New Horizons REX Data Set Review – KEM Cruise 1

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Date: October 2, 2018

Executive Summary

The level 2 (raw) and level 3 (calibrated) New Horizons Radio Science Experiment (REX) datasets, `nh-x-rex-2-kemcruise1-v1.0` and `nh-x-rex-3-kemcruise1-v1.0`, respectively, were reviewed and found to be well-documented and contain the expected data on the spacecraft side, but missing the corresponding DSN uplink tracking files associated with each experiment/test. The datasets contain all relevant documentation in order to use the data. I attempted to reproduce some of the results shown in the documentation in both the raw and calibrated datasets to validate the data in the archive. Minor corrections to one document (rex_activities_kemcruise1.pdf) would greatly improve usability, as would either inclusion of DSN uplink tracking files or updating the documentation on why they are not present in these archives.

Data

This dataset contains solar conjunction test data from Jan 2-6, 2017, for 100s of Doppler per day. I examined RCP from Side A ("0x7b1") was able to read the FITS-formatted data and extract the In-phase and Quadrature (IQ) measurements. From the IQ, I was able to run a spectral FFT to generate frequency estimates, which are in-line with what I expected.
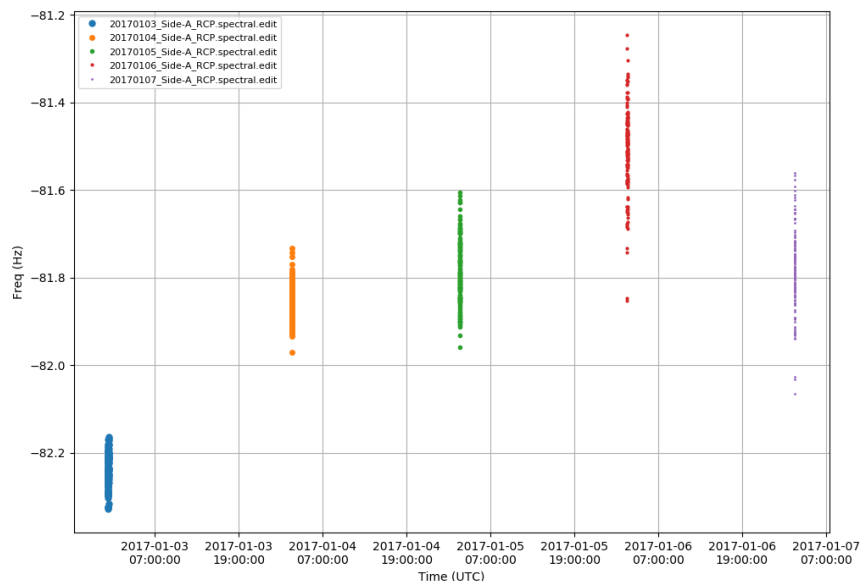

Figure 1. Frequency estimates from the solar conjunction tests on Jan 2-6, 2017

A bistatic "dry test run" was documented to have occurred on December 1, 2017, but appeared to be a typo in the documentation. The data for it appears on December 11, 2017 (see file comments below). I was able to reproduce the figure in the "rex_activities_kemcruise1.pdf" document showing each individual DSN uplink.
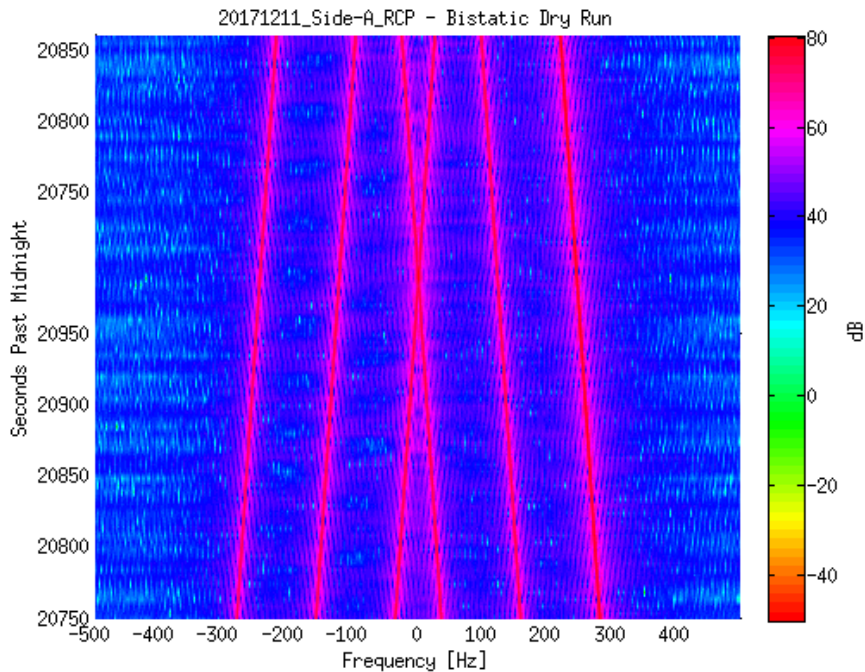

Figure 2. Spectrogram from the December 11, 2017 bistatic dry run test.

Additionally, the documentation describes there were SNR verification tests throughout the year. I did not look at these data but assume they are in good order since the other two experiments were good.

Lack of DSN Uplink Tracking Files

I could not find any reference to the DSN uplink tracking files, which are documented to be in the DATA/TNF folder, which does not exist. Neither the Level 2 or Level 3 dataset contains them. They should either be included, or alternately documented somewhere that there are no TNF files in the archive. A readme explanation placed in the DATA/TNF folder could suffice or modification of the dataset catalog.

Documentation Comments

rex_activities_kemcruise1.pdf

- Section 2/3: Include the dates of the SNR verification in the paragraph like done for the other two sections rather than reading the cryptic "DataTrack" subsection
- Section 4: "December 1th, 2017" should be "December 11, 2017"
- By including consistent dates it makes it easier for the user to correlate which directory in the DATA/ folder to look in for a given activity