MT 26
International Conference
on Magnet Technology
Vancouver, Canada | 2019

Contribution ID: **1087** Type: **Poster Presentation**

Mon-Af-Po1.18-02 [59]: CICCs coupling losses: Analytical COLISEUM model enhancement and experimental cross-checks

Monday 23 September 2019 14:30 (2 hours)

Modelling by analytical approach the coupling losses of CICCs used in tokamaks remains a challenge to be reliable at all frequencies. This is usually done using either CPU consuming numerical approaches or heuristic models such as MPAS now used for ITER.

A recently developed analytical model COLISEUM (COupling Losses analytIcal Staged cablEs Unified Model) applies at various scales going from strands to two-stage cables and is able to predict AC losses upon geometrical and electrical parameters of a cable. A previous analysis identified the impact of these parameters on the behavior of a multiplet of strands, in order to give our model a solid base starting from the most academic step of the simulation. COLISEUM and MPAS are based on different assumptions and confronted to cross validate and strengthen themselves.

In the present work we confront COLISEUM with results from purely numerical model (JACKPOT, U. Twente). Previous crosscheck performed showed a moderate mismatch that we tried to understand by starting over from basic CICC stages (low level multiplets). We will in particular put the emphasis on conductances definitions in every models (i.e. MPAS, COLISEUM, JACKPOT) and the way to ensure their crossed consistency.

The analysis using COLISEUM and MPAS is confronted to experimental measurements of AC losses performed at CEA Cadarache in the JOSEFA facility using magnetization method. Two main objectives: compare the construction (assumptions, limitations, etc.) and reduce the number of free parameters in both models. New settings were implemented in JOSEFA enabling to generate sinusoidal field variations, giving access to more refined signal interpretations.

Contribution of the above results to COLISEUM and MPAS enhancement and complementarity of analytical, experimental and numerical part of the work will be discussed to consolidate our models. Recommandation will be given regarding extension of the model to three stage description.

Author: Mr CHILETTI, Maxime (CEA Cadarache)

Co-authors: BAGNI, Tomasso (U. Twente); Mr DUCHATEAU, Jean Luc (CEA); Mr TURCK, Bernard (CEA); Mr ZANI, Louis (CEA Cadarache); Mr NIJHUIS, Ajend (U. Twente); Mr TOPIN, Frederic (AMU); Mr LOUZGUITI, Alexandre (CERN); Mr ARRANGER, Denis (CEA Cadarache); Mr TENA, Manuel (CEA Cadarache); Mr LLORENS, Julien (CEA Cadarache); Mr JIOLAT, Guillaume (CEA Cadarache)

Presenter: Mr CHILETTI, Maxime (CEA Cadarache)

Session Classification: Mon-Af-Po1.18 - Fusion IV: Thermohydraulics, Mechanical, and AC Losses