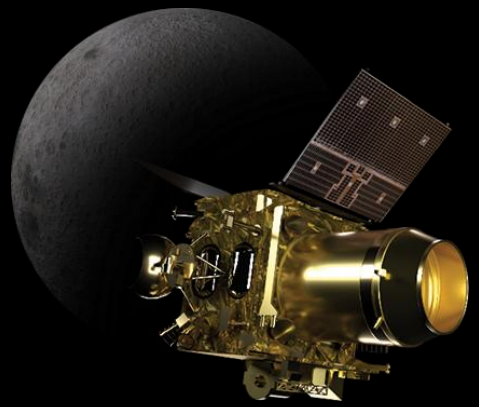
PDS4 Data Archive For Chandrayaan-2 Mission Payloads (TMC2, OHRC and IIRS)



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Outline

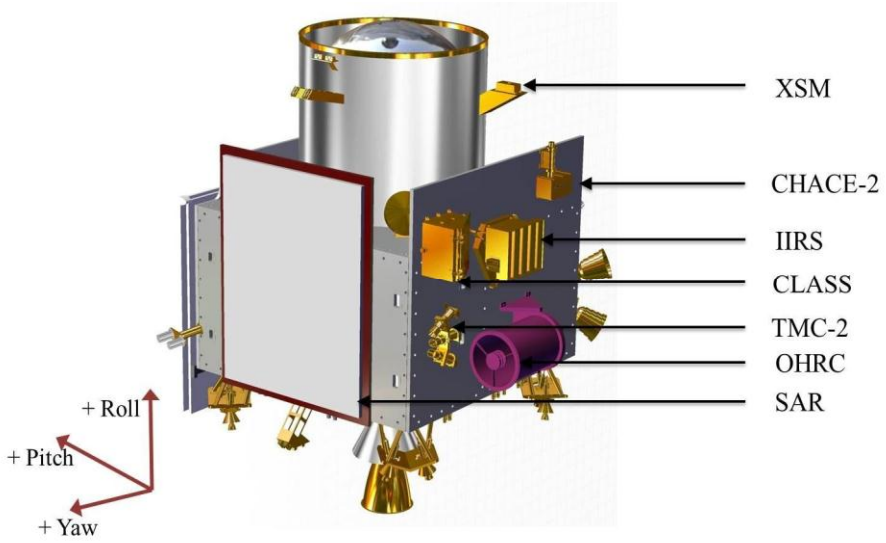
- PDS4 - Overview
- Chandrayaan-2 Mission & Payloads
- Data Archive Process
- Data Archive Process – Chandrayaan-2 Mission
- Data Archive Design & Development
- Operations & Maintenance
- Data Products Release

PDS - Overview

- Well-known established global planetary archive standard.
- Archives and distributes scientific data from planetary missions.
- Ensure the long-term access and usability of data.
- Self Structured, Peer-reviewed, well-documented and freely available.
- Planetary Data System is adopted by NASA, ESA, JAXA, ISRO and other space agencies across globe.
- There are many versions of PDS got released over many decades.
- PDS Version history is shown below:
  - PDS 1
  - PDS 2
  - PDS 3
  - PDS 4

