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From the measurement of the Lamb Shift in Muonium towards its Fine Structure

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Muonium is a purely leptonic bound-state containing a positive muon and an electron. The absence of finite size effects and its light mass makes Muonium a distinguished probe for bound- state QED and recoil effects [1], as well as for new Physics beyond the Standard Model. Focusing on Lorentz and CPT violation in the muonic sector [2], the Mu-MASS collaboration measured the Lamb Shift $(2S_{1/2} \rightarrow 2P_{1/2})$ in Muonium to be $1047.2(2.3)_{\text{stat}}(1.1)_{\text{syst}}$ MHz and was able to put constraints onto two isotropic non-relativistic coefficients of the Standard Model Extension [3]. A measurement of the Muonium Fine Structure ($(2S_{1/2} \rightarrow 2P_{3/2})$) would give access to different SME coefficients using a transition between different angular momenta from J = 3/2 to J = 1/2. The setup of the Muonium Lamb Shift experiment is being upgraded since the last year with a microwave waveguide to perform the 10 GHz excitation needed to access the Fine Structure transition. I will present the progress of the experimental setup towards the measurement of the Muonium Fine Structure which is scheduled to be performed this year.

[1] G. Janka et al., EPJ Web Conf., 2022. doi: 10.1051/epjconf/202226201001.

[2] A. H. Gomes et al., Physical Review D, 2014. doi: 10.1103/PhysRevD.90.076009.

[3] B. Ohayon et al., Physical Review Letters, 2022. doi: 10.1103/PhysRevLett.128.011802.

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