

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 $\theta = 90$ 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 monochromator. 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 $\theta = 90$ degrees.

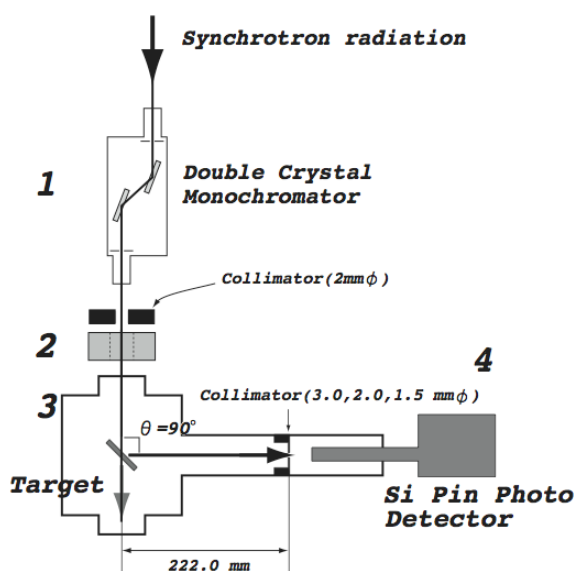


Fig. 1 Experiment arrangement

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.

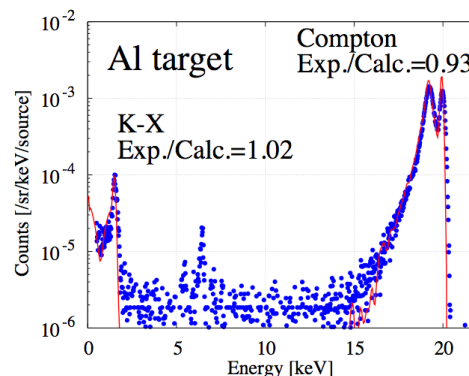


Fig. 2 Comparison of the energy spectrum for aluminum target for the incident energy of 20 keV. The experimental data is shown by blue dot. EGS5 data is shown by red line.

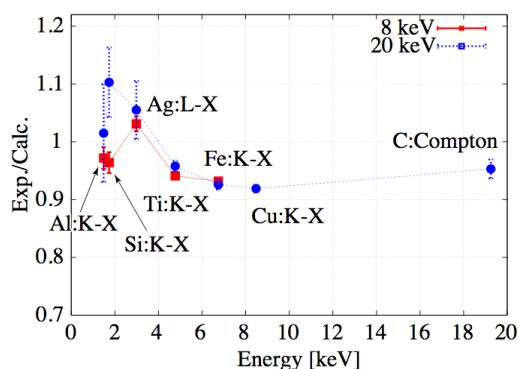


Fig. 3 Ratio of experimental results and calculation for each peak.

Reference

[1] H. Hirayama et al. "The EGS5 Code System," SLAC-R730, Stanford Linear Accelerator Center (2005)

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