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High Performance HTS Conductors for Compact Fusion Tokamak Facility

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Significant progress has been made recently in the U.S. Fusion community to develop a strategic plan to enable engineering design and construction of a Fusion Pilot Plant (FPP). Princeton Plasma Physics Laboratory (PPPL) is working on developing high performance HTS conductors for fusion, and partnering with the U.S. industry, we are evaluating feasibility and affordability of cable on round core (CORC) that can be used for next-step compact fusion tokamak facility. High current density achieved by CORC cable based model coil recently tested at NHMFL motivated its consideration for low cost, reduced size fusion magnet application. This is of interest to PPPL because it is directly scalable to tokamak central solenoids in terms of required double flux swing for plasma startup operations. Working with Advanced Conductor Technologies, we design and build a two-layer CS model coil using CORC cable to demonstrate its direct applicability for Compact Tokamak Test Facility such as the Fusion Nuclear Science Facility and the U.S. Sustained high-power density tokamak facility. The 250 mm diameter CS model coil will be wound by a two layer CORC cable and can generate 6 T at 4.2 K when operated at 28 kA.

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