SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2) Advanced Space Communications and Navigation Systems (7)

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LEO-TO-GROUND OPTICAL COMMUNICATIONS USING SOTA (SMALL OPTICAL TRANSPONDER) –PAYLOAD VERIFICATION RESULTS AND EXPERIMENTS ON SPACE QUANTUM COMMUNICATIONS–

Abstract

Free-space optical communications have held the promise of revolutionizing space communications for a long time. The benefits of increasing the bitrate while reducing the volume, mass and energy of the space terminals have attracted the attention of many researchers for a long time. In the last few years, more and more technology demonstrations have been taking place with participants from both the public and the private sector. The National Institute of Information and Communications Technology (NICT) in Japan has a long experience in this field. SOTA (Small Optical TrAnsponder) is the last NICT space lasercom mission, designed to demonstrate the potential of this technology applied to microsatellites. Since the beginning of SOTA mission in 2014, NICT has been regularly establishing communication using the Optical Ground Stations (OGS) located in the Headquarters at Koganei (Tokyo) to receive the SOTA signals, with over one hundred successful links and counting. To date, all the goals of the SOTA mission have been fulfilled, including up to 10-Mbit/s downlinks using two different wavelengths and apertures, coarse and fine tracking of the OGS beacon, space-to-ground transmission of the on-board-camera images, experiments with different error correcting codes and interoperability with other international OGS. Currently, an extra-success phase of the SOTA mission is taking place, consisting of demonstrating fundamental properties of quantum communications from space. In this paper, the SOTA characteristics and basic operation are explained, along with the most relevant technological demonstrations.