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MULTIPLE-QUANTUM-WELL MODULATING-RETRO-REFLECTOR CUBESAT PAYLOAD OPERATING AT 1070 NM FOR ASYMMETRIC FREE-SPACE OPTICAL COMMUNICATIONS

Abstract

Preceding papers submitted to this conference introduced the concept of modulating retroreflectors (MRR) for free space optical communications. The major advantage of MRRs over conventional laser communication systems is that they require significantly less pointing accuracy on the spacecraft; typical values are between a few degrees to 10s of degrees. However, this advantage is bought at the price of an increased optical power from the ground station on the order of several kilowatts. Lasers capable of producing these relatively high continuous optical powers are commercially available, but only in a limited subset of wavelengths, typically ranging from 1.0 to 1.1 microns. Consequently, to take advantage of these commercially available lasers, MRRs operating in a corresponding wavelength, at sufficiently high data rates with an adequate aperture are required. Modulators based on multiple quantum wells fulfill the latter two requirements but had not been demonstrated in the specified wavelength range.

In the first part of this paper we describe design, production and testing of a multiple quantum well MRR that operates at a wavelength of 1070 nm. This wavelength corresponds to that of the popular Ytterbium doped fiber lasers which are extensively used in laser machining. The second part of the paper describes the design and testing of driver electronics in a 1U form factor, allowing the MRR to operate in a cubesat. The driver is versatile and can therefore act either as a communication subsystem or an independent payload that could be utilized for a technical demonstration of the MRR technology in space.