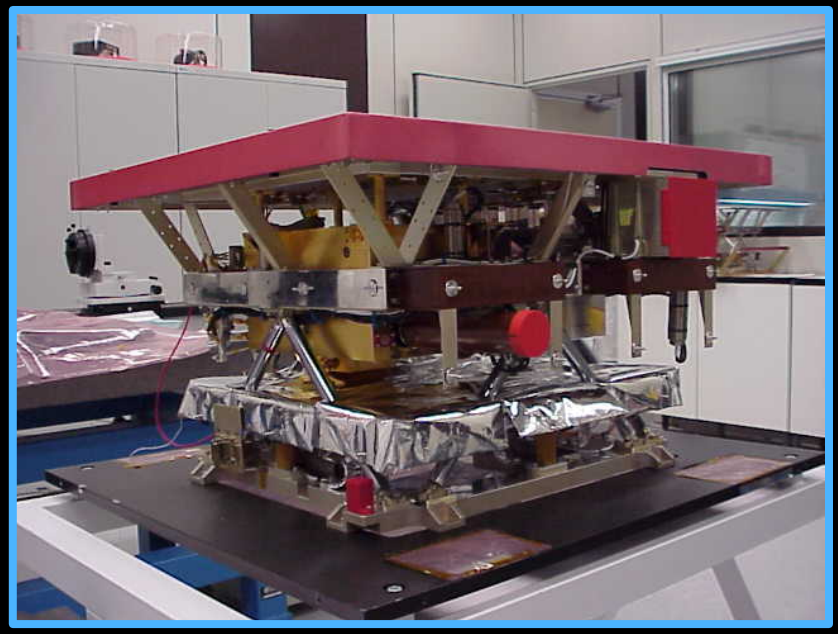
VIRTIS Status

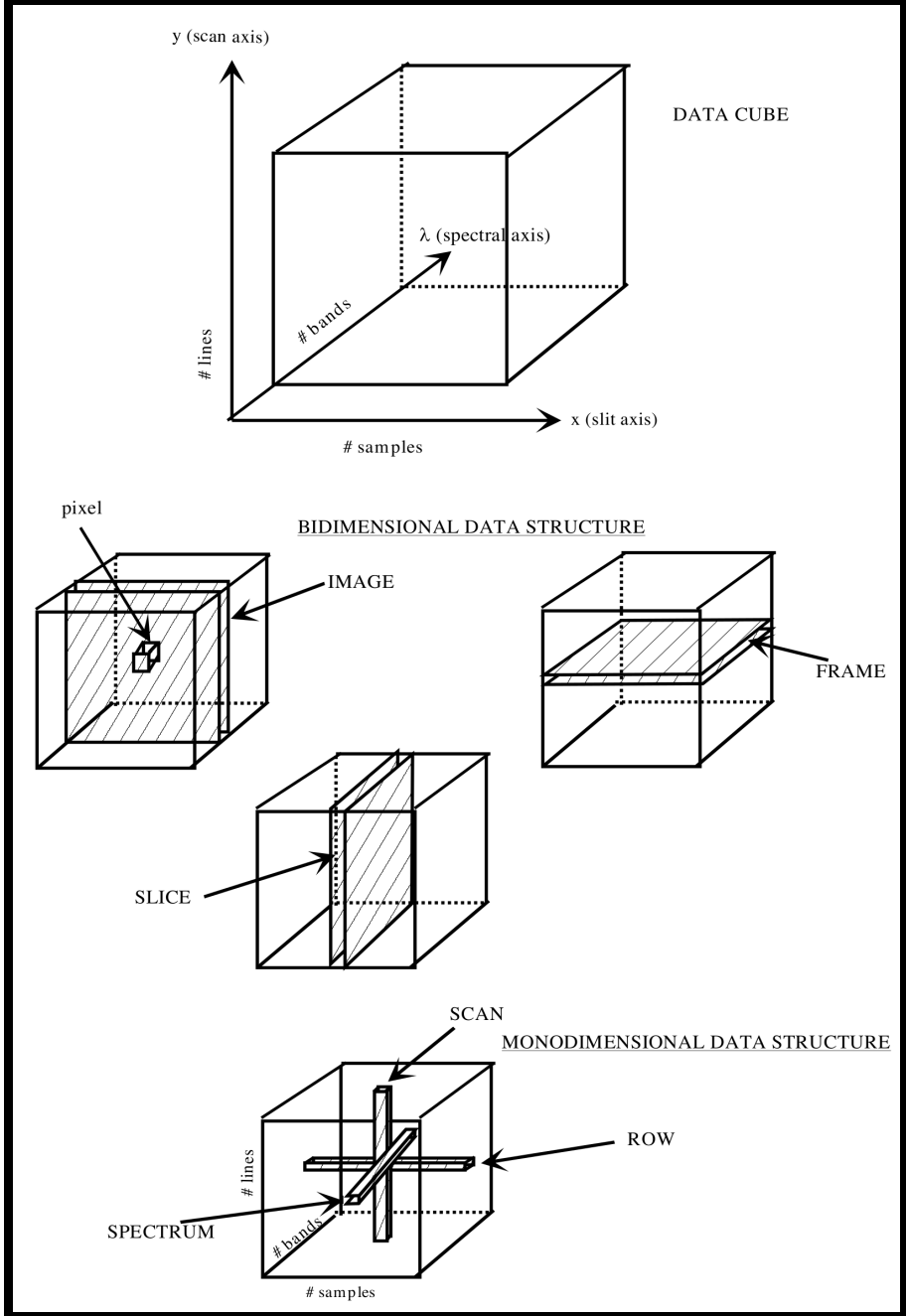


Fabrizio Capaccioni on behalf of the VIRTIS Science Team

Rosetta Science Working Team Meeting #48

ESAC – Madrid 6-10 November 2017

VIRTIS Data Storage



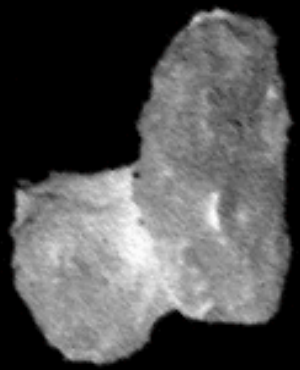
The data area, a Qube, is composed by a 3-dimension matrix containing science measurements (the core) and a sideplane containing the housekeeping.

Data generated during a sub-session (Start Science TC – Stop Science TD) by each of the three focal planes (VIS, IR and H) are always stored in separate PDS-formatted files.

For each channel, raw science data and dark frames are stored in the same file, interleaved in the Qube core, in the order in which they are transmitted.

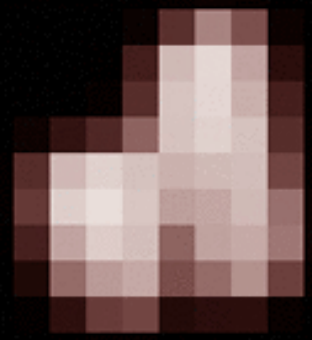
Each frame of the Qube core corresponds to a frame in the sideplane containing the HK parameters acquired at the corresponding time.

