Parametric Down Conversion of X-rays under the Dynamical Diffraction Condition

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Parametric down conversion[1] is known as phenomena that an X-ray photon is converted into two photons satisfying the conservation laws of energy and momentum. The refractive index of materials for X-rays is isotropic and has a simple dependence on the wavelength. Thus the reciprocal lattice vector is inevitable to satisfy those conservation laws, that is, the phase matching condition. Hitherto most works are done under the kinematical diffraction condition, and the coincidence technique is used to detect those two photons emitted in different directions[2].

In this work parametric down conversion of X-rays is studied under the dynamical diffraction of a perfect crystal to satisfy the phase matching condition. The process that a photon with an energy of 20.6 keV is converted into two photons with almost the same energies of 10.3 keV is observed under the asymmetric diffraction condition of Ge 800 reflection. One of paired photons is detected by a combination of a channel-cut crystal analyzer and a solid-state detector, and photons with a half of incident energy are observed only when the phase matching conditions are satisfied.

[1] Eisenberger P., McCall S.L., *Phys. Rev. Lett*., 1971, **26** , 684. [2] Yoda Y.,et al., *J. Synchrotron Rad.*, 1998, **5**, 81.

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