Focusing system of synchrotron radiation with refractive mosaic lenses for the station “Extreme state of matter” of the VEPP-4

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Abstract

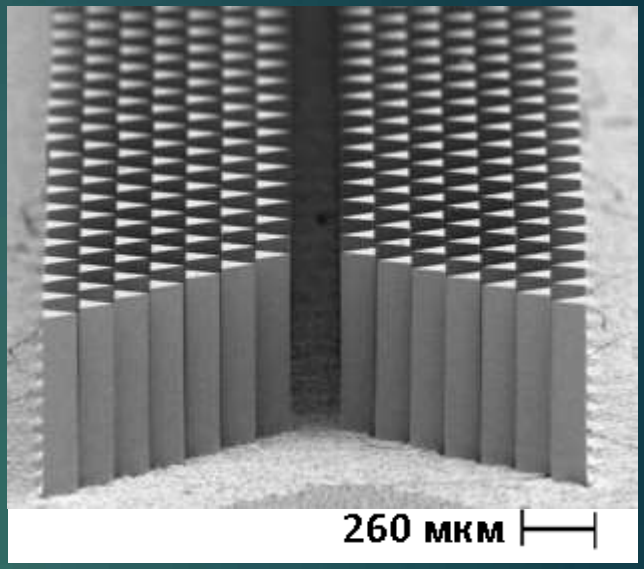
- **A fast processes investigation with an exposure time of diffraction patterns of 100 ps at the INP requires high intensity of synchrotron radiation beam;**
- **A local matter structure investigation at the INP needs x-ray nanobeam production technology;**
- **Using x-ray refractive optics the radiation intensity can be increased.**

Objectives:

- **To design and create the adjustment device for adjusting the position of the x-ray lens**
- **install and debug the device on the VEPP-4 channel;**
- **to calculate the lens absorbtion with modelling programs XOP, Spectra, ANSYS**
- **get the size of the focal spot obtained with x-ray lens.**

Experimental setup

- The epoxy resin SU-8 Planar mosaic 1D lens[1]
- Lens length – 55 mm.
- Aperture – 2*6 mm^2.
- Focusing distance for x-ray beam – 5 m (37.5 keV).

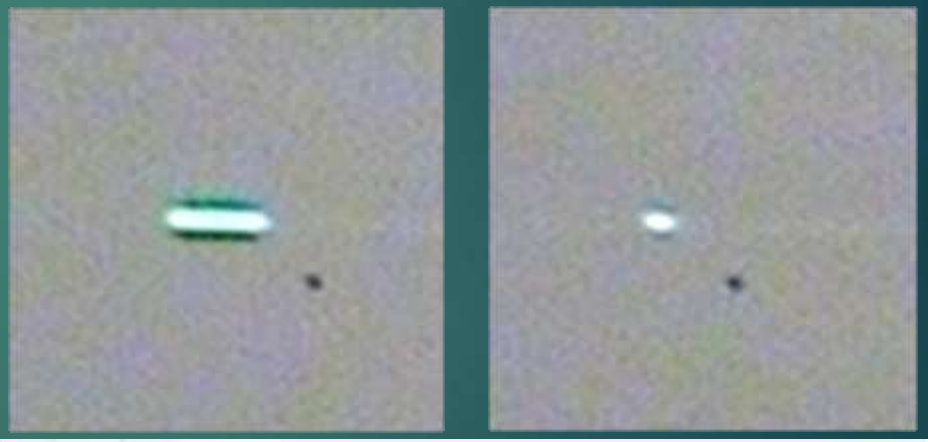


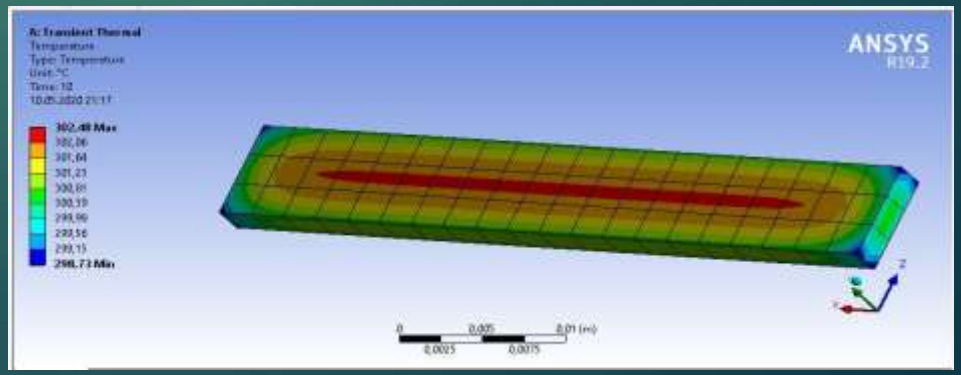
- The adjusting device for x-ray lens was designed and created.
- Four step motors controls linear x,y coordinates and angle coordinates φ, 2θ.
- The device was installed on the station and checked out.

1. Nazmov V.P., Tolochko B.P. Patent RF 2572045.

Experimental results

- The lens was installed on the adjustment device.
- During experiment 50 keV monochromatic x-ray beam was used.
- X-ray beam focal spot before lens installing (left) and after (right).
- The SR beam compression coefficient is 4.
- The lens absorption was calculated with XOP, Spectra, ANSYS programs.
- The lens heats up strongly by polychromatic radiation (17 deg/s).





Conclusion

- **The synchrotron radiation focusing system for VEPP-3/VEPP-4 complex was designed and created.**
- **The experiments of focusing beam using x-ray refracting lens were conducted.**
- **The lens absorption calculation and heating experiments were conducted.**
- **The lens heats up strongly by polychromatic radiation (17 deg/s).**
- **The focal spot of focused 50 keV monochromatic beam was obtained.**
- **The SR beam compression coefficient is 4.**