

## Assembly and Test of HD2, a 36 mm Bore High Field Nb<sub>3</sub>Sn Dipole Magnet

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**Abstract**—We report on the fabrication, assembly, and test of the Nb<sub>3</sub>Sn dipole magnet HD2. The magnet, aimed at demonstrating the application of Nb<sub>3</sub>Sn superconductor in high field accelerator-type dipoles, features a 36 mm clear bore surrounded by block-type coils with tilted ends. The coil design is optimized to minimize geometric harmonics in the aperture and the magnetic peak field on the conductor in the coil ends. The target bore field of 15 T at 4.3 K is consistent with critical current measurements of extracted strands. The coils are horizontally pre-stressed during assembly using an external aluminum shell pre-tensioned with water-pressurized bladders. Axial pre-loading of the coil ends is accomplished through two end plates and four aluminum tension rods. The strain in coil, shell, and rods is monitored with strain gauges during assembly, cool-down and magnet excitation, and compared with 3D finite element computations. Magnet's training performance, quench locations, and ramp-rate dependence are then analyzed and discussed.

**Index Terms**—Dipole magnet, Nb<sub>3</sub>Sn

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