]	Phase [deg]	SubSol Lat [deg]	SubSol Lon [deg]	SubS/C Lat [deg]	SubS/C Lon [deg]
Pluto	22,967,127	104.1	14.9	49.4	133.6	41.8	152.1
Charon	22,980,477	51.6	15.0	49.4	313.6	41.7	332.1

Load 15184  
Approach Phase 3

PC\_Multi\_Map\_A7  
(MVIC Color TDI)

250 km/px

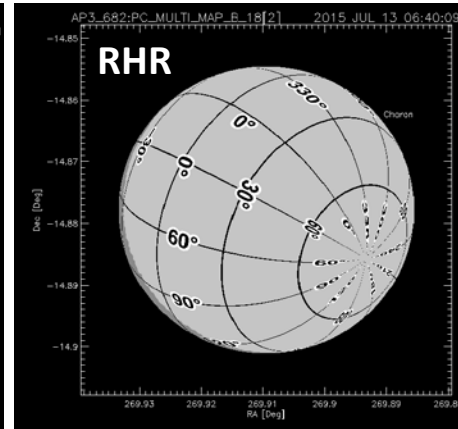
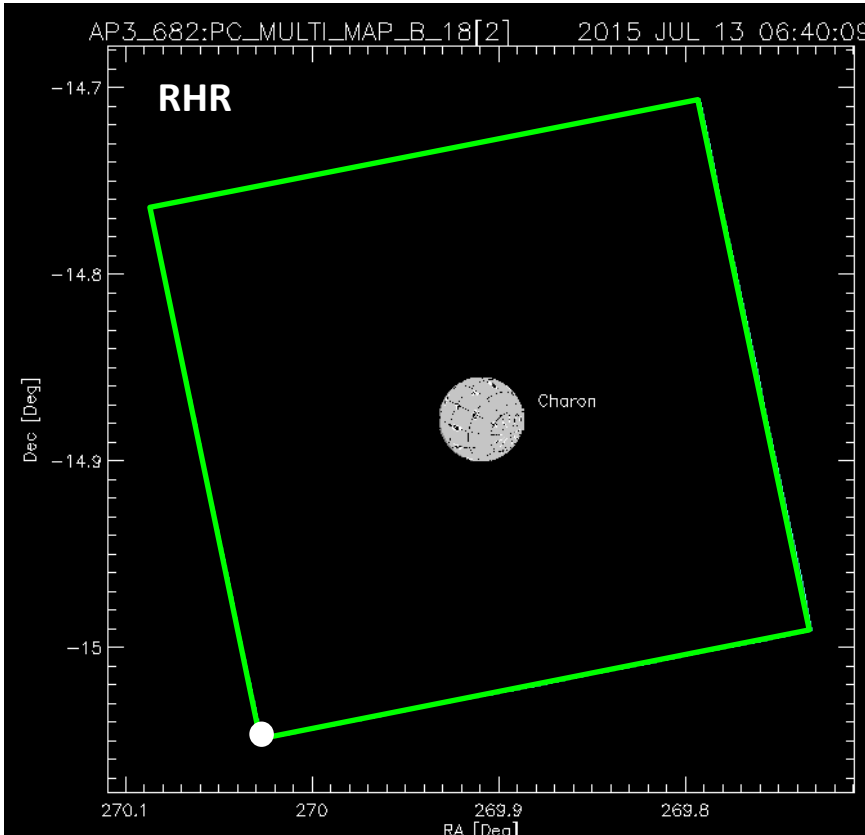


Event	Time (UTC)	Time (EDT)	Compress.
Imaging (s/c, start)	2015-184_23:02:03	184_19:02:03	
1 <sup>st</sup> Look Playback (GRT, end)	2015-187_10:48:35	July 6 <sup>th</sup> , 6:49 am 187_06:48:35	Lossless Subrame
Browse Playback	2015-	-	-
Full Playback	-	-	-

Body	Range [km]	Ang Diam [urad]	Phase [deg]	SubSol Lat [deg]	SubSol Lon [deg]	SubS/C Lat [deg]	SubS/C Lon [deg]
Pluto	12,537,956	190.6	15.0	49.4	359.4	41.7	18.0
Charon	12,525,011	94.7	15.0	49.4	179.4	41.8	198.0

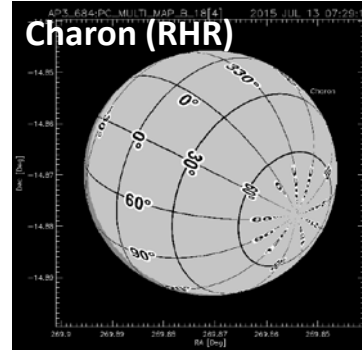
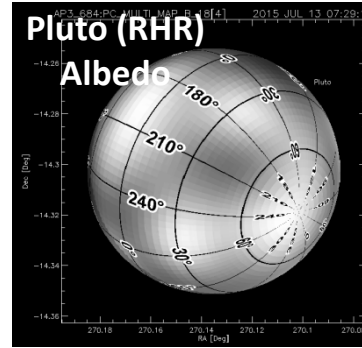
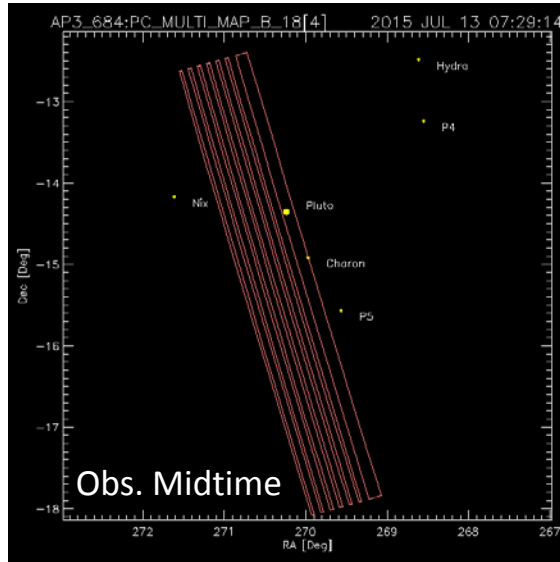
# 15188 – Core Load Near Encounter Phase





Event	Time (UTC)	Time (EDT)	Compress.
Imaging (s/c, start)	2015-194_06:36:57	194_02:36:57	
1 <sup>st</sup> Look Playback (GRT, queue start)	2015-194_14:52:50	July 13 <sup>th</sup> , 10:52 am 194_10:52:50	Lossy
1 <sup>st</sup> Look Playback (GRT, end)	Exact time Unknown		
Browse Playback	2015-	-	-
Full Playback	-	-	-

Body	Range [km]	Ang Diam [urad]	Phase [deg]	SubSol Lat [deg]	SubSol Lon [deg]	SubS/C Lat [deg]	SubS/C Lon [deg]
Charon	1,461,222	811.3	15.6	49.4	14.6	41.0	33.4

