Observation Log for New Horizons Pluto Encounter mission phase

1. List of Sequence IDs

The following tables list New Horizons (NH) sequences for all observations planned for the NH REX instrument during the NH Pluto Encounter mission phase, from January, 2015 through mid-2016.

Each table groups items by Visit, that is, grouped by the observations as taken by the spacecraft.

List of Tables

Table 1 **15096:O_REX_TEST_PATTERN_1_ORT**

Start UTC:	2015-04-08T18:16:23
Start MET (SCLK):	3/0290822900:11250
Short description:	REX Test Patterns (REX-A and B)
Long description:	Functional testing: measure pre-programmed, synthetic, known signal to REX FPGA hardware to ensure proper instrument operation. See Section 6.2 of [TYLERETAL2008]. This activity cycles each REX instrument through its corresponding group of self-test patterns. Test patterns should be run prior to the first NEP REX event, preferably within six hours. Test patterns should also be run following the last REX event, as soon as is feasible, preferably within two hours. There are no pointing requirements for this test since it is an internal self-test of the REX hardware.

Table 2 **15096:P_REX_THERMSCAN_ORT**

Start UTC:	2015-04-08T18:20:55
Start MET (SCLK):	3/0290823172:11250
Short description:	—
Long description:	Operational readiness test (ORT) for THERMSCAN. Duplicates activities for day of Pluto Encounter (Flyby), but the point is to verify that the Project can operate the DSN and the REX in sychrony. See Section 4 of [TYLERETAL2008] The description below is copied from the Pluto Encounter THERMSCAN, but does not involve any BSR uplink or measurement of any planetary surface during the ORT. REX radiometry, double scan Uplink radiation from the Deep Space Network on Earth, reflecting off of Pluto and potentially detected by by REX, makes this a BiStatic Radar (BSR) experiment of opportunity. For the REX surface temperature scan, the HGA will be slewed across the full width of Pluto twice, with 2.4 sigma downtrack coverage. The first scan (there is a slight preference for doing this one first) will be roughly central, to catch the Earth specular point (which will be near the photometric equator on the illuminated crescent), with a slight preference for scanning from the bright side to the dark side, to maintain constant phase angle. A linear scan through the specular point at Pluto's +2 sigma along-track location and the specular point at the -2 sigma location will probably come close enough to the specular point regardless of Pluto's actual downtrack location. The second scan will be displaced northward to cross the north (winter) pole. Similarly, align the scan to cross the pole at both the +2 sigma and -2 sigma locations. We do not have a preference on the scan direction for this one, but it probably makes sense to scan in the opposite direction to the first scan. The pointing deadband for the scan should be 0.5 mrad or tighter. Radiating with two 34m DSN antennas, one at each polarization (RHC, LHC), offset for the specular reflection is currently in the trade-space, but doesn't impact the spacecraft sequence.

Table 3 **15096:P_OCC_ORT**

Start UTC:	2015-04-08T18:25:05
Start MET (SCLK):	3/0290823422:11250
Short description:	REX P_OCC
Long description:	Operational Readiness Test (ORT) for Pluto Occultation. Duplicates activities for day of Pluto Encounter (Flyby), but the point is to verify that the Project can operate the DSN and the REX in sychrony. See Section 2 of [TYLERETAL2008] The ALICE instrument is not powered during this ORT (different than in P_OCC) to avoid detector gain sag i.e. accumulated sun-on-detector damage.

Table 4 **15096:X_PLASMAROLL_3_ORT**

Start UTC:	2015-04-08T18:43:54
Start MET (SCLK):	3/0290824551:11249
Short description:	Start plasma roll scan at .761 deg per sec.
Long description:	Approach plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 5 **15096:C_OCC_ORT**

Start UTC:	2015-04-08T19:56:22
Start MET (SCLK):	3/0290828899:11246
Short description:	REX C_OCC
Long description:	Operational readiness test for Charon Occultation. Duplicates activities for day of Pluto Encounter (Flyby), but the point is to verify that the Project can operate the DSN and the REX in sychrony. See Section 2 of [TYLERETAL2008] The ALICE instrument is not powered during this ORT (different than in C_OCC) to avoid detector gain sag i.e. accumulated sun-on-detector damage.

