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Cloverleaf dipole demonstrator magnet with 2-tape ReBCO stack conductor

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For future 20+ T accelerator type magnets, ReBCO tape based conductors are ideal for their capability of carrying high current densities in high magnetic field. At CERN, demonstrator dipole magnets using ReBCO conductor are being developed in order to study the feasibility of this technology. A key problem in such magnets is how to realize the coil ends when using ReBCO tape conductor without causing degradation due to coil winding, coil processing, cool down and operation. Here, the design of a new short racetrack magnet is presented, comprising two poles equipped with so-called Cloverleaf coil ends. Essentially the Cloverleaf geometry allows the tape to be passed over the particle beam pipe without any hard-way bending to avoid tape damage. An additional advantage is the relatively short length of the coil end sections when compared to so-called flared ends. The ReBCO coil is wound with a stack-cable comprising two ReBCO tapes by which the ReBCO layers are facing each other. For quench protection, the coils use non-insulated winding technology, allowing the coil current at quench to bypass local hot spots by flowing transversally through the winding pack. Progress on the electromagnetic and mechanical design of the magnet is reported in this paper.

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