Operation of a Hyperspectral Imager

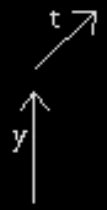


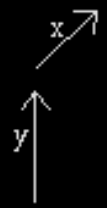
Target Object

Slit Position



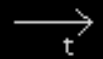
Object through slit



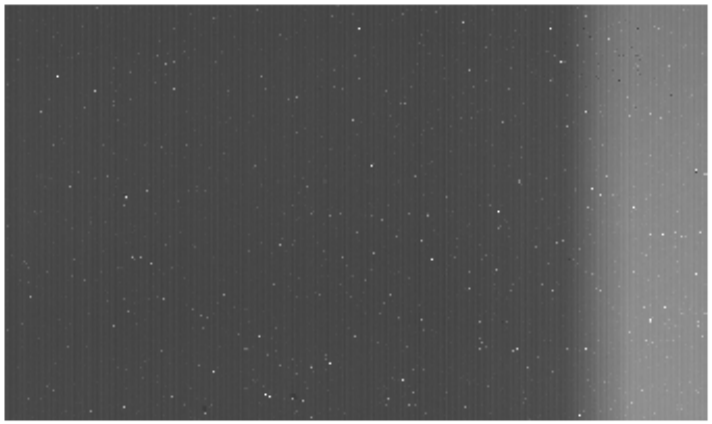


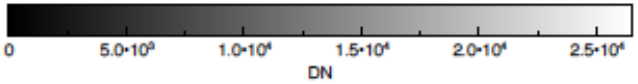
xyplane / individual spectrum

image cube 

image cube rotated
so that ytplane faces front 

data storage for -M channel





dark frame

acquisition frame →

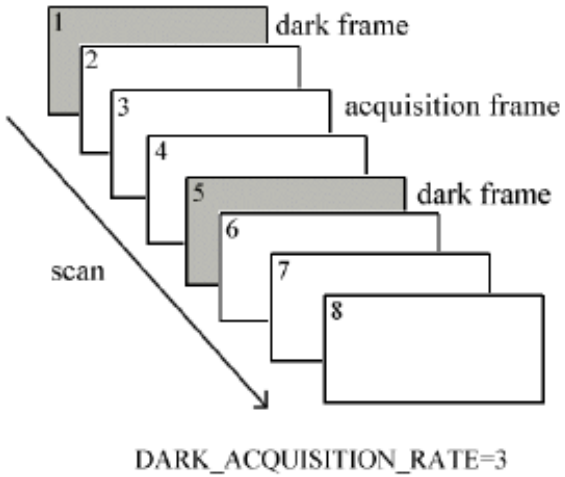
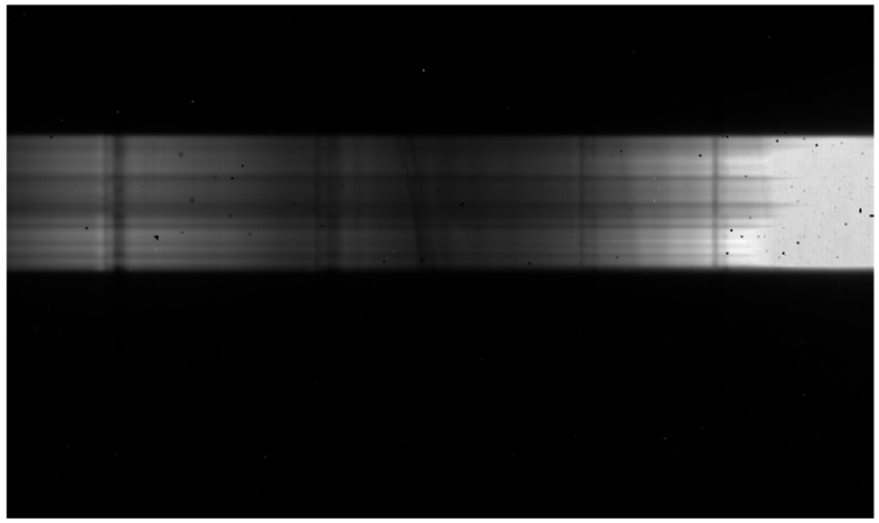
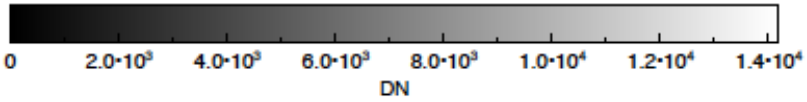
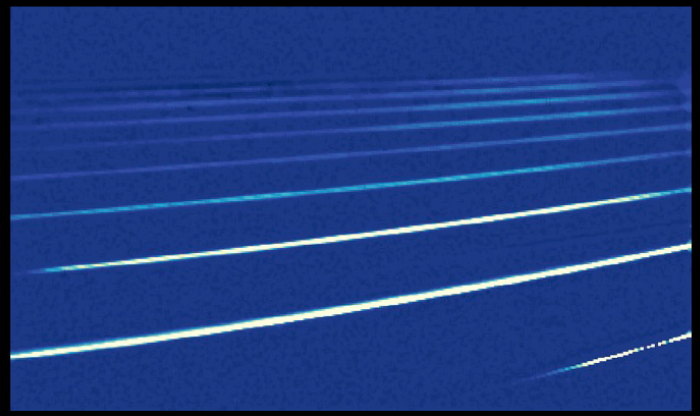


