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AUTO-TDS: ENABLING LASER COMMUNICATION NETWORKS TO AUTO DETECT INCOMING LINKS, SECURING CONNECTION AND AUTO-ROUTING THE DATA

Abstract

Laser Communication has been a growing area of interest in recent years. In the near future thousands of satellites will be orbiting earth that will communicate between each primarily via laser communication. Transmitting data to Earth will potentially be done more and more via Laser terminals. One of the key issues with this regard is that a new infrastructure and especially fully automatic processes and protocols are necessary to be established to achieve the expected potential. Research needs to be done and decisions are to be made to evolve from a time where optical satellite links are pre-planned and established manually between orbiting satellites and optical downlink stations towards an instant on-demand communication by an autonomously operated and scalable network of ground stations and in-orbit terminals. The goal is to enable a network routing like the current ground based internet and telecommunication networks, leading to enhancements of systems like EDRS or ESA's MoonLight constellation. It will bring full-constellation-knowledge directly on-board the satellite.

At Jena-Optronik GmbH we plan to develop a dedicated sensor that is mandatory for such an autonomously operating network. Our autonomous optical terminal detection sensor (AUTO-TDS) will be able to identify autonomously one and even multiple optical terminals simultaneously that want to establish a link to the laser terminal on board of the satellite where AUTO-TDS is located. As a secure communication is desired, the trustworthiness of the sender/receiver shall be checked at best before establishing a communication link. Hence, our sensor will be part of a sensor suite that is able to demodulate signals on the beacon laser and thereby performs a trustworthiness check via a handshake, token or by other means. In large networks/constellations, it is often the case that the source of information and its destination are not directly connected. In consequence, the information needs to be transmitted within the network from node to node. Our sensor will answer to this need as the sender/receiver information will be transferred and processed after the handshake such, that a connection to the next node in the network will be started simultaneously.

This paper will report on the latest status of AUTO-TDS. Currently, the sensor is in a predevelopment phase, where instrument requirements are established and first concepts are being traded. This predevelopment is funded by ESA in the frame of the ARTES 4.0 Strategic Programme Line – Optical