

X-rays from long laboratory sparks: Influence of the anode geometry
Energetic Radiation from Thunderstorms and Lightning

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In this paper, based on measurement of X-rays produced by long laboratory sparks for rod-sphere configurations with varying anode-sphere sizes, we investigate the influence of anode geometry over average energy of X-rays produced.

The paper presents the result of 45 negative sparks (with a standard lightning impulse voltage) applied to a 95cm rod-sphere gap with three different anode-sphere sizes. The gap was supplied with a voltage just above the 50% breakdown voltage for each configuration; hence breakdown occurred for all sparks.

The output of a NaI scintillator based X-ray detector together with gap voltage and the current were measured. X-rays could be detected from 42 sparks out of the total 45 sparks.

By calculating the average energy of X-rays produced for each rod-sphere geometry, we show that when the diameter of the anode-sphere is increased, the average energy of X-rays is reduced.

We discuss the possible origin of X-rays in spark gap as the location where the two streamer heads meet according to these results. We also discuss the influence of placement of the X-ray detector because of the high directionality of X-rays.