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## muCool: A novel low-energy muon beam for precision experiments

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High precision experiments using muons ( $\mu^+$ ) and muonium atoms ( $\mu^+e^-$ ) offer promising opportunities to test theoretical predictions of the Standard Model in a second-generation, fully-leptonic environment. Such experiments including the measurement of the muon  $g-2$ , muonium spectroscopy and muonium gravity would benefit from intense high-quality and low-energy muon beams.

At the Paul Scherrer Institute, a novel device (muCool) [1] is being developed to reduce the phase space of a standard  $\mu^+$  beam by a factor of 109 with 10–4 efficiency, for a 105 boost in brightness.

The muon beam is stopped in cryogenic helium gas and using complex electric and magnetic fields in combination with a gas density gradient the muons are steered to a mm-size spot, where they have an eV energy spread. From here, they are extracted through a small orifice into a vacuum and into a magnetic field free region. The entire process takes less than 10  $\mu\text{s}$ , which is crucial given the short 2.2  $\mu\text{s}$  muon lifetime.

The presented poster will outline the working principle, the present status and future prospects of the muCool experiment with a special focus on the extraction stage from the orifice into vacuum.

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[1] Belosevic, I., Antognini, A., Bao, Y. et al. muCool: a next step towards efficient muon beam compression. Eur. Phys. J. C 79, 430 (2019). <https://doi.org/10.1140/epjc/s10052-019-6932-z>

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