Paper ID: 44629
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IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Advanced Technologies for Space Communications and Navigation (7)

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OPTICAL COMMUNICATION TO MOVE LARGE AMOUNTS OF DATA IN SPACE

Abstract

With ever more powerful sensors on board, the amount of data generated on earth observation satellites is continuously growing. Direct to earth (DTE) optical communication links or data relay optical communication links via a GEO data relay satellite provide a solution to get the increasing amount of data to ground. LEO satellite constellations are very attractive to connect people worldwide and to address Internet of Things (IoT) applications on a global scheme. To make efficient use of these constellations, intersatellite links (ISLs) are applied. Optical ISLs offer a very attractive solution for those intersatellite links in terms of size, weight and power while offering multiple gigabit per second data rate capabilities.

In addition, optical communication links offer high operational security and immunity to interference sources while benefitting of a non-regulated optical frequency spectrum.

For all these advantages, optical communication in space is now a reality and is taken into account in current and future space programs. Starting from LEO to LEO ISLs demonstrated in 2008, TESAT has built a broad portfolio of optical communication solutions ranging from powerful GEO to GEO longdistance ISLs to small, low complex DTE solutions for cubesat missions.

The first commercial application of optical communication in space is GEO data relay. The European Data Relay System (EDRS) is relying on TESAT optical ISLs at a data rate of 1.8 Gbps. As of today, there are two LCTs on board of GEO satellites and four LCTs on board of LEO satellites. Since end of 2016, the EDRS service is operational and is continuously used to get realtime data from the Sentinel earth observation satellites to ground.

For DTE applications, a research and development program is currently running together with DLR IKN and TESAT as the industrial partner. For cubesats, the CubeL DTE terminal offers a 100Mbps downlink data rate with a size, weight and power of 0,3U, 300gr and 8W, respectively. The TOSIRIS DTE terminal drives the downlink data rate up to 10Gbps.

TESATs ConLCT is addressing the LEO constellation intersatellite link needs. 10Gbps of data can be transmitted over 6000km.

This paper will give an overview on the commercial usage of optical communication in EDRS and will present the optical communication solutions for DTE and constellation applications.