New Horizons LEISA Pluto Cruise

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LEISA

The LEISA detector is a 1.2 to 2.5 micrometer HgCdTe PICNIC array, supplied by Rockwell Scientific Corporation of Camarillo CA. The array is a 256x256 pixel array and each pixel is 40x40 micrometers^2 in area.

LEISA forms a spectral map by scanning the FOV across the surface in a push broom fashion. The image cube is recorded as a series of N image frames, with N determined by the length of the scan multiplied by the frame rate. Detector frame rate is adjustable between 0.25 and 8 Hz in 1 ms steps. Each frame covers the complete range of wavelengths. LEISA is normally operated in a scanning mode, with the target moving through the image plane, row by row. Slicing the image cube along one row gives a scanned image of the target in one wavelength. Co-registering each wavelength image (removing motion and optical distortion) yields an IR spectrum of the target.
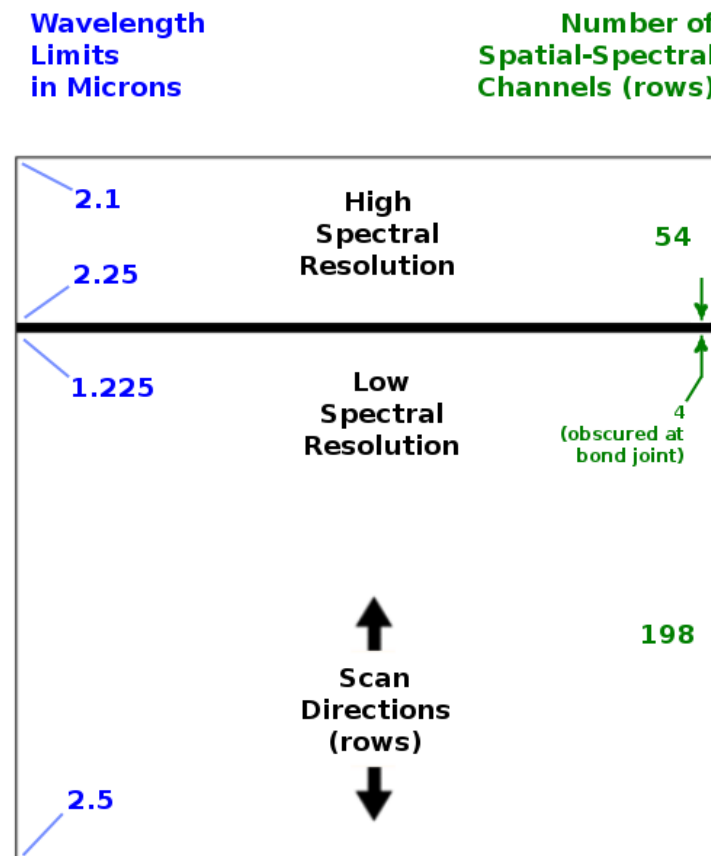
Figure 8-1:Layout for LVF Filter Assembly

Data sets

- NH–X–LEISA–2–PLUTOCRUISE–V1.0–>New Horizons LEISA Pluto Cruise Raw Data

- NH–X–LEISA–3–PLUTOCRUISE–V1.0–>New Horizons LEISA Pluto Cruise Calibrated Data

Data sets

Flight data obtained during the pluto cruise mission phase of the New Horizons mission, taken by the Linear Etalon Imaging Spectral Array instrument of the New Horizons spacecraft.

Short name	Start(1,3)	Stop(2,3)	Full MISSION_PHASE_NAME, plus optional Description
PLUTOCRUISE	2007-06-27	2014-12-31	PLUTO CRUISE, Jupiter-Pluto/Charon Interplanetary Cruise

Pluto Cruise:

    Short phase name (in DSID): PLUTOCRUISE

    Formal mission phase name: PLUTO CRUISE

    Mission Phase Start Time - 2007-06-27

    Mission Phase Stop Time - 2014-12-31

    Activities during the approximately 8-year PLUTOCRUISE mission phase

to Pluto include annual spacecraft and instrument checkouts (ACOs),

trajectory corrections, instrument calibrations and Pluto encounter

rehearsals.