Fig. 4.2 – Structure of dark frames acquisition





Virtis-H detector

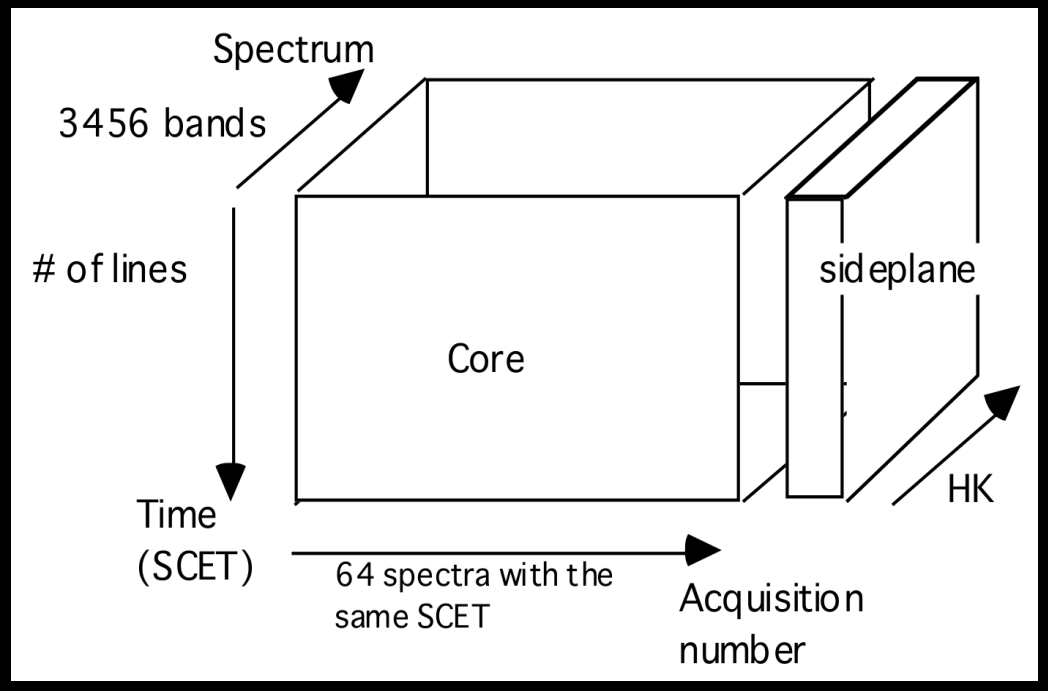


VIRTIS-H Data Storage

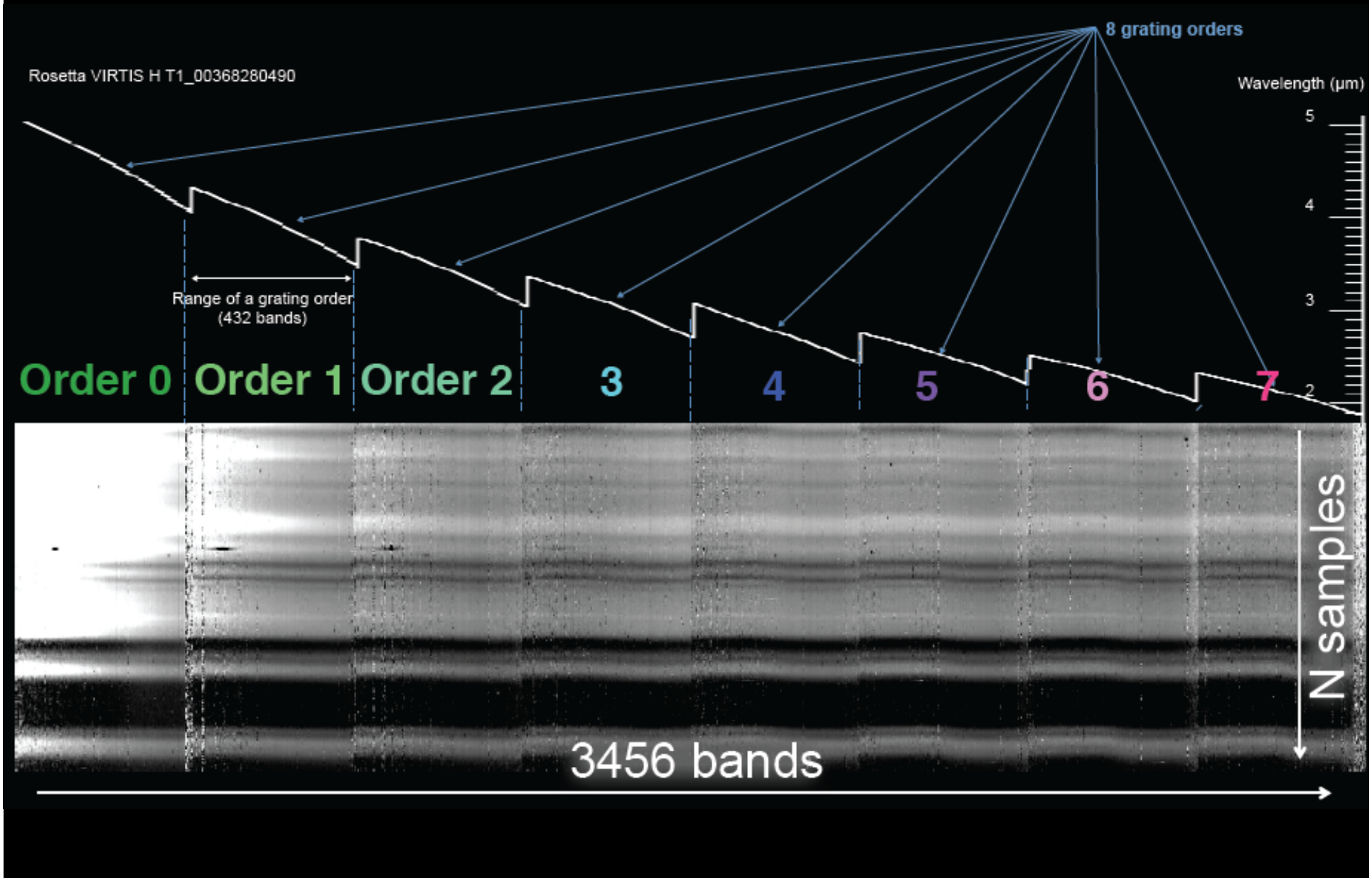
Data measurements are grouped as sets of 64 spectra and transferred as "64-spectra slice", interleaved with dark measurements transferred as "spectrum". Two files are written together:

- a science Qube, the core of which contains the measured spectra grouped in sets of 64 (3456 X 64 X sequence length).
- A dark Qube, the core of which contains the dark spectra (3456 X 1 X number of dark spectra). The number of dark measurements associated to one "spectral slice" depends on operational parameters.

The sideplane of each qube contains the corresponding housekeeping parameters.



