Beamlet monitoring on the beam accelerator
with multi-slot grounded grid for LHD-NBI

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In order to obtain the better beam injection power, the investigation on beam characteristics is one of the important issues for the neutral beam injectors (NBI). The beam accelerator consists of the multi-electrode grids with multi-apertures, and the accelerator has following three functions to gather the multi-beamlets. The first is the beam focusing which is determined by a ratio of the electrostatic potentials supplied to the grids. The second is the beam concentration by gathering the multi-beamlets at a point near the beam injection port. The last is the correction of the beamlet trajectories deflected by the magnetic field prepared to sweep the co-extracted electrons with H$^-$ ions in the negative ion sources. The whole beam is a superposition of the multi-beamlet, and the observation of the beamlet characteristics is necessary to separate the errors of the beamlet-handling functions described above. A new type of beam accelerator is installed in one of the LHD-NBI beamlines. The accelerator consists of a hybrid configuration of the grids with multi-apertures and multi-slots, and the configuration has the different beam characteristics comparing to the conventional accelerators [1,2]. In order to investigate the beamlet characteristics, we installed a beamlet monitoring system with a graphite plate and infrared camera. The beamlet profiles are observed as a temperature images on the graphite plate, and the images are recorded with the infrared camera. Using the monitoring system, we found that the minimum beamlet divergent angles in the directions parallel to the slot long and short sides are 4 and 6 mrad, respectively. Some errors in the beamlet steering angles, which is applied to multi-beamlets concentration are observed. The errors are corrected in the accelerator for the LHD experiment.

[1] K. Tsumori, K. Nagaoka, M. Osakabe et. al, Rev. of Sci. Instrum, **75** (2004) 1847.
[2] K. Tsumori et al, proceedings of the 20th IAEA conference FT/1-2b, Vilamoura (2004).