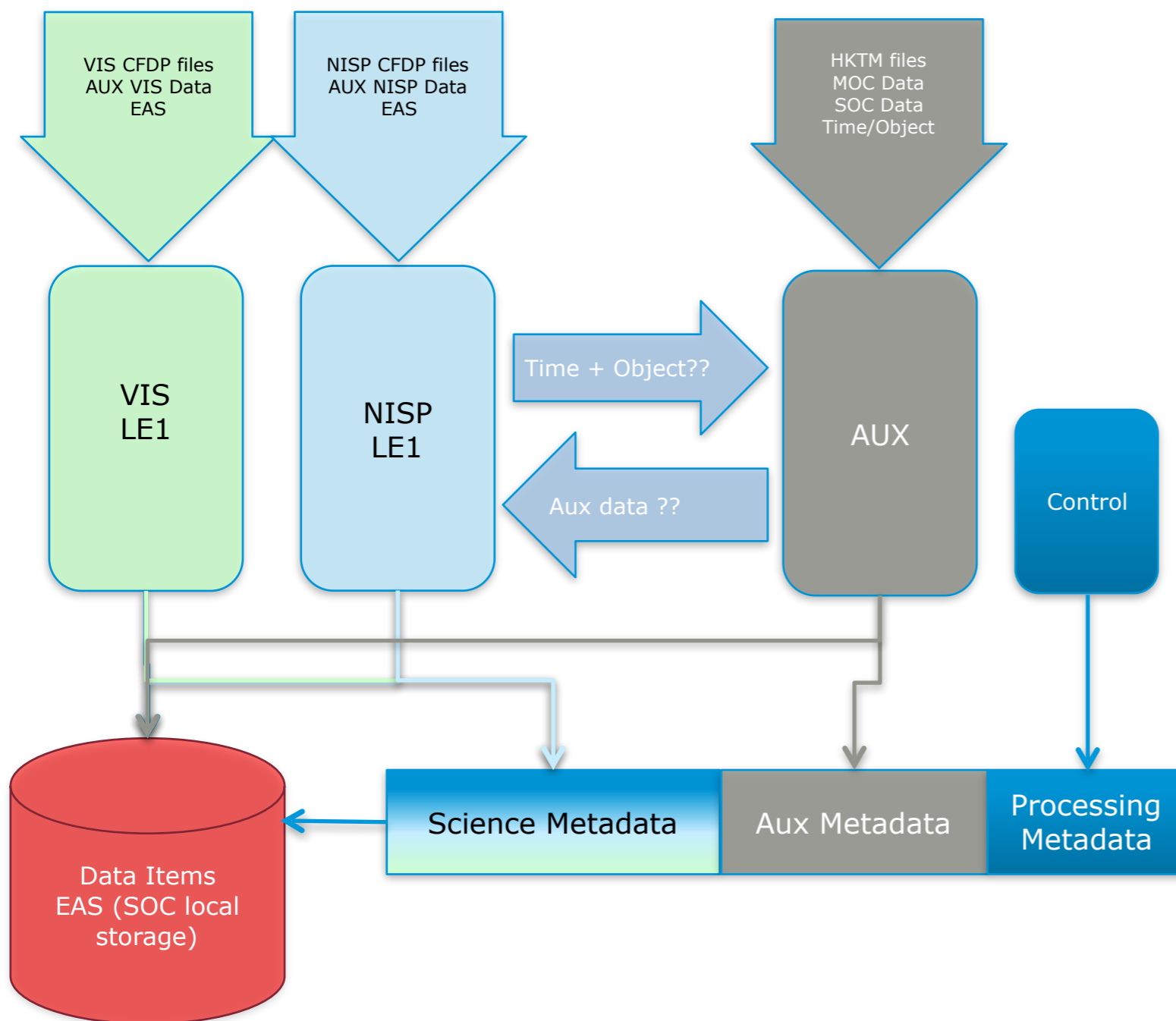


Euclid QLA & HMS

Luca Conversi
Euclid SOC Instrument Scientist

- Euclid SOC is in charge of designing, developing and running a QLA system capable of:
 - ▶ running autonomously over ALL data;
 - ▶ verifying that the intended planned activities are executed;
 - ▶ analysing the data to identify instrument problems (misconfigurations, sudden reconfigurations, impacts, others) that could be mitigated with fast SOC/MOC/IOT intervention;
 - data include VIS, NISP-P, NISP-S “science” data, i.e. including calibration exposures
 - ▶ analysing and extracting H/K parameters from instruments and S/C;
 - ▶ analysing AOCS data for pointing performance assessment;
 - ▶ providing quality flags and alerts, augmenting but not part of the level 1 product (i.e. not defined by level 2 requirements).
- QLA will use level 1 data and run some processing on it - “level 1.5” data produced on the fly (eventually stored only in a local buffer archive). The level of processing is TBD depending on performance.

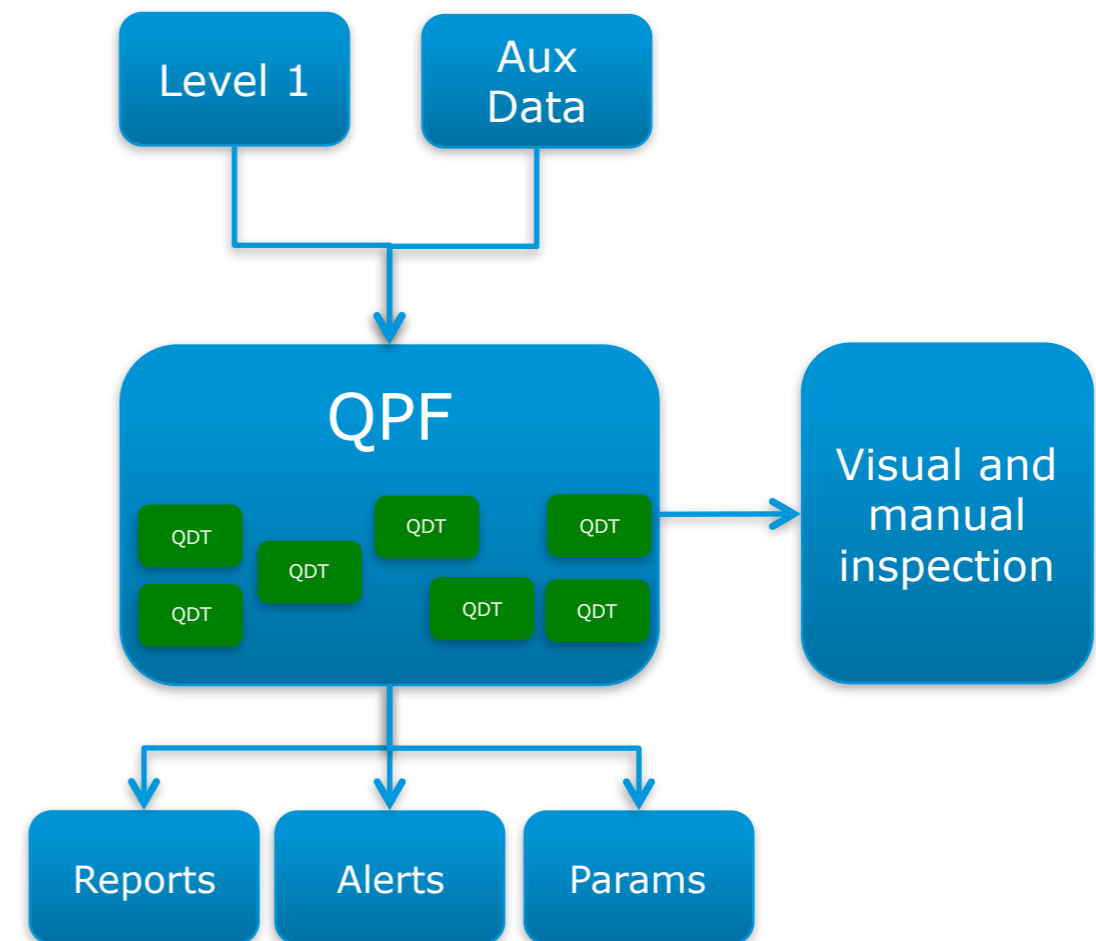
- Level 1 is the processing function that gathers and conforms to the data model the data from On Board and from ground, ready for processing by the SGS.
- It is a “special” processing function, since its inputs are not Common Data Model compliant.
- It is also “special”, since it is the only processing function where timeliness is required (i.e. 48 hours from reception of last component)
- A level 1 “product” is thus a collection of data containers and associated metadata. It is not necessarily a self standing item (i.e. a zipped file) but a reference in the EAS to metadata and data files.
- The development under EC, however ESAC runs it and contributing to some components: house-keeping telemetry (HKTm), framework, interfaces.
- All the incoming and generated data is ingested in the SOC local EAS Storage, and published in EAS. A distribution policy will ensure that level 1 data is available to all the subsequent Processing Functions.



