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Wed-Af-Po3.21-12 [78]: Heat Treatment Studies of Nb3Sn RRP wires for Superconducting Planar Undulators

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NbTi-based superconducting undulators have been developed and proven to increase the brightness by an order of magnitude at high x-ray energies at the ANL Advanced Photon Source (APS). Nb3Sn has the potential to further enhance the performance of SCUs. These Nb3Sn undulators operate at maximum on-conductor field ranges between 4 T and 6 T; such comparatively low field values present stability issues, which was addressed by using 0.6 mm in diameter Nb3Sn wire with small sub-element size, specifically a Restacked Rod Processed (RRP) wire with 150 superconducting subelements over 169 total subelements. The effective sub-element diameter, Deff, of this wire is ˜35 μm. At these small Deff values, the critical current density Jc is known to deteriorate. In addition, the Residual Resistivity Ratio, or RRR, of such small diameter wires is very sensitive to heat treatment. A delicate balance has to be found to obtain parameters within operation specifications. In this paper we show performance results from different heat treatments on 150/169 RRP wires between 0.5 mm and 0.8 mm with both high-Sn and intermediate-Sn designs.

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