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Mon-Mo-Or2-01: Technology for Compact CORC Multi-Layer Solenoid and Racetrack Coils

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ReBCO-CORC wires, long dreamed about practical high current density thin conductors, are now reality and feature diameters in the 2 to 4 mm range. They are multi-purpose, but at CERN specifically developed for application in high-field magnets. CERN is interested to further aid the development of such conductors for possible implementation in the next generation of accelerator magnets and high-field insert coils. Therefore, a series of demonstrator coils are planned to develop and mature the technology. Here we report on two CORC based demonstrator coils currently in development.

The first is a solenoid to be used either standalone or as an insert. It aims to demonstrate the high performance of CORC wires in magnets, as well as to find critical parameters in the design and handling of both wire and magnet. The solenoid comprises two layers of 3.3 mm diameter CORC wire of each 17 turns wound on a former of 60 mm diameter. The 53 μ H coil, with critical current of 9.7 kA in self-field and 4.2 K, can generate 4.5 T central field. As insert in a background of 10 T, it yields an additional 2.5 T central field. Test results at 77 K in self-field are reported followed by a test at 4.5 K during summer of 2019.

The second demonstrator magnet is a compact multi-layer racetrack coil of 190 mm long, 54 mm wide and with 20 mm head radius. It is wound with CORC wire embedding cutting-edge ReBCO tape comprising 25 μ m substrate thickness. The reduction of substrate thickness from 30 to 25 μ m yields a thinner and more flexible CORC wire, which is a hard requirement for this magnet. The manufacturing technology of this unique coil is reported along with its test results. More exciting new developments can be expected in the near future.

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