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Effects of RF on Tokamak Plasma Near The Axis[1]

S.C. CHIU, Sunrise R&M, Inc., V.S. CHAN, Y.R. LIN-LIU, Y.A. OMELCHENKO, General Atomics — Radiofrequency (RF) waves provide an attractive source of auxiliary power necessary for a tokamak plasma to reach and sustain reactor conditions. In addition to providing heating and current drive, RF may also affect confinement of the plasma. Thus, understanding the effect of RF on confinement is critical for optimizing RF applications in a reactor plasma. Specifically, RF was found experimentally to affect the toroidal rotations of tokamak plasmas. A conjecture for this effect was that RF induces enhanced radial fluxes due to large orbit effects [C.S .Chang, Bull. Amer. Phys. Soc. **43**, 173 (1998)], which in turn induces a radial return current of the bulk plasma. The resulting $J \times B$ torque drives plasma rotation. In the core region of the plasma, many particles have orbits large compared with the minor radius. It is thus interesting to see how the RF affects particle orbits in that region. In this paper, we investigate the analytic behaviour of particle orbits due to RF near the core region. The diffusion of the orbits due to heating is investigated in the quasilinear approximation. Its effect on radial particle currents will be estimated.

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S.C. Chiu
chiu@fusion.gat.com
Sunrise R&M, Inc.

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