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Development of a AC Loss Model for the ITER CS Coils

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AC loss is a major heat load in the fast-pulsed, superconducting ITER coils, and thus a design driver for the cryo-system and superconductor. Given the importance of AC loss, extensive AC loss characterization of the components of the ITER coils, from the superconducting strands, cables and insert-coils to the completed coils, were conducted over the past years.

Following factory cold testing of the first Central Solenoid (CS) modules, AC loss data are now available for some as-built coils, providing a fully consistent set, fully representative of the operational conditions. The comparison with experimental data is essential for the validation of the computer models. The model validation and as-built coil performance assessment are both critical steps for the preparation of ITER Tokamak operation and commissioning.

The following describes the AC loss computer models for the ITER CS modules, including its validation for the different stages, from conductor to coil. Such a model needs to be simple to implement and fast to execute to allow simulation of the long ITER plasma scenarios. The paper will explain the simplifications applied and discuss the implications. Predictions of the AC loss during ITER plasma scenarios will also be briefly discussed.

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