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Low-energy behavior near the semi-Dirac point SWAPNONIL BANERJEE, W.E. PICKETT, University of California, Davis — The recent discovery that a three unit cell slab of VO_2 confined to 2D dispersion within insulating TiO_2 slabs leads to point Fermi surfaces [PRL 102, 166803 (2009)] has opened up a new class of electronic behavior. It shows four symmetry related point Fermi surfaces along the (1,1) directions in the 2D Brillouin zone. The dispersion away from this point is however different from graphene and was unanticipated: disperson is linear along one direction but quadratic in the perpendicular direction. This semi-Dirac behavior has extreme anisotropy, from massless to massive. The dispersion depends on the Fermi velocity v_F and the effective mass m^*, but finally scales to a single semi-Dirac system with energy scale $m^* v_F^2$. We have extended the study of the low energy behavior of this system [PRL 103, 016402 (2009)], showing that the Hall coefficient reduces to the conventional expression $\frac{1}{nec}$ (n is the carrier concentration) as also the case for graphene, but does not hold generally. The small-q electronic response and plasmon frequency, and its very strong anisotropy, will be presented and analyzed.

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