

Challenges towards 50 nrad-stability of x-rays for a next generation light source by refinements of SPring-8 Standard monochromator with cryo-cooled Si crystals

Hiroshi Yamazaki^{1,2}, Yasuhisa Matsuzaki¹, Yasuhiro Shimizu¹, Ichiro Tsuboki¹, Yuki Ikeya¹, Tomoyuki Takeuchi¹, Masayuki Tanaka¹, Takanori Miura¹, Hikaru Kishimoto¹, Yasunori Senba^{1,2}, and Haruhiko Ohashi^{1,2*}

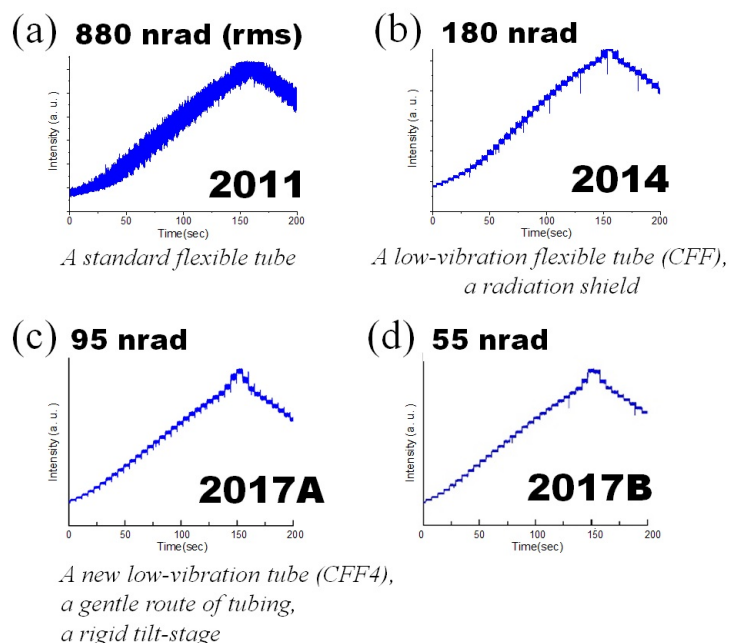
¹Japan Synchrotron Radiation Research Institute (JASRI), Japan

²RIKEN SPring-8 Center, Japan

**hohashi@spring8.or.jp*

The key issue of a beamline optics is to handle stably the high brilliant x-rays. Stability of x-rays from a high-heat-load monochromator is much more crucial for preserving beam properties of next generation light sources. Most of undulator beamlines in SPring-8 are equipped with a double crystal monochromator with cryogenically cooled silicon to manage high heat load. The 21 sets of SSM (SPring-8 standard monochromator) and cryogenically cooling system are in operational. The flow of liquid nitrogen and the temperature fluctuation cause harmful instabilities of the monochromatic beams in short and long terms.

Therefore, we have investigated the origins of the instabilities in SSM, and developed various components to reduce or control the sources such as a low-vibration flexible tube [1], a highly rigid tilt-stage and a precise temperature controller of LN₂. The recent refinements of SSM have been adopted to 4 beamlines in 2017 and the angular vibration was improved to about 1/10 for 6 years as shown in the figure. In this paper we report on the latest results of improvement in some beamlines and challenges towards 50-nrad stability of x-rays.



Improvement on angular stability of x-rays evaluated by intensity fluctuation

References

[1] Patent of RIKEN, JASRI and Osaka Rasenkan Kogyo Co., LTD: Clear Flow Flex (CFF).