CU6 Spectroscopic First Look

Instrument and data sanity check

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Top level work packages

From CU6 Processing development plan (GAIA-C6-SP-OPM-DK-002-1)

The 4 “common” Top-level work packages:
GWP-C-601-00000 Coordination & management of CU6
GWP-D-602-00000 Architecture & technical coordination of CU6
GWP-D-603-00000 Software quality assurance
GWP-C-604-00000 Integration of CU6 sub-systems & test of CU6 system

The 8 “sub-system” Top-level work packages:
GWP-D-609-00000 Host framwork development, validation & test
GWP-S-610-00000 Spectroscopic first look, sanity check & science alerts
GWP-S-620-00000 Spectra extraction
GWP-S-630-00000 Calibration of the spectroscopic instrument
GWP-S-640-00000 Radial velocity zero point
GWP-S-650-00000 Single transit analysis
GWP-S-660-00000 Multiple transits analysis

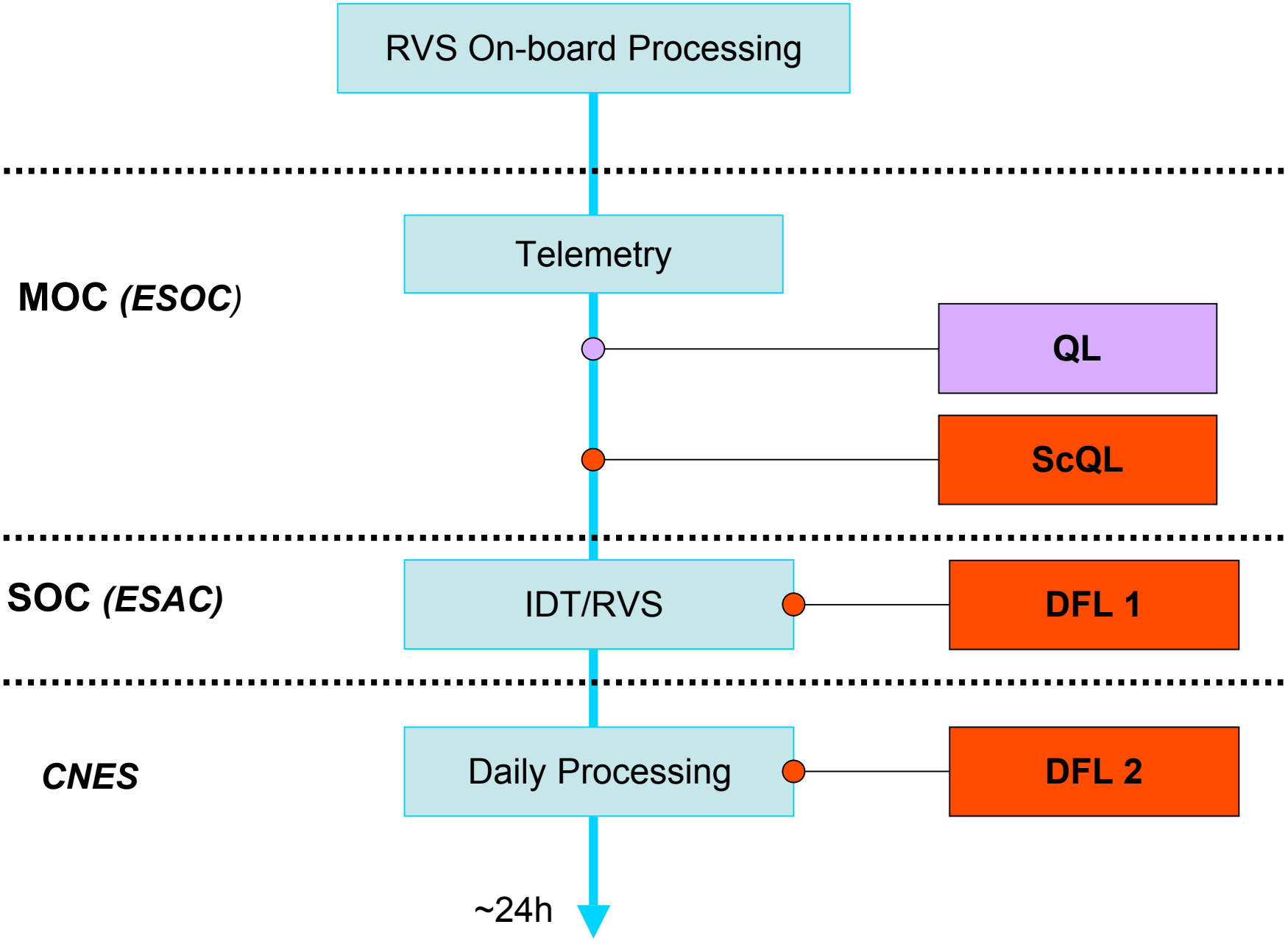
Spectroscopic first look & science alerts

