



Contribution ID: 758

Type: **not specified**

P2.187 Experimental investigation on HCLL-TBS In-box LOCA

Tuesday, 18 September 2018 11:00 (2 hours)

The experimental facility THALLIUM was designed and installed at ENEA C.R. Brasimone to investigate the consequence of a HCLL-TBS (Helium Cooled Lithium Lead) In box LOCA, ensuring a good level of geometrical relevance with HCLL-TBM. Within the framework of the contractual activities agreed with Fusion for Energy, a first experimental campaign was carried out in HCLL-TBS relevant conditions. The experiments simulated a rupture in a cooling plate of the HCLL-TBM with the aim to study the In-box LOCA transient. Thereafter, a new experimental campaign was developed in order to evaluate the effects of a larger He injection into the HCLL-TBM mock-up by installing an injection valve with a bigger orifice. The main aim of the experimental activity is the analysis of the accidental transient with an He injection representative of the worst conceivable accidental condition in the HCLL-TBM. The experimental campaign followed the same experimental procedure of the first one, freezing the parameters that were varied during the first campaign and instead changing the injection pressure in the range 50-70 bar and the injection time. As in the first campaign, the pressure wave evolution in different points of the facility and the effectiveness of the mitigation strategy for HCLL-TBS are the most important outcomes of the experiments. A different behavior with respect to the first campaign was observed. In particular, the first pressure peaks are smaller as a percentage of the injection pressure and the pressure is increasing during the whole transient. The relief valve on the expansion tank drives the transient, confirming the importance of the design of this component to mitigate the effects of an In-box LOCA. The outcomes of this experimental investigation are not only supporting the design of HCLL-TBS but also provide important data in view of the conceptual design of HCLL breeding blanket for DEMO.

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Session Classification: P2