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N=4 supersymmetric Yang-Mills thermodynamics from effective field theory

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The free energy density of N=4 supersymmetric Yang-Mills theory in four space-time dimensions is derived through second order in the 't Hooft coupling λ at finite temperature using effective-field theory methods. The contributions to the free energy density at this order come from the hard scale T and the soft scale $\lambda\sqrt{T}$. The effects of the scale T are encoded in the coefficients of an effective three-dimensional field theory that is obtained by dimensional reduction at finite temperature. The effects of the electric scale $\lambda\sqrt{T}$ are taken into account by perturbative calculations in the effective theory.

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