

Three-dimensional topological insulators famously host a single Dirac cone of nearly free electrons at their surface. Recent work has shown that this weakly-interacting Dirac liquid may be equivalently described as a strongly-correlated liquid of 'dual' Dirac fermions coupled to an emergent photon, or by self-dual bosons coupled to a Chern-Simons gauge field. I will present an exact mapping that implements these dualities in concrete models, focusing on the realization of symmetries for the various degrees of freedom, i.e., bosons, vortices, fermions and fermionic vortices. In addition, I will describe an interesting 'modular' structure that arises in the case of power-law interactions.