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Breakdown Events and Dark Current: a B.I.R.D. - eye view

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Breakdown events are a very important issue in high-voltage vacuum holding studies. These events are usually and efficiently studied using heuristic predictive models based on some experimentally-given parameters. However, the complete microscopic view is still lacking. A different, but related topic is the dark-current-emission which have been first theoretically studied by Fowler and Nordheim. Their theoretical predictions match the essential features of experiments, but some correction, not simply justifiable, must be taken into account. Dark current emissions and breakdown events seem to be very different phenomena and have been described with a wide plethora of different models. Moreover, a third phenomenon usually occurs during the so-called conditioning phase of a pair of electrodes, i.e. the random impulsive current emissions, that can be thought as intermediate events between dark current and breakdown. In this work, we propose the B.I.R.D. model as a possible view to highlight the link between all these phenomena. The present investigation aims to arrange the different phenomena mentioned above in a single theoretical framework, also overcoming some well-known historical shortcomings.

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Modelling and Simulations

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