

Nano Radian Angular Resolution Flexure Stage for ID28 Post-monochromator

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On ESRF Beamline ID28 a post-monochromator was required downstream from the silicon (111) pre-monochromator to further reduce the heat load on the very high-energy resolution back scattering monochromator. A silicon channel cut crystal with a higher reflection order (331) was selected for this post-monochromator. The rocking curve width of this reflection is very narrow (typically between 2 & 5 micro-radians). Hence the angular resolution of the crystal positioning mechanics should ideally be less than 1 micro radian.

A novel flexure stage driven by a high resolution DC mike linear actuator was designed & developed to give an angular resolution of 0.1 micro radians. The design incorporates a circular cartwheel flexure stage with a radial thin blade that gives a very large de-multiplication to the movement of the linear actuator.

This paper presents the design of the flexure stage, the finite element analysis, and the measured results obtained in the laboratory.

The post-monochromator has been installed and operated on the ESRF beamline ID28.