Status and plan of LHFW(Lower Hybrid Fast Wave) current drive research in VEST

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The slow wave in LH (Lower Hybrid) resonance range has been utilized as the most efficient current drive method in tokamaks. However, the density limit and strong electron Landau damping of slow wave make it hard to penetrate into the core plasma region in a reactor grade plasmas. In this respect, the fast wave branch of LH waves could be a good candidate for the central electron heating and current drive due to its penetration and damping in more high density plasmas. To investigate the feasibility of LHFW current drive, analytic study and ray tracing simulations have been carried out on VEST (Versatile Experiment Spherical Torus)[1]. And the RF power systems with 500MHz, 10kW klystron and $n_{\parallel}$(~4) variable comb-line antenna are being developed in collaboration with Korea Atomic Energy Research Institute and Kwangwoon university. The diagnostic tools such as magnetic probe and EBE (Electron Bernstein wave Emission) radiometer are being prepared to analyze the wave propagation and absorption characteristics via wave number and electron temperature. In 2016, fast wave coupling will be investigated to increase the coupling efficiency through the developed coupling model and edge density measurement of pre-ionization plasma produced by EBW heating and electron gun injection. Installation of RF systems and fast wave coupling experiments are planned in 2017 and the LHFW current drive experiments will be attempted in 2018.

[1] S.H. Kim, S.H. Jeong, H.W. Lee, B.J. Lee, J.G. Jo, H.Y. Lee, and Y.S. Hwang, "Heating and current drive by fast wave in lower hybrid range of frequency on Versatile Experiment Spherical Torus", submitted to ISFNT-12 held in Jeju of Korea 14th~18th. Sep. (2015).