- The system takes as inputs the raw CFDP files containing instrument scientific data, and also HKTM, ancillary & other external items.
- The instrument processors gather all data belonging to an exposure, decompressing it and formatting in the level 1 Common Data Model structure (FITS).
- Another module deals with HKTM and other sources metadata extraction, and with the generation of the HKTM data files.
- Given different time spans (daily for HKTM, per exposure/dither on the Science), coordination is required.
- The products are registered in the EAS, involving metadata registration and DSS storage of data files.

- QLA will run automatically over all received data sets:
 - ▶ This means being able to “understand” and qualify quickly all possible instrument modes and data types.
 - ▶ A report shall be ready within 48 hours from data reception from MOC (including level 1 generation). Not all possible checks fit.
 - ▶ QLA is memory-less: runs over single products, without knowledge of other past exposures.
 - ▶ It generates metadata quality information gathered in the form of reports, and alerts on the “lesser” quality products.
 - ▶ For these lesser quality products, QLA will offer ad hoc visual inspection (through external tools) and processes to be conducted by an operator or scientist.
 - ▶ Extracted parameters and results will be uploaded into the ARES database which will feed the health monitoring system (HMS)

- Automatic cases:
 - ▶ Data ingestion
 - ▶ VIS Checks
 - ▶ NISP Checks
 - ▶ System Checks (i.e. pointing, certain verification on HKTМ, etc.)
 - ▶ Alert generation (based on the checks outcome)
- Manual processing of given inputs (all or subset of previous)
- Visualisation of data products
- Extraction and archive of QLA product information as parametric metadata
- Generation of QLA reports
- Interfacing with EAS



The system will run automatically on all data received, based on triggering rules implemented at the QPF. However, it allows for manual operations (Instrument Scientists at SOC) to verify Alarms or to more closely examine given data sets

- QLA Processing Framework (QPF) provides the processing framework to execute system functionalities, implements the main HMI, the data access and persistence mechanisms, the logging and the management of the tasking, and the gathering and collection of reports.
- QLA Diagnostic Tools (QDT): they implement different algorithms and functions to perform over the data. They encompass data extraction (HKTM and parametric data), data processing and reporting:
 - ▶ Common (including HKTM extraction and processing)
 - ▶ VIS functions
 - ▶ NISP functions
 - ▶ AOCS functions
- On top, it will rely and integrate external tools for more advanced data analysis (e.g. Sextractor, Scamp) and visualisation (e.g. DS9).

- Euclid SOC is also in charge of designing, developing and running a HMS capable of:
 - ▶ gathering all observable parametric information linked to instrument and mission performance;
 - ▶ archiving it in a mission-long database: ARES;
 - ▶ providing access methods and tools to investigate and identify trends and evolutions;
 - ▶ providing this access also to IOTs;
 - ▶ running automated analysis;
 - ▶ providing systems for automatic alerting.
- Data in the ARES database will come from e.g. H/K information, but also from “higher level” processed products such as parameters obtained during the QLA analysis

- It is a software developed in Python (QDT) and Qtk/C++ (QPF)
- The QLA was released as part of the SOC V1 software release in April 2016
- The QPF component very advanced, implementing:
 - ▶ HMI (System Start, Stop, Log, Monitor, Partial Configuration)
 - ▶ Task registration, configuration and connection
 - ▶ Execution of processing
 - ▶ Access to EAS/DSS
 - ▶ Internal DB for local persistence of products
- The QDT was released for VIS, allowing a subset of checks to be implemented over raw data sets as produced by the VIS SIM data as well as lab data (some reformatting needed). Available as stand alone functions called from command line
- VIS processing emanated from a VIS-QLA Data Description and Diagnostics document, describing the "pipeline". A NISP similar document under evaluation, provided by IPAC
- Tested successfully on V1 release
- AOCS diagnostic tools developed in MatLab

QLA Processing Framework

File Edit Tools Window Help

Main Control

Actions

STOP SYSTEM

System info

Status: **INITIALISED**

Verbosity: INFO

Uptime: 2016-05-11 10:06:33.192

Hosts: <hosts>

Log Messages Data Ingestion Monitoring Browser Internal/Local Archive

Processing Tasks Agents Status Alerts

| Started at | Finished at | Task Name | Agent | Proc.Element | Status | Progress | Exit Code |
|--------------------------------|--------------------------------|---------------------------------|----------|---|----------|----------|-----------|
| 2016-05-11T09:16:45.889537286Z | 2016-05-11T09:17:00.352053194Z | TaskAge1://jolly_borg | TaskAge1 | /qpf/run/TaskAge1-20160511T111644-1/LE1_VIS_MetadataCollector | FINISHED | 100% | 0 |
| 2016-05-11T09:17:08.043628027Z | 2016-05-11T09:17:18.252187642Z | TaskAge2://dunk_stonebraker | TaskAge2 | /qpf/run/TaskAge2-20160511T111704-1/LE1_VIS_MetadataCollector | FINISHED | 100% | 0 |
| 2016-05-11T09:22:51.06654555Z | 2016-05-11T09:23:01.50688188Z | TaskAge1://happy_barach | TaskAge1 | /qpf/run/TaskAge1-20160511T112248-3/LE1_VIS_Processor | FINISHED | 100% | 0 |
| 2016-05-11T09:24:07.392095713Z | 2016-05-11T09:24:07.937634391Z | TaskAge2://backstabbing_maitner | TaskAge2 | /qpf/run/TaskAge2-20160511T112401-2/LE1_VIS_Ingestor | FAILED | 0% | 2 |

Configuration Tool

Source: /home/euocps/qpf/qpf_v1_rc1_multihost_euocdev02+euocdev03.json

General

Machines

Products & Processors

Network

Orchestration

Storage

Hosts

| | Host name | IP | Host Type | Num.Agents |
|---|--------------------|--------------|-----------------|------------|
| 1 | euocdev02.net3.lan | 10.66.180.97 | Master Host | 2 |
| 2 | euocdev03.net3.lan | 10.66.180.95 | Processing Host | 5 |

Other Information

Master Host: euocdev02.net3.lan Base port: 7999

Discard Save as... Save

mi6.may.11.11.24.13.2016

Setup

Debug Info

QLA QPF System Logging



The screenshot displays the QLA Processing Framework interface. On the left, there is a 'Main Control' panel with a 'STOP SYSTEM' button and a 'Stop processing incoming data' button. Below this is the 'System Info' section, which shows the system is 'RUNNING' with a status bar, and provides details on verbosity ('INFO'), uptime ('2016-05-11 10:06:33.192'), and hosts ('<hosts>'). At the bottom left, there is a 'Setup' section with a checked 'Debug Info' option.

The central area contains several log windows:

- QPFHMI**: Shows operational status and task messages, including 'New TaskRes chunk' and 'Incoming message: TASK_RES'.
- EvtMng**: Displays event management logs, such as 'Incoming message: INDATA' and 'RECEIVED NOTIFICATION OF TASK'.
- DataMng**: Shows data management logs, including 'Incoming message: INDATA' and 'ERROR: Failed cmd INSERT INTO products_info'.
- TskOrc**: Lists task execution details, such as 'NIR_RAW: EUC_NIR_RAW_C-1130-2_2000070411982'. It includes file paths and task IDs.
- TskMng**: Shows task management logs, including 'Proc. Elem. in rule: LET_VIS_MetadataCollector' and 'Selected Agent is: TskAge1'.

At the bottom of the interface, there is a task management bar with buttons for 'DataMng', 'EvtMng', 'LogMng', 'QPFHMI', 'TskAge1', 'TskAge2', 'TskMng', and 'TskOrc'.



