

Excited Baryon Spectroscopy from Lattice QCD: Finite Size Effect and Hyperfine Mass Splitting

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Abstract: A study of the finite-size effect is carried out for spectra of both ground-state and excited-state baryons in quenched lattice QCD using Wilson fermions. Our simulations are performed at $\beta=6.2$ with three different spatial sizes, La 1.6, 2.2 and 3.2 fm. It is found that the physical lattice size larger than 3 fm is required for delta states in all spin-parity ($J^P = 1/2^\pm, 3/2^\pm$) channels and also negative-parity nucleon state ($J^P = 1/2^-$) even in the rather heavy quark mass region. We also find a peculiar behavior of the finite-size effect on the hyperfine mass splittings between the nucleon and the delta in both parity channels.