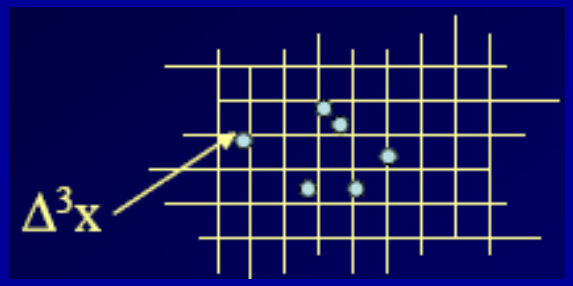
Transport theory

$$p^\mu \partial_\mu f(x,p) = C_{22}$$

We consider two body collisions

$$\mathcal{C}_{22} = \frac{1}{2E_1}\int \frac{d^3p_2}{(2\pi)^3 2E_2}\frac{1}{\nu}\int \frac{d^3p_1'}{(2\pi)^3 2E_1'}\frac{d^3p_2'}{(2\pi)^3 2E_2'} f_1' f_2' |\mathcal{M}_{1'2'\to 12}|^2 (2\pi)^4 \delta^{(4)}(p_1' + p_2' - p_1 - p_2)$$
$$- \frac{1}{2E_1}\int \frac{d^3p_2}{(2\pi)^3 2E_2}\frac{1}{\nu}\int \frac{d^3p_1'}{(2\pi)^3 2E_1'}\frac{d^3p_2'}{(2\pi)^3 2E_2'} f_1 f_2 |\mathcal{M}_{12\to 1'2'}|^2 (2\pi)^4 \delta^{(4)}(p_1 + p_2 - p_1' - p_2')$$



$$\Delta t \to 0$$

$$\Delta^3 x \to 0$$

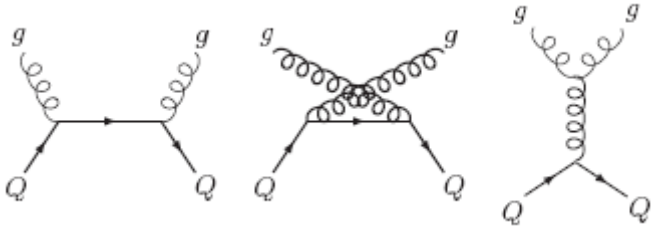
→ **Exact solution**

Collision integral is solved with a local stochastic sampling

$$P_{22} = \frac{\Delta N_{\text{coll}}^{2\to 2}}{\Delta N_1 \Delta N_2} = v_{\text{rel}} \sigma_{22} \frac{\Delta t}{\Delta^3 x}$$

[V. Greco et al PLB670, 325 (08)]
[Z. Xhu, et al. PRC71(04)]

Cross Section gc -> gc



The infrared singularity is regularized introducing a **Debye-screaning-mass μ_D**

$$\sum|\mathcal{M}|^2 = \pi^2\alpha^2(Q^2)\left[\frac{32(s-M^2)(M^2-u)}{t^2} + \frac{64}{9}\frac{(s-M^2)(M^2-u)+2M^2(s+M^2)}{(s-M^2)^2}\right.$$

$$+\frac{64}{9}\frac{(s-M^2)(M^2-u)+2M^2(M^2+u)}{(M^2-u)^2} + \frac{16}{9}\frac{M^2(4M^2-t)}{(s-M^2)(M^2-u)}$$

$$\left.+16\frac{(s-M^2)(M^2-u)+M^2(s-u)}{t(s-M^2)} - 16\frac{(s-M^2)(M^2-u)-M^2(s-u)}{t(M^2-u)}\right].$$

$$\frac{1}{t} \rightarrow \frac{1}{t-m_D}$$

$$m_D = \sqrt{4\pi\alpha_s}T$$

[B. L. Combridge, Nucl. Phys. B151, 429 (1979)]
[B. Svetitsky, Phys. Rev. D 37, 2484 (1988)]

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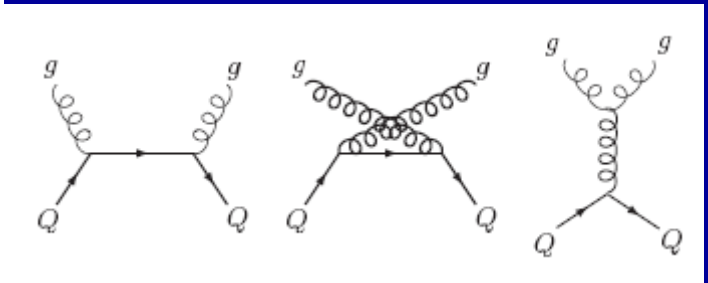

