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Generic Symmetry Breaking Instability of Topological Insulators due to a Novel van Hove Singularity[1] XUGANG HE, Brookhaven National Lab and Stony Brook University, XIAOXIANG XI, Photon Sciences, Brookhaven National Lab, WEI KU, Brookhaven National Lab and Stony Brook University — We point out that in the deep band-inverted state, topological insulators are generically vulnerable against symmetry breaking instability, due to a divergently large density of states of 1D-like exponent near the chemical potential. This feature at the band edge is associated with a novel van Hove singularity resulting from the development of a Mexican-hat band dispersion. We demonstrate this generic behavior via prototypical 2D and 3D models. This realization not only explains the existing experimental observations of additional phases, but also suggests a route to activate additional functionalities to topological insulators via ordering, particularly for the long-sought topological superconductivities.

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