
SECONDARY CHARGED PARTICLE MEASUREMENT FROM 2 GeV ELECTRON INDUCED REACTIONS WITH CURRENT TIME OF FLIGHT TECHNIQUE

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The yield and energy spectrum of secondary neutrons from high energy electron induced reactions are important to evaluate shielding design of high energy electron accelerator such as 4th generation synchrotron light source. We measured the energy spectrum of secondary charged particles from C, Al, Cu and W plate bombarded with 2 GeV electrons at the injector Linac in Pohang Light Source, POSTECH, Korea. The charged particles are easy to distinguish from intense backgrounds, photons and neutrons, associated with the reaction by using coincidence and ΔE -E method. The charged particle data are useful to evaluate neutron data which are important to shielding design of accelerators.

Electrons of 2.04 GeV, 10Hz repetition rate, 1 ns width bombard a thin plate sample in front of beam dump inside the injector Linac tunnel. The sample set to incline 45 degree from the electron beam axis to decrease energy loss of emitted charged particles. Above the sample, at 90 degree from the electron beam axis, there is 10.4 m flight path with 3 m thick concrete collimator to lead secondary particles to detectors. The detector is a counter telescope consisted of two thin NE102A plastic scintillator and one thick Pilot-U scintillator. In this setup, high intensity photons and plural numbers of neutron and charged particle enter to the detector for each electron beam bunch. Thus, the detectors are connected to the electronics with Multi-hit TDC to measure time-of-flight of each particle. In addition, digital storage oscilloscope is also connected to the detector to take waveforms for 500 ns in 0.5 ns steps after electron beam signal. The energy spectrum of protons and deuterons for each samples were obtained from 50 MeV to 300 MeV and from 60 MeV to 250 MeV, respectively.