Spinor Maxwell Equations in Riemannian Space-Time and Modeling Constitutive Relations in Electrodynamics

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Abstract: It is known that vacuum Maxwell equations being considered on the background of any pseudo-Riemannian space-time may be interpreted as Maxwell equations in Minkowski space but specified in some effective medium, which constitutive relations are determined by metric of the curved space-time. In that context, we have

considered de Sitter, anti de Sitter, and Schwarzschild models. Also we have studied hyperbolic Lobachevsky and spherical Riemann models, parameterized by coordinates with spherical or cylindric symmetry. We have proved that in all the examined cases, effective tensors and of electric permittivity $\varepsilon_{ij}(x)$ and magnetic permeability $\mu_{ij}(x)$ obey one the same condition: $\varepsilon_{ij}(x)\mu_{jk}(x) = \delta_{ik}$. Expressions for tensors $\varepsilon_{ij}(x)$ and $\mu_{jk}(x)$ are simple, but this simplicity is misleading. For each curved space-time model we are to solve Maxwell equations separately and anew. We have constructed the solutions, applying Maxwell equations in spinor form.

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