

# New Horizons LORRI KEM2 Data Sets

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PDS-SBN Review

Jan. 22, 2024

# Datasets consist of both raw and calibrated LORRI images and calibration files

- Raw dataset contained in directory:
  - nh-a-lorri-2-kem2-v1.0
- Calibrated dataset contained in directory:
  - nh-a-lorri-3-kem2-v1.0

# Part 1: Review of raw dataset nh-a-lorri-2-kem2-v1.0

- The directory includes the following:
  - “calib” directory
  - “catalog” directory
  - “data” directory
  - “document” directory
  - “index” directory
  - “aareadme.txt” ascii text file
  - “voldesc.cat” ascii text file
- Follows PDS3 directory tree naming convention

# Part 1a: Verifying the ASCII files in nh-a-lorri-2-kem2-v1.0

- aareadme.txt
- voldesc.cat
  - PDS3 catalog file

One possible issue found:

- Line 124: “The AAREADME file; a backup is in /DOCUMENT/”.
- I did not find a aareadme.txt in the document directory, or I may be misinterpreting this line.

No issues

# Part 1b: Verifying the contents of nh-a-lorri-2-kem2-v1.0/calib

- calinfo.txt

No issues

- superseded directory
  - All .fit files opened with DS9.
  - All .fit files had respective .lbl file
  - All .fit files successfully read into astropy as HDU objects
  - All .lbl files opened as ASCII text files

No issues

# Part 1b: Verifying the contents of nh-a-lorri-2-kem2-v1.0/calib

- .fit files contained in directory
  - All files opened with DS9.
  - All files had respective .lbl file
  - All files successfully read into astropy as HDU objects

```
cflat_grnd_4x4_synthetic_v2.fit  
cflat_grnd_sfa_20050309_v2.fit  
dead_ground_1x1_synthetic.fit  
dead_ground_4x4_synthetic.fit  
delta_bias_4x4_synthetic.fit  
dsmear_ematrix_1024.fit  
dsmear_ematrix_256.fit  
hot_ground_1x1_synthetic.fit  
hot_ground_4x4_synthetic.fit  
sap_006_combined_100img_1x1.fit
```

No issues

# Part 1b: Verifying the contents of nh-a-lorri-2-kem2-v1.0/calib

- .lbl files contained in directory
  - All .lbl files opened as ASCII text files

No issues

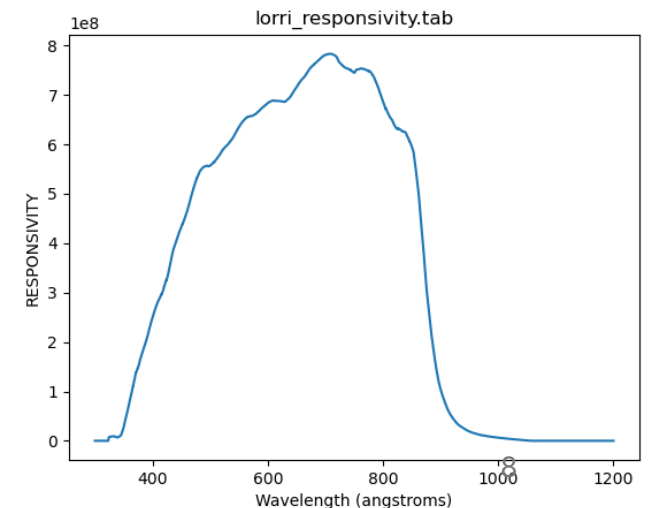
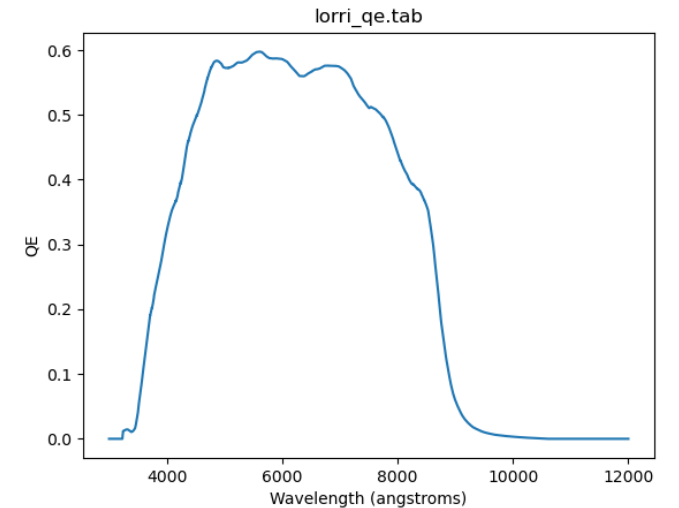
cflat\_grnd\_4x4\_synthetic\_v2.lbl  
cflat\_grnd\_sfa\_20050309\_v2.lbl  
dead\_ground\_1x1\_synthetic.lbl  
dead\_ground\_4x4\_synthetic.lbl  
delta\_bias\_4x4\_synthetic.lbl  
dsmear\_ematrix\_1024.lbl  
dsmear\_ematrix\_256.lbl  
hot\_ground\_1x1\_synthetic.lbl  
hot\_ground\_4x4\_synthetic.lbl  
lorri\_qe.lbl  
lorri\_responsivity.lbl  
sap\_006\_combined\_100img\_1x1.lbl

# Part 1b: Verifying the contents of nh-a-lorri-2-kem2-v1.0/calib

- .tab files contained in directory
  - All .tab files opened as ASCII text files
  - All .tab were imported as astropy Table objects and plotted successfully.
  - No issues with associated .lbl files
  - Plots similar to soc\_inst\_icd.pdf page 48.

