

REX Activities in KEM1 Approach, Encounter, and Cruise

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The REX activities in Loads 18240 to 19017, are associated with two tasks:

1. MU69 Encounter Observations
2. Radio Path Characterization

Each of the tasks was bookended with the REX Test Patterns, that use preset sequences with known response to compare with the REX output and verify performance of the REX process. Since the Test Patterns are run in concert with every REX event, they will not be further described in the four REX measurements to follow.

1. MU69 Encounter Observations (Load 18359)

The following is a description of the REX measurements and the DataTrack listing of the REX data during the MU69 Encounter.

1.1 These data are the REX Test Patterns described above.

18344	KARX_1ab_TestPatt_2018_358	2018-358_19:04:33	S/C	407,984,193	407,984,318
18344	KARX_1ab_TestPatt_2018_358	2018-358_19:04:48	S/C	407,984,208	407,984,318

1.2 On approach to MU69. This was an attempt to measure the dayside radio brightness temperature of MU69. The HGA was pointed at the target for a 'stare' and the REX data recorded. However, the spacecraft was at too large a distance and no increase in the radiometric temperature was detected.

18359	KERX_MU69_CA03-TEMP_REX_2019001__RADIOMETRIC	2019-001_04:28:04	S/C	408,622,807	408,623,822
18359	KERX_MU69_CA03-TEMP_REX_2019001__RADIOMETRIC	2019-001_04:28:19	S/C	408,622,822	408,623,689

1.3 Shortly after closest approach to MU69, the HGA was scanned across the expected direction to MU69. The scan was on MU69's night side and was over the error ellipse, i.e. the angular range determined to include position offsets due to imprecise knowledge of MU69's location. The scan did detect the thermal emission from MU69, such that its radio brightness temperature was measured to be 26K +/-4K. Contemporaneous with the thermal scan, six uplink transmissions from earth illuminated MU69, and a radar bistatic experiment was performed. The data in this data set includes the bistatic reflections from MU69.

18359	KERX_M_CA08P_REX	2019-001_05:48:19	S/C	408,627,621	408,628,218
18359	KERX_M_CA08P_REX	2019-001_05:48:34	S/C	408,627,636	408,628,677

1.4 Following the nightside radiometric scan of MU69, the HGA was pointed toward earth to record the uplink transmissions directly in the HGA. It was unlikely MU69 would possess an ionosphere. Even so, this REX data sets an upper limit on the total electron content in the vicinity of MU69.

18359	KERX_EARTH_CA12-IONSPHR_REX_2019001	2019-001_06:05:44	S/C	408,628,674	408,630,748
18359	KERX_EARTH_CA12-IONSPHR_REX_2019001	2019-001_06:05:59	S/C	408,628,689	408,671,798

1.5 Following the ionosphere detection attempt, the HGA scanned the identical portion of the sky background for the MU69 radiometric scan. This data is intended to provide the background reference profile for the radio brightness measurement.

18359	KERX_X_CA08-TEMP-BKGD_REX_2019002	2019-002_03:18:39	S/C	408,705,044	408,709,585
18359	KERX_X_CA08-TEMP-BKGD_REX_2019002	2019-002_03:18:54	S/C	408,705,059	408,709,600
18359	KERX_X_CA03-TEMP-BKGD_REX_2019002	2019-002_04:34:27	S/C	408,709,594	408,710,820
18359	KERX_X_CA03-TEMP-BKGD_REX_2019002	2019-002_04:34:42	S/C	408,709,609	408,710,820

1.6 These data are the REX test patterns, described earlier.

19003	KDRX_1ab_TestPatt_2019_004	2019-004_22:04:33	S/C	408,945,393	408,945,518
19003	KDRX_1ab_TestPatt_2019_004	2019-004_22:04:48	S/C	408,945,408	408,945,518

2. Radio Path characterization (Loads 18240, 18287, and 19017)

Radio path characterization measurements with REX occur nominally on a monthly cadence during the New Horizons extended mission. Due to operations constraints such as spacecraft hibernation, and DSN scheduling, the monthly cadence has been irregular. The REX data is from uplinks in both polarizations (RCP and LCP), and recorded and processed as described for the solar conjunctions. The objective is to assess the uplink's frequency and amplitude stability, and to associate the standard deviation measure of the stability distributions with characteristics of the radio path such as multipath propagation. The Radio Path Characterization was done on September 9, 2018, October 20, 2018, and February 2, 2019.

The following is the DataTrack listing of the REX data during the Radio Path Characterizations.

09/09/2018:

18240	KARX_1ab_TestPatt_2018_252	2018-252_09:42:30	S/C	398,792,070	398,792,372
18240	KARX_1ab_TestPatt_2018_252	2018-252_09:42:45	S/C	398,792,085	398,792,387
18240	KARX_3ab_Radio_Path_Characterization_2018_252	2018-252_09:47:34	S/C	398,792,374	398,792,568
18240	KARX_3ab_Radio_Path_Characterization_2018_252	2018-252_09:47:49	S/C	398,792,389	398,792,568

10/20/2018:

18287	KARX_1ab_TestPatt_2018_293	2018-293_07:36:17	S/C	402,326,897	402,327,199
18287	KARX_1ab_TestPatt_2018_293	2018-293_07:36:32	S/C	402,326,912	402,327,214

18287	KARX_3ab_Radio_Path_Characterization_2018_293	2018-293_07:41:21	S/C	402,327,201	402,327,390
18287	KARX_3ab_Radio_Path_Characterization_2018_293	2018-293_07:41:36	S/C	402,327,216	402,327,390

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19017	KDRX_1ab_TestPatt_2019_033	2019-033_21:08:59	S/C	411,447,659	411,447,961
19017	KDRX_1ab_TestPatt_2019_033	2019-033_21:09:14	S/C	411,447,674	411,447,976
19017	KDRX_3ab_Radio_Path_Characterization_2019_033	2019-033_21:14:03	S/C	411,447,963	411,448,152
19017	KDRX_3ab_Radio_Path_Characterization_2019_033	2019-033_21:14:18	S/C	411,447,978	411,448,152