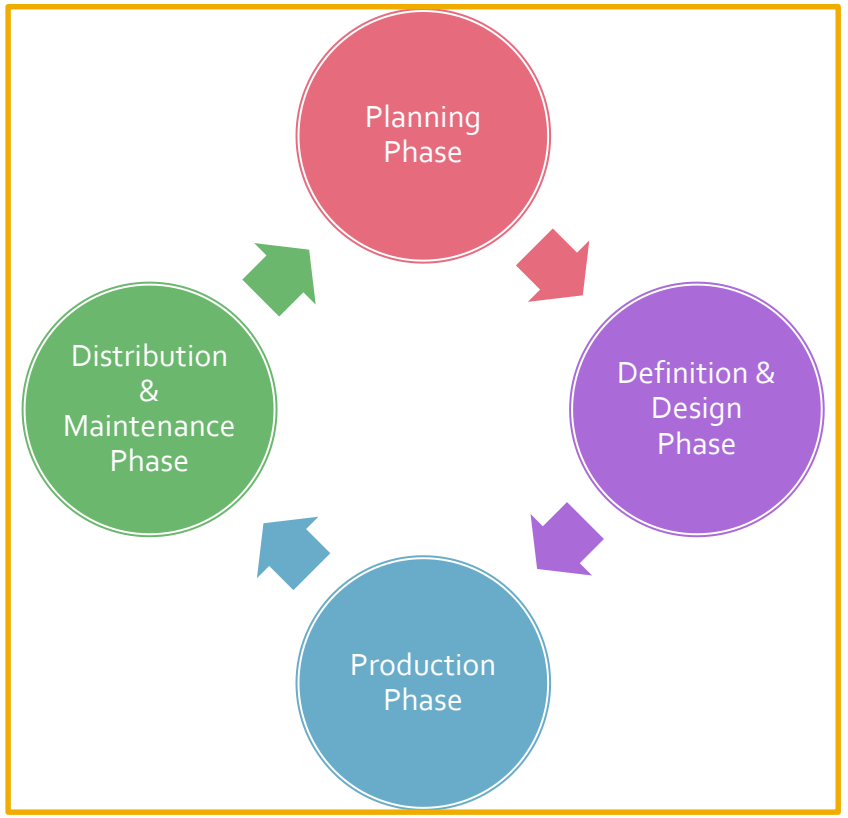
Mission & Payloads - Overview

- Chandrayaan-2, the second Indian mission to the moon was launched on 22nd July 2019 with Orbiter, Lander and Rover configuration
- Highly Complex mission compared to the previous missions of ISRO
- There were eight scientific payloads hosted on the orbiter
  - Terrain Mapping Camera (TMC2)
  - Imaging Infrared Spectrometer (IIRS)
  - Orbiter High Resolution Camera (OHRC)
  - Dual Frequency Synthetic Aperture Radar (DFSAR)
  - Chandrayaan-2 Large Area Soft X-ray Spectrometer (CLASS)
  - X-ray Solar Monitor (XSM)
  - Chandra's Atmospheric Composition Explorer (CHACE-2)
  - Dual Frequency Radio Science (DFRS) experiment



Data Archive Process

- Archiving any planetary data in PDS4 involves technical activity.
- Data needs to be re-engineered by following well defined archive process model.
- The process model contains well defined sequence of steps that needs to be followed during development of an archive.
- PDS4 has defined the various phases to be followed for development of PDS4 data archive
- For Chandrayaan-2 mission, tailored the Archive Process and define activities under each phase of process model



Archive Process Model

Data Archive Process – Chandrayaan-2 Mission

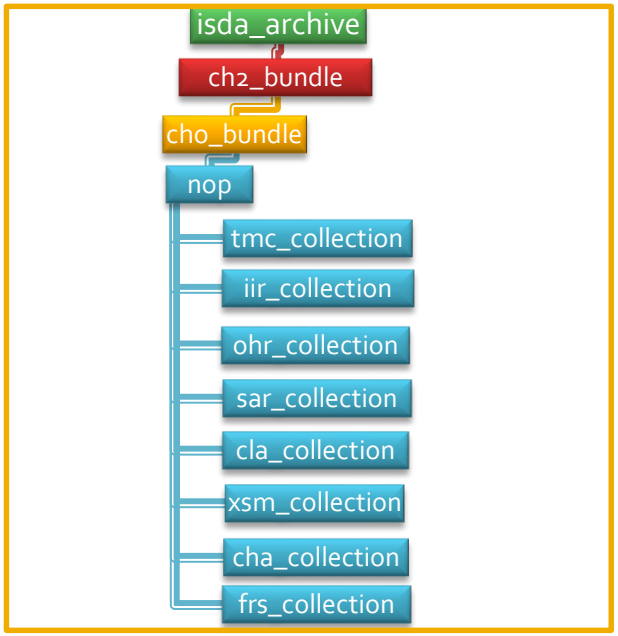
Archive Process Phase	Defined PDS4 Archival Activities	Status
Planning Phase	Formation of Archive Working Group	Completed
	Data Archive Requirements Collection	Completed
	Data Archive Process Definition to be followed by all the Principal Investigator (PI) of Chandrayaan-2 mission.	Completed
Definition and Designing Phase	Preparation of the Archive Conventions	Completed
	Preparation of the Data Management & Archive Plan	Completed
	Design the Archive Structure ▪ Mission, Instrument and Data Product Level	Completed
	Define the PDS Data Product ▪ Primary data product ▪ Ancillary data product	Completed
	Design Data Products ▪ Product Level ▪ Label Level	Completed

