Characterization of the elliptical multipole wiggler(BL08W)

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After the performance of a monochromator for 300 keV X-rays at the BL08W, the vertical distributions of the Intensity and the degree of circular polarization Pc of monochromatized 274 keV X-rays emitted from the elliptical multipole wiggler were measured by means of spin-dependent Compton scattering method. As for a standard sample, a polycrystalline Fe thick plate placed In the air was used. The scattering angle was 165.3°, which was evaluated the energy of the Compton peak shown in Fig. 1. The saturation of the sample was achieved by incorporating it in a closed magnetic circuit consisting of a small C-type electromagnet. A slit scan with a width 0.2 mm was carried out, and the results are shown in Fig. 2, where the wiggler was operated with K_x=0.6 and K_y=11.2. On the basis of the theoretical spin-dependent Compton scattering cross section, Pc is calculated, and is shown in Fig. 2: The angles between the magnetized spin direction and the incident and scattered X-rays were 156.6° and 152.6°, respectively, and the magnetic moment of Fe is taken to be 1.8 μ_B. A maximum Pc of 0.8 was observed at the center. Since the flux of 274 keV X-rays was low, a large volume (130 cm3) pure Ge detector was employed for the measurement. It took a 6000 seconds accumulation time to measure a spin-dependent Compton profile, during which the magnetization direction was reversed every 20 seconds. The normalization of Compton profiles to total incident photon numbers was made by simultaneous measurements of intensities of Compton scattered X-rays from a thin Cu plate placed at an upstream position. The evaluated Pc is consistent with a calculated value with a 2% coupling constant.

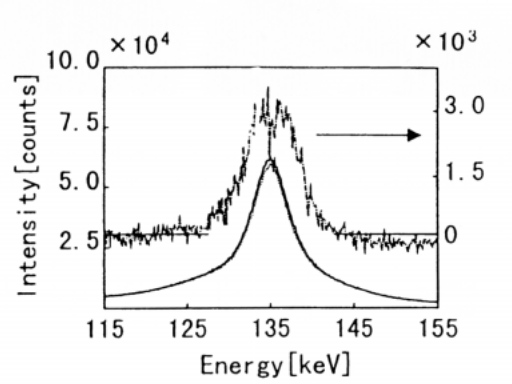

Fig.1. Compton profile of Fe measured with 274 keV circularly polarized x-rays. A spin-dependent scattering distribution is also shown in the figure.

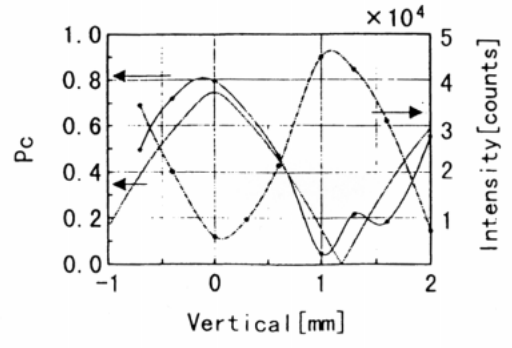

Fig.2. Vertical distribution of the intensity and Pc of 274keV x-rays. A calculated Pc is denoted by dots.