Abstract Submitted
for the GEC15 Meeting of
The American Physical Society

Numerical Study of Breakdown Pattern Induced by Intense Microwave under Atmospheric Conditions[1] MASAYUKI TAKAHASHI, OHNISHI NAOFUMI, Tohoku Univ — Breakdown experiment using intense microwaves was conducted under atmospheric pressure, and plasma arrays were observed in nitrogen. However, in helium breakdown, the breakdown pattern is different from that of nitrogen. Discrete plasma pattern was obtained in the downstream region of the plasma propagation. On the other hand, the upstream region shows a diffusive plasma pattern in the helium breakdown. Propagation speed of the plasma front has dependencies on chemical species; however, organized discussion of the breakdown process was not conducted for several chemical species. We simulate the microwave discharge process for nitrogen, helium, and hydrogen using a one-dimensional fluid modeling to examine dependencies of the breakdown structure on chemical species. Plasma arrays are obtained in nitrogen and hydrogen because the electron diffusion is smaller than that of helium. On the other hand, the diffusive pattern is reproduced in helium because the electron diffusion is larger. The propagation speed of the helium breakdown is larger than that of nitrogen and hydrogen because of larger diffusion and larger ionization. We will discuss that dependencies of the breakdown process on chemical species based on a multi-dimensional fluid model in the full paper.

[1]This work was supported by JSPS KAKENHI Grant Number H255089.

Masayuki Takahashi
Tohoku Univ

Date submitted: 17 Jun 2015 Electronic form version 1.4