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Electronic Helicity Flipping via Podolsky in the Light Front

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The generalized elecrodynamics proposed by Podolsky is based on the Lagrangian density
\begin{equation*}
{\cal L}{\text{o}}=-\frac{1}{4}F^{\mu \nu }F{\mu \nu }+\frac{a^{2}}{2}\partial
{\nu }F^{\mu \nu }\partial ^{\lambda }F{\mu \lambda },
\end{equation*}%
in which a is a constant with dimension of length. This Lagrangian density generates a linear field theory, with gauge symmetry of the type $U(1)$, that reduces to the Maxwell theory when we let $a = 0$. Evidently this is a higher order theory since the equations of movement contain fourth order derivatives of the vector potential. As in the Maxwell's theory, Podolsky's theory also pesents positive definite energy in the electrostatic case that, nonetheless, is finite for a point charge. This last result clearly shows that the force between two point charges is no longer of Coulomb type, a point that deserves to be closely looked at.

In this work we focus on the Podolsky's electrodynamics on the light front. As a consequence, it is shown that the electron's helicity is flipped.

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