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Density of states scaling at the semimetal to metal transition in three dimensional topological insulators IGOR HERBUT, Simon Fraser University, KEN IMURA, Hiroshima University, TOMI OHTSUKI, KOJI KOBAYASHI, Sophia University — The quantum phase transition between the three dimensional Dirac semimetal and the diffusive metal can be induced by increasing disorder. Taking the system of disordered Z2 topological insulator as an important example, we compute the single particle density of states by the kernel polynomial method. We focus on three regions: the Dirac semimetal at the phase boundary between two topologically distinct phases, the tricritical point of the two topological insulator phases and the diffusive metal, and the diffusive metal lying at strong disorder. The density of states obeys a novel single parameter scaling, collapsing onto two branches of a universal scaling function, which correspond to the Dirac semimetal and the diffusive metal. The diverging length scale critical exponent and the dynamical critical exponent are estimated, and found to differ significantly from those for the conventional Anderson transition. Critical behavior of experimentally observable quantities near and at the tricritical point is also discussed. (K. Kobayashi et al, Phys. Rev. Lett. vol. 112, 016402 (2014))

Igor Herbut
Simon Fraser University

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