

RESEARCH AND DEVELOPMENT OF NON-DESTRUCTIVE EXAMINATION SYSTEM WITH INFRARED THERMOGRAPHY FOR DIVERTOR COMPONENTS

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In the first set of ITER-divertor, the straight segment of the Vertical Target (VT) consists of the Carbon-Fiber-reinforced Composite (CFC) monoblock, the interlayer of the Oxygen-Free high-conductivity Cu and the cooling tube. In this part of the divertor, the capability to remove the high heat flux (HHF) up to 20MW/m^2 has to be provided. Therefore, the method of performance test for the VT is one of key issues in procurement of the actual components. Non-Destructive Examination (NDE) with the infrared thermography is required as one of the performance tests to detect the overall defect for the CFC monoblock in the procurement activity of the ITER divertor.

Figure 1 shows the Facility of Infrared NDE for Divertor (FIND) established in Japan Atomic Energy Agency. The CFC monoblock heated at 95 degrees C in steady state condition is instantaneously cooled down by a cold water (5 degrees C) flow in the test section. During the thermal transient, the infrared thermography is performed via measuring the maximum temperature difference between the defect-free CFC monoblock and the test object. FIND is able to detect the position and magnitude of the integrated defects in the CFC monoblock and its joint interface.

In this study, the thermographic examinations for VT mock-ups have been performed in FIND to validate the repeatability of this system. The experimental demonstration shows the following results: (i) reproducibility of a switch between hot and cold water in the same scheme (scattering band, statistic deviation), (ii) dependency of positions between three test sections as shown in Fig. 1, (iii) fluctuation of flow rate, (iv) study on mechanical switching duration between hot and cold water. This paper discusses the reliability of FIND as an indispensable test facility in the procurement activity of the ITER divertor VT components, from the viewpoint of its repeatability.

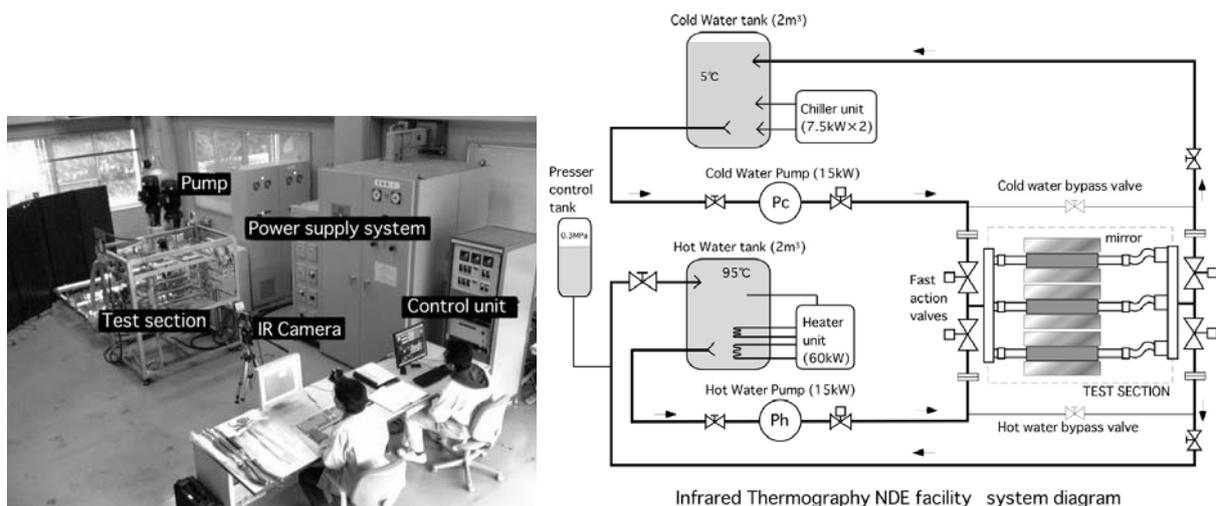


Figure 1: The Facility of Infrared NDE for Divertor (FIND) in JAEA. Left side is a photograph of the FIND. Right side is a configuration of the FIND.