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"Holographic" treatment of surface disorder in topological insulators KUN WOO KIM, ROGER MONG, California Institute of Technology, MARCEL FRANZ, University of British Columbia, GIL REFAEL, California Institute of Technology — What is the effect of surface-only disorder on the electronic states of a 3d TI? The layers in the clean bulk parallel to surface probe the surface impurities as they hop in and out of the surface layer. A recursive treatment of the impurity effects is made possible through successive elimination of the lattice layer by layer. This leads to non-linear renormalization group flow of an effective surface impurity potential. We found an exact mapping between the recursion relation and Schrodinger equation along the layers, therefore the modified self energy due to surface impurity could be simply obtained from the transfer matrix method. As a concrete example of 2d topological insulator, we found the exact expression of on-layer self energy for a clean system and an asymptotic expression that captures a general behavior of layers deep in the bulk.

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