Status of the muon g-2/EDM experiment at J-PARC (E34)

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Though Standard Model (SM) for elementary particle physics was complete by the Higgs observation at LHC, many problems such as dark matter and the baryon-antibaryon asymmetry of the Universe still remain unsolved. These questions indicate that new physics (NP) will emerge at higher energy scale. One of the indications for NP up to now is in the muon anomalous magnetic moment (g-2); there is 3.3σ discrepancy between the SM prediction and measurement by the E821 experiment [1] with an accuracy of 0.54 ppm. One of the other windows to NP is the muon electric dipole moment (EDM); having the CPT symmetry, the EDM violates CP, which is necessary for the baryon-antibaryon asymmetry while strongly suppressed in SM.

The J-PARC muon g-2/EDM experiment (E34) [2] aims to measure the muon g-2 and EDM with an accuracy of 0.1 ppm and a sensitivity of 10^{-21} e · cm, respectively, to cast light on NP. Fig.1 shows our experimental setup. To achieve the world best accuracy, high intensity beam at J-PARC MUSE and novel technique of the ultra-cold muon beam are used. The ultra-cold beam enables muons to be stored and detected in the magnetic field with no electric focusing, resulting in no need to choose the magic momentum of 3.094 GeV/c used for decades and minimizing dimensions of the stored magnetic field and its systematics.

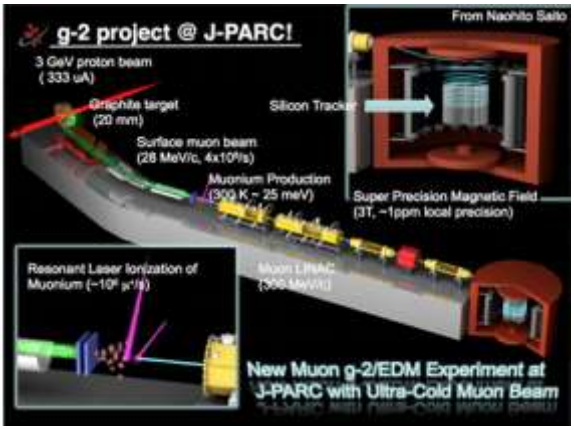

Fig.1 Schematic view of the E34 experiment configuration.

We are intensively developing the muon beamline, the ultra-cold muon source, detector etc. to start the experiment in the late 2010s. Current status of the experiment is reported in this presentation.

References

[1] G.W. Bennett *et al.*, Phys. Rev. D **73**, 072003 (2006).
[2] N. Saito *et al.*, AIP Conf. Proc. **73** (2012) 45