2D Numerical Simulations of HTS Cable-in-Conduit Conductor Cables

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Abstract **-** Among the designs of high-temperature superconducting (HTS) cables considered for fusion magnet applications, the Twisted Stacked Tape Cable-in-Conduit-Conductor (TSTC-CICC) has gained considerable interest due to its easy manufacturing process, very high tape length usage, and flexibility capabilities. Over the past decade, ENEA has launched several experimental campaigns aimed primarily at studying the electromechanical capabilities of these TSTC-CICCs. In order to clarify different aspects of the experimental results, we have developed a 2D finite element (FE) model based on the recently proposed T-A formulation. The simulations have been implemented using a commercial FE analysis, solver and multiphysics simulation software. Such FE model includes the contact resistance of the electrical terminations used to inject the current and takes into account the angular dependence of the critical current on the local magnetic field. This 2D model allows to reproduce the experimental V-I results obtained in TSTC-CICCs with excellent agreement. Furthermore, the numerical simulations have allowed to deepen the understanding of those mechanisms that govern the current distribution inside the cable. The numerical model will be used to analyze the ac losses of a fully energized cable, to improve the capabilities of existing designs and to find an optimal configuration.

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