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Experimental Results and Validation of Thermo-Mechanical Models Used for the PREMUX Test Campaign, as Part of the Roadmap towards an Out-of-Pile Testing of a Full Scale HCPB Breeder Unit Mock-up

Friday 17 October 2014 14:00 (4h 45m)

PREMUX is a key experiment in the roadmap for a full-scale test of a Helium Cooled Pebble Bed Breeder Unit (HCPB BU) mock-up at the Karlsruhe Institute of Technology in Germany. This experiment reproduces a slice of the BU corresponding to the most thermally loaded region of the Li_4SiO_4 pebble bed in the BU.

The experiment has 3 main goals: (1) to serve as a test rig to validate the feasibility of a new heater concept designed for a future BU out-of-pile testing, (2) to be used as benchmark experiment to validate the different finite element codes used for the thermo-mechanical performance assessment of the BU and (3) to evaluate the thermal conductivity of the Li_4SiO_4 pebble bed. Additional tests have been performed to evaluate the influence of the purge gas pressure in the temperature of the pebble bed and as a preliminary assessment of the robustness of the BU against variations of the coolant mass flow.

The paper aims at reporting the results from the experimental campaign in PREMUX and presents the thermal and thermo-mechanical finite element models implemented in ANSYS that are used for the assessment of the thermo-mechanical performance of the HCPB BU. A benchmarking exercise using the experimental results of PREMUX for the validation of these models is reported and discussed.

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Germany

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