

Influence of density profiles on LH wave propagation in fusion edge plasma^{*}

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The investigations on the interaction between electromagnetic (EM) waves and plasma are important in theoretical, experimental and numerical research of fusion plasma¹. Low hybrid wave (LHW) injection is one of the effective methods to heat the plasma to achieve fusion reaction^{2,3}. Due to the steep density gradient and fluctuations in tokamak edge region, the more accurate results can be obtained by using the numerical method than the theoretical WKB method⁴. Especially in low frequency range, when the density profile has the large local gradient caused by fluctuation or the gradient scale length is comparable with the wavelength of incident EM waves^{4,5}. In this work, a multiple-layer plasma model is used, and the different density gradient profiles with fluctuations are assumed to investigate the influence of density profile on LHW propagation in tokamak edge plasma using 1D finite difference time domain (FDTD) simulations. The temporary evolution and spatial profiles of plasma variables and EM waves such as the density, velocity, current, electric field, magnetic field, Poynting vector, EM wave power, etc. are calculated. The width of the half reduction power peak are affected by the different incident EM wave frequency, the collision frequency, the plasma density, together with the amplitude and the wave number of fluctuations. Those results will help to understand the LHW propagation in edge plasma. Additional results will be shown in the presentation.

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