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A REVIEW OF NEAR FUTURE OPTICAL TECHNOLOGY FOR HIGH-SPEED AND SECURE  
CUBESAT COMMUNICATIONS

**Abstract**

The next generation of high-speed and secure communication satellites using laser communication (LaserCom) are required to provide data rates of multiple terabit/s. Unlike conventional radio frequency (RF) electronics, LaserCom offers high compactness, efficiency and scalability for quantum communication, suitable for CubeSat payloads. Recently, interoperability between RF and LaserCom has emerged in the use of both systems in constellations for downlink and inter-satellite link, respectively. This interoperability has also allowed us to envision the future of the 5th generation of mobile communications (5G) and beyond (5G+) using photonic microwaves. However, LaserCom beam pointing requirements remain the main challenge for CubeSats. This paper examines the state of the art of photonic beamforming in space applications and looks at ways to overcome these limitations for constellations and 5G+. It also discusses the beam-forming effect for quantum communication in CubeSats. The coarse and fine pointing resolution for the compensation of quantum entanglement drift is discussed, and an optimal configuration for the integration of these technologies in a CubeSat is proposed.

**Keywords:** nanosatellite, laser communication, microwave photonics, quantum drift, pointing, CubeSat, inter-satellite link, photonic beamforming