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Microwave Plasma Excitation Using Cylindrical Cavity with Dual Injection YUICHI HASEGAWA, KEIJI NAKAMURA, Chubu University, SOONAM PARK, SATORU KOBAYASHI, Applied Materials, HIDEO SUGAI, Nagoya Industrial Science Research Institute, CHUBU UNIVERSITY TEAM, APPLIED MATERIALS TEAM, NAGOYA INDUSTRIAL SCIENCE RESEARCH INSTITUTE TEAM — Large high-density plasmas have been generated by injecting magnetron-based microwaves radiated from slots cut on a wall of a rectangular or coaxial waveguide. However, a standing structural microwave in the waveguide often causes non-uniformity of plasma density. To minimize such inhomogeneity excited by the conventional waveguide, we adopt a resonant cylindrical cavity combined with a solid-state microwave amplifier. Microwave is injected into the cavity from two ports azimuthally apart by 90 degrees to each other (*dual injection*). FDTD simulations are performed for a TE_{111} mode resonant cavity excited by *single* or *dual* microwave injection. In the case of the dual injection with a phase difference of $\pi/2$, the wave field azimuthally rotates in the cavity, and hence the slots cut on a cavity bottom wall launch travelling waves, thus minimizing the azimuthal inhomogeneity of the resultant plasma. 40-cm-diameter plasmas are experimentally generated in argon at $0.1 \sim 5$ Torr with microwaves of 2.4–2.5GHz and 400W. Threshold powers for plasma ignition are much less in *dual* injection than those in *single* injection. Optical emission images of the cylindrical plasmas show that the plasma uniformity is considerably improved in *dual* injection, particularly at high-pressure and low-power.

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