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Chiral symmetry breaking in QCD Lite

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We compute the spectral density of the (Hermitean) Dirac operator in Quantum Chromodynamics with two light degenerate quarks near the origin. We use CLS lattices generated with two flavours of O(a)-improved Wilson fermions corresponding to pseudoscalar meson masses down to 190 MeV, and with spacings in the range 0.05–0.08 fm. Thanks to the coverage of parameter space, we can extrapolate our data to the chiral and continuum limits with confidence. The results show that the spectral density at the origin is non-zero because the low modes of the Dirac operator do condense as expected in the Banks–Casher mechanism. Within errors, the spectral density turns out to be a constant function up to eigenvalues of approximatively 80 MeV. Its value agrees with the one extracted from the Gell–Mann–Oakes–Renner relation.

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