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Considerations on the photon-photino mixing in presence of fermion condensates and space-time anisotropies

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In this contribution, we reassess a supersymmetric model that takes into account the photon-photino sector in presence of a supersymmetric, but Lorentz-symmetry violating (LSV), background. The photon and photino fields appear mixed due to the presence of a constant background Majorana fermion that, as a by-product of supersymmetry, induces the mixing . Two real four-vectors, which represent possible space-time anisotropies, are included that violate Lorentz symmetry and affect the photon and photino masses. In this scenario, we have worked out the mass spectra for the photon and photino in terms of the complete background-fermion condensates and the anisotropies and show how the photon-photino mass degeneracy is lifted. Actually, it is shown how the LSV background supermultiplet yields supersymmetry breaking . As a step further, it is investigated how the LSV background and space-time anisotropies affect the Gordon decomposition of the photino spin current. Finally, we turn into another issue and focus our attention on a number of results that illustrate how the space-time anisotropies considered here may affect properties of Dirac fermions, by pursuing an analysis of the modified dispersion relation and group velocity, deriving the extended fermionic propagator, working out the Gordon decomposition of the electromagnetic current, obtaining the positive- and negative-energy solutions and reconsidering the Kleins's Paradox and the phenomenon of *Zitterbewegung*.

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