Observation Log for New Horizons Launch, Jupiter and Pluto Cruise mission phases

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 Launch, Jupiter and Pluto Cruise mission phases, from launch in January, 2006 through January, 2015.

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

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Table 1 **06098:CORX01a_01_TstPatt**

Start UTC:	2006-109T11:59:48
Start MET (SCLK):	1/0007753906
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 2 **06098:CORX02a_01_SpurMeas**

Start UTC:	2006-109T12:04:48
Start MET (SCLK):	1/0007754206
Short description:	No Uplink Spur Measurement (SSR [TYLERETAL2008] Section 6.3)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. The test for spurs in the REX band is part of the Annual Checkout activities for New Horizons. The test involves setting the open-loop AGC to near the upper end of it's range and acquiring REX data with no uplink. A spur is a narrowband frequency, revealed as a narrow spectral line in the time-integrated spectrum of the REX band.

Table 3 **06098:CORX03a_01_UplkSnr**

Start UTC:	2006-109T12:19:48
Start MET (SCLK):	1/0007755106
Short description:	Acquire uplink, characterize SNR (SSR [TYLERETAL2008], Section 6.4)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. To verify that REX has adequate sensitivity the REX commissioning SNR tests emulated the expected uplink signal strength at 40 AU by reducing the transmitted power from the DSN to a level which resulted in a signal strength of -110 dBm in REXs baseband channel. The data obtained under those conditions were use to quantify the uplink signal strength, the Spurious Free Dynamic Range (SFDR), and the level of the noise floor.

Table 4 **06098:CORX04a_01_GainLin**

Start UTC:	2006-109T12:29:43
Start MET (SCLK):	1/0007755701
Short description:	Gain Linearity
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. The gain setting (AGC or AGCGAIN) is designed to produce linear results in the radiometry calibration formula in units of dBm (the formula is available in the Science Operations Center/Instrument Interface Control Document - SOC_INST_ICD). To linear performance with gain, these tests varied the gain setting (steps of two in the gain setting, equivalent to ĩdB) while measuring a single target source i.e. an unmodulated, constant-strength signal sent from the DSN.

Table 5 **06098:CORX05a_01_BandPass**

Start UTC:	2006-109T12:59:29
Start MET (SCLK):	1/0007757487
Short description:	REX Passband characterization (SSR [TYLERETAL2008] Section 6.6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. In order to measure the in-flight response of the REX narrow band filter, a DSN uplink signal frequency was swept slowly across the REX passband. N.B. For some of these passband characterizaion tests, the spacecraft was in its spin-stabilized attitude control mode, a small sinusoidal variation of +/-0.5 dB was observed in the received power at the spin frequency. This is attributed to a slight misalignment of the spacecraft spin axis with the HGA's boresight. Analysis compensates for this effect by modeling the power variations and removing the effect of the spin from the data.

Table 6 **06098:CORX06a_01_ModUplk**

Start UTC:	2006-109T14:09:48
Start MET (SCLK):	1/0007761706
Short description:	Uplink simulates multi-tones to assess intermodulation distortion
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Two uplinks, close in frequency in the REX band, were transmitted to New Horizons in each of Right-hand and Left-hand Circular Polarization (RCP and LCP), to assess the incidence of intermodulation distortion.

Table 7 **06098:CORX09a_01_USOShrt**

Start UTC:	2006-109T14:24:48
Start MET (SCLK):	1/0007762606
Short description:	USO Short Stability (SSR [TYLERETAL2008] Section 6.6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. DNS uplink signal was transmitted with the radiated frequency adjusted for Doppler shifts associated with the Earth and spacecraft in order to control the received frequency at NH. Signal acquisitions by REX spanned periods of typically 100 seconds (USO short stability), but occasionally lasting up to 1000 seconds (USO long stability). From these observations the REX-based estimates of uplink frequency can be made, and from those estimates the USO stability (Allan deviation) can be calculated.

Table 8 **06143:CORX01a_01_TstPatt**

Start UTC:	2006-152T17:29:48
Start MET (SCLK):	1/0011488906
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 9 **06143:CORX02a_01_SpurMeas**

Start UTC:	2006-152T17:34:47
Start MET (SCLK):	1/0011489205
Short description:	No Uplink Spur Measurement (SSR [TYLERETAL2008] Section 6.3)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. The test for spurs in the REX band is part of the Annual Checkout activities for New Horizons. The test involves setting the open-loop AGC to near the upper end of it's range and acquiring REX data with no uplink. A spur is a narrowband frequency, revealed as a narrow spectral line in the time-integrated spectrum of the REX band.

Table 10 **06143:CORX03a_01_UplkSnr**

Start UTC:	2006-152T17:49:47
Start MET (SCLK):	1/0011490105
Short description:	Acquire uplink, characterize SNR (SSR [TYLERETAL2008], Section 6.4)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. To verify that REX has adequate sensitivity the REX commissioning SNR tests emulated the expected uplink signal strength at 40 AU by reducing the transmitted power from the DSN to a level which resulted in a signal strength of -110 dBm in REXs baseband channel. The data obtained under those conditions were use to quantify the uplink signal strength, the Spurious Free Dynamic Range (SFDR), and the level of the noise floor.

