

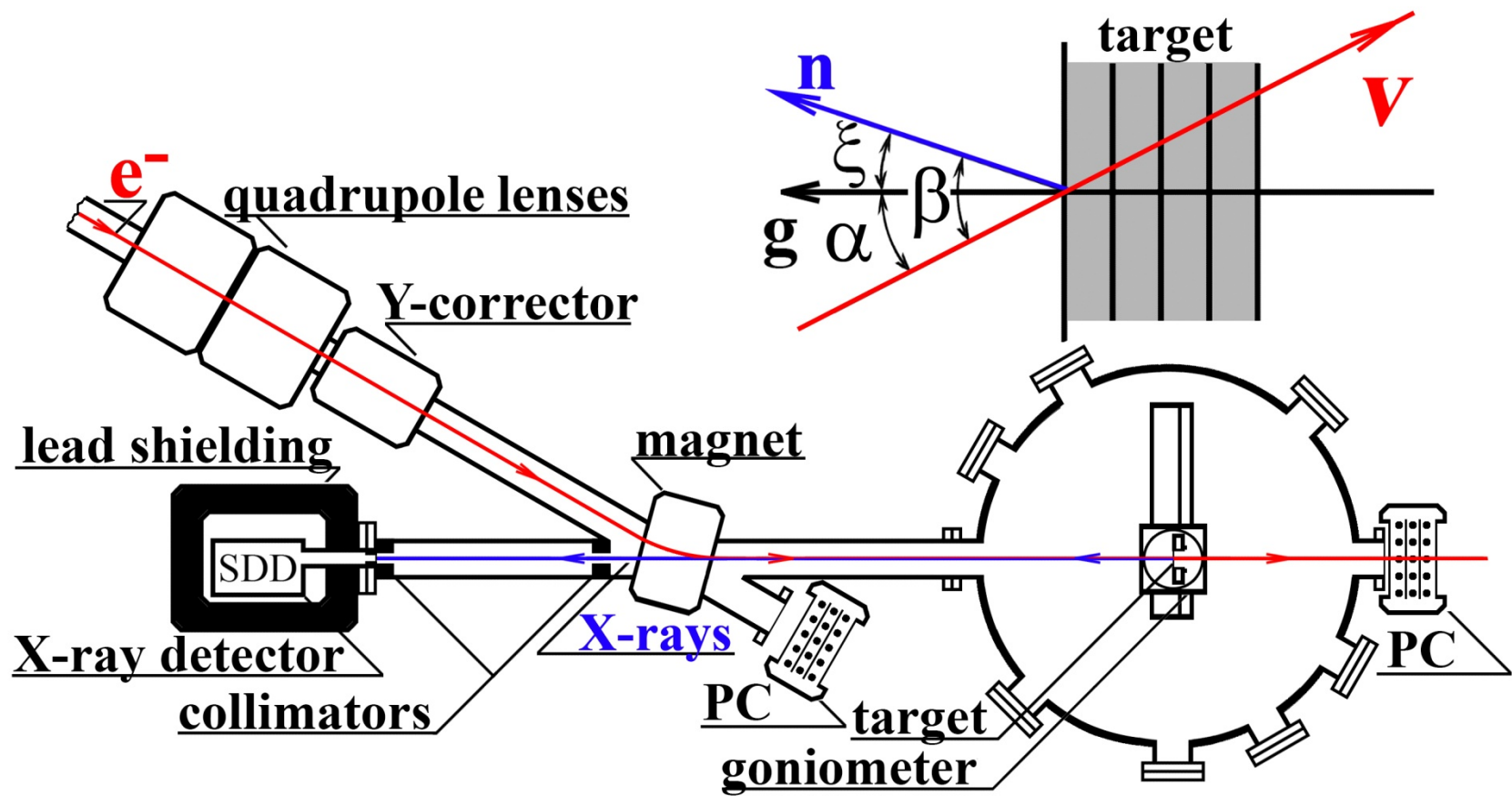
Parametric X-ray radiation in backward geometry under interaction of relativistic electrons with crystals

