ON THE LORENTZIAN TRANSFORMATION AND THE RADIATION FROM A MOVING ELECTRON.

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1. *Introduction.* The electromagnetic field produced by a moving charge has been discussed by many writers.* Langevin † in particular has given an elegant investigation of the field due to a moving electron. Poincaré ‡ has partially solved Langevin's problem by the Lorentzian § transformation. In the present paper the Lorentzian transformation is applied to the expressions for the scalar and vector potentials in the form of definite integrals instead of to the differential equations for the electromagnetic field. The field due to an electron whose velocity is zero at the instant considered is very simply determined. By means of the Lorentzian transformation, the field for the more general case when the velocity is not zero is deduced. The results are Langevin's expression for the electric force and a new expression for the magnetic force.

2. *The electromagnetic equations and their solution.* Let E denote the electric force, H the magnetic force, ρ the volume density, and v the velocity of the electrons, and let the velocity of light be the unit of velocity. Lorentz's || fundamental equations are

$$(1) \qquad \operatorname{div} E = \rho, \qquad (2) \qquad \operatorname{div} \rho v = -\frac{\partial \rho}{\partial t},$$

$$(3) \qquad \operatorname{curl} H = \frac{\partial E}{\partial t} + \rho v, \qquad (4) \qquad \operatorname{curl} E = -\frac{\partial H}{\partial t}.$$

The solution of these equations is known to be reducible to the determination of a scalar potential ϕ and a vector potential α which satisfy the equations

* See Lorentz, Encyklopädie, d. math. Wissensch., vol. V. 2, p. 174.
† *Journal de Physique*, 1905.
‡ *Circolo mat. di Palermo*, 1906.
§ Lorentz, *Amsterdam Proc.*, 1903. Einstein, *Annalen der Physik*, 1905.
|| Loc. cit.