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Two-dimensional Dirac fermions and quantum transport in (Sr/Ca)$MnBi_2$ KEFENG WANG, Condensed Matter Physics and Materials Science Department, Brookhaven National Laboratory Upton, New York 11973 USA, D. GRAF, National High Magnetic Field Laboratory, Florida State University, LIMIN WANG, HECHANG LEI, Condensed Matter Physics and Materials Science Department, Brookhaven National Laboratory Upton, New York 11973 USA, S.W. TOZER, National High Magnetic Field Laboratory, Florida State University, CEDOMIR PETROVIC, Condensed Matter Physics and Materials Science Department, Brookhaven National Laboratory Upton, New York 11973 USA — We report two dimensional Dirac fermions and quantum transport behavior in single crystals of $SrMnBi_2$ and $CaMnBi_2$. The non-zero Berry's phase, small cyclotron resonant mass and first-principle band structure suggest the existence of the Dirac fermions in the Bi square nets. Angular dependent magnetoresistance and quantum oscillations suggest dominant two-dimensional (2D) Fermi surfaces. The in-plane transverse magnetoresistance exhibits a crossover at a critical field B^* from semiclassical weak-field B^2 dependence to the high-field unsaturated linear magnetoresistance ($\sim$120% in 9 T at 2 K) due to the quantum limit of the Dirac fermions. The temperature dependence of B^* satisfies quadratic behavior, which is attributed to the splitting of linear energy dispersion in high field. Our results demonstrate the universal existence of two dimensional Dirac fermions in different materials with Bi square nets.

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