Table 6 **15096:X_PLASMA_ROLL_107**

Start UTC:	2015-04-17T01:18:35
Start MET (SCLK):	3/0291539432:10824
Short description:	Start plasma roll scan at .6429 deg per sec. –Scan Axis: Y. –P
Long description:	Approach plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 7 **15110:X_PLASMA_ROLL_115**

Start UTC:	2015-04-25T00:18:35
Start MET (SCLK):	3/0292227032:10415
Short description:	Start plasma roll scan at .6429 deg per sec. –Scan Axis: Y. –P
Long description:	Approach plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 8 **15110:X_PLASMA_ROLL_121**

Start UTC:	2015-04-30T23:58:35
Start MET (SCLK):	3/0292744232:10107
Short description:	Start plasma roll scan at .6429 deg per sec. –Scan Axis: Y. –P
Long description:	Approach plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 9 **15124:X_PLASMA_ROLL_128**

Start UTC:	2015-05-08T09:13:35
Start MET (SCLK):	3/0293382332:09726
Short description:	Start plasma roll scan at .6429 deg per sec.
Long description:	Approach plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 10 **15134:X_REX_TEST_PATTERN_139**

Start UTC:	2015-05-19T12:38:54
Start MET (SCLK):	3/0294345051:09146
Short description:	REX Test Pattern
Long description:	Functional testing: measure pre-programmed, synthetic, known signal to REX FPGA hardware to ensure proper instrument operation. See Section 6.2 of [TYLERETAL2008]. This activity cycles each REX instrument through its corresponding group of self-test patterns. Test patterns should be run prior to the first NEP REX event, preferably within six hours. Test patterns should also be run following the last REX event, as soon as is feasible, preferably within two hours. There are no pointing requirements for this test since it is an internal self-test of the REX hardware.

Table 11 **15134:X_80KW_PIT_DOY_139**

Start UTC:	2015-05-19T12:43:58
Start MET (SCLK):	3/0294345355:09146
Short description:	REX 80kW Uplink
Long description:	Operational test to verify the project can operate REX in synchrony with DSN radiating at 80kW.

Table 12 **15148:X_PLASMA_ROLL_148**

Start UTC:	2015-05-28T08:58:36
Start MET (SCLK):	3/0295109433:08691
Short description:	Start plasma roll scan at .6429 deg per sec
Long description:	Approach plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 13 **15148:X_PLASMA_ROLL_156**

Start UTC:	2015-06-05T18:03:37
Start MET (SCLK):	3/0295833334:08245
Short description:	Start plasma roll scan at .6429 deg per sec
Long description:	Approach plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 14 **15174:X_PLASMAROLL_D_1**

Start UTC:	2015-06-25T04:25:47
Start MET (SCLK):	3/0297512264:07230
Short description:	Start plasma roll scan at .642916 deg per sec
Long description:	Approach plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] Plasma roll P-21 d to P-2 d and P+2 d to P+21 d. PEPSSI and SWAP plasma roll with 100 s REX for USO characterization. For purposes of USO characterization, both REX's will be recording uplink signals and therefore it is required that uplink be supplied by the DSN from two stations, one per polarization, and frequency adjusted for direct path to New Horizons. This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 15 **15174:X_PLASMAROLL_D_2**

Start UTC:	2015-07-01T15:36:41
Start MET (SCLK):	3/0298070919:06891
Short description:	Start plasma roll scan at .642916 deg per sec
Long description:	Approach plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] Plasma roll P-21 d to P-2 d and P+2 d to P+21 d. PEPSSI and SWAP plasma roll with 100 s REX for USO characterization. For purposes of USO characterization, both REX's will be recording uplink signals and therefore it is required that uplink be supplied by the DSN from two stations, one per polarization, and frequency adjusted for direct path to New Horizons. This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 16 **15188:X_PLASMAROLL_D_4**

