

Investigation on the transmission of a DC current through a space gap

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It is well known that when a relative high-voltage is applied to a needle or group of needles placed in a plate electrode, corona discharge appear on the needles tip. Corona discharges are associated with the generation of current impulses such as Trichel or streamer impulses (see Fig. 1). Such impulses have a short rise time, in the order of a few nano-seconds. Some are regular such as the Trichel pulses in the negative polarity. Others, like the streamer impulses in positive polarity are more chaotic.

In several floating electrode experiments, it has been observed that a DC Corona source can charge a floating electrode. However, by extending these experiments to a high impedance current source, it has been observed that Corona discharge can bridge gaps of certain length –circa 500 mm–.

Observations in well controlled gap-experiments have shown that the current flowing in the high voltage electrode side is the same as the current measured in the earth side. These gap-experiments have shown that it is possible to transfer a DC current through the air. This indicates that a DC current is transformed into an ionic current that bridges the gap. However, it is interesting to investigate if displacement or currents are also produced in the interelectrodical gap space.

In this paper we investigate if there are important displacement currents responsible for the measured current in the earth side. Obtained results are presented and discussed.

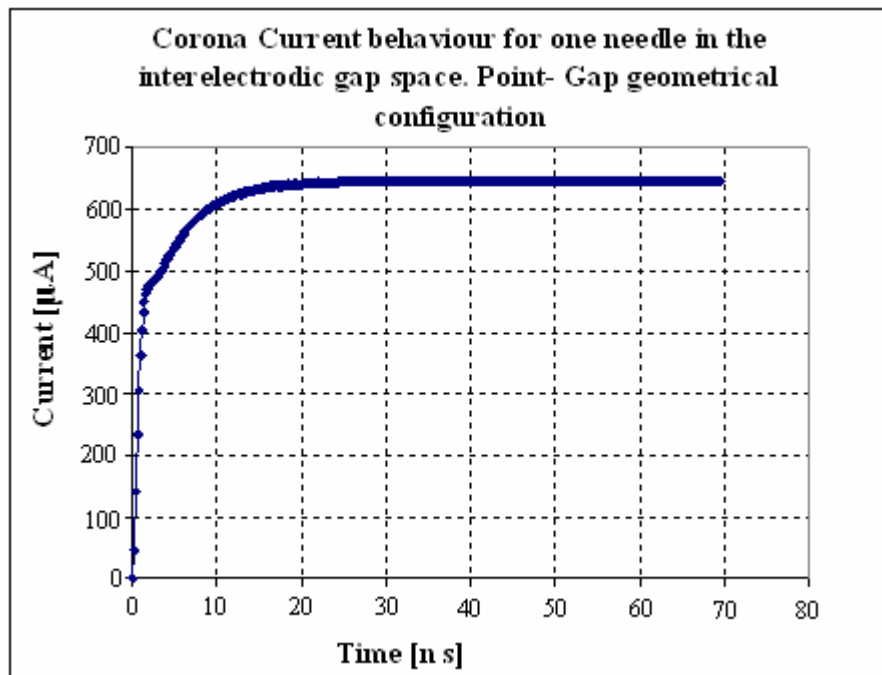


Fig. 1 –Corona Current behaviour in the interelectrodical gap space for a needle-to-point configuration. Notice the calculated first nanoseconds of a Trichel pulse