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Microwave-excited Microplasma Arrays in Atmospheric Air by Coplanar Waveguide Resonator

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Microplasma arrays in atmospheric air for wide area have been developed. The plasma sources consist of quarter-wavelength resonators. Slot line resonators and coplanar waveguide resonators were used due to the compact size and simple structure [1]. The single resonator is capable of generating microplasmas with less than 5-W input power at resonance, and specific gas supply such as argon or helium is not necessary to sustain the microplasmas [2]. Therefore, the air microplasmas can last for hours without being turned off if the microwave power is continuously supplied. A comparative analysis of plasma physics including radical generation and plasma temperatures for each argon, helium and air plasmas has been conducted with optical emission spectroscopy to characterize the plasma generator. The electric field distribution and reflection coefficient have been analyzed with ANSYS HFSS to verify the possibility of plasma generation prior to the device fabrication. Two methods related to multiple microplasmas are discussed in this work. The first is about the multiple microplasmas source using a Wilkinson power divider. For stable power distribution to individual resonator, the Wilkinson power divider on printed circuit board was designed and made. Secondly, applying coupled mode theory to the multiple microplasmas for uniformity is discussed [3].

Keywords: microwave, air microplasmas, coplanar waveguide resonators, Wilkinson power divider, coupled mode theory

Ref.
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