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SU(4) symmetry of hadrons upon quasi-zero Dirac mode elimination.

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A large degeneracy of mesons of given spin has been discovered upon reduction of the quasi-zero modes of the Dirac operator in a dynamical simulation. One expects a priori, that upon elimination of the quasi-zero modes of the Dirac operator, the chiral symmetry should be restored, since the quark condensate of the vacuum is connected with the density of the quasi-zero modes. However, it has turned out that not only degeneracy patterns from the $SU(2)_R \times SU(2)_L$ and $U(1)_A$ symmetries are observed, but a larger degeneracy that includes all possible chiral multiplets for given spin. This symmetry has been established to be $SU(4)$ that includes both the isospin rotations of quarks of given chirality as well as the rotations chirality itself. This symmetry is higher than the symmetry of the QCD Lagrangian and should be consequently considered as an emergent symmetry that reflects the QCD dynamics without the quasi-zero modes of the Dirac operator. This symmetry implies the absence of the color-magnetic field in the system and might be interpreted as a manifestation of the dynamical QCD string.

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