Contribution ID: **221** Type: **Poster**

Thermal analysis of transient tungsten melting experiments at JET

Thursday, 20 October 2016 14:00 (4h 45m)

Tungsten (W) melting by transient power loads, for example those delivered by edge localised modes (ELMs), is a major concern for next step fusion devices. By virtue of its size, the amplitude of unmitigated Type I ELMs on JET can be sufficient to induce transient flash melting at the divertor targets provided a deliberately misaligned element is introduced. A first experiment was performed in JET in 2013 using a special lamella with a sharp leading edge gradually varying from h = 0.25 mm to 2.5 mm in the poloidal direction towards the high field side in order to maximise the inter-ELM temperature rise. ELM-induced flash melting has been successively achieved allowing investigation of the resulting melt motion. However, using the available IR viewing geometry from top, it was not possible to directly discriminate between the top and leading edge power loads. To improve the experimental validation of heat load and melt motion modelling codes, a new protruding W lamella with a 15° slope in the toroidal direction has been installed for the 2015-16 campaigns, allowing direct, spatially resolved observation of the top surface and reduced sensitivity of the analysis to the surface incidence angle of the magnetic field. This paper reports on the results of these more recent experiments, with specific focus on IR data analysis and heat flux calculations during L-mode and ELMing H-mode discharges. It will demonstrate that, at least in L-mode, the assumption of optical heat flux projection is justified.

Reproducible L-mode discharges have been performed in the old and new experiments, providing, for a given parallel heat flux, IR surface temperature for three different geometries: protruding sharp leading edge, protruding 15° slope and standard shaped lamella. Thermal modelling based on the Finite Element Method has been performed assuming an optical projection of the parallel heat flux, together with a specific IR sensor correction to simulate spatial resolution related effects. The amplitude of the parallel heat load is determined by iteration comparing synthetic with experimental IR data. Using the same model and underlying assumptions, good agreement is obtained for all three geometries, validating the assumption of optical heat load projection and providing a solid basis for the more complex H-mode conditions.

Paper Number

EX/P6-5

Country or International Organization

France

Primary author: Mr CORRE, yann (FrCEAIRFM)

Co-authors: Mr IGLESIAS, Daniel (CCFE); Mr MATTHEWS, Guy (Culham Centre for Fusion Energy); Mr COFFEY, Ivor (ccfe, uk); Dr COENEN, Jan Willem (Forschungszentrum Juelich GmbH); Mr GASPAR, Jonathan (Aix-Marseille University); Mr RACK, Michael (Forschungszentrum Juelich GmbH); Dr DEJARNAC, Renaud

(CzIPP); Mr PITTS, Richard (IO); Mr JACHMICH, Stefan (CCFE); Mr GAUTHIER, eric (FrCEAIRFM); Ms BALBOA, itziar (CCFE, UK); Mr BUNTING, patrick (ccfe, uk); Mr SILBURN, scott (CCFE, UK)

Presenter: Mr CORRE, yann (FrCEAIRFM)

Session Classification: Poster 6

Track Classification: EXS - Magnetic Confinement Experiments: Stability