No issues

lorri\_qe.tab  
lorri\_responsivity.tab





# Part 1c: Verifying the contents of nh-a-lorri-2-kem2-v1.0/catalog

- catinfo.txt

No issues

- .cat files contained in directory

- dataset.cat
- lorri.cat
- nh\_kem.cat
- nh\_kem2.cat
- nhsc.cat
- ref.cat

No issues

# Part 1d: Review of raw dataset nh-a-lorri-2-kem2-v1.0/data

- The directory includes the following:
  - “20190101\_040861” directory
  - “20190101\_040862” directory
- Follows PDS3 directory naming convention as specified in aareadme.txt

# Part 1d: Review of raw dataset

## nh-a-lorri-2-kem2-v1.0/data/20190101\_040861

- .fit files contained in directory
  - All files opened with DS9.
  - All files had respective .lbl file
  - All files successfully read into astropy as HDU objects

```
lor_0408617170_0x630_eng.fit  
lor_0408617171_0x630_eng.fit  
lor_0408617244_0x630_eng.fit  
lor_0408617245_0x630_eng.fit
```

# Part 1d: Review of raw dataset nh-a-lorri-2-kem2-v1.0/data/20190101\_040861

- Questions about .fit files contained in directory
  - Is the FITS file extension explained by SOC ICD page 36, Table 9-1?

*Table 9-1: Level 1 FITS file extension layout (ApID => Packet Application ID)*

FITS File Storage Location	Description
Primary HDU	Reconstructed image from telemetry
First Extension	histogram from image descriptor packet (ApID 0x611)
Second Extension	Instrument housekeeping from first 34 pixels
Third Extension	Matching image descriptor

vs. what the FITS data HDU structure is?

Filename: lor\_0408617170\_0x630\_eng.fit

No.	Name	Ver	Type	Cards	Dimensions	Format
0	PRIMARY	1	PrimaryHDU	353	(1028, 1024)	int16
1	HISTOGRAM	1	ImageHDU	9	(32,)	int32 (rescales to uint32)
2	IMAGE HEADER	1	ImageHDU	7	(51,)	uint8
3	IMAGE DESCRIPTOR	1	ImageHDU	7	(174,)	uint8
4	WINDOW_MISMATCHES	1	BinTableHDU	29	5R x 10C	[J, J, J, J, J, J, J, 5A, E, 20A]

# Part 1d: Review of raw dataset nh-a-lorri-2-kem2-v1.0/data/20190101\_040861

- Questions about .fit files contained in directory
- UT of the image start: 2019-001T02:54:12.053
  - Should the RA and DEC from FITS WCS match with JPL Horizons?
  - 18:19:44.26 -22:18:57.9      From FITS images in DS9
  - 06:41:39.66 +21:12:19.2      From Horizons 500@-98 [NH spacecraft]
  - 19:08:37.68 -20:34:42.4      From Horizons 500 (@earth)

I assume the FITS WCS is correct, but wanted to double check where the info for interpreting them is.

# Part 1d: Review of raw dataset

## nh-a-lorri-2-kem2-v1.0/data/20190101\_040861

- .lbl files contained in directory
  - All .lbl files opened as ASCII text files

lor\_0408617170\_0x630\_eng.lbl  
lor\_0408617171\_0x630\_eng.lbl  
lor\_0408617244\_0x630\_eng.lbl  
lor\_0408617245\_0x630\_eng.lbl

No issues

# Part 1d: Review of raw dataset nh-a-lorri-2-kem2-v1.0/data/20190101\_040862

- .fit files contained in directory
  - All files opened with DS9.
  - All files had respective .lbl file
  - All files successfully read into astropy as HDU objects

Same potential issues:  
HDU and WCS questions

```
lor_0408626249_0x636_eng.fit  
lor_0408626250_0x636_eng.fit  
lor_0408626251_0x636_eng.fit  
lor_0408626252_0x636_eng.fit  
lor_0408626253_0x636_eng.fit  
lor_0408626254_0x636_eng.fit  
lor_0408626255_0x636_eng.fit  
lor_0408626256_0x636_eng.fit  
lor_0408626263_0x636_eng.fit  
lor_0408626395_0x636_eng.fit  
lor_0408626396_0x636_eng.fit  
lor_0408626397_0x636_eng.fit  
lor_0408626398_0x636_eng.fit
```

# Part 1d: Review of raw dataset

## nh-a-lorri-2-kem2-v1.0/data/20190101\_040862

- .lbl files contained in directory
  - All .lbl files opened as ASCII text files

No issues

lor\_0408626249\_0x636\_eng.lbl  
lor\_0408626250\_0x636\_eng.lbl  
lor\_0408626251\_0x636\_eng.lbl  
lor\_0408626252\_0x636\_eng.lbl  
lor\_0408626253\_0x636\_eng.lbl  
lor\_0408626254\_0x636\_eng.lbl  
lor\_0408626255\_0x636\_eng.lbl  
lor\_0408626256\_0x636\_eng.lbl  
lor\_0408626263\_0x636\_eng.lbl  
lor\_0408626395\_0x636\_eng.lbl  
lor\_0408626396\_0x636\_eng.lbl  
lor\_0408626397\_0x636\_eng.lbl  
lor\_0408626398\_0x636\_eng.lbl



# Part 1e: Review of raw dataset nh-a-lorri-2-kem2-v1.0/document

- All files opened in the directory.

Potential issue: is a copy of aareadme.txt supposed to be in this directory.

# Part 1f: Review of raw dataset nh-a-lorri-2-kem2-v1.0/index

- All files opened in the directory.

No issues

# Part 2: Review of calibrated dataset nh-a-lorri-3-kem2-v1.0

- The potential issues for the calibrated dataset are the same as with the raw. Potentially some issues or potentially none.