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Pulsed CW laser for long-term spectroscopic measurements at high power in deep-UV

Tuesday 4 July 2023 21:00 (2 hours)

We present a novel technique for in-vacuum cavity-enhanced UV spectroscopy that allows nearly continuous measurements over several days, minimizing mirror degradation caused by high-power UV radiation. Our method relies on pulsing of the cavity's internal power, which increases the UV intensity to maximum only for short periods when the studied atom is within the cavity mode volume while keeping the average power low to prevent mirror degradation. Additionally, this method significantly decreases laser-induced background on charged particle detectors. The described 244 nm laser system is designed for 1S-2S two-photon CW spectroscopy of muonium in the Mu-MASS project. It was tested to provide intracavity powers above 20 W, requiring maintenance only a few times a day. The pulsing technique demonstrates minimal impact on the radiation frequency, with no observed shifts exceeding 15 kHz. Our approach represents a promising new technique for high-precision spectroscopy of atoms in harsh UV environments and demonstrates the feasibility of CW spectroscopy of muonium.

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