

Theory of surface ion cyclotron O-modes

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Theory of surface ion cyclotron O-modes propagation along plasma-vacuum interface across an external magnetic field is presented and their possible application for solids processing is discussed. The first experimental results devoted to plasma production by propagation of surface O-modes in mirror-device are presented in [1], but only the case of electron cyclotron resonance is studied there. Possibility of the surface ion cyclotron O-modes propagation is investigated in [2] for the case of semi-bounded plasma with uniform density profile. The present paper is devoted to generalization of the theory for the case of non-uniform density profile. Theoretical analysis is done in the frame of kinetic description using model of mirror reflection for interaction between plasma particles and plasma-vacuum interface. Further, an electro-dynamic model of the gas discharge sustained by these ion cyclotron O-modes has been elaborated. Collisional and collisionless mechanisms of the surface ion cyclotron O-modes power transfer into the plasma have been investigated. To estimate size of uniform plasma region sustained due these O-modes propagation the power balance equation has been applied. Effect of plasma system parameters on the discharge is discussed.

[1] A. Ganguli, M.K. Akhtar, R.D. Tarey, *Plasma Sources Sci. Technol.* **8** 519 (1999).

[2] V.O. Girka, *Plasma Phys. Control. Fusion.* **42** 999 (2000).