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One-loop lattice study of composite bilinear operators in Supersymmetric QCD

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We study 4-dimensional SQCD with gauge group $SU(N_c)$ and N_f flavors of chiral super-multiplets on the lattice. We perform extensive calculations of matrix elements and renormalization factors of composite operators in Perturbation Theory. In particular, we compute the renormalization factors of quark and squark bilinears, as well as their mixing at the quantum level with gluino and gluon bilinear operators. From these results we construct correctly renormalized composite operators, which are free of mixing effects and may be employed in non-perturbative studies of Supersymmetry. All our calculations have been performed with massive matter fields, in order to regulate the infrared singularities which are inherent in renormalizing squark bilinears. Furthermore, the quark and squark propagators are computed in momentum space with nonzero masses.

This work is a feasibility study for the perturbative computations relevant to a number of observables, such as spectra and distribution functions of hadrons, but in the context of supersymmetric QCD, as a forerunner to lattice investigations of SUSY extensions of the Standard Model.

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