MLF Experimental Report	提出日 Date of Report 2013/05/20
課題番号 Project No. 2012B0190 実験課題名 Title of experiment Search for efficient materials for thermal muonium production target 実験責任者名 Name of principal investigator Takashi Nagatomo 所属 Affiliation IMSS, KEK	装置責任者 Name of responsible person Yasuhiro Miyake 装置名 Name of Instrument/(BL No.) D2 実施日 Date of Experiment 2013/01/27-2013/01/29

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.

Ir metal foil
(99.95 % purity, 30 mm x 35 mm x 50 μmt)

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.

In order to search efficient materials for the thermal muonium production, systematic measurements of the amount of the produced muonium from surface of several materials are necessary, because the evaporation process or mechanism was not understood enough.

The experiment was carried out at D2 area of J-PARC/MLF/MUSE. Surface muons with the momentum of 27.0 MeV/c were provided from D2 beam line. After passing through the energy degraders, which were 50-μm thick stainless steel and tungsten foils, a half of the injected muons were stopped inside the Ir sample. The Ir foil was heated up to 1600 ℃ by the DC current. During the thermal-muonium-evaporation process, the DC current was shut off in order to suppress harmful effects induced by magnetic field around the target and the feed-through bars. The evaporated muoniums were detected by the hodoscope that consisted of plastic scintillation fibers. The hodoscope was set parallel with respect to a normal of the Ir surface plane to detect the point at which the evaporated thermal muoniums decayed. Detecting the decay positions as the function of time, the evaporation and diffusing into vacuum process were scrutinized, and then the amount of muoniums was obtained.

2. 実験方法及び結果（つづき） Experimental method and results (continued)

The surface of Ir sample was cleaned in the ultra-high vacuum chamber by the O_2 roasting to remove carbons on surface, and after that process, the high temperature baking of 1600℃ to remove the residual O on the surface. By using the hodoscope, we measured time spectra with the Ir-sample temperature from 600℃ to 1600℃ by 200-℃ steps as well as at room temperature.. The temperature was measured by a radiation thermometer though a view port. As preliminary results, the ratios of muonium-decay time spectra at high temperature to that at room temperature at several decay positrons were shown in Fig. 1. From the Fig. 1, in the case of 1400 ℃, we observed larger enhancements from the time spectra at the room temperature compared to the 600℃ and that is considered as the thermal-muonium-evaporation signals. Further analyses to reject the background noise are in progress to compare the production rate of the muoniums evaporated from the hot tungsten that is a standard material at present.

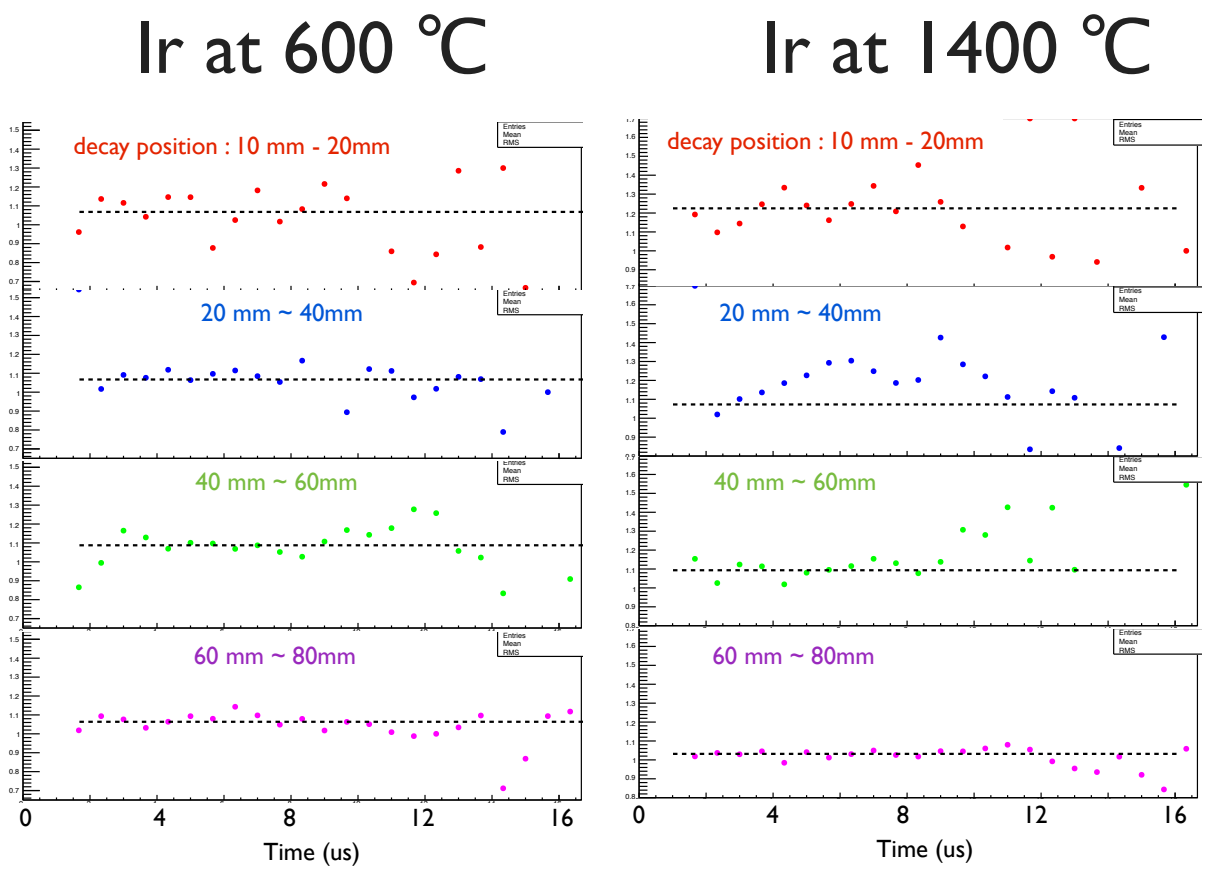

Fig. 1 Ratios of time spectra that obtained with high temperature Ir sample to that at room temperature. The time-spectrum ratios of the Ir sample at 600℃ and 1400℃ were shown in left and right figures, respectively.