Tackling the infamous g^6 term of the QCD pressure

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Abstract

The determination of the hot QCD pressure has a long history, and has – due to its phenomenological relevance in cosmology, astrophysics and heavy-ion collisions — spawned a number of important theoretical advances in perturbative thermal field theory applicable to equilibrium thermodynamics.

In particular, the long-standing infrared problem that obstructs the perturbative series has been overcome by a systematic use of dimensionally reduced effective theories, essentially mapping the problem of determining a full physical leading-order determination of the pressure to an extremely tough, but in principle doable, four-loop perturbative calculation in finite-temperature Yang-Mills theory.

We present advances in organizing this challenging calculation [1], by classifying and filtering the distinct contributions, and push ahead systematic simplifications of the remaining core sum-integral structures taking into account systems of linear relations that originate from symmetry- as well as integration-by-parts- relations. This will eventually allow us to gauge the grade of difficulty of a full determination of the physical leading-order QCD pressure, by analytic means.

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References

[1] P. Navarrete and Y.Schröder, PoS (LL2022) 014 [arXiv:2207.10151].