# Comparison Between Muon and Positron Images Using Imaging Plates

M. Doyama[1*], Y. Kogure[1], M. Inoue[1], T. Kurihara[2], Xingzhong Cao[2], K. Nishiyama[3], and K. Shimomura[3]

[1] *Teikyo University of Science and Technology, Uenohara, Yamanashi 409-0193, Japan*
[2] *Slow Positron Facility, High Energy Accelerator Research Organization, Tsukuba, Ibaraki 305-0801, Japan*
[3] *Muon Science Laboratory, High Energy Accelerator Research Organization, Tsukuba, Ibaraki 305-0801, Japan*

Imaging plates are widely used in X-ray science, medical analysis and in transmission electron microscopy. A plate is only a card which easily inserts into a vacuum chamber without darkness. Darkness is required only during exposure and transfer to a reader. The images can be erased and imaging plates can be used many times. Imaging intensity is accumulative, it is not good for coincidence measurements. However, when the kind of particles is known and particularly particles are one kind, it is quite conveniently used. The sensitivity is quite high and proportional to the fluence in six digits. Imaging plates can be cut to a size we want. We have found imaging plates are quite sensitive to positrons. In this paper we will show that imaging plates are also sensitive to muons. At the last run of Muon Facility, Muon Channel, Tsukuba, KEK, we have applied imaging plates for muons. This is probably the first application of imaging plates to muons to the positional resolution of 50$\mu$m x 50$\mu$m; this can be improved to 10 $\mu$m x 10 $\mu$m. Kinetic energies of muons available at the facility are much higher than those of positrons at the Slow Positron Facility at KEK, so that the penetration depth is much higher than positrons available at Slow Positron Facility, KEK. We have used surface positive muons this time. The momentum was about 26 MeV/C. Because the penetration depth is large, we have used Imaging Plates of Type FDL UR-V's (Fuji Photo Film Co., Ltd.) for transmission electron microscopy. The size of a plate is 81 X 100 mm. The surface is covered by a protective layer. Below the protective layer, there is a particle sensitive layer which composed of $Eu^{+2}$ doped barium fluorohalides phosphors. The IP recorded layer is scanned by a He-Ne Laser (633$\mu$m). Photo-Stimulated-Luminescence (PSL) per area, I, is proportional to PSL. I is expressed in the unit of PSL/mm$^2$. The transmission muon images are compared with transmission positron images. The similarity and the difference are shown and discussed. Generally speaking transmission muon images have higher contrast compared with the corresponding transmission positron images. This will be a new field in muon science.

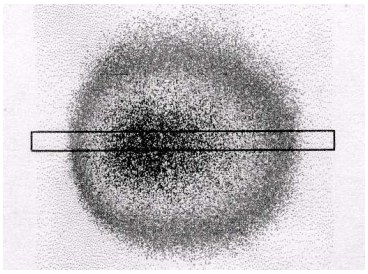

Fig. 1. Cross section of muon intensity.

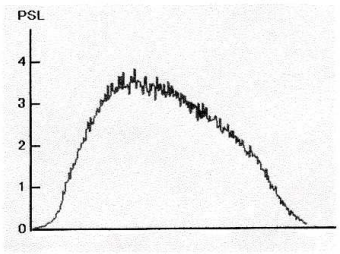


Fig. 2. Muon beam intensity of within the rectangle shown in Fig.1

Fig. 3. Transmission muon image of shrimps.

*Corresponding author. Tel.: +81554634411 ; fax: +81554634431 ; e-mail: doyama@ntu.ac.jp