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Spinning particle: Is Newton-Wigner the only way?

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A rapidly spinning compact object couples to an ambient curved background via the so-called spin-curvature coupling. In expressing this, one has to deal with the ambiguity of the definition of the center of mass of the body. What is worse, in a Hamiltonian formalism, this choice corresponds to an unphysical "parasitic" degree of freedom in the dynamical system. A solution to this is to apply a Hamiltonian constraint on the system and to obtain a set of brackets where the center-of-mass degree of freedom is erased from the algebra. In this talk I will report on my progress in this procedure in the case of the so-called Tulczyjew-Dixon (or "covariant") supplementary spin condition and in my effort to cover the resulting phase space with canonical coordinates.

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