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A novel linear microwave plasma source using circular  $TE_{11}$  mode and continuous line slot antenna

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For conventional linear microwave plasma sources with co-axial TEM waveguide, there is relatively large resistive loss in inner conductor of the waveguide. The wave electric field is directed normal to the quartz window surface, which enhances electron loss. To improve performances of linear microwave plasma sources, a novel linear microwave plasma source suitable for large area deposition and etching process has been developed. In the proposed plasma source, circular  $TE_{11}$  mode has been used for plasma generation. After mode conversion from rectangular  $TE_{10}$  to circular  $TE_{11}$ , 2.45 GHz microwave power is transferred to plasma via continuous line slot antenna along the wave propagation direction. The direction of radiated electric field is almost parallel to the quartz window. Diagnostics on the basic plasma properties using electrical probe proposed source has better plasma generation efficiency compared with the conventional source. For 300 mTorr Ar plasma with 0.6kW microwave input power, plasma density improvement about 80% was achieved. In addition, more stable impedance matching characteristics has been observed in proposed plasma source.

Microwave plasma source, linear plasma source