

## CHARACTERISTIC OF AN ATMOSPHERIC MICROWAVE PLASMA TORCH\*

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The microwave plasma torch (MPT) system<sup>1</sup> is composed of a 1-10kW magnetron power supply, microwave transmission and monitoring system, short-circuit plunger and 2.45 GHz plasma cavity based on the rectangular waveguide with dimensions 109×54mm, which can produce argon, helium, nitrogen and air plasma torch at atmospheric pressure. The electron density of the microwave plasma torch at atmospheric pressure was measured with a Mach-Zehnder interferometry. The radial and spatial distributions of the electron density on the cross-section of laser beam are characterized by the temporal instability and the spatial irregularity to a certain extent, which reveals that there exists randomly many ionizing branches consistent with the experimental phenomenon observed at the edge of the plasma torch. Based on the fringe shifts, the averaged electron density of the plasma was calculated to be on the order of  $10^{17}/cm^3$  at different microwave power, one order higher than that deduced from the Stark broadening of spectral lines. The electron temperature was obtained by use of atomic emission spectrometry. This microwave plasma torch source can be used in sterilization, material surface treatment, and many other industrial fields.

1. Q. Zhang, G. X. Zhang, L. M. Wang, "Measurement of the Electron Density In a Microwave Plasma Torch at Atmospheric Pressure, Applied Physics Letters 95, 201502, 2009

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