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JOKARUS - AN OPTICAL ABSOLUTE FREQUENCY REFERENCE ON A SOUNDING ROCKET BASED ON MOLECULAR IODINE

Abstract

Frequency stabilized laser systems are a key technology for future space missions, in particular for missions using inter-satellite laser ranging for, e.g., space-borne gravitational wave detection or Earth observation.

We present a compact and autonomous absolute optical frequency reference based on hyperfine tran-

sitions in molecular iodine for application on a sounding rocket mission. It is based on a micro-integrated extended cavity diode laser at 1064nm with integrated optical amplifier, fiber pigtailed second harmonic generation wave-guide modules, and a quasi-monolithic spectroscopy setup with operating electronics [1]. This frequency reference is scheduled for launch in May 2018 onboard the TEXUS 54 sounding rocket. The JOKARUS mission is an important qualification step towards space application of iodine frequency references and related technologies for inter-satellite ranging. We aim for a fractional frequency instability of better than $3 \cdot 10^{-14}$ to meet the requirements of state-of-the art missions as demonstrated in previous works [2,3]. The payload will operate autonomously and its optical frequency will be compared to an optical frequency comb during its space flight. We will report in detail on the results of this mission and the prospects of further advancing the technology readiness level of key componentes, such as microintegrated diode lasers, on future small satellite missions [4,5].

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