Start UTC:	2015-07-08T17:47:29
Start MET (SCLK):	3/0298683567:06514
Short description:	—
Long description:	Approach plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] Plasma roll P-21 d to P-2 d and P+2 d to P+21 d. PEPSSI and SWAP plasma roll with 100 s REX for USO characterization. For purposes of USO characterization, both REX's will be recording uplink signals and therefore it is required that uplink be supplied by the DSN from two stations, one per polarization, and frequency adjusted for direct path to New Horizons. This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 17 **15188:X_PLASMAROLL_E_1**

Start UTC:	2015-07-10T18:08:09
Start MET (SCLK):	3/0298857607:06408
Short description:	—
Long description:	Approach plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] Plasma roll P-21 d to P-2 d and P+2 d to P+21 d. PEPSSI and SWAP plasma roll with 100 s REX for USO characterization. For purposes of USO characterization, both REX's will be recording uplink signals and therefore it is required that uplink be supplied by the DSN from two stations, one per polarization, and frequency adjusted for direct path to New Horizons. This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 18 **15188:X_PLASMAROLL_E_2**

Start UTC:	2015-07-11T17:58:09
Start MET (SCLK):	3/0298943407:06356
Short description:	—
Long description:	Approach plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] Plasma roll P-21 d to P-2 d and P+2 d to P+21 d. PEPSSI and SWAP plasma roll with 100 s REX for USO characterization. For purposes of USO characterization, both REX's will be recording uplink signals and therefore it is required that uplink be supplied by the DSN from two stations, one per polarization, and frequency adjusted for direct path to New Horizons. This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 19 **15188:X_PLASMAROLL_E_3**

Start UTC:	2015-07-13T03:16:19
Start MET (SCLK):	3/0299063297:06283
Short description:	
Long description:	Approach plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] Plasma roll P-21 d to P-2 d and P+2 d to P+21 d. PEPSSI and SWAP plasma roll with 100 s REX for USO characterization. For purposes of USO characterization, both REX's will be recording uplink signals and therefore it is required that uplink be supplied by the DSN from two stations, one per polarization, and frequency adjusted for direct path to New Horizons. This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 20 **15188:O_REX_TEST_PATTERN_1**

Start UTC:	2015-07-13T14:14:35
Start MET (SCLK):	3/0299102793:06258
Short description:	REX Test Patterns (REX-A and B)
Long description:	Functional testing: measure pre-programmed, synthetic, known signal to REX FPGA hardware to ensure proper instrument operation. See Section 6.2 of [TYLERETAL2008]. This activity cycles each REX instrument through its corresponding group of self-test patterns. Test patterns should be run prior to the first NEP REX event, preferably within six hours. Test patterns should also be run following the last REX event, as soon as is feasible, preferably within two hours. There are no pointing requirements for this test since it is an internal self-test of the REX hardware.

Table 21 **15188:X_PLASMAROLL_1**

Start UTC:	2015-07-13T20:35:19
Start MET (SCLK):	3/0299125637:06244
Short description:	
Long description:	Encounter plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect data for use in gravity investigation, which requires radio metric tracking data archived separately from REX instrument data. See Section 3 of [TYLERETAL2008]

Table 22 **15188:X_PLASMAROLL_2**

Start UTC:	2015-07-14T05:58:04
Start MET (SCLK):	3/0299159402:06224
Short description:	
Long description:	Encounter plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect data for use in gravity investigation, which requires radio metric tracking data archived separately from REX instrument data. See Section 3 of [TYLERETAL2008]

