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Searching for $X(3872)$ using lattice QCD SONG-HAENG LEE, CARLETON DETAR, University of Utah, MILC / FERMILAB COLLABORATION — For decades, many excited charmonium states have been discovered that cannot be explained within the conventional quark model. Among the those mesons, the narrow charmonium-like state $X(3872)$ has been examined using various phenomenological models, however, the question for its constituent still remains open. One of the strong candidates is a $D\bar{D}^*$ molecular state because its mass is within 1 MeV of the $D\bar{D}^*$ threshold, however, such a molecular state cant be directly studied by perturbative QCD in such a low energy regime where the interaction of the colored quarks and gluons is very strong. Numerical simulation with lattice QCD provides a nonperturbative, ab initio method for studying this mysterious meson state. In this talk, I present preliminary simulation results for this charmonium-like states with quantum numbers $J^{\rm PC} = 1^{++}$ in both the isospin 0 and 1 channels. We use interpolating operators including both the conventional excited P-wave charmonium state (χ_{c1}) and the $D\bar{D}^*$ open charm state for the isospin 0 channel, but only $D\bar{D}^*$ for the isospin 1 channel. We extract large negative S-wave scattering length and find an $X(3872)$ candidate 13 ± 6 MeV below the $D\bar{D}^*$ threshold in the isospin 0 channel.

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