



X-ray bursts observation along and perpendicularly to the streamer path

Pavlo Kochkin, Vung Nguyen, and Alexander van Deursen

Dept. of Electrical Engineering, Eindhoven University of Technology, Eindhoven, The Netherlands

We present measurements of X-ray emission from long laboratory sparks at atmospheric pressure. A 17 kJ Marx generator with a $1.2/52\mu\text{s}$ pulse shape when unloaded was used to generate 200 surges of positive and negative polarity. The distance between the floating high voltage (HV-) and the grounded (GND-) point electrodes was 108 cm. X-ray bursts were registered by two $\text{LaBr}_3(\text{Ce}^+)$ scintillation detectors placed perpendicular to each other. Detector 1 was directed along the breakdown axis and was located beneath the grounded electrode. Detector 2 was perpendicular to the surge at a distance of 140 cm. The current through the GND- and the HV-electrode were recorded together with the x-ray signal. For positive discharges x-ray bursts detection rate was 66% and 64% for detector 1 and detector 2 respectively. In the case of negative discharges the detection rate was 36% and 42%. Timing of X-ray bursts correspond perfectly to streamers occurrence time. For the negative discharges, x-ray radiation was recorded immediately before the cathode current jump, during the negative streamers originated in high-voltage electrode. For the positive discharge time interval of x-ray is wider than for the negative. Most often the x-ray bursts for positive discharges observed during the early growth of cathode current (presumably the streamer phase). In 20% of positive discharges were reported two bursts and 2% three bursts of x-ray radiation during a single discharge.