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## GAMMA 10/PDXダイバータ模擬実験における非接触プラズマ研究の進展

## Recent research progress on plasma detachment in divertor simulation experiments in GAMMA 10/PDX


江角 直道, 坂本 瑞樹, 飯島 貴朗, イスラム シャヒヌル, 寺門 明紘, 野尻 訓平, 朝倉 伸幸[1] 市村 和也[2], 大野 哲靖[3], 田中宏彦[3], 門 信一郎[4], 坂本 隆一[5], 澤田 圭司[6], 畑山 明聖[7], 福本 正勝[1], 松浦 寛人[8], 池添 竜也[9], 假家 強, 小波蔵 純子, 沼倉 友晴, 平田 真史, 南 龍太郎, 吉川 正志, 東郷 訓, 中嶋 洋輔, 今井 剛, 市村 真

N. Ezumi, M. Sakamoto, T. Iijima, M.S. Islam, Terakado, K. Nojiri, A. N. Asakura[1], K. Ichimura[2], N. Ohno[3], H. Tanaka[3], S. Kado[4], R. Sakamoto[5], K. Sawada[6], A. Hatayama[7], M. Fukumoto[1], H. Matsuura[8], R. Ikezoe[9], T. Kariya, J. Kohagura, T. Numakura, M. Hirata, R. Minami, M. Yoshikawa, S. Togo, Y. Nakashima, T. Imai and M. Ichimura

筑波大プラ研セ, [1]QST那珂, [2]神戸大工, [3]名大工, [4]京大エネ研, [5]核融合研, [6]信州大工, [7]慶應大理工, [8]大阪府大, [9]九大応力研

PRC Univ. Tsukuba, [1]QST-Naka, [2]Kobe Univ., [3]Nagoya Univ., [4]IAE Kyoto Univ., [5]NIFS, [6]Shinshu Univ., [7]Keio Univ., [8]Osaka Pref. Univ., [9]RIAM Kyushu Univ.


Control of spatial profile and position of detached plasma is one of the key issues for handling heat and/or particle load to the plasma facing components and managing high-performance core and edge-divertor plasmas of magnetic fusion devices, ITER and a demo reactor. In Plasma Research Center, University of Tsukuba, divertor simulation experiments have been conducted at the end region of the tandem mirror device GAMMA 10/PDX, as shown in Fig. 1 (a). The high temperature end loss plasmas are a functional tool for simulating edge and divertor plasmas and contribute to developing a deeper understanding of the physics involved in plasma detachment.

So far, we have performed characterization of plasma detachment from high temperature plasma (ion temperature ~ a few hundred eV) produced by the divertor simulation experimental module (D-module) located at end-loss region of the tandem mirror plasma device for various seeding gases (see in Fig. 1 (b))

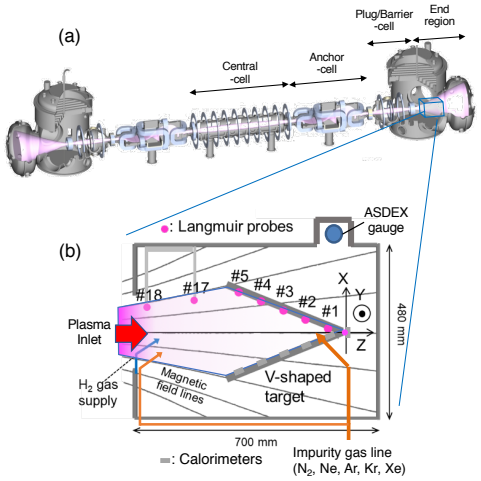


*Fig. 1. Schematics of the experimental setup. (a)Perspective view of GAMMA 10/PDX tandem mirror, (b) The D-module.*

[1,2]. These experimental results are partly confirmed by the numerical simulation using LINDA (Linear Divertor Analysis with fluid model) code [3,4]. We have recently investigated effects of transient heat flux on the detached plasma caused by hydrogen molecular activated recombination [5] and impurities injection [6] utilizing high power electron cyclotron resonance heating. Transition phenomena from detached to attached state has been clearly observed for the both cases. Furthermore, as one of notable results, we have found a combination of $N_2$ and $H_2$ puffs showed clear decrease of ion flux [7]. The new results indicate the possibility of achieving a reliable divertor operation scheme and the importance of deeper understanding of the $H_2$ and $N_2$ assisted recombination process.

We are currently preparing a new super-conducting simple mirror device with a steady-state high-density plasma source and high-power heating system for contributing DEMO divertor activities.

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