A new approach for Mu-$\overline{\text{Mu}}$ conversion search

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The conversion from muonium (Mu, μ^+e^-) to anti-muonium ($\overline{\text{Mu}}$, μ^-e^+) is strongly suppressed in the Standard Model (SM) of particle physics because it violates the conservation of the leptonic family number. On the other hand, many SM extensions predict the Mu-$\overline{\text{Mu}}$ conversion is observable level, just below the current experimental upper limit of 8.3×10^{-11} [1], which is determined by beam-related background. A new method is required to go beyond the limit.

We propose a new method to search for the Mu-$\overline{\text{Mu}}$ conversion: Mu produced in a silica aerogel is emitted to a vacuum. By shooting the ionization laser for Mu/$\overline{\text{Mu}}$, dissociated μ^- is transported by electric and magnetic components. Because there is no source of μ^- in such an experimental setup, background-free search can be conducted. The method is inspired by the ultra-slow μ^+ beam [2], just switching the beamline polarity. This method has pros in scanning magnetic field while the precursory study had to apply a high field to analyze the β-decay electron.

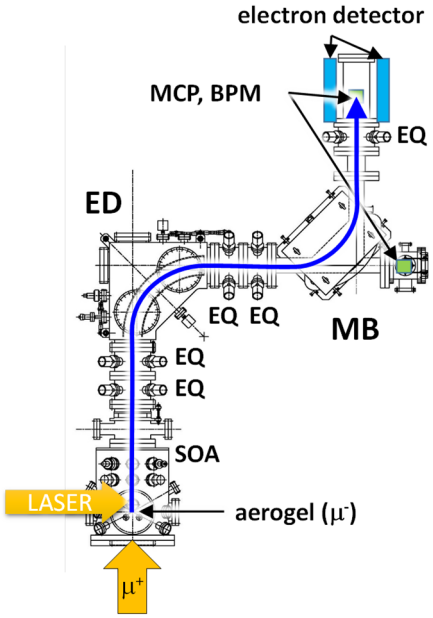

Fig. 1 Experimental setup of the feasibility study in MLF

We will present the details of the concept and the R&D status.

References

[1] L. Willmann *et al.*, Phys. Rev. Lett. **82** 491 (1999).

[2] S. Kanda *et al.*, J. Phys.: Conf. Ser. **2462** 012030.