INVITED SPEAKER NOMINATION FOR THE 23RD ISHW2022

Nomination statement:

Please provide a support statement addressing why this topic is important, which substantial research results exists and would be generated until the conference and please address the qualifications of the speaker and provide any other supporting information. Please limit your statement to one page maximum.
Please provide a tentative title, list of authors and abstract on the next page!

Name and affiliation of nominator:

Dr. Santhosh Kumar,
Scientist, HSX project
University of Wisconsin, Madison

Name and affiliation of nominee:

Dr. Shinji KOBAYASHI, Assoc. Prof.
Institute of Advanced Energy, Kyoto University, Japan

Support statement:

This talk will present recent overview results obtained in Heliotron J project with respect to 3D effect of the magnetic configuration. A wide variety of magnetic configuration scan using the coil control in Heliotron J enables them to study the relation of 3D magnetic topology to energy confinement, turbulence transport and energetic particle transport as well as edge plasma physics. Theoretical study for the edge plasmas and MHD stability will help to understand the characteristics of the transport.

The speaker, Dr. Kobayashi, is an associate professor at the Institute of Advanced Energy, Kyoto University. He has been leading the Heliotron J experiments, especially in the transport studies. Dr. Kobayashi has made numerous publications and has given oral presentations at various international conferences. He will give an outstanding talk at ISHW2022 on recent progress of isotope effect on turbulent transport, iota dependence on transport including magnetic island, suppression of MHD instabilities by ECH/ECCD and edge physics.

EFFECT OF 3D MAGNETIC FIELD ON CONFINEMENT AND TRANSPORT IN HELIOTRON J

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Three-dimensional (3D) effect of magnetic configuration on transport has been attracting attention in many torus devices. In this paper, we report our recent comprehensive study on the 3D effect of the magnetic configuration on the energy, turbulence and energetic particle transport and edge plasmas in Heliotron J. The Helioton J is a medium-sized Heliotron device with an L/M = 1/4 helically winding coil, which has characteristics of low magnetic shear, magnetic well in the whole confining region and wide flexibility for magnetic configuration by controlling five sets of magnetic coils independently. A wide scan of the edge rotational transform in the ECH plasma reveals that the energy confinement is improved with a decrease in the rotational transform, showing the opposite trend to the ISS04 scaling [1]. Moreover, a recent experimental study of a fine scan of the edge rotational transform indicates that the global plasma parameters strongly depend on the position of the magnetic island in the edge region. As well as the global parameters, we have observed that the position of the edge E_r shear measured with reflectometer is affected by the edge magnetic island. The properties of turbulence and turbulent transport against the variation of isotope ratio and zonal flow activity are elucidated in Heliotron [2]. The correlation length of turbulent fluctuations increases when the D ratio increases, however, a decoupling between density and potential fluctuations have been observed in D plasmas. An analysis of heat load onto vacuum chamber wall with the EMC3-EIRENE shows that the heat flux distribution strongly depends on the geometrical edge structure of the magnetic configurations even when the edge rotational transform is unchanged [3]. We demonstrate that the control of the energetic particle (EP)-driven MHD modes by ECH [4]. The theoretical study of the EP-driven MHD modes using MEGA code reveals that the free boundary simulation is effective to understand the MHD mode structure in the peripheral region [5]. A new discharge scenario of the NBI plasma start-up using the assist of non-resonant microwave launch is demonstrated for lower magnetic field operation [6]. The non-resonant microwaves generate MeV-class electrons by a mechanism of stochastic interactions between the electric field of the microwave and electrons.

[1] K. Nagasaki, et al., *30th Int. Toki Conf. Plasma Fusion Res.* Nov/16-19/2021, Toki city, Japan, 16Aa2.
[2] S. Ohshima, et al., Plasma Phys. Control. Fusion **63** (2021) 104002. [3] R. Matoike, et al., Plasma Phys. Control. Fusion **63** (2021) 115002. [4] S. Yamamoto, et al., Nucl. Fusion **60** (2020) 066018. [5] P Adulsiriswad., et al., Nucl. Fusion **61** (2021) 116065. [6] S. Kobayashi, et al., Nucl. Fusion **61** (2021) 116009.