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Phase diagrams of disordered Weyl semimetals HASSAN SHAPOURIAN, TAYLOR L. HUGHES, Univ of Illinois - Urbana — Weyl semimetals are gapless quasi-topological materials with a set of isolated nodal points forming their Fermi surface. They manifest their quasi-topological character in a series of topological electromagnetic responses including the anomalous Hall effect. Here we study the effect of disorder on Weyl semimetals while monitoring both their nodal/semi-metallic and topological properties through computations of the localization length and the Hall conductivity. We present detailed phase diagrams of three different lattice tight-binding models and we find that weak disorder preserves the nodal points up to the diffusive limit, but does affect the Hall conductivity. We show that the trend of the Hall conductivity is consistent with an effective picture in which disorder causes the Weyl nodes move within the Brillouin zone along a specific direction that depends deterministically on the properties of the model and the neighboring phases to the Weyl semimetal phase.

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