Building an H Data Qube



Instrument known issues

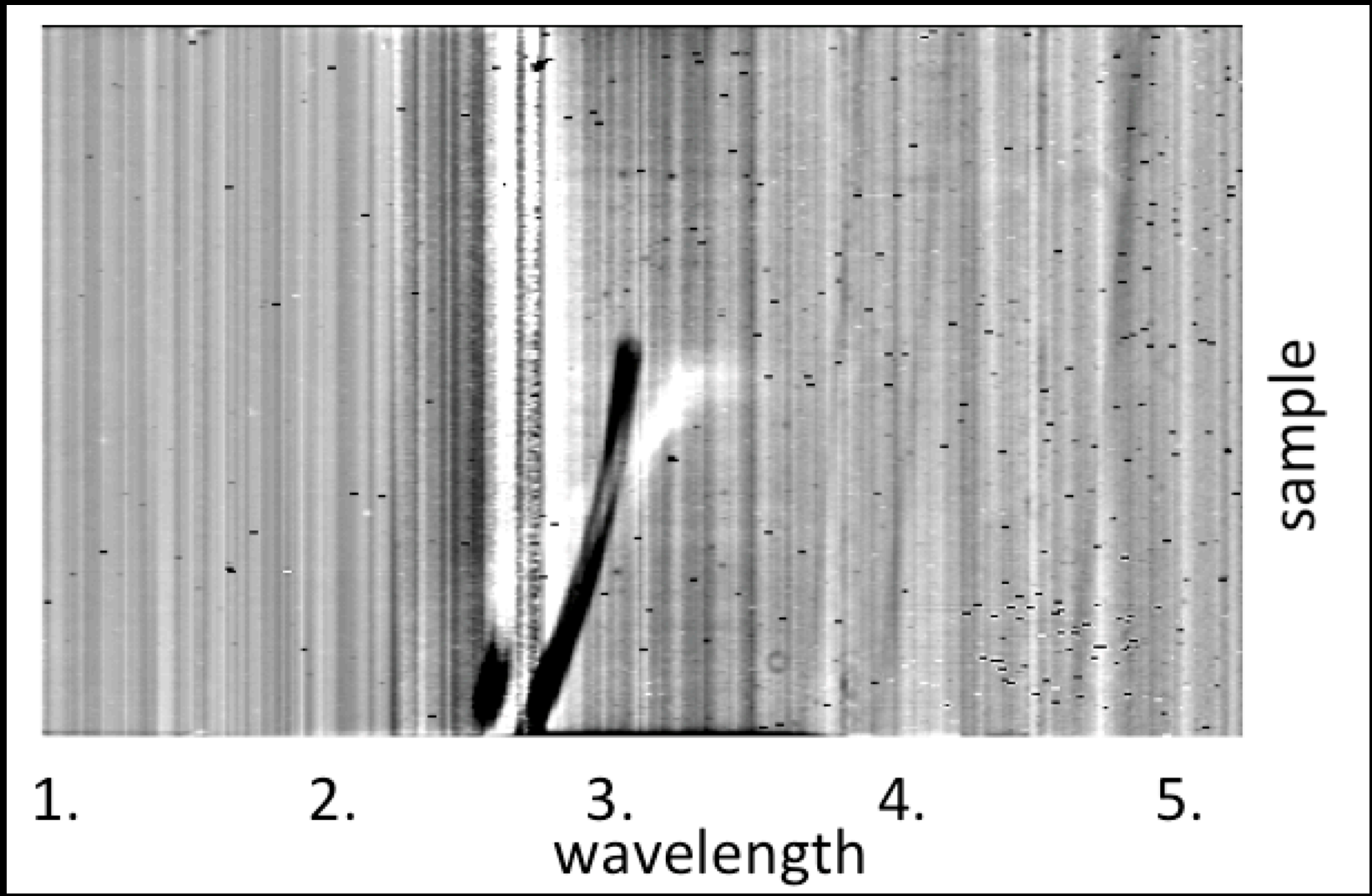
The instrument is the first of its generation (also onboard Venus Express and Dawn) and thus shows several issues which were mostly resolved before launch in the later models

VIRTIS-M

- Misalignment between grating grooves and CCD columns
- Higher diffraction order filters on top of the IR detector >> spurious signal at junctions
- Filters damage at junction
- Odd/Even effect

Instrument known issues

VIRTIS-M Transfer Function Matrix (includes flat field)



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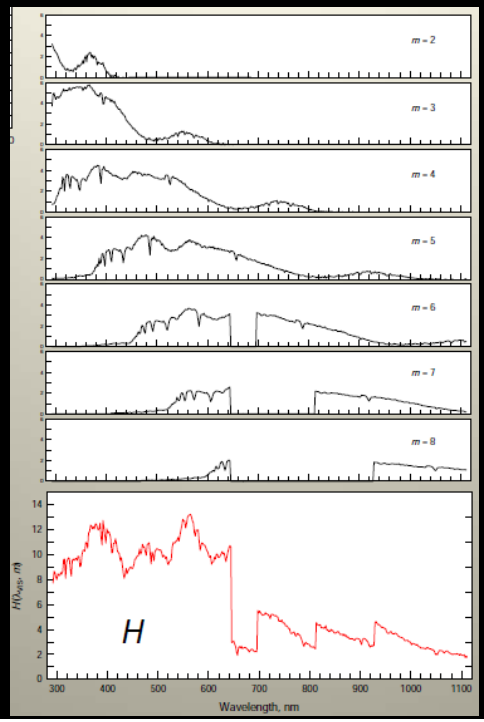
- Odd/Even effect
- Contamination of VIS signal due to IR grating



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- Contamination of VIS signal due to IR grating
- Stray-light

