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Accurate characterization of RF antennas for low-temperature plasma discharges with non-uniform magneto-static fields DAVIDE MELAZZI, University of Padova, Padova, Italy, VITO LANCELLOTTI, Eindhoven University of Technology, Eindhoven, The Netherlands, ALESSANDRO CARDINALI, ENEA Unità Tecnica Fusione, Rome, Italy, MARCO MANENTE, T4i S.r.l., Padova, Italy, DANIELE PAVARIN, University of Padova, Padova, Italy — The analysis of Radio Frequency Helicon plasma sources appears to have focused on the absorption of electromagnetic energy, but not much on the role played by the antenna driving the plasma discharge. In fact, most approaches assume (i) the induced current density on the antenna a priori, and (ii) a uniform magneto-static field aligned with the plasma column. To determine the antenna current self-consistently and to consider non-uniform magneto-static fields we have developed two codes: ADAMANT and RAYWh. The former implements a full-wave approach to evaluate the current distribution on the antenna and the antenna impedance, which is crucial for the design of the feeding network. RAYWh solves the 3D Maxwell-Vlasov model equations by a WKB asymptotic expansion, and is capable of predicting the occurrence of mode transitions. We report on a comparative study of various antennas working in the 1-30 MHz range commonly used in Helicon sources. The current distribution on the antenna, power deposition, and wave propagation phenomena have been investigated for various density profiles, magneto-static field configurations, neutral pressure, electron temperature.

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