

muCool: Development of a novel high-brightness low-energy muon beamline

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The next generation experiments with muons and muonium atoms require muon beams with low energy, small transverse size and high intensity. At the Paul Scherrer Institute we are developing a novel device that reduces the phase space of a standard μ^+ beam by a factor of 10^{10} with 10^{-3} efficiency. The phase space compression is achieved by stopping μ^+ in cryogenic helium gas and applying strong electric and magnetic fields and gas density gradients. The beamline consists of several consecutive stages. The compression has already been demonstrated for each stage individually. The measurements show that we can achieve a muon beam compression with a high efficiency within few microseconds, as predicted by the simulations. In the next step, we will merge the various stages and extract the compressed muon beam from the gas into the vacuum.

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