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Power absorption of atmospheric-pressure microwave-line-plasma¹ HIROTAKA TOYODA, HARUKA SUZUKI, YUTO TAMURA, YOSUKE KOIKE, YOSHIKI BABA, Nagoya University — Large-scale atmospheric pressure (AP) plasmas have been given much attention because of its high cost benefit and a variety of possibilities for industrial applications. Microwave discharge plasma using slot is attractive due to its ability of high-density and stable plasma production, and we have developed a long-scale AP microwave plasma (AP microwave line plasma: AP-MLP) source up to ~1 m in length using loop-structured waveguide and travelling wave. However, mechanism of uniform plasma production along the slot and power absorption behavior of this plasma source is still unclear. In this study, we discuss power absorption process using an electromagnetic simulation software. In the simulation, a long waveguide with a long slot along the waveguide is supposed. Plasma is assumed inside the slot as a resistive material (conductivity: <10 S/m) based on measured electron density and assumed collision frequency. Electromagnetic wave propagation along the waveguide and through the slot is simulated varying the resistivity of the plasma. The simulation showed that the power absorption decreases with increasing the electron density. Considering the power balance of the slot plasma, this result suggests that the fluctuation of the electron density at a certain position is stabilized by the power absorption property of the plasma, resulting in better uniformity of the plasma along the slot.

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