QLA Processing Framework

File Edit Tools Window Help

Main Control

Actions

STOP SYSTEM

Stop processing incoming data

System info

Status: **RUNNING**

Verbosity: INFO

Uptime: 2016-05-11 10:06:33.192

Hosts: <hosts>

Setup

Debug Info

Log Messages Data Ingestion Monitoring Browser Internal/Local Archive

| | PRODUCTID | PRODUCTTYPE | UCTST | PRODUCTVERSIC | PRODUCTSIZE | CREATOR | INSTRUMENT | OBSMODE | STARTTIME | ENDTIME | REGTIME | URL |
|----|--|---------------|-------|---------------|-------------|---------|------------|---------|-----------------|-----------------|-----------------|---------------------------------------|
| 1 | EUC_NIR_INFO_C-0030-1_20200707T035055Z | NIR_INFO | OK | 01.00 | 842412852 | SOC_L1P | VIS | TEST | 2020-07-07 0... | 2001-01-01 0... | 2016-05-11 1... | file:///home/eucops/qpf/data/inbo... |
| 2 | EUC_NIR_INFO_C-1130-2_20200707T041158Z | NIR_INFO | OK | 01.00 | 875967284 | SOC_L1P | VIS | TEST | 2020-07-07 0... | 2001-01-01 0... | 2016-05-11 1... | file:///home/eucops/qpf/data/inbo... |
| 3 | EUC_NIR_RAW_C-0030-1_20200707T035055Z | NIR_RAW | OK | 01.00 | 859190834 | SOC_L1P | VIS | TEST | 2020-07-07 0... | 2001-01-01 0... | 2016-05-11 1... | file:///home/eucops/qpf/data/inbo... |
| 4 | EUC_NIR_RAW_C-1130-2_20200707T041158Z | NIR_RAW | OK | 01.00 | 859190834 | SOC_L1P | VIS | TEST | 2020-07-07 0... | 2001-01-01 0... | 2016-05-11 1... | file:///home/eucops/qpf/data/inbo... |
| 5 | EUC_SIR_INFO_W-0020-1_20200707T033452Z | SIR_INFO | OK | 01.00 | 842412852 | SOC_L1P | VIS | TEST | 2020-07-07 0... | 2001-01-01 0... | 2016-05-11 1... | file:///home/eucops/qpf/data/inbo... |
| 6 | EUC_SIR_INFO_W-1120-2_20200707T035555Z | SIR_INFO | OK | 01.00 | 875967284 | SOC_L1P | VIS | TEST | 2020-07-07 0... | 2001-01-01 0... | 2016-05-11 1... | file:///home/eucops/qpf/data/inbo... |
| 7 | EUC_SIR_RAW_W-0020-1_20200707T033452Z | SIR_RAW | OK | 01.00 | 926036789 | SOC_L1P | VIS | TEST | 2020-07-07 0... | 2001-01-01 0... | 2016-05-11 1... | file:///home/eucops/qpf/data/inbo... |
| 8 | EUC_SIR_RAW_W-1120-2_20200707T035555Z | SIR_RAW | OK | 01.00 | 926036789 | SOC_L1P | VIS | TEST | 2020-07-07 0... | 2001-01-01 0... | 2016-05-11 1... | file:///home/eucops/qpf/data/inbo... |
| 9 | EUC_VIS_INFO_W-0000-1_20200707T033452Z | VIS_INFO | OK | 01.00 | 959656242 | SOC_L1P | VIS | TEST | 2020-07-07 0... | 2001-01-01 0... | 2016-05-11 1... | file:///home/eucops/qpf/data/inbo... |
| 10 | EUC_VIS_INFO_W-0001-1_20200707T034417Z | VIS_INFO | OK | 01.00 | 959656242 | SOC_L1P | VIS | TEST | 2020-07-07 0... | 2001-01-01 0... | 2016-05-11 1... | file:///home/eucops/qpf/data/inbo... |
| 11 | EUC_VIS_LE1_META_W-0000-1_20200707T033452Z | VIS_LE1_ME... | OK | 01.00 | 875770417 | SOC_L1P | VIS | TEST | 2020-07-07 0... | 2001-01-01 0... | 2016-05-11 1... | file:///home/eucops/qpf/data/archi... |
| 12 | EUC_VIS_RAW_W-0000-1_20200707T033452Z | VIS_RAW | OK | 01.00 | 825374002 | SOC_L1P | VIS | TEST | 2020-07-07 0... | 2001-01-01 0... | 2016-05-11 1... | file:///home/eucops/qpf/data/inbo... |
| 13 | EUC_VIS_LE1_META_W-0001-1_20200707T034417Z | VIS_LE1_ME... | OK | 01.00 | 875770417 | SOC_L1P | VIS | TEST | 2020-07-07 0... | 2001-01-01 0... | 2016-05-11 1... | file:///home/eucops/qpf/data/archi... |
| 14 | EUC_VIS_RAW_W-0001-1_20200707T034417Z | VIS_RAW | OK | 01.00 | 825374002 | SOC_L1P | VIS | TEST | 2020-07-07 0... | 2001-01-01 0... | 2016-05-11 1... | file:///home/eucops/qpf/data/inbo... |

QLA QPF System: Agents And Tasks



QLA Processing Framework

File Edit Tools Window Help

Main Control

Actions

STOP SYSTEM

System info

Status: **INITIALISED**

Verbosity: INFO

Uptime: 2016-05-11 10:06:33.192

Hosts: <hosts>

Setup

Debug Info

Log Messages Data Ingestion **Monitoring** Browser Internal/Local Archive

Processing Tasks Agents Status Alerts

| Task Agent | Total tasks | Run | Wait | Pau | Sto | Fall | Fin | Client/Server | Load Avgs. | Up time |
|------------|-------------|-----|------|-----|-----|------|-----|--------------------------------------|----------------|---------|
| TskAge1 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | tcp://10.66.180.97:7111/tcp://*:7111 | 2.14 1.55 1.27 | 0 |
| TskAge2 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | tcp://10.66.180.97:7112/tcp://*:7112 | 2.14 1.55 1.27 | 0 |
| TskAge3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | tcp://10.66.180.95:7113/tcp://*:7113 | 2.14 1.55 1.27 | 0 |
| TskAge4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | tcp://10.66.180.95:7114/tcp://*:7114 | 2.14 1.55 1.27 | 0 |
| TskAge5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | tcp://10.66.180.95:7115/tcp://*:7115 | 2.14 1.55 1.27 | 0 |
| TskAge6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | tcp://10.66.180.95:7116/tcp://*:7116 | 2.14 1.55 1.27 | 0 |
| TskAge7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | tcp://10.66.180.95:7117/tcp://*:7117 | 2.14 1.55 1.27 | 0 |



QLA Processing Framework

File Edit Tools Window Help

Main Control

Actions

STOP SYSTEM

System info

Status: **INITIALISED**

Verbosity: INFO

Uptime: 2016-05-11 10:06:33.192

Hosts: <hosts>

Log Messages Data Ingestion Monitoring Browser Internal/Local Archive

Internal Database Browser

Database

- QPSQL:europs@qpfdb
 - configuration
 - message_type
 - messages
 - node_states
 - observation_modes
 - transmissions**
 - instruments
 - creators
 - product_status
 - task_status
 - task_outputs
 - tasks_info
 - variables
 - alarms
 - products_info
 - task_inputs

| | id | msg_date | msg_from | msg_to | msg_type | msg_bcas | |
|----|--------|---------------|----------|--------|-----------|----------|--|
| 7 | 928648 | 11/5/16 10:06 | TskAge1 | LogMng | DATA_INFO | N | ["header":{"crc":0,"dateCreation":"20160511T100637","dateReception":"","dateTransmission":"","destinatio |
| 8 | 928649 | 11/5/16 10:06 | TskAge2 | LogMng | DATA_INFO | N | ["header":{"crc":0,"dateCreation":"20160511T100637","dateReception":"","dateTransmission":"","destinatio |
| 9 | 928650 | 11/5/16 10:06 | TskAge1 | LogMng | DATA_INFO | N | ["header":{"crc":0,"dateCreation":"20160511T100639","dateReception":"","dateTransmission":"","destinatio |
| 10 | 928651 | 11/5/16 10:06 | TskAge2 | LogMng | DATA_INFO | N | ["header":{"crc":0,"dateCreation":"20160511T100640","dateReception":"","dateTransmission":"","destinatio |
| 11 | 928652 | 11/5/16 10:06 | TskAge1 | LogMng | DATA_INFO | N | ["header":{"crc":0,"dateCreation":"20160511T100642","dateReception":"","dateTransmission":"","destinatio |
| 12 | 928653 | 11/5/16 10:06 | TskAge2 | LogMng | DATA_INFO | N | ["header":{"crc":0,"dateCreation":"20160511T100642","dateReception":"","dateTransmission":"","destinatio |
| 13 | 928654 | 11/5/16 10:06 | TskAge1 | LogMng | DATA_INFO | N | ["header":{"crc":0,"dateCreation":"20160511T100643","dateReception":"","dateTransmission":"","destinatio |
| 14 | 928655 | 11/5/16 10:06 | TskAge2 | LogMng | DATA_INFO | N | ["header":{"crc":0,"dateCreation":"20160511T100643","dateReception":"","dateTransmission":"","destinatio |
| 15 | 932725 | 11/5/16 11:14 | EvtMng | LogMng | DATA_INFO | N | ["header":{"crc":0,"dateCreation":"20160511T111437","dateReception":"","dateTransmission":"","destinatio |
| 16 | 928656 | 11/5/16 10:06 | TskAge1 | LogMng | DATA_INFO | N | ["header":{"crc":0,"dateCreation":"20160511T100645","dateReception":"","dateTransmission":"","destinatio |
| 17 | 928657 | 11/5/16 10:06 | TskAge2 | LogMng | DATA_INFO | N | ["header":{"crc":0,"dateCreation":"20160511T100645","dateReception":"","dateTransmission":"","destinatio |
| 18 | 928658 | 11/5/16 10:06 | TskAge1 | LogMng | DATA_INFO | N | ["header":{"crc":0,"dateCreation":"20160511T100647","dateReception":"","dateTransmission":"","destinatio |
| 19 | 928659 | 11/5/16 10:06 | TskAge2 | LogMng | DATA_INFO | N | ["header":{"crc":0,"dateCreation":"20160511T100647","dateReception":"","dateTransmission":"","destinatio |
| 20 | 928660 | 11/5/16 10:06 | TskAge2 | LogMng | DATA_INFO | N | ["header":{"crc":0,"dateCreation":"20160511T100649","dateReception":"","dateTransmission":"","destinatio |
| 21 | 928661 | 11/5/16 10:06 | TskAge1 | LogMng | DATA_INFO | N | ["header":{"crc":0,"dateCreation":"20160511T100649","dateReception":"","dateTransmission":"","destinatio |
| 22 | 928662 | 11/5/16 10:06 | TskAge2 | LogMng | DATA_INFO | N | ["header":{"crc":0,"dateCreation":"20160511T100652","dateReception":"","dateTransmission":"","destinatio |