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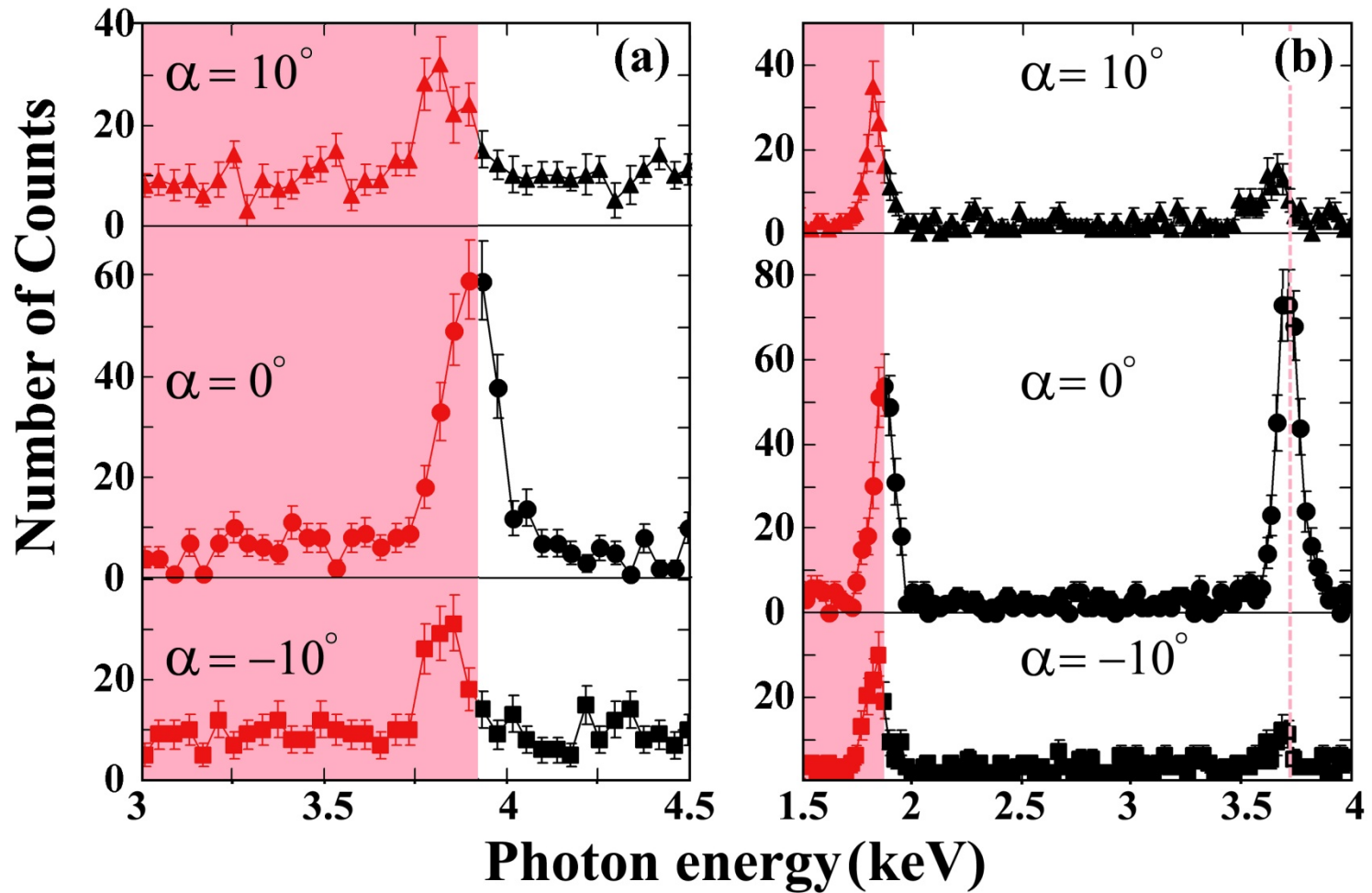
