MLF Experimental Report	提出日 Date of Report
課題番号 Project No. 2016A0067 実験課題名 Title of experiment Development of the slow muon source for muon acceleration 実験責任者名 Name of principal investigator 大谷将士 所属 Affiliation KEK	装置責任者 Name of responsible person 装置名 Name of Instrument/（BL No.） 実施日 Date of Experiment

試料、実験方法、利用の結果得られた主なデータ、考察、結論等を、記述して下さい。（適宜、図表添付のこと）
Please report your samples, experimental method and results, discussion and conclusions. Please add figures and tables for better explanation.

1. 試料 Name of sample(s) and chemical formula, or compositions including physical form.

Al foil

2. 実験方法及び結果（実験がうまくいかなかった場合、その理由を記述してください。）
Experimental method and results. If you failed to conduct experiment as planned, please describe reasons.

Muon acceleration will take us to new horizon of muon science; it enables us to measure muon anomalous magnetic moment (g-2) with high precision to cast light on new physics beyond Standard Model of particle physics (J-PARC E34) [URL]; it is a essential part of the transmission muon microscope. In order to demonstrate the muon acceleration, the slow muon source is necessary. The $Mu^-(\mu^+e^-e^-)$ emission from the thin Al foil is expected to have average energy of 0.2 keV, which is suitable for the muon acceleration with the RFQ [Phys. Rev. AB 16. 040102, 2013]. The Mu^- measurements are discussed in this proposal.

The experimental layout is shown in Fig. 1 and Fig. 2. The muon beam at the MUSE D2 area is utilized with 25.0 MeV/c. The beam muons stop in the thin Al foil and a fraction of muons picks electrons to form Mu^-. The generated slow Mu^- goes to the electro-static acceleration and focusing (SOA lens). It acquires kinetic energy of 20 keV at the end of acceleration. Then, there are a electro-static and a magnetic bending for energy, momentum, and charge separation. Finally, Mu^- reaches the low-E μBPM installed downstream of the bending followed

by a pair of quadrupoles. The low-E μBPM consists of microchannel plate (MCP), phosphor screen, and CCD camera with dedicated optical lens system. Charge in all the pixels of the camera are read for profile measurement with 25 Hz synchronized to the Mu^- arrival time.

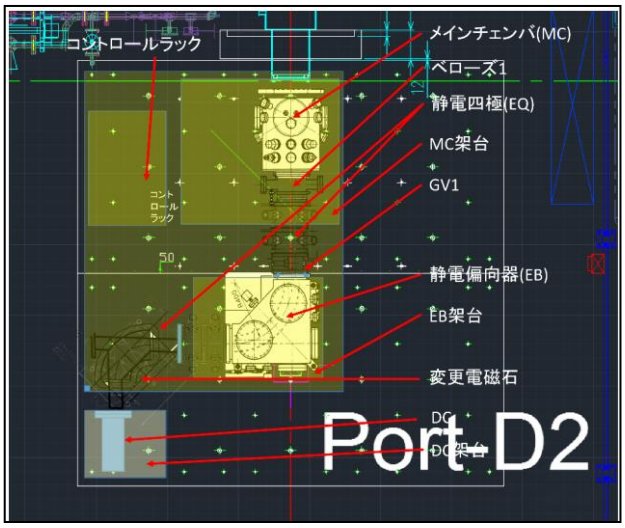

Figure 1. drawing of the experimental setup

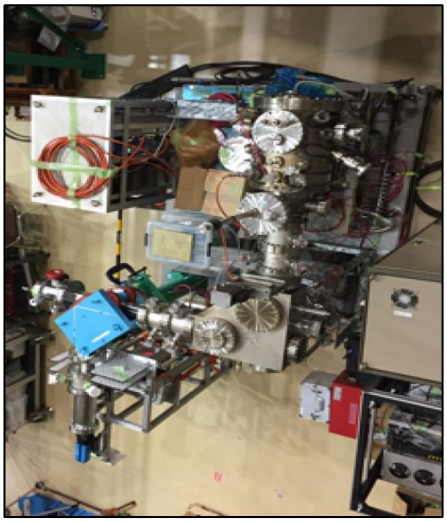

Figure 2. photo of the setup

Preliminary results will be shown below.

Figure 3 shows a pulse height distribution observed at the low-E μBPM. Blue histogram in the figure shows the distribution for off-timing events, mainly due to the background events. Red in the figure shows the distributions for events in expected signal timing. It can be seen that there is a clear separation between the Mu- signal and backgrounds due to the decay-positron with lower pulse height than the signal. Figure 4 shows a event timing distribution. We succeeded in observing the clear signal peak at expected timing of about 1700 nsec.

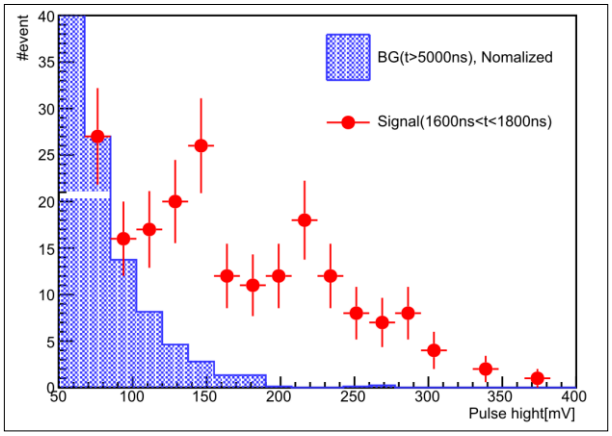

Figure 3. pulse height distributions.

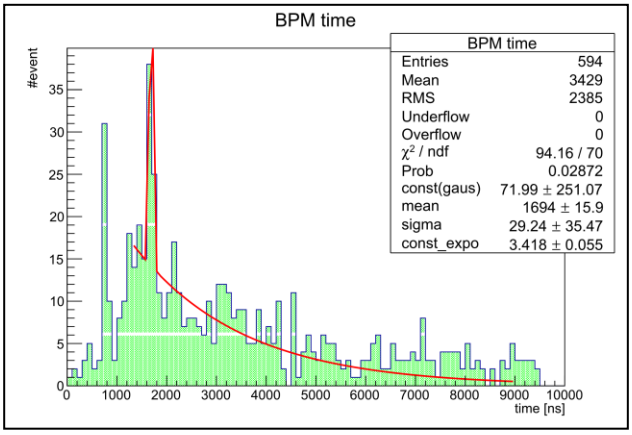

Figure 4. event timing distribution.