Development of dual-path multi-pass Thomson scattering system in GAMMA 10/PDX

M. Yoshikawa[1*], J. Kohagura[1], Y. Shima[1], Y. Nakashima[1], N. Ezumi[1], R. Minami[1], R. Yasuhara[2], I. Yamada[2], H. Funaba[2], N. Kenmochi[2], T. Minami[3], H. van der Meiden[4], M. Sakamoto[1]

[1]*Plasma Research Center, University of Tsukuba, Tsukuba 305-8577, Japan*
[2]*National Institute for Fusion Science, National Institutes of Natural Sciences, Toki, 509-5292, Japan*
[3]*IAE, Kyoto University, Uji 611-0011, Japan*
[4]*DIFFER, Eindhoven, Netherlands*

Plasma detachment formation in fusion plasma devices is one of the most useful methods for handling heat and particle fluxes to the plasma facing components. In the tandem mirror GAMMA 10/PDX, the divertor simulation experimental module (D-module) is set in the end-cell (EC) for studying the underlying mechanisms for reducing heat and particle fluxes to the divertor plate under plasma detached conditions relevant for ITER SOL and divertor plasma. GAMMA 10/PDX confines the main plasma in the central-cell (CC), and the escaping plasma is led to the D-module to perform divertor simulation plasma experiments. In the D-module, the electron temperature and density are normally measured using the electrostatic probes on the V-shaped target plate. In the previous studies, we have developed the dual-path Thomson scattering system (DPTS) for simultaneously observing electron temperature and densities both in the core and end plasmas [1]. The DPTS contains CC Thomson scattering system (CC-TS) and the end-cell Thomson scattering system (EC-TS). In the CC-TS, we have been developing multi-pass system to improve the signal intensities and time resolution. In the EC-TS, double-pass system has been developed as a preliminary step of developing the multi-pass system. In the previous EC-TS, optical components for double-pass configuration were set in the vacuum vessel. To reduce the influence of stray light and facilitate alignment, a hole for double-pass laser path was made on the partition wall in the vacuum chamber so that the probe laser could be extracted to the atmosphere and the double path configuration could be easily adjusted. We applied the DPTS to detached plasma experiments and successfully measured core and edge electron temperatures and densities, simultaneously.

This study was conducted with the support and under the auspices of the NIFS Collaborative Research Program (NIFS11KUGM056) and the Bidirectional Collaboration Research Programs (NIFS14KUGM086, NIFS14KUGM088).

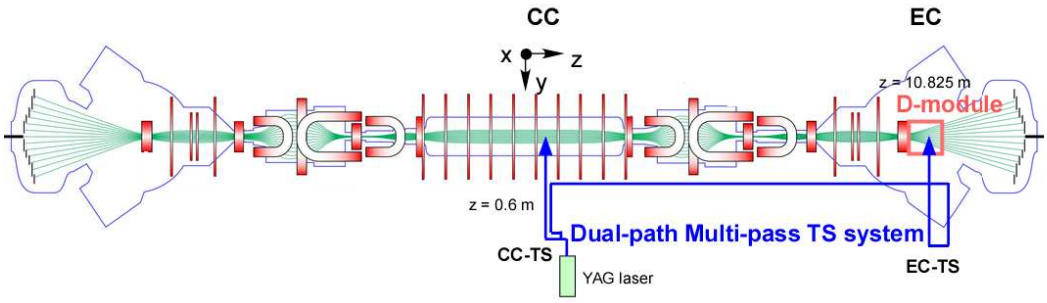

Figure 1. Schematic of GAMMA 10/PDX and DPTS.

[1] M. Yoshikawa, *et al.,* AIP Advance. **11** (2021)125231-1-6.

*Presenting author: yosikawa@prc.tsukuba.ac.jp