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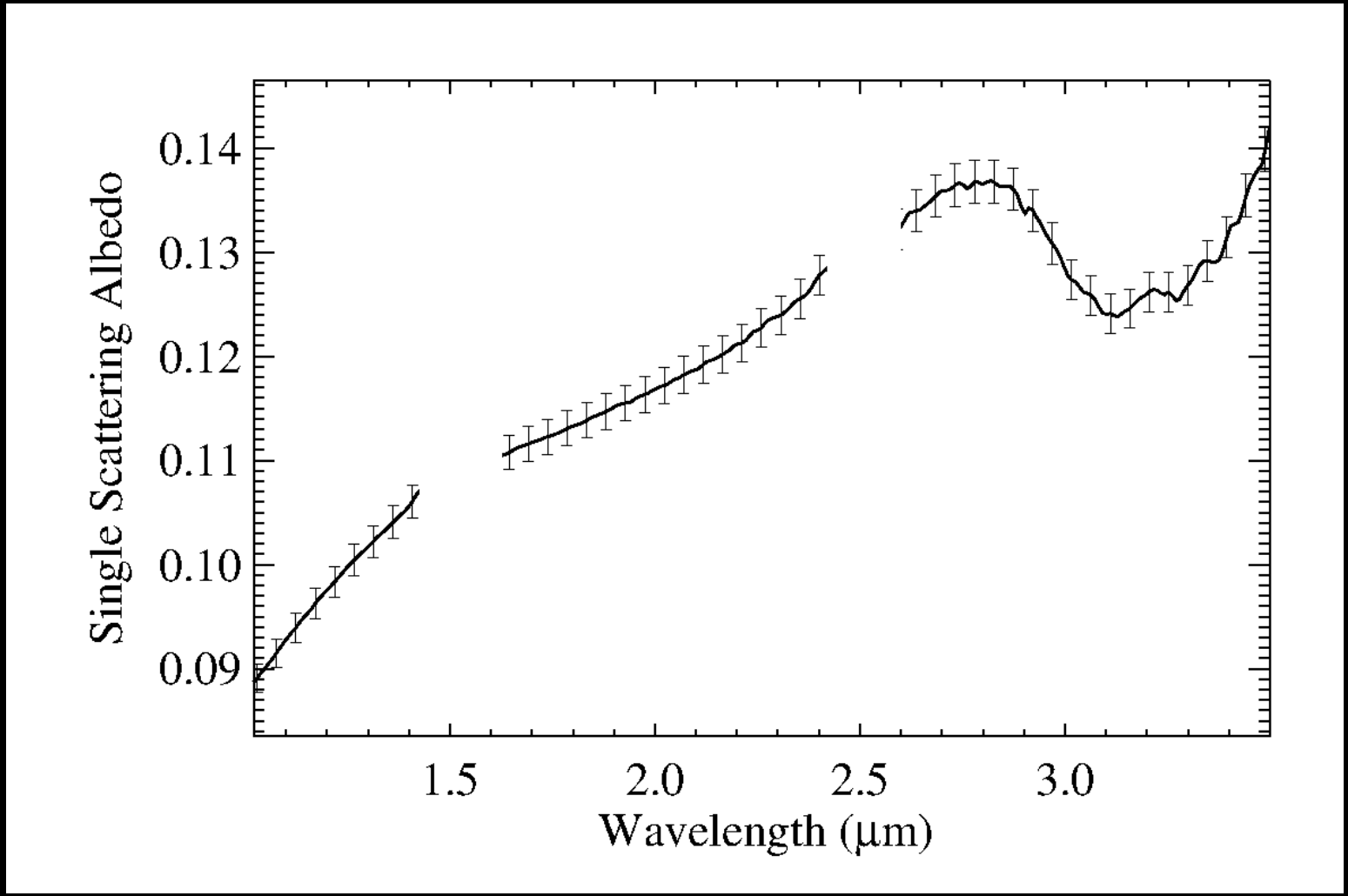
- Contamination of VIS signal due to IR grating
- Stray-light

Features smaller than ~1.5% of the average signal are probably artefacts



