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STATISTICAL MODEL FOR DETERMINATION OF PROBABILITY OF LIGHTNING STROKES TO GROUND OBJECTS

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Authors
E.I. Sokol[1], M.M. Rezinkina[2]*, O.L. Rezinkin[1], O.G. Gryb[1], E.E. Svetlichnaya[1]**
[1] – National Technical University «Kharkiv Polytechnic Institute»,
Frunze st., 21, Kharkiv, 61002, Ukraine
[2] – State Institution «Institute of Technical Problems of Magnetism of the National Academy of Sciences of Ukraine»,
Industrialna st., 19, Kharkiv, 61106, Ukraine,
e-mail: marinar2@mail.ru
ORCID ID:* ID: http://orcid.org/0000-0002-0454-3331
ORCID ID:** http://orcid.org/0000-0001-8151-5636

Abstract

A statistical model describing the electrical physical processes in the last stage of propagation of lightning leader channel to the ground, taking into account the possibility of appearance the ascending sparks from ground objects has been proposed. Experimental data on the speed of the lightning leader channel, the electric field strengths necessary for development of leader

channels of negative and positive polarity, specific linear conductivity of the leader and streamer channels, etc. are laid in the basis of the model. Compliance of this model with the investigated process has been validated by comparison of the results of calculation of probabilities of places of high-voltage discharge strikes to the earth and located on it objects with known experimental data. References 15, figures 2.

Key words: leader channel of lightning, electrical physical processes, statistical model, probability of lightning stroke, lightning rod.

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References

1. Akopian A.A. Investigation of the protective action of lightning rods. *Trudy Vsesoiuznogo Elektrotekhnicheskogo Instituta*
. 1940. Vol. 36. P. 94–159. (Rus)
2. Bazelyan E.M., Gorin B.N., Levitov V.I. Physical and engineering foundations of lightning protection. Leningrad: Gidrometeo-izdat, 1978. 222 p. (Rus)
3. Bazelyan E.M., Rojansky I.M. Spark discharge in the air. Novosibirsk: Nauka, 1988. 165 p. (Rus)
4. Bazelyan E.M., Raizer Yu.P. Physics of lightning and lightning protection. Moskva: Fizmatlit, 2001. 319 p. (Rus)
5. Bazelyan E.M., Raizer, Yu.P. Spark discharge. Moskva: Izdatelstvo Moskovskogo Fizicheskogo Tekhnicheskogo Instituta, 1997. 320 p. (Rus)
6. RD 34.21.122-87. Manual for lightning protection of buildings and structures. Moskva: Energoatomizdat, 1989. 24 p. (Rus)

7. Cooray V. Lightning Protection. London: The Institution of Engineering and Technology, 2010. 1036 p.
8. Cooray V., Rakov V., Theethayi N. The lightning striking distance – Revisited. *J. Electrostatics* . 2007. No 65. P. 296–306.
9. IEC 62305-2. International standard “Protection against lightning – Part 2: Risk management”. Geneva: IEC, 2010. 84 p.
10. IEC 62305-1. International standard “Protection against lightning – Part 1: General principles”. Geneva: IEC, 2010. 67 p.
11. NFPA 780 Standard for the Installation of Lightning Protection Systems, 2004. 108 p.
12. Rakov V.A. Parameters of Rocket-Triggered Lightning. *Int. J. of Plasma Environmental Science & Technology* . 2010. Vol. 4. No 1. P. 80–85.
13. Rezinkina M.M., Knyazyev V.V., Kravchenko V.I. Mathematical Description of Leader Channel Propagation for Selection of Model Experiment Parameters and Lightning Guard System. *Technical physics.* 2007. Vol. 52. No 8. P. 1006–1010.
14. Rezinkina M.M. Technique for predicting the number of lightning strokes to extended objects. *Technical physics*. 2008. Vol. 53. No 5. P. 533–539.
15. Uman M.A. The Art and Science of Lightning Protection. New York: Cambridge University Press, 2008. 240 p.

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