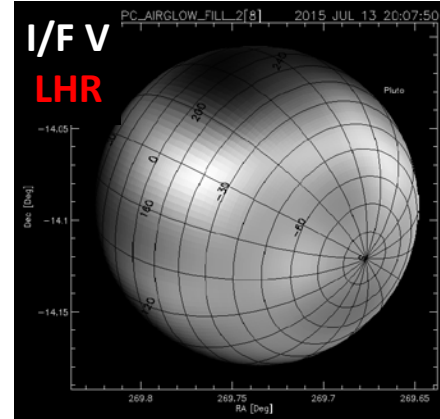
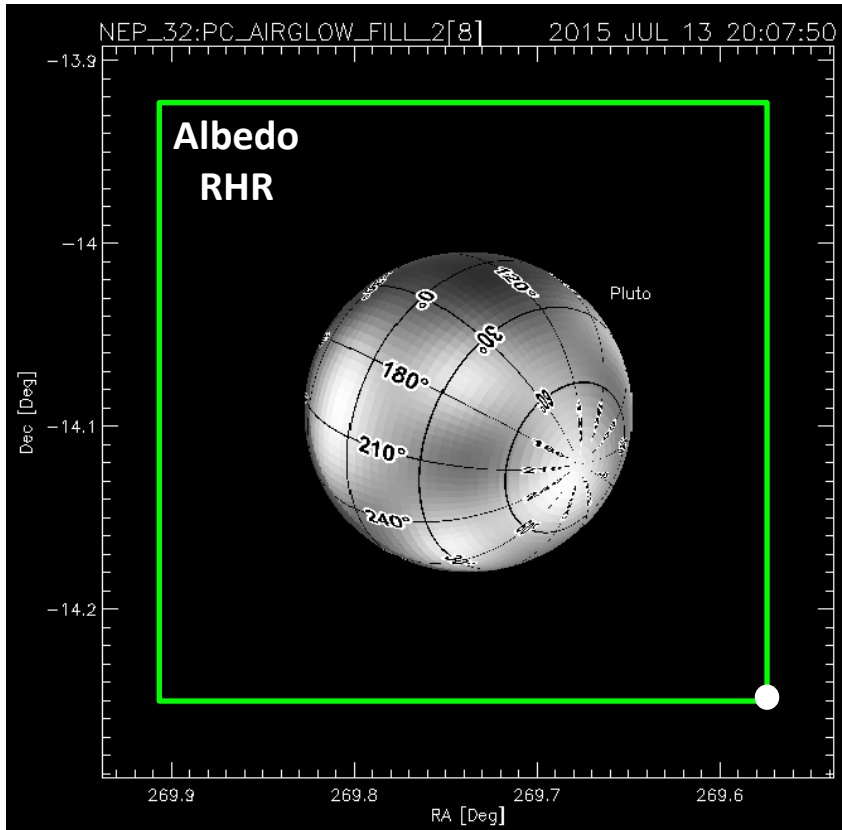


Event	Time (UTC)	Time (EDT)	Compress.
Imaging (s/c, start)	2015-194_07:37:55	194_03:37:55	
1 <sup>st</sup> Look Playback (GRT, queue start)	2015-194_14:52:50	July 13 <sup>th</sup> , 10:52 am 194_10:52:50	Lossless Subframes
1 <sup>st</sup> Look Playback (GRT, end)	Pluto: 2015-194_16:05:02 Charon: 2015-194_16:19:31	July 13 <sup>th</sup> , 12:05 pm 194_12:05:02 July 13 <sup>th</sup> , 12:19 pm 194_12:19:31	Lossless Subframes
Browse Playback	2015-	-	-
Full Playback	-	-	-

Body	Range [km]	Ang Diam [urad]	Phase [deg]	SubSol Lat [deg]	SubSol Lon [deg]	SubS/C Lat [deg]	SubS/C Lon [deg]
Pluto	1,405,511	1699	15.6	49.4	192.6	41.5	211.9
Charon	1,418,370	835.8	15.6	49.4	12.6	41.0	31.4

PC\_AIRGLOW\_FILL\_2\_08

3.890 km/px

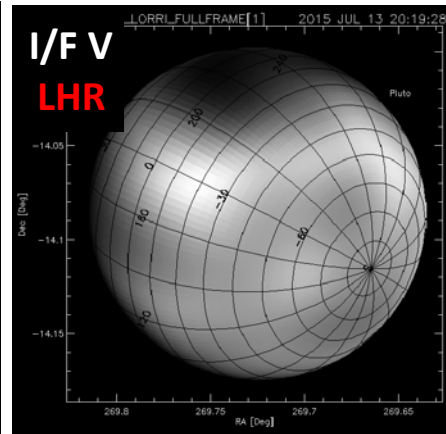
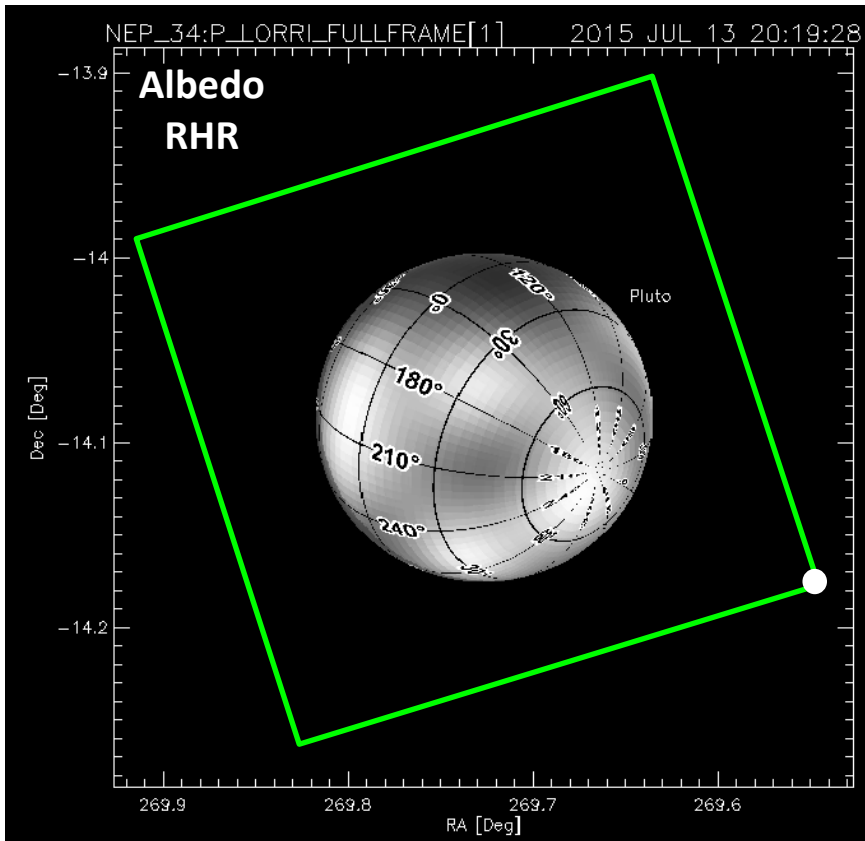