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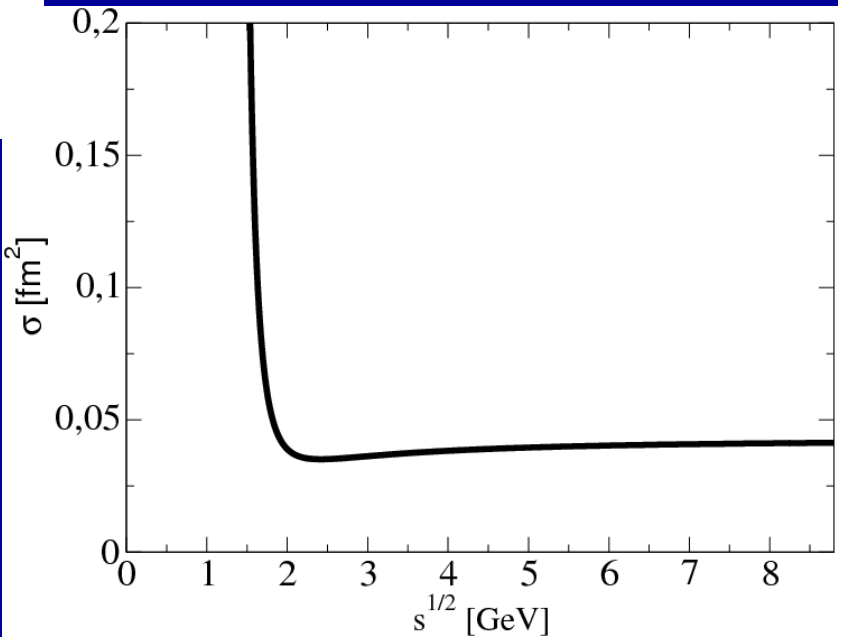
$$\hat{\sigma} = \frac{1}{16\pi(s-M^2)^2}\int_{-(s-M^2)^2/s}^{0} dt \sum |\mathcal{M}|^2$$



