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Resummation of the soft and hard logarithms in Cold and Dense QCD

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We will discuss the recent developments in perturbative QCD at zero temperature and high barionic densities notably how can we effectively resum the so-called soft, hybrid, and hard leading logarithms. We pave the way to the resummation of the next-to-leading logarithms by identifying the anomalous dimensions of the mixed sector in QCD.

By identifying the massive renormalization group (RG) properties within the hard thermal loop (HTL) formalism, we resum to all orders $\alpha_{S,p \geq 3}$ the leading and next-to-leading logarithmic soft mode contributions to the cold and dense QCD pressure at high baryon chemical potential μ_B .

We obtain noticeably reduced residual scale dependence with respect to the state-of-the-art results. Extension to the resummation of the so-called hybrid logarithms and hard logarithms is discussed. We finish by paving the way to the evaluation of the anomalous dimensions of the mixed sector, required for the full resummation of the next-to-leading logarithms in QCD.

Mostly based on L. Fernandez and J.-L. Kneur, arXiv:2109.02410 and more recent work in progress with Risto Paatelainen, Saga Säppi, Kaapo Seppänen and Aleksu Vuorinen.

Primary author: FERNANDEZ, Loic (Helsinki Institute of Physics, University of Helsinki)

Presenter: FERNANDEZ, Loic (Helsinki Institute of Physics, University of Helsinki)

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