Index Theorem and Random Matrix Theory for Improved Staggered Quarks

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Abstract: We study various improved staggered quark Dirac operators on quenched gluon backgrounds in lattice QCD. We find a clear separation of the spectrum of eigenvalues into high chirality, would-be zero modes and others, in accordance with the Index Theorem. We find the expected clustering of the non-zero modes into quartets as we approach the continuum limit. The predictions of random matrix theory for the epsilon regime are well reproduced. We conclude that improved staggered quarks near the continuum limit respond correctly to QCD topology.