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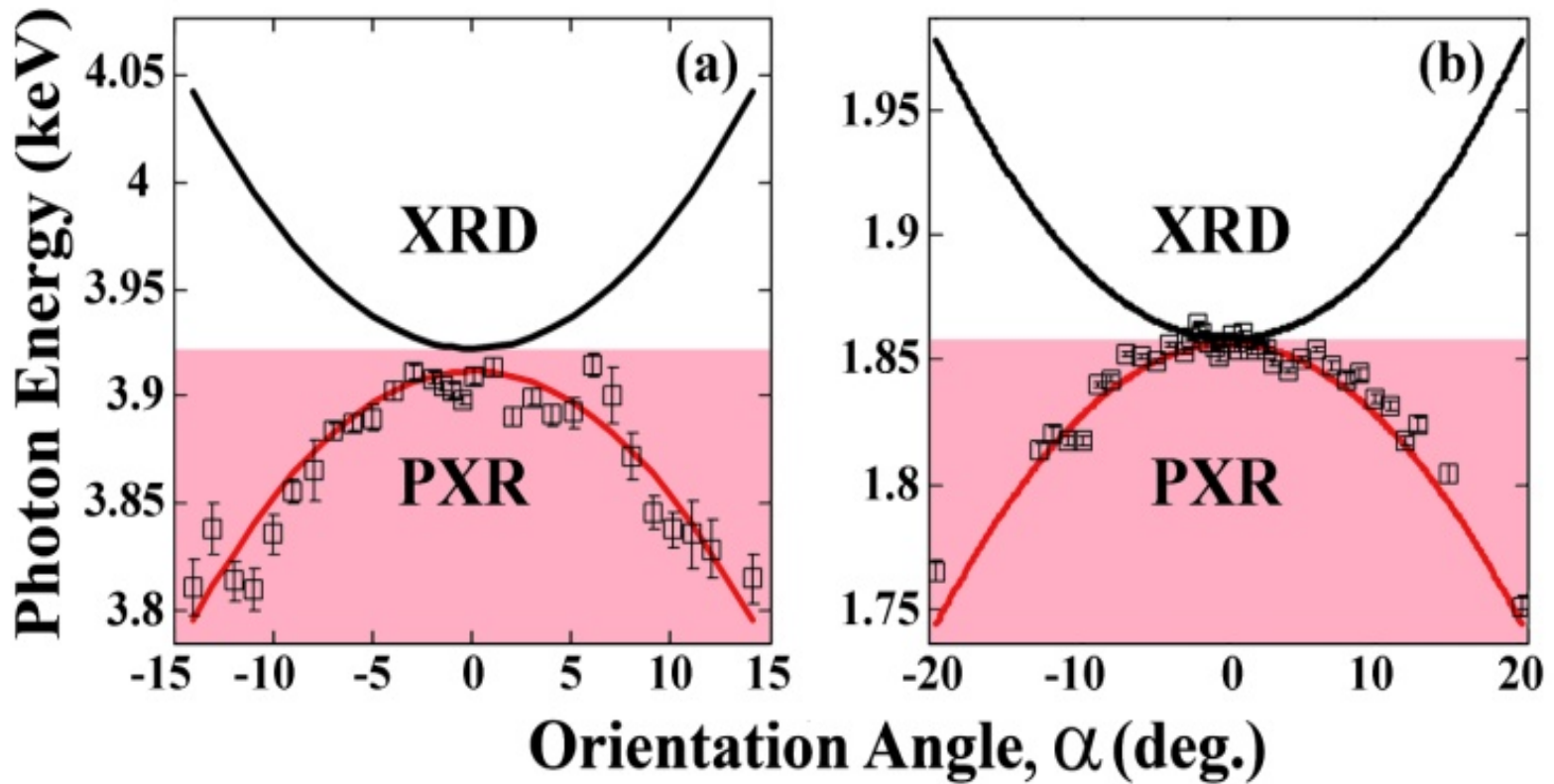


