

Status of the LI System Commissioning Preparation

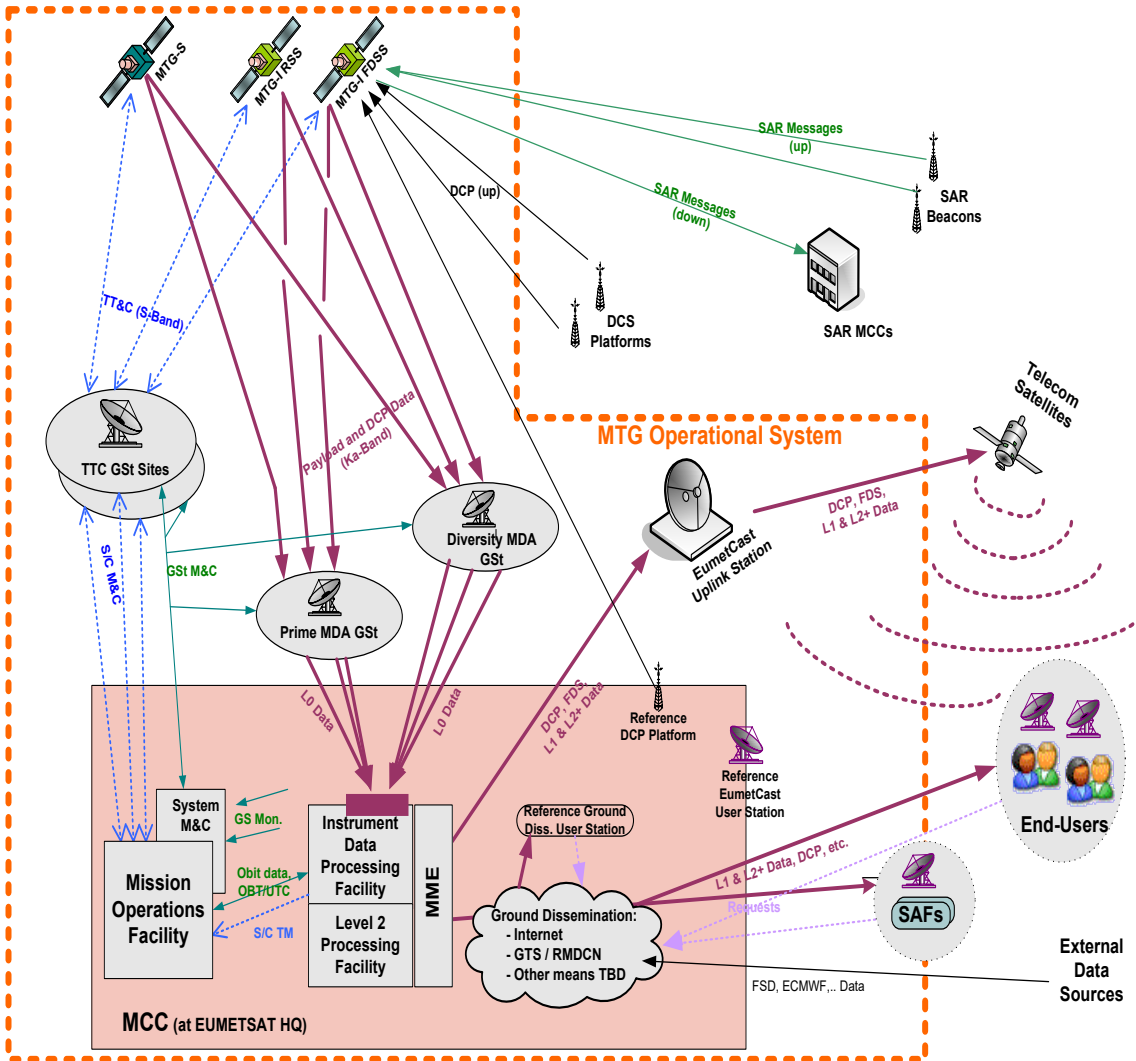
EUMETSAT LI IFCT



Outline

- Introduction
- EUMETSAT plan
- Discussion

Introduction



The objective of the commissioning is to ensure that the capabilities of the system are demonstrated in operational configuration under operating conditions.

