

Why the quark mass is so small: the chiral symmetry and Heun's equation

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We show that a holographic abelian Higgs model leads us to the Heun's equation, which is the same one derived for the bag model studied by Lichtenberg. The correspondence between two models resembles the AdS/CFT dictionary. The spectrum follows linear confinement for zero quark mass, while it is highly non-linear for finite quark mass. It can be traced back to the difference in the singularity class of equation of motion made by the quark mass. It suggests that the origin of the chiral symmetry is tied to the dynamics of color confinement.

Presenter: SIN, Sang-Jin (Hanyang University)

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