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Near-conformal dynamics in a chirally broken system

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Composite Higgs models must exhibit very different dynamics from quantum chromodynamics (QCD) regardless whether they describe the Higgs boson as a dilaton-like state or a pseudo-Nambu-Goldstone boson. Large separation of scales and large anomalous dimensions are frequently desired by phenomenological models. Mass-split systems are well-suited for composite Higgs models because they are governed by a conformal fixed point in the ultraviolet but are chirally broken in the infrared. In this work we use lattice field theory calculations with domain wall fermions to investigate a system with four light and six heavy flavors. We demonstrate how a nearby conformal fixed point affects the properties of the four light flavors that exhibit chiral symmetry breaking in the infrared. Specifically we describe hyperscaling of dimensionful physical quantities and determine the corresponding anomalous mass dimension. We obtain y_m=1+gamma^*= 1.47(5) suggesting that N_f=10 lies inside the conformal window. Comparing the low energy spectrum to predictions of dilaton chiral perturbation theory, we observe excellent agreement which supports the expectation that the 4+6 mass-split system exhibits near-conformal dynamics with a relatively light 0^++ isosinglet scalar.

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