

SPACE OPERATIONS SYMPOSIUM (B6)
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THE DIFFERENT ROLES OF THE DLR GERMAN SPACE OPERATIONS CENTER IN RECENT
LASER COMMUNICATION PROJECTS

Abstract

Laser communication is of growing importance for space programs and is utilized in several recent satellite missions, since it offers the advantages of high data rates over long distances. Since 2007, the German Space Operations Center (GSOC) of the German Aerospace Center (DLR) is involved in a number of projects in which laser communication plays a significant role, such as TerraSAR-X, TDP-1, EDRS-A and the upcoming EDRS-C. The role performed by GSOC is different for each of these missions, thus it covers a broad portfolio of operational experience in laser communication.

For TerraSAR-X, a low earth orbit (LEO) satellite, GSOC performs the satellite as well as all payload operations. TerraSAR-X is equipped with a Laser Communication Terminal (LCT) as secondary payload, which is capable of inter-satellite (ISL) as well as space-to-ground links (SGLs). The development of these LCTs is led by the Space Administration of DLR, funded by the Federal Ministry for Economic Affairs and Energy, and performed by TESAT Spacecom GmbH.

In contrast, EDRS-A is a hosted payload on a GEO satellite and the first step in the European Data Relay System, which will soon be supported by a second relay terminal, EDRS-C. The relay system offers LEO satellites more possibilities for high speed data downlinks via laser. For EDRS-A, GSOC fulfills the role of the LCT payload control center. For EDRS-C, the task of GSOC is extended to dedicated satellite operations including the LCT payload.

ESAs TDP-1 ("Technology Demonstration Payload No.1") project is the proof-of-concept for EDRS. It is a collaboration between DLR, ESA, and TESAT-Spacecom. The mission involves LCTs installed as secondary payloads on board a variety of LEO and GEO satellites as well as on ground, allowing for ISLs as well as for SGLs. Here, GSOC fulfills the role of the Mission Control Center, which includes collection of orbit and availability data, calculation of feasible link slots, scheduling of customer link requests, and generation of operational products for the LCT payloads of the involved spacecraft. These products are delivered to the different spacecraft control centers or associated facilities like TECO, INMARSAT and ESOC. One important aspect of this advanced concept is the connection to multiple control centers, which is a necessary prerequisite for successful laser communication between different satellite projects.

This paper gives an overview of the operational concepts of GSOC within the four mentioned projects, with a focus on our involvement in the TDP-1 program.