SQL Query

Clear Submit

66.180.97:7111/tcp://*:7111
1.27 Up time: 0

66.180.97:7112/tcp://*:7112
1.27 Up time: 0

66.180.95:7113/tcp://*:7113
1.27 Up time: 0

66.180.95:7114/tcp://*:7114
1.27 Up time: 0

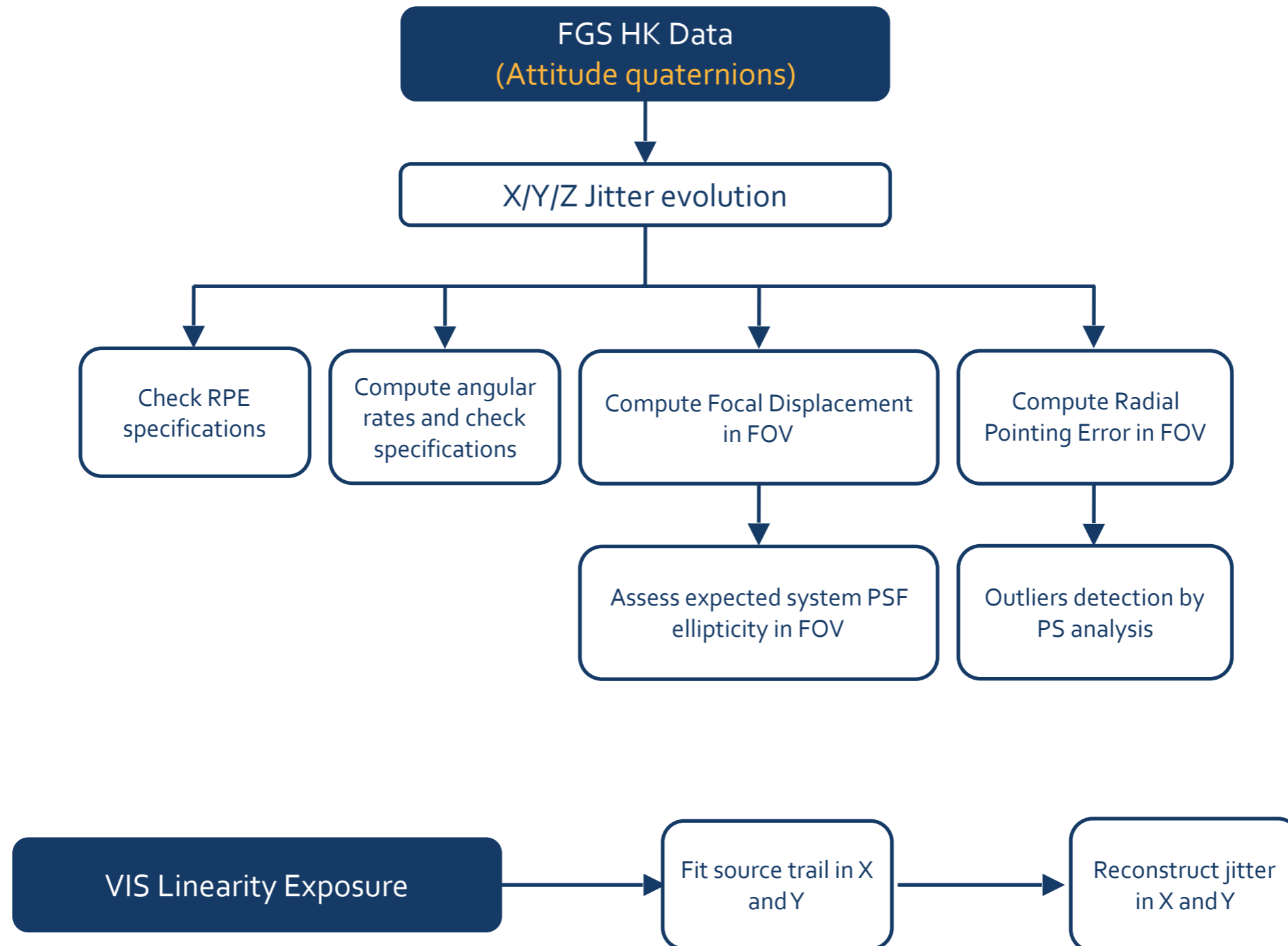
66.180.95:7115/tcp://*:7115
1.27 Up time: 0

66.180.95:7116/tcp://*:7116
1.27 Up time: 0

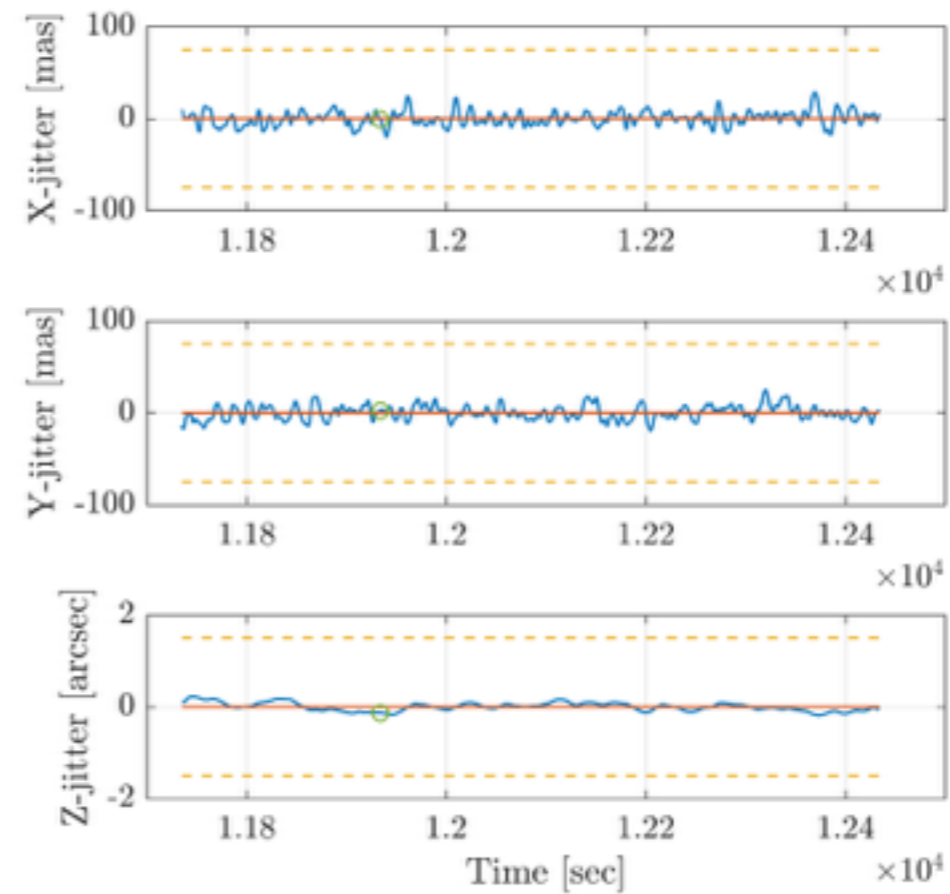
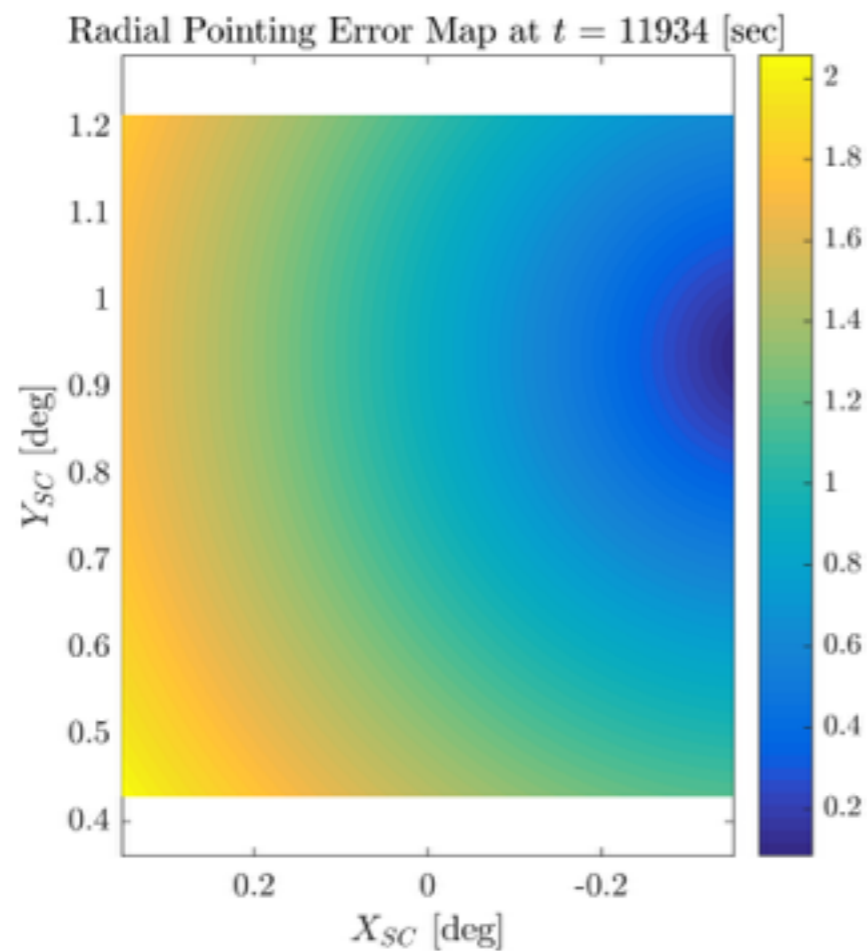
66.180.95:7117/tcp://*:7117
1.27 Up time: 0

