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Mode transition and bistable hysteresis physics in inductively coupled plasmas[1] HYO-CHANG LEE, Korea Research Inst of Standards and Science (KRISS) — Many different gas discharges and plasmas exhibit bistable states under a given set of conditions, and the history-dependent hysteresis that is manifested by intensive quantities of the system upon variation of an external parameter has been observed in inductively coupled plasmas (ICPs) [1]. The fundamental understanding of the mode transitions and hysteresis is essential and highly important owing to the widespread use of ICPs and if, in such applications, plasma undergoes a mode transition and hysteresis occurs in response to external perturbations, the process result will be strongly affected. Due to these reasons, this work comprehensively compares possible effects (stepwise ionization, impedance matching, and electron energy distribution (EEDF)), which can cause the hysteresis [1-3]. It is revealed that, as a new aspect, the evolution of the EEDF can creates the hysteresis [1, 2]. Because electrons are not in a thermal equilibrium in most plasma discharges, this EEDF-effect on the hysteresis may be generalized to a universal phenomenon in gas discharge plasmas. [1] H-C Lee, Applied Physics Reviews 5, 011108 (2018). [2] H-C Lee et al., Scientific Reports 5, 15254 (2015). [3] H-C Lee et al., Applied Physics Letters 102, 234104 (2013).

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