MT 26
International Conference on Magnet Technology
Vancouver, Canada | 2019

Contribution ID: **814** Type: **Poster Presentation**

Wed-Af-Po3.16-05 [23]: Development of a Nb3Sn superconducting undulator for the Advanced Photon Source

Wednesday 25 September 2019 14:00 (2 hours)

NbTi superconducting undulators (SCUs) are currently reliably operating at the Advanced Photon Source (APS) at Argonne National Laboratory (ANL). These devices significantly enhanced x-ray flux and brightness at high energy spectrum. As NbTi SCU technology is close to its full potential, further performance enhancement requires using different superconducting materials. Nb3Sn is a promising candidate to achieve that goal. Recently APS has started developing a Nb3Sn double undulator compatible with the APS storage ring. The magnetic length of each Nb3Sn undulator is about 1.4 m, totaling to 2.8 m. The completed device is planned to be installed in the APS storage ring. To develop the Nb3Sn SCU technology, a series of short SCU models has been fabricated and successfully tested. The SCU magnet design is being scaled up to an intermediate length of ˜0.5 m. In the course of the short model magnet R&D, performance, quench behavior, mechanical and magnetic instabilities of the design have been experimentally evaluated and improved. The details of this work will be reported in this paper. In addition, on-going scaling-up efforts to intermediate lengths and relevant test results will also be presented and discussed.

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Session Classification: Wed-Af-Po3.16 - Magnets for Light Source