Table 11 **06143:CORX04a_01_GainLin**

Start UTC:	2006-152T17:59:43
Start MET (SCLK):	1/0011490701
Short description:	Gain Linearity
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. The gain setting (AGC or AGCGAIN) is designed to produce linear results in the radiometry calibration formula in units of dBm (the formula is available in the Science Operations Center/Instrument Interface Control Document - SOC_INST_ICD). To linear performance with gain, these tests varied the gain setting (steps of two in the gain setting, equivalent to ĩdB) while measuring a single target source i.e. an unmodulated, constant-strength signal sent from the DSN.

Table 12 **06143:CORX05a_01_BandPass**

Start UTC:	2006-152T18:29:28
Start MET (SCLK):	1/0011492486
Short description:	REX Passband characterization (SSR [TYLERETAL2008] Section 6.6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. In order to measure the in-flight response of the REX narrow band filter, a DSN uplink signal frequency was swept slowly across the REX passband. N.B. For some of these passband characterizaion tests, the spacecraft was in its spin-stabilized attitude control mode, a small sinusoidal variation of +/-0.5 dB was observed in the received power at the spin frequency. This is attributed to a slight misalignment of the spacecraft spin axis with the HGA's boresight. Analysis compensates for this effect by modeling the power variations and removing the effect of the spin from the data.

Table 13 **06143:CORX06a_01_ModUplk**

Start UTC:	2006-152T19:39:47
Start MET (SCLK):	1/0011496705
Short description:	Uplink simulates multi-tones to assess intermodulation distortion
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Two uplinks, close in frequency in the REX band, were transmitted to New Horizons in each of Right-hand and Left-hand Circular Polarization (RCP and LCP), to assess the incidence of intermodulation distortion.

Table 14 **06143:CORX09a_01_USOShrt**

Start UTC:	2006-152T19:54:47
Start MET (SCLK):	1/0011497605
Short description:	USO Short Stability (SSR [TYLERETAL2008] Section 6.6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. DNS uplink signal was transmitted with the radiated frequency adjusted for Doppler shifts associated with the Earth and spacecraft in order to control the received frequency at NH. Signal acquisitions by REX spanned periods of typically 100 seconds (USO short stability), but occasionally lasting up to 1000 seconds (USO long stability). From these observations the REX-based estimates of uplink frequency can be made, and from those estimates the USO stability (Allan deviation) can be calculated.

Table 15 **06171:CORX01a_02_TstPatt**

Start UTC:	2006-172T01:59:48
Start MET (SCLK):	1/0013161106
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 16 **06171:CORX08a_beampatt**

Start UTC:	2006-172T02:09:24
Start MET (SCLK):	1/0013161682
Short description:	HGA response mapping beam pattern (SSR [TYLERETAL2008] Section 6.5)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. The REX science team obtained the beam pattern by tuning the frequency of an unmodulated uplink signal of constant power from the DSN to arrive at the NH spacecraft with a constant frequency; the signal served as a calibration source. At the same time, the team varied the spacecraft attitude with respect to the direction to Earth, thus implementing a scan of the HGA beam over a small range of angles about the Earth direction, centered approximately on the beam maximum. The initial offset of the scan was set at the upper left corner of a 2deg x 2deg angular box. The beam direction then was made to 'nod and step' parallel to the box edges so as to perform a raster scan about the Earth direction. During the scan, REX processed the uplink signal from the tranceiver, with the REX output recorded and time-tagged on-board. At the same time the spacecraft body vectors were logged and time-tagged. The combination of these two time sequences allowed the team to map estimates of the uplink signal power to the spacecraft pointing direction.

Table 17 **06180:CORX01a_01_TstPatt**

Start UTC:	2006-180T11:49:48
Start MET (SCLK):	1/0013887706
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 18 **06180:CORX07a_11acoldrad**

Start UTC:	2006-180T11:56:43
Start MET (SCLK):	1/0013888121
Short description:	Cold Sky Cal
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. For the NH radio subsystem, without an absolutely calibrated thermal noise source, it is possible to calculate the System Noise Temperature (SNT) using multiple standard radio sources and Cold Sky: 'on' is when the HGA is pointing at a standard radio source; 'off' is when the HGA is pointing at Cold Sky. The typical Cold Sky location chosen for NH REX is [RA,DEC] = [15.2deg, -8.1deg], where the the sky temperature is within a few tenth's of a Kelvin of the Cosmic Microwave Background - CMB - over a section of the sky larger than several times the half-power beam width of the HGA.

Table 19 **06361:CORX01b_01_TstPatt**

Start UTC:	2007-005T13:56:21
Start MET (SCLK):	1/0030311299
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 20 **06361:CORX02b_01_SpurMeas**

Start UTC:	2007-005T14:01:20
Start MET (SCLK):	1/0030311598
Short description:	No Uplink Spur Measurement (SSR [TYLERETAL2008] Section 6.3)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. The test for spurs in the REX band is part of the Annual Checkout activities for New Horizons. The test involves setting the open-loop AGC to near the upper end of it's range and acquiring REX data with no uplink. A spur is a narrowband frequency, revealed as a narrow spectral line in the time-integrated spectrum of the REX band.

Table 21 **06361:CORX03b_01_UplkSnr**

Start UTC:	2007-005T14:36:20
Start MET (SCLK):	1/0030313698
Short description:	Acquire uplink, characterize SNR (SSR [TYLERETAL2008], Section 6.4)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. To verify that REX has adequate sensitivity the REX commissioning SNR tests emulated the expected uplink signal strength at 40 AU by reducing the transmitted power from the DSN to a level which resulted in a signal strength of -110 dBm in REXs baseband channel. The data obtained under those conditions were use to quantify the uplink signal strength, the Spurious Free Dynamic Range (SFDR), and the level of the noise floor.

