

Novel production method of a cold muonium beam

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Muonium ($M = \mu^+ + e^-$) is a purely leptonic exotic atom which can be used as an unique probe for New Physics through precision spectroscopy measurements or through a gravity measurement testing the weak equivalence principle on elementary antimatter. We are developing a novel M source based on stopping accelerator muons in a layer of superfluid helium at cryogenic temperatures.

In this contribution results from the first observation of M emitted from superfluid helium are presented. An initial characterization of the novel M source shows the fast diffusion of M atoms in the superfluid resulting in a vacuum M yield comparable to standard M sources, which use low energy muons only available at much lower muon intensities. The emitted M atoms showed an sub-thermal behaviour with a high velocity and a directed emission. Prospects of this newly developed high intensity, low emittance atomic M beam from superfluid helium in the context of a free fall experiment of M will be discussed.

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