On new approaches in the description of the stationary electric field inside the dielectric media and at their interface

© A.S. Chuev

Bauman Moscow State Technical University, Moscow, 105005, Russia

The article presents analysis of the known images of stationary electric field inside the dielectric media and at their interface and notes paradoxical nature in these images represented by the various vectors — electrical voltage and electrical induction. We offer other options of fields images that lack the mentioned paradox. However, these options require revision of the established ideas, in particular, the notions of breaking the lines of the electric induction at the interface of two media and the strengthening of the electric displacement inside the dielectric. A new model to explain the behaviour of the electric vector on the boundary between two media is suggested.

Keywords: *electric field, the electric vectors, dielectrics, the principle of superposition.*

REFERENCES

[1] Irodov I.E. *Elektromagnetizm. Osnovnye zakony* [Electromagnetism. Basic laws]. 4th ed., revised. Moscow, BINOM – Laboratory of Knowledge Publ., 2003, 320 p.
[2] Chuev A.S. *Zakonodatel'naya i prikladnaya metrologiya — Legal and Applied Metrology*, 2007, no. 3, pp. 30–33.
[3] Chuev A.S. *Nauka i obrazovanie: elektronnoe nauchno-tekhnicheskoe izdanie — Science and Education: Electronic scientific and technical periodical*, 2012, no. 2. Available at: http://technomag.edu.ru/doc/299700.html (дата обращения 02.02.2012).
[4] Chuev A.S. *Zakonodatel'naya i prikladnaya metrologiya — Legal and Applied Metrology*, 2012, no. 3, pp. 71–75.
[5] Sommerfeld A. *Elektrodynamik.* Band III. Akademische Verlagsgesellschaft Geest & Portig K.-G., Leipzig, 1949. 505 s.
[6] Martinson L.K., Morozov A.N., Smirnov E.V. *Elektromagnitnoe pole* [Electromagnetic Field]. Moscow, BMSTU Publ., 2013, 422 p.
[7] Feynman R., Leighton R., Sands M. *Feynman Lectures on Physics*. *Vol. 5*. Moscow, Mir Publ., 1966, 296 p. [in Russian].
[8] Chuev A.S. *Zakonodatel'naya i prikladnaya metrologiya — Legal and Applied Metrology*, 2013, no. 3, pp. 51–53.
[9] Matveyev A.N. *Elektrichestvo i magnetism* [Electricity and Magnetism]. Moscow, Vysshaya shkola, 1983, 463 p.
[10] Prokhorov A.M., chief ed. Populyarizatsiya vakuuma [Vacuum polarization]. *Fizicheskaya entsiklopediya* [Physical Encyclopedia]. Vol 4. Moscow, Soviet Encyclopedia Publ., 1994, 704 p.
[11] Chuev A.S. *Zakonodatel'naya i prikladnaya metrologiya — Legal and Applied Metrology*, 2012, no. 6, pp. 45–48.
[12] Kalashnikov S.G. *Electrichestvo* [Electricity]. 5th ed. Moscow, Nauka Publ., Ch. Editorial of Phys.-Math. literature, 1985, 576 p. (General Course of Physics).

[13] Savel'ev I.V. *Kurs obschey fiziki. V 5 knigakh.* [General Physics Course. In 5 books]. *Kniga 2. Elektrichestvo i magnetism* [Book 2. Electricity and Magnetism]. Moscow, AST Publ., 2004, 334 p.

[14] Tamm I.E. Osnovy teorii elektrichestva [Basics of the theory of electricity*]*. 11th ed., rev. and enl. Moscow, FIZMATLIT Publ., 2003, 616 p.

Chuev A.S. (b. 1949) graduated from Bauman Moscow Higher Technical School in 1972. Ph.D., Assoc. Professor of the Physics Department at Bauman Moscow State Technical University. Scientific interests include: General Physics, Metrology.
e-mail: chuev@mail.ru

A new method for the calculation of electric field distributions in the systems with spatiallyrestricted regions filled with polar media with nonlocal diel.Â The field distribution inside a uniform and isotropic nonlocal dielectric medium outside the spherical cavity containing a spherically symmetric charge distribution (the system represents the ion inside the polar solvent) has illustrated this new approach. Electric fields are continuous fields of vectors, so at a given point, one can find the forces that several fields will apply to a test charge and add them to find the resultant. Key Terms. orthogonal : Of two objects, at right angles; perpendicular to each other.Â Diagram of a Parallel-Plate Capacitor : Charges in the dielectric material line up to oppose the charges of each plate of the capacitor. An electric field is created between the plates of the capacitor as charge builds on each plate. Capacitance. All capacitors collect charge on the two, separate conductive surfaces; one side is positive and the other negative. The electric field inside the inner cylinder would be zero. When drawing electric field lines, the lines would be drawn from the inner surface of the outer cylinder to the outer surface of the inner cylinder. For the excess charge on the outer cylinder, there is more to consider than merely the repulsive forces between charges on its surface.Â This concept of the electric field being zero inside of a closed conducting surface was first demonstrated by Michael Faraday, a 19th century physicist who promoted the field theory of electricity. Faraday constructed a room within a room, covering the inner room with a metal foil. He sat inside the inner room with an electroscope and charged the surfaces of the outer and inner room using an electrostatic generator.