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MATRIX OPTICAL SWITCH DESIGNED FOR SPACE RF PHOTONICS PAYLOAD

Abstract

The objective of the Horizon 2020 European Research and Innovation program SODaH (SOftware Defined space optical Data Highway) is to mature the key photonics technologies in order to enable the implementation of an OISL (Optical Inter Satellites Links) based "Fiber like Network" in the sky for the next generation of satellites constellations. If the Laser Communication Terminal (LCT) is now a mature and flight proven technology, their efficient use and integration in transparent, reconfigurable and smart miniaturized telecom payload remains a challenge.

The SODaH Photonic - Modulation, Routing and Digitalization unit, thanks to a fiber based Matrix Optical Switch, performs the interface between the satellites OISLs and the payload digital processor. This Photonic Unit plays a key role in the proper functioning, offering efficient routing and possible redundancy while ensuring advanced multiplexing of signals.

In the frame of SODaH project the optical Switch Matrix, which routes photonic signal, is developed and qualified to TRL5 within a consortium, by Sodern (F) a space equipment supplier and HUBER+SUHNER Polatis (UK) a major player in fibre optics connectivity equipment for ground applications. In addition, the flight concept is studied in a low cost and "new space" approach. This collaboration will leverage the state of the art DirectLight® technology of Polatis as well as the Sodern experience in designing and manufacturing reliable and low cost space equipment.

The proposed Matrix Optical Switch is made of two main building blocks. The first one is the opto-mechanical subsystem, referred as "slices", that performs the switching between optical fibered ports, by finely actuating small lenses. It robustness to space environment has been demonstrated by Sodern and Polatis, in the frame of a previous H2020 project named OPTIMA.The second bloc is the driving electronic that controls finely the piezoelectric beam-steering architecture, which connects the optical fibers. This driving electronics is specifically built with OTS EEE components in order to reach the constellation cost and SWaP target.

In the frame of SODaH project, it is proposed to develop and qualify the 48 ports Matrix Optical Switch. The paper reports on the development and qualification of the Engineering Model, and on the future FM design.

Keywords: Photonic, optical communication, matrix optical switch, OISL constellation