

Instrument Operations

23 febbraio, 2022

5° Meeting Euclid ITA

- IOT Activities & Tools
 - ICR Tool E. Romelli, D. Tavagnacco
 - IODA G. Riccio, M. Brescia, S. Cavuoti



Euclid Instrument Operations

1. Simple, repetitive and replicated for every stage in the S/C observation strategy, a set of calibration and science exposures repeated, at various frequencies, thousands of times over the course of the mission
2. Ideally, the **Survey defined at Launch should be the one valid** for the rest of the mission
3. **However...**
 - Assumptions on performance have to be reassessed with System In Flight
 - Unknown systematics may appear
 - Room for optimization may be found (i.e. Calibration Strategy)
 - Instrumental or System problems found
4. Beyond those “global” changers, punctual operational problems may hinder execution of parts of the defined Survey. May need local alterations.
5. **Key is Survey monitoring**



IOT Activities

1. Routine Activities - mostly tested during SOVT-1

- **Daily operations** **Health assessment & reports** - IODA
- **Long term activities** **Trend & reports** - IODA
- **Planning operations** **Instrument Commanding Requests** - ICR Tool
- **Calibration** **Process & evaluate calibration obs** - IODA
- Implement new calibrations requests** - ICR Tool
- Update routine calibration plan
- Maintenance activities Database maintenance
- Flight ops procedures maintenance
- OBSW maintenance
- CALF, EGSE, IOT system maintenance





