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Development of a high-brightness muonium beam

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Muonium is the bound state of an antimuon with an electron (μ^+e^-). Muonium is an ideal tool to perform precision measurements of fundamental parameters. This poster presents our ideas to develop a high-brightness muonium source at the Paul Scherrer Institut (PSI). The muonium beam will be produced by deflecting a slow, high-brightness muon beam (currently under development by muCool collaboration) into the vertical direction and letting it impinge on a thin film of superfluid helium at 100 mK. Inside the superfluid helium muonium is formed with high efficiency and once it diffuses to the surface emitted into vacuum as a beam. Such a high-brightness muonium source enables various interesting measurements as, e.g., the detection of the 1s-2s energy interval of muonium or the gravitational interaction of muonium – a test of the gravitational interaction of antimatter and 2nd generation particles.

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