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[Invited] The EuCARD2 Future Magnets Program for particle accelerator high field dipoles: review of results and next steps

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The EuCARD-2* collaborative programme (2013-2017) is part of the European long term development aimed at exploring magnet technology operating at 16 T to 20 T dipole field for the next CERN collider projects. The collaboration had as a main focus the development of a 10 kA-class superconducting, high current density cable suitable for accelerator magnets, to be tested in small scale coils and magnets capable to deliver about 5 T when energized in stand-alone mode, and 15-18 T when inserted in a 12-13 T background magnet. After evaluating various possibilities, for the conductor we selected REBCO tapes assembled in a Roebel cable. The EuCARD2 programme has come to an end with the successful test of the 10 kA class conductor. The YBCO tape has demonstrated a record critical current density 4.2 K, 20 T and the conductor exceed 12 kA in a 6 m long unit wound in a small coil (FM0.4) and has shown almost no current degradation in special test under 400 MPa of transverse pressure. The coil test, spanning the 4 to 80 K temperature range, has also shown that we can rely on current transfer among cable strands and new systems have been tested and partly validated to detect the transition onset early. The test results of an accelerator-quality magnet of novel design (Feather_M2) with various types of conductor are reported, as well a test of a classical costheta design. The HTS accelerator magnet work plan beyond EuCARD2, supported by a task in the H2020-ARIES program aiming at doubling the Je at 20 T in the tape, and including investigations of new designs as well as a series of technology developments will also be presented.

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