Contribution ID: **28** Type: **not specified**

Discrete symmetries in dimer diagrams

Wednesday, 15 January 2020 18:00 (15 minutes)

Following the paper called Discrete Symmetries in Dimer Diagrams (https://arxiv.org/abs/1907.06938), we apply dimer diagram techniques to uncover discrete global symmetries in the fields theories on D3-branes at singularities given by general orbifolds of general toric Calabi-Yau threefold singularities. The discrete symmetries are discrete Heisenberg groups, with two generators A,B with commutation AB=BAC, with C a central element. These generators depend on the abelian orbifold. This fully generalizes observations in particular orbifolds of the flat space, the conifold and other toric Sasaki-Einstein manifolds. The generator A is realized as a shift in the dimer diagram, associated to the orbifold quantum symmetry; the action of B is determined by equations describing a 1-form in the dimer graph in the unit cell of the parent theory with twisted boundary conditions; finally, C is an element of the (mesonic and baryonic) non-anomalous U(1) symmetries, determined by geometric identities involving the elements of the dimer graph of the parent theory. These discrete global symmetries of the quiver gauge theories are holographically dual to discrete gauge symmetries from torsion cycles in the horizon. Our findings allow to easily construct the discrete symmetries for infinite classes of orbifolds.

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Session Classification: short talk