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4.20 Improvement of Infrared Imaging Video Bolometer for Application to LHD Deuterium Experiment

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InfraRed imaging Video Bolometer (IRVB) was improved for the application to the measurement under neutron environment of the deuterium experiment in the Large Helical Device (LHD). Plasma radiation measurement is crucial to understand the power balance and plasma detachment. Multi-dimensional measurement is required since the radiation occurs outside the last closed flux surface. IRVB is useful for the measurement and consists of a pinhole camera part with a Pt foil detector and an IR camera part. Deuterium plasma experiment was started from 2017 in LHD. (1) A shielding for the IR camera and (2) high-reproducibility and high-uniformity carbon coating on the Pt detector with the size of 130 mm x 100 mm x 2.5 micron for in-situ calibration of the thermal characteristics were required for the application of the IRVB under the neutron environment. Then, the neutron shielding was designed using MCNP6 code with the three-dimensional modeling of LHD. Evaporation technique was introduced to the carbon coating and the improved coating with 160-micron thickness could be obtained. Owing to these improvements, the IRVB was successfully operated in the neutron emission rate up to 3.3 × 10ˆ15 n sˆ-1, which is the maximum rate in the first experimental campaign.

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