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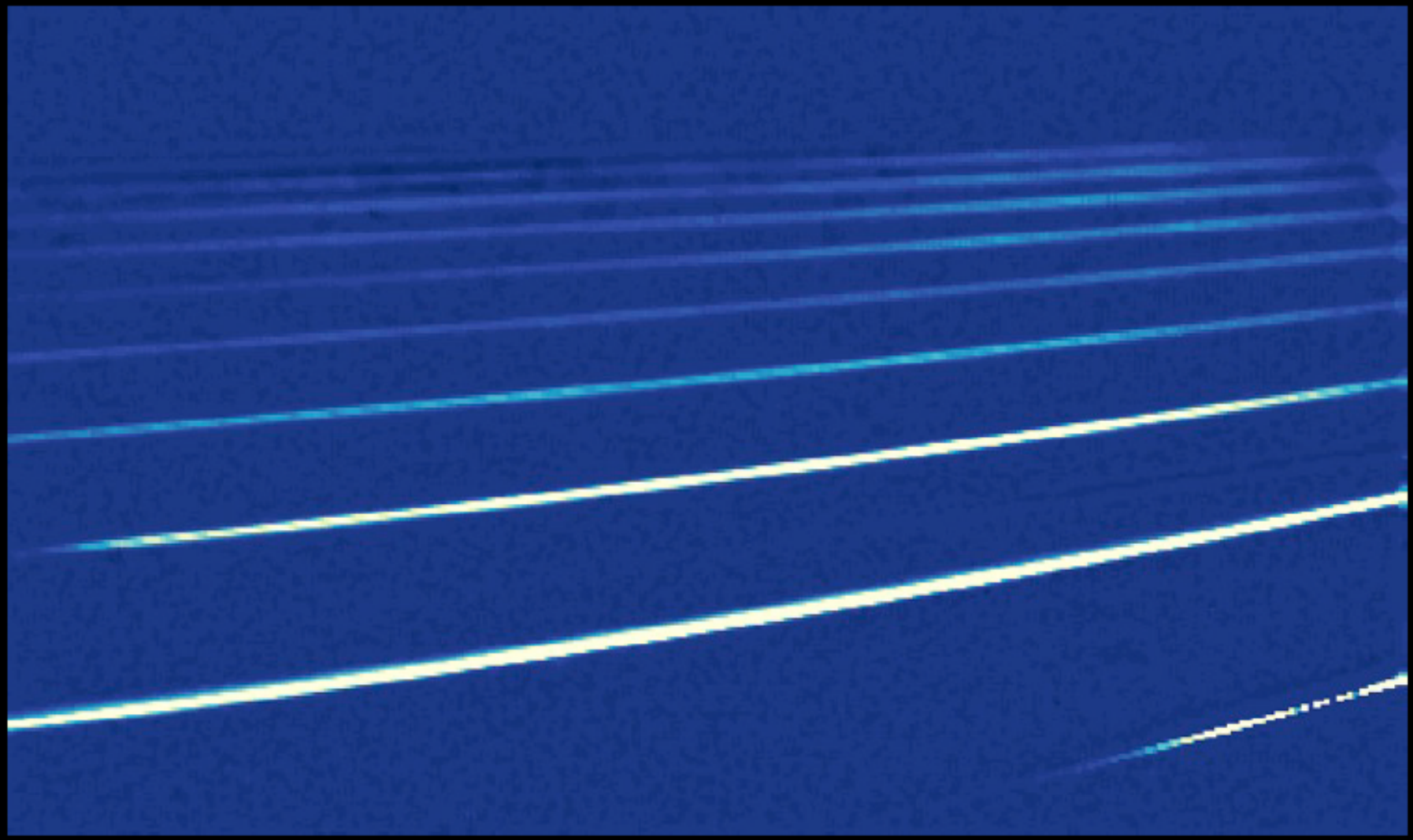
- Filters damage at junction
- Odd/Even effect
- Contamination of VIS signal due to IR grating
- Stray-light

