

Overview of the KSTAR research progress and future plan toward ITER and K-DEMO

Monday, October 22, 2018 2:50 PM (25 minutes)

The KSTAR research efforts have been focused on expansion of the KSTAR operating space for ITER and K-DEMO[1], validation of critical physics and search of new physics. The operating regimes are high β_p (up to ~ 2.8) non-inductive long pulse up to ~ 8 s, high β_N up to ~ 4.3 , and k of ~ 2.16 and a long H-mode discharge over a minute. An improved underlying physics of resonant and non-resonant magnetic perturbation (RMP and NRMP) with the IVCC coils resulted in a long pulse edge localized mode (ELM)-crash suppressed H-mode discharge (~ 34 s).[2] The ELM-crash suppression dependence on critical physical parameters, such as q_{95} , d , and β_N was extensively investigated. Identification of the role of turbulence induced by RMPs in suppression of the ELMs identified the turbulence flow ($\omega_{\perp}(Le)$) physics during the RMP ramp up and down periods.[3] The study of L/H transition threshold power (P_{th}) dependence on the non-axisymmetric field found that the P_{th} is significantly affected by RMPs while NRMP components had no influence on P_{th} . [4] New physics of interaction between the macroscopic fluctuation (2/1 island) and micro turbulences [5] and validation of q_0 issue in sawtooth instability has been explored.[6] Also the misaligned RMP configurations are used to test the divertor heat flux dispersal. [6] A major upgrade plan in KSTAR will be initiated in ~ 2021 for stable higher beta long pulse operation. Emphasis will be placed on a new actively cooled tungsten divertor possibly with new first wall materials and current drive (LHCD/Helicon). For the search of metal wall materials in the KSTAR upgrade plan, test of specially designed castellated tungsten block tiles of various shapes,[7] impurity transport physics experiments via injection of trace Ar and Kr gases and tungsten dust were performed. *This work is supported by the KSTAR research project funded by Korea Ministry of Science, ICT and Future Planning.

References:

- [1] Y.K. Oh et al., FED 84 344 (2009)
- [2] Y. In et al., NF 55, 043004 (2015)
- [3] J. Lee et al., PRL, 117 (7), 075001 (2016), J. Lee et al., ibid (2018)
- [4] W.H. Ko et al., APS bulletin (2017)
- [5] J.M. Kwon et al., ibid (2018), M.J. Choi et al., NF 57, 126058 (2017)
- [6] Y. In et al., ibid (2018)
- [7] S.H. Hong et al., ibid (2018)

Country or International Organization

Korea, Republic of

Paper Number

OV/2-3

Primary author: Prof. PARK, HYEON KEO (UNIST)

Co-authors: Dr LOARTE, Alberto (ITER IO); Dr CHANG, Choongseock (PPPL); HUMPHREYS, Dave (GA); Dr MUELLER, Dennis (PPPL); Prof. YUN, Gunsu (POSTECH); Dr PARK, Hyungho (NFRI); Dr LEE, Jaehyun (NFRI); Dr KIM, Jayhyun (NFRI); Dr CHUNG, Jinil (NFRI); Dr KO, Jinseok (NFRI); Dr KWAK, Jonggu (NFRI); Dr PARK, Jongkyu (PPPL); Dr KWON, Jemin (NFRI); Dr AHN, Junwook (ORNL); Dr LEE, K.C. (NFRI); Dr CHOI, Minjun (NFRI); Dr PITTS, Richard (ITER IO); Dr HAHN, Sanghee (NFRI); Dr YOON, Siwoo (NFRI); Dr SABBAGH, Steve (Columbia); Dr HONG, Sukho (NFRI); Dr KO, Wonha (NFRI); Dr CHOE, Wonho (KAIST); Dr LEE, Woochang (NFRI); Dr CHU, Yong (NFRI); Prof. IN, Yonggyun (UNIST); Dr OH, Yongkuk (NFRI); Dr PARK, Yongseok (Columbia); Dr JEON, Youngmu (NFRI); Dr WANG, sunjong (NFRI); Dr NAM, yongun (nfri)

Presenter: Prof. PARK, HYEON KEO (UNIST)

Session Classification: OV/2 Overview Magnetic Fusion

Track Classification: OV - Overviews