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Roper State from Overlap Fermion

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Variational method with valence overlap fermion is employed to calculate the Roper state on the $24^3 \times 64$ domain-wall fermion lattice at a = 0.114 and 330 MeV pion mass. It is found that the results are consistent with those from the sequential empirical Bayes (SEB) method. They are about 300 MeV lower than those with the clover fermion at comparable lattice spacing and pion mass. To understand the difference, we study the would-be $\eta - \pi$ ghost state in the isovector scalar channel with the $\bar{q}q$ interpolation field in the quenched approximation for both the overlap and Wilson fermions to compare their couplings to the two hadron state with the single hadron interpolation field.

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