Setup

Debug Info

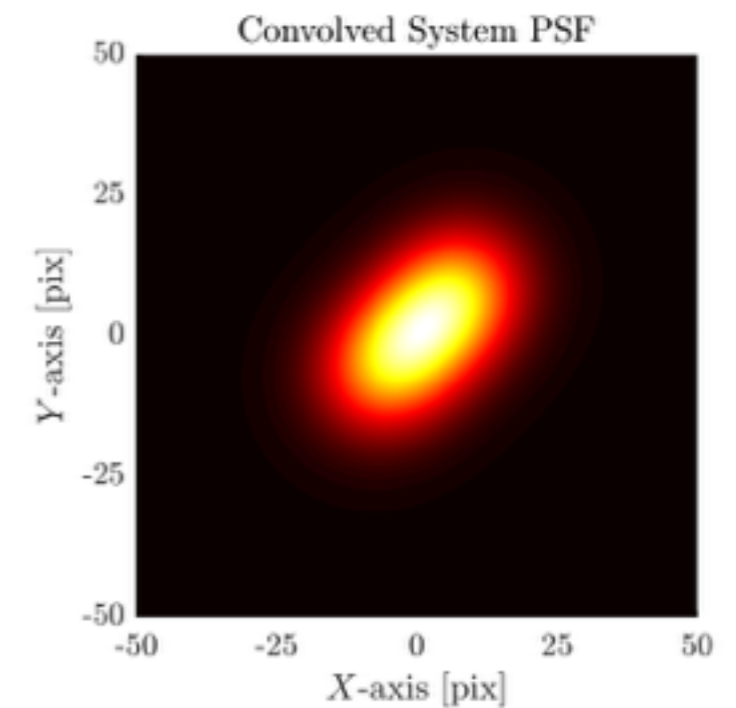
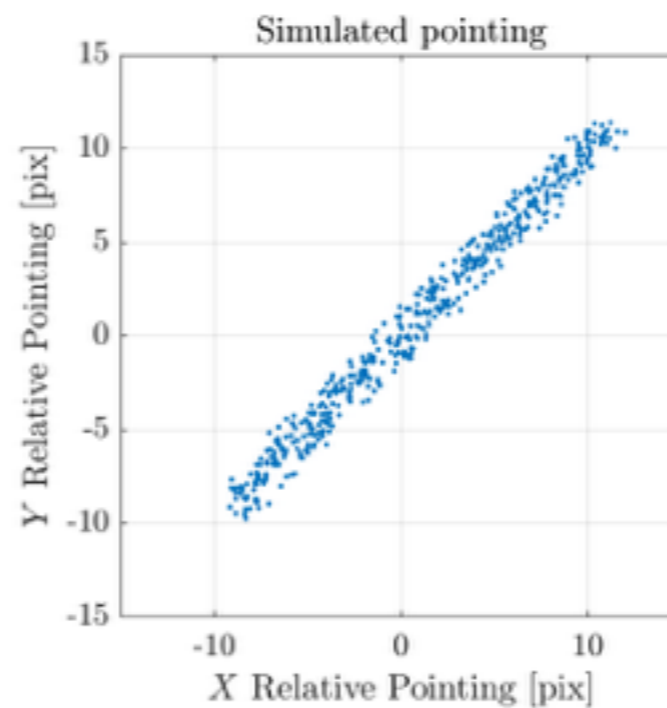
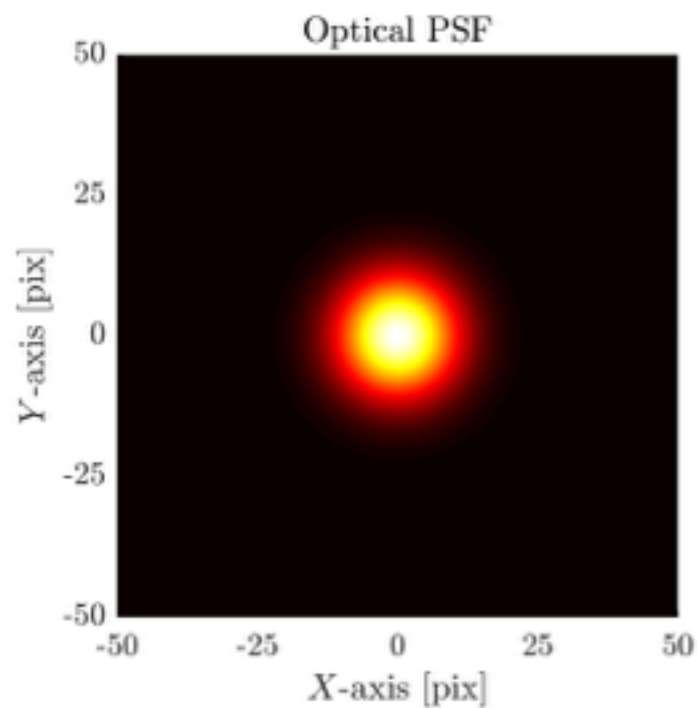
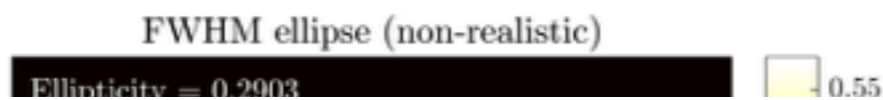


- Translate jitter angles into displacement on the VIS and NISP focal plane
- Radial error evolution in the field of view (FOV)



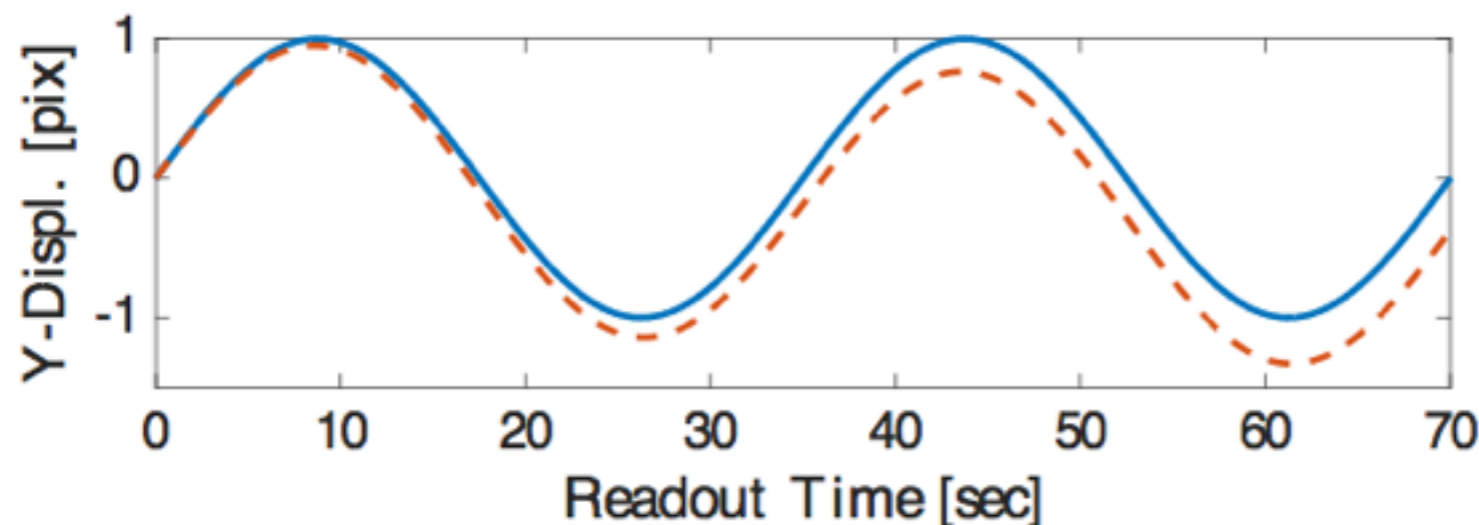
- Compute ellipticity induced by jitter on a Gaussian beam
- Methods:
 - ▶ Quadrupole moments
 - ▶ Ellipse fitting at FWHM
 - ▶ 2D gaussian fit

