

DOI: <https://doi.org/10.15407/techned2018.03.020>

AS FOR CONCEPTION OF ELECTRICAL VOLTAGE IN ELECTRICAL ENGINEERING

Journal	Tekhnichna elektrodynamika
Publisher	Institute of Electrodynamics National Academy of Science of Ukraine
ISSN	1607-7970 (print), 2218-1903 (online)
Issue	No 3, 2018 (May/June)
Pages	20 – 27

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Abstract

In the paper the concepts of electrical voltage used in the circuit theory and electromagnetic field theory are compared. The voltage is defined as the difference in electric potentials in the circuit theory, but in the field theory there is no unique concept and the different definitions for voltage are used. As shown by two examples, the concepts of voltage in the circuit theory and

field theory are consistent with each other and with the concept applied in practice if the voltage is defined as the line integral of the potential part of electric intensity $E_p = -\nabla\varphi$. Note that the first term on the right hand of the known expression for electric intensity

$$E = -\nabla$$

$$\varphi - \partial$$

$$A/$$

∂t is the potential component only when the Cou-lomb gauge for vector magnetic potential is chosen as

$$\nabla \cdot A = 0.$$

Using such agreed concept, the particularities of volt-age measurement in AC circuit are considered. As revealed, under alternating magnetic field, the voltmeter indications can differ from the voltage at measurable points and this difference is associated with electromotive force induced in the connecting wires of the voltmeter.

References 21, figures 3.

Key words: potential and vortex electric field, electric circuits, electromagnetic field, electric and magnetic potentials, voltage, Cou-lomb gauge.

Received: 16.11.2016

Accepted: 22.01.2018

Published: 13.04.2018

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