$$\omega^{PXR} = \frac{-\vec{g}\vec{V}_e}{1-\vec{n}\vec{V}_e\sqrt{\epsilon}}$$

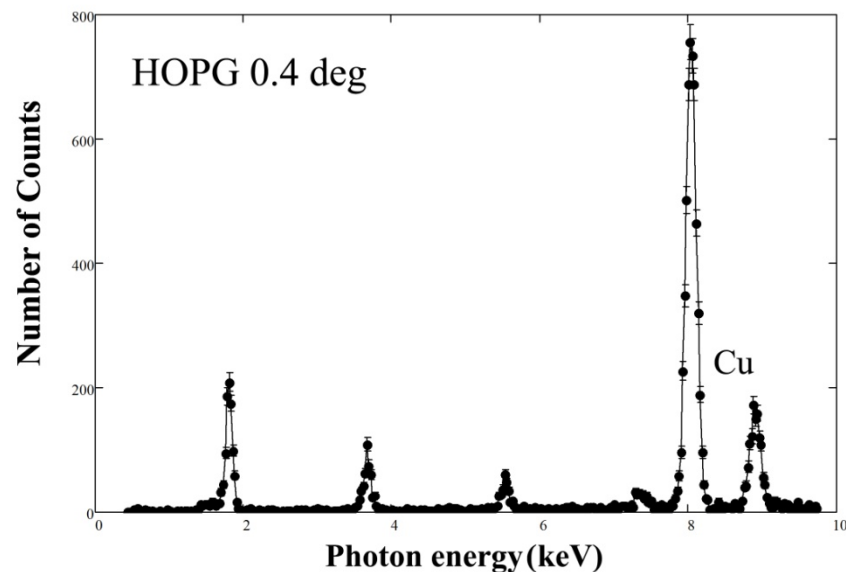
$$\omega^{XRD} = \frac{g^2}{2\vec{n}\vec{g}}$$



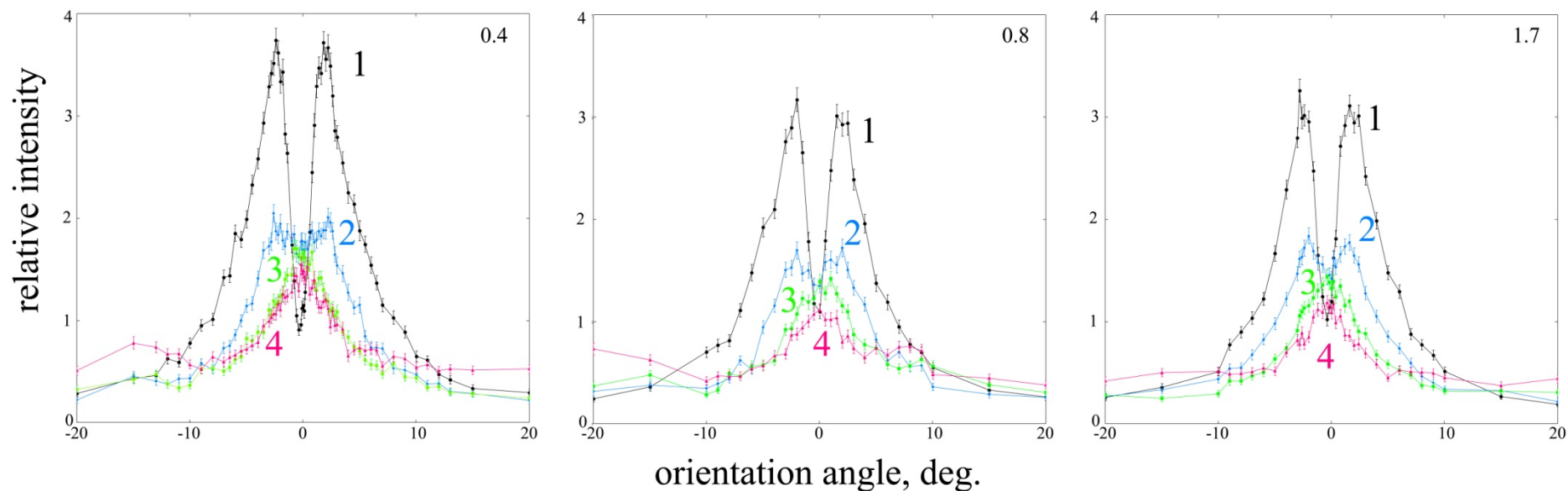
PXR spectra measured in the backward geometry under different orientation angles for both the tungsten (a) and the HOPG (b) targets. The region in red background represents the anomalous diffraction region.



