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# INTEGRATION OF NONHOMOGENEOUS EQUATIONS OF ELECTRODYNAMICS IN A SPACE WITH ITS METRIC DEFINED THROUGH ROTATION

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**The general solution to nonhomogeneous wave equations of electrodynamics in the Riemann space corresponding to a rotational reference system is obtained. Partition of the electromagnetic field into field components of the electric and magnetic type waves is performed. The Debye potentials and the functions after G. T. Markov are defined.**

The present work is an extension to [1]. Because of this, the through numbering of formulas in both papers is used.

Assume first that the electromagnetic field is excited only by electric charges and currents varying with frequency $\omega_0$ measured during time $t$. Since in $V_3$, as in $R_3$, the "primary" direction along the $z$-axis exists (the unit vector $\overline{1}_z$ — "longitudinal direction" by convention), we may assume that the EM field in $V_3$ may be broken down into the fields of the electric and magnetic type waves. In Maxwell's equations (11) and material equations (14)

$$\hat{\overline{H}} = (\hat{H}^{\varphi z}, -\hat{H}^{rz}, \hat{H}^{r\varphi}), \hat{\overline{D}} = (\hat{D}^{r}, \hat{D}^{\varphi}, \hat{D}^{z}),$$

$$\overline{E} = (E_r, E_\varphi, E_z), \overline{B} = (B_{\varphi z}, -B_{rz}, B_{r\varphi}).$$

By setting the "longitudinal" component of magnetic inductance $B_{r\varphi}$ in (14) equal to zero, for the EM field of the electric type wave we obtain expressions, which relate the components of the EM field objects to each other. Then, having replaced, in right-hand parts of homogeneous equations (11), the components of vector density $\hat{\overline{D}}$ and bi-vector $\overline{B}$ at $B_{r\varphi} = 0$ with the aid of the above expressions, we arrive at the equation system linking the "lateral" components $E_r^{\mathrm{e}}$, $E_\varphi^{\mathrm{e}}$, $H_r^{\mathrm{e}}$, $H_\varphi^{\mathrm{e}}$, and the longitudinal component $\hat{D}^z$ of the electric type wave.

By setting $\hat{D}^z = 0$ in (14), for the magnetic type wave we obtain the expressions relating the components of the EM field objects. Then, having replaced, in right-hand parts of homogeneous equations (14), the components of vector density $\hat{\overline{D}}$ and of bi-vector $\overline{B}$ with the aid of the above expressions, we arrive at the equation system linking the "lateral" components $E_r^{\mathrm{m}}, E_\varphi^{\mathrm{m}}, H_r^{\mathrm{m}}, H_\varphi^{\mathrm{m}}$, and the "longitudinal" component $B_{r\varphi}$ of the magnetic type wave.

By considering separately the equation systems for the electric and magnetic type waves, and introducing auxiliary functions $V^{\mathrm{e}}$ and $V^{\mathrm{m}}$, we see that the latter must satisfy the equations

$$LV^{\mathrm{e,m}} = 0, \tag{38}$$

while the components of field intensity vectors and the "longitudinal" components $\hat{D}^z$ and $B_{r\varphi}$ can be expressed via $V^{\mathrm{e}}$ and $V^{\mathrm{m}}$ as follows:

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