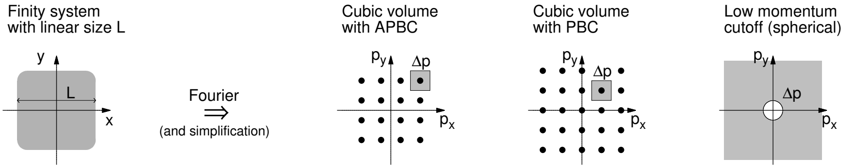
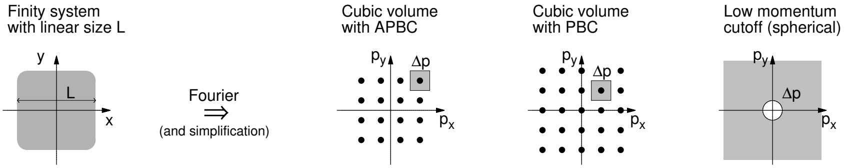


Problem: still critical behavior in mean-field models



Problem: still critical behavior in mean-field models

Keep integration

$$\mathcal{Z} = \int \mathcal{D}\phi e^{-\beta\mathcal{U}(\phi)} \xrightarrow{singlemode} \int_{-\infty}^{\infty} d\phi e^{-\beta\mathcal{U}(\phi)} \tag{1}$$

Then

$$\langle\phi\rangle = \frac{1}{\mathcal{Z}} \int_{-\infty}^{\infty} d\phi \, \phi \, e^{-\beta\mathcal{U}(\phi)} \tag{2}$$

Potential to be used: $\sim \quad N_f = 1$ quark-meson model $\Rightarrow \mathcal{U}(T, \mu, h)$

Note: T, μ, h have to be related to Ising variables. Every $\chi_k^{T,\mu,h}$ scales as external field.

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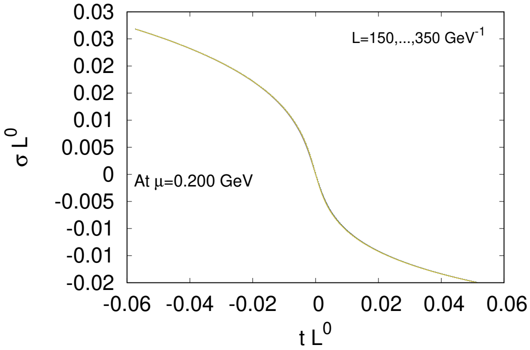
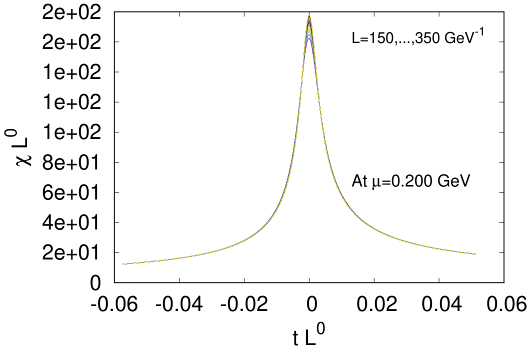
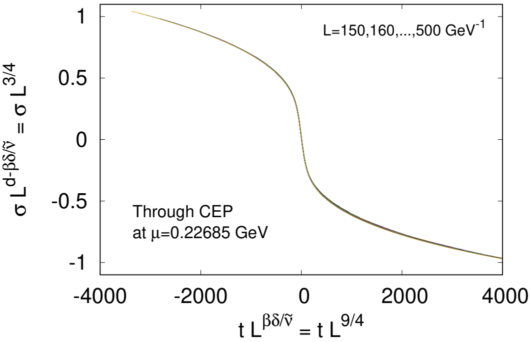
CROSSOVER: NO SCALING

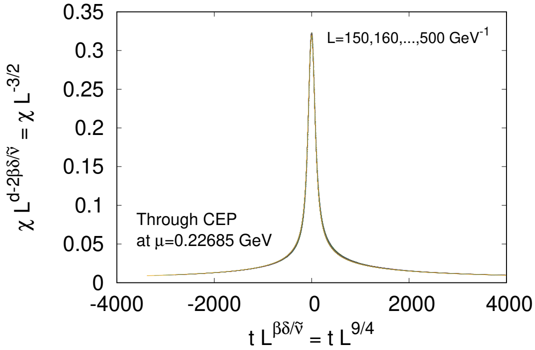
Expectation: $\sigma(tL^0) \propto L^0$, $\chi(tL^0) \propto L^0$



