

Shadow visualization of an atmospheric pressure pulse discharge in a quasi-homogeneous and highly inhomogeneous electric field

A. A. Kozlov, A. N. Dolgov, R. H. Yakubov, V. O. Revazov and S. G. Davydov

Dukhov Research Institute of Automatics (VNIIA)
22 Sushchevskaya st., Moscow, 127055, Russia

Received 17.04.2024; revised 23.05.2024; accepted 31.05.2024

The article presents experimental results obtained by shadow visualization of a pulsed discharge of atmospheric pressure in a quasi-homogeneous and highly inhomogeneous electric field. In experiments, a shock wave formed during a pulsed breakdown of a short gas gap of atmospheric pressure initiated by a spark discharge along the surface of a dielectric was recorded. A comparative analysis of the features of shock wave propagation during its excitation in discharge devices of various geometries is carried out.

Keywords: shadowgraphy, gas discharge, shock waves.

REFERENCES

1. Sedov L. I., Appl. Math. Mech. Leningrad **10**, 241 (1946).
2. Bethe H. A., Fuchs K., Hirschfelder J. O., Magee J. L., Peierls R. E. and van Neumann J., Blast Wave, Los Alamos, NM, USA, 1947.
3. Davydov S. G., Dolgov A. N., Kozlov A. A., Revazov V. O. and Yakubov R. Kh., Technical Physics **67** (10), 1316 (2022).
4. Vovchenko E. D., Kuznetsov A. P. and Savelov A. S., Lazernye metody diagnostiki plazmy: ucheb. posobie, Moscow, MIFI, 2008 [in Russian].
5. Raizer Y. P., Vvedenie v gidrogasodinamiku i teoriyu udarnyx voln dlya phisikov: Ucheb. posobie, Dolgoprudny, Izdatel'skiy dom "Intellect", 2011 [in Russian].
6. Ivanova A. A. and Mursenkova I. V., Moscow University Physics Bulletin **78** (2), 204 (2023).
7. Marshak I. S., UFN **71** (2), 229 (1962) [in Russian].
8. Drabkina S. I., Journal of Experimental and Theoretical Physics **21**, 4 (1951) [in Russian].
9. Baselyan E. M. and Raizer Y. P., Iskrovoy razryad: Ucheb. posobie dlya VUZov, Moscow, MPHTI, 1997 [in Russian].
10. Kesaev I. V., Katodnye processy elektricheskoi dugi, Moscow, Nauka, 1968 [in Russian].
11. Alpherov D. Ph., Ivanov V. P. and Sidorov V. A., Elektro **2**, 31 (2002) [in Russian].
12. Davydov S. G., Dolgov A. N., Korneev A. V., Pshenichny A. A. and Yakubov R. Kh., Usp. Prikl. Fiz. (Advances in Applied Physics) **7** (1), 3–9 (2019) [in Russian].
13. Mesyats G. A., Ectons in Vacuum Discharges: Breakdown, Spark, and Arc, Moscow, Nauka, 2000 [in Russian].
14. Owen K. G. Measurements of vibrational relaxation and dissociation of oxygen with laser absorption spectroscopy with applications for energy transfer in nonequilibrium air. Stanford University, 2014.
15. Bechina A. I. and Kustova E. V., Vestnik Sankt-Peterburgskogo universiteta. Matematika. Mekhanika. Astronomiya **6** (1), 118 (2019) [in Russian].
16. Znamenskaya I. A., Koroteev D. A. and Lutsky A. E., Physics of Fluids **20**, 056101-1 (2008).