PXR peak energy dependences on the orientation angle for both the tungsten (a) and the HOPG (b) targets. The solid curves correspond to the calculation by (1a) and (1b) in the backward geometry. The region in red background represents the anomalous diffraction region.

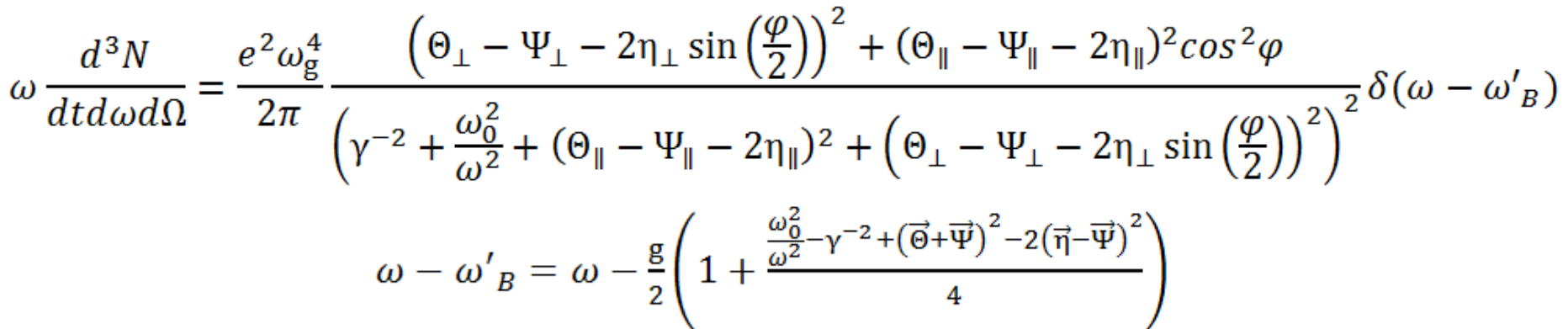


Typical PXR spectrum measured in the backward geometry from the HOPG crystal

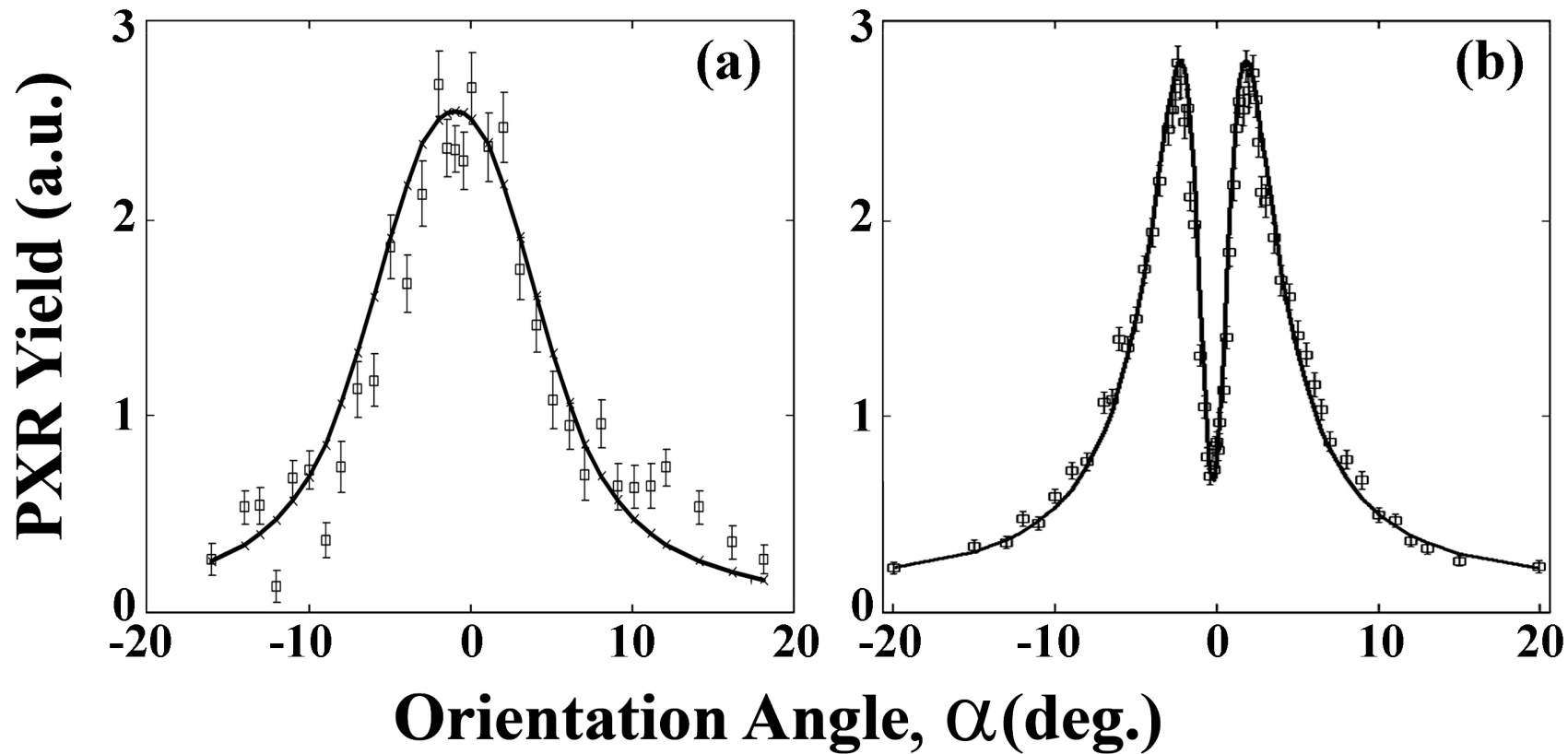


PXR yield dependences for different planes and mosaicity on the orientation angle for the HOPG crystals.