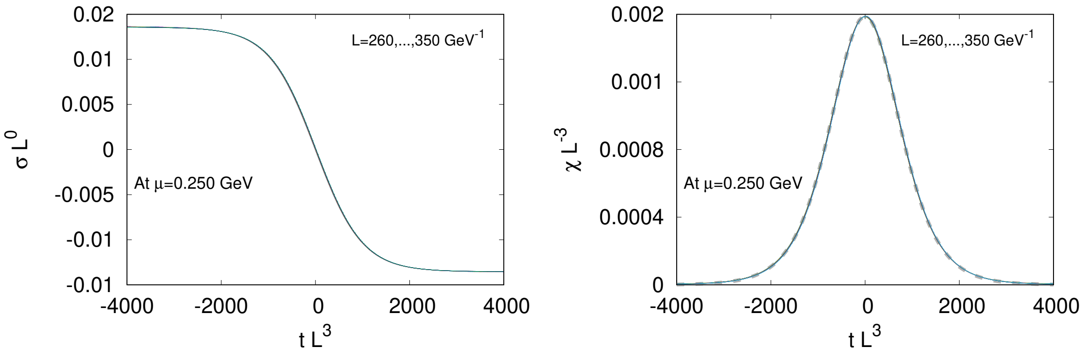


Expectation: $\sigma(tL^{\beta\delta/\tilde{\nu}}) \propto L^{\beta\delta/\tilde{\nu}-d}$, $\chi(tL^{\beta\delta/\tilde{\nu}}) \propto L^{2\beta\delta/\tilde{\nu}-d}$ (hyperscaling violation!)



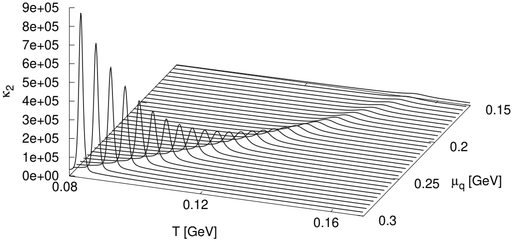


Expectation: $\sigma(tL^3) \propto L^0$, $\chi(tL^3) \propto L^3$ (coexistence)

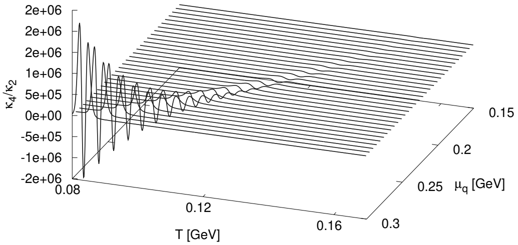


No extremum along the transition line

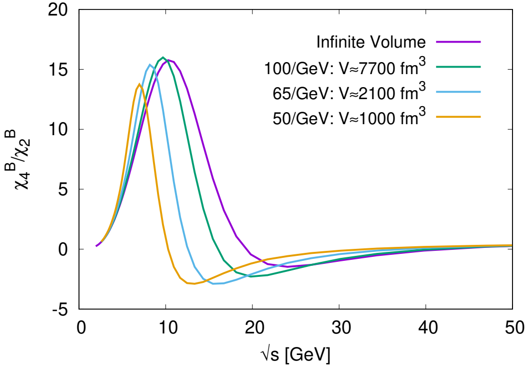
κ_2

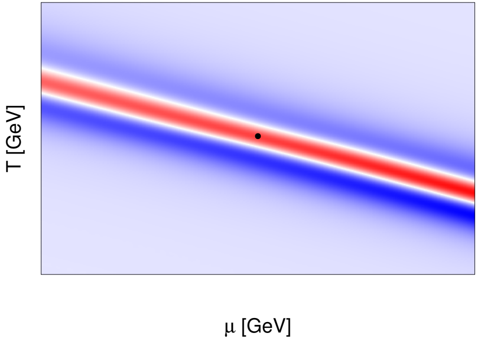


κ_4/κ_2



Dip peak structure of χ_4/χ_2 due to freeze-out–phase transition separation





n

Double Gaussian probability distribution

$$\begin{aligned} P_{DG}(\phi) = & \frac{A}{(2\pi \mathrm{T})^{1/2}} \Big[e^{(\eta\, \sigma_a + \frac{1}{2}\eta^2 \chi_a)\frac{L^d}{\mathrm{T}}} e^{-\frac{(\phi-\sigma_a-\eta\chi_a)^2}{2\chi_a}\frac{L^d}{\mathrm{T}}} \\ & + e^{(\eta\, \sigma_b + \frac{1}{2}\eta^2 \chi_b)\frac{L^d}{\mathrm{T}}} e^{-\frac{(\phi-\sigma_b-\eta\chi_b)^2}{2\chi_b}\frac{L^d}{\mathrm{T}}} \Big] \end{aligned} \tag{3}$$

with proper normalization, that gives

$$\begin{aligned} \langle\phi\rangle_{DG} = & \lambda_a U_a + \lambda_b U_b \,, \\ \chi_{DG} = & \chi_a U_a + \chi_b U_b + \frac{L^d}{\mathrm{T}}(\lambda_b - \lambda_a)^2 U_a U_b \,. \end{aligned} \tag{4}$$

Fluctuation between minima/phases.