Event	Time (UTC)	Time (EDT)	Compress.
Imaging (s/c, start)	2015-194_20:02:43	194_16:02:43	
1 <sup>st</sup> Look Playback (GRT, queue start)	2015-196_09:32:29	July 15 <sup>th</sup> , 5:32 am 196_05:32:29	Lossy
1 <sup>st</sup> Look Playback (GRT, end)	2015-196_10:46:53	July 15 <sup>th</sup> , 6:47 am 196_06:46:53	Lossy
Browse Playback	2015-	-	-
Full Playback	-	-	-

Body	Range [km]	Ang Diam [urad]	Phase [deg]	SubSol Lat [deg]	SubSol Lon [deg]	SubS/C Lat [deg]	SubS/C Lon [deg]
Pluto	777,907	3068	16.1	49.4	162.9	41.2	182.7

P\_LORRI\_FULLFRAME (1 image)

3.847 km/px

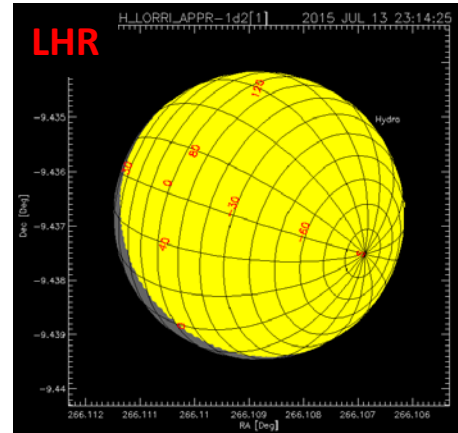
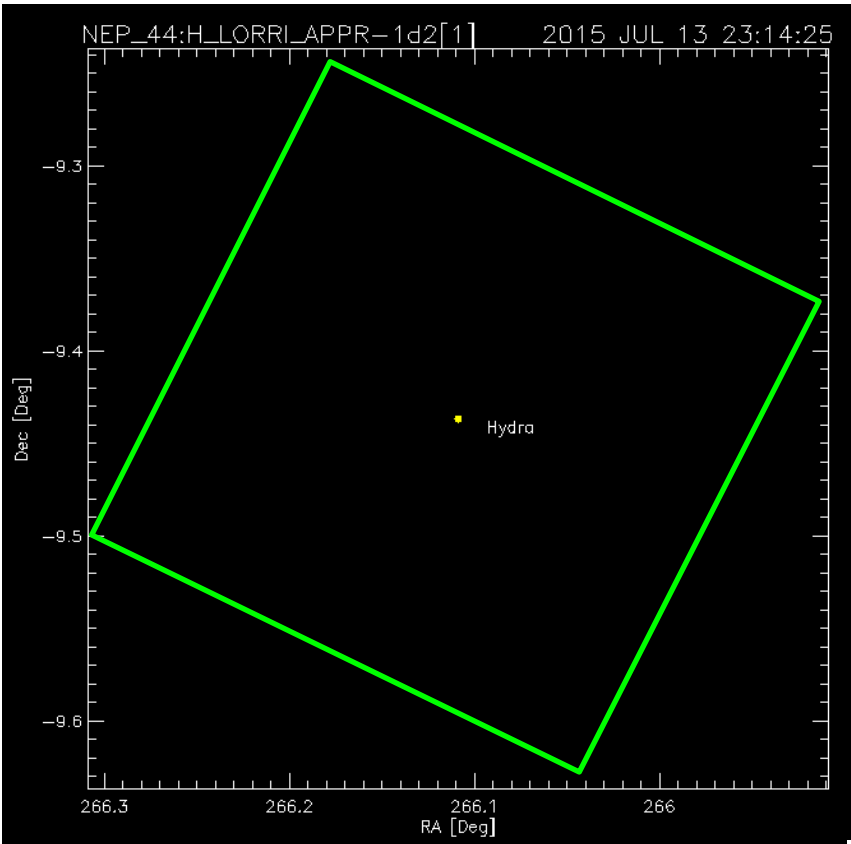


Event	Time (UTC)	Time (EDT)	Compress.
Imaging (s/c, start)	2015-194_20:17:28	194_16:17:28	
1 <sup>st</sup> Look Playback (GRT, queue start)	2015-195_02:24:25	July 13 <sup>th</sup> , 10:24 pm 194_22:24:25	Lossy
1 <sup>st</sup> Look Playback (GRT, end)	2015-195_03:07:22	July 13 <sup>th</sup> , 11:07 pm 194_23:07:22	Lossy
Browse Playback	2015-	-	-
Full Playback	-	-	-

Body	Range [km]	Ang Diam [urad]	Phase [deg]	SubSol Lat [deg]	SubSol Lon [deg]	SubS/C Lat [deg]	SubS/C Lon [deg]
Pluto	768,301	3106	16.1	49.4	162.4	41.2	182.2

H LORRI APPR 1d2

3.227 km/px

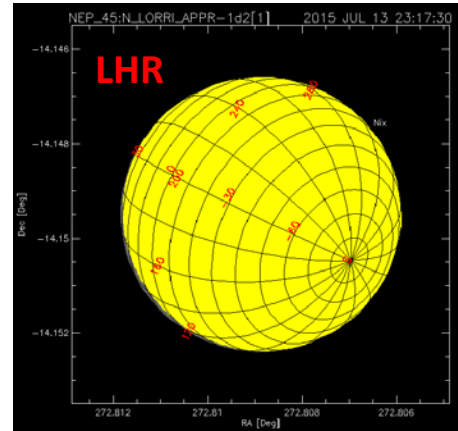
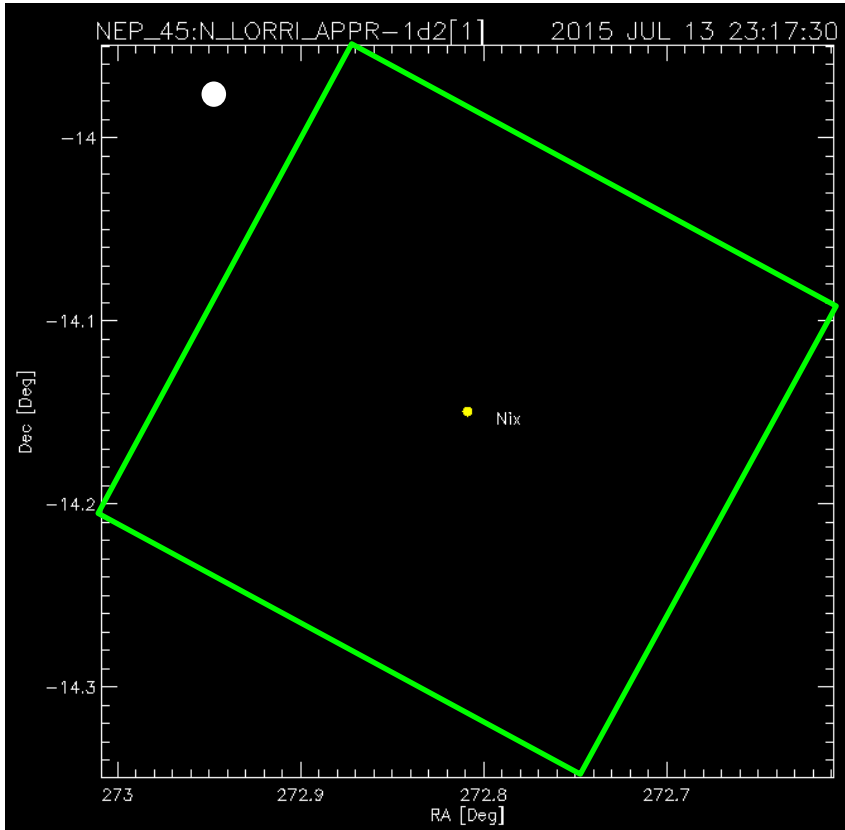


