



Contribution ID: 343

Type: **Contributed Oral Presentation**

Digital evaluation of filament distortion and RRR degradation in drawn and rolled PIT and RRP® Nb₃Sn wires

Tuesday 30 June 2015 12:15 (15 minutes)

PIT and RRP® Nb₃Sn strands are being studied as potential candidates for high field accelerator magnet upgrades for the LHC. It is well known that maintaining diffusion barrier integrity in these strands is vital to retaining adequate RRR for magnet stability. Here we report a quantitative study of the shape and position of filaments or sub-elements after rolling lengths of unreacted PIT and RRP® round wires to simulate cabling deformation. In the as-drawn condition shape deformation occurs preferentially in the outer ring filaments, increasing progressively with radial position, but rolling induces non-uniform shear bands that induce greater distortion of inner ring filaments. By making a full digitization of the shapes of all filaments, and by taking measurements of RRR, we find that a critical distortion occurs for thickness reductions between 10 and 20%. In this deformation range, the filament shapes transition from higher aspect ratio in outer filament rings to much larger aspect ratios in inner filament rings, especially in the vicinity of the strong 45° shear bands imposed by the rolling. We have benchmarked the deformation to determine a limit past which unacceptable damage has occurred, and will discuss how to best limit this damage, which inevitably leads to Sn leakage and RRR degradation when uncontrolled. Progress is currently being made toward an approach for accurate modeling and prediction of wire deformation in hopes of limiting degradation, thereby enhancing wire performance.

Author: BROWN, Michael (Florida State University)

Co-authors: TARANTINI, Chiara (FSU); LARBALESTIER, David (National High Magnetic Field Laboratory); LEE, Peter (Florida State University); Dr OATES, William (FSU); STARCH, William (ASC)

Presenter: BROWN, Michael (Florida State University)

Session Classification: M2OrA - Superconductor Materials III: Nb₃Sn

Track Classification: ICMC-01 - NbTi/Nb₃Sn/A15 Processing and Properties