

DART/LICIACube Radio Science Collection PDS4 Review

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Executive Summary

The data relating to the DART LICIACube Radio Science collection was reviewed. The contents of this include the DSN TRK-2-34 tracking data type and an archive Software Interface Spec document. This is a **re-review** of the data now that the proper files have been uploaded. The data files are of good quality and contain the expected information. I recommend the inclusion of ionosphere data, if available, and small updates to the SIS.

Data Comments

Missing data -

There is no Earth ionosphere calibration data provided. This is typically included in a radio science archive. DSN must have produced this for the LICIACube navigation team? Highly recommended to include. If not available, a statement must be made in the SIS that this data was not collected for LICIACube.

data_tnf -

Traditional tracking data in standard DSN TRK-2-34 data. Documentation states that the files were sorted by record number for easier labeling, similar to what is usually done with this data format. I took several of the TNF files and confirmed that the files were sorted correctly. I did spot checks of the label entries which look good. I ran the PDS transform tool over some data files, which produced table outputs from the binary data as expected.

I ingested the entirety of the TRK-2-34 data into the JPL MONTE orbit determination software to confirm that the data can be loaded correctly into a third-party tool and validate the data are complete for a radio science analysis of the DART mission. The data coverage is:

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Summary for all spacecraft

Points	Measurement Type	First Point (TAI)	Last Point (TAI)
619687	DSN Two-way Doppler	12-SEP-2022 00:04:53	24-OCT-2022 12:40:20
* 328	DSN Two-way Doppler	12-SEP-2022 23:05:46	14-OCT-2022 10:12:05
586	DSN Three-way Doppler	29-SEP-2022 03:35:41	29-SEP-2022 03:45:51
3182	DSN Two-way SRA Range	12-SEP-2022 17:07:56	24-OCT-2022 12:34:05
* 23	DSN Two-way SRA Range	17-SEP-2022 16:03:02	01-OCT-2022 20:42:30
623806	Total points	12-SEP-2022 00:04:53	24-OCT-2022 12:40:20

(* Indicates DSN flagged measurement as duplicate. This is completely normal.)

The data coverage is consistent with the deployment of LICIAcube on September 12 and end of mission about 6 weeks later on October 23. The 2-way Doppler observable data look like:

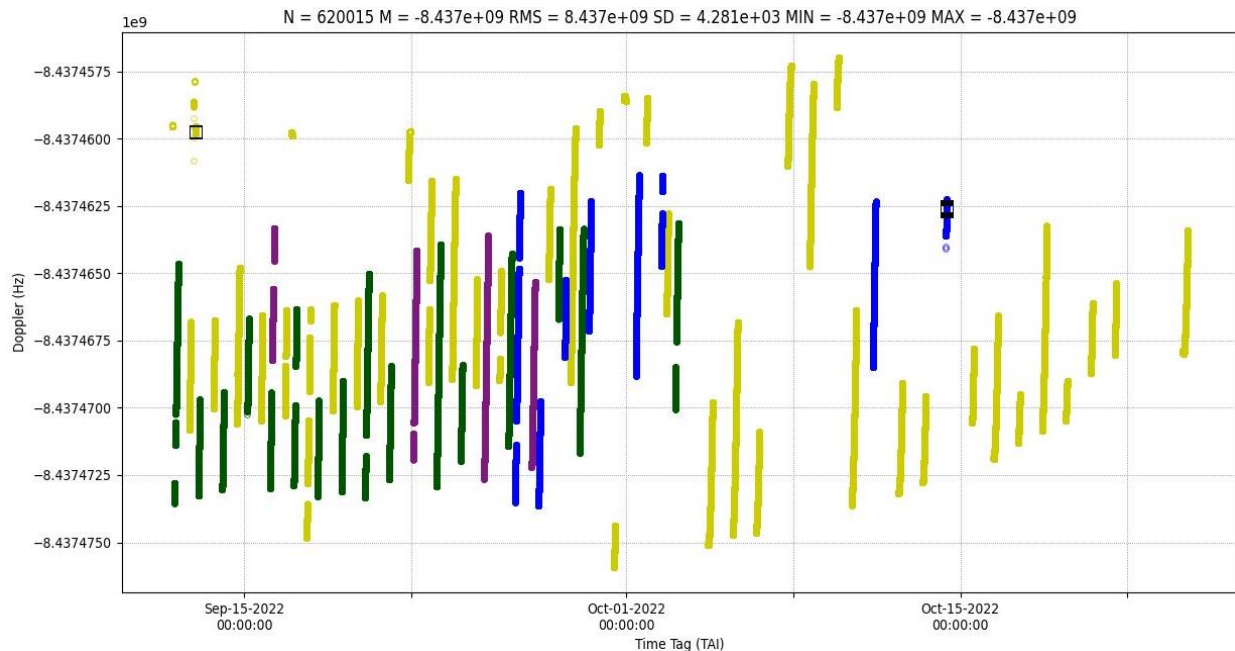


Figure 1. LICIAcube Doppler observables from the TNF data.

Which is as expected, approximately 8.437 MHz (stated in the SIS).

Maneuver data -

XML maneuver files are in the documents collection. The documentation for using them is minimal which will make them challenging to use but not impossible. An investigator would probably know what to do. I think it would be better if these were actually in their own collection as data files, since they are. However, its fine they're documents, but the SIS should highlight that more clearly because I got confused at first where to find them.

Documentation Comments

There is one SIS for the radio science data. Specific comments:

- Page 1 – appears to have been produced in landscape orientation but some of the graphics and text is mis-aligned, confirm this was the intent?
- Page 5 – error in table of contents
- Page 6 – typo first paragraph section 2, remove DRACO
- Page 7 – missing telecom information
 - Please provide turnaround ratio
- Page 9 – SFH data collection is missing from the bundle