Additional Data Files with respect to January 2014 PDS review

20110607_016975 Functional Test EARTH

20120518_019968 Functional Test EARTH

20120601_020088 LEISA Stellar Calibration RADEC=279.23,38.78=Vega20130622_023420

20130622_023420 Functional Test EARTH

20130710_023575 Rehearsal of Pluto encounter 2013 EARTH

20130710_023578 Rehearsal of Pluto encounter 2013 EARTH

20130712_023592 Rehearsal of Pluto encounter 2013 EARTH

20130712_023593 Rehearsal of Pluto encounter 2013 EARTH

20140629_026635 Functional Test EARTH

20140719_026804 LEISA Stellar Calibration with Arcturus RADEC=213.92,19.18

20140719_026805 LEISA Stellar Calibration with Arcturus RADEC=213.92,19.18

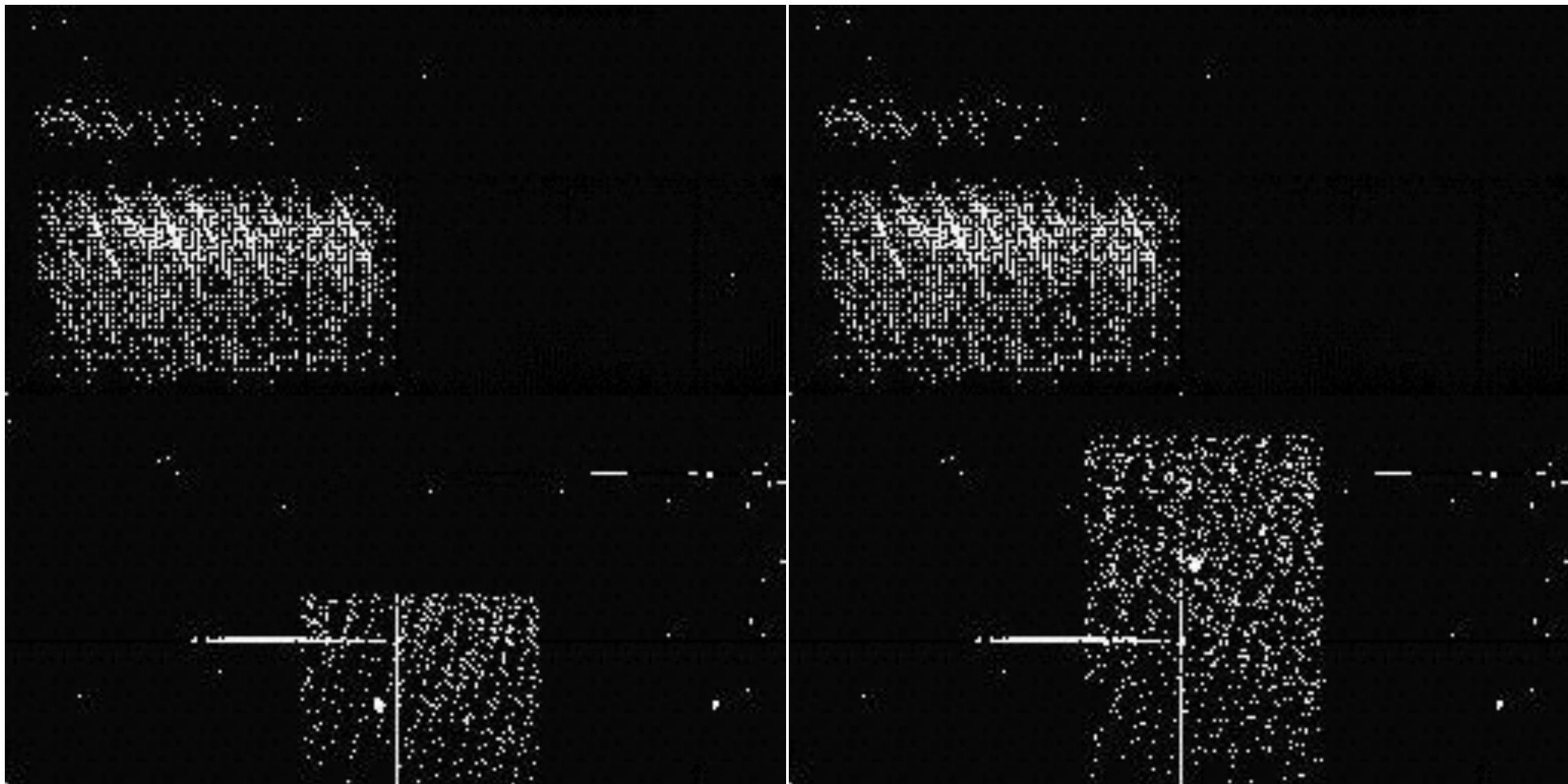20140720_026814 LEISA test of scan for flat field at Pluto RADEC=270.65,−14.55=P5

