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Static quark operators based on Laplacian Eigenmodes

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We investigate a representation of static quark operators based on trial states formed by eigenvector components of the covariant lattice Laplace operator. We test the method for computing the static quark-antiquark potential and compare the results to standard Wilson loop measurements. The runtime of the new method is significantly smaller when computing the static potential not only for on-axis, but also for many off-axis quark-antiquark separations, i.e., when a fine spatial resolution is required, e.g., for string breaking calculations. We further improve the signal by using multiple eigenvector pairs, weighted with Gaussian profile functions of the eigenvalues, providing a basis for a generalized eigenvalue problem (GEVP), as it was recently introduced to improve distillation in meson spectroscopy. The method presented here can be applied to extract other potential functions for all possible excitations of a gluonic string with fixed ends, hybrid or tetra-quark potentials, as well as static-light systems.

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