Data Archive Process - Chandrayaan-2 Mission cont'd

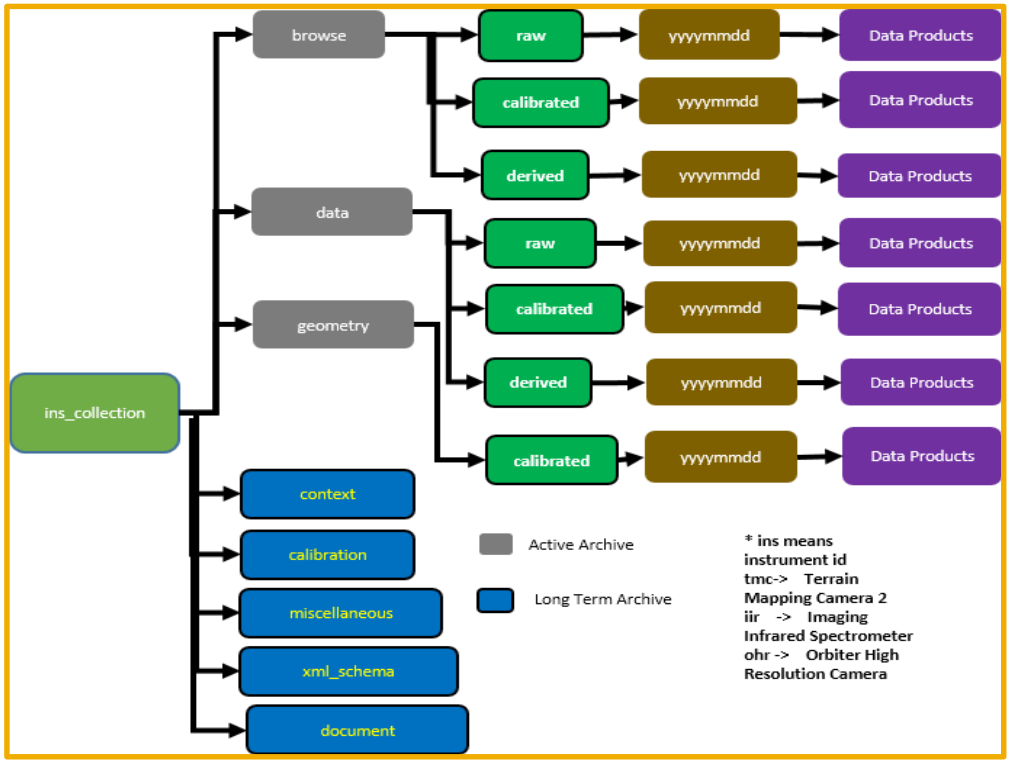
Archive Process Phase	Defined PDS4 Archival Activities	Status
Production Phase	Software Development of PDS4 Data Archive Software (Requirements, design, implementation and testing)	Completed
	Conducting of pre launch cross pre-peer review	Completed
	Operationalization of Archival software for generating active archive during various defined mission phases of Chandrayaan-2	Completed
	Conducting of post launch cross pre-peer review	Completed
Distribution and maintenance Phase	Long Term Archive Preparation ▪ Documented Data Products Generation - **done** ▪ Data products validation - **done** ▪ Internal Review - **done** ▪ Peer-Review Process – **done**	Completed
	Final data products to be made available on-line	
	Data archive maintained via periodic refreshes, addition of new/updated data products	

Data Archive Planning, Design & Development

- As per design process, top down approach was adopted i.e. Mission (bundle)-> instrument (collection) -> data products (data)
- For development bottom up approach was adopted.
- For every payloads science data products definition was identified.



