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Spin-dependent inertial force and spin current in accelerating systems MAMORU MATSUO, Kyoto university, JUN'ICHI IEDA, Japan Atomic Energy Agency, EIJI SAITOH, Tohoku university, SADAMICHI MAEKAWA, Japan Atomic Energy Agency — In the frontier of spintronics, much attention is paid on the control of spin currents. Due to the recent progress of nanoelectromechanics, mechanical manipulation of spins will increase in importance. We discuss theoretically the generation of spin currents in both rotationally and linearly accelerating systems. The explicit form of the spin-dependent inertial force acting on electrons in accelerating systems in the presence of electromagnetic fields is derived from the generally covariant Dirac equation. It is shown that the force is responsible for the generation of spin currents by mechanical rotation and vibration in the first order of the spin-orbit coupling. We also investigate $SU(2) \times U(1)$ gauge theory in accelerating systems, which allows us to extend the spintronic theory in inertial frame to non-inertial frame.

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