Paper ID: 83307
oral

IAF EARTH OBSERVATION SYMPOSIUM (B1)
Interactive Presentations - IAF EARTH OBSERVATION SYMPOSIUM (IP)

Author: Dr. Emiliano Capolongo
OHB Italia SpA, Italy

Mr. Giovanni Galiero
OHB Italia SpA, Italy
Mr. Salvatore Mignano
OHB Italia SpA, Italy
Mr. Silvio Neglia
OHB Italia SpA, Italy
Dr. Anna Notarantonio
OHB Italia SpA, Italy
Dr. Francesco Petullà
OHB Italia SpA, Italy
Mr. Salvatore Vono
OHB Italia SpA, Italy

HIGH DATA VOLUME/THROUGHPUT PDT SYSTEM TASKS FOR NEXT GENERATION COPERNICUS MISSIONS

Abstract

Due to their success, the Copernicus Next Generation missions will be based on improved science data volume collection with the aim to improve their scientific objectives as well as their spatial-temporal resolutions.

Many of this paper authors had personal involvements and experience in the design/test of the Copernicus Sentinel1 A/B/C/D missions. Hence, based on an ESA report (June 2023), it was possible to estimate the increased science data volume to be acquired and downloaded for a Copernicus Sentinel1 NG mission. Figures estimated were:maximum input data rate 6Gbps, maximum useful downlink data rate of 10Gbps.

The PDT is a key subsystem in high science data throughput missions. In its recent heritage, OHB Italia had the mission system responsibility to design and to develop both the Space and the Ground segment of an optical Earth Observation Mission. The heritage PDT main characteristics were:input data rate of about 12 Gbps, XBand downlink data rate 600Mbps, daily data volume 2.4Tbits.

For these reasons, OHB Italia developed a method to define/design the main PDT characteristics based on the following inputs: Spacecraft Orbit; Number and locations of the Ground Stations; Science and Platform housekeeping telemetries input data rates variable along S/C orbits.

The Copernicus S1-NG case study was chosen for its high data volume throughput, estimated to be in the order of 14Tbits per day.

To illustrate the simulations/estimations method capabilities, hereinafter are reported the hypothesis on which it relies on (common to every mission with similar data volume characteristics): Ka Band dual polarization data downlink; Adoption of the SCCC (CCSDS 131.2); CFDP(class 1 and 2).

This method allows to: A-determine the optimal ACM format for each G/S and chosen visibility angles; B-determine the optimal locations of the G/Ss; C-evaluate the impact on the required PDT Mass Memory of the CFPD Ground architectures.

It is an iterative process; the first step consists in the choice of the initial ACM formats to check if the specified data volume is downloadable. It allows also to preliminarly check if the chosen G/Ss are suitable based on their attenuation estimations and RF link closure. Once that ACM formats are chosen, further simulations are run to estimate the effects of the Step C hypothesis on the PDT Mass Memory.

The case study demonstrated that with only 3 polar G/Ss it is possible to design a PDT suitable for the S1-NG mission and that suitably fit in the OHB Italia platform.