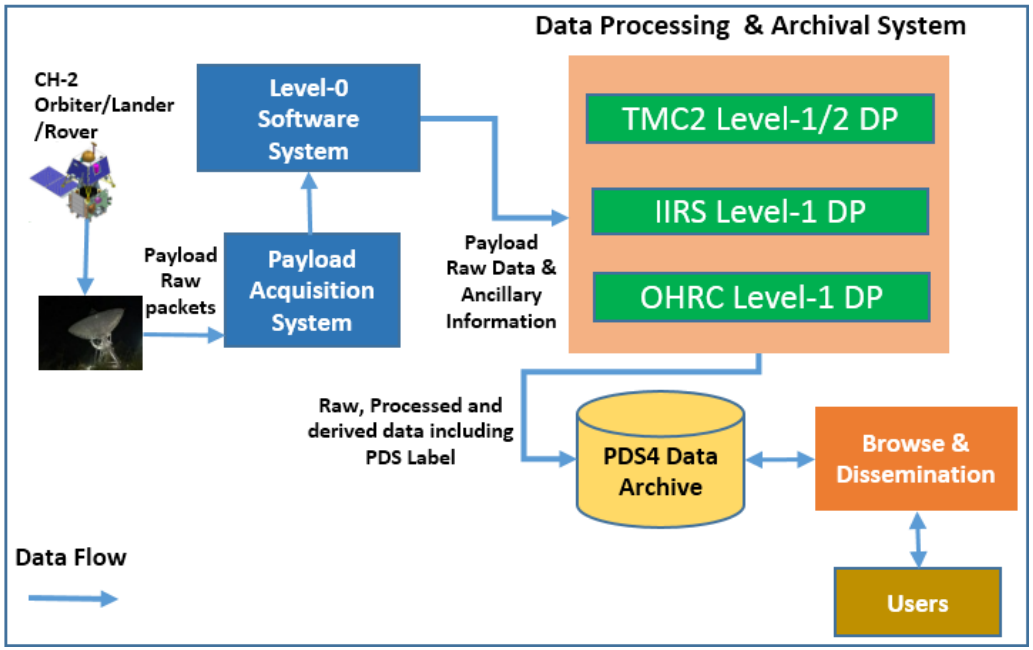
Mission Archive



Instrument and Data Products Archive

Production Phase

- In the production phase Data Processing and Archival software was designed, developed and tested based on the planning and design phase mentioned above at ISSDC.
- At present mission is in production phase and software is operationalized at ISSDC. The active archive for TMC2 and IIRS is getting generated as per mission payload operations plan.



