Contribution ID: **3459** Type: **not specified**

P4.1083 Mapping of power deposition zone of electron Bernstein waves externally excited via mode conversion in tokamak plasmas

Thursday, 11 July 2019 14:00 (2 hours)

See the full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P4.1083.pdf

In tokamak plasmas, electron Bernstein (EB) waves mode-converted from X waves at the upper hybrid resonance (UHR) layer propagate toward the higher field side and are cyclotron-damped away at Doppler shifted frequency before arriving at the electron cyclotron resonance (ECR) layer. Resulted power deposition profile depends on local density, temperature and field profiles and is usually analysed using the ray tracing technique for EB wave propagation and absorption in inhomogeneous magnetized plasmas [1].
In the case of axisymmetric low beta tokamak plasmas, possible power deposition zone can be mapped and also associated current drive efficiency [2] can be estimated directly from the information on wave frequency and plasma profiles including the density, temperature and field profiles, without ray racing calculations. Mapping results in the case of a moderately over dense plasma analytically generated using Solov'ev profiles [3] to solve the Grad-Shafranov equation are shown to well predict the ray tracing results for both XB and OXB schemes of mode conversion. In the cases of highly over dense, low q and low aspect ratio plasmas $\omega/\Omega ce$ is rather close to 2 at the UHR layer and the second harmonic cyclotron damping can take place along the ray trajectory just after OXB mode conversion, depending on the parameters. Mapping is shown to work in this case as well. The mapping technique is based on distinctive characteristics of EB wave propagation and absorption, and, therefore, is useful to guide the ray racing calculations and to understand the ray tracing results.
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Presenter: MAEKAWA, T. (EPS 2019)

Session Classification: Poster P4

Track Classification: MCF