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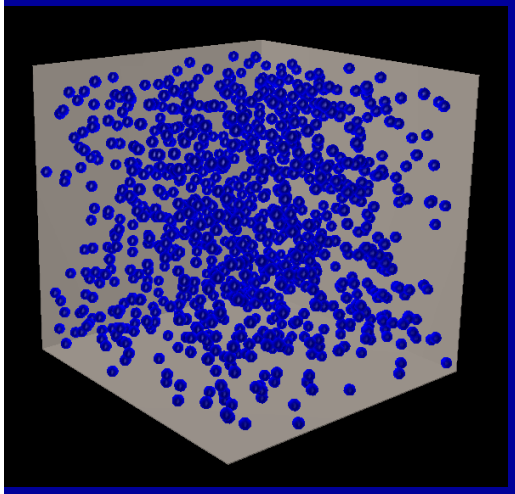
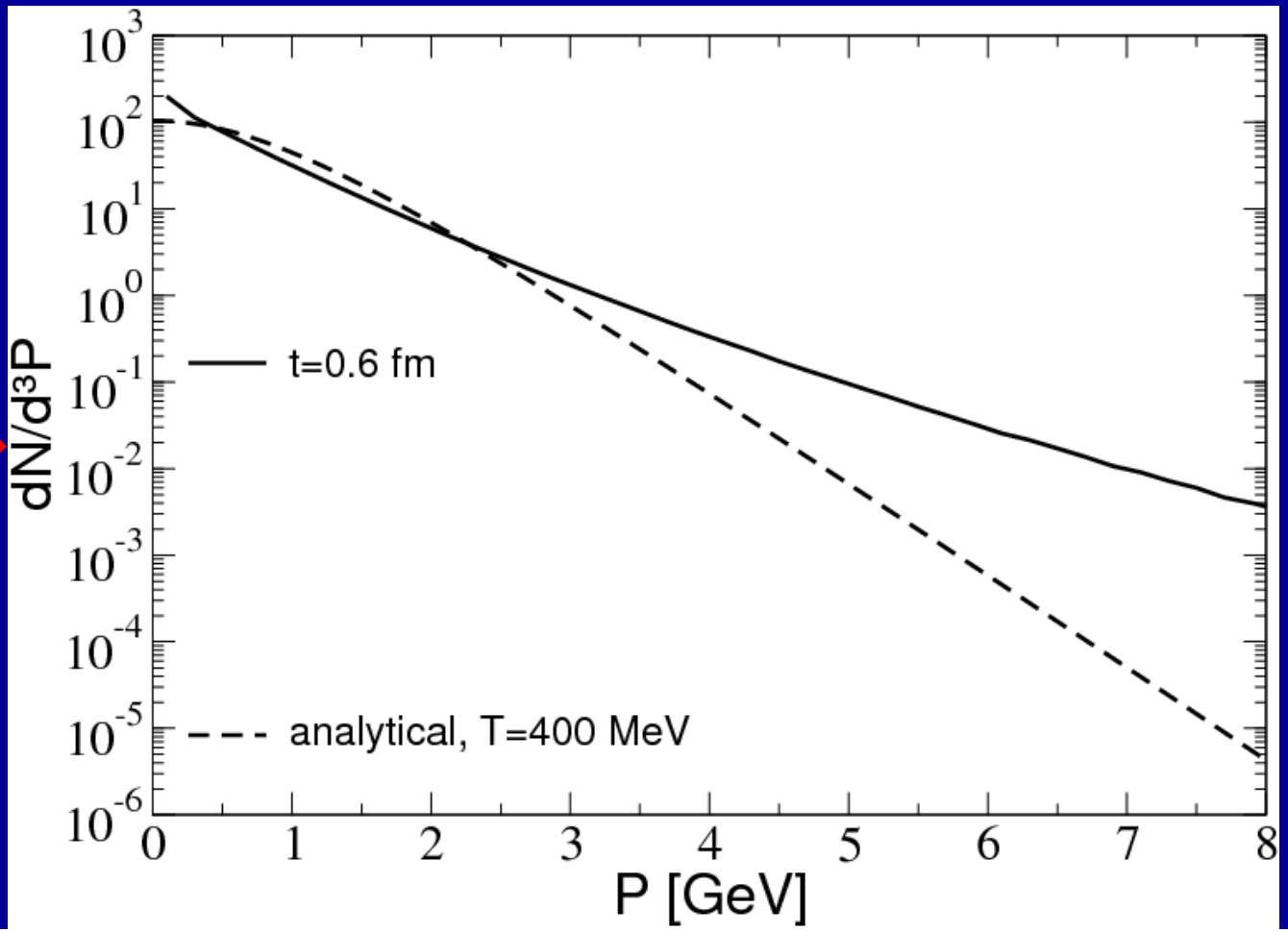
Charm evolution in a static medium



Simulations in which a particle ensemble in a **box** evolves dynamically

Bulk composed only by **gluons** in **thermal equilibrium** at **T=400 MeV**

c and $\overline{\mathbf{c}}$ initially are distributed: **uniformily in r-space**, while in **p-space**



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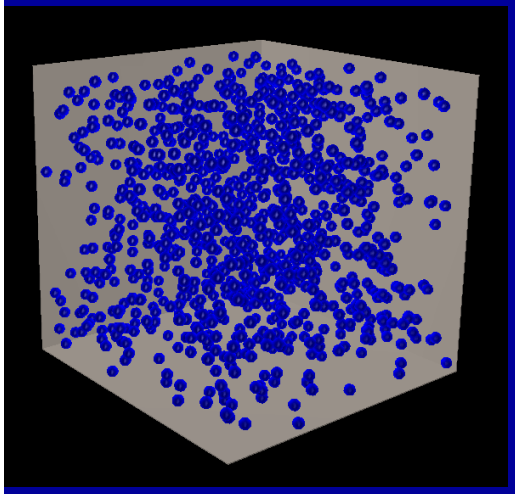