Table 22 **06361:CORX04b_01_GainLin**

Start UTC:	2007-005T14:46:16
Start MET (SCLK):	1/0030314294
Short description:	Gain Linearity
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. The gain setting (AGC or AGCGAIN) is designed to produce linear results in the radiometry calibration formula in units of dBm (the formula is available in the Science Operations Center/Instrument Interface Control Document - SOC_INST_ICD). To linear performance with gain, these tests varied the gain setting (steps of two in the gain setting, equivalent to ĩdB) while measuring a single target source i.e. an unmodulated, constant-strength signal sent from the DSN.

Table 23 **06361:CORX05b_01_BandPass**

Start UTC:	2007-005T15:26:01
Start MET (SCLK):	1/0030316679
Short description:	REX Passband characterization (SSR [TYLERETAL2008] Section 6.6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. In order to measure the in-flight response of the REX narrow band filter, a DSN uplink signal frequency was swept slowly across the REX passband. N.B. For some of these passband characterizaion tests, the spacecraft was in its spin-stabilized attitude control mode, a small sinusoidal variation of +/-0.5 dB was observed in the received power at the spin frequency. This is attributed to a slight misalignment of the spacecraft spin axis with the HGA's boresight. Analysis compensates for this effect by modeling the power variations and removing the effect of the spin from the data.

Table 24 **06361:CORX06b_01_ModUplk**

Start UTC:	2007-005T16:26:20
Start MET (SCLK):	1/0030320298
Short description:	Uplink simulates multi-tones to assess intermodulation distortion
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Two uplinks, close in frequency in the REX band, were transmitted to New Horizons in each of Right-hand and Left-hand Circular Polarization (RCP and LCP), to assess the incidence of intermodulation distortion.

Table 25 **06361:CORX08b_01_BmPat**

Start UTC:	2007-005T16:45:57
Start MET (SCLK):	1/0030321475
Short description:	HGA response mapping beam pattern (SSR [TYLERETAL2008] Section 6.5)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. The REX science team obtained the beam pattern by tuning the frequency of an unmodulated uplink signal of constant power from the DSN to arrive at the NH spacecraft with a constant frequency; the signal served as a calibration source. At the same time, the team varied the spacecraft attitude with respect to the direction to Earth, thus implementing a scan of the HGA beam over a small range of angles about the Earth direction, centered approximately on the beam maximum. The initial offset of the scan was set at the upper left corner of a 2deg x 2deg angular box. The beam direction then was made to 'nod and step' parallel to the box edges so as to perform a raster scan about the Earth direction. During the scan, REX processed the uplink signal from the tranceiver, with the REX output recorded and time-tagged on-board. At the same time the spacecraft body vectors were logged and time-tagged. The combination of these two time sequences allowed the team to map estimates of the uplink signal power to the spacecraft pointing direction.

Table 26 **07009:CORX01b_01_TstPatt**

Start UTC:	2007-011T09:12:51
Start MET (SCLK):	1/0030812689
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 27 **07009:CORX16b_01_WkTone**

Start UTC:	2007-011T09:17:50
Start MET (SCLK):	1/0030812988
Short description:	Find weak tones in the REX band with a large AGC gain
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. The test for spurs in the REX band is part of the Annual Checkout activities for New Horizons. The test involves setting the open-loop AGC to near the upper end of it's range and acquiring REX data with no uplink. A spur is a narrowband frequency, revealed as a narrow spectral line in the time-integrated spectrum of the REX band.

Table 28 **JREXCAL01**

Start UTC:	2007-055T02:05:00
Start MET (SCLK):	1/0034588617
Short description:	REX - looking at Jupiter
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. REX radiometry of Jupiter, taken as part of the REX radiometer calibration.

Table 29 **07052:JRexCal_01_TstPatt**

Start UTC:	2007-055T02:44:48
Start MET (SCLK):	1/0034591006
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 30 **07052:JRexCal_01**

Start UTC:	2007-055T02:55:46
Start MET (SCLK):	1/0034591664
Short description:	REX/Jupiter Radiometer Calib (SSR [TYLERETAL2008] Section 6.8)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. REX radiometry of Jupiter, taken as part of the REX radiometer calibration.

Table 31 **JREXCAL02**

Start UTC:	2007-064T11:42:00
Start MET (SCLK):	1/0035400837
Short description:	REX - looking at Jupiter
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. REX radiometry of Jupiter, taken as part of the REX radiometer calibration.

Table 32 **07052:JRexCal_02_TstPatt**

Start UTC:	2007-064T11:56:48
Start MET (SCLK):	1/0035401726
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 33 **07052:JRexCal_02**

Start UTC:	2007-064T12:07:46
Start MET (SCLK):	1/0035402384
Short description:	REX/Jupiter Radiometer Calib (SSR [TYLERETAL2008] Section 6.8)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. REX radiometry of Jupiter, taken as part of the REX radiometer calibration.

Table 34 **07066:CORX01b_01_TstPatt**

Start UTC:	2007-072T09:40:49
Start MET (SCLK):	1/0036084767
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 35 **07066:CORX16b_01_WkTone**

Start UTC:	2007-072T09:45:48
Start MET (SCLK):	1/0036085066
Short description:	Find weak tones in the REX band with a large AGC gain
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. The test for spurs in the REX band is part of the Annual Checkout activities for New Horizons. The test involves setting the open-loop AGC to near the upper end of it's range and acquiring REX data with no uplink. A spur is a narrowband frequency, revealed as a narrow spectral line in the time-integrated spectrum of the REX band.