Table 23 **15188:PC_REX_DISKTHERM**

Start UTC:	2015-07-14T06:23:06
Start MET (SCLK):	3/0299160904:06223
Short description:	
Long description:	Radiometery of Pluto and Charon, underresolved, just stare at targets for long enough to get good SNR. A rule of thumb for the SNR is to take 10 s as the baseline for a full disk (for 0.1K precision) and then multiply the fill factor. See Section 4 of [TYLERETAL2008] For these events, the HGA will be pointed to either cold-sky (+/- 3 degrees declination) from the body center for calibration, or at the body center for the actual measurement. In all cases, a pointing deadband of 0.5 mrad or better is all that is required. The stare duration has to do with the size of the object in question relative to the beamwidth of the HGA. The cold-sky stares perform a dual-REX 100 second observation (100 seconds being the overlap time between the two instruments). For the day-side Pluto stare at 2015-07-14T06:28:50 the measurement will be a 300 second observation. For the 2015-07-14T06:28:50 Charon stare, the measurement will also be 300 seconds. C_REX_NIGHT will be 400 seconds. P_REX_NIGHT_1 will be 400 seconds. P_REX_NIGHT_2 will be 1600 seconds. If any of these events move in time, the durations will have to be recalculated and verified with the new target diameters and fill factors. DSN ground assets are not needed explicitly for the surface temp stares.

Table 24 **15188:P_REX_THERMSCAN**

Start UTC:	2015-07-14T11:53:22
Start MET (SCLK):	3/0299180720:06211
Short description:	REX radiometry, double scan, with Bi-Static Radar (BSR) uplink
Long description:	REX radiometry, double scan Uplink radiation from the Deep Space Network on Earth, reflecting off of Pluto and potentially detected by by REX, makes this a BiStatic Radar (BSR) experiment of opportunity. For the REX surface temperature scan, the HGA will be slewed across the full width of Pluto twice, with 2.4 sigma downtrack coverage. The first scan (there is a slight preference for doing this one first) will be roughly central, to catch the Earth specular point (which will be near the photometric equator on the illuminated crescent), with a slight preference for scanning from the bright side to the dark side, to maintain constant phase angle. A linear scan through the specular point at Pluto's +2 sigma along-track location and the specular point at the -2 sigma location will probably come close enough to the specular point regardless of Pluto's actual downtrack location. The second scan will be displaced northward to cross the north (winter) pole. Similarly, align the scan to cross the pole at both the +2 sigma and -2 sigma locations. We do not have a preference on the scan direction for this one, but it probably makes sense to scan in the opposite direction to the first scan. The pointing deadband for the scan should be 0.5 mrad or tighter. Radiating with two 34m DSN antennas, one at each polarization (RHC, LHC), offset for the specular reflection is currently in the trade-space, but doesn't impact the spacecraft sequence.

Table 25 **15188:P_OCC**

Start UTC:	2015-07-14T12:15:56
Start MET (SCLK):	3/0299182074:06210
Short description:	REX Pluto occultation
Long description:	Pluto occultation: over an hour of data to measure the ionosphere, detect the inbound and outbound limbs of Pluto, and measure the night side 7.3GHz thermal emission of Pluto. See Section 2 of [TYLERETAL2008] Alice and REX observations with 6500 km science start and 2.4-sigma errors (preferred) or 2.0-sigma erros (minimum). The REX A and B sides will be staggered; this will ensure coverage during the mid-event. If the If the setup times for a 1900 s observations is 92 s and wrapup is 24 s, then we can cover this by: Ingress A: 1619 to 3635 duration 2016 start when pointed, end at midtime - (WRAPUP + SETUP) Ingress B: 1711 to 3751 duration 2040 start Ingress A start + SETUP, end at midtime Egress A 3751 to 5837 duration 2086 start at midtime, end WRAPUP before egress B ends Egress B: 3876 to 5861 duration 1985 start at midtime + (WRAPUP + SETUP), end at 2.4 sig end time The HGA will be Earth pointed for the occultation with a deadband of 0.5 mrad or tighter. Uplink signals will be transmitted simultaneously from the 70-m DSN antennas at Goldstone and Canberra. Each antenna will radiate an estimated 20 kW of power in a single tone. One antenna will transmit in right-circular polarization and the other in left-circular polarization. The frequency of the two uplink signals will be tuned so that they arrive at the spacecraft with a separation of 200 Hz, symmetric about the center of the REX receiver passband. The spacecraft will record data simultaneously using both REX side A and side B. Both sides will operate continuously throughout the occultation experiment, with no interruption when the spacecraft is geometrically behind Pluto. However, the start times of the two sides will be staggered so that a spacecraft anomaly (such as a CandDH reset) that affects one side will not prevent successful acquisition of data by the other. In the current implementation, REX A begins recording at about 12:16:31, 33 minutes prior to the midpoint of the occultation. REX B begins recording 7 minutes later, at about 12:23:31. Each REX collects data continuously for about 59 minutes. This results in a 52-minute span during which both REXs are recording data and a 66-minute span during which at least one REX is recording data, with both intervals centered halfway between the ingress and egress occultations.