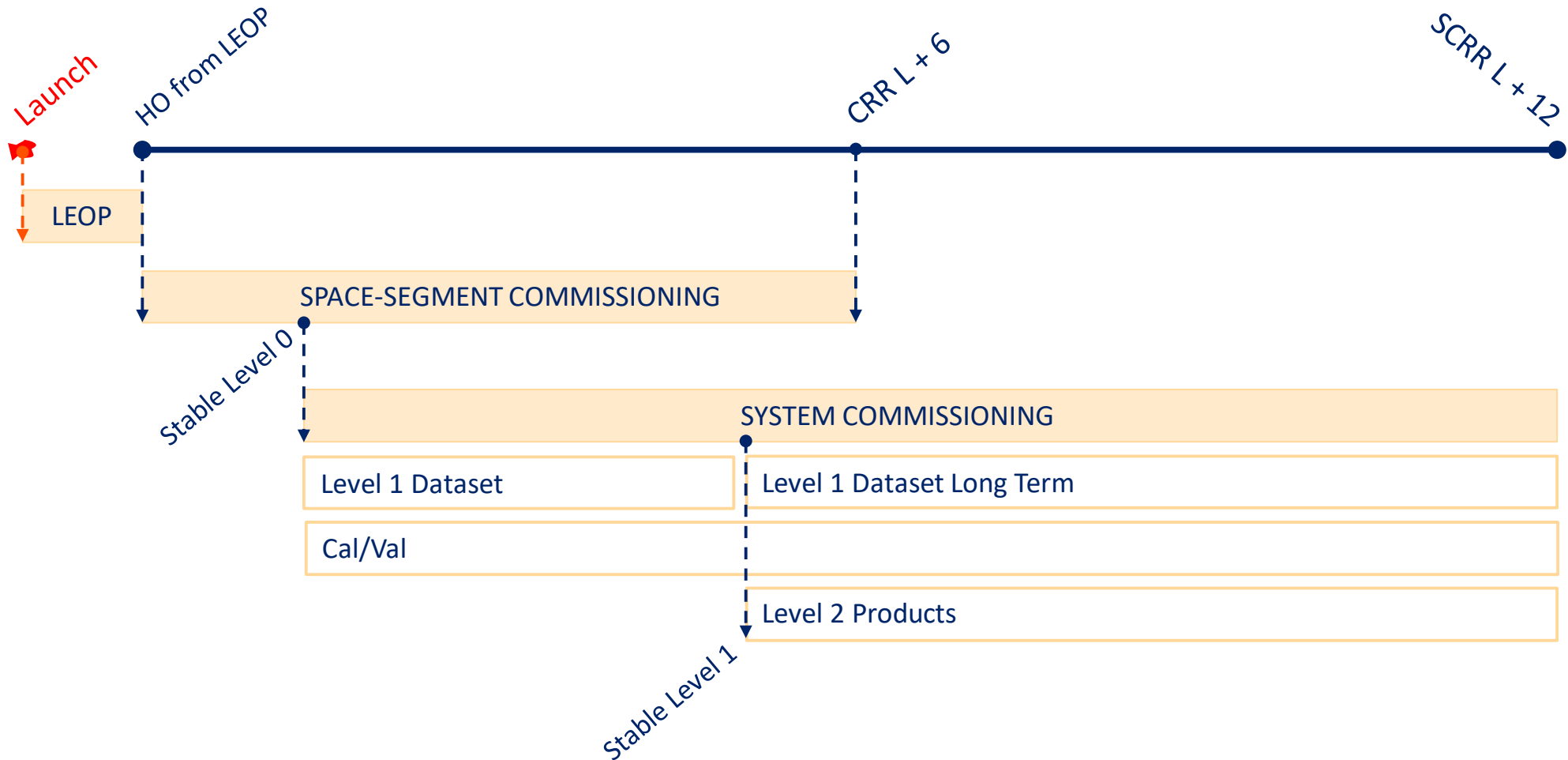
The main goal of the commissioning is to establish sufficient and objective confidence about the readiness of the System allowing the hand-over of the MTG spacecraft operational responsibility, corresponding ground segment and services to the Operations Department (OPS).

Introduction

The duration of the commissioning will be of 1 year; of which 6 months will be devoted to the space-segment commissioning

- Space-segment commissioning objectives:
assess the satellite instruments functionality, operability and performance against the space segment requirements.
- System commissioning objectives:
 - I. assess the system readiness to deliver validated Level 1b data and Level 2 products to end-users;
 - II. assess the functionality, operability and performance of the entire system prior to commencing the routine operations.