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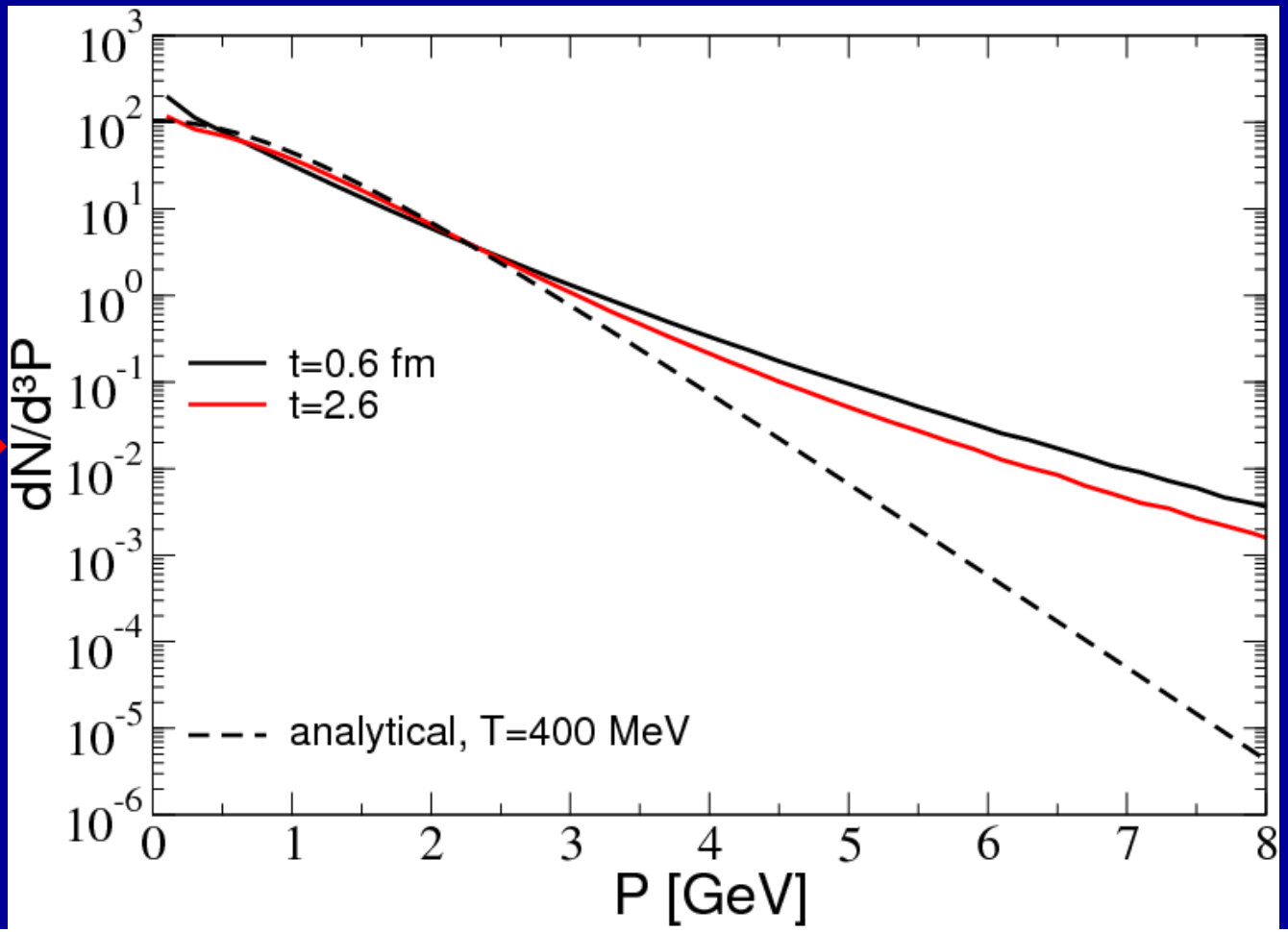

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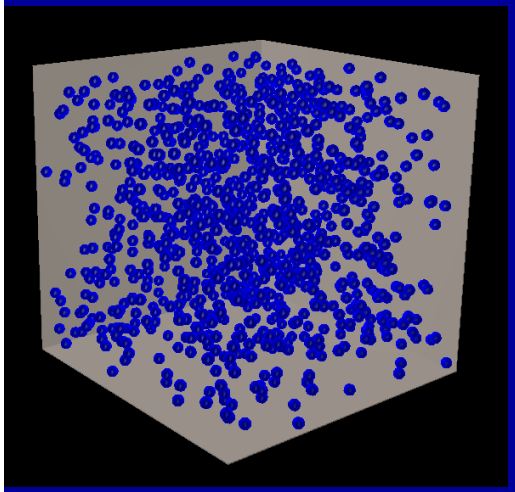

