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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. In contrast to conventional EO satellites, key elements of EO data processing is taking place on board using advanced avionics with the aim of delivering the EO product to the End Users with very low latency. Applications considered in the project are ship detection and severe weather monitoring and nowcasting. An important element is the communications subsystem which has to deliver bulk data and alerts generated on board with high data rates and minimum latency. The latency requirements for global data delivery are quite stringent: 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 necessary. The alerts are small in comparison (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 is investigating a variety of efficient solutions for data delivery on a global scale meeting the latency and throughput requirements. Ka-band direct-to-ground links with data rates up to 1.8 Gbit/s are the baseline for bulk data delivery. Alternatively, new developments in the area of optical terminals both for direct-to-ground communications using optical ground stations as well as optical data relay links to the European Data Relay Satellite (EDRS) system have been investigated. The near-real-time delivery of the alerts imposes a major challenge. An S-band payload on board of the satellite 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 using INMARSAT L-band capacity which has recently become commercially available is an interesting candidate for providing a global data relay service meeting the requirements for the transfer of alerts to the end users. A dedicated constellation of small satellites in a ring topology is another option for alert delivery. The paper presents

the communications requirements for this novel architecture of EO systems, discusses the advantages and draw-backs of the different technical solutions for the communications system (optical and RF) and presents the preferred system for EO-ALERT.