



Contribution ID: 288

Type: Poster

Cryogenic muonium beam for the LEMING experiment

Tuesday, 18 October 2022 16:21 (1 minute)

The LEMING experiment aims to measure the free fall of muonium ($M = \mu^+ + e^-$) and thereby testing for the first time the weak equivalence principle using a purely leptonic, second-generation antimatter dominated system. Such a direct measurement requires a high-intensity, low-emittance M beam. We have demonstrated the working principle of this novel M beam by stopping accelerator muons in a thin layer of superfluid helium and by the subsequent observation of M emission from the helium target. The experimental setup including cryogenic scintillation detectors operating at < 0.2 K temperatures will be described. Further, an initial characterization of the novel M source will be presented, showing the non-thermal behaviour of the M beam required for the LEMING experiment.

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Session Classification: BBQ - Drinks & Posters