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Stability evaluation of a double crystal monochromator using an optical linear encoder

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A dedicated jig with an optical linear encoder was developed to evaluate the pitching stability between the first and second crystals of a double crystal monochromator in a standalone configuration. This method does not require synchrotron radiation, enabling direct assessment of the monochromator's intrinsic stability. Unlike beamline-based measurements influenced by upstream optics, this approach isolates the monochromator's performance. Designed and implemented by Kohzu Precision, the system is currently applied to a symmetrical layout monochromator to assess angular stability in mechanically decoupled configurations. The encoder counter supports readout rates up to 12 MHz; however, considering the latch interval of the system, the effective sampling rate is about 5 kHz. Measurements were conducted at approximately 2 kHz. At a Bragg angle of 10 degrees, the angular stability (RMS) in the pitching direction was better than 20 nrad, and a dominant vibration peak was observed near 180 Hz. These results demonstrate the system's effectiveness in characterizing the stability of high-performance monochromator configurations.

Footnotes

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Author: OKUI, Masato (Kohzu Precision Co., Ltd. (Japan); University of Hyogo)

Co-authors: Mr SHIMOBUCHI, Atsushi (Kohzu Precision Co., Ltd. (Japan)); Mr NAGATA, Daiki (Kohzu Precision Co., Ltd. (Japan)); Dr FUKUZAWA, Hironobu (Photon Science Innovation Center); Dr YAMANE, Hiroyuki (Photon Science Innovation Center); Prof. YOSHIDA, Junya (Tohoku University); Mr YATO, Naoki (Kohzu Precision Co., Ltd. (Japan)); Prof. NAKAMURA, Tetsuya (Tohoku University; Photon Science Innovation Center); Mr IKEYA, Yuki (Photon Science Innovation Center)

Presenter: OKUI, Masato (Kohzu Precision Co., Ltd. (Japan); University of Hyogo)

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