Table 36 **07092:CORX01b_01_TstPatt**

Start UTC:	2007-093T13:34:48
Start MET (SCLK):	1/0037913206
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 37 **07092:CORX09b_01_USOShrt**

Start UTC:	2007-093T13:39:47
Start MET (SCLK):	1/0037913505
Short description:	USO Short Stability (SSR [TYLERETAL2008] Section 6.6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. DNS uplink signal was transmitted with the radiated frequency adjusted for Doppler shifts associated with the Earth and spacecraft in order to control the received frequency at NH. Signal acquisitions by REX spanned periods of typically 100 seconds (USO short stability), but occasionally lasting up to 1000 seconds (USO long stability). From these observations the REX-based estimates of uplink frequency can be made, and from those estimates the USO stability (Allan deviation) can be calculated.

Table 38 **07141:JERE_01_IFTstPatt**

Start UTC:	2007-146T20:09:48
Start MET (SCLK):	1/0042516106
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 39 **07141:JERE_01_Interference**

Start UTC:	2007-146T20:14:47
Start MET (SCLK):	1/0042516405
Short description:	Multi-insrument interference test
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. For REX, both REX and ALICE will operate simultaneously to observe the occultations of the Earth and Sun by Pluto and Charon. The mutual interference test for REX and ALICE had both instruments on, i.e. both REX and ALICE were acquiring data REX without an uplink and ALICE without the Sun in it's aperture.

Table 40 **07267:CORX01a_01_TstPatt**

Start UTC:	2007-273T05:39:49
Start MET (SCLK):	1/0053436706
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 41 **07267:CORX07a_11acoldrad**

Start UTC:	2007-273T06:30:44
Start MET (SCLK):	1/0053439761
Short description:	Cold Sky Cal
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. For the NH radio subsystem, without an absolutely calibrated thermal noise source, it is possible to calculate the System Noise Temperature (SNT) using multiple standard radio sources and Cold Sky: 'on' is when the HGA is pointing at a standard radio source; 'off' is when the HGA is pointing at Cold Sky. The typical Cold Sky location chosen for NH REX is [RA,DEC] = [15.2deg, -8.1deg], where the the sky temperature is within a few tenth's of a Kelvin of the Cosmic Microwave Background - CMB - over a section of the sky larger than several times the half-power beam width of the HGA.

Table 42 **07267:CORX01a_02_TstPatt**

Start UTC:	2007-273T11:24:49
Start MET (SCLK):	1/0053457406
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 43 **07267:CORX02a_01_SpurMeas**

Start UTC:	2007-273T11:29:48
Start MET (SCLK):	1/0053457705
Short description:	No Uplink Spur Measurement (SSR [TYLERETAL2008] Section 6.3)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. The test for spurs in the REX band is part of the Annual Checkout activities for New Horizons. The test involves setting the open-loop AGC to near the upper end of it's range and acquiring REX data with no uplink. A spur is a narrowband frequency, revealed as a narrow spectral line in the time-integrated spectrum of the REX band.

Table 44 **07267:CORX04a_01_GainLin**

Start UTC:	2007-273T13:49:44
Start MET (SCLK):	1/0053466101
Short description:	Gain Linearity
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. The gain setting (AGC or AGCGAIN) is designed to produce linear results in the radiometry calibration formula in units of dBm (the formula is available in the Science Operations Center/Instrument Interface Control Document - SOC_INST_ICD). To linear performance with gain, these tests varied the gain setting (steps of two in the gain setting, equivalent to $\tilde{1}$dB) while measuring a single target source i.e. an unmodulated, constant-strength signal sent from the DSN.

Table 45 **07267:CORX01a_03_TstPatt**

Start UTC:	2007-278T08:04:49
Start MET (SCLK):	1/0053877406
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 46 **07267:CORX10a_01_USOLong**

Start UTC:	2007-278T08:09:48
Start MET (SCLK):	1/0053877705
Short description:	USO Long Stability (SSR [TYLERETAL2008] Section 6.6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. DNS uplink signal was transmitted with the radiated frequency adjusted for Doppler shifts associated with the Earth and spacecraft in order to control the received frequency at NH. Signal acquisitions by REX spanned periods of typically 100 seconds (USO short stability), but occasionally lasting up to 1000 seconds (USO long stability). From these observations the REX-based estimates of uplink frequency can be made, and from those estimates the USO stability (Allan deviation) can be calculated.

Table 47 **07281:CORX01a_04_TstPatt**

Start UTC:	2007-281T20:09:49
Start MET (SCLK):	1/0054180106
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 48 **07281:CORX10a_02_USOLong**

Start UTC:	2007-281T20:14:48
Start MET (SCLK):	1/0054180405
Short description:	USO Long Stability (SSR [TYLERETAL2008] Section 6.6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. DNS uplink signal was transmitted with the radiated frequency adjusted for Doppler shifts associated with the Earth and spacecraft in order to control the received frequency at NH. Signal acquisitions by REX spanned periods of typically 100 seconds (USO short stability), but occasionally lasting up to 1000 seconds (USO long stability). From these observations the REX-based estimates of uplink frequency can be made, and from those estimates the USO stability (Allan deviation) can be calculated.

