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Holographic analysis of near-conformal dynamics and light dilaton

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We carry out a detailed analysis of the region slightly outside the conformal window of a non-trivial infrared fixed point in a generic bottom-up holographic setup. We focus on models, which study the dynamics of a scalar field, dual to quark degrees of freedom, in a (nearly) AdS geometry. Such models realize the picture expected for vector-like near-conformal theories from Dyson-Schwinger analysis. The analysis covers a toy model, which allows for analytic solutions, and a more general setup as well, which encompass a complete model for the ultraviolet physics. We analyze the conditions for the appearance of a parametrically light scalar state in the spectrum, which can act as a candidate for the Pseudo-Nambu-Goldstone boson arising from breaking of the approximate conformal symmetry. We also present detailed results for the vacuum structure, correlators, and Ward identities in the near-conformal regime.

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