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Canonical partition functions, virial expansion and the critical point(s) of QCD

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We study the interplay of the fugacity expansion for the Grand Canonical Partition Function, and the Taylor and virial expansion for the number density. We compare results from the Vladivostok group lattice QCD study [1], and from a toy model of QCD with the predictions of a Cluster Model Expansion. We outline different strategies for the search of singularities in the complex chemical potential plane, including a possible QCD critical point for real chemical potential.

[1] V.G.Bornnyakov, D.L.Boyda, V.A.Goy, A.V.Molochkov, A.Nakamura, A.A.Nikolaev and V.I.Zakharov, Phys.Rev.D95(2017)9,094506

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