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Ballistic spin dynamics in Rashba spin-orbit coupled systems RYO MATSUMOTO, Department of Physics, Tokyo Institute of Technology, SHUICHI MURAKAMI, Department of Physics, Tokyo Institute of Technology, PRESTO, Japan Science and Technology Agency — We theoretically study a time evolution of a transient spin grating in a two-dimensional electron gas with a Rashba spin-orbit coupling in a ballistic regime. We calculate the out-of-plane spin Fourier components, which decays with a rapid oscillation. We investigate their lifetime and frequency and analyze their dependence on the grating vector q and the spin-orbit coupling constant α . The frequency is proportional to q and α , and we find that the lifetime of the spin polarization is proportional to the inverse square of α for the small q limit. Finally we compare our calculation with the case for a diffusive regime. We show that the lifetime of the spin polarization is longer when the grating vector becomes smaller, which is in contrast with the diffusive case.

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