Precision measurement of muonium hyperfine splitting at J-PARC; development of the chamber and the cavity.

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We are planning a measurement of the ground state hyperfine structure of muonium at J-PARC/MLF. Muonium is a hydrogen-like bound state only consist of leptons, and its HFS is a good probe for testing QED theory. Fundamental constants of muon such as mass and magnetic moment have been so far determined by the muonium HFS experiment at LAMPF[1]. The high intensity beam (H-line)[2] soon to be available at J-PARC allows one order of magnitude more accurate determination of those constants, which also plays an important role in the new measurement of anomalous magnet moment of muons. Muonium atoms are formed by electron capture reaction with Krypton gas and their spin are flipped by microwave magnetic field (Fig. 1). We are developing the stable RF system and the gas system which monitors the pressure of Kr gas and the purity with a high degree of accuracy. In this contribution, we present the progress of cavity and chamber development and the estimation of uncertainties.

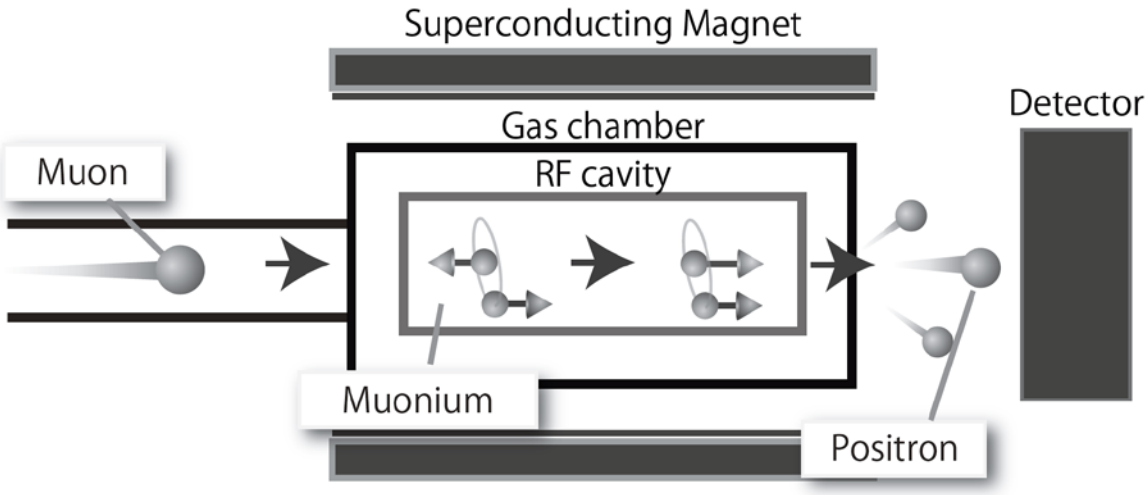

Fig. 1 Setup of this experiment

References

[1] W. Liu et al., Phys. Rev. Lett., 82,711 (1999).

[2] N. Kawamura et al., JPS Conf. Proc. 2, 010112 (2014)