Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Mu-MASS: Towards the first CW spectroscopy of the 1S-2S transition in Muonium[1] ZAK BURKLEY, BEN OHAYON, GIANLUCA JANKA, CARLOS VIGO, PAOLO CRIVELLI, ETH Zurich, THOMAS PROKSCHA, XIAOJIE NI, Paul Scherrer Institute — The Mu-MASS experiment aims for a 1000-fold improvement in the determination of the 1S-2S transition frequency in Muonium (M), the positive-muon/electron bound state. This substantial improvement beyond the current state-of-the-art is possible due to advances in accelerator and UV laser technology, as well as recent demonstrations in the extraction of cold M into vacuum. The results of Mu-MASS, which will take place at the Paul Scherrer Institute (PSI), will determine the muon mass to 1 ppb. In combination with the ongoing hyperfine splitting measurements at J-PARC, Mu-MASS will also determine the Rydberg constant at a few ppt independently of the proton radius. Such robust and reliable values of these constants can help shed light on interesting anomalies that have accumulated in the muon sector, such as the anomalous muon magnetic moment (g-2) and the muonic hydrogen Lamb shift measurement. This talk will review the status and plans for Mu-MASS, present our recent results at PSI of efficient production, tagging and detection of metastable Muonium in vacuum, and display the performance of the high power, CW 244 nm laser system for exciting the M 1S-2S transition which is currently being developed at the Institute of Particle Physics and Astrophysics at ETH Zurich.

[1]ERC Consolidator Grant

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Date submitted: 31 Jan 2020 Electronic form version 1.4