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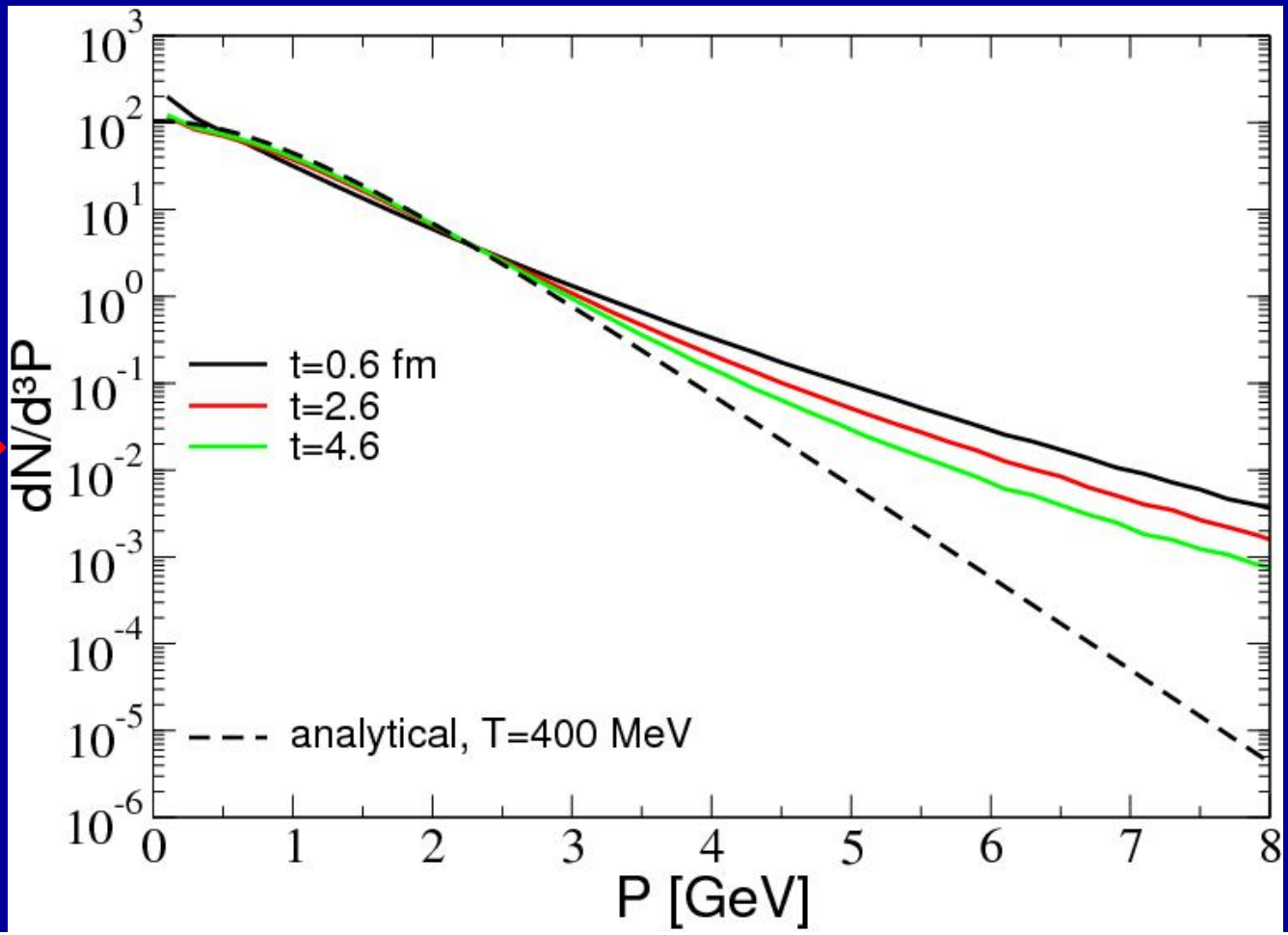

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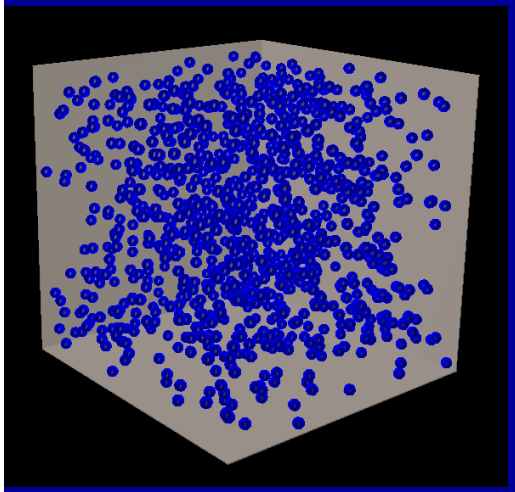

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