Abstract Submitted
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Magnetotransport of Bi nanowires: Evidence for surface carriers in bismuth.[1] TITO HUBER, Howard University, ALLA NIKOLAEVA, LEONID KONOPKO, Academy of Sciences Moldova, MICHAEL J. GRAF, Physics Department. Boston College. — Angle resolved photoemission spectroscopy studies (Hirahara et al, Phys. Rev. Lett. 97, 146803 (2006)) provide evidence of quantum-confined bulk-like states and surface states in ultrathin Bi films. Can these states be observed in electronic transport? We studied magnetotransport of trigonal Bi nanowires (30 nm $<$ diameter $<$ 200 nm) for fields up to 14 T. Bulklike states (M.R. Black et al, Phys. Rev. B68, 235417 (2003)) are identified because of its anisotropic Fermi surface and low effective mass. A two-dimensional behavior was expected of high-effective mass surface carriers; we found instead a three-dimensional behavior, with a rich spectrum of Landau levels in a nearly spherical Fermi surface. This behavior is related to the long penetration length of surface states in non-basal surfaces. On the basis of similarity of spectra, we show that recent observations of sharp peaks in the bulk Bi Nernst thermopower near the 9 T quantum limit, attributed to charge fractionalization (K. Behnia, L. Balicas and Y. Kopelevich, Science 317, 1729 (2007)), can be more plausibly interpreted in terms of quasiparticles that are based on surface states. Bismuth true quantum limit is 70 T.

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