

LHDにおけるイメージングボロメータ計測
Infrared imaging video bolometer systems in LHD

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Radiation profile measurements are an important issue for investigating plasma detachment and radiation collapse phenomena. It is known that the radiation from the ergodic region plays an important role in the phenomena [1, 2]. Therefore, the three-dimensional measurement of radiation profiles is required to study them in more detail since the radiation from the ergodic region has a three-dimensional structure. The InfraRed (IR) imaging Video Bolometer (IRVB) [3] is a useful diagnostic to investigate the plasma radiation profile. The structure is a combination of a pinhole camera and an IR camera then IRVB can observe the plasma radiation as images. It has a large number of channels and this characteristic is an advantage for a tomography technique to reconstruct the three-dimensional radiation profile.

Currently, four IRVB systems are operating in LHD. Figure 1 and Table 1 show the Field of Views (FoVs) and the specifications of the four IRVB systems, respectively. Here, NETD means noise equivalent temperature difference of the IR camera. These IRVBs have various directions of FoVs for the three-dimensional tomography. Two IRVBs at 6-T and 10-O ports have a tangential view in clockwise direction and a semi-tangential view in counter clockwise direction, respectively. The other two IRVBs at 6.5-U and 6.5-L ports have vertical views as shown in Figure 1. In the experimental campaign of FY2013, the FoV at 6.5-U port is improved for the tomography [4]. Moreover, IR cameras are replaced at 6.5-L and 10-O ports as shown in Table 1. The numbers of IR camera pixels are increased 16 and 4 times, respectively. The S/N ratios of the IRVBs at those ports are improved by the high performance of the NETDs.

Results of the plasma experiment using the new IRVB systems will be presented. Also the FoV of a new IRVB system which is being developed at 8-O port to focus on the closed divertor measurement will be presented.

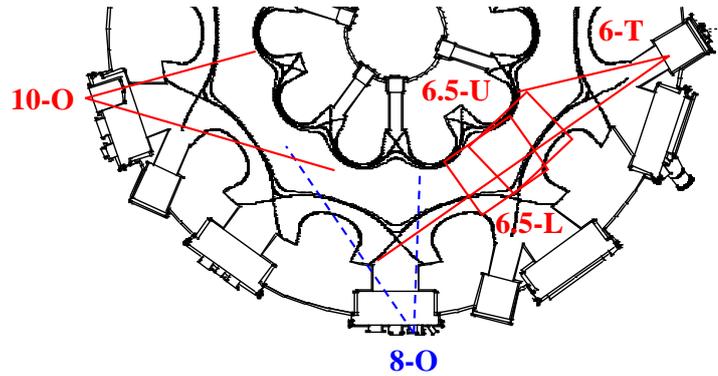


Fig. 1. FoVs of four IRVB systems in LHD

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 [2] B.J. Peterson *et al.*, J. Nucl. Mater. **415** (2011) S1147.
 [3] B.J. Peterson *et al.*, Rev. Sci. Instrum. **70** (2000) 3696.
 [4] Sano, R. *et al.*, 22nd International Toki Conf. (2012) P1-39. To be published in Plasma Fusion Res.

Table 1. Specification of IR cameras

Port	Camera	Pixels	Full frame rate [Hz]	NETD [mK]
6-T	FLIR/SC4000	320x256	420	<25
6.5-U	FLIR/SC655	640x480	50	<50
6.5-L	FLIR/Omega	160x120	30	<85
	-> FLIR/SC655	640x480	50	<50
10-O	FLIR/SC500	320x240	60	<70
	-> FLIR/SC7600	640x480	100	<25