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Experimental Research on RF Matching Characteristics in Helicon Wave Plasma Discharges
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Helicon wave plasma(HWP) is a kind of plasma source with high efficiency. RF power supplies the power to the plasma by generating radio frequency waves through the antenna, coupled with the helicon waves in the plasma. With the increase of RF power output, the antenna coupling efficiency will change, so there will be a variety of mode transitions in the helicon wave discharges. In this study, the RF source power, the plasma absorbed power and the antenna current was measured by Z-scan, voltage and current probe to explore their effect on mode transitions. The matching state of the matching network in different modes is also investigated by using Smith chart. The influence of the matching capacitance on the absorbed power of the plasma in the positive and negative feedback region is measured. In traditional Inductively Coupled Plasma(ICP) discharges exists hysteresis phenomenon, i.e., the critical jump power when the plasma absorbed power decreases is larger than that when it increases. This may because the influence of matching network was not taken into consideration in

traditional ICP discharge studies. In this work, thinking over the matching network properties, the hysteresis in HWP discharge is tried to observe to contribute to the study of coupling mechanism between the plasma and the antenna.

Key words: HWP, matching network, smith chart, hysteresis

Reference:

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