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Author: Mrs. Daria Stepanova
German Orbital Systems GmbH, Germany

Mr. Mikolaj Podgorski
Scanway sp. z o.o., Poland
Mr. Walter Ballheimer
German Orbital Systems GmbH, Germany

Mr. Michał Zieba
Scanway sp. z o.o., Poland
Mr. Jędrzej Kowalewski
Scanway sp. z o.o., Poland
Mr. Connor Jonas
German Orbital Systems GmbH, Germany

Prof. Valentin Pryanichnikov
Keldysh Institute of Applied Mathematics of RAS, Russian Federation

OPTICAL PAYLOAD DESIGN FOR A SMALL SATELLITE LASER COMMUNICATIONS

Abstract

There is no doubt that small satellites are attracting more attention for various space organizations by providing new commercial, scientific and technological opportunities. While their capabilities are growing as technology matures, the question of communication poses a biggest challenge. Free space optical communication technology might give a chance to overcome the constraints of power, low gain antennas and limitations of radio spectrum. On the other side, it influences the communication system and satellite design requiring better pointing and tracking capabilities. There were several studies and missions, which addressed the question of establishing the optical link between small satellites, however the technology did not prove itself yet.

This work provides a new vision of system architecture for the optical terminal and a host satellite for intersatellite laser communications. The new approach is based on gimbal utilization together with alternative optical system design and provides promising increase in performance. The paper covers the use case scenario analysis and mission design, requirements definition for the optical terminal and engineering solution for the proposed configuration. For the experimental validation of the developed concepts and engineering model, the system prototype is developed and tested in laboratory conditions. The analysis of achieved representative parameters, such as pointing accuracy and angular speeds, finalize the paper.