Search for Muon-Electron Conversion in Nuclear Field by using High-Purity High-Power Pulsed Proton Beam from J-PARC RCS

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Muon-electron conversion, $\mu^- + \mathrm{A(N,Z)} \rightarrow e^- + \mathrm{A(N,Z)}$, is one of the processes that violate charged lepton-flavor conservation, and thus is not implemented in the standard model of particle physics. The current upper limits to this process are given by the experiments performed at TRIUMF and PSI[1]. However, many physics models beyond the standard model imply charged lepton-flavor violation, which may be observed by improving the experimental sensitivity by only a few orders of magnitudes.

In this presentation, an overview of DeeMe project at J-PARC aimed at a search for the muon-electron conversion in the nuclear field of Si and Carbon will be given. The sensitivity of DeeMe will be a level of 10^{-14}, which provides an improvement over the current upper limits by 2 orders of magnitudes. Even if the signal is not observed, the improved upper limit will provide important information about physics beyond the standard model.

DeeMe is a unique experiment since it utilizes muonic atoms formed in the primary proton target. The signal electrons are extracted from the primary target using a large-acceptance secondary beamline (H-line). The 3-GeV high-purity high-power pulsed proton beam from the J-PARC RCS provides very clean experimental conditions, which is important in such a high sensitivity rare-decay experiment. The detector construction of

DeeMe is currently ongoing. The DeeMe system will be ready in 2015, and the data taking will commence once the H-line becomes available.

References

[1] S. Ahmad, G. Azuelos, M. Blecher *et al.*, Phys. Rev. D **38** (1988) 2102.
C. Dohmen, K.-D. Groth, B. Heer *et al.*, Phys. Lett. B **317** (1993) 631—636.
[2] M. Aoki and DeeMe Collaboration, AIP Conf. Proc. **1441** (2012) 599—601.