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IMPLEMENTATION OF A KA-BAND COMMUNICATION PATH FOR ON-ORBIT SERVICING

Abstract

The objectives of On-Orbit Servicing (OOS) Missions include manipulation, proximity operations and inspection of target satellites. Therefore the servicer satellite often has to be teleoperated at low latency for several minutes to fulfill these tasks. That means communication plays a crucial role for OOS missions because real time teleoperation including high data rates has to be realized. So the communication path from front end sensors on the servicer spacecraft to the operator on ground has to be optimized and the latency time has to be minimized. Furthermore a long access time from the ground station is required because continuous communication with the satellite is mandatory for most of the OOS tasks. This can be realized by an inter-satellite link via a geostationary relay satellite, which has the advantage that a satellite in Low Earth Orbit can be accessed from one ground station for about half an orbit.

To evaluate both, the requirement of a long access time from the ground station as well as the need of a short latency time, an end to end communication scenario was implemented at the Institute of Astronautics (LRT) at the Technische Universität München (TUM). This scenario includes different spacecraft sensors (e.g. stereo cameras, LIDAR systems), a Ka-Band ground station and man machine interfaces.

This paper describes the implementation and evaluation of the Ka-Band communication path from a data source to an operator via space-link. Furthermore latency time is measured depending on the data source.