A NOVEL MEASUREMENT METHOD FOR X-RAY SPECTROMETERS WITH POSITION-SENSITIVE DETECTORS TO ENHANCE THE ENERGY RESOLUTION

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Crystals are used widely in X-ray optics to monochromatize and focus X-ray beams. The use of crystals is based on the constructive interference of the X-rays from atoms arranged in periodic lattice. For simple unstrained lattice, the diffraction angle is given by the Bragg's law $n\lambda = 2d \sin\theta_B$, where θ_B is the angle between the incident ray and the plane of reflection, λ is the wavelength of the diffracted radiation, n is order of the reflection and d is the separation of the planes of reflection. As the diffraction depends on λ, the crystals can be utilized as energy analysers in X-ray spectroscopy.

In order to increase the intensity of the collected radiation scattered by the sample, curved crystals are often used. Downside of the curving process is that it induces additional stresses inside the crystal, which worsen the energy resolution of the analyser[viite]. The stresses can relieved by making cuts along the analyser surface[viite], but this also leads to the loss of collected intensity in terms of decreased analyser surface.

As we've shown in [1], the resolution curve of a spherically bent analyser can be explained with an additional angular compression that causes shift in the local resolution curve. In this poster, we describe a novel measurement method for X-ray crystal spectrometers using a position-sensitive (2D) detector, and demonstrate how it can be used to compensate the angular compression related degradation of the energy resolution of sphrical crystal analyser.

[1] A.-P. Honkanen, R. Verbeni, L. Simonelli, M. Moretti Sala, G. Monaco and S. Huotari, J. Synchrotron Rad. **21**, 104-110 (2014).