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A necessary and sufficient condition for non-zero longitudinal magnetoresistance HRIDIS PAL, DMITRII MASLOV, University of Florida — While conventional wisdom predicts zero longitudinal magnetoresistance (LM) in any material owing to the fact that the Lorentz force on a charge carrier acts perpendicular to the applied magnetic field and hence should not affect its motion in the direction of the field, numerous experiments show otherwise. We find that the origin of non-zero LM, in the simplest model, can be attributed to the Fermi surface topology. It is shown that, as a minimal requirement for non-zero LM, presence of anisotropy in the spectrum is essential, although not all types of anisotropy can give rise to the non-zero value, thus requiring anisotropy to be present in a special way. We derive a necessary and sufficient condition for the spectrum to show non-zero LM and discuss its implications.

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