Reflected Laser Communications for Small Satellites

Hileman, Matthew

The purpose of this project is to develop a laser communications method for short space missions, voiding an emitter onboard the satellite bus. Building a cubesat to incorporate the new communications and test it is a secondary objective. The new communications utilizes retroreflectors to send a parent beam back to its source, modulating the laser with a shutter to encode data. After proving the new communications method, a framework and working model is produced to simulate realistic environments. Key systems of the cubesat a mapped out, each system broken into key components where at subsystem is tested for functionality throughout the design process. Additive manufactured (3D printed) framework is created for the cubesat to store the testing payload. The testing payload consists of several sensors and tracking equipment, allowing enough space and mass in the budget for possible payloads. The satellite conformed to standard cubist constraints, the new communications system successfully transmitted data through a modulated beam via a shutter. Testing provided results as to the communications performance, for accuracy and speed. Plans on filtering and protocols to signal both ground and satellite are established. Frequency modulated laser communications have several advantages, reducing mass while exploring alternatives to normally expensive technology. Proving this method viable, more research and development can be conducted to exploit the advances of such technology.

Awards Won:

International Council on Systems Engineering - INCOSE: First Award of $1,000

International Council on Systems Engineering - INCOSE: First Award of $3,000