

## Master equations governing the coupling between spin-currents and gravity

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In this work we consider the Einstein-Hilbert action in the first order order formalism coupled to Dirac spinors. From the little group symmetry, we derive the corresponding Bargmann-Wigner current which is conserved but not gauge invariant. Therefore, we construct a gauge invariant version of the Bargmann-Wigner current which is not conserved but potentially observable. Because it is not conserved we split this current into fermionic and gravitational sectors and derive their broken continuity equations for each sector. These equations compose the master equations governing the interaction of spin-currents with gravity. Furthermore, we derive the corresponding master equations in the weak field approximation.

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