

Simulation of localized fast-ion heat loads in test blanket module simulation experiments on DIII-D

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Abstract. Infrared imaging of hot spots induced by localized magnetic perturbations using the Test Blanket Module (TBM) mock-up on DIII-D is in good agreement with beam-ion loss simulations. The hot spots were seen on the carbon protective tiles surrounding the TBM as they reached temperatures over 1000°C. The localization of the hot spots on the protective tiles is in fair agreement with fast-ion loss simulations using a range of codes: ASCOT, SPIRAL, and OFMCs while the codes predicted peak heat loads that are within 30% of the measured ones. The orbit calculations take into account the birth profile of the beam ions as well as the scattering and slowing down of the ions as they interact with the localized TBM field. The close agreement between orbit calculations and measurements validate the analysis of beam ion loss calculations for ITER where ferritic material inside the tritium breeding TBMs is expected to produce localized hot spots on the first wall.

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