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Dynamics of phase-flip transition with changing coupling strength between two inductively coupled glow discharge plasmas NEERAJ CHAUBEY, SUBROTO MUKHERJEE, ABHIJIT SEN, Inst for Plasm Res — The dynamics of a phase-flip transition as a function of the coupling strength is studied between two inductively coupled glow discharge plasma sources. The self-sustained oscillations are produced in two independent systems that are then inductively coupled to each other through externally wound copper wires. It is observed that with the progressive increase in the oscillation frequency of one of the systems while keeping the other system parameters fixed, the coupled oscillations of the two systems abruptly jump from an in-phase to an anti-phase state. This transition is found to be dependent on the positions of the externally wound wires which determines the mutual coupling strength. When the wound wire bunch on one of the systems is placed at a distance of 6 cms away from the cathode (i.e on the plasma column) and the wire bunch on the other system near the electrode sheath area then a small entrainment region is observed without any phase-flip transition while when the wires are placed on top of the plasma column then a larger entrainment region is observed with a phase-flip transition. Model calculations to understand these observations are carried out using a coupled set of Van der Pol equations and results are found to be in good match with the experimental results.

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