

Mu-MASS experiment at PSI

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In this talk I will present a brief overview of the Muonium lAser Spectroscopy (Mu-MASS) experiment at the Paul Scherrer Institute (PSI), which aims for a 1000-fold improvement in the determination of the 1S-2S transition frequency of Muonium (M) [1]. This substantial improvement beyond the current state-of-the-art relies on the novel cryogenic M converters, on the new excitation and detection schemes which we implemented for positronium spectroscopy, and the tremendous advances in generation of UV radiation, as well as the unique low-energy-muon (LEM) beamline.

Such a measurement will provide the most accurate value of the muon mass to 1 ppb. Combining our result with an improved determination of the ground state hyperfine structure of M [2] will yield the Rydberg constant to 4 ppt free of finite size effects, and test QED to the ppb level. With the High intensity muon beam (HIMB) upgrade to PSI, as well as novel muon moderation methods, this work will allow an independent and competitive determination of the muon $g-2$ from M spectroscopy [3].

[1] P. Crivelli, *Hyperfine Interactions*, 239(1), (2018)

[2] S Kanda, et. al., *PLB*, 815, 136154, (2021)

[3] C. Delaunay, et. al., *arXiv:2106.11998*, (2021)