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Precision measurement of muonium hyperfine structure at J-PARC

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Muonium is the bound state of a positive muon and an electron. Muonium is free from the finite-size effect of nucleons, thus the theoretical value of muonium hyperfine splitting (MuHFS) can be determined precisely. MuSEUM (Muonium Spectroscopy Experiment Using Microwave) aims ten-fold improvement of the preceding measurement of the experimental value of MuHFS in the ground state both in zero magnetic field and in high magnetic field. This can be achieved by using the most intense pulsed muon beam supplied at J-PARC MLF MUSE.

The procedure of this measurement is as follows :

1. Spin polarized muons are injected to a RF cavity filled with Kr gas, which is covered with magnetic shields or a superconducting magnet.
2. Muonium is formed via electron capture in Kr gas and its HFS transition is induced by RF field.
3. Spectroscopy of MuHFS is performed by the measurement of angular asymmetry of decay positron from muon decay.

In this presentation, I report the result of the MuHFS measurement in zero magnetic field and future prospect.

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