

ITERダイバータ赤外サーモグラフィーにおける校正手法の開発 Development of Calibration Method of Divertor IR Thermography for ITER

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In ITER, divertor IR thermography [1] for measurement of surface temperature on divertor plates with high resolutions in both time and space has been designed by Japan. One of the issues is in-situ calibration of emissivity in IR light on the divertor plates, because the emissivity will change due to changes in surface properties caused by depositions and erosions. However, the in-situ calibration method has not been established yet. We recently conceived a new calibration method [2] that an IR laser (quantum cascade laser) is irradiated to an observation surface and the emissivity will be evaluated from the scatter light. Therefore, laboratory experiments for development of calibration methods have been performed by using the components such as IR camera, heater, IR laser, black body source.

Figure 1 shows the experimental arrangement for the development of the calibration method. The IR camera has an InSb with the detected wavelength of 2.5-5.1 μm . The band-pass filters made of sapphire in the wavelength of 2.95 μm and 4.67 μm are used. The tungsten sample can be heated by a ceramic heater up to 300 degC. The wavelength of the IR laser can be changed from 3.08 μm to 3.34 μm .

First, the IR camera was calibrated by a plane black body with the emissivity of 0.94 in the temperature up to 600 degC. Then, the radiance of the tungsten heated by the ceramic heater was observed. Figure 2 shows the dependence of emissivity on the surface temperature of the tungsten. The emissivity in the wavelength of 2.95 μm is about 1.6 times higher than that of 4.67 μm . The emissivity in the wavelength of 2.5-5.1 μm seems to have dependence on the surface temperature on the tungsten. The preliminary data of the scattered light of the laser that irradiated to the tungsten were acquired and we will discuss about the evaluation of emissivity.

[1] M. Takeuchi *et al.*, to be published in Plasma and Fusion Research **8**, pp.2402147 1-5 (2013).

[2] M. Takeuchi *et al.*, Proceedings of Fusion Reactor Diagnostics in Varenna, P.C6 (2013).

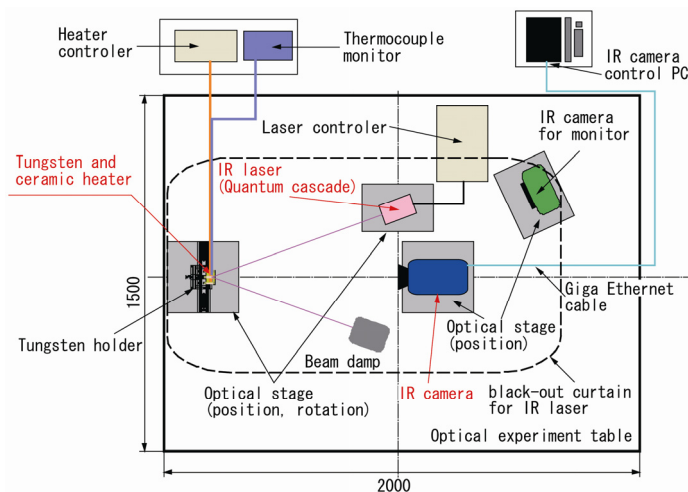


Figure 1. The arrangement of experiment for the development of calibration method.

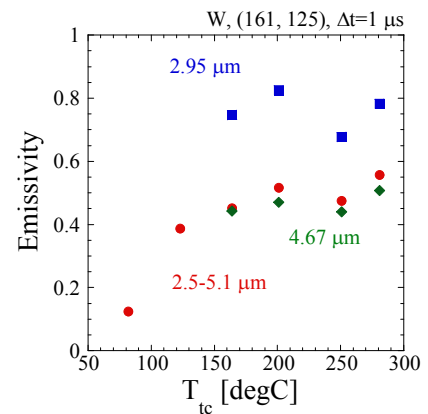


Figure 2. The dependence of emissivity on the surface temperature of the tungsten.