I think it would be good in dataset.cat to mention e.g., what is Rehearsal of Pluto encounter
or Functional Test

Data Analysis: Vega

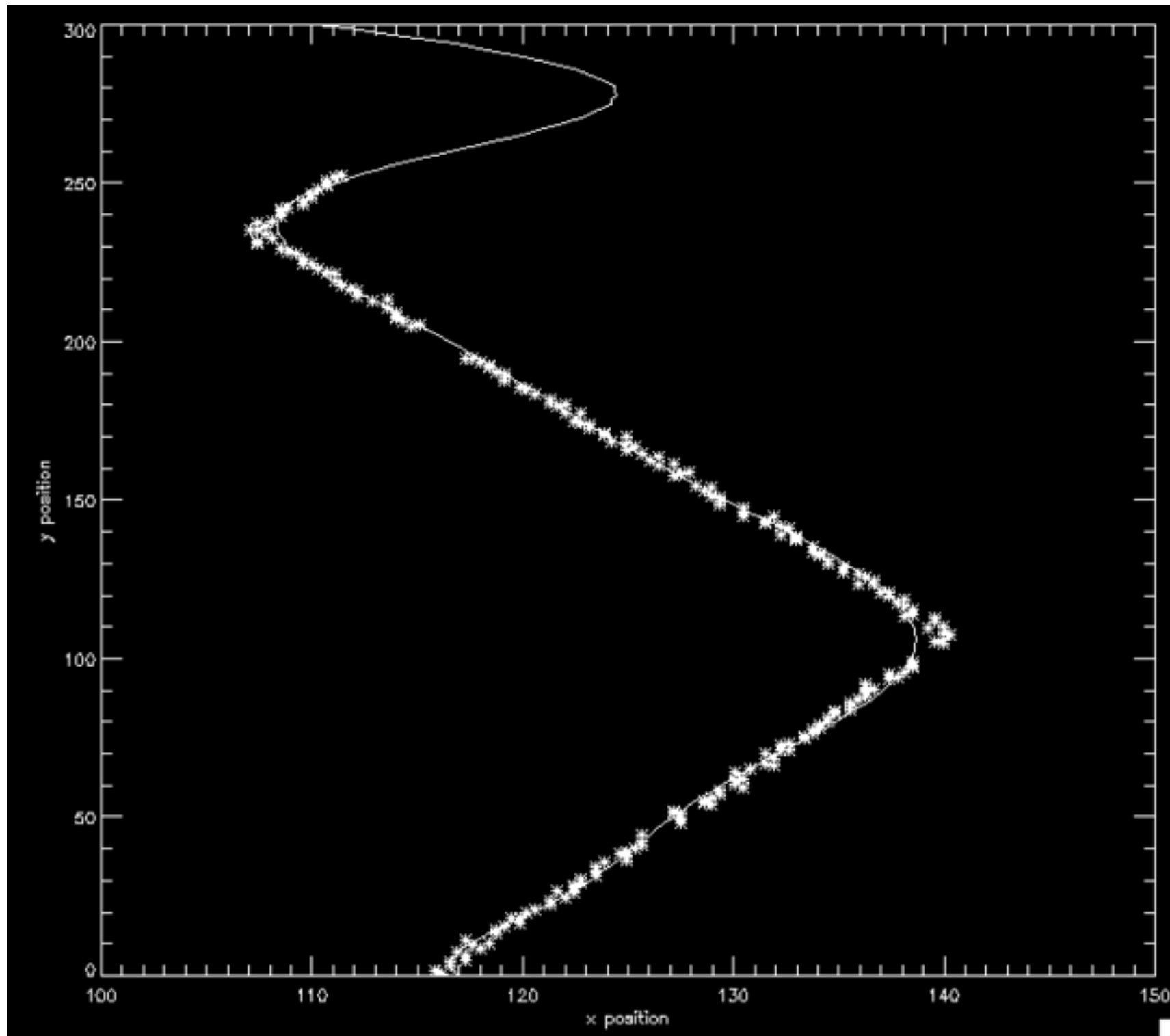nh-x-leisa-3-plutocruise-v1.0/data/20081018_008661/lsb_0086619718_0x53c_sci_1.fit'
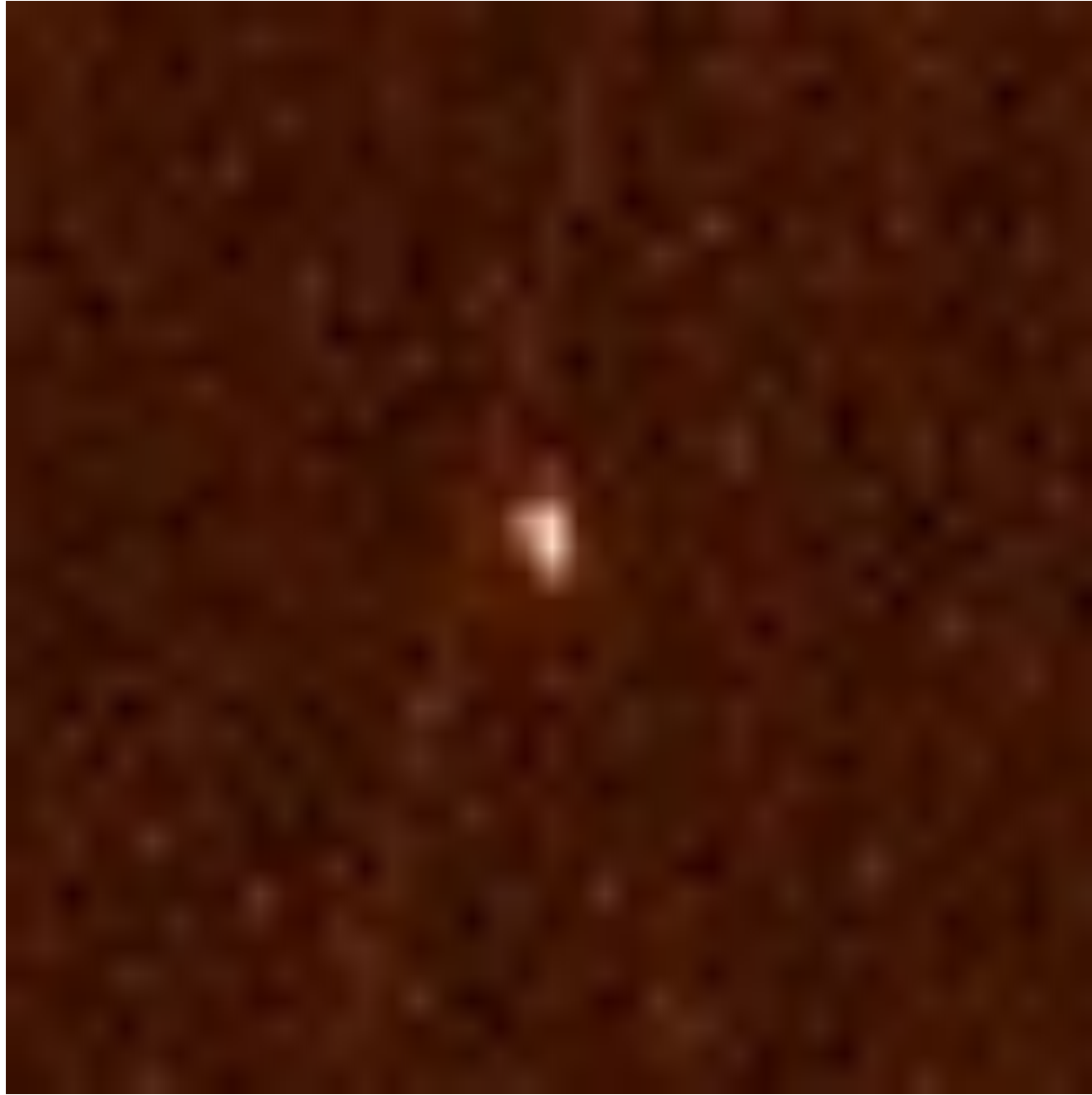
channel 55