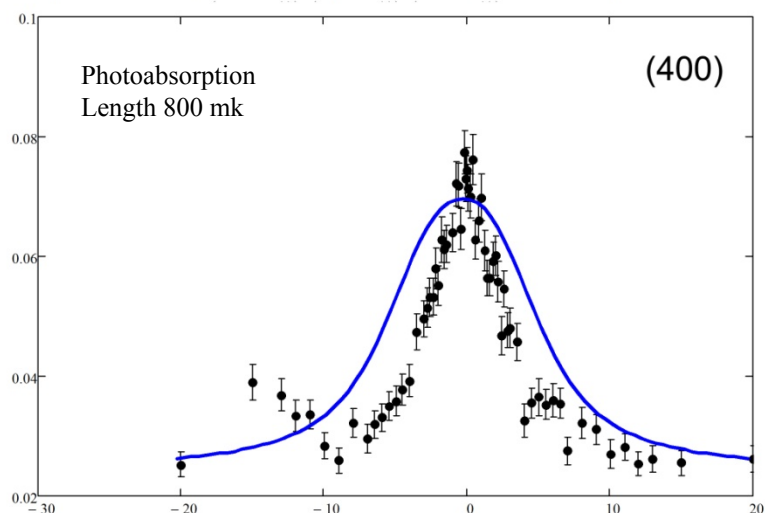
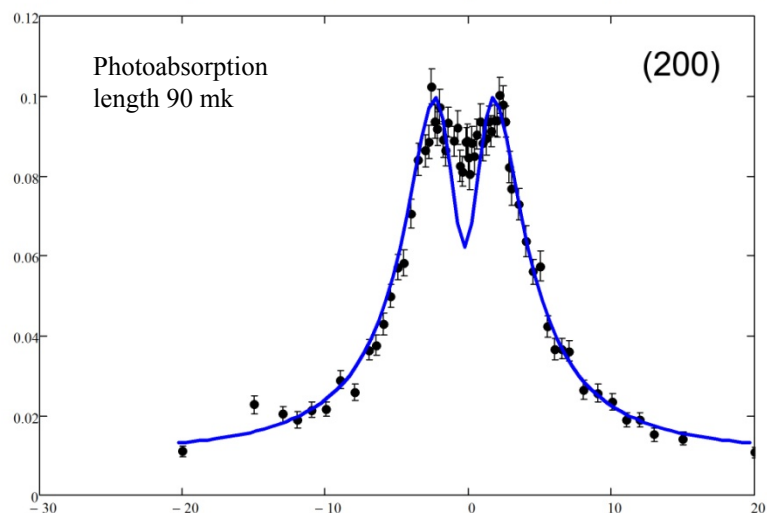
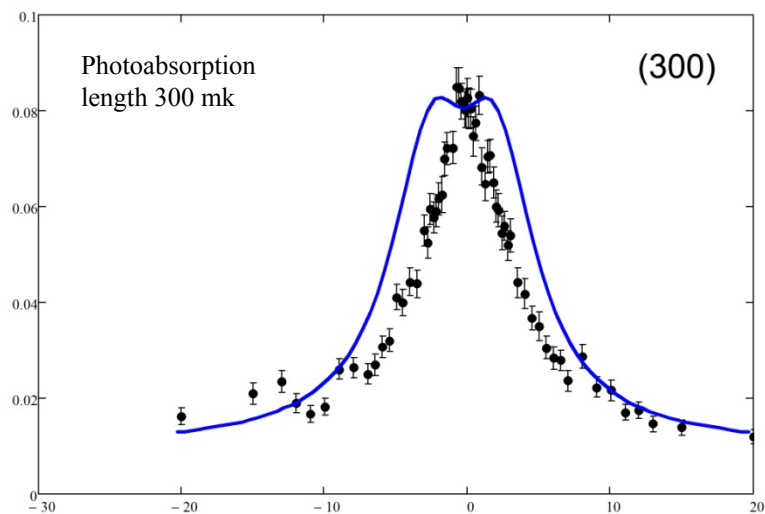
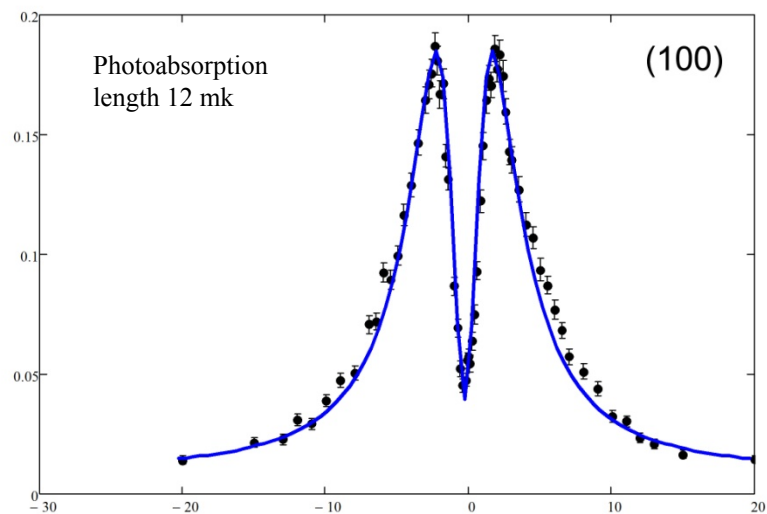
Points 1, 2, 3 and 4 correspond to the first, second, third and fourth diffraction orders.



The geometry and spectral-angular distribution for PXR description



The PXR yield dependences for the tungsten foil (a) and HOPG (b).
Solid line – theory.



orientation angle, degrees

orientation angle, degrees

PXR yield dependences for different planes on the orientation
angle for the HOPG. Solid line – theory.

Results

Spectra and orientation dependencies of PXR are measured under interaction of 7 MeV electron beam with textured tungsten polycrystalline foil and highly oriented pyrolytic graphite crystals. The results can be summarized as follows:

- PXR spectral peaks were observed at energy smaller than low-energy limit for diffraction of free X-rays in accordance with the theoretical prediction;
- PXR orientation dependence is in good accordance with theory for the first diffraction order, the measured orientation dependences for third and fourth orders are substantially narrow in comparison with the theory.

Thanks a lot for your attention!