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Study of a Filamentary Dielectric Barrier Discharge in Air at Atmospheric Pressure SEBASTIEN CELESTIN, EM2C - Ecole Centrale Paris / LPTP - Ecole Polytechnique, BARBAR ZEGHONDY, EM2C - Ecole Centrale Paris, OLIVIER GUAITELLA, LPTP - Ecole Polytechnique, ANNE BOURDON, EM2C - Ecole Centrale Paris, ANTOINE ROUSSEAU, LPTP - Ecole Polytechnique
— Dielectric Barrier Discharges (DBD) at atmospheric pressure have many applications, for instance ozone production, surface treatment, and waste gas treatment. Generally, such a discharge is filamentary but it can be diffuse under particular conditions. Understanding the formation of the filament, which is an ionization wave or so-called "streamer", is very hard theoretically, numerically, and experimentally. This is due, first, to the non-linearity of the equations concerned, and second, because of the scaling in space and time of this phenomenon: a streamer has a radius on the order of a few microns, and propagates through distances of several centimeters in a few nanoseconds. In this study we will present the results obtained in experiments and in simulations for a plane-to-plane DBD. We electrically characterized this device and have observed collective effects that are still poorly understood. A point-to-plane DBD has also been studied for producing a much more localized discharge. In parallel with the experimental study we have developed a numerical model based on the Immersed Boundary Method (IBM) to introduce an electrode having a complex geometry into a structured Cartesian mesh. The first results of the code will be discussed.

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