Event	Time (UTC)	Time (EDT)	Compress.
Imaging (s/c, start)	2015-194_23:16:11	194_19:16:11	
1 <sup>st</sup> Look Playback (GRT, queue start)	2015-196_09:32:29	July 15 <sup>th</sup> , 5:32 am 196_05:32:29	Lossy
1 <sup>st</sup> Look Playback (GRT, end)	2015-196_10:54:57	July 15 <sup>th</sup> , 6:55 am 196_06:54:57	Lossy
Browse Playback	2015-	-	-
Full Playback	-	-	-

Body	Range [km]	Ang Diam [urad]	Phase [deg]	SubSol Lat [deg]	SubSol Lon [deg]	SubS/C Lat [deg]	SubS/C Lon [deg]
Hydra	644,914	92.9	21.5	49.4	288.8	39.8	296.0

N LORRI APPR 1d2

2.952 km/px

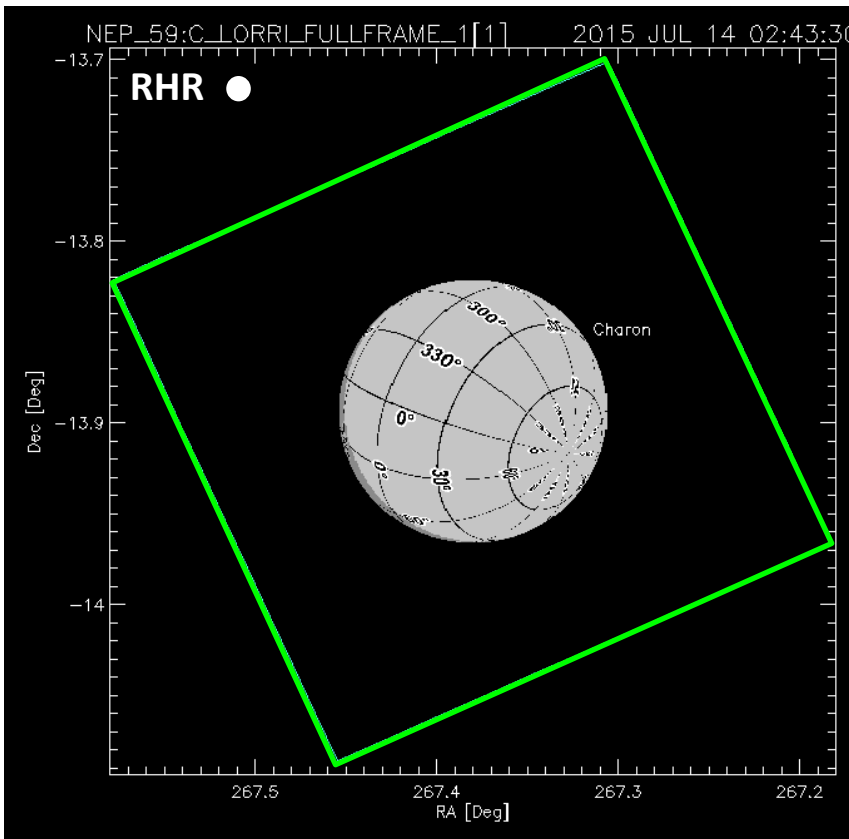


Event	Time (UTC)	Time (EDT)	Compress.
Imaging (s/c, start)	2015-194_23:19:16	194_19:19:16	
1 <sup>st</sup> Look Playback (GRT, queue start)	2015-196_05:07:25	July 15 <sup>th</sup> , 7:25 am 196_01:07:25	Lossy
1 <sup>st</sup> Look Playback (GRT, end)	2015-196_15:31:45	July 15 <sup>th</sup> , 11:31 am 196_11:31:45	Lossy
Browse Playback	2015-	-	-
Full Playback	-	-	-

Body	Range [km]	Ang Diam [urad]	Phase [deg]	SubSol Lat [deg]	SubSol Lon [deg]	SubS/C Lat [deg]	SubS/C Lon [deg]
Nix	589,919	101.6	13.5	49.4	139.7	43.8	157.6

