Dynamics of Dirac particle spins in arbitrary stationary gravitational fields.

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Since a metric tensor is symmetric, it can be diagonalized with respect to space coordinates (without a diagonalization with respect to time). The diagonalized metric tensor can be transformed to an isotropic form. The latter does not affect any specific geometrical properties of spacetime.

We recast the covariant Dirac equation for spin-1/2 particles in stationary spacetimes into the familiar Schrödinger form and obtain the exact Hermitian Hamiltonian. We perform the FW transformation of this Hamiltonian and retain all terms of the zero and first orders in the Planck constant, $\hbar$, and leading terms of order of $\hbar^2$ which do not vanish in the both nonrelativistic and weak field approximations. The last terms describe the gravitational Darwin interaction. The gravitational field is supposed to be strong. We derive the operator equation of spin motion, perform the semiclassical transition, and consider dynamics of particle spins. The semiclassical equation of spin motion is identical to the corresponding classical equation.

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