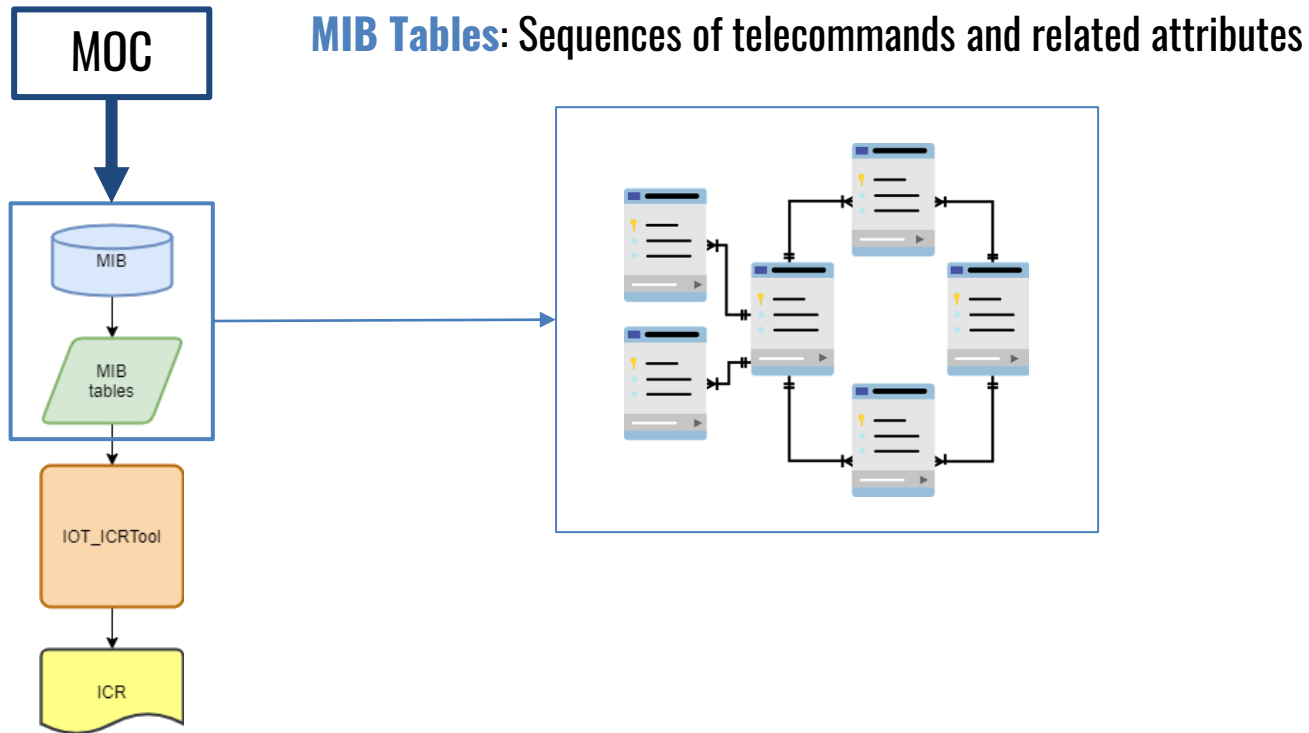
IOT

The ICRTool

Erik Romelli & Daniele Tavagnacco
SDC-IT

5° Meeting Nazionale Collaborazione Euclid

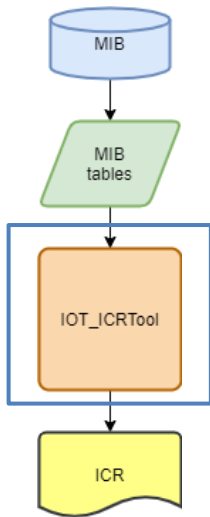
IOT_ICRTool in a nutshell



IOT_ICRTool in a nutshell

ICRTool: provides a user interface to:

- ❑ Handle sequences and parameters
- ❑ Create the ICR as agreed in the IOT-SOC ICD
- ❑ Export the ICR as XML file



NISP

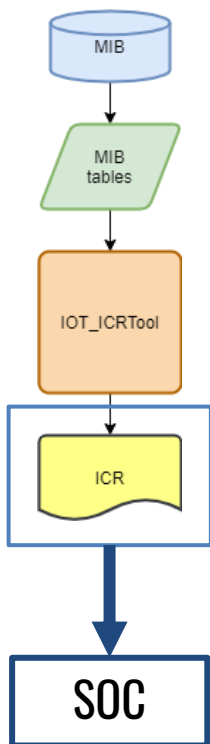
VIS

The screenshot displays the ICRTool interface with several overlapping windows. The primary window, 'Add ICR Form', includes input fields for 'Name', 'Origin', 'Source', 'Justification', 'Approval', 'Instrument', 'Generation Date', 'MIB Version', and 'Recipient'. Below these fields is a 'COMMENTS' section with a '+ Add another Comment' button. Two smaller windows are overlaid: 'Change POP procedure' and 'Change Sequence'. The 'Change POP procedure' window shows fields for 'Name', 'Description', and 'Note'. The 'Change Sequence' window shows a table of parameters with their values and units.

IOT_ICRTool in a nutshell

ICR: Instrument Commanding Request

- ❑ Set of instructions for the spacecraft instruments
- ❑ The mechanism by which IOT may ask for activities not covered by the Reference Survey Definition.
- ❑ XML file containing sequences of parameters and their values, needed to perform a specific Activity



```
<InstrumentCommandingRequest id="1">
  <Header>
    <Originator>admin</Originator>
    <Source>ICD v7 updates</Source>
    <Justification>Provide an example</Justification>
    <Approval>Test</Approval>
    <Instrument>VIS</Instrument>
    <Generation>ICRTool_v2.0_on_localhost</Generation>
    <GenerationDate>2022-02-09T17:07:38.719Z</GenerationDate>
    <MibVersion>R00089-0.89.1</MibVersion>
    <Recipient>SOC</Recipient>
  </Header>
  <Component id="1">
    <ComponentName>Test_1</ComponentName>
    <ComponentType>MIB</ComponentType>
    <EarliestStartTime>2022-02-09T17:04:50Z</EarliestStartTime>
    <LatestStartTime>2022-02-09T17:04:51Z</LatestStartTime>
    <Duration>666</Duration>
    <Attitude>
      <Longitude>10.0</Longitude>
      <Latitude>10.0</Latitude>
      <PositionAngle>10.0</PositionAngle>
      <Frame>ECLIPTIC</Frame>
    </Attitude>
    <SpecialConditions>Do the barrel roll</SpecialConditions>
    <CalifJustification>Because we can</CalifJustification>
  </Component>
  <Activity id="1">
    <MibSequenceId>VIF500A</MibSequenceId>
    <OffsetTime>0</OffsetTime>
    <MibParameter>
      <Name>VOGF8018</Name>
      <Value>2</Value>
      <Representation>Raw</Representation>
      <Radix>dec</Radix>
      <Position>1</Position>
      <Unit>_</Unit>
    </MibParameter>
  </Activity>
</InstrumentCommandingRequest>
```