C\_LORRI\_FULLFRAME\_1

2.329 km/px

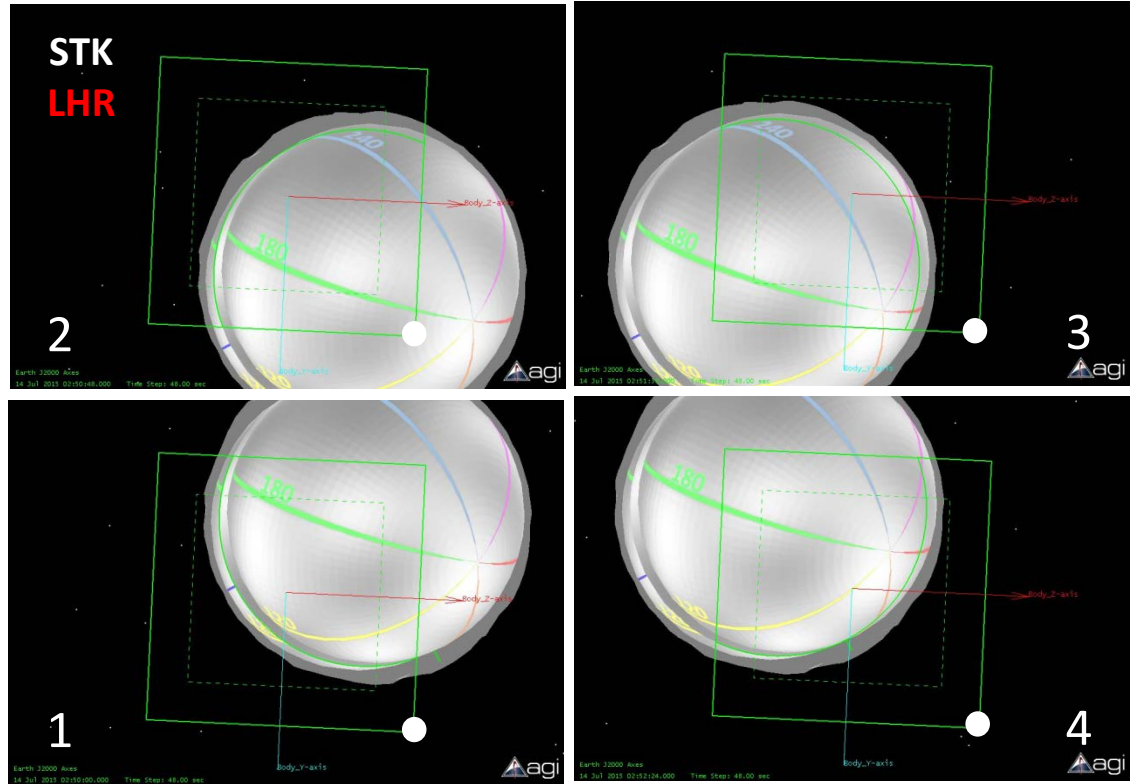
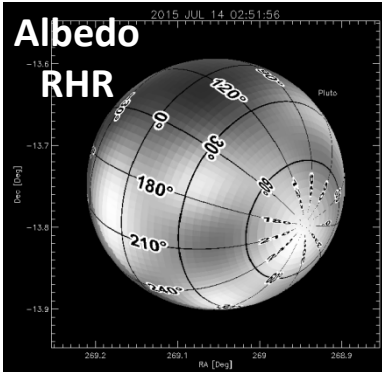


Event	Time (UTC)	Time (EDT)	Compress.
Imaging (s/c, start)	2015-195_02:41:49	194_22:41:49	
1 <sup>st</sup> Look Playback (GRT, queue start)	2015-196_09:32:29	July 15 <sup>th</sup> , 5:32 am 196_05:32:29	Lossy
1 <sup>st</sup> Look Playback (GRT, end)	2015-196_10:22:35	July 15 <sup>th</sup> , 6:22 am 196_06:22:35	Lossy
Browse Playback	2015-	-	-
Full Playback	-	-	-

Body	Range [km]	Ang Diam [urad]	Phase [deg]	SubSol Lat [deg]	SubSol Lon [deg]	SubS/C Lat [deg]	SubS/C Lon [deg]
Charon	465,870	2543	18.2	49.4	327.4	39.2	348.7

P\_LORRI\_TIMERES\_3

2.219 km/px



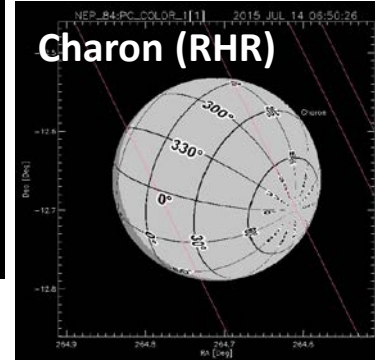
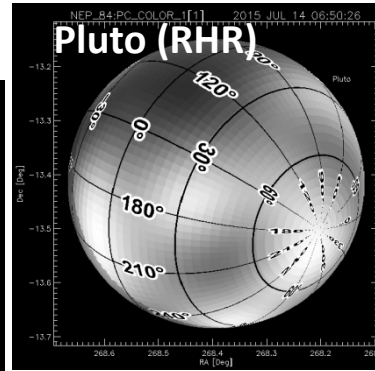
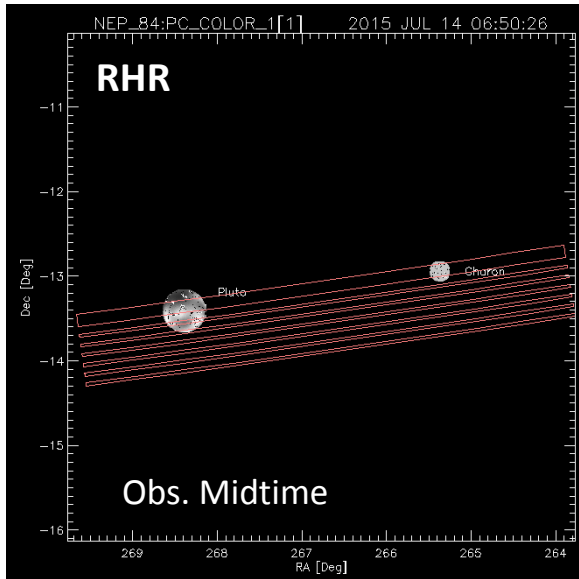
Event	Time (UTC)	Time (EDT)	Compress.
Imaging (s/c, start)	2015-195_02:49:47	195_22:49:47	
Early High Priority Playback (GRT, queue start)	2015-198_13:17:37	July 17 <sup>th</sup> , 9:17 am 198_09:17:37	Lossy
Early High Priority Playback (GRT, end)	2015-198_15:42:00	July 17 <sup>th</sup> , 11:42 am 198_11:42:00	Lossy
Browse Playback	2015-	-	-
Full Playback	-	-	-

Body	Range [km]	Ang Diam [urad]	Phase [deg]	SubSol Lat [deg]	SubSol Lon [deg]	SubS/C Lat [deg]	SubS/C Lon [deg]
Pluto	443,809	5371	16.8	49.4	147.1	40.8	167.6



PC\_Color\_1  
(MVIC Color TDI)

