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ITER/P1-32: Observation of Localized Fast-Ion Induced Heat Loads in Test Blanket Module Simulation Experiments on DIII-D

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Heat loads on the first wall of ITER can potentially be very high in localized regions such as the divertor or in regions on the first wall where magnetic field perturbations can channel energetic ions to create localized hot spots. One area where hot spots can be created in ITER is on the Test Blanket Modules (TBMs) because of the ferritic steel required for these components and their effect on the distortion of the poloidal and toroidal magnetic field near the modules. Simulating the level of those heat loads is important for assessing their effects on the ITER first wall. It is therefore essential that the codes that perform such assessments are validated against experimental results using configurations similar to those expected in ITER. The development of the mock-up ITER-like TBM on DIII-D allows just such a validation to be carried out on DIII-D for the case of neutral beam ions. An important new capability in the last run period was the direct infra-red imaging of the front surface of the protective TBM tiles and the calibration of the images to infer heat loads induced by the localized deposition of deuterium beam ions. A key result of the experiments is that the detailed simulations using a variety of particle following codes reproduce well the heat loads observed using the infra-red camera.

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Country or International Organization of Primary Author

USA

Primary author: Mr KRAMER, Gerrit J. (Princeton Plasma Physics Laboratory)

Co-authors: Mr MCLEAN, Adam G. (Lawrence Livermore National Laboratory); Dr SPONG, Donald A. (Oak Ridge National Laboratory); Dr SNIPES, Joseph A. (ITER Organization); Dr SHINOHARA, Koji (Japan Atomic Energy Agency); Dr VAN ZEELAND, Michael A. (General Atomics); Dr SCHAFFER, Michael J. (General Atomics); Dr BROOKS, Neil H. (General Atomics); Dr NAZIKIAN, Raffi (Princeton Plasma Physics Laboratory); Dr ELLIS, Robert (Princeton Plasma Physics Laboratory); Dr BUDNY, Robert V. (Princeton Plasma Physics Laboratory); Dr KOSKELA, T. (Helsinki University); Ms KURKI-SUONIO, Taina (Helsinki University); Dr HEIDBRINK, William W. (University of California Irvine)

Presenter: Mr KRAMER, Gerrit J. (USA)

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