Emission of X-ray and high-frequency radio radiation during intensive FORMATION OF STREAMERS in high-voltage discharge [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2023.50.2023.1.1.170

1Parkevich E.V., 1Khirianova A. I., 1Khirianov T.F., 1Baidin I.S., 1Shpakov K.V., 1Rodionov A.A., 1Bolotov Ya.K., 1Ryabov V.A., 2Kurilenkov Yu.K., 1Oginov A.V.

1P.N. Lebedev Physical Institute of the Russian Academy of Sciences 119991, Moscow,
 Russia, parkevich@phystech.edu,
2Joint Institute of High Temperatures of the Russian Academy of Sciences, Izhorskaya St.,
 13/2, Moscow 125412, Russia

The paper provides comprehensive data on the spectral and temporal characteristics of low-frequency (LF) (10–150 MHz) and high-frequency (HF) (1–4 GHz) radio emissions recorded during the development of extended high-voltage discharge in 50 cm air gaps at voltages of the order of 1 MV. The relationship between the generation of radio emissions and the formation of streamers in the category is investigated. It is shown that the propagation of streamers from the cathode to the anode is accompanied only by the emission of LF radio emission, whereas HF radio emission occurs when the oncoming streamers move from the anode. At the same time, the power of LF radio emission increases sharply almost synchronously with the appearance of emission of HF radio emission. It has been established that HF radio emission has a complex spectral-time structure and is a set of short (less than 1 ns) bursts of HF radio signal power, characterized by various frequency components in subnosecond time intervals. For the first time, by the method of high-frequency radio interferometry, the areas of the "sources" of radio emissions were localized with centimeter accuracy. A close relationship was found between the generation of HF radio emissions and the intensive development of numerous streamers of opposite polarity.

References

1. E.V. Parkevich, A.I. Khirianova, T.F. Khirianov, I.S. Baidin, K.V. Shpakov, A.A. Rodionov, Ya.K. Bolotov, V.A. Ryabov, Yu.K. Kurilenkov, I.S. Samoylov, S.A. Ambrozevich, A.V. Oginov. Electromagnetic emissions in the MHz and GHz frequency ranges driven by the streamer formation processes. Phys. Rev. E, 106(4), 045210 (2022), doi: 10.1103/PhysRevE.106.045210; <https://link.aps.org/doi/10.1103/PhysRevE.106.045210>
2. E.V. Parkevich, K.V. Shpakov, I.S. Baidin, A.A. Rodionov, A.I. Khirianova, T.F. Khirianov, Ya.K. Bolotov, M.A. Medvedev, V.A. Ryabov, Yu.K. Kurilenkov, A.V. Oginov. Streamer formation processes trigger intense x-ray and high-frequency radio emissions in a high-voltage discharge. Phys. Rev. E, 105, L053201 (2022), doi: 10.1103/PhysRevE.105.L053201; <https://link.aps.org/doi/10.1103/PhysRevE.105.L053201>
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/L/Lt/ru/EG-Parkevich.docx) [↑](#footnote-ref-1)