PROBA-V Image Quality Center: vicarious calibration software system

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PROBA-V IQC : Main partners

» Qinetiq Space :
  » prime
  » satellite platform

» OIP
  » camera

» Vito
  » PI
  » user segment
    » Data ingestion (DIF)
    » Production (PF)
    » Image Quality (IQC Radiometric)
PROBA-V IQC : Mission

» ESA mission
» SPOT VGT replacement/gapfiller
» Small satellite platform (Proba)
» 1 sensor
» 3 cameras
» 1 VNIR and 3 SWIR detectors per camera
» 4 spectral bands : blue, red, nir and swir
» Swath approx. 2000km
» Max Spatial resolution 330m (100m)
» Launch date 19/04/2013
» VEGA launcher (Kourou)
PROBA-V IQC : Challenge

» No active thermal control system
» No onboard calibration devices
» 3 different cameras
  which may show different performance degradation patterns
» Relatively large differences in viewing geometry for the different detectors, especially for the SWIR detectors compared to the VNIR detectors
PROBA-V IQC : User Segment

Data providers

Calibration manager

DRS

IQC

IPC

DIF

PF

PQC

LTDA

PDF

PQC operator

Users

IPC operator

MCC

Other US operators
PROBA-V IQC : Design principles

» Independent from other subsystems
» Parallel processing with automated workflows
  » L1B data upto calibration result
  » All results inserted in local database
» Graphical User Interface
  » View on database
  » Plotting results
  » Statistical processing based on the database content and input from GUI
» New Instrument calibration parameter updates
  » traceability (database)
  » GUI
  » Automated distribution towards other subsystems
PROBA-V IQC : Design principles (cont)

» Reprocessing simple and traceable
  » All products automatically processed default settings
  » After evaluation, one or more products can be reprocessed
  » New set of processing parameters stored and versioned
  » Results of versions can be compared
  » Versions can be made new default
PROBA-V IQC : Layout
PROBA-V IQC : Implemented methods

» Absolute and Interband (OSCAR facilities)
  » Rayleigh
  » Sunglint
  » DCClouds
» Desert (absolute / multi temporal / cross sensor)

» Dark Current
» Multi Angular - equalisation over fov
» Camera to Camera Overlap
» Badpixel detection
» Linearity Check
» Lunar calibration (under development)
PROBA-V IQC : Software components

- Algorithmic modules:
  - C++ including Interfaces to Modtran, libRadtran and 6SV
- Workflows logic:
  - Java framework Jodi developed at Vito
  - Master-Worker pattern
  - Job pulling: automatical load balancing
- Database (ORACLE SPATIAL):
  - L1B products ingested automatically
  - Workflows triggered based on the content of the database
  - Instrument Calibration Parameters stored in database + updates
- Statistical calibration reporting library (Java)
- Graphical User Interface (Java)
PROBA-V IQC : Workflow

- Data extraction / conversion
  - HDF5 -> ENVI
- Resample
- Overlap
- Pixel masking
- LUT generation
- Method
- Store in database
PROBA-V IQC : User interface
PROBAV IQC : SVT results DARK CURRENT

- Dark current values from SVT test data (camera covered)

Blue

Red

SWIR1

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PROBA-V IQC : SVT results Cam2Cam

» Comparison overlapping pixels of the right to center camera
PROBA-V IQC : Conclusion

» Developed a fully fledged and highly autonomous software system for the calibration of PROBA-V

» Finished SVT tests in December 14 2012

» Lets launch !