

Solitonic Vortex in 4d SQCD vs Critical Superstring

Tuesday, 10 November 2020 15:45 (15 minutes)

In this talk we are going to discuss recent results on non-Abelian vortex strings in four-dimensional (4D) $\mathcal{N} = 2$ supersymmetric QCD with $U(N = 2)$ gauge group and $N_f = 4$ flavors of quark hypermultiplets.

It has been recently shown that these vortices behave as critical superstrings. The spectrum of closed string states in the associated string theory was found and interpreted as a spectrum of hadrons in 4D $\mathcal{N} = 2$ supersymmetric QCD. In particular, the lowest string state appears to be a massless BPS “baryon.”

Here we show the occurrence of this stringy baryon using a purely field-theoretic method. To this end we study the conformal world-sheet theory on the non-Abelian string – the so called weighted $\mathcal{N} = (2, 2)$ supersymmetric $\mathbb{C}\mathbb{P}$ model. Its target space is given by the six-dimensional non-compact Calabi-Yau space Y_6 , the conifold. We use mirror description of the model to study the BPS kink spectrum and its transformations on curves (walls) of marginal stability. Then we use the 2D-4D correspondence to show that the deformation of the complex structure of the conifold is associated with the emergence of a non-perturbative Higgs branch in 4D theory which opens up at strong coupling. The modulus parameter on this Higgs branch is the vacuum expectation value of the massless BPS “baryon” previously found in string theory.

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