$$\text{PSF}_{\text{sys}} = \text{PSF}_{\text{opt}} \otimes \text{Jitter}$$



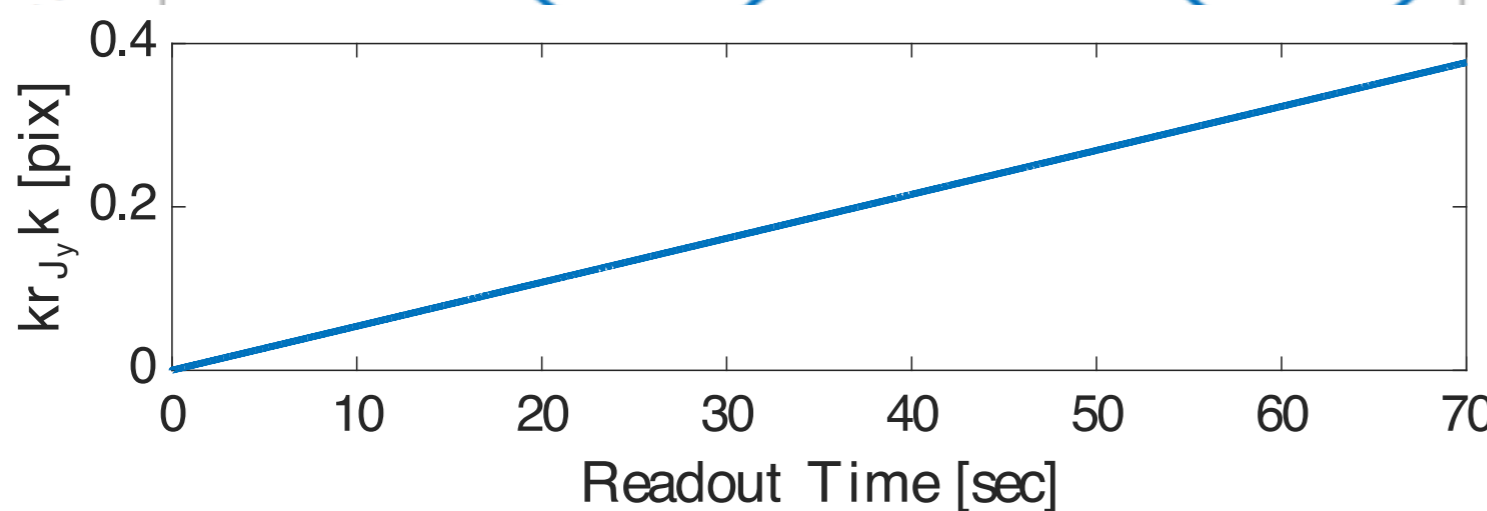
- Target: reconstruct focal displacement (and eventually the spacecraft's attitude if possible) by using the CCD readout during the linearity observations. Pros:
 - ▶ Independent source of information
 - ▶ Higher frequency than FGS HK data
- Simulation concept: simulate the readout of a CCD quadrant region with some specified width around the original position of the selected source.
 - ▶ Evaluate optical PSF according to a known focal displacement (X/Y) and readout velocity (Y).
 - ▶ Noise and background characterised from images generated with the VIS simulator.
 - ▶ Limitations: no CTI, cosmic rays not included in the simulations, Gaussian PSF.
- Reconstruction basis: Perform one-dimensional fits of the PSF along Y-cutouts to infer the focal displacement evolution.
- X/Y problems are decoupled:
 - ▶ X-direction: evolution of PSF's mean relative location.
 - ▶ Y-direction: evolution of PSF's area.

- Y-jitter can be *viewed* as slowing/accelerating the movement of charges during the read-out
- The curve along the read-out direction will be equivalent to the derivative of the jitter plus a constant: the number of electrons generated during a read-out in case of no jitter



\bar{c}

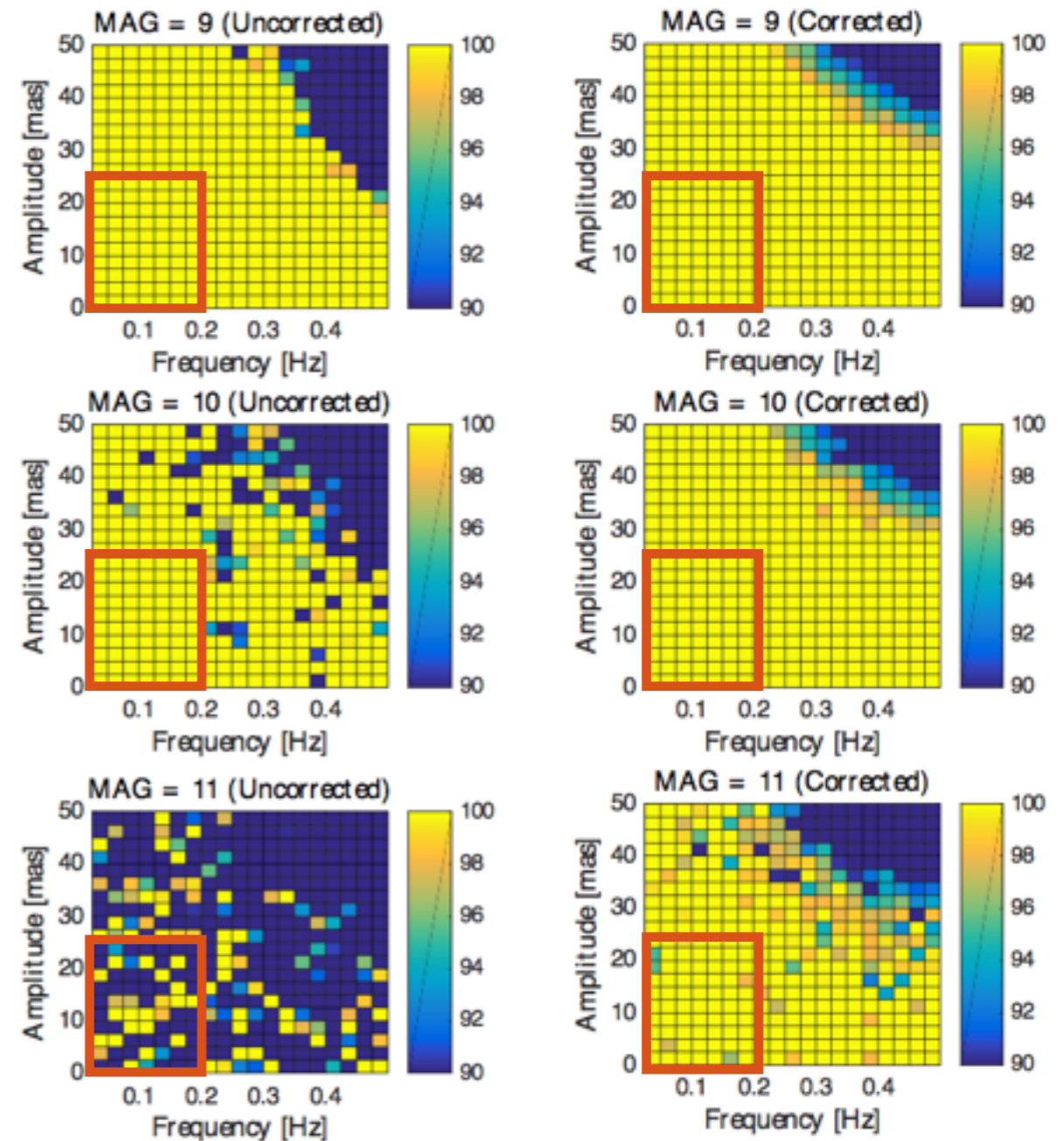
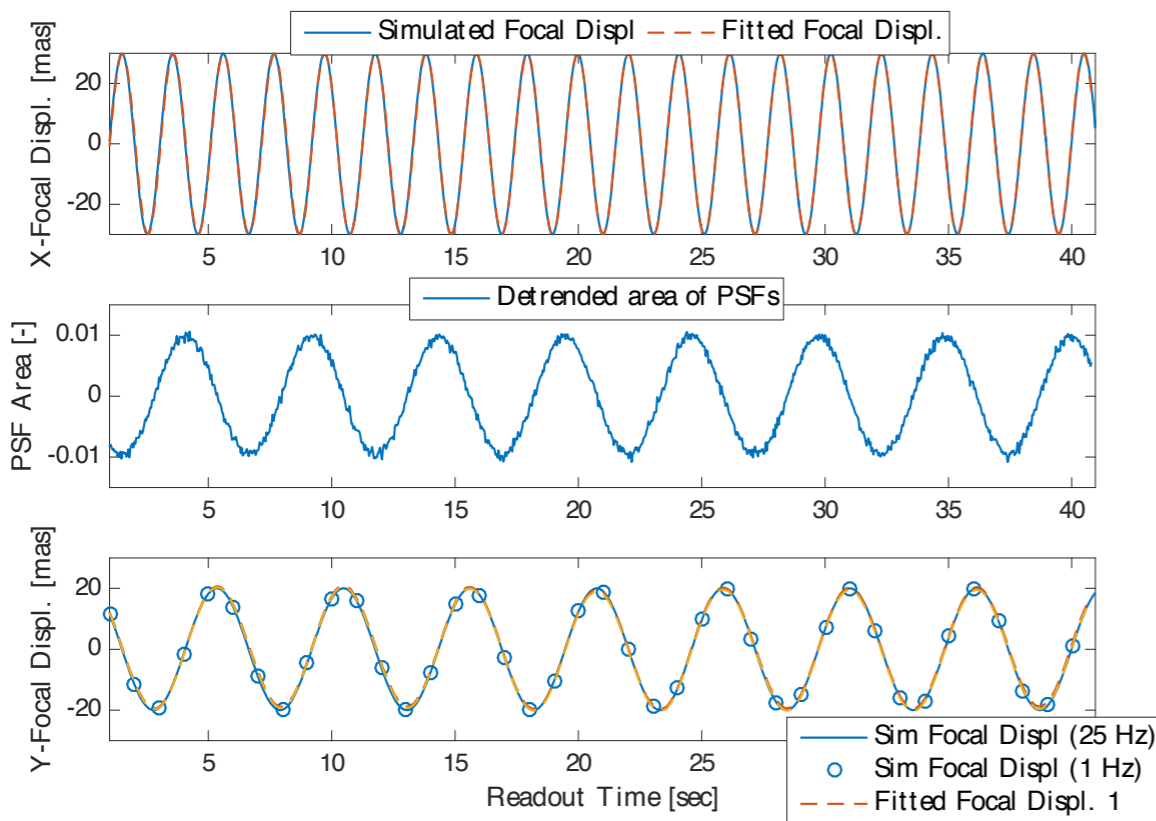
$$\bar{I}(p) = \frac{dJ_y(p)}{dp} + \bar{c}$$



