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A NEW CHAPTER BEGINS FOR EO-MISSIONS - HYBRID OPTICAL/RF PAYLOAD FOR DATA
RELAY APPLICATION BECOMES OPERATIONAL

Abstract

Modern earth observation and monitoring systems like Copernicus rely on LEO satellites gathering information with their various types of imaging or non-visible spectrum sensors. The amount of data acquired by such sensors can easily reach several terabits in volume and is traditionally transmitted to ground in a store forward scheme facilitated by X-Band RF downlinks. The drawbacks of this solution are obvious: the data dump window is limited to approx. 10 minutes based on the visibility window of a fly-by LEO satellite over a dedicated ground station. Additional to the high data transfer capabilities the demand is for not jammable data transfer from Spacecraft to user. This is needed for the increasing harmful interference – intentional or unintentional – communication links. The combination of OISL with a data relay architecture is providing additional solutions for the barrier of re-tasking a earth observation during their mission and to reduce the latency time for data refreshing. DLR and ESA are fostering the realization of a GEO relay service within the PPP of EDRS, the European Data Relay System To overcome those specific drawbacks ESA, DLR and Astrium Services (ASV) have started the European Data Relay Satellite (EDRS) program which provides for a solution to resolve the drawbacks described above. The introduction of a geostationary satellite (GEO) acting as a relay satellite receiving data from earth observing LEOs and relaying it to ground is key to an enhanced LEO to ground data link performance. More than one GEO satellite is required to cover the whole earth and, if installed, would allow for near real time data downlinks to earth from any LEO satellite. The data rate of the LEO - GEO link should be very high in order to cope with the large amounts of data to be relayed from different LEOs. Tesat Spacecom has developed together with ESA and ASV the Hybrid Optical/Ka-Band payloads necessary to fulfill the requirements placed upon a near real time data relay system between LEO - GEO Ground. Further to this Optical/Ka-Band payload element a Ka-Band inter-satellite link (KA-ISL) functionality is implemented to serve LEO satellites without an LCT counter terminal. On November 28, 2015 with the commissioning of the optical link between the Copernicus LEO Satellite Sentinel-1A and the GEO Satellite Alphasat as the relay a new era of data transmission for images starts.