Contribution ID: **6** Type: **not specified**

Thermo-hydraulic simulation of the ITER PF coil joints based on their coupling losses calculated with JackPot-AC

Wednesday 12 October 2011 11:00 (30 minutes)

The paper describes the results from the new thermo-hydraulic model for cable-in-conduit conductor (CICC) joints, which has been specifically developed to analyse the temperature margin of ITER PF coil joints. The heat generation is calculated with the electromagnetic model JackPot-AC, which can calculate the coupling losses in such a CICC joint on a strand-level. Because of this high-level of detail in JackPot's output, the temperature is calculated for the six final-stage sub-cables (petals) individually, instead of assuming only one homogeneous cross-sectional temperature. This allows the simulation of localised power input from the copper sole into the petals only if they are in contact with each other. The geometry calculated with the JackPot-AC joint model is used to determine this, as well as the wetted perimeter of the sole and the contact area between the petals and the sole. The cross-sectional temperature in the helium, sub-cable strand bundles and copper sole is assumed homogeneous; however they can all vary along the length of the cable. The helium paths in the petals are thermally connected to each other through the petal wraps, which is at the same time the only thermal exchange that can take place between the petals. The results show indeed a small variation of cross-sectional temperatures among the petals in an ITER plasma scenario, but due to the strong dependence of the critical current of NbTi strands -which are used in the PF conductors- on temperature, this can have a large impact on the temperature margin of the joints.

Author: VAN LANEN, Ezra (University of Twente)

Co-authors: NIJHUIS, Arend (University of Twente); OFFRINGA, Wietse (University of Twente); ILIN, Yuri (ITER Organization)

Presenter: VAN LANEN, Ezra (University of Twente)

Session Classification: Session 1 - Heat Transfer