

Specifics of generation, localization and recording of microwave sources observed in the initial phase of a high-voltage atmospheric spark discharge

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For the experimental study of high-frequency radio emission generated in the initial phase of a high-voltage atmospheric discharge, we have developed a multi-channel RF diagnostic complex consisting of ultra-wide-band antennas with an expanding slit (Vivaldi antennas). The complex allows recording radio emission pulses with frequencies from 500 MHz to 6 GHz with a standing wave coefficient (SWR) not exceeding 2. A spectral analysis of the radiation has been carried out and several characteristic time stages of spark discharge development have been identified, at which bursts of microwave radiation are observed.

An upgraded stand for localization of a radio emission source by triangulation is presented. A series of experiments was carried out, the results of which demonstrated the spatial location in the discharge gap of the sources of the first, most high-frequency, radio emission pulses generated at the stage of voltage growth in the discharge gap. During the transition from the stage of formation and development of electronic avalanches to streamer-leader processes in the discharge interval, the amplitude of radio emission increases sharply, but the contribution of radiation with a frequency of more than 2 GHz decreases.

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