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THERMO-MECHANICAL DESIGN FOR A MINIATURIZED QUANTUM LIGHT SOURCE ON
BOARD THE SPOOQY-1 CUBESAT

Abstract

This paper presents the thermo-mechanical design of the quantum light source on board SpooQy-1, a 3U CubeSat that was deployed from the International Space Station on 17th June 2019. SpooQy-1 is a technology demonstrator for space-based quantum networks. The on-board light source generates and detects polarization-entangled photon pairs to validate its in-orbit performance. Entangled photons are generated using spontaneous parametric down-conversion (SPDC) necessitating stringent dimensional stability and temperature requirements. Under laboratory conditions these requirements are routinely met using off-the-shelf laboratory mounts and alignment mechanisms. However, when facing harsh environments such as the vibration during rocket launch or temperature changes due to fluctuating illumination conditions, custom thermo-mechanical solutions are required. In this work, the development and in-orbit demonstration of an isostatic payload mount is discussed. This mounting approach enables future space missions with quantum instruments on resource-constrained CubeSat platforms with limited thermal control capabilities.