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Infinite Distance Limits, Light Towers & Duality Frames

Since their discovery in the 90's, multiple string dualities have been discovered, relating seemingly different perturbative and non-perturbative regimes of the space of parameters (or moduli space), in such a way that in its asymptotic regions one is usually able to work in some duality frame with perturbative control (e.g. large volume and small string coupling). On the other hand, over the recent years, the Swampland Program has tried to state various criteria (or conjectures) that EFT consistent with QG must satisfy. The Swampland Distance Conjecture states that moving towards an asymptotic limit of moduli space is accompanied by the existence of a tower of states becoming light. At the same time, the Emergent String Conjecture constrains the possible types of these light towers. We use this to restrict the possible moduli-dependences of the different towers and QG cut-off (or Species Scale) of the different asymptotic regimes. Under certain assumptions, this enables a classification in terms of a finite list of polytopes, which in turn allows us to understand how the different duality frames are globally “glued” together in the moduli space, as well as their ranges of validity. We illustrate this for 9d theories with different amounts of supersymmetry.

Author: RUIZ GARCIA, Ignacio (Universidad Autonoma de Madrid (ES))

Presenter: RUIZ GARCIA, Ignacio (Universidad Autonoma de Madrid (ES))

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