Paper ID: 80402
oral

IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Advances in Space-based Communication Systems and Services, Part 2 (3)

Author: Dr. Paul Serra
Massachusetts Institute of Technology (MIT), United States

RESULTS FROM THE CLICK-A LASER COMMUNICATION EXPERIMENT

Abstract

Optical communications offer several key advantages over radio frequency communications. Thanks to tighter beams, laser communication terminals are highly efficient, and allow higher throughput and reduced Size, Weight, and Power (SWaP) compared to radio. With very high carrier frequencies, in the hundreds of terahertz, optical communications offer a very wide amount of spectrum. This spectrum is free of regulatory and coordination issues thanks to the high directivity of optical links.

The Cubesat Laser Infrared CrosslinK (CLICK) mission's goal is to demonstrate miniaturized transceivers capable of both downlink full-duplex optical communications and high precision ranging between two nanosatellites. CLICK is jointly developed by the Massachusetts Institute of Technology (MIT), the University of Florida (UF), and the NASA Ames Research Center. The mission includes two separate launches of a total of three 3U CubeSats. The first launch was in July 2022 with deployment of the CLICK-A CubeSat from the International Space Station in September 2022. CLICK-A is demonstrating a ¿10 Mbps downlink to the Portable Telescope for Laser communications (PorTeL). The CLICK-A payload design includes a high-precision two-stage pointing, acquisition, and tracking system, using a Microelectromechanical System (MEMS) Fine Steering Mirror (FSM) to steer a 1.3 mrad (FWHM) beam for data downlink. The data is encoded using Pulse-Position Modulation (PPM), with an average power of 200 mW, at a wavelength of 1550 nm.

CLICK-A has achieved several experiments since its launch, and demonstrated its precision pointing and tracking capabilities over a series of passes with the MIT PorTeL ground station. In addition, the spacecraft is currently completing experiments with international partners. The spacecraft is expected to deorbit near the end of Spring 2023. In this work we give an overview of the results collected during the flight, and a summary of the performances of the system as well as its critical components.