Nernst effect in Bismuth and graphite beyond the quantum limit

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A rare opportunity to explore the fate of a three-dimensional gas of highly mobile electrons confined to their lowest Landau levels is provided by elemental semi-metals such as bismuth and graphite. Coulomb interaction, neglected in the band picture, is expected to become significant in this extreme quantum limit, with poorly understood consequences.
The Nernst response sharply peaks when a Landau tube is squeezed inside the thermally fuzzy Fermi surface. Our study of the angular-dependent Nernst effect in bismuth resolves these peaks with a complex angular dependence in very good agreement with the theory. Beyond the quantum limit, we resolve a set of additional unexpected Nernst peaks of unknown origin.
According to our study of the Nernst effect in graphite extended up to 45 T, the onset of the field-induced phase transition leads to a drastic drop in the Nernst response signaling the sudden vanishing of Landau tubes. The magnitude of this drop suggests the destruction of multiple Landau tubes possibly because of simultaneous nesting of the electron and hole pockets.

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