VIRTIS-H

- Stray-light

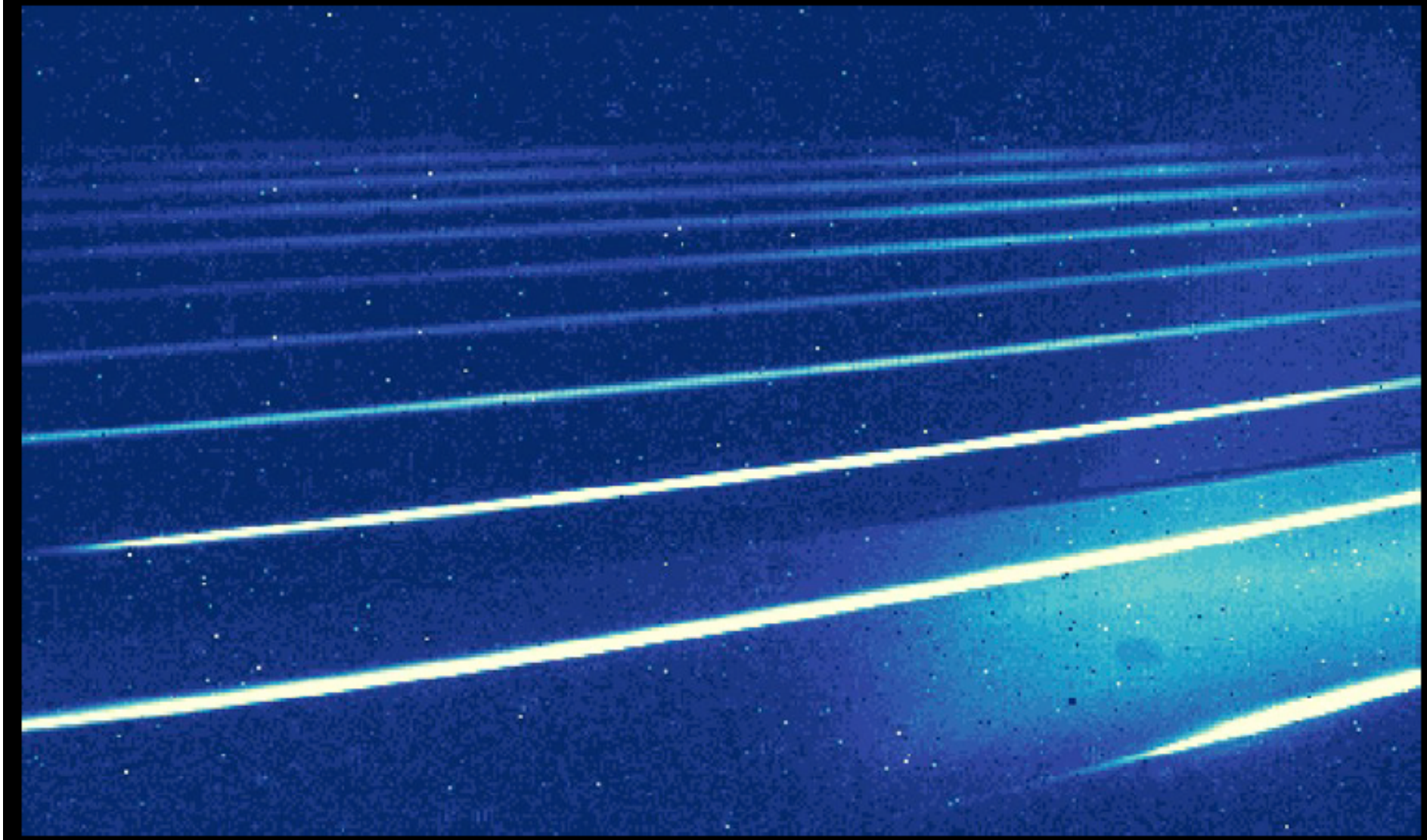
VIRTIS-H stray-light

The illuminated matrix does not look like this...