Table 49 **07281:CORX01a_01_TstPatt**

Start UTC:	2007-287T00:24:49
Start MET (SCLK):	1/0054627406
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 50 **07281:CORX09a_01_USOShrt**

Start UTC:	2007-287T00:29:48
Start MET (SCLK):	1/0054627705
Short description:	USO Short Stability (SSR [TYLERETAL2008] Section 6.6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. DNS uplink signal was transmitted with the radiated frequency adjusted for Doppler shifts associated with the Earth and spacecraft in order to control the received frequency at NH. Signal acquisitions by REX spanned periods of typically 100 seconds (USO short stability), but occasionally lasting up to 1000 seconds (USO long stability). From these observations the REX-based estimates of uplink frequency can be made, and from those estimates the USO stability (Allan deviation) can be calculated.

Table 51 **07281:CORX01a_02_TstPatt**

Start UTC:	2007-288T17:24:49
Start MET (SCLK):	1/0054775006
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 52 **07281:CORX10a_01_USOLong**

Start UTC:	2007-288T17:29:48
Start MET (SCLK):	1/0054775305
Short description:	USO Long Stability (SSR [TYLERETAL2008] Section 6.6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. DNS uplink signal was transmitted with the radiated frequency adjusted for Doppler shifts associated with the Earth and spacecraft in order to control the received frequency at NH. Signal acquisitions by REX spanned periods of typically 100 seconds (USO short stability), but occasionally lasting up to 1000 seconds (USO long stability). From these observations the REX-based estimates of uplink frequency can be made, and from those estimates the USO stability (Allan deviation) can be calculated.

Table 53 **07297:CORX04a_01_GainLin**

Start UTC:	2007-303T18:59:44
Start MET (SCLK):	1/0056076701
Short description:	Gain Linearity
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. The gain setting (AGC or AGCGAIN) is designed to produce linear results in the radiometry calibration formula in units of dBm (the formula is available in the Science Operations Center/Instrument Interface Control Document - SOC_INST_ICD). To linear performance with gain, these tests varied the gain setting (steps of two in the gain setting, equivalent to $\tilde{1}$dB) while measuring a single target source i.e. an unmodulated, constant-strength signal sent from the DSN.

Table 54 **07297:CORX02a_01_SpurMeas**

Start UTC:	2007-303T19:29:48
Start MET (SCLK):	1/0056078505
Short description:	No Uplink Spur Measurement (SSR [TYLERETAL2008] Section 6.3)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. The test for spurs in the REX band is part of the Annual Checkout activities for New Horizons. The test involves setting the open-loop AGC to near the upper end of it's range and acquiring REX data with no uplink. A spur is a narrowband frequency, revealed as a narrow spectral line in the time-integrated spectrum of the REX band.

Table 55 **07297:CORX01a_01_TstPatt**

Start UTC:	2007-303T19:39:49
Start MET (SCLK):	1/0056079106
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 56 **07313:CORX01a_01_TstPatt**

Start UTC:	2007-313T18:59:49
Start MET (SCLK):	1/0056940706
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 57 **07313:CORX07a_11acoldrad**

Start UTC:	2007-313T19:50:44
Start MET (SCLK):	1/0056943761
Short description:	Cold Sky Cal
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. For the NH radio subsystem, without an absolutely calibrated thermal noise source, it is possible to calculate the System Noise Temperature (SNT) using multiple standard radio sources and Cold Sky: 'on' is when the HGA is pointing at a standard radio source; 'off' is when the HGA is pointing at Cold Sky. The typical Cold Sky location chosen for NH REX is [RA,DEC] = [15.2deg, -8.1deg], where the the sky temperature is within a few tenth's of a Kelvin of the Cosmic Microwave Background - CMB - over a section of the sky larger than several times the half-power beam width of the HGA.

Table 58 **08287:P12_A2RX002_01_004_009_b_spur_gain_uso**

Start UTC:	2008-291T07:26:42
Start MET (SCLK):	1/0086534319
Short description:	Spur Meas, USO Stability (SSR [TYLERETAL2008] Sections 6.2, 6.6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. The test for spurs in the REX band is part of the Annual Checkout activities for New Horizons. The test involves setting the open-loop AGC to near the upper end of it's range and acquiring REX data with no uplink. A spur is a narrowband frequency, revealed as a narrow spectral line in the time-integrated spectrum of the REX band. DNS uplink signal was transmitted with the radiated frequency adjusted for Doppler shifts associated with the Earth and spacecraft in order to control the received frequency at NH. Signal acquisitions by REX spanned periods of typically 100 seconds (USO short stability), but occasionally lasting up to 1000 seconds (USO long stability). From these observations the REX-based estimates of uplink frequency can be made, and from those estimates the USO stability (Allan deviation) can be calculated.

Table 59 **08287:A2RX01b_01_TstPatt**

Start UTC:	2008-291T14:24:48
Start MET (SCLK):	1/0086559405
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 60 **08287:A2RX11b_01_RadCal**

Start UTC:	2008-291T15:15:47
Start MET (SCLK):	1/0086562464
Short description:	REX Radiometer Calibration (SSR [TYLERETAL2008] Section 6.8)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Crossed scans of radio astronomy sources, sometimes together with dwells on cold sky. Typcally, the spacecraft HGA was commanded to point at an offset from the source direction of -1 degree along the NH body X coordinate, and then scanned across the source at 1E-4 rad/s to X = +1 degree, a maneuver that required approximately 350s. Similar scans were performed for the vertical, or Z coordinate, but with a dwell of 300 s at the origin X = Z = 0.

