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The Roebel Assembled Coated Conductor (RACC) cable, status of performance and prospects for further upgrades

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The high temperature REBCO coated conductor development is progressing in available conductor length and current capacity performance. Such conductors are available commercially and are used in an increasing number of applications. The application in large superconducting magnets (fusion) or high current windings (generators, motors) requires high current carrying conductors with low AC losses, as the RACC cable. In contrast to most of the alternative cable concepts, the RACC cable shows a comparable current anisotropy in background fields as the REBCO tape. This gives the opportunity to take advantage of nearly the maximum possible current aligning the cable in the favourable field orientation. The consequence is an advantage of up to approximately the 4-fold current compared to alternative cable concepts where the tapes are twisted and are experiencing all field directions. This is important for the costs and the optimum in engineering current density.
The RACC cable is assembled from Roebel strands punched out from tapes. The absence of defects in particular along the tape is a crucial quality feature of the strand since the current flows in a meander like trace. An option for further reduced AC losses are filament structures in the strands, cut by a laser. A filament structure is extraordinary sensitive to defects, in particular if their size approaches the filament width. With reduced width an increasing influence on the transport current is observed. We present data on REBCO tapes and results achieved on Roebel strands with up to 20 filaments. A systematic work on filamentarized RACC conductors will be shown.
Summarizing the different contributions affecting the currents, the potential of the current carrying capability of RACC cables will be discussed and evaluated.

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