PACS: 52.80.Mg

Determination of the radiation power of arc by the value of radiation flux to photodetector

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Received August 16, 2022

In the work, a correspondence between the power of electromagnetic radiation of the arc plasma and the value of the radiation flux incident on the surface of the sensitive element of the photodetector is established. To this end, the equation of radiation transfer in the arc plasma is solved for cases where the surfaces of the electrodes completely reflect or completely absorb the radiation incident on them. The case is considered when the discharge plasma is axially symmetrical, homogeneous and in a state of local thermodynamic equilibrium. The formulas for the power P_{pl} of the arc radiation and the power P_d of the radiation incident on the photodetector are obtained. A relationship is derived that relates the P_{pl} and P_d powers. Numerical analysis of this relation has been performed in a wide range of values of geometric parameters of the problem. The calculation results are presented in a convenient graphical form. Simple asymptotic formulas binding P_{pl} and P_d in a wide range of experimental parameters are obtained.

Keywords: electromagnetic radiation, electric arc, radiation transfer equation, photodetector.

DOI: 10.51368/1996-0948-2022-5-25-31

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