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Induced microwave scattering in the ITER edge transport barrier at ECRH and possibility of its modeling at ASDEX-Upgrade

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High power electron cyclotron resonance heating (ECRH) is widely used in the current toroidal devices for auxiliary electron heating. The O1-mode ECRH technique is also considered for the local electron heating providing the neoclassical tearing mode control in ITER. Until very recently the propagation and absorption of ordinary microwaves were believed to be well-described by the linear theory and assumed to be predictable in detail. However, as it was shown in [1], in ITER they can suffer from a low threshold induced side-scattering instability in the edge transport barrier. The presence of a large density gradient have a significant impact on the properties of waves in the low hybrid (LH) frequency range, leading to new transparency windows that are absent in the homogeneous plasma [2]. These new modes can be 2D localized along the direction of a plasma inhomogeneity due to the gradient effects and along the magnetic field due to the magnetic ripples. The instability power threshold leading to this 2D localized LH wave excitation appears to be much less than 1 MW. It can be overcome in future O1-mode ECRH experiments at ITER and at DEMO, leading to broadening of the power deposition profile and therefore decreasing the neoclassical tearing mode suppression efficiency. Thus the urgent experimental investigation of this parametric decay instability seems important for the ITER experiment planning. In the present paper we demonstrate a possibility to investigate the O-mode induced side-scattering instability and its consequences in the CTS and O2-mode ECRH experiments at the ASDEX-Upgrade tokamak. The instability threshold is shown to be well below 0.5 MW. Its dependence on the density gradient in the edge transport barrier, magnetic field ripple and on the scattering angle is studied. The instability growth rate and the frequency spectra produced by it are determined.
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[1] E Z GUSAKOV and A YU POPOV Phys. Rev. Lett. 128, 065001 (2022)
[2] E. Z. GUSAKOV, M. A. IRZAK, and A. D. PILIYA JETP Lett. 65, 25 (1997)

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