$$\left(c = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} PSF(x, y) dx dy \right)$$

$$\hat{J}_y(p) = \int_{p_0}^{p_n} (\bar{I}(p) - \bar{c}) dp$$

- Further correction available:
 - ▶ Linear fit 1 Hz residuals from FGS HK data
 - ▶ Combine the reconstruction of different sources in the FOV
- Simulations show stars of magnitude 11 or below are needed for proper reconstruction



Common Checks

- identify the VIS observing mode
- compare commanded to executed/downloaded data.
- subtract the bias, for each of the 144 quadrants
- convert to FLOAT each of the 144 quadrants
- run a series of checks on exposures taken in all modes
- identify all overflow pixels in each of the 144 quadrants
- identify all underflow pixels in each of the 144 quadrants
- determine the readout noise in each of the 144 quadrants
- determine the electronic offset value in each of the 144 quadrants

Nominal Exposure Checks

- determine saturation level in each of the 144 quadrants
- identify saturated pixels in each of the 144 quadrants
- determine, for each of the 36 CCDs, the sky background statistics: mean, median, stddev, ...
- identify cosmics in each of the 36 CCDs
- create a catalogue of objects for each of the 36 CCDs
- identify potential objects, for each of the 36 CCDs
- create list of filtered objects, for each of the 36 CCDs
- determine objects centroid, for each of the 36 CCDs
- determine objects flux, for each of the 36 CCDs
- determine, for each of the 36 CCDs, mean PSF image quality
- determine WCS, for each of the 36 CCDs
- determine pointing parameters, for each of the 36 CCDs

Bias Exposure Checks

- flag new hot columns, for each of the 144 quadrants
- determine the electronic offset value in each of the 144 quadrants

Flat Field Exposure Checks

- set different thresholds depending on the LED used
- identify saturated pixels in each of the 144 quadrants
- check how many pixels has less than TBD and compare to a given threshold, in each of the 144 quadrants
- determine the flat field fluence
- determine small area PRNU, in each of the 144 quadrants
- determine serial CTI from trailing, in each of the 144 quadrants
- check the gain & offset consistency across quadrant boundaries, in each of the 36 CCDs
- determine the particulate contamination

Dark Exposure Checks

- identify pixels affected by cosmics for each of the 144 quadrants
- determine the average dark signal for each of the 144 quadrants
- derive some statistics/information regarding the spatial distribution of cosmics: are they clustered or spread on the FPA?
- derive some statistics/information regarding the energy deposited by cosmics

Charge Injection Exposure Checks

- identify saturated pixels in each of the 144 quadrants
- determine the charge injection pattern for each of the 144 quadrants
- determine the charge injection level for each of the 144 quadrants
- determine parallel CTI from first pixel response for each of the 144 quadrants
- determine parallel CTI from trailing for each of the 144 quadrants
- determine serial CTI from trailing for each of the 144 quadrants

Trap Pumping Exposure Checks

- identify saturated pixels in each of the 144 quadrants
- determine dipole contrast

Common Checks

identify the NISP observing mode

compare commanded to executed/downloaded data

run a series of checks on exposures taken in all modes

identify all overflow pixels in each of the 16 detectors

identify all underflow pixels in each of the 16 detectors

apply bad pixel, dark, and reference correction for each of the 16 detectors

convert to FLOAT each of the 16 detectors

Flat Field Exposure Checks

determine image statistics

Dark Exposure Checks

determine image statistics

Linearity Exposure Checks

determine image statistics

check correct number of ramps are downloaded

Nominal Exposure Checks

apply linearity correction

subtract dark frame

determine, the sky background statistics: mean, median, stddev, ...

identify cosmics

determine objects centroid

determine mean PSF image quality

run noise pixel statistics on objects to check for blurring

determine photometry

determine WCS

determine pointing parameters

identify spectra (check the grism PA)

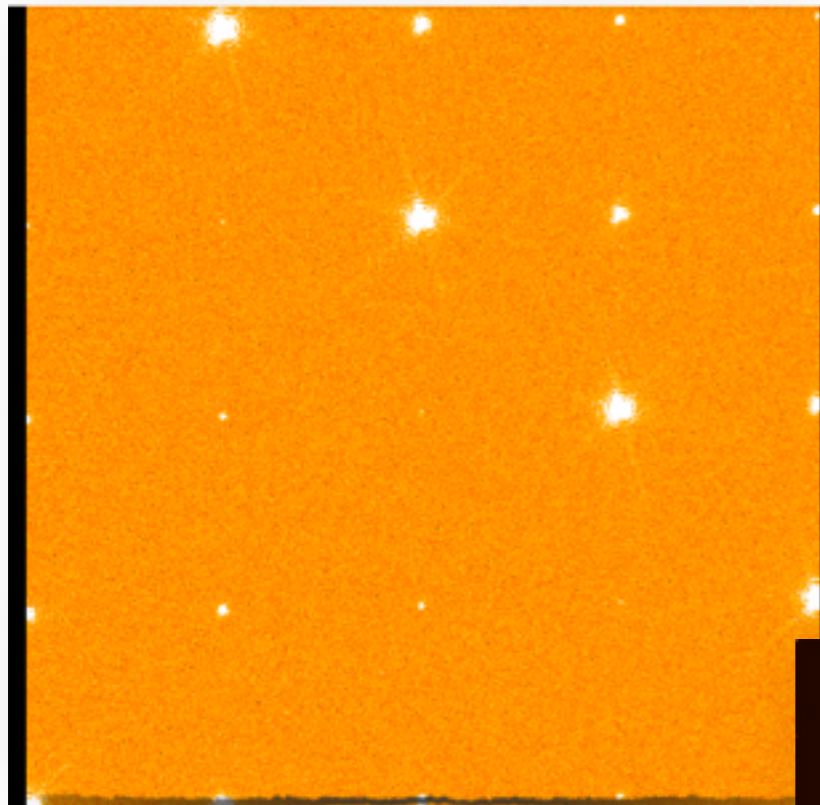
identify lines (TBD)

