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Nernst effect in bismuth and graphite across the quantum limit

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Bismuth and graphite are elemental semimetals, which host a dilute liquid of highly mobile carriers of both signs. These features conspire to generate a very large Nernst coefficient. The quantum limit is attained when the magnetic field puts all electrons in their lowest Landau level and can be crossed in bismuth and graphite for particular orientations of the magnetic field. The fate of a three-dimensional electron gas pushed to this ultraquantum regime has been barely explored. According to recent studies on bismuth and graphite in the vicinity of the quantum limit, whenever a Landau level intersects the Fermi level, the Nernst signal sharply peaks and the oscillating signal exceeds by far the monotonous background. Both these features are absent in two-dimensional systems. Beyond the quantum limit, Nernst effect in bismuth detects field scales unexpected in the one-particle picture. Our recent angular-dependent Nernst measurements find that the band picture, quite successful in explaining the complex electronic spectrum of bismuth up to 9 T, is inadequate as the quantum limit is crossed, An enigmatic reorganization of electrons, most probably due to collective effects, occurs far beyond the quantum limit around B=40 T. **Collaborators:** Zengwei Zhu, Benoit Fauqué, Huan Yang, Baptiste Vignolle, Cyril Proust, Arlei Antunes, Liam Malone, Tim Murphy, Luis Balicas, Yakov Kopelevich and Jean-Paul Issi.