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Enhancing the predictive capability of the modified Paschen law using Bayesian calibration[1] RENNAN SILVA DA COSTA, Univ of California - Merced, VENKATTRAMAN AYYASWAMY, University of California, Merced — Microscale gas breakdown is an important failure mechanism that needs to be mitigated for the successful long-term operation of microelectromechanical systems operating at low to moderate voltages. While the Paschen law governs traditional breakdown in macroscale gaps, several independent datasets have observed unusual breakdown at gap sizes less than 10 m. It is now well-established that the driving mechanism for this deviation is field-induced electron emission thereby leading to what is referred to as the modified Paschen law. In spite of the existence of several models to predict breakdown in microgaps, the significant uncertainty in the field enhancement factor of a given electrode surface limits the predictive capability of these models. More recently, it has been hypothesized that there is a strong inverse correlation between the field enhancement factor and the electric field. In this context, the current work quantifies this correlation using a modified Paschen law in conjunction with several experimental datasets by performing a rigorous calibration exercise using sophisticated statistical methods. Specifically, a Bayesian approach was used, and the outcomes of this effort are anticipated to significantly add to the predictive capability of the modified Paschen law.

[1]Brazilian Scientific Mobility Program

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