VIRTIS-H stray-light

... But like this



Instrument known issues

The instrument is the first of its generation (also onboard Venus Express and Dawn) and thus shows several issues which were mostly resolved before launch in the later models:

VIRTIS-M

- Misalignment between grating grooves and CCD columns
- Higher diffraction order filters on top of the IR detector >> spurious signal at junctions
- Filters damage at junction
- Odd/Even effect
- Contamination of VIS signal due to IR grating
- Stray-light

VIRTIS-H

- Stray-light
- Strabism

Calibration files VR-M

VIRTIS_M_VIS_RESP_10_V1.DAT	= 432x256 double precision matrix (binary) containing the VIRTIS-M-VIS Instrumental Transfer Function, including the VIS flat-Field.
VIRTIS_M_IR_RESP_10_V1.DAT	= 432x256 double precision matrix (binary) containing the VIRTIS-M-IR Instrumental Transfer Function, including the VIS flat-Field.
VIRTIS_M_HRES_SPECAL_10_V1.TAB	= 432 row ASCII table containing the wavelengths of the VIRTIS-M-VIS and -M-IR channels in High Resolution Mode.
VIRTIS_M_NRES_SPECAL_10_V1.TAB	= 144 row ASCII table containing the wavelengths of the VIRTIS-M-VIS and -M-IR channels in Nominal Resolution Mode.
VIRTIS_RESAMPLED_IR_NOM.TAB	= Kurucz solar irradiance from 1 AU resampled at ROSETTA VIRTIS_M-IR sampling and resolution in nominal resolution mode (144 bands).
VIRTIS_RESAMPLED_IR_HIGH.TAB	= Kurucz solar irradiance from 1 AU resampled at ROSETTA VIRTIS_M-IR sampling and resolution in high resolution mode (428 bands).
VIRTIS_RESAMPLED_VIS_NOM.TAB	= Kurucz solar irradiance from 1 AU resampled at ROSETTA VIRTIS_M-VIS sampling and resolution in nominal resolution mode (144 bands).
VIRTIS_RESAMPLED_VIS_HIGH.TAB	= Kurucz solar irradiance from 1 AU resampled at ROSETTA VIRTIS_M-VIS sampling and resolution in high resolution mode (428 bands).

Calibration files VR-H

DEADPIXELMAP	= pixels not included in the summing of the intensity of pixels illuminated through the slit.
VIRTIS_H_SPECTRAL_COEF_V1.TAB	= Contains the coefficients of the polynomials used to compute the wavelengths of VIRTIS -H channels.
VIRTIS_H_SPECTRAL_WIDTH_V1.TAB	= Contains the coefficients of the polynomials used to compute the FWHM of VIRTIS -H channels.
VIRTIS_H_TRANSFERT_FCT_V1.TAB	= Contains the transfer function for VIRTIS -H channels. Each column corresponds to one VIRTIS -H spectral order.

VIRTISPDS

Good news is that you do not have to worry about how to read data Qubes (Level 2), CAL (Level 3) and Geometry data as the VIRTIS team provide a software (VIRTISPDS) that reads archived data and extracts the core information.

What is it?

This library is intended to read a variety of PDS data files under IDL/GDL, in particular files containing Qube objects. It is particularly intended to read the files from the two VIRTIS experiments on board the Rosetta and Venus-Express missions, and should be used as the lower level layer in VIRTIS data processing software under IDL. From version 2.8, it is also intended to provide access to PDS data files in the frame of the EuroPlaNet-RI program, including through VO mechanisms. Version 3.0 supports a much broader scope of datasets.

This library is included in the VIRTIS Rosetta and Venus-Express archives at the PSA as the standard data access software, under the name LecturePDS. It is partly based on the SBNPDS 2.0 library and on the IDLASTRO library, and is maintained by S. Erard (LESIA, Observatory of Paris), with contributions from the VIRTIS teams. Port to GDL was done in the framework of EuroPlaNet-RI.

More info?

- The Interface document RO_VIRTIS_EAICD_4.5 is stored along with the data in the dataset and contains:
  - Description of the instrument
  - Description of the adopted data formats (Science and internal calibration)
  - Description of the Calibration pipeline and how to use the associated files
  - Overview of the data
  - VIRTISPDS Software user manual
- Calibration Pipeline report (M+H)
- User Manual
- Geometry description

In case of need contact us:

Fabrizio.capaccioni@iaps.inaf.it

Romolo.politi@iaps.inaf.it

ROSETTA - VIRTIS
To Planetary Science Archive
Interface Control Document
VIR-INAF-IC-007
Issue 4.5
23-10-2016