4.96 km/px



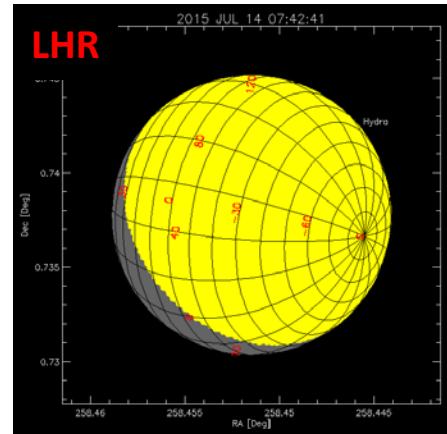
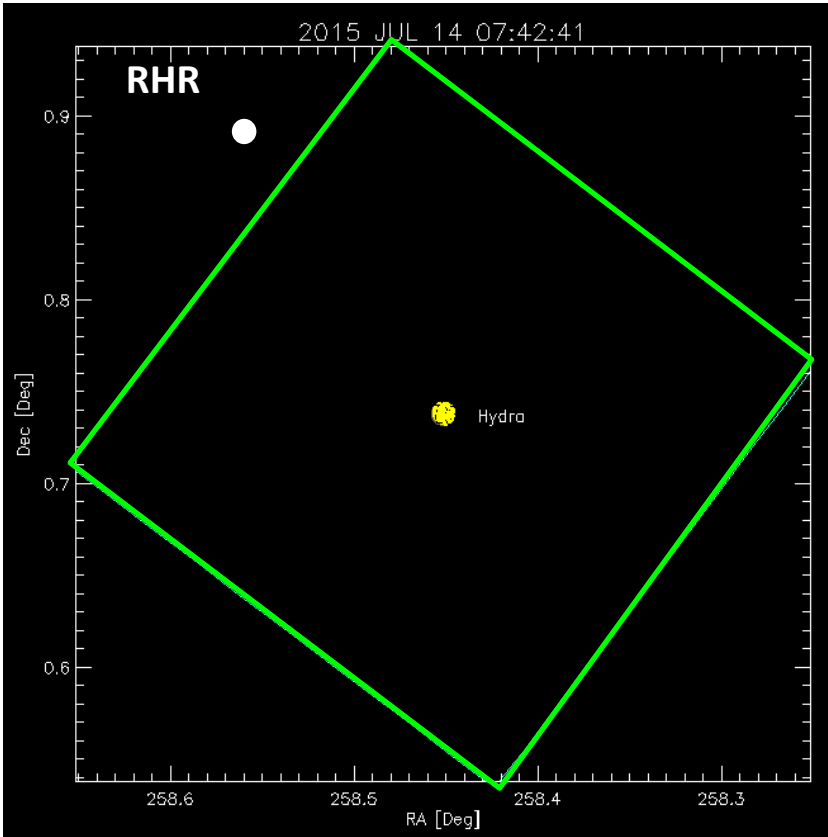
Event	Time (UTC)	Time (EDT)	Compress.
Imaging (s/c, start)	2015-195_06:49:08	195_02:49:08	
Fail Safe Playback (GRT, queue start)	2015-197_09:07:24	July 16 <sup>th</sup> , 5:07 am 197_05:07:24	Complete Lossy
Fail Safe Playback (GRT, end)	2015-197_13:04:53	July 16 <sup>th</sup> , 9:05 am 197_09:04:53	Complete Lossy
Browse Playback	2015-	-	-
Full Playback	-	-	-

Body	Range [km]	Ang Diam [urad]	Phase [deg]	SubSol Lat [deg]	SubSol Lon [deg]	SubS/C Lat [deg]	SubS/C Lon [deg]
Pluto	254,072	9363	17.6	49.4	137.7	40.3	159.1
Charon	268,771	4403	20.4	49.4	317.7	37.8	341.1

H LORRI BEST

MET: 299,165,491

1.156 km/px

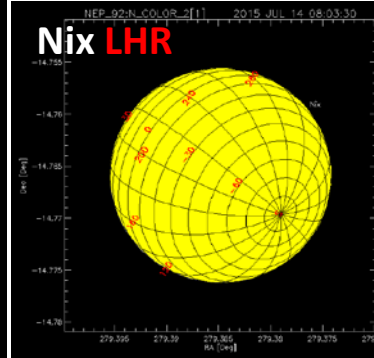
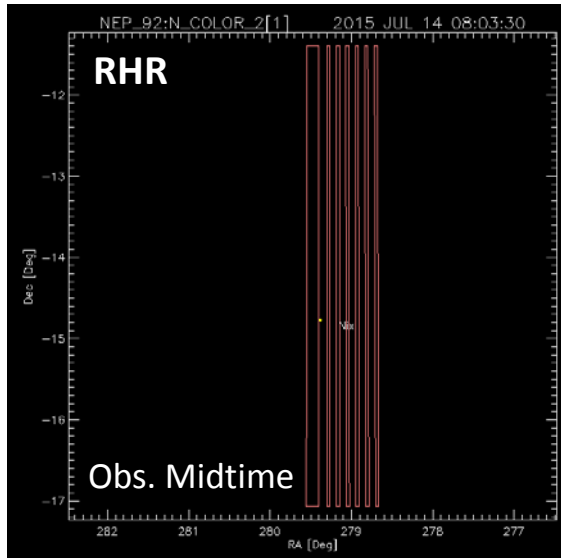


Event	Time (UTC)	Time (EDT)	Compress.
Imaging (s/c, start)	2015-195_07:39:28	195_03:39:28	
1 <sup>st</sup> Look Playback (GRT, queue start)	2015-198_13:17:37	July 17 <sup>th</sup> , 9:17 am 198_09:17:37	Lossy
1 <sup>st</sup> Look Playback (GRT, end)	2015-198_15:42:00	July 17 <sup>th</sup> , 11:42 am 198_11:42:00	Lossy
Early High Priority Playback (GRT, queue start)	Not scheduled.		
Browse Playback	2015-	-	-
Full Playback	-	-	-

Body	Range [km]	Ang Diam [urad]	Phase [deg]	SubSol Lat [deg]	SubSol Lon [deg]	SubS/C Lat [deg]	SubS/C Lon [deg]
Hydra	230,632	259.5	33.8	49.4	285.2	35.1	307.3

N\_Color\_2  
(MVIC Color TDI)