channel 101

Data Analysis: Vega

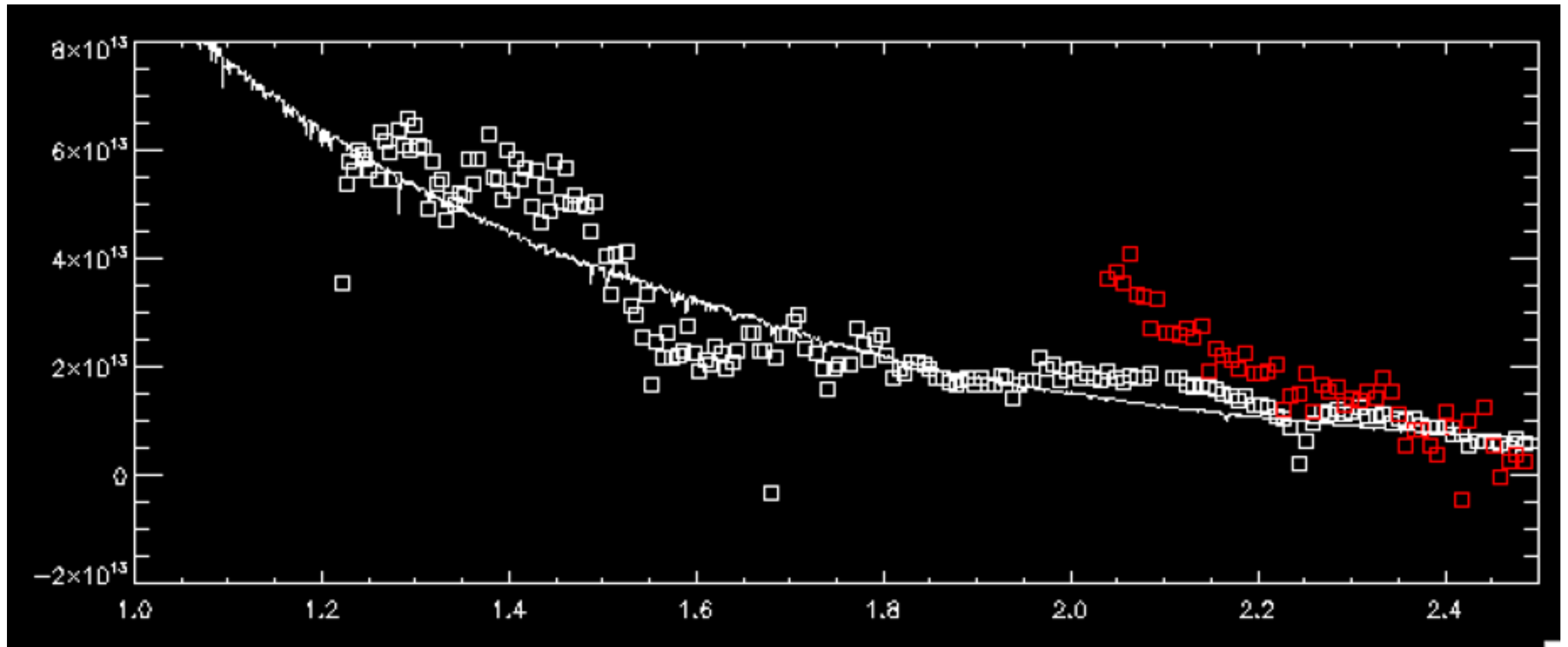Array of x and y positions of the object as it slides through the scene.