Table 61 **08287:A2RX105_01_REXREXAliceInt**

Start UTC:	2008-292T16:51:48
Start MET (SCLK):	1/0086654625
Short description:	REX/Alice Instrument Interference
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. For REX, both REX and ALICE will operate simultaneously to observe the occultations of the Earth and Sun by Pluto and Charon. The mutual interference test for REX and ALICE had both instruments on, i.e. both REX and ALICE were acquiring data REX without an uplink and ALICE without the Sun in it's aperture.

Table 62 **08287:P12_A2RX010_01_b_uso_longterm**

Start UTC:	2008-294T18:07:48
Start MET (SCLK):	1/0086831985
Short description:	USO Long Stability (SSR [TYLERETAL2008] Section 6.6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. DNS uplink signal was transmitted with the radiated frequency adjusted for Doppler shifts associated with the Earth and spacecraft in order to control the received frequency at NH. Signal acquisitions by REX spanned periods of typically 100 seconds (USO short stability), but occasionally lasting up to 1000 seconds (USO long stability). From these observations the REX-based estimates of uplink frequency can be made, and from those estimates the USO stability (Allan deviation) can be calculated.

Table 63 **08287:P12_A2RX010_02_b_uso_longterm**

Start UTC:	2008-301T17:41:48
Start MET (SCLK):	1/0087435225
Short description:	USO Long Stability (SSR [TYLERETAL2008] Section 6.6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. DNS uplink signal was transmitted with the radiated frequency adjusted for Doppler shifts associated with the Earth and spacecraft in order to control the received frequency at NH. Signal acquisitions by REX spanned periods of typically 100 seconds (USO short stability), but occasionally lasting up to 1000 seconds (USO long stability). From these observations the REX-based estimates of uplink frequency can be made, and from those estimates the USO stability (Allan deviation) can be calculated.

Table 64 **08302:P12_A2RX010_01_b_uso_longterm**

Start UTC:	2008-312T06:04:48
Start MET (SCLK):	1/0088343805
Short description:	USO Long Stability (SSR [TYLERETAL2008] Section 6.6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. DNS uplink signal was transmitted with the radiated frequency adjusted for Doppler shifts associated with the Earth and spacecraft in order to control the received frequency at NH. Signal acquisitions by REX spanned periods of typically 100 seconds (USO short stability), but occasionally lasting up to 1000 seconds (USO long stability). From these observations the REX-based estimates of uplink frequency can be made, and from those estimates the USO stability (Allan deviation) can be calculated.

Table 65 **08318:P12_A2RX010_01_b_uso_longterm**

Start UTC:	2008-319T22:27:48
Start MET (SCLK):	1/0089007585
Short description:	USO Long Stability (SSR [TYLERETAL2008] Section 6.6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. DNS uplink signal was transmitted with the radiated frequency adjusted for Doppler shifts associated with the Earth and spacecraft in order to control the received frequency at NH. Signal acquisitions by REX spanned periods of typically 100 seconds (USO short stability), but occasionally lasting up to 1000 seconds (USO long stability). From these observations the REX-based estimates of uplink frequency can be made, and from those estimates the USO stability (Allan deviation) can be calculated.

Table 66 **09205:A3RX123_01_a**

Start UTC:	2009-211T12:27:48
Start MET (SCLK):	1/0111262786
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 67 **09205:A3RX123_01_b**

Start UTC:	2009-219T13:38:48
Start MET (SCLK):	1/0111958246
Short description:	REX Test Patterns (SSR [TYLERETAL2008] Section 6.2)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. N.B. Almost all antenna-source observations are preceded by a small number of frames of Test Patterns

Table 68 **10162:A4REX_1a_2a_4a_9a**

Start UTC:	2010-173T06:09:48
Start MET (SCLK):	1/0139492906
Short description:	ACO (Test Patterns, Spur Measurement, Gain- and USO Short-Stability)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. The test for spurs in the REX band is part of the Annual Checkout activities for New Horizons. The test involves setting the open-loop AGC to near the upper end of it's range and acquiring REX data with no uplink. A spur is a narrowband frequency, revealed as a narrow spectral line in the time-integrated spectrum of the REX band. To linear performance with gain, these tests varied the gain setting (steps of two in the gain setting, equivalent to $\tilde{1}$dB) while measuring a single target source i.e. an unmodulated, constant-strength signal sent from the DSN. DNS uplink signal was transmitted with the radiated frequency adjusted for Doppler shifts associated with the Earth and spacecraft in order to control the received frequency at NH. Signal acquisitions by REX spanned periods of typically 100 seconds (USO short stability), but occasionally lasting up to 1000 seconds (USO long stability). From these observations the REX-based estimates of uplink frequency can be made, and from those estimates the USO stability (Allan deviation) can be calculated.

Table 69 **10184:A4RX_01_02_04_09_b_spur_gain_uso**

Start UTC:	2010-186T13:37:02
Start MET (SCLK):	2/0140642940
Short description:	ACO (Test Patterns, Spur Measurement, Gain- and USO Short-Stability)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. The test for spurs in the REX band is part of the Annual Checkout activities for New Horizons. The test involves setting the open-loop AGC to near the upper end of it's range and acquiring REX data with no uplink. A spur is a narrowband frequency, revealed as a narrow spectral line in the time-integrated spectrum of the REX band. To linear performance with gain, these tests varied the gain setting (steps of two in the gain setting, equivalent to $\tilde{1}$dB) while measuring a single target source i.e. an unmodulated, constant-strength signal sent from the DSN. DNS uplink signal was transmitted with the radiated frequency adjusted for Doppler shifts associated with the Earth and spacecraft in order to control the received frequency at NH. Signal acquisitions by REX spanned periods of typically 100 seconds (USO short stability), but occasionally lasting up to 1000 seconds (USO long stability). From these observations the REX-based estimates of uplink frequency can be made, and from those estimates the USO stability (Allan deviation) can be calculated.

