

Photodetachment of positronium negative ion

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Photodetachment of the positronium negative ion (Ps^-) has been performed employing a linac based pulsed slow positron beam combined with the use of a high intensity pulsed Nd: YAG laser at the slow positron facility of KEK.

The low energy pulsed positron beam (12ns, 50pps) was incident onto a Na coated tungsten target to form Ps^- [1]. The Ps^- was accelerated by the potential difference between the target and a grid which was mounted in front of the target. The blue-shifted γ -rays from two-photon self-annihilation of the Ps^- were detected by pure Ge detectors [2].

An intense fundamental laser light from Q-switched Nd:YAG laser (400mJ/pulse at 1064nm, 12ns, 25pps) synchronized to the Ps^- bunch was irradiated and attenuation of the Ps^- signal in the annihilation γ -rays energy spectrum has been observed as shown in figure1. This attenuation indicates that the *o*- Ps atoms which do not contribute to Ps^- signal were produced by the photodetachment of Ps^- . The success of the photodetachment will provide a potential source of the energy tunable Ps beam.

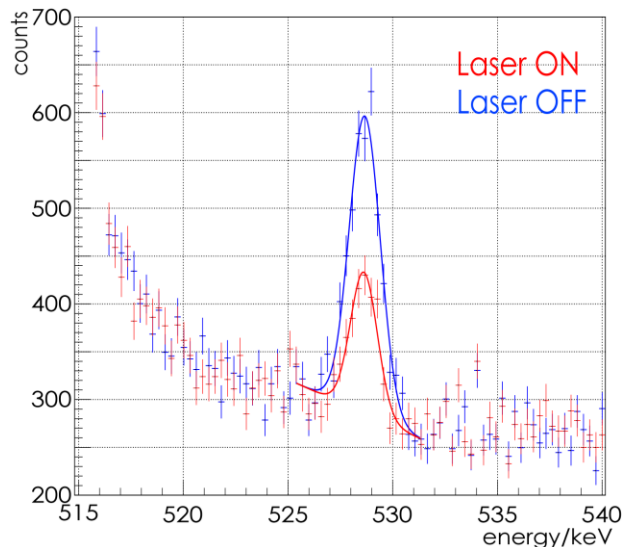


Figure1: Annihilation γ -rays energy spectrum with laser on and off.

[1] H. Terabe, K. Michishio, T. Tachibana and Y. Nagashima, J. Phys. Conf. Series in press.

[2] T. Tachibana, K. Michishio, H. Terabe, K. Wada, T. Hyodo, T. Kurahara, A. Yagishita, and Y. Nagashima, Nucl. Instr. and Meth. in Phys. Res. A **621**, 670-672 (2010).