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Thoughts on Spacetime Models and Cosmological Constant: Gravitation and Electromagnetism

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Cosmology is mainly based on the *Friedmann's equations* assuming Isotropy and Homogeneity of the Einstein spacetime, starting from the Friedmann-Lemaître-Robertson Walker metric. Introduction of an ad hoc Cosmological Constant allows to model phenomenologically the so-called *Dark Energy* for explaining the acceleration of the Universe expansion discovered by Riess et al. and Permuter et al. in 1998.

Considering an Einstein-Cartan vacuum spacetime, this work focus on the influence of *electromagnetic background* field on this accelerated Universe expansion. In addition to metric and torsion (generated by independent connection), we study the influence of the compatibility of both of them with the *volume-form*, needed to correctly define any Lagrangian of the vacuum.

The action including **Einstein-Palatini** (extended version of Hilbert-Einstein Lagrangian) and **Yang-Mills** Lagrangians is considered all along the study. Application of rigorous *Variation Procedure* allows us to derive an extended system of fields equations : (1) Maxwell, (2) Einstein-Maxwell and (3) additionally a linking third relation giving what we called « **Distortion of the spacetime** ». This (third-order) distortion tensor is expressed explicitly and is generated by a particular component of the background electromagnetic wave : the **Chern-Simmons** current which is constituted by Magnetic Helicity and Spin Angular Momentum of the wave.

Beyond the classical assumption of Perfect Fluid filling Universe, electromagnetic background clearly induces Anisotropy (and eventually Inhomogeneity) of the Spacetime which precludes any easy derivation of a sufficiently tractable extended Friedmann's equations in such a case. Nevertheless, assuming that if only the trace torsion-vector is considered, the integral curves of the vector field might be suggested as the tangent field of *giant filaments*, and confirming that the two major forces remain the gravitation and magnetic forces. By the way, considering a volume-form compatible with metric and connection (with torsion) permits to obtain strikingly action similar to that of *Brans-Dicke* action.

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