Data Analysis: Vega

Co-registering each wavelength image (removing motion and optical distortion) yields an IR spectrum of the target.

Data cube, wavelength channel 66

Data Analysis: Vega

Note: I could not find the units in the header or label

Typos/Missing references

nh-x-leisa-2-plutocruise-v1.0/catalog/nh.cat

- Closing In: Pluto

    The cameras on New Horizons will start taking data on Pluto and
    Charon months before the spacecraft arrives. Pluto and Charon will
    first appear as unresolved bright dots, but the planet and its moon
    appear larger as the encounter date approaches. About three months
    from the closest approach — when Pluto and Charon are about 105
    million kilometers away — the cameras on the spacecraft can make the
    first maps. For those three months, the mission team will take
    pictures and spectral measurements.

    Pluto and Charon each rotate once every 6.4 Earth days. For the last
    two Pluto days before encounter *(11 to 12 Earth days)*, the team will
    compile maps and gather spectral measurements of Pluto and Charon
    every half-day. The team can then compare these maps to check
    changes over a Pluto day, at a scale of about 48 kilometers, as
    might be caused by new snows or other weather.

    should it be *12 to 13 Earth days* ?

Typos/Missing references

nh-x-leisa-2-plutocruise-v1.0/catalog/leisa.cat

- The LEISA description was **was** adapted from Reuter et al. (2007)
  [REUTERETAL2007], Reuter et al. (2005) [REUTERETAL2005] and the
  New Horizons website.
  Remove one ``was''

- **hase-angle-dependent** spectral maps of Pluto and Charon
  Missing ``P''

- Calibration
  ========

  See Reuter et al. (2007) sections 5 &

  Operational Considerations
  ========

  Missing text after ``&''

- The array readout is performed in Read/Reset pairs. The accumulated charge is
  read, then the CCD is reset and read immeadiately. After the integration time
  has expired, the readout cycle is repeated. The difference between the Read
  value and the previous Reset value is the charge accumulated durring the
  integration time. LEISA has two recording modes. In the Subtracted mode the
  Reset value is subtracted from the Read value and the result is recorded. In
  the Raw mode the Read and Reset values are both recorded.

  Spelling error ``immeadiately'' and ``durring''

- Operational Considerations
  ========

  LEISA images a scene through a wedged filter (linear variable filter,
  Rosenberg et al., 1994)

  Rosenberg et al., 1994 not listed in ref.cat

Typos/Missing references

nh-x-leisa-2-plutocruise-v1.0/aareadme.txt

- The RALPH instrument and payload overview SSR papers, I.E.

