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Inductive and Capacitive Power Deposition of Anti-parallel Current Source using Plasma Modeling KALLOL BERA, JOHN FORSTER, SHAHID RAUF, UMESH KELKAR, Applied Materials, Inc. — Inductive and capacitive power deposition to plasma for anti-parallel current carrying conductors as plasma source has been investigated at different frequency and pressure using plasma modeling. In our model capacitive electric field is calculated by solving scalar potential, φ, in Poisson equation. In addition, induced magnetic and electric fields have been solved based on coil current. The power deposition to electrons includes both inductive and capacitive power deposition. The coupled set of equations governing the scalar potential, φ, momentum equation for ions and drift-diffusion equations for electrons are solved implicitly in time. The characteristic discharge dimension we considered is a few cm. The rf current and voltage are applied to the rod. At intermediate pressure of a few Torr at 13.5 MHz, it is found that ICP-only operation requires very high current. In this condition the skin depth being large the inductive coupling is not effective. With increase in frequency to 60 MHz, the skin depth decreases, the inductive coupling improves and current requirement decreases. At lower pressure the current requirement decreases as the inductive coupling improves due to smaller skin depth. The inductive and capacitive power couplings to the plasma at different operating frequency and pressure have been characterized for the plasma source.

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