From CU6 Processing development plan (GAIA-C6-SP-OPM-DK-002-1)

GWP-S-610-00000 Spectroscopic first look & science alerts

GWP-C-610-01000 Management, configuration management & interfaces of FL/SA
GWP-C-610-02000 Detailed functional analysis of first look and science alerts
GWP-S-610-03000 Interface with Quick Look group
GWP-S-610-04000 Science Quick Look: on-board processing logs
GWP-S-610-05000 Science Quick Look: raw data
GWP-S-610-06000 Detailed First Look: calibrations
GWP-S-610-07000 Detailed First Look: radial and rotational velocities
GWP-S-610-08000 Detailed First Look: faint stars
GWP-S-610-09000 Science alerts

Intermediate data treatments (IDT)
Science Quick Look (ScQL)
Detailed first look: (DFL)
Quick Look: (QL)


RVS On-board Processing
Telemetry
MOC (ESOC)
QL
ScQL
SOC (ESAC)
IDT/RVS
DFL 1
CNES
Daily Processing
DFL 2
~24h

Responsabilities within the RVS First Look task

Task	Definition	Development	Integration	Operation
QL	ESOC (input from industry, CU3, CU6)	ESOC	ESOC	ESOC
ScQL	CU3, CU6, ESOC	under discussion	ESOC	ESOC
DFL Monitor (using IDT)	CU6, CU3	CU6	ESAC	ESAC (automatic)
DFL Evaluator (using IDT)	CU6, CU3	CU6	ZAH (CNES)	CU3 (mirrored → CU6)
DFL Monitor	CU6, CU3	CU6	CNES	ESAC (automatic)
DFL Evaluator	CU6, CU3	CU6	ZAH (CNES)	CU3 (mirrored → CU6)

GWP-C-610-01000 Management, configuration management & interfaces of FL/SA

- GWP-C-610-01100 Planning, schedule, internal resource, action tracking & followup
- GWP-C-610-01200 Facilities, tools & communication
- GWP-C-610-01300 Document & software reviewing, bug tracking
- GWP-C-610-01400 Validate result data
- GWP-C-610-01500 Interfaces: requests for simulation, auxiliary data, etc…

GWP-C-610-02000 Detailed functional analysis of first look & science alerts

- GWP-C-610-02100 Definition of functional requirements
- GWP-C-610-02300 Feed-back on data model
- GWP-C-610-02400 Definition of data flows
- GWP-C-610-02500 Definition of data volume

GWP-S-610-03000 Interface with Quick Look group

[To Be Defined]

With MOC (ESOC) via CU3

On-board data treatments and telemetry

On-board data treatments usefull for FL:

- Detection of sources by the sky-mappers:
  - List of t,y,F for detected objects + SSM windows
- Selection of samples and attributes windows:
  - Using t,y,F from detection, select the MBP and RVS samples that should be send to the ground
- Perform CCD to CCD homogenizing and co-addition yield also « on-board processing log » *[To Be Confirmed]:*
  - List and locations of rejected cosmics (or just number of rejected cosmics if too heavy for the telemetry stream)
  - Maps of non-coadded CCDs (if not too heavy for telemetry stream)
  - Total counts (TBC – test compression/decompression)

Telemetry:

