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Detection of topological states in two-dimensional Dirac systems by the dynamic spin susceptibility MASAAKI NAKAMURA, Department of Physics, Ehime University, AKIYUKI TOKUNO, Centre de Physique Theorique, Ecole Polytechnique;College de France — We discuss dynamic spin susceptibility (DSS) in two-dimensional (2D) Dirac electrons with spin-orbit interactions to characterize topological insulators. The imaginary part of the DSS appears as an absorption rate in response to a transverse AC magnetic field, just like an electron spin resonance experiment for localized spin systems. We found that when the system is in a static magnetic field, the topological state can be identified by an anomalous resonant peak of the imaginary part of the DSS as a function of the frequency of the transverse magnetic field ω. This anomalous peak is related to a transition between two Landau levels close to the Fermi level, which is not allowed in the trivial state. In the absence of the static magnetic field, the imaginary part of the DSS becomes a continuous function of ω with a threshold frequency ω_c. In this case, the topological and the trivial phases can also be distinguished by the values of ω_c and by the line shapes. Thus the DSS is an essential and an experimentally observable physical quantity to characterize the topological insulators.

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