Data Processing and Archival System @ ISSDC

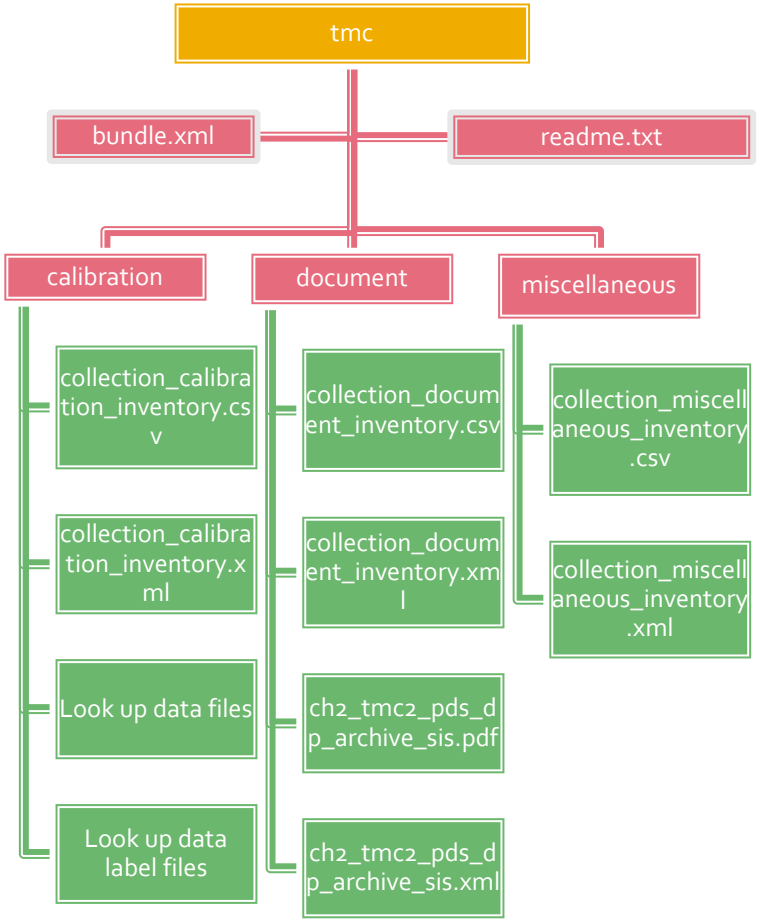
Distribution & Maintenance Phase

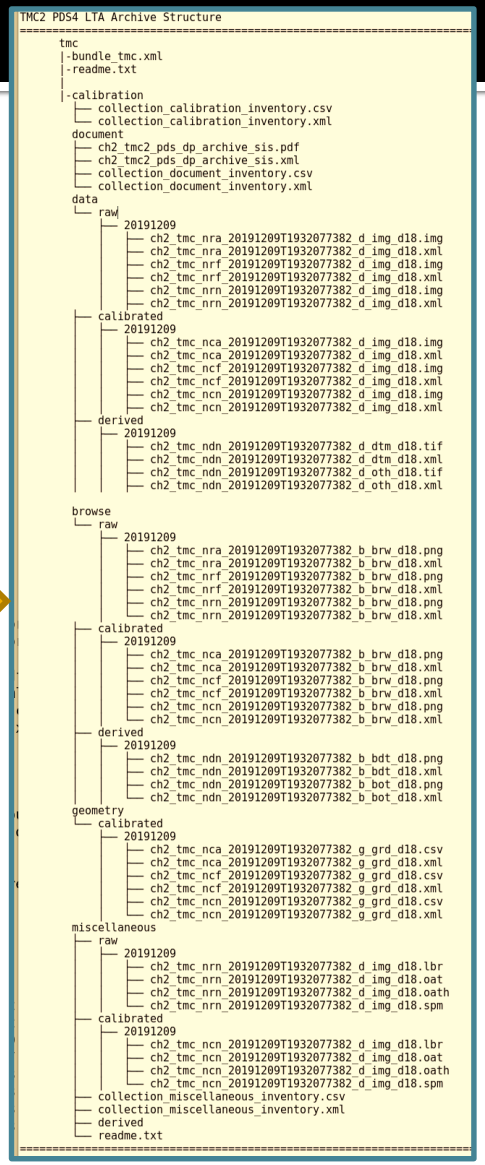
- This phase comes once instrument lock-in period is over.
- In this phase long term archive preparation was done by taking active archive as input and other PDS4 components - calibration, document, context, miscellaneous and xml_schema will get assembled with active archive.
- Once long term archives are ready for validation and verification, peer review process will be carried out. Once the data peer review is done, the data sets will be released to the scientific community by hosting map based web browse application from ISSDC.
- At ISSDC, archive is maintained via periodic refreshes, addition of new/updated data products.

Payload	Release based Imaging Seasons	Date Released to Public	Products	Number of Data Products
TMC2	1,2,3 and 4	Nov. 2020, Oct.2021,Feb.2022	Raw, Calibrated and Derived (DTM & Ortho)	287
IIRS	1 and 2	Aug. 2021, Feb. 2022	Raw and Calibrated	183
OHRC	1,2,3,4	Dec. 2020, Jul. 2021, Feb. 2022, April 2022	Raw and Calibrated	42

