Measurement of Monochromatic Radiation Using a Silicon PIN Photo-Detector

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Introduction

We have performed a mono-energetic photon scattering experiment at the BL-14C1 in KEK Photon Factory. Photons scattered by several targets were measured by a silicon PIN photo-detector at = 90 degrees. The experimental data were compared with calculations using the EGS5 code [1].

Experiments

The experimental procedure is shown as follows (See also Fig.1),
1. Synchrotron photons from a vertical wiggler were monochromized by a Si (2,2,0) double crystal monochrometer. The incident photon energies are 8 and 20 keV.
2. Number of incident mono-energetic photon beams was measured by a free-air ionization chamber placed in front of the target.
3. Mono-energetic photon beams were scattered by a target. Target materials were carbon, aluminium, silicon, titanium, iron, copper and silver.
4. The scattered photons were detected by a silicon PIN photo-detector located at θ = 90 degrees.

Results

The experimental energy spectrum for the aluminum target for the incident energy of 20 keV is shown in Fig.2 with the results calculated by the EGS5 code [1]. The experimental and calculated results showed the difference within 7% for the Compton peak. The K-X peak at 1.5 keV from aluminum target had the difference within 2%.

The ratio of experimental results and EGS5 calculation for the characteristic X-ray peaks from several targets are shown in Fig. 3. The experimental and calculated results showed the difference within 10% for Compton, K-X and L-X peaks.

Reference


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