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Redmine page: <https://euclid.roe.ac.uk/projects/icrtool/wiki>

GitLab project: https://gitlab.euclid-sgs.uk/SDC-IT/iot_icrtool

EUCL-OTS-DDD-8-007: <https://euclid.roe.ac.uk/dmsf/files/11968/view>

Video Tutorial: <https://euclid.roe.ac.uk/dmsf/files/12465/view>





IOT – IODA

Instrument Operation Data Analysis



Giuseppe Riccio, Stefano Cavuoti & Massimo Brescia

5° Meeting Nazionale Collaborazione Euclid

IODA is a portable, multi-tasking and multi-user web application, specialized for tabular/image data analysis and monitoring, equipped with a local data repository and organized as a series of software modules specialized on several multi-process and multi-thread tasks

IODA IS THE OFFICIAL TOOL FOR IOT MONITORING & REPORTING OPERATIONS

● **Instrument monitoring, report generation and delivery**

- periodic report generation on a user-defined parameters list and delivery to remote archive;
- on demand customised report generation on a user selected parameter list, locally stored;

● **Visualization/Exploration**

- series of plots on user selected parameters/data products and ranges
 - dynamic histograms, scatter plots, trend plots
- observed images (static view, dynamic windowing, statistical characterization)

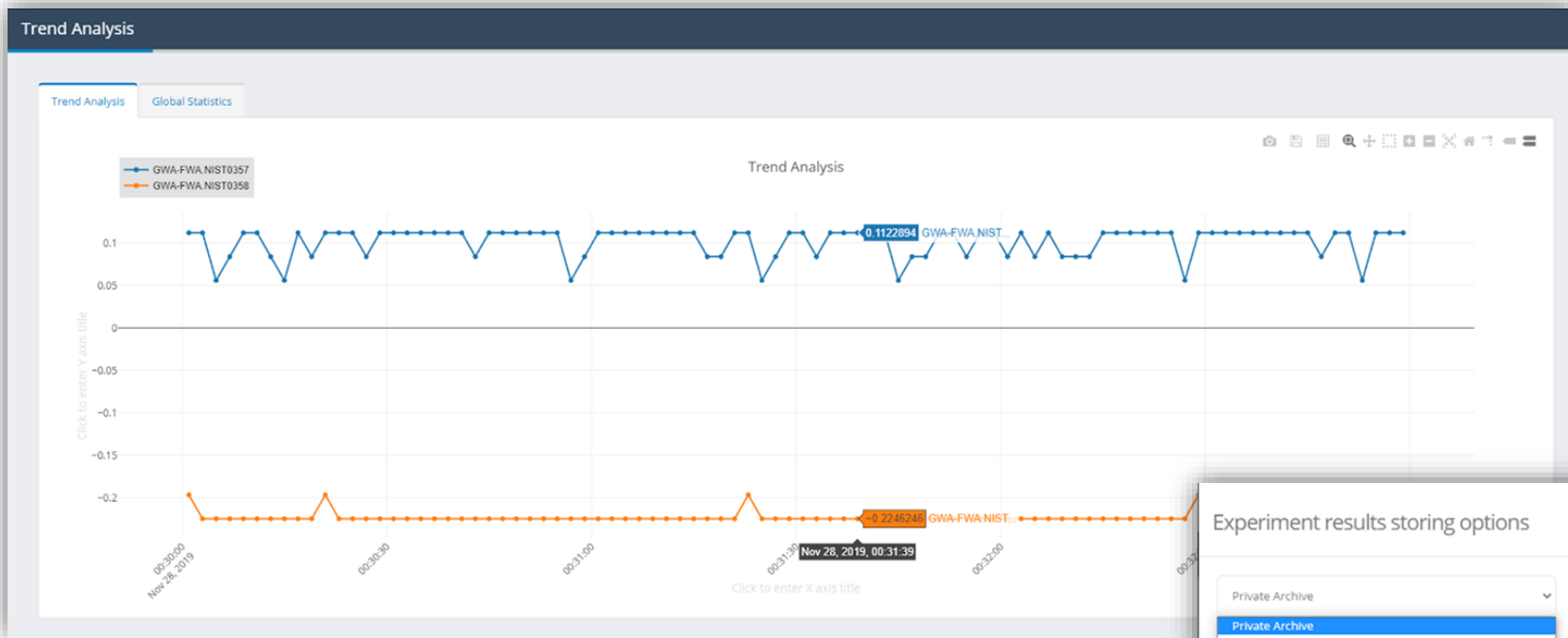
● **Statistics**

- base (default) estimators (automatically produced with the plots)
 - mean, median, RMS, σ , variance, min-max, MAD, NMAD, kurtosis, skewness, ...
- special estimations (tables/images), expandable upon requests
 - mode, percentiles, map counting, thresholding maps, biweight, σ -clipping, ...

● **Machine/Deep Learning**

- Regression/classification/clustering experiments on available data

Description & Docs : <https://euclid.roe.ac.uk/projects/ioda-euclid-operations-data-analysis-software-system/wiki>



Flagging system example: form suitable to flag and dispatch any anomaly detected by the IOT user during visual inspection of HK/TM or STM data.