172 km/px

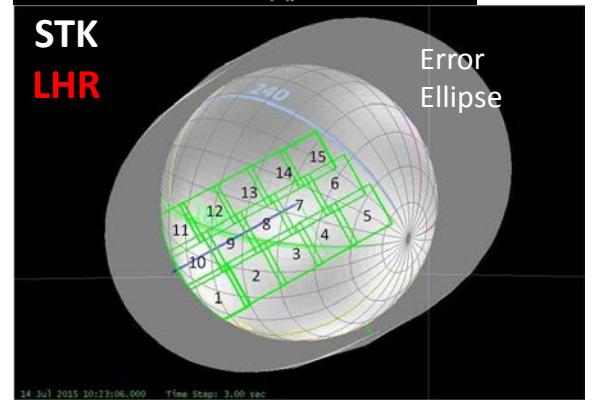
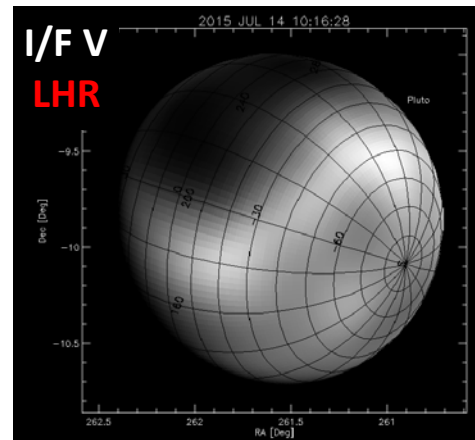
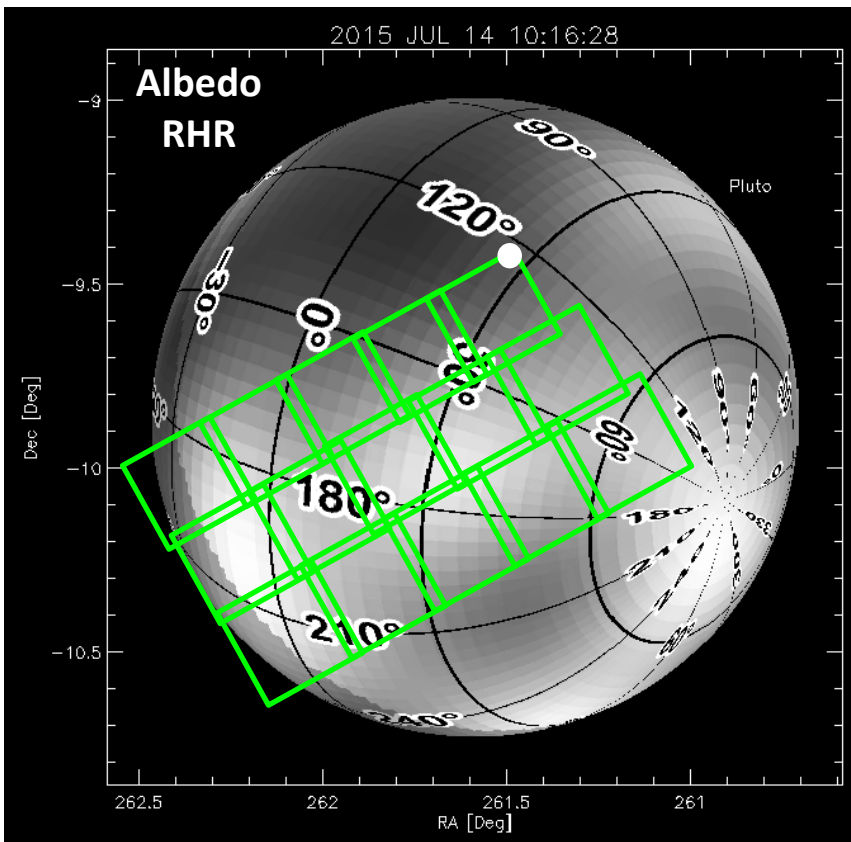


Event	Time (UTC)	Time (EDT)	Compress.
Imaging (s/c, start)	2015-195_08:02:39	195_04:02:39	
Early High Priority Playback (GRT, queue start)	2015-199_05:53:41	July 18 <sup>th</sup> , 1:53 am 199_01:53:41	Lossless Subframe
Early High Priority Playback (GRT, end)	2015-199_09:37:31	July 18 <sup>th</sup> , 5:37 am 199_05:37:31	Lossless Subframe
Browse Playback	2015-	-	-
Full Playback	-	-	-

Body	Range [km]	Ang Diam [urad]	Phase [deg]	SubSol Lat [deg]	SubSol Lon [deg]	SubS/C Lat [deg]	SubS/C Lon [deg]
Nix	165,038	362.2	8.1	49.4	134.6	49.0	147.0

P\_LORRI\_STEREO\_MOSAIC

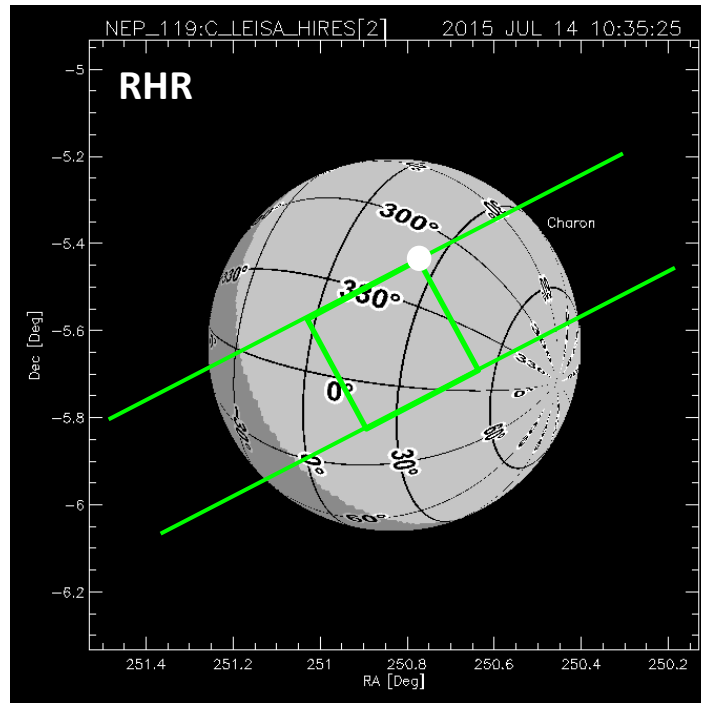
0.386 km/px



Event	Time (UTC)	Time (EDT)	Compress.
Imaging (s/c, start)	2015-195_10:10:15	195_06:10:15	
1 <sup>st</sup> Look Playback (GRT, queue start)	2015-196_12:31:31	196_8:31:31 (3 images)	Lossy
1 <sup>st</sup> Look Playback (GRT, estimated downlink)	2015-196_16:31:22	July 15 <sup>th</sup> , 12:31 pm 196_12:31:22	Lossy
Early High Priority Playback (GRT, queue start)	2015-201_13:05:54	July 20 <sup>th</sup> , 9:06 am (4 images)	Lossy
Early High Priority Playback (GRT, estimated downlink)	2015-201_14:26:27	July 20 <sup>th</sup> , 10:26 am 201_10:26:27	Lossy

Body	Range [km]	Ang Diam [urad]	Phase [deg]	SubSol Lat [deg]	SubSol Lon [deg]	SubS/C Lat [deg]	SubS/C Lon [deg]
Pluto	77,298	30449.8	25.1	49.4	129.7	35.4	158.3

Notes: 15 images: Images 8, 9, and 12 are queued for lossy played back on DOY 196 and images 3, 4, 7, and 13 on DOY 201 (the rest will not come back until later).

