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Thu-Mo-Po.10-04: Optimization of coupling loss in HTS sector-shaped conductors

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High-temperature superconductors (HTS) coil systems are currently being considered within the context of magnetic confinement fusion for enabling higher operating temperatures, increased transport currents, and stronger magnetic fields. For the DEMO Central Solenoid coil, a novel HTS sector cable-in-conduit conductor (CICC), targeting 60 kA at 4.5 K and 18 T, has been proposed recently. In HTS cables, AC losses constitute a major performance limitation and must be carefully considered throughout the design and thermal assessment of the magnet. Beside the hysteresis losses, also coupling and Eddie current losses both play a significant role in the sector-shaped twisted-stacked tape conductor. This work leverages on a FEM model based on the 2D electrostatic formulation of the coupling loss in twisted HTS cables. The model was implemented based on a previously developed and validated model for LTS strands. The aim is to optimize the cable design by exploring variations in the aspect ratio and tape arrangements within the cable's internal structure.

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