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Tackling the infamous g^6 term of the QCD pressure

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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, by classifying the distinct contributions, filtering out a large fraction of sub-diagrams that exhibit a factorized structure, 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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