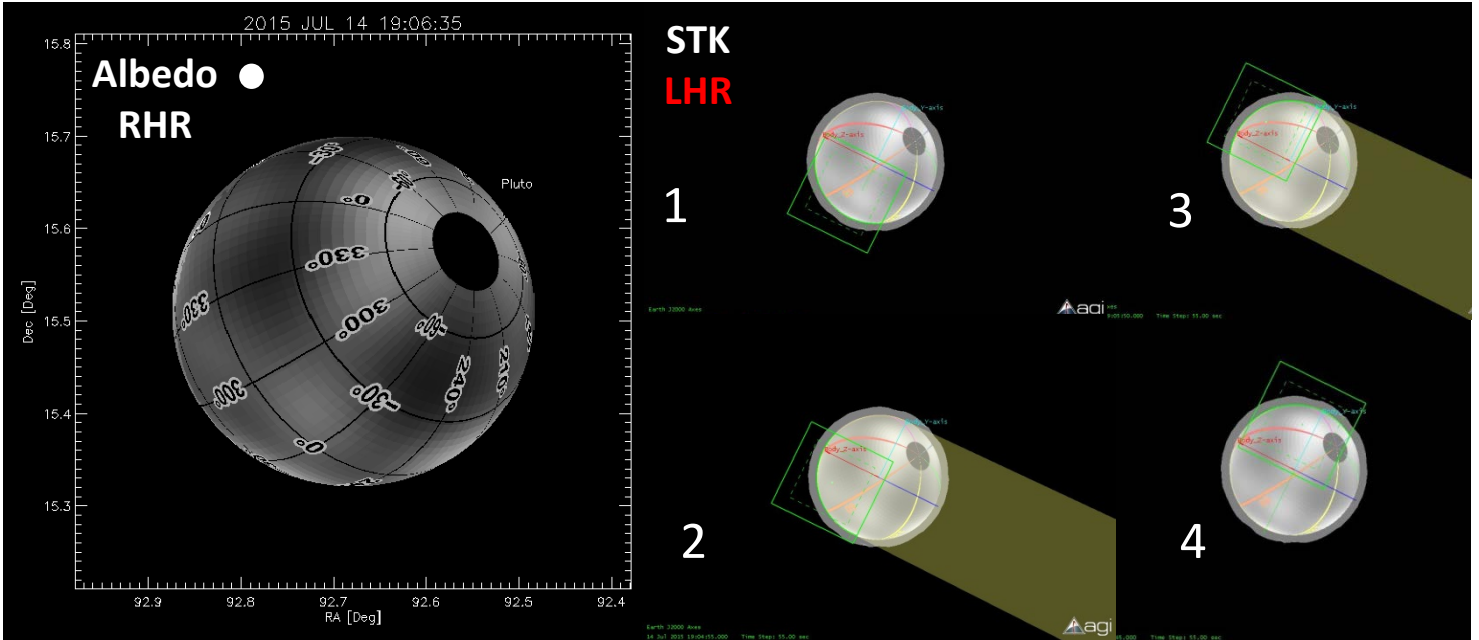


Event	Time (UTC)	Time (EDT)	Compress.
Imaging (s/c, start)	2015-195_10:23:47	195_06:23:47	
1 <sup>st</sup> Look Playback (GRT, queue start)	2015-197_05:31:44	197_01:31:44 July 16 <sup>th</sup> , 1:31 am	Lossy
1 <sup>st</sup> Look Playback (GRT, end)	(4) 197_05:57:48 (7) 197_06:23:37 (10) 197_06:49:26	July 16 <sup>th</sup> , (4) 1:57 am (7) 2:23 am (10) 2:49 am	Lossy
Browse Playback	2015-	-	-
Full Playback	-	-	-

Body	Range [km]	Ang Diam [urad]	Phase [deg]	SubSol Lat [deg]	SubSol Lon [deg]	SubS/C Lat [deg]	SubS/C Lon [deg]
Charon	78,717	14952	36.5	49.4	308.9	26.3	345.7

PC\_MULTI\_DEP\_LONG\_2\_01  
(Pluto)

1.799 km/px



Event	Time (UTC)	Time (EDT)	Compress.
Imaging (s/c, start)	2015-195_19:06:24	195_15:06:24	
1 <sup>st</sup> Look Playback (GRT, queue start)	Not scheduled.		
Early High Priority Playback (GRT, queue start)	2015-199_05:53:41	July 18 <sup>th</sup> , 1:53 am 199_01:53:41	Lossy
Early High Priority Playback (GRT, end)	2015-199_08:08:53	July 18 <sup>th</sup> , 4:08 am 199_04:08:53	Lossy
Browse Playback	2015-	-	-
Full Playback	-	-	-

Body	Range [km]	Ang Diam [urad]	Phase [deg]	SubSol Lat [deg]	SubSol Lon [deg]	SubS/C Lat [deg]	SubS/C Lon [deg]
Pluto	359,895	6619	167.1	49.4	108.9	-43.1	305.2

# Appendix

# Acronyms and Terminology

PE – Pluto Encounter  
 LR – LORRI  
 MV - MVIC  
 P\_ – Pluto targeted in observation  
 C\_ – Charon targeted in observation  
 PC\_ - Pluto and Charon targeted in observation  
 GRT – Ground Receipt Time  
 UTC – Coordinate Universal Time  
 EDT – Eastern Daylight Time (UTC -4 hrs)  
 DOY – Day of Year  
 MET – Mission Elapsed Time (s since launch)  
 S/C – Spacecraft  
 CA – Closest Approach  
 FOV – Field of View (not to be confused with the below)  
 I/F V – reflectance in the V-band (see Buie et al., 2010)  
 LHR – left hand rule coordinate system (used for encounter planning)  
 RHR – right hand rule coordinate system (to be used in publications)  
 STK – Systems Tool Kit (software)  
 DSN – [Deep Space Network](#)  
 SAP – Science Activity Plan  
 MT – Measurement Technique  
 SOC – Science Operations Center

<i>AP1</i>	Approach Phase 1
<i>AP2</i>	Approach Phase 2
<i>AP3</i>	Approach Phase 3
<i>NEP</i>	Near Encounter Phase
<i>DP1</i>	Departure Phase 1
<i>DP2</i>	Departure Phase 2
<i>DP3</i>	Departure Phase 3
<i>DOY</i>	Day of Year
<i>TCA</i>	Time from Closest Approach
<i>MOPS</i>	Mission Operations
<i>PS-N</i>	Passive Spin Normal
<i>SSR2</i>	Solid State Recorder 2
<i>3A-N</i>	Three-Axis Normal
<i>TCM</i>	Trajectory-Correction Maneuver
<i>SDC</i>	Student Dust Counter
<i>HTS</i>	High-Threshold Setting
<i>LTS</i>	Low-Threshold Setting
<i>DSN</i>	Deep Space Network
<i>DDOR</i>	Delta-Difference One-way Ranging
<i>ORT</i>	Operational Readiness Test
<i>Blocks</i>	Chunks of time available for doing science
<i>L1 var</i>	LORRI imaging, looking for variability
<i>L4 lc</i>	LORRI binned, looking for Nix Hydra lightcurves
<i>MC var</i>	MVIC color, looking for variability
<i>LE var</i>	LEISA variability / lightcurve