Available for ALL analysis tools

Experiment results storing options

Private Archive Download a copy

Public Archive

Flag your experiment

Not Defined Ok Warning Serious

Details for GWA-FWA.NIST0357

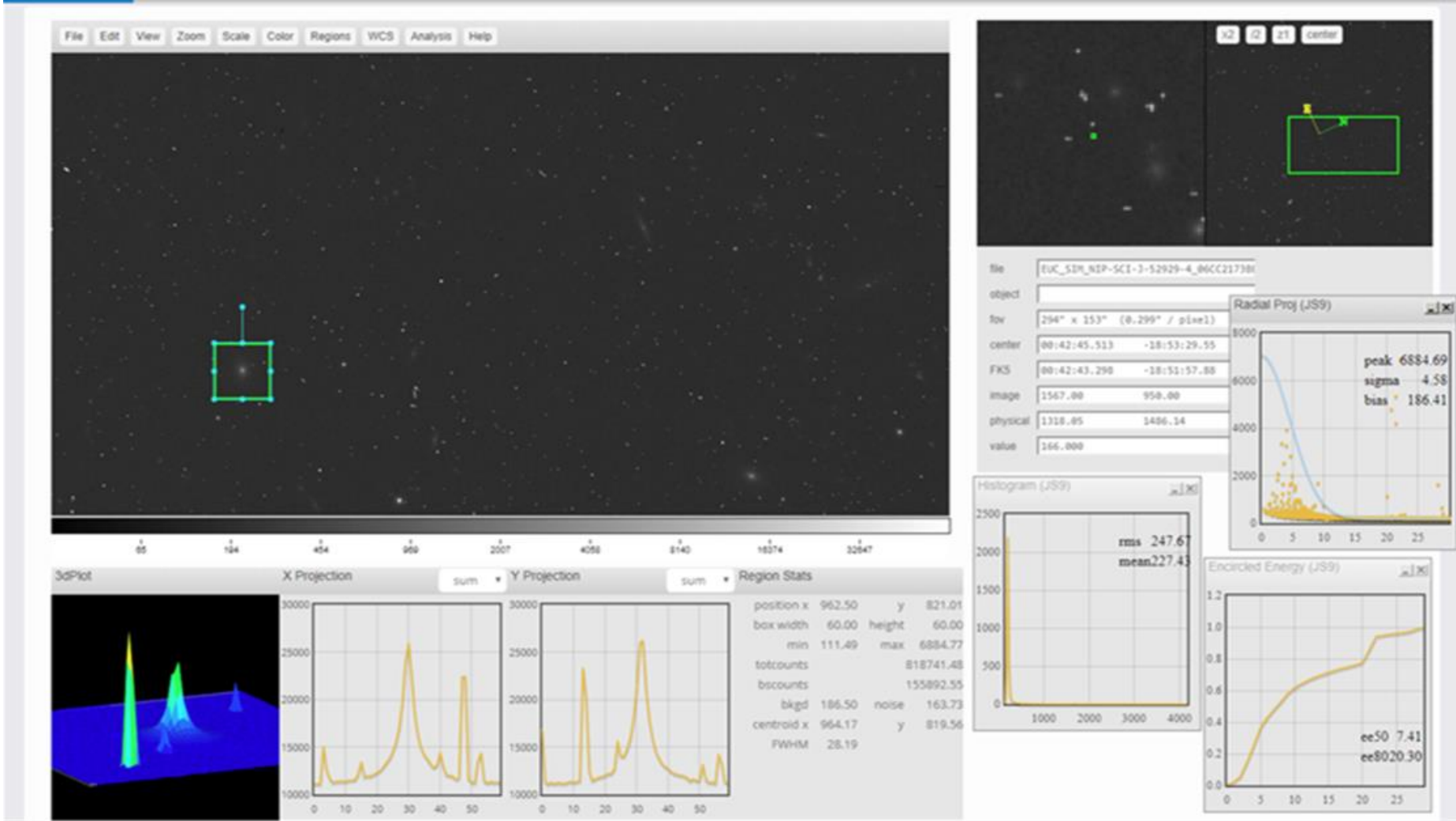
Parameter flag: Serious


Comments

Out of range

Send alert email to:


Close Confirm





IODA

Instrument Operations Data Analysis



Euclid IOT On-Demand Report id: 12433

iot-report-12433-custom-20191128003000_20191128003300_NISP

Report Periodicity: CUSTOM
 Report generation time: 2020-12-09 16:41:57
 Generated by: GiuseppeRiccio
 Configuration file: test_custom_nisp.json
 Owner: GiuseppeRiccio

*** Configuration

Date Start: 2019-11-28 00:30:00
 Date Stop: 2019-11-28 00:33:00
 Sampling: full

*** Notes

NISP Status: Detected 8 error(s)

NISP Error List

Level	Origin	Description
	HKTM	Impossible to retrieve data from local DB during analysis step. Analysis can not be performed
	HKTM	No data available in local DB for parameter NIST0913 during acquisition #1
	HKTM	Parameter : NIST0913. One or more additional parameters have no data available for Acquisition #1, Operation #1
	SCIENCE	90 values out of range for parameter NIST0357 during acquisition #1
	HKTM	90 values out of range for parameter NIST0357 during acquisition #1
	HKTM	Parameter : NIST0357. One or more additional parameters have no data available for Acquisition #1, Operation #1
	HKTM	Parameter : NIST0357. One or more additional parameters have no data available for Acquisition #1, Operation #2
	HKTM	Parameter : NIST0357. One or more additional parameters have no data available for Acquisition #1, Operation #3

