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Measurement of power transfer efficiency and ion density in various radio-frequency inductively coupled plasma JAE-WON LEE, HYE-JU HWANG, IK-JIN CHOI, YOUNG-KWANG LEE, CHIN-WOOK CHUNG, Department of Electrical Engineering, Hanyang University — The power transfer efficiency and plasma density were measured in low pressure inductive coupled argon plasma at 20–100 mTorr, 20–80 W and 13.56–60 MHz. For this experiment, a variable-frequency matching box (matcher) was developed and a modified method to determine the power transfer efficiency was used. To match 13.5MHz, 40.68MHz and 60MHz rf power source, three vacuum variable capacitors and one fixed capacitor were built in matching box to the plasma characteristic impedance. We measured the feeding line current using Rogowski coil to obtain matcher resistance and plasma resistance, so the power transfer efficiency could be obtained. The calibration process, calculations of the exact current from the voltage, is not necessary to obtain power transfer efficiency. This is the advantage of using Rogowski coil. It is clearly observed that the power transfer efficiency decrease with increasing driving frequency and decreasing pressure, whereas the ion density shows the opposite tendency compared to power efficiency.

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