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Higgs Mechanism for the Ashtekar Self-Dual Connection

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We introduce the Higgs mechanism for the self-dual spin connection (also known as the Ashtekar connection), using the Plebański formulation of gravity. We develop our formalism within the framework of the chiral action and derive the equations of motion of the theory. One particular test model is explored: since anisotropy is an intrinsic property of the theory, a modified version of the spatially flat Bianchi I model with two different scale factors is considered. We apply our formalism and derive the Friedmann equations which regulate the scale factors and the Higgs field. We also present a Proca-like term for the connection, which when reduced to minisuperspace with a positive Λ yields a De Sitter universe with an effective cosmological constant that depends on the mass of the gauge fields. We finally investigate the effect of these mass terms on gravitational waves and find that the wave equation remains unchanged relatively to GR; however the Weyl tensor is scaled by a constant which depends on the mass of the connection components.

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