

LHDにおけるイメージングボロメータ計測の中性子環境下への適用
**Application of infrared imaging video bolometer measurement
 to neutron irradiation environment in LHD**

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InfraRed imaging Video Bolometers (IRVBs) have been installed for plasma radiation measurements to study plasma detachment and radiation collapse phenomena in the Large Helical Device (LHD) [1, 2]. In-situ calibration of the thermal characteristics of each pixel of the platinum foil detectors e.g. emissivity is required to apply the IRVBs to the neutron environment in the LHD deuterium experiment.

An in-situ calibration system was designed as shown Figure 1 [3]. The foil size is 13 cm × 10 cm or 9 cm × 7 cm. The thickness of platinum is 2.5 μm. The irradiation point of a He-Ne laser can be scanned to the center of each pixel with the size of 2.5 mm square using a mirror with a biaxial goniometer. Since a hot mirror transmits the visible light and reflects the IR signal, the laser can be injected to the foil and the temperature profile on the foil can be observed using an IR camera.

The platinum foil is coated by carbon with a thickness of a few μm on both sides to increase the emissivity. Here, we should note that the laser is injected from the opposite side of the plasma radiation in this system. Therefore, the both sides of the foil must be coated with uniformity and reproducibility for the in-situ calibration. In this study, a vacuum evaporation method was applied to improve the current spray coating. The He-Ne laser irradiated sample foils with the spray coating or the evaporation coating after 400 °C annealing for 30 minutes. According to the IR camera observation, the uniform temperature profile obtained on the evaporation coated sample compared with the spray coated one as shown in Figure 2.

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[1] B. J. Peterson *et al.*, Rev. Sci. Instrum. **74** (2003) 2040.

[2] K. Mukai *et al.*, Nucl. Fusion **55** (2015) 083016.

[3] K. Mukai *et al.*, Rev. Sci. Instrum. **85** (2014) 11E435.

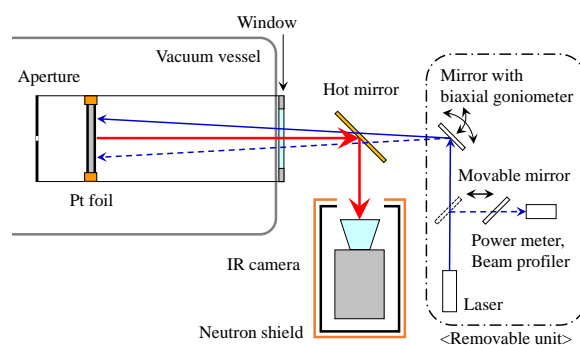


Fig. 1. Schematic of in-situ calibration system for IRVB foil. Blue arrows and red arrows indicate paths of visible light and IR, respectively [3].

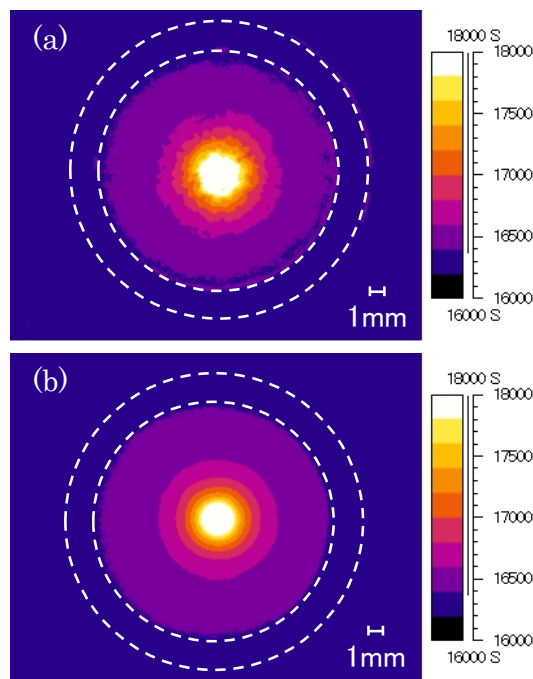


Fig. 2. IR images of the sample foils during laser irradiation ((a) spray coating, (b) evaporation coating). Dashed lines indicate the holder of the sample foil.