Introduction



(S)CRR = (System) Commissioning Results Review
LEOP = Launch and Early Operations Phase

System Requirements and Tests

LI Data Acquisition Requirements

Level 1b data completeness	• Check of the data format against the Level 1b Format Specifications; • Check on the timeliness (for both DTs and background).
Level 2 data completeness	• Check of the data format against the Level 2 Format Specifications; • Check on the timeliness (for DTs, groups, flashes and accumulated products).
DT data content (at Level 0)	• DT energy; • DT columns and rows, in detail, these must be in the range [1:1170] and [1:1000], respectively; • Time information, in detail, by examining different DTs one must verify that the time is increasing through the DT sequence; • The DT background; • The RTPP threshold for the DT; • The content of the 3x3 window.
Coverage	• Re-gridding of the navigated LI Optical Channels (OCs) on the FCI IR grid and check on the coverage of the combined re-gridded data; • Specific check on the coverage of EUMETSAT member states (required 100%).
Detection parameters configuration	Variation of on-board detection parameters with the aim of verifying a correct response of the system (<u>tightly related to the tuning process for optimizing the detection performances</u>)
Notes	These tests will be performed ad-hoc and will not constitute continuous monitoring

System Requirements and Tests

LI Dataset Level 1 Requirements

Detection Efficiency (DE) and Triggered Events

- **Monitoring of the lightning radiance;**
- Monitoring of the background reflectance at the locations of lightning detections;
- **Lightning radiance vs background radiance density plot;**
- **Assessment of the minimum detected lightning radiance against background radiance;**
- **DE assessment against external data;**
- DE assessment by using simultaneous detections between 3 LI OCs in small overlap regions.

False Alarm Rate (FAR) at Level 1b and Level 2

- Number of DTs at Level 1b;
- Number of true DTs after Level 2 filtering;
- FAR and Flash FAR assessment against external data.

Flash DE

- **FDE assessment against external data.**

Radiometric accuracy

- Radiometric calibration and stability monitoring through the use of Deep Convective Cloud (DCC) targets by means of the GSICS DCC calibration method/tool:
 1. Target selection via brightness temperature in the IR 10.5 FCI channel;
 2. Target extraction from the LI Level 1b background images;
 3. Analysis restricted to ± 20 deg (E-W, N-S);
 4. Method currently applicable for stability monitoring.

System Requirements and Tests

LI Dataset Level 1 Requirements

Radiometric accuracy

- Radiometric absolute calibration and stability monitoring through the use of desert targets:
 1. Fixed set of targets: deserts and oceans;
 2. Key targets are deserts, while ocean ones are used for sanity check;
 3. The LI instrument is calibrated as a whole since the four LI OCs combined provide the complete set of targets (DCC method allows to monitor single LI OCs.)
 4. Absolute accuracy 5%.
- **Intra-OC monitoring with statistical approach based on the comparison of background radiance histograms over regions of overlap between OCs.**
- **Intra-OC pixel-by-pixel comparison monitoring.**
- **LI vs FCI pixel-by-pixel comparison monitoring.**
- Analysis of the DN histograms that are available operationally for each LI pixel; the monitoring will take place over stable and cloud-free targets such as desert targets.

Notes

These tests will be done during Commissioning and for long-term monitoring

System Requirements and Tests

LI Dataset Level 1 Geometric Requirements

ASPKE

- BASELINE- Landmark analysis of Level 1b background images (same approach adopted for FCI; applicable during the day);
- **ASPKE assessment against external data.**

Notes

These tests will be done during Commissioning and for long-term monitoring

More tests

Extra tests

- **Lightning detection Time Accuracy assessment against external data.**
- **Exhaustive climatology of LI Level 2 data against climatology results from other instruments/networks.**
- Monitoring of the number of DTs (both processed and rejected) by each Level 1b filter.
- Specific tests of the single Level 1b filters:
 1. Properties of false DTs rejected by the Spatio-Temporal Coherency Filter;
 2. Micro-Vibration filter tested by checking the derived micro-vibration spectrum against the variation of the total number of DTs at Level 0 and through the use of the Micro-Vibration Window that will allow us to derive, in an independent way, the micro-vibration spectrum.
- Monitoring of the Level 2 products:
 1. Group rate;
 2. Flash rate;
 3. DT rate;
 4. ...
- Monitoring of the accumulated products against external data.
- Monitoring of the instrument (Dark, Readout Noise, Offset).

Conclusions

- LI Commissioning preparation is on-going;
- The implementation of the OFTs for the LI Commissioning is on-going;
- EUMETSAT is involved also in the preparation of the LI Space Segment Commissioning.
 - ESA and EUMETSAT could prepare a presentation on the Space Segment Commissioning for the LI MAG meeting #12 (June 2021)