- On-ground decoding/decompression of HK data
- **Quick look**
- On-ground decoding/decompression of sky-mapper, MBP and RVS data

ScQL : « on-board processing log »

GWP: *GWP-S-610-04000*
Objective: *Test the good behaviour of the on-board processing*
Execution: *ESOC*

- Cosmic ray tests *[if on-board co-addition exists]*
  - Constant rate (TBC)
  - Random locations
- Rejected samples *[if on-board co-addition exists]*
  - Constant rate (TBC)
  - Random rate from CCD / CCD
- Compression/decompression
  - Check no-modification of total counts
- On-board selection *[if windowing mode confirmed –very likely]*
  - Check attribution of windows with respect to: e.g. magnitude, location on CCD

IDT

Execution: *ESAC*

- Cross-match SSM RVS data:

[TBC: maybe unnecessary with new design because of the windowing mode]

Re-generate link between object and corresponding samples in raw images/ribbon (using on-board selection algorithms)

- Refine centroding and flux
- Perform cross-matching with objects in main Data-base (object ID)

DFL1 : « IDT data »

GWP: *GWP-S-610-05000*
Objective: *check the good quality of the raw data with minimal or no use of IDT data*
Execution: *ESAC*

- Model the windows (using previous calibrations : overall response, spectral dispersion law, SSM data : locations in FP and MBP data : flux, color index) and compare to real data

  Test : stability of overall response, good location of spectra OR if too heavy for processing power, just sum of the flux in the window.

- Check spectra length : select bright, little-crowded, late type stars + identify Ca lines in spectra + check distance in samples between Ca lines.

  Test : first order stretches

- Check spectra height

  Test : PSF AC

- Check PSF AL profile : derive line widths distribution, analysis « narrow-line part » of the distribution

  Test image focus

From ESAC to CNES

- *Ingestion in the main database*

- *Transfer raw and associated data from ESAC to CNES/nominal pipeline*

- *Execute daily derivation of the calibration: bright stars*

  Execution: *CNES*

  - Extraction: extraction, apply calibration, clean & subtract background on bright stars
  - Derivation of RV, vsini of bright stars
  - Calculate new calibrations from bright stars

DFL2 - Part 1/3: « Calibrations »

GWP: *GWP-S-610-06000*
Objective:
(1) Monitor the good health of the instrument (effects that may/would have been missed by DFL calibrations)
(2)Check the quality of the process of deriving the calibrations
Execution: *CNES*

- [P1] Monitor the evolution of the radial and rotational velocities for bright stars.
- [P1] Compare derived and known a-priori RV and v sin i for bright reference stars.
- [P0] Monitor the evolution of the calibration parameters: e.g. spectral dispersion law, overall throughput, Read-out noise, etc…
- [P1] Monitor the evolution of the residuals between the calibrated spectra of the day and previous observations with Gaia
- [P0] Analyse the residuals between the calibrated spectra of the day and ground-based spectra for reference stars.

- ***Execute daily derivation of radial & rotational velocities***

  Execution: *CNES*

- Extraction:
  Extraction, apply calibration, clean & subtract background on all stars

- Derivation of RV, v sin i of stars V < 15

DFL2 - Part 2/3: « radial & rotational velocities »

GWP: *GWP-S-610-07000*
Objective:
(1) Monitor the good health of the instrument (effects that may/would have been missed by DFL calibrations)
(2)Check the quality of the process of deriving the calibrations
Execution: *CNES*

- Monitor the evolution of the radial and rotational velocities for stars V<15.
- Compare derived and known a-priori RV and v sin i for stars V<15.

DFL3 - Part 3/3: « Faint stars »

GWP: *GWP-S-610-08000*

Objective:

(1) Monitor the good health of the instrument (effects that may/would have been missed by DFL calibrations)

(2)Check the quality of the process of deriving the calibrations

Execution: *CNES*

- Monitor the evolution of the residuals between the calibrated spectra of the day and previous observations with Gaia (V > 15 or subset of stars)

Techniques: co-addition of pixels or co-addition of spectra, …

Collaboration is welcome…