Excited Nucleon Spectrum from Lattice QCD with Maximum Entropy Method

M. Asakawa[a], T. Hatsuda[b], K. Sasaki[b] and S. Sasaki[b]

[a] *Physics of Department, Kyoto University*
[b] *Physics of Department, University of Tokyo*

We are interested in a long-standing puzzle regarding the excited state spectra of the nucleon, namely the level order of the positive-parity excited nucleon N' and the negative-parity nucleon N^*. Recent quenched lattice QCD studies show that the wrong ordering between N' and N^* actually happens in the relatively heavy quark mass region [1]. Thus, we address the serious question whether or not the level switching between N' and N^* would occur in the light quark mass region. Finding of this possibility is directly connected to the understanding of the mysterious Roper resonance $N'(1440)$.

In this talk, we present preliminary results of the mass spectrum for the first excited state of the nucleon N' on a $16^3 \times 32$ lattice at $\beta = 6.0$ with the Wilson fermion. We utilize two types of Bayesian approaches, the maximum entropy method [2] and the constrained curve fitting [3], in order to access the excited state spectrum. We carry out our analysis in a systematic way through checking consistency between the two approaches.

References

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