Table 26 **15188:X_PLASMAROLL_3_RX**

Start UTC:	2015-07-14T13:28:07
Start MET (SCLK):	3/0299186405:06207
Short description:	
Long description:	Encounter plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect data for use in gravity investigation, which requires radio metric tracking data archived separately from REX instrument data. See Section 3 of [TYLERETAL2008] PEPSSI and SWAP plasma roll; Roll about +Y at 1.199 deg/sec 5 times. Roll at 1.199 deg as per Heather Elliot, May 23 2008 For the REX portion, the HGA should be pointed at Earth with a 0.5 mrad deadband, or tighter. Both REX instruments turn on and record 10 minutes of a carrier sent two separate antennas at the DSN, one at each polarization (RHC and LHC). The length was increased to 10 minutes at the request of Dave Hinson for a Pluto/Charon mass estimation. This observation is intended for in between P_OCC and C_OCC

Table 27 **15188:C_OCC**

Start UTC:	2015-07-14T13:46:05
Start MET (SCLK):	3/0299187483:06207
Short description:	REX Charon occultation
Long description:	Charon occultation: over an hour of data to measure the ionosphere, detect the inbound and outbound limbs of Charon, and measure the night side 7.3GHz thermal emission of Charon. See Section 2 of [TYLERETAL2008] The HGA will be Earth pointed for the Charon occultation with a deadband of 0.5 mrad or tighter. Uplink signals will be transmitted simultaneously from the 70-m DSN antennas at Goldstone and Canberra. Each antenna will radiate an estimated 20 kW of power in a single tone. One antenna will transmit in right-circular polarization and the other in left-circular polarization. The frequency of the two uplink signals will be tuned so that they arrive at the spacecraft with a separation of 200 Hz, symmetric about the center of the REX receiver passband. The spacecraft will record data simultaneously using both REX side A and side B. Both sides will operate continuously throughout the occultation experiment, with no interruption when the spacecraft is geometrically behind Charon. However, the start times of the two sides will be staggered so that a spacecraft anomaly (such as a CandDH reset) that affects one side will not prevent successful acquisition of data by the other. The measurement duration will be 2713 seconds centered halfway between the Charon ingress and egress occultations.

Table 28 **15188:C_REX_NIGHT**

Start UTC:	2015-07-14T18:35:51
Start MET (SCLK):	3/0299204869:06196
Short description:	
Long description:	Radiometery of night side of Charon, underresolved, just stare at Charon for long enough to get good SNR. A rule of thumb for the SNR is to take 10 s as the baseline for a full disk (for 0.1K precision) and then multiply the fill factor. See Section 4 of [TYLERETAL2008]

Table 29 **15188:P_REX_NIGHT_1**

Start UTC:	2015-07-14T18:48:26
Start MET (SCLK):	3/0299205624:06195
Short description:	
Long description:	Radiometery of night side of Pluto, underresolved, just stare at Pluto for long enough to get good SNR. A rule of thumb for the SNR is to take 10 s as the baseline for a full disk (for 0.1K precision) and then multiply the fill factor. See Section 4 of [TYLERETAL2008]

Table 30 **15188:X_PLASMAROLL_4**

Start UTC:	2015-07-14T19:53:02
Start MET (SCLK):	3/0299209500:06193
Short description:	
Long description:	Encounter plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect data for use in gravity investigation, which requires radio metric tracking data archived separately from REX instrument data. See Section 3 of [TYLERETAL2008]

