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Asymmetry Current in ICRF Heating ITER Plasmas

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The possibilities of using transverse ICRF heating tokamak plasma minorities for toroidal current driving is investigated in this paper.

Three ways of this heating utilization are proposed. Firstly, such heating gives possibility to drive the seed current near magnetic axis, secondly, it can be used for safety current profile adjusting (the negative shear producing) due to synchronous heating of two types of minorities –hydrogen and helium ions, and , third, it can be used for non-inductive asymmetry toroidal current drive in plasma cross-section.

Unlike to the isotropic heating when the ratio between amount of trapped and untrapped particles is conserved, during the transverse heating almost all particles become trapped and precisely trapped particles drive toroidal current due to asymmetry ion motion in and against inductive current direction. For the asymmetry current calculation theoretical distribution function of the minority proposed by T.H.Stics and distribution function measured in JET tokamak were used.

Fulfilled estimations show that the transverse ICRF heating hydrogen minority up to energy in several MeV that is possible to have the toroidal current in the mega-amperes range.

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