

## High Heat Flux Testing of ITER First Wall Mockups at the JUDITH-1 Facility

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The first wall of the ITER(International Thermonuclear Experimental Reactor) consists of a Be tile joined to a Cu-alloy heat sink plate which has SS cooling tubes inside it. The Cu-alloy plate is joined to a thick SS back-plate. We used the HIP(Hot Isostatic Pressing) method to join the Be tile to the Cu-alloy plate. In order to develop the HIP joining technology, we fabricated six first wall mockups with different interlayer types between the Be tile(80×80 mm<sup>2</sup>) and the Cu-alloy plate, and high heat flux tests were carried out to elucidate the best interlayer type. The thermal cycle tests for the six mockups were carried out at the electron beam facility JUDITH-1 in Germany. It can provide an electron beam power of 60 kW on an area of 100×100 mm<sup>2</sup> with an acceleration voltage of 120 kV, and it has the potential for testing toxic materials such as Be. We proposed that the mockups would be tested at 1.5, 2.0 and 2.5 MW/m<sup>2</sup>. Each load step started with a screening test which was followed by 20 cycles with 45 sec heating and 45 sec cooling. The total flow rate of the cooling water was 0.732 kg/sec at room temperature. During the test, we measured the inlet and outlet temperatures of the cooling water and the flow rate, from which the irradiated heat flux was deduced. We also measured the surface temperature profile of the Be tile by using an infrared(IR) camera. From a careful investigation of the IR image, we could easily establish if a delamination had occurred between the Be tile and Cu-alloy plate. In this work, we will present the detailed testing procedure and the testing results for the six mockups.