

BLANKET MANUFACTURING TECHNOLOGIES : THERMOMECHANICAL TESTS ON HCLL BLANKET MOCKS UP (P4-H-507)

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In the Helium Cooled Lithium Lead (HCLL) Blanket concept, the lithium lead plays the double role of breeder and multiplier material, and the helium is used as coolant. The HCLL Blanket Module are made of steel boxes reinforced by stiffening plates. These stiffening plates form cells in which the breeder is slowly flowing. The power deposited in the breeder material is recovered by the breeder cooling units constituted by 5 parallel cooling plates. All the structures such as first wall, stiffening and cooling plates are cooled by helium. Due to the complex geometry of these parts and the high level of pressure and temperature loading, thermo-mechanical phenomena expected in the HCLL blanket concept; have motivated the present study.

The aim of this study, carried out in the frame of EFDA Workprogram, is to validate the manufacturing technologies of HCLL blanket module by testing small scale mock-up under breeder blanket representative operating conditions. The first step of this experimental program is the design and manufacturing of a relevant test section in the DIADEMO facility, which was recently upgraded with an He cooling loop (pressure of 80 bar, maximum temperature of 500°C, flow rate of 30 g/s) taking the opportunity of synergies with the gas-cooled fission reactor R&D program. The second step will deal with the thermo-mechanical tests.

This paper focuses on the program made to support the cooling plate mock up tests which will be carried out on the DIADEMO facility (CEA) by thermo-mechanical calculations in order to define the relevant test conditions and the experimental parameters to be monitored.