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## Modeling of AC losses in the CS and TF conductors for the ITER Project

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The cable-in-conduit conductor (CICC) that will be adopted for the 3L module of the ITER Central Solenoid (CS) coil and for the Toroidal Field (TF) magnets of the ITER Machine have been extensively characterized in the SULTAN facility in Villigen, Switzerland by means of DC and AC tests. The AC tests were performed superimposing a sinusoidally varying magnetic field, with amplitude of 0.2–0.3 T and frequency in the range 0.1 – 5 Hz, to a background constant magnetic flux density of 2 T and 9 T. These tests were performed before and after the electromagnetic cyclic loading of the conductors, either without transport current or setting its value to the nominal level. This paper describes the analysis of the AC loss results obtained on two CIC Conductors, namely identical to those used for the manufacturing of the CS Insert and TF Insert recently tested in the CSMC facility in Naka, Japan. The numerical modeling of these experiments was performed by means of the THELMA model, previously developed and validated at the University of Bologna, by pushing the analysis to different levels of discretization (sub-cables, triplets, strands). The comparison between measured and computed losses per cycle is presented in a wide range of experimental conditions. This study allows assessing the variations of interstrand contact resistances during the test campaign. Moreover, the numerical model provides useful hints for the interpretation of the experimental results. Finally, the results of the numerical model are compared with analytical formulae available in the literature.

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