



Contribution ID: 195

Type: **not specified**

Shifted Quiver Yangians and Representations from BPS Crystals

Thursday, 26 August 2021 16:30 (30 minutes)

We introduce a class of new algebras, the shifted quiver Yangians, as the BPS algebras for type IIA string theory on general toric Calabi-Yau three-folds. We construct representations of the shifted quiver Yangian from general subcrystals of the canonical crystal. We derive our results via equivariant localization for supersymmetric quiver quantum mechanics for various framed quivers, where the framings are determined by the shape of the subcrystals. Our results unify many known BPS state counting problems, including open BPS counting, non-compact D4-branes, and wall crossing phenomena, simply as different representations of the shifted quiver Yangians. Furthermore, most of our representations seem to be new, and this suggests the existence of a zoo of BPS state counting problems yet to be studied in detail.

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Session Classification: Formal SUSY Theories

Track Classification: Formal SUSY Theories