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# Does pQCD constrain the neutron star equation?

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Knowing the QCD phase diagram is one of the biggest physics challenges we have nowadays.
Neutron stars are true laboratories that test extreme conditions, essential to determine the QCD phase diagram.
In their core, the density can reach $n_B \approx 3{-}8n_s$ (where $n_s = 0.16fm^{-3}$ is the saturation density), a range of densities where QCD is unknown.
Ab-initio calculations determine the EoS for densities $n_B > 40n_s$, where perturbative QCD (pQCD) is valid, and for $n_B < 1.1n_s$, where the EoS is determined using chiral effective field theory (cEFT).
Is it possible to restrict the region of $1.1n_s < n_B < 40n_s$ using the information we have about pQCD and cEFT?
In DOI: 10.1103/physrevlett.128.202701, Komoltsev & Kurkela restrict the unknown region of the QCD phase diagram using thermodynamic relations and the pQCD and cEFT EoS together with i) the causality condition; ii) the thermodynamic relation $n = dP/d\mu$.
We review this work and we apply the constraints to a Relativistic Mean Field (RMF) model.

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