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Parity doubling of baryons in QCD thermodynamics

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Motivated by the recent lattice study by the FASTSUM collaboration [1], thermal masses of the baryon parity-doublers are explored for various pion masses [2]. A general trend of the octet and decuplet parity-doublers is consistent to the results in [1], whereas their hyperon masses are modified to a large extent for the physical pion mass.

We further investigate the fluctuations and correlations involving baryon number in hot hadronic matter with modified masses of negative-parity baryons, in the context of the hadron resonance gas [3]. Confronting the baryon number susceptibility, baryon-charge correlation, and baryon-strangeness correlation and their ratios with the lattice QCD data, we show that the strong downward mass shift in hyperons can accidentally reproduce some correlation ratios, however it also tends to overshoot the individual fluctuations and correlations. This indicates, that in order to correctly account for the influence of the chiral symmetry restoration on the fluctuation observables, a consistent framework of in-medium effects beyond hadron mass shifts is required.

References

- [1] G. Aarts, et al., JHEP 1706, 034 (2017).
- [2] C. Sasaki, Parity doubling of baryons in a chiral approach with three flavors," arXiv:1707.05081 [hep-ph].
- [3] K. Morita, C. Sasaki, P. M. Lo and K. Redlich, Overlap between Lattice QCD and HRG with in-medium effects and parity doubling," arXiv:1711.10779 [hep-ph].

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