Integrated simulation of ICRF heating by TASK/WM+GNET

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Self-consistent and accurate modeling of wave-plasma interactions is one of the key issues in producing and sustaining burning plasmas. We have upgraded wave-related components of the integrated modeling code TASK/WM[1] in order to describe the absorption of ICRF waves by energetic ions. The full wave component was coupled with the Fokker-Planck component and the GNET code[2, 3] to describe the modification of the minority ion phase-space distribution and to calculate the power deposition profile including the finite orbit size effects. The GNET solves the drift kinetic equation in 5D phase-space.

In this paper the TASK/WM and GNET codes are combined and applied to the ICRF minority heating in a tokamak plasma. The RF wave elecric field and wave number are evaluated by TASK/WM and the energetic minority ion distribution is evaluated by GNET. The analyses are carried out several heating scinarios. The characteristics of energetic ion distribution in the phase-space are investigated. These advanced modeling provides more accurate evaluation of the efficiency of wave heating and current drive in tokamak configurations.

[1] A. Fukuyama, et al., Proc. 18th IAEA Conf. on Fusion Energy (Sorrento, Italy, 2000) THP2-26.
[2] S. Murakami, et al., Nucl. Fusion 46 (2006) S425.
[3] S. Murakami, et al., Contrb. Plasma Phys. 50 (2010) 546.