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The dynamics of charged particles close to the E-H mode transition in argon and oxygen inductively coupled radio-frequency plasmas
MUJAHID ZAKA UL ISLAM, TIMO GANS, DEBORAH O'CONNELL, BILL GRAHAM, Queen's University Belfast — Inductively coupled radio-frequency plasmas can operate in different operation modes. At low input power and comparatively low plasma densities the plasma is sustained in capacitive mode (E-mode). As the power and hence plasma density increases a transition to inductive mode (H-mode) is observed. Argon and oxygen plasmas and their mixtures are investigated. Here we report on investigations into the power coupling close to the E-H mode transition. Electron, positive and negative ion density measurements (Langmuir probe & photo-detachment) and space and phase resolved optical emission spectroscopy (PROES) are employed. The measurements reveal that this transition region is of particular interest and governed by a non-linear dynamics exhibiting complex mixtures of various power coupling mechanisms through capacitive and inductive electric fields.

Mujahid Zaka ul Islam
Queen's University Belfast

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