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Thomas Rotation and Quantum Entanglement

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Abstract content
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The composition of two non-linear boosts on a particle in Minkowski space-time are not commutative. This non-commutativity has the result that the Lorentz transformation formed from the composition is not a pure boost but rather, a combination of a boost and a rotation. The rotation in this Lorentz transformation is called the Wigner rotation. In curved space-time, the Thomas precession combines with a geometric effect caused by the gravitationally curved space-time to produce a geodetic effect. In this work we present how the Thomas precession affects the correlation between the spins of entangled particles and propose a way to detect forces acting on entangled particles by looking at how the Thomas precession degrades the entanglement correlation. Since the Thomas precession is a purely kinematical effect, it could potentially be used to detect any kind of force, including gravity (in the Newtonian or weak field limit). We present the results that we have so far.

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