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Globally and Locally Supersymmetric Effective Theories for Light Fields

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We study how and under which conditions heavy fields can be integrated out in a supersymmetric way in globally and locally supersymmetric theories. We argue that to neglect higher-derivatives compatibly with supersymmetry one has to require that also fermions and auxiliary fields are small in unit of the heavy fields mass scale. In supergravity theories this means in particular that the gravitino mass must be small. We show then that under these assumptions, heavy chiral and vector multiplets can be integrated out at the superfield level by imposing stationarity respectively of the superpotential and the Kahler potential, both in globally and locally supersymmetric theories.

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