All Ramp Data Checks

run on-board processing algorithm

measure read-out noise

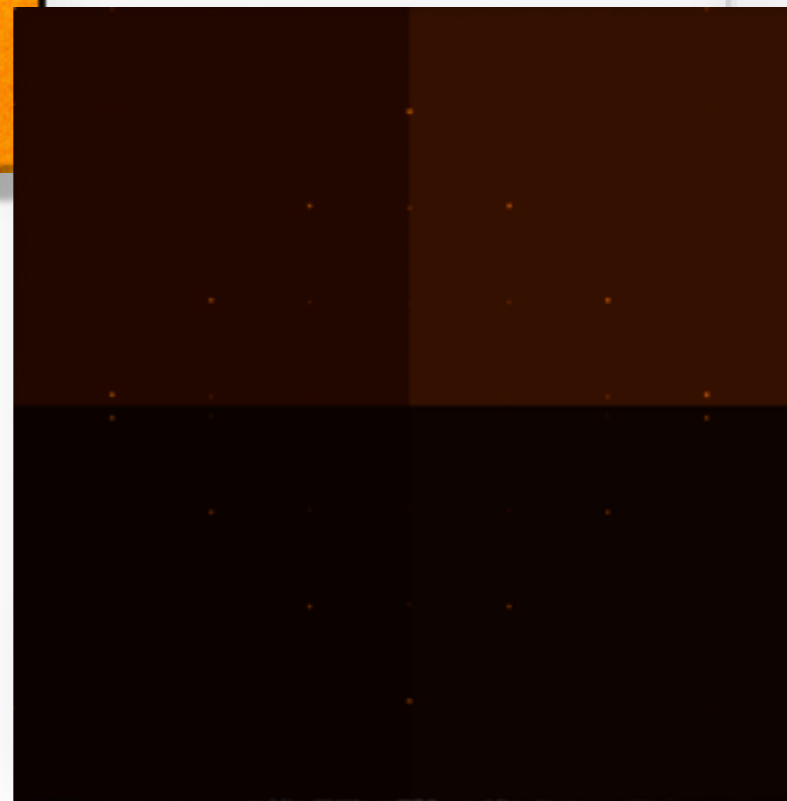
Simulated 4 identical quadrants with different biases



Generate report
Raise warnings
where applicable

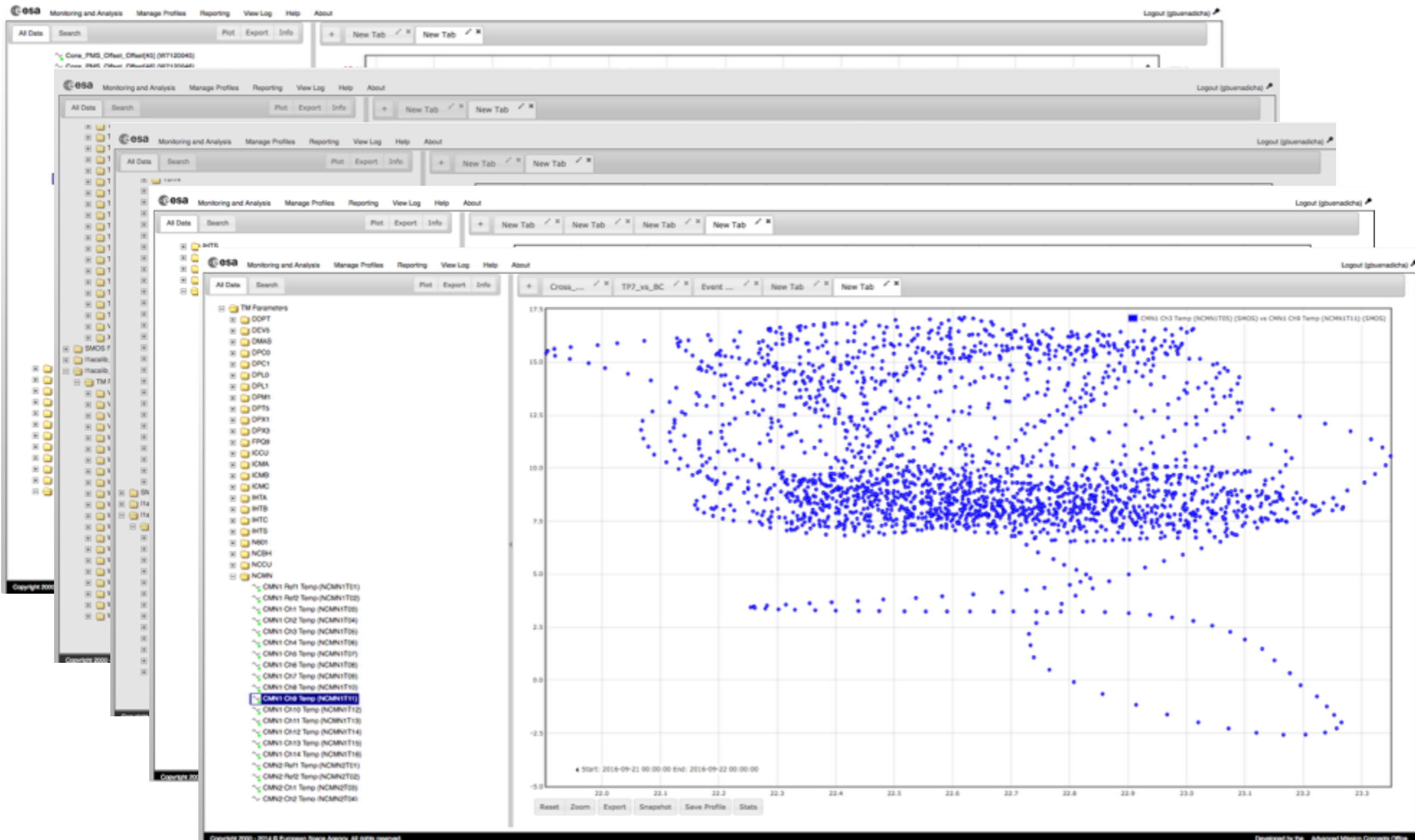


Create CCD image from
the 4 quadrants



```
report.out
nes/root/SOC_SW_TESTING/V1_RELEASE/QLA/TEST_DATA/VIS/QLA_Checks/Flat/OUTPUT_DATA/report.out
"CCD_NoCTI_NoCR_FLAT_Consistency.fits": {
  "CCD_1-6": {
    "CCD-Consistency": {
      "Result": "Warning",
      "Values": {
        "Q1Column-Q2Column": 310.0,
        "Q1Line-Q3Line": 3846.0046292947563,
        "Q2Line-Q4Line": 7072.0092585895127,
        "Q3Column-Q4Column": 3538.6255555555549
      },
      "Warnings": [
        "Delta value between quadrants exceeded"
      ]
    },
    "Illumination_Fluence": {
      "Result": "Nominal",
      "average_fitted_surface": 3010.8952721547394,
      "peak_to_valley": 3.6793359313366207,
      "surface_fitting": [
        0.7042387947973515,
        1.9816777014837557,
        -2528.1523080105035
      ]
    },
    "Particulate_Contamination": {
      "Result": "Warning",
      "Warnings": [
        "Low response pixel number threshold exceeded"
      ],
      "low_response_pixels": 9247227
    },
    "Q-1": {
      "Electronic-Offset": {
        "Result": "Nominal",
        "Value": 1000.0031045751634
      },
      "Overflow-Pixels": {
        "Number": 1,
        "Result": "Nominal"
      },
      "PRNU": {
        "Result": "TBD",
        "max": 5314.3846246356516,
        "mean": 91.550173084268124,
        "min": 9.6795451326183226,
        "std": 487.88806683552886
      },
      "Processing applied": {
        "BIAS_COR": {
          "Value": 1000.0
        },
        "GAIN_COR": {
          "Value": 3.1
        }
      }
    }
  },
}
```

HMS Web Interface (ARES For SMOS)



- Another main release of the system foreseen for Q4/2016, and then another prior to the DR in 2017
 - ▶ Consolidation of the QPF and QDT functions
 - ▶ QPF orchestrator as per user request (currently per product type)
 - ▶ Full integration between QPF and QDT
- VIS processing functions enlarged with test data coming from ground testing and OU-SIM simulations
- NISP processing functions:
 - ▶ Data description and diagnostics document under discussion with IPAC
 - ▶ Development of the processing algorithms will be part of an ongoing agreement with IPAC for collaboration in the QLA development
- AOCS processing functions:
 - ▶ consolidation and conversion of diagnostic tools into Python
 - ▶ full integration with QPF and QDT (for the pointing extraction from VIS linearity data)

- ESA - Euclid SOC
 - ▶ Guillermo Buenadicha
 - ▶ Luca Conversi
 - ▶ *Juan Garcia*
 - ▶ John Hoar
 - ▶ Ralf Kohley
 - ▶ Jose Carlos Gonzalez
 - ▶ Matteo Miluzio
 - ▶ Roland Vavrek
 - ▶ *Victor Villar*

- NASA - IPAC
 - ▶ Peter Capak
 - ▶ George Helou
 - ▶ Harry Teplitz