Extended MQCD and SUSY/non-SUSY duality

RIKEN   Kazutoshi Ohta and Ta-Sheng Tai

E-mail: `tasheng@riken.jp`

We show how the SUSY/non-SUSY duality proposed by Aganagic et al. can have a corresponding Type IIA brane picture. Apart from conventional ones, where antibranes are wrapped on a CY by hand, the setup here involves changing the orientation of local two-cycles through a varying background NS-flux. This dose work because B-field gives a Kahler moduli $\sim B_{NS} = \sum_k t_k v^k$ of arbitrary sign to shrinking two-cycles and hence controls their flops. Note that v parameterizes a CY here. And our convention will be $v = x^4 + ix^5$, $w = x^7 + ix^8$ and $-\log t = x^6 + ix^{10}$.

On Type IIA side, we interpret this background as two crossing NS5-branes where D4-branes appear naturally for flipped orientations. Consequently, simultaneous presence of D4- and antiD4-branes soon suggests a way to realize various kinds of SUSY/non-SUSY vacua via adjusting parameters the NS-flux contains. Moreover, curved NS5-branes on (v, t)-plane with N = 2 SUSY correspond to what has been known as the extended Seiberg-Witten theory. One can further add FI parameters to partially break N = 2 down to N = 1, which is as well pictorially accounted for via our Type IIA brane picture.

We also considered M-theory lift. Without t_k perturbation, the M-theory curve itself is either a degenerated Seiberg-Witten curve on (v, t)-plane or a loop equation of DV matrix model on (v, w)-plane. Though adding higher t_k terms has no effect on the planar loop equation, we find that N = 1 effective superpotential gets modified. In particular, it seems that the above partial SUSY breaking process can be described by deforming one given M-theory curve in order to incorporate quantum effects. We leave these problems to future works.