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Junction conditions in bi-scalar Poincaré Gauge gravity

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Abstract

In this work, we study the junction conditions of the ghost-free subclass of quadratic Poincaré Gauge gravity, which propagates one scalar and one pseudo-scalar. For this purpose, we revisit the theory of distributions and junction conditions in gravity, giving a novel insight to the subject by introducing a convenient notation to deal with regular and singular parts. Then, we apply this formalism to bi-scalar Poincaré Gauge gravity and study some paradigmatic cases. We compare our results with the existing literature and the well-known predictions of General Relativity. We find that monopole spin densities are admissible, whereas both thin shells and double layers are allowed for the energy-momentum. Such layers can be avoided by setting appropriate continuity conditions on the dynamic fields of the theory, as well as on the Ricci scalar of the full connection and the Holst pseudo-scalar.

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