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Spin-charge Dynamics On Surface States of Topological Insulators and 2DEG XIN LIU, JAIRO SINOVA, Department of Physics, Texas A&M University — We study the spin-charge dynamics on the surface of a topological insulator and spin-orbit coupled two dimensional electron gas. A new approach is developed to study the spin-charge dynamics even valid in the very strong spin-orbit coupling regime where the spin splitting energy due to SOIs is at the same order to the Fermi energy. The effects of Coulomb interaction and external field are also considered. We predict the fast oscillation of spin polarization perpendicular and parallel to the surface. Based on our theory, we provide a scheme to measure the transport property of the surface state isolated from the bulk contribution.

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