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TEST RESULTS OF ADVANCED COMMUNICATIONS SOLUTIONS FOR THE NEXT GENERATION OF EARTH OBSERVATION SATELLITES

Abstract

EO- ALERT is a European Commission H2020 project coordinated by Deimos Space. Partners are DEIMOS Imaging, OHB Italia, DLR, Politecnico di Torino and TU Graz. The goals of the project are the definition and development of the next-generation Earth Observation (EO) data processing chain. EO data processing is taking place on board using advanced avionics and very powerful Field Programmable Arrays (FPGAs) with the aim of delivering the EO product to the End Users with very low latency. Applications considered in the project are ship detection, severe weather monitoring and nowcasting. The communications subsystem has to transmit bulk data (raw and processed SAR and optical images) and alerts generated on board with data rates in the Gbit/s range and minimum latency. The latency requirements for global data delivery are quite strict: 30 minutes for bulk data and max. 5 minutes for alerts. Since the raw synthetic aperture radar (SAR) and optical images are large (466 and 200 MB each), high-speed links are required. On the other hand, the alerts containing text and thumbnail images are small (typically 10 kB), but during an orbit up to 900 alerts can be generated resulting in a data volume of 9 MB. In the framework of EO-ALERT TU Graz developed a communications link emulator representative of the flight system containing a simulated Ka-band and S-band chain as well as a hardware solution with an INMARSAT-compatible transceiver for global alert delivery. A hardware S-band link simulator has been designed to send alerts directly to small, low-cost hand-held terminals. These are considered advantageous for rescue teams on ground, who have no Internet access. A small transceiver (iDRS) using INMARSAT L-band capacity is planned for global alert delivery. The product has been developed by the company ADVALUE and is already flying. For the system tests TU Graz has been using a commercial BGAN terminal connected to the INMARSAT infrastructure. Data rates of 200...250 kbit/s and the target latency were verified. The near-real-time delivery of the alerts is

performed simultaneously via Ka-band, S-band and the INMARSAT transceiver. The paper presents the communications requirements for this novel architecture of EO systems, the technical solution of the communications systems emulator and the results of the system tests. The Ka-band system is simulated in terms of orbit delay and wave propagation effects by an FPGA board.