

## **An Experimental Study on the Positive Streamer Leader Propagation under Slow Front Impulse Voltages in a 10m Rod-Plane Air Gap**

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**Abstract :** In this work, we performed a large-scale investigation into leader development in a 10 m rod-plane gap under a long front positive impulse. To describe the leader propagation under slow front impulse voltages, we recorded the leader propagation with a high-speed charge coupled device (CCD) camera. It is important to figure out this phenomenon to deepen our understanding of leader discharge. The observation results showed that the leader mechanism is a very complex physical phenomenon; it could be categorized into two types of leader process, namely, continuous and the discontinuous leader streamer-leader propagation. Furthermore, we studied the continuous leader development parameters, including two-dimensional (2-D) leader length, injected charge, and final jump stage, as well as leader velocity for rod-plane configuration. We observed that the discontinuous leader makes an important contribution to the appearance of channel re-illuminations of the positive leader. The comparative study shows better results in terms of standard switch impulse and long front positive impulse. Finally, the results are presented with a view toward improving our understanding of propagation mechanisms related to restrike phenomena, which are rarely reported. To clarify the above doubts under long front cases, we carried out extensive experiments in this study.

**Keywords :** continuous and discontinuous leader, high-speed photographs, long air gap, positive long front impulse, restrike phenomena

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