Table 31 **15188:X_PLASMAROLL_5**

Start UTC:	2015-07-15T03:48:29
Start MET (SCLK):	3/0299238027:06176
Short description:	
Long description:	Encounter plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect data for use in gravity investigation, which requires radio metric tracking data archived separately from REX instrument data. See Section 3 of [TYLERETAL2008]

Table 32 **15188:P_REX_NIGHT_2**

Start UTC:	2015-07-15T04:08:14
Start MET (SCLK):	3/0299239212:06175
Short description:	
Long description:	Radiometery of Pluto, underresolved, just stare at Pluto for long enough to get good SNR. A rule of thumb for the SNR is to take 10 s as the baseline for a full disk (for 0.1K precision) and then multiply the fill factor.Radiometery of Pluto, underresolved, just stare at Pluto for long enough to get good SNR. A rule of thumb for the SNR is to take 10 s as the baseline for a full disk (for 0.1K precision) and then multiply the fill factor. See Section 4 of [TYLERETAL2008]

Table 33 **15188:O_REX_TEST_PATTERN_2**

Start UTC:	2015-07-15T07:38:16
Start MET (SCLK):	3/0299251814:06167
Short description:	REX Test Patterns (REX-A and B)
Long description:	Functional testing: measure pre-programmed, synthetic, known signal to REX FPGA hardware to ensure proper instrument operation. See Section 6.2 of [TYLERETAL2008]. This activity cycles each REX instrument through its corresponding group of self-test patterns. Test patterns should be run prior to the first NEP REX event, preferably within six hours. Test patterns should also be run following the last REX event, as soon as is feasible, preferably within two hours. There are no pointing requirements for this test since it is an internal self-test of the REX hardware.

Table 34 **15188:X_PLASMAROLL_F_1**

Start UTC:	2015-07-15T16:24:29
Start MET (SCLK):	3/0299283387:06148
Short description:	
Long description:	Departure plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] Plasma roll P-21 d to P-2 d and P+2 d to P+21 d. PEPSSI and SWAP plasma roll with 100 s REX for USO characterization. For purposes of USO characterization, both REX's will be recording uplink signals and therefore it is required that uplink be supplied by the DSN from two stations, one per polarization, and frequency adjusted for direct path to New Horizons. This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 35 **15188:P_REX_NIGHT_COLD_SKY**

Start UTC:	2015-07-15T16:51:19
Start MET (SCLK):	3/0299284997:06147
Short description:	
Long description:	Successively stare at 3 cold sky positions which form a triad around the position of Pluto. See Section 4 of [TYLERETAL2008]

Table 36 **15188:P_REX_NIGHT_A_1**

Start UTC:	2015-07-15T17:23:30
Start MET (SCLK):	3/0299286928:06146
Short description:	
Long description:	Radiometery of Pluto, under-resolved; stare at Pluto for long enough to get good SNR. A rule of thumb for the SNR is to take 10 s as the baseline for a full disk (for 0.1K precision) and then multiply the fill factor. See Section 4 of [TYLERETAL2008] This description of the REX Radiometric Measurement of Pluto from the night side is applicable to both tasks designated as P_REX_NIGHT_A_1, and P_REX_NIGHT_A_2. The REX radiometric channel in the X-Band Receiver has a bandwidth of 4.5 MHz, and is sampled at 10 Msamples/sec. The total radiometric power in the channel, results from the sum of the RF power in the beam and the internal thermal noise of the receiver. The total power is obtained by squaring the samples from the radiometric channel and averaging for non-overlapping epochs of 0.1 second duration. The average power in each epoch is sent to the NH SSR in the REX high-speed telemetry. Sequences of these power estimates are further averaged for the duration of the acquisition time. Accordingly, estimates of total average power are obtained for each radiometric task, A1 and A2. Because these estimates are obtained from averages of a Gaussian distributed, thermal noise dominated process, their average and standard deviation scale according to the statistics of a Gaussian distribution. In this case, the mean is stationary with an expectation value that converges on the true mean with an expected variation that is the standard deviation, itself that scales by the ration of the mean to the square-root of the total number of samples a acquired. For A1 and A2, the total number of samples is fixed by the product of the REX radiometric bandwidth and the acquisition time, where this product is 4.5x10$\hat{6}$ x 900, or 4.05x10$\hat{9}$ samples. Consequently, the 900 seconds of acquisition results in a measurement precision for Pluto's night side that is respectively 25 and 14 standard deviations for A1 and A2. The increase in beam power, after removing the contributions from the background sky and the X-band receiver's noise, is then attributed to the thermal noise from the target in the HGA's beam, which in this case is Pluto. In summary, the nominal temperature resolution of a radiometric measurement of Pluto's night side temperature by REX at event times of A1 and A2, would be respectively 0.4 degrees-Kelvin, and 0.7 degrees-Kelvin.

