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Demonstration Test of Two New 80 kA@12T/4K class ReBCO CORC Cable-In-Conduit Conductors for Fusion and Detector Magnets

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Two new record size ReBCO CORC Cable-In-Conduit-Conductors were designed and manufactured by CERN in collaboration with the CORC strand supplier ACT in Boulder, and tested in cooperation with the Sultan team at PSI. The cables in both conductors are of similar design and use the six-around-one cable layout with six CORC strands. The cables are 2.8 m in length, rated 80 kA at 12T/4.5K and comprise 252 SCS4050 Super-Power tapes with 5 microns copper plating per side. The first conductor is designed for use in large detector magnets featuring conduction cooling and an OFHC copper jacket. The second is intended for operation in large magnets for nuclear fusion facilities with a stainless steel jacket and internal forced flow cooling. The conductors are tested in the SULTAN facility at PSI, Villigen, Switzerland. The facility provides current up to 100 kA, an external magnetic field on the sample up to 10.8 T and a testing temperature from 4.5 to 40 K. Both conductors are tested at the same time as two legs of a hairpin sample. The conductor temperature is controlled by adjusting temperature and flow-rate of the helium gas. A two cooling channel approach allows a temperature difference of a few Kelvin between both legs of the sample, allowing Ic(B, T) measurements to be performed on the individual conductors. Several current and magnetic field cycles are performed to evaluate the mechanical long-term performance of cable and jacket and check for performance degradation due to temperature and load cycling. In the paper details on both CORC Cable-In-Conduit Conductors are provided and the test results are summarized.

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