Photo-Neutron Yields from Thin and Thick Targets Irradiated by 2.0 GeV Electrons

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The information of photo-neutron yields for high energy electron accelerator have been required constantly according to many constructions and great uses of synchrotron facility, X-FEL, and Linear Collider. The photo-neutron measurements have been conducted using electron linac at Pohang Light Source since 1998.

Early in the measurements, the photo-neutron spectra at 90 degree relative to the incident 2.0 GeV electrons were measured by the pulsed beam time-of-flight technique with Pilot-U plastic scintillator and the NE213 liquid scintillator with 2-inch in length and 2-inch in diameter. Targets, from low-Z element (Carbon) to high-Z element (Bismuth) and with thin (0.5 X0) and thick (10 X0) thickness, were used on this study. The differential photo-neutron yields between 2 MeV (Mainly 8 MeV) and 400 MeV were obtained. The systematics was studied to make empirical yield terms for shielding application.

Recently the study of the angular distributed yields was attempted. The same measurements have been conducted at two observing angles, 48 and 140 degrees, in the linear accelerator tunnel. Those flight distances were 6.9 m and 8.3 m, respectively. The photo-neutron yields between 8 MeV and 250 MeV have been obtained for thick targets.

In this paper, the experimental process, data reduction method, summarized results, and ongoing plan will be introduced.