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Optical Properties of Dirac Materials¹ DENNIS DREW, CNAM, Physics Department, University of Maryland, College Park, MD — Recently strong spin-orbit interaction and topological considerations have led to materials with 3D Weyl or Dirac energy band dispersions. Several novel phases have been predicted for these materials, including fractionalized topological insulators, chiral spin liquids, topological Weyl semimetals, axion insulators and spin liquids. These 3D materials are semimetals corresponding to zero gap semiconductors. As such their optical properties have new features not seen in conventional materials including logarithmic singularities in the dielectric function. We will present preliminary optical studies on several of these new materials. The materials studied include Dirac materials Cd_3As_2 and Na_3Bi and the Weyl semimetal $Eu_2Ir_2O_7$ which has broken time reversal symmetry in the antiferromagnetic state. The optical data give the first evidence for a Weyl state in $Eu_2Ir_2O_7$. We also observe the logarithmic singularities associated with the Pauli blocking of the inter Dirac cone excitations in Cd₃As₂ and Na₃Bi. These optical data provides important information about the 3D energy band structure of these novel materials that are not amenable to surface probes such as ARPES or STM.

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