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Interaction of High-Frequency Electromagnetic Waves with Pre-Breakdown Atmospheric Pressure Micro-Discharge Region[1] ABBAS SEMNANI, DIMITRIOS PEROULIS, Purdue University — The properties of a micro-scale gap at atmospheric pressure are completely different in pre- and post-breakdown conditions.[2] Unlike the quasi-neutral region formed after breakdown, the ion number density is orders of magnitude higher than the electron density in pre-breakdown conditions.[3] Consequently, ions may also contribute on the discharge conductivity even though they are much heavier than electrons. In this work, we study the interaction of high frequency electromagnetic waves with the discharge region before and after breakdown. The study is done at room temperature and atmospheric pressure conditions with gaps in the order of hundreds of nanometers up to a few micrometers. Gas discharge simulations are performed by using the PIC/MCC technique while the finite difference time domain (FDTD) method is used for electromagnetic simulations. The species are imported into EM simulations by a conduction current term in Ampere's law. The validity of conventional wisdom of ignoring the ions' contribution is examined for different cases.

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[3]A. Venkattraman et al. Phys. of Plas., **19**, 123515 (2012)

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