  Reuter, D. C., et al., 2008 [REUTERETAL2008]

  Reuteretal2008 is not listed in ref.cat

- Calibrated data are in scientific or engineering units, such as
    radiance (W/(m**2 um sr)) or impact particle mass (GRAMs). The
    conversion to calibrated data from raw data was performed according
    to an instrument performance model, which was developed from
    scientific analysis of ground- and inflight-calibrations, and which
    is documented in files in this data set under the DOCUMENT/ and
    CALIB/ subdirectories. Refer to **to** DOCUMENT/DOCINFO.TXT and
    CALIB/CALINFO.TXT for pointers to more information.

  Remove one of the two ``to''

- Data are provided in FITS format with detached PDS labels; the FITS
    files are the same as those generated by the NH Project data
      processing pipeline and used by the **by** NH instrument teams. Users

  Remove ``by''

Open Questions

- Q1 Are MET and SCRMET the same?

In nh-x-leisa-2-plutocruise-v1.0/aareadme.txt

```
Data Filenames and Product IDs
==============================

The filenames of data files and the Product IDs of observations adhere
to a common convention e.g.

        ALI_0123456789_0X0AB_ENG_1.FIT

            0123456789 is defined as Spacecraft Receipt Mission
        Elapsed Time (SCRMET)
```

In nh-x-leisa-2-plutocruise-v1.0/catalog/dataset.cat

```
Filename/Product IDs
      --------------------

        The filenames and product IDs of observations adhere to a
        common convention e.g.

        ALI_0123456789_0X0AB_ENG_1.FIT

        0123456789 is MET (Mission Event Time) i.e. Spacecraft Clock
```

Open Questions

• Q2 Is dataset.cat compatible with seq_leisa_plutocruise.tab?

In nh-x-leisa-2-plutocruise-v1.0/catalog/dataset.cat

The spacecraft was in hibernation for much of the Pluto Cruise mission phase, and the focus for RALPH (MVIC and LEISA) during Annual CheckOuts one through four (ACO1-4) was preparation for the Pluto Encounter in 2015, including functional tests, and calibrations. Science observations performed by MVIC during this phase included Uranus and Neptune at phase angles not available from Earth (MVIC), calibrations with Neptune as a navigation test target (MVIC), Sun in the SIA (MVIC and LEISA), Vega (LEISA), the M6 and M7 clusters (MVIC), and other calibrations (stray light, dark, interference with other instruments).

1. SIA not defined

2. In nh-x-leisa-2-plutocruise-v1.0/document/seq_leisa_plutocruise.tab I find a sequence "LEISA Stellar Calibration with Arcturus'' which is not empty. Indeed,

Open Questions

Label of example data file:

```
MISSION_NAME          = "NEW HORIZONS"

DATA_SET_ID           = "NH-X-LEISA-2-PLUTOCRUISE-V1.0"

PRODUCT_ID            = "LSB_0268046518_0X53C_ENG_1"

PRODUCER_INSTITUTION_NAME = "SOUTHWEST RESEARCH INSTITUTE"

PRODUCT_TYPE          = "EDR"

MISSION_PHASE_NAME    = "PLUTO CRUISE"

NEWHORIZONS:SEQUENCE_ID = "

  14169:A8LE021B_02_FUNCTIONALRAWDATA"

NEWHORIZONS:OBSERVATION_DESC  = "

  LEISA STELLAR CALIBRATION WITH ARCTURUS

"

TARGET_NAME           = "CALIBRATION"
```

Why sometimes   TARGET_NAME   = "CALIBRATION" and others as in the case of Vega
is set to TARGET_NAME   = "STAR" ?

I know that in datset.cat there is a paragraph called ``Caveat about TARGET_NAME in PDS
labels and observational intent''. My question is whether ARCTURUS should be listed as
calibration target as Vega or not.

Where is the target?

I could not find Vega in

nh-x-leisa-3-plutocruise-v1.0/data/20120601_020088/*.fit