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# Analysis and modelling of the quench experiment on HTS sub-sized cable-in-conduit conductors for fusion applications

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The Central Solenoid (CS) of the EU DEMO is under design within the EUROfusion Consortium. Two different design options are under investigation. One option is based on Low Temperature Superconducting (LTS) Cable-In-Conduit Conductors (CICCs), following an ITER-like design approach. The other option is to employ both High Temperature Superconducting (HTS) and LTS materials to build an hybrid CS.
However, the response of HTS CICCs in typical transients expected in a superconducting coil, such as quench initiation and propagation, is less known with respect to that in LTS CICCs. Therefore, an experimental campaign on the investigation of quench propagation in HTS CICCs was launched by EUROfusion. So far, different CICC concepts designed by the Swiss Plasma Center (SPC) were tested in SULTAN. The conductors were equipped with several voltage taps along the conductor axis as well as temperature sensors on the stainless-steel conduit (jacket) and protruding in the He stream. The quench tests were performed with different mass flow rates and with different values of the transport current and background magnetic field.
In this work, the analysis of the experimental data of the tests performed on two different conductors, i.e., the solder-filled and the BSCCO conductors, is performed first. The analysis is mainly aimed at quantify the normal zone propagation speed and hot spot temperature, using the voltage measurements.
After this analysis, the implementation of the numerical model of the solder-filled and of the BSCCO conductors in the H4C code is described. The free parameters of the model are then calibrated and different tests not used for the calibration are then used for the model validation. The agreement between the experimental data and the computed results is good both on a global scale, e.g., the total voltage, as well as on a local scale, e.g., local voltages and He and jacket temperatures.

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