



**Towards the FCI Commissioning
Strategy for product quality assessment**

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FCI-MAG #6



- System commissioning in a nutshell;
- Introduction – what are “Test specifications”?
- In more detail:
 - FCI Level 1 Dataset Test Specification;
 - FCI Level 2 Products Test Specification;
- Summary.



- The overall objective of the commissioning is to ensure that the capabilities of the system are demonstrated in operational configuration under operating conditions.
- The processes involved at this stage consist of:
 - **In-Orbit Verification:** confirmation that the satellite (including instruments) meets the relevant subset of Space Segment requirements [the satellite manufacturer has to demonstrate compliance against the satellite specifications];
 - **System Verification:** confirmation that the MTG System meets the relevant subset of System level requirements;
 - **Operational Validation:** confirmation that the System (including operations data, people and processes) is able to support the operational services;
 - **Scientific Validation:** confirmation that the scientific data and products generated by the System meet the intended scientific performance objectives.



What are “System Commissioning Test Specifications”? (1/2)

- The Level 1 dataset, Level 2 product and Calibration Validation commissioning are guided by so called **System Commissioning Test Specifications**;
- First versions of the test specifications for these commissioning activities were available at the MTG-I and -S System CDR (mid-2019 and mid-2021, respectively);
- The final version of the test specifications is prepared for the relevant satellite Launch Operational Readiness Review (LORR), together with the tools needed during the commissioning activities;
- Following the execution of the commissioning tests, test reports are written and the readiness for the product to be released to the operational users is assessed in a Product Validation Review Board (PVRB);
- ***NB: The tests are specified in the commissioning test specs, and the Cal/Val related activities performed during commissioning are embedded in these.***



What are “System Commissioning Test Specifications”? (2/2)

- The tests are the result of a balancing between:
 - The need to comprehensively test the compliance of the System to the System Requirements;
 - And the limitations of the in-orbit verification feasibility;
 - Methodology limitations (envisaged tests may be more or less conclusive);
 - Limited capacities to perform special acquisitions (satellite safety, limited flexibility);
 - Limited resources before commissioning (to describe the test, set-up the procedure, develop/test the OFTs);
 - Limited resources during commissioning (6 months for System commissioning, availability of experts);
- Not all the System Requirements are verified in-orbit (some are verified by ground testing, review of design, analysis etc.);
- Satellite specific tests (characterisation, tuning, operability) are tested in the Satellite Commissioning (ESA and industry) beforehand.



**FCI Level 1 Dataset Test
Specification**

&

**FCI Level 2 Products Test
Specification**

- **First image inspections (Level-0, Level-1b, Level-1c);**
- **Geometric tests on Level-1c:**
 - Tuning of the INR processing:
 - Observables processing (stars, landmark, ranging);
 - Geometric calibration: daily deformations measured with stars;
 - Kalman filter;
 - Absolute navigation error;
 - Channel to Channel relative navigation error;
 - Image to Image relative navigation error;
 - Coverage;
- **Geometric tests on L1b:**
 - Inter-swath navigation error.

- **Radiometric tests on Level-1b:**
 - First in-flight calibration parameters from Deep Space, Mirror Neutral Density (VIS-NIR), Black Body (IR);
 - Detector pixels health monitoring: radiometric noise, noise power spectral density, uniformity of gains and offset;
 - Noise modelling over the specified dynamic range;
 - Back telescope transmission for the decontamination;
 - Earth Stray Light;
 - Sun Stray Light;
 - Radiometric saturation;
 - Striping (also performed on Level-1c);
- **Calibration and Inter-calibration on Level-1c and Level-1b:**
 - Inter-calibration of the IR channels with IASI and SEVIRI;
 - Vicarious calibration for the VIS-NIR: Moon, deserts, deep convective clouds.

- **The tests are performed on nominal acquisitions, and the relevant ones are repeated for**
 - Satellite manoeuvres: Station Keeping (East-West and North-South), Yaw Flip;
 - Particular conditions: eclipse;
- **Most of the tests are routinely and automatically performed by the commissioning tools;**
- **Tests relying on special acquisitions and Level-1b:**
 - Scan with 50% overlapping swaths: for Earth Stray Light and Inter-Swath Navigation Error;
 - North-South vertical scan: for detector normalisation;
 - Varying integration times: for non-linearity;
 - Satellite de-pointing: for multiple lunar acquisitions (calibration and Earth Stray Light);
- **Functional testing of the scan coverage and processing:**
 - Full Disk Coverage (in 10 min);
 - Rapid Scan (northern quarter in 2.5 min);
 - Ad-hoc subset of swaths (some tens of sec);
- **Timeliness and availability.**

Individual Monitoring

- Compute statistics across the FCI disk or selected geographical regions;
- Compute and store statistics for both geophysical parameters and corresponding data quality indicators;
- Compute and store statistics for different cloud types/retrieval scenarios (OCA).

Continuous validation

- Collocate FCI and corresponding reference data spatially and temporally and compute statistics on the per-pixel differences;
- Compute and store statistics for different cloud types/retrieval scenarios (OCA and CTTH).

Reference datasets:

- SEVIRI/MPEF;
- SEVIRI/NWC-SAF;
- FCI/L2PF (comparable products like CTTH and OCA);
- Radiosonde observations (AMVs).

	Individual monitoring	Continuous validation				
		SEVIRI MPEF	SEVIRI NWC-SAF	Radiosonde observations	FCI L2PF	FCI L2PF previous R/C
CLM	✓	✓	✓			✓
CLMTest	✓		✓			
CT	✓	✓	✓		✓	✓
CTTH	✓	✓	✓		✓	
OCA	✓	✓	✓		✓	✓
GII	✓	✓				
FIR	✓	✓				✓
ASR	✓	✓				
CRM	✓	✓				
OLR	✓					
AMVI	✓	✓				
AMVF	✓	✓		✓		



- The implementation and validation of the commissioning tools is well under way;
 - The first versions have been delivered and tested in IVV campaigns;
- Set-up an access to the geometric information from the IPDF-I, in complement to the Level-1b;
- Set-up the Level-1b processing of the commissioning special acquisitions with IDPF-I or IQT-I;
- The Test Specifications need to be enhanced with the associated procedures and put into the commissioning timeline;
- Rehearsal of the commissioning tests.



Thank you!

Questions are welcome.