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Conceptual design of the HTS split coil test facility for the Muon Collider cooling section

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The cooling section of the Muon Collider requires a number of solenoidal coils of various diameters (0.05-2 m) and fields (2-60 T). An unusual feature of the cooling section is that the RF cavities operate under the large magnetic fields and field gradients generated by the focusing elements. Here we present the design of a test facility based on split coils, wound with HTS, to study the performance of RF cavities under magnetic field. The main characteristics are: 330 mm free room temperature bore, uniform 7 T field along 300 mm on axis, coils energized with parallel or antiparallel field: this last configuration provides a gradient field of about 40 T/m. The use of HTS in form of REBCO tape enables magnet operation at 20 K and cooling via solid conduction by cryocoolers. This facility will be a first prototype of the cooling cell magnets that are being designed in cryogen-free layout at 20 K for energy saving and will allow to anticipate system integration concepts. The conceptual design of the facility is almost frozen and the engineering design is well under way. If we get financial support by 2025 we can commission the facility in 2027.

Footnotes

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