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FEASIBILITY ANALYSIS OF OPTICAL COMMUNICATION SYSTEM FOR A MOON ORBITING
CUBESAT AND EARTH STATION**Abstract**

Data return capabilities of nano-satellites in deep-space missions are limited by available radio frequency bandwidth, platform size, weight and power (SWaP) constraints. Laser communications offers orders of magnitude higher data rates and miniature transmitting components on these satellites. This paper presents a comprehensive optical system link design analysis of a 6-U Cubesat for a lunar orbit, 395,000km range with a compact, low-cost 40cm Telescope on Earth achieving 250Mbps Pulse Position Modulated downlink. The Cubesat optical communication payload features a 5Watts, 1550nm Solid State Laser and MEMS Steering Mechanism to provide beam pointing control. Reaction wheels are employed for the Cubesat attitude control. An annual link availability and outage estimation is evaluated for a fixed ground terminal in Fukuoka, Japan and the link performance is compared at different weather conditions. Keywords: Optical Communications; Laser; Cubesat; Moon; Data Rate.