Investigation of Direct Momentum Transfer from the RF Waves to Plasmas when the Mode Conversion Occurs

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Mode conversion have been observed in multi-ion species ICRF heating near a resonance in Alcator C-Mod tokamak[1] and also in JET[2]. The numerical investigations also have been conducted make use of full wave codes in good agreement with experiments. Recently, one of the most potentially important effect of mode converted heating, the toroidal flow generation, has been observed in both of C-Mod and JET and compared the results with each other[3]. They reported the weak dependence of the flow on antenna current phase and implicated that the momentum is not coming from the wave itself. But there still exist a possibility of direct momentum transfer from the mode converted wave because that the mode conversion occurs spontaneously when the plasma conditions are satisfied. Therefore, the weak dependence on the external driving force, i.e. antenna current phase, may not be the key factor in judging whether the momentum comes from the wave or not. So, we calculate the Maxwell stress tensor of the ICRF wave for the case of the mode converted heating, to estimate how much momentum could be transferred from the wave to the plasmas and compare it with the case of minority heating.

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