Table 70 **11132:A5REX_1ab_2ab_4ab_occ**

Start UTC:	2011-140T13:59:48
Start MET (SCLK):	3/0168205906
Short description:	Test Patterns, No signal spur test, gain linearity, Lunar Occultatn
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. The test for spurs in the REX band is part of the Annual Checkout activities for New Horizons. The test involves setting the open-loop AGC to near the upper end of it's range and acquiring REX data with no uplink. A spur is a narrowband frequency, revealed as a narrow spectral line in the time-integrated spectrum of the REX band. To linear performance with gain, these tests varied the gain setting (steps of two in the gain setting, equivalent to $\tilde{1}$dB) while measuring a single target source i.e. an unmodulated, constant-strength signal sent from the DSN. In 2011 and 2012, REX observations were made during a Lunar occulation of Earth, similar to what would be done during the Pluto Encounter. DSN uplink signal was detected before the occultation and affected near the ingress limb crossing, lost behind the Moon, affected again near the egress limb crossing and detected after the occultation.

Table 71 **11175:A5REX_1ab_2ab_4ab**

Start UTC:	2011-175T10:49:49
Start MET (SCLK):	3/0171218506
Short description:	ACO5 test patt, no-uplk spur, gain lin (SSR [TYLERETAL2008] Sect. 6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. The test for spurs in the REX band is part of the Annual Checkout activities for New Horizons. The test involves setting the open-loop AGC to near the upper end of it's range and acquiring REX data with no uplink. A spur is a narrowband frequency, revealed as a narrow spectral line in the time-integrated spectrum of the REX band. To linear performance with gain, these tests varied the gain setting (steps of two in the gain setting, equivalent to $\tilde{1}$dB) while measuring a single target source i.e. an unmodulated, constant-strength signal sent from the DSN.

Table 72 **12006:A6REX_1ab_2ab_4ab_occ**

Start UTC:	2012-021T18:54:48
Start MET (SCLK):	3/0189478005
Short description:	Test Patterns, No signal spur, Gain Linearity, Lunar Occult, Tst Ptt
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. The test for spurs in the REX band is part of the Annual Checkout activities for New Horizons. The test involves setting the open-loop AGC to near the upper end of it's range and acquiring REX data with no uplink. A spur is a narrowband frequency, revealed as a narrow spectral line in the time-integrated spectrum of the REX band. To linear performance with gain, these tests varied the gain setting (steps of two in the gain setting, equivalent to ĩdB) while measuring a single target source i.e. an unmodulated, constant-strength signal sent from the DSN. In 2011 and 2012, REX observations were made during a Lunar occulation of Earth, similar to what would be done during the Pluto Encounter. DSN uplink signal was detected before the occultation and affected near the ingress limb crossing, lost behind the Moon, affected again near the egress limb crossing and detected after the occultation.

Table 73 **12150:PERX_X_PLASMAROLL_1**

Start UTC:	2012-150T20:24:19
Start MET (SCLK):	3/0200628976
Short description:	Rehearsal plasma roll, not Earth pointed
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 74 **12150:PERX_X_PLASMAROLL_2**

Start UTC:	2012-151T05:57:51
Start MET (SCLK):	3/0200663388
Short description:	Rehearsal plasma roll, not Earth pointed
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 75 **12150:PERX_PC_REX_DISKTHERM**

Start UTC:	2012-151T06:15:34
Start MET (SCLK):	3/0200664451
Short description:	Rehearsal Disk Therm, no target
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 76 **12150:PERX_P_REX_THERMSCAN**

Start UTC:	2012-151T11:45:49
Start MET (SCLK):	3/0200684266
Short description:	Rehearsal Thermscan, no target
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 77 **12150:PERX_P_OCC**

Start UTC:	2012-151T12:08:00
Start MET (SCLK):	3/0200685597
Short description:	Rehearsal Pluto Occultation, not Earth pointed
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 78 **12150:PERX_X_PLASMAROLL_3**

Start UTC:	2012-151T13:22:54
Start MET (SCLK):	3/0200690091
Short description:	Rehearsal plasma roll, not Earth pointed
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 79 **12150:PERX_C_OCC**

Start UTC:	2012-151T13:38:14
Start MET (SCLK):	3/0200691011
Short description:	Rehearsal Charon Occultation, not Earth pointed
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 80 **13014:A7REX_1ab_2ab_4ab**

Start UTC:	2013-021T15:09:46
Start MET (SCLK):	3/0221086903
Short description:	ACO7 test patt, no-uplk spur, gain lin (SSR [TYLERETAL2008] Sect. 6)
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. The test for spurs in the REX band is part of the Annual Checkout activities for New Horizons. The test involves setting the open-loop AGC to near the upper end of it's range and acquiring REX data with no uplink. A spur is a narrowband frequency, revealed as a narrow spectral line in the time-integrated spectrum of the REX band. To linear performance with gain, these tests varied the gain setting (steps of two in the gain setting, equivalent to $\tilde{1}$dB) while measuring a single target source i.e. an unmodulated, constant-strength signal sent from the DSN.

