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Quantum transport in Weyl semimetals YUYA OMINATO, MIKITO KOSHINO, Tohoku Univ — Quantum transport in 3D Weyl (massless Dirac) electron system with long-range Gaussian impurities is studied theoretically using a self-consistent Born approximation (SCBA). We find that the conductivity significantly changes the behavior at a certain scattering strength which separates the weak and strong disorder regimes. In the weak disorder regime, the SCBA conductivity mostly agrees with the Boltzmann conductivity, while the agreement fails near the Weyl point where the SCBA conductivity drops to zero linearly to the Fermi energy. In the strong disorder regime, the conductivity is smooth and finite near the Weyl point, and the minimum conductivity becomes larger in increasing the disorder potential, contrary to the usual metallic behavior. We also study the charged impurities, and argue the qualitative difference from the Gaussian case. The theory applies to three dimensional gapless band structures, including Weyl semimetals.

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