

Advances in Applied Superconductivity Technologies for High Luminosity LHC Project

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Abstract - Intensive magnet R&D efforts are underway to meet the requirements of future colliders and enable new discoveries in High Energy Physics. The LHC luminosity upgrade provides the opportunity to refine the results obtained in proof-of-principle high-field Nb₃Sn models and extend them to full-size production magnets, suitable for operation in a challenging accelerator environment. Starting in 2004, the US LHC Accelerator Research Program has developed large aperture Nb₃Sn quadrupole models of progressively increasing performance and complexity, with particular emphasis on addressing length scale-up and accelerator quality issues. Significant contributions to this R&D effort were also provided by CERN, initially through magnet assembly and test, and later expanding to coil design and fabrication. At this time, the program is completing the technology demonstration phase and transitioning toward prototyping and production. Key achievements to date and remaining challenges are discussed.

Keywords - Superconducting accelerator magnets, Niobium-Tin, Large Hadron Collider

IEEE/CSC & ESAS European Superconductivity News Forum (ESNF) No. 23 January 2013; Category 6.
Invited presentation 2SLE-01 given at ASC 2012.