on-demand reports recap on a set of NISP parameters, defined in a JSON configuration file. The same structure applies to periodic reports and to VIS & QLA

*** Summary of analyzed parameters

NISP HKTM			
Parameter	Subsystem	Description	Status
NIST0357	GWA-FWA	FWA Motor phase A current	
NIST0913	DFU-DCU	DFU1 DCU1 2.50_PWR Current	
NIST0230	GWA-FWA	GWA Motor phase B current	

NISP SCIENCE			
Parameter	Subsystem	Description	Status
NIST0230	GWA-FWA	GWA Motor phase B current	
NIST0357	GWA-FWA	FWA Motor phase A current	

The JSON configuration file can be easily edited by using the IODA online editor or uploaded by user

NEW Interface with **EAS** for Nominal **VIS/NISP** Operations and **NISP IWS** for Commissioning/Contingency

• **Currently working** on data from:

UPGRADE

LE1 SCIENCE TM NISP

UPGRADE

SOC HTKM for NISP and VIS

NEW

LE2 specific DP for VIS

NEW

QLA data provided by SOC

NEW

tables/images uploaded by users

UPGRADE

Flagging system to highlight errors or issues in plots, reports & images



Easy customizable for other systems/instruments/DPs



Administration panel for **easy configuration**

NEW

Docker version for easy installation

NEW

Backup system for data recovery



Monitored data are **not permanently stored** on IODA machine (thus reducing redundancy and storage reqs)

UPGRADE

Authentication service to access with registration and password recovery forms



Image analysis and cut-out extraction



Extensive use of **parallel computing** for highest performances



Machine Learning and advanced statistics tools

IODA current installations:

- NISP01 machine interfacing with IWS repository
- NISP01 machine interfacing with EAS
- VIS machine interfacing with EAS

IODA has been SUCCESSFULLY tested during SOVT-1 campaign