Table 37 **15188:P_REX_NIGHT_A_2**

Start UTC:	2015-07-16T03:59:39
Start MET (SCLK):	3/0299325097:06123
Short description:	
Long description:	Radiometery of Pluto, under-resolved; stare at Pluto for long enough to get good SNR. A rule of thumb for the SNR is to take 10 s as the baseline for a full disk (for 0.1K precision) and then multiply the fill factor. See Section 4 of [TYLERETAL2008] This description of the REX Radiometric Measurement of Pluto from the night side is applicable to both tasks designated as P_REX_NIGHT_A_1, and P_REX_NIGHT_A_2. The REX radiometric channel in the X-Band Receiver has a bandwidth of 4.5 MHz, and is sampled at 10 Msamples/sec. The total radiometric power in the channel, results from the sum of the RF power in the beam and the internal thermal noise of the receiver. The total power is obtained by squaring the samples from the radiometric channel and averaging for non-overlapping epochs of 0.1 second duration. The average power in each epoch is sent to the NH SSR in the REX high-speed telemetry. Sequences of these power estimates are further averaged for the duration of the acquisition time. Accordingly, estimates of total average power are obtained for each radiometric task, A1 and A2. Because these estimates are obtained from averages of a Gaussian distributed, thermal noise dominated process, their average and standard deviation scale according to the statistics of a Gaussian distribution. In this case, the mean is stationary with an expectation value that converges on the true mean with an expected variation that is the standard deviation, itself that scales by the ration of the mean to the square-root of the total number of samples a acquired. For A1 and A2, the total number of samples is fixed by the product of the REX radiometric bandwidth and the acquisition time, where this product is 4.5x10$\hat{6}$ x 900, or 4.05x10$\hat{9}$ samples. Consequently, the 900 seconds of acquisition results in a measurement precision for Pluto's night side that is respectively 25 and 14 standard deviations for A1 and A2. The increase in beam power, after removing the contributions from the background sky and the X-band receiver's noise, is then attributed to the thermal noise from the target in the HGA's beam, which in this case is Pluto. In summary, the nominal temperature resolution of a radiometric measurement of Pluto's night side temperature by REX at event times of A1 and A2, would be respectively 0.4 degrees-Kelvin, and 0.7 degrees-Kelvin.

Table 38 **15197:X_PLASMAROLL_F_2**

Start UTC:	2015-07-16T15:38:17
Start MET (SCLK):	3/0299367015:06097
Short description:	Start plasma roll scan at 0.642916 deg per sec
Long description:	Departure plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] Plasma roll P-21 d to P-2 d and P+2 d to P+21 d. PEPSSI and SWAP plasma roll with 100 s REX for USO characterization. For purposes of USO characterization, both REX's will be recording uplink signals and therefore it is required that uplink be supplied by the DSN from two stations, one per polarization, and frequency adjusted for direct path to New Horizons. This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 39 **15197:X_PLASMAROLL_F_3**

Start UTC:	2015-07-17T13:04:17
Start MET (SCLK):	3/0299444175:06050
Short description:	Start plasma roll scan at 0.642916 deg per sec
Long description:	Departure plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] Plasma roll P-21 d to P-2 d and P+2 d to P+21 d. PEPSSI and SWAP plasma roll with 100 s REX for USO characterization. For purposes of USO characterization, both REX's will be recording uplink signals and therefore it is required that uplink be supplied by the DSN from two stations, one per polarization, and frequency adjusted for direct path to New Horizons. This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 40 **15197:X_PLASMAROLL_F_4**

