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Author: Mr. Oilid Bouzekri
TU Graz, United Kingdom

Prof. Otto Koudelka
Graz University of Technology (TU Graz), Austria
Mr. Edward W. Ashford
Graz University of Technology (TU Graz), Austria

MODULAR COMMUNICATION SUBSYSTEMS FOR LOW EARTH ORBIT SATELLITES

Abstract

The growth of the market for LEO satellites has been exponential over the past decade. Many different applications have been flown on this increasingly used space segment which relies on various measurement technologies. Improved satellites and sensor technology, utilisation of wider frequency bands, easier access, and interpretation of Earth Observation data have all contributed to an increased demand for more and more satellite data delivery back to Earth.

The growth of this new market has opened the door to a lot of new space players such as OneWeb, Omnispace etc. All of these new missions operating in LEO have the same challenge to address: gain access to a cost-effective plug-and-play communication solution both for satellite attitude control and data flow transmission. There is, therefore, a real gap in the market for offering an innovative and industrially realistic solution for a modular communication subsystem aimed at LEO applications.

The purpose of this paper is to focus not only on proposing a viable design for a generic and modular telecom module for LEO satellites but also to articulate how the industrial phase will be approached. The system requirements that such modular telecom solution would have to meet are well known because LEO satellites have been in operation since the 60s. But on the other hand, the industrialisation constraints associated with the delivery of a solution capable of meeting the right price point are far more challenging.

The ambition of the work presented in this paper is to adopt standard telecom performance methodology and to provide an innovative design. The solution will have to provide a TM/TC link which will rely on the nominal S-Band frequencies with the addition of providing payload data link using Ka-band frequencies but as well as integrating the next generation of data links by optical terminals.

The analyses will be done in adherence with the mission specific design drivers identified for a typical Earth Observation mission. This will be followed by a review of the potential industrial implementation of the design possibly relying on traditional solutions but also looking at the promotion of new technologies adopted in the area of optical/photonics.

In the design trade-off, considerations such as the maturity of the technology, the industrialisation constraints, the pragmatism and realism of the implementation will also be presented. The paper will conclude with a recommendation for a business strategy to successfully bring this new modular telecom solution to market.