Table 81 **13186:PERX_X_PLASMAROLL_D_4**

Start UTC:	2013-187T18:38:33
Start MET (SCLK):	3/0235441831
Short description:	Rehearsal plasma roll, not Earth pointed
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 82 **13186:PERX_X_PLASMAROLL_E_1**

Start UTC:	2013-189T19:06:16
Start MET (SCLK):	3/0235616294
Short description:	Rehearsal plasma roll, not Earth pointed
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 83 **13186:PERX_X_PLASMAROLL_E_2**

Start UTC:	2013-190T18:56:16
Start MET (SCLK):	3/0235702094
Short description:	Rehearsal plasma roll, not Earth pointed
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 84 **13186:PERX_X_PLASMAROLL_E_3**

Start UTC:	2013-192T04:14:53
Start MET (SCLK):	3/0235822011
Short description:	Rehearsal plasma roll, not Earth pointed
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 85 **13186:PERX_O_REX_TEST_PATTERN_1**

Start UTC:	2013-192T15:13:09
Start MET (SCLK):	3/0235861507
Short description:	Rehearsal Test Pattern
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 86 **13186:PERX_X_PLASMAROLL_1**

Start UTC:	2013-192T21:33:50
Start MET (SCLK):	3/0235884348
Short description:	Rehearsal plasma roll, not Earth pointed
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 87 **13186:PERX_X_PLASMAROLL_2**

Start UTC:	2013-193T06:56:35
Start MET (SCLK):	3/0235918113
Short description:	Rehearsal plasma roll, not Earth pointed
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 88 **13186:PERX_PC_REX_DISKTHERM**

Start UTC:	2013-193T07:21:40
Start MET (SCLK):	3/0235919618
Short description:	Rehearsal Disk Therm, no target
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 89 **13186:PERX_P_REX_THERMSCAN**

Start UTC:	2013-193T12:51:55
Start MET (SCLK):	3/0235939433
Short description:	Rehearsal Thermscan, no target
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 90 **13186:PERX_P_OCC**

Start UTC:	2013-193T13:14:06
Start MET (SCLK):	3/0235940764
Short description:	Rehearsal Pluto Occultation, not Earth pointed
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 91 **13186:PERX_X_PLASMAROLL_3**

Start UTC:	2013-193T14:26:38
Start MET (SCLK):	3/0235945116
Short description:	Rehearsal plasma roll, not Earth pointed
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 92 **13186:PERX_C_OCC**

Start UTC:	2013-193T14:44:20
Start MET (SCLK):	3/0235946178
Short description:	Rehearsal Charon Occultation, not Earth pointed
Long description:	Non-science observation(s); one of a few spacecraft instrument rehearsals, performed during the Pluto Cruise mission phase, for testing and validating the Pluto flyby sequence. During these rehearsals, the spacecraft was typcally not pointed as it would be for the Pluto Encounter. Also, data recorded on-board during the rehearsals was only partially downlinked. Refer to the observation log for the Pluto Encounter mission phase for a description of the various sequences rehearsed.

Table 93 **14183:A8REX_1ab_2ab_4ab_17ab**

Start UTC:	2014-194T11:54:48
Start MET (SCLK):	3/0267558405
Short description:	Test Patterns, No signal spur test, Gain/Linearity, 70m USO Acqustn
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. The test for spurs in the REX band is part of the Annual Checkout activities for New Horizons. The test involves setting the open-loop AGC to near the upper end of it's range and acquiring REX data with no uplink. A spur is a narrowband frequency, revealed as a narrow spectral line in the time-integrated spectrum of the REX band. To linear performance with gain, these tests varied the gain setting (steps of two in the gain setting, equivalent to $\tilde{1}$dB) while measuring a single target source i.e. an unmodulated, constant-strength signal sent from the DSN.

Table 94 **14195:A8REX_7ab**

Start UTC:	2014-198T04:34:48
Start MET (SCLK):	3/0267877605
Short description:	Test Pattern, Cold Sky Radiometric Cal
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Instead of processing the signal from the HGA antenna, REX is commanded to process any of a set of internal test patterns stored in the REX signal processor: impulse response; three square waves of different frequencies; two pseudo-random number sequences of different amplitudes; all zeros. Because in these cases the inputs are known, the outputs will be deterministic and can be used to confirm proper REX operation. For the NH radio subsystem, without an absolutely calibrated thermal noise source, it is possible to calculate the System Noise Temperature (SNT) using multiple standard radio sources and Cold Sky: 'on' is when the HGA is pointing at a standard radio source; 'off' is when the HGA is pointing at Cold Sky. The typical Cold Sky location chosen for NH REX is [RA,DEC] = [15.2deg, -8.1deg], where the the sky temperature is within a few tenth's of a Kelvin of the Cosmic Microwave Background - CMB - over a section of the sky larger than several times the half-power beam width of the HGA.

Table 95 **14208:A8REX_1a_3a**

Start UTC:	2014-219T05:57:48
Start MET (SCLK):	3/0269696985
Short description:	Test Pattern, 80kW uplink test
Long description:	Non-science observation(s); one of several of instrument commissioning, Annual Check-Out, and instrument characterization, performance and calibration activities. Operational test to verify the project can operate REX in synchrony with DSN radiating at 80kW.