Start UTC:	2015-07-18T13:00:17
Start MET (SCLK):	3/0299530335:05997
Short description:	Start plasma roll scan at 0.642916 deg per sec
Long description:	Departure plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] Plasma roll P-21 d to P-2 d and P+2 d to P+21 d. PEPSSI and SWAP plasma roll with 100 s REX for USO characterization. For purposes of USO characterization, both REX's will be recording uplink signals and therefore it is required that uplink be supplied by the DSN from two stations, one per polarization, and frequency adjusted for direct path to New Horizons. This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 41 **15201:PLASMA_ROLL_201**

Start UTC:	2015-07-20T20:28:35
Start MET (SCLK):	3/0299730033:05875
Short description:	Start plasma roll scan at .6429 deg per sec
Long description:	Departure plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] Plasma roll P-21 d to P-2 d and P+2 d to P+21 d. PEPSSI and SWAP plasma roll with 100 s REX for USO characterization. For purposes of USO characterization, both REX's will be recording uplink signals and therefore it is required that uplink be supplied by the DSN from two stations, one per polarization, and frequency adjusted for direct path to New Horizons. This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 42 **15201:PLASMA_ROLL_204**

Start UTC:	2015-07-23T01:43:35
Start MET (SCLK):	3/0299921733:05758
Short description:	Start plasma roll scan at .6429 deg per sec
Long description:	Departure plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] Plasma roll P-21 d to P-2 d and P+2 d to P+21 d. PEPSSI and SWAP plasma roll with 100 s REX for USO characterization. For purposes of USO characterization, both REX's will be recording uplink signals and therefore it is required that uplink be supplied by the DSN from two stations, one per polarization, and frequency adjusted for direct path to New Horizons. This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 43 **15201:PLASMA_ROLL_207**

Start UTC:	2015-07-26T10:58:35
Start MET (SCLK):	3/0300214233:05578
Short description:	Start plasma roll scan at .6429 deg per sec
Long description:	Departure plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] Plasma roll P-21 d to P-2 d and P+2 d to P+21 d. PEPSSI and SWAP plasma roll with 100 s REX for USO characterization. For purposes of USO characterization, both REX's will be recording uplink signals and therefore it is required that uplink be supplied by the DSN from two stations, one per polarization, and frequency adjusted for direct path to New Horizons. This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 44 **15201:PLASMA_ROLL_209**

Start UTC:	2015-07-28T08:23:35
Start MET (SCLK):	3/0300377733:05478
Short description:	Start plasma roll scan at .6429 deg per sec
Long description:	Departure plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] Plasma roll P-21 d to P-2 d and P+2 d to P+21 d. PEPSSI and SWAP plasma roll with 100 s REX for USO characterization. For purposes of USO characterization, both REX's will be recording uplink signals and therefore it is required that uplink be supplied by the DSN from two stations, one per polarization, and frequency adjusted for direct path to New Horizons. This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.

Table 45 **15313:PLASMA_ROLL_209**

Start UTC:	2015-11-11T21:36:50
Start MET (SCLK):	3/0309583728:00006
Short description:	Start plasma roll scan at .6429 deg per sec
Long description:	Departure plasma roll: PEPSSI and SWAP observation point HGA at Earth; REX takes advantage as a ride-along instrument to collect 100s of uplink tone for use in USO Stability characterization. See Section 6.5 of [TYLERETAL2008] Plasma roll P-21 d to P-2 d and P+2 d to P+21 d. PEPSSI and SWAP plasma roll with 100 s REX for USO characterization. For purposes of USO characterization, both REX's will be recording uplink signals and therefore it is required that uplink be supplied by the DSN from two stations, one per polarization, and frequency adjusted for direct path to New Horizons. This is a plasma roll that is driven by SWAP science, commanded by PEPSSI, with a REX ride-along. Please see 15188:X_PLASMAROLL_3_RX for original synopsis; this description has been modified from that.