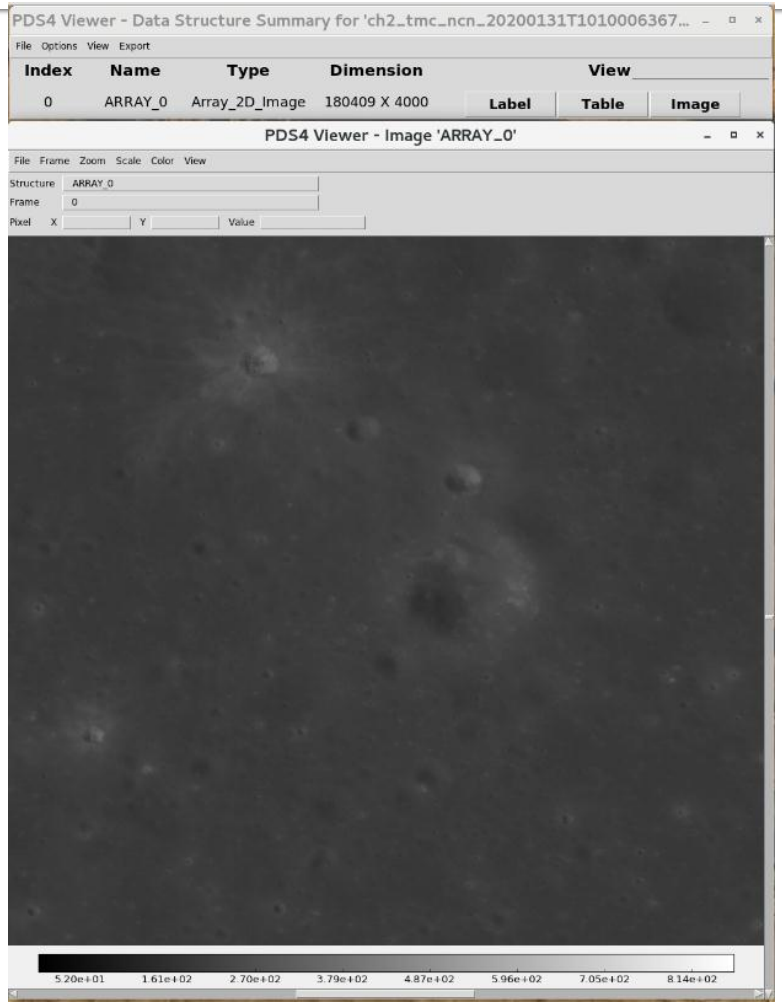
https://pradan.issdc.gov.in/ch2/

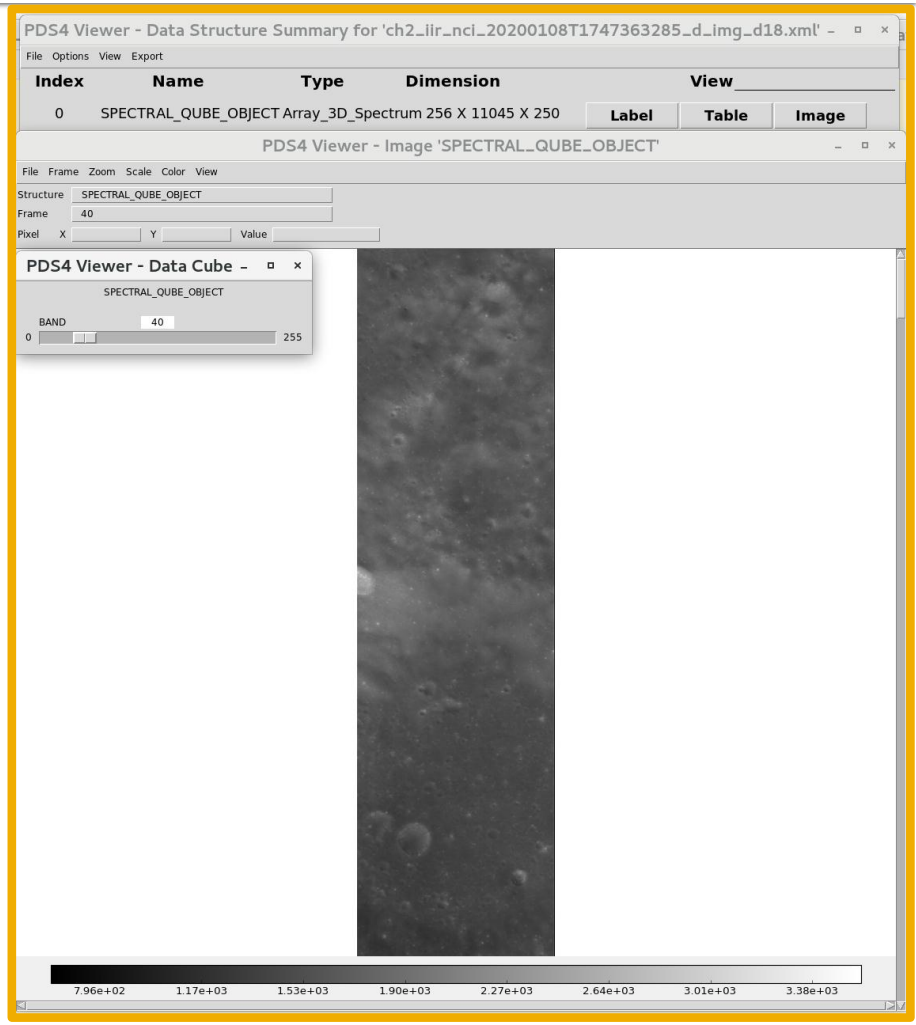
Instrument Collection & Data Products





Science Data Products





Indian Space Science Data Centre @Bengaluru, India

- Developed and established ISRO Science Data Archive (ISDA) at Indian Space Science Data Centre (ISSDC) Bangalore.
- ISDA is the central repository for all scientific and engineering data acquired by different ISRO's planetary missions.
- All ISDA data are compliant with Planetary Data System (PDS) Standards.
- ISDA has adopted PDS4 for ISRO's upcoming and future planetary missions.

THANKS