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Vibration stability of a liquid nitrogen cooled double-crystal monochromator at HALF

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The requirement for monochromators with high precision and vibrational stability is crucial for the beamlines of diffraction-limited storage-ring light sources. A high stability double-crystal monochromator (DCM) with a high-stiffness flexure hinge has been developed for the Hefei Advanced Light Facility (HALF) at the National Synchrotron Radiation Laboratory. A comprehensive test was conducted to assess the stability performance of the DCM. Under a liquid nitrogen flow rate of 2 L/min, the system achieved a relative stability of 10.1 nrad RMS within the frequency range of 1–500 Hz. Additional stability tests performed at various Bragg angles demonstrated consistently favorable performance across the full angular range of 0° to 60°. Long-term stability was also investigated, yielding a peak-to-valley relative stability of 135.5 nrad over a continuous 2-hour period under identical cooling conditions. These results confirm that the DCM exhibits excellent overall stability, sufficient to meet the requirements of synchrotron beamlines.

Footnotes

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