standard MX synchrotron beamlines. If no anomalous scatter is available within this range, proteins are either labelled by soaking of ions into the crystals or by the exchange of methionine with seleno-methionine. However, both methods are limited in their applicability. Ideally, the phase problem should be solved directly from the unmodified, native protein or RNA/DNA crystal. This can be realized by using the intrinsic anomalous signal from sulphur or phosphorous present in these crystals. However, so far the success of long-wavelength phasing has been mainly limited to well diffracting crystals with high sulphur content due to the lack of optimised experimental facilities.

Beamline I23 at Diamond Light Source will be the first dedicated beamline for long-wavelength phasing experiments from macromolecular crystals. It will operate in a core wavelength range from 1.5 to 4 Å, offering a complementary setup to the suite of already five existing MX beamlines at Diamond. To minimize absorption effects, the complete beamline will be operated in vacuum. An X-ray tomography setup will be integrated into the experimental end station to determine the crystal shape and size as a basis for an analytical absorption correction. A large curved detector will allow access to diffraction data up to $2\theta = \pm 90^{\circ}$. An overview of the current status of the beamline project will be given, addressing all aspects of in-vacuum long-wavelength MX and the opportunities by extending the wavelength range towards the sulphur and phosphorous K-absorption edges.

Keywords: anomalous scattering, long-wavelength, synchrotron beamline

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Feasibility study of hard X-ray resonator of sapphire using back reflection

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X-ray cavity interference in sapphire resonator was investigated. The sapphire (0 0 30) reflection was chosen as the back diffraction for 14.315 KeV. The advantages of using sapphire resonator are (1) there is only one ordinary reflection under the back diffraction condition, and (2) the absorption is much less than for silicon [1], [2]. These factors could enhance the resonance interference and improve the cavity finesse. Several sets of crystal resonators with different thicknesses and gaps were manufactured and used for the X-ray diffraction experiment. The resonance spectrum in energy was obtained by using a high resolution monochromator consisting of four silicon crystals with the energy resolution of about 0.82 meV. The separation of two adjacent resonance peaks in energy scan, the so-called the free spectrum range, was measured, which is in good agreement with the theoretical value. These results indicate that the hard X-ray resonator of sapphire is potentially useful for X-ray optics, which can be used as a beam conditioner for producing quasi-coherent X-rays.

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On a New "Gram"

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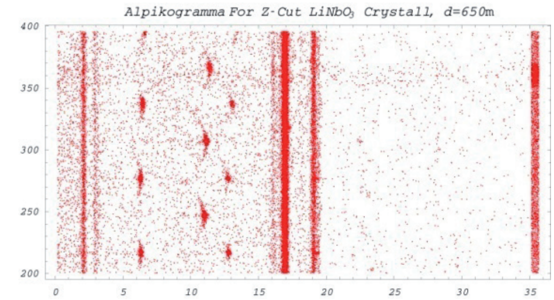
The investigation of phenomenon of radiation of electromagnetic wave by relativistic electrons shows that dynamic maxima are formed.

The dynamic maxima for quartz single crystals were first observed by the authors [1,2] on MAMI microtrone of Mainz University (Germany) for electron energy 255 MeV. In this work, it is reported about a new "gram" for crystal investigation with obvious advantages to the existing ones. In this work, the characteristic sections of dynamic maxima has been named to Alpik-grams in the author's honour.

Further the analogous investigations on SiO_2 sample were made for electron energies of 180 MeV and 280 MeV.

The present work is devoted to the possibility of detailed investigation of crystal structure and determination of the universality of detection of location of both the light and heavy atoms. On the figure below is shown the Alpik-gram of $LiNbO_3$. In the picture, the locations of the dynamic reflections $(3\bar{3}00)$ of lithium niobate (for the energies ~6 keV, ~11keV, ~13 keV) and the characteristic radiation lines K_α-0.52 keV of oxygen and K_α-16.61 keV, K_β-16.615 keV of the niobate are clearly seen.

Thus, by detecting the radiation of the scattered electrons and on the basis of Bragg condition, it is possible to construct the spatial structure of $LiNbO_3$. The suggested method enables to perform both the spectral and structural analysis analogous with Debye-Scherrer patterns and Laue-grams both for light and heavy nuclei.



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NE-CAT crystallography beamlines for challenging structural biology research

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The NorthEastern Collaborative Access Team (NE-CAT), located at the Advanced Photon Source (APS), focuses on the design, construction, and operation of synchrotron X-ray beamlines for the solution of technically challenging structural biology problems and provides an