 MLF Experimental Report	提出日 Date of Report
課題番号 Project No. 2016A0297 実験課題名 Title of experiment First measurements of total scattering cross sections of positive muon for noble gases 実験責任者名 Name of principal investigator Kazuhiko Ninomiya 所属 Affiliation Osaka University	装置責任者 Name of responsible person Y. Miyake 装置名 Name of Instrument/(BL No.) Muon D2 実施日 Date of Experiment 2016/12/19-20

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.
Argon gas

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.
<p>We performed the first trial study for measuring total scattering cross sections of positive muons with 2 MeV and 4 MeV kinetic energies. We constructed the experimental setup as shown in Figure 1. Two measurements were performed with 2 Pa Ar gas sample and vacuum conditions in each momentum condition.</p> <p>The incident muon passes the collimator and the gas cell, and reaches to the detector (plastic scintillation counter). By comparing counting rate of the muon detection between 2 Pa Ar gas sample and vacuum conditions, the total cross section of muon scattering can be obtained as following equation;</p> $\ln\left(\frac{I_0}{I}\right) = \sigma Ln$ <p>where I₀ is counting rate of vacuum condition, I is counting rate of 2 Pa argon condition, L is length of the gas cell (10 cm), n is density of the argon gas sample (5.3 x 10¹⁴ atoms/cm³) and σ is cross section.</p>

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

We performed positive muon irradiation experiment as the condition shown in Table 1. From these experiments, we obtained the total cross section values as 0.2 ± 2.7 Mb for 2 MeV condition and -11 ± 6 Mb for 4 MeV condition with the $k=1$ accuracy condition. The obtained results is much smaller than the estimated values from the reported total cross section of positrons.

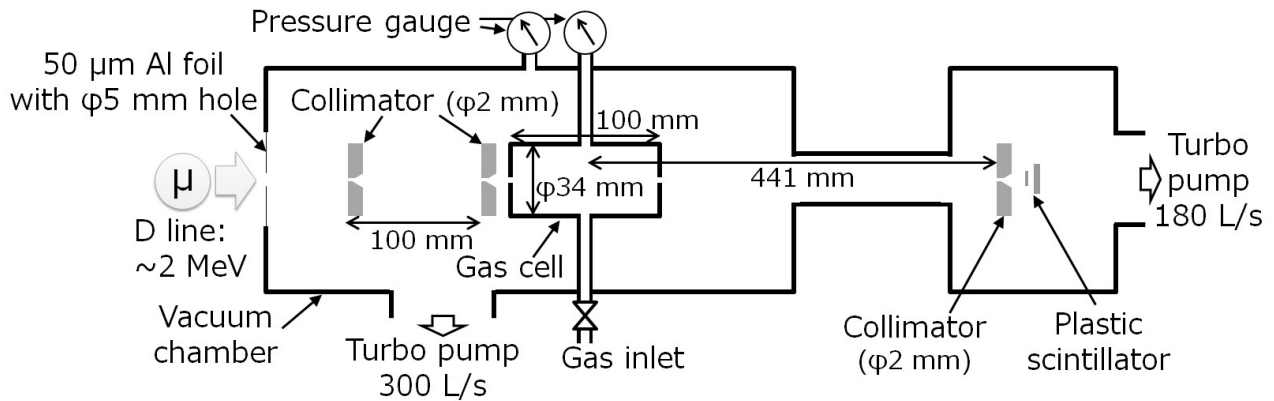


Figure 1: Schematic view of the experimental setup

Table 1: Summary of the experimental condition

Muon energy (MeV)	Sample in gas cell	Irradiation time (h)
2	0.0 Pa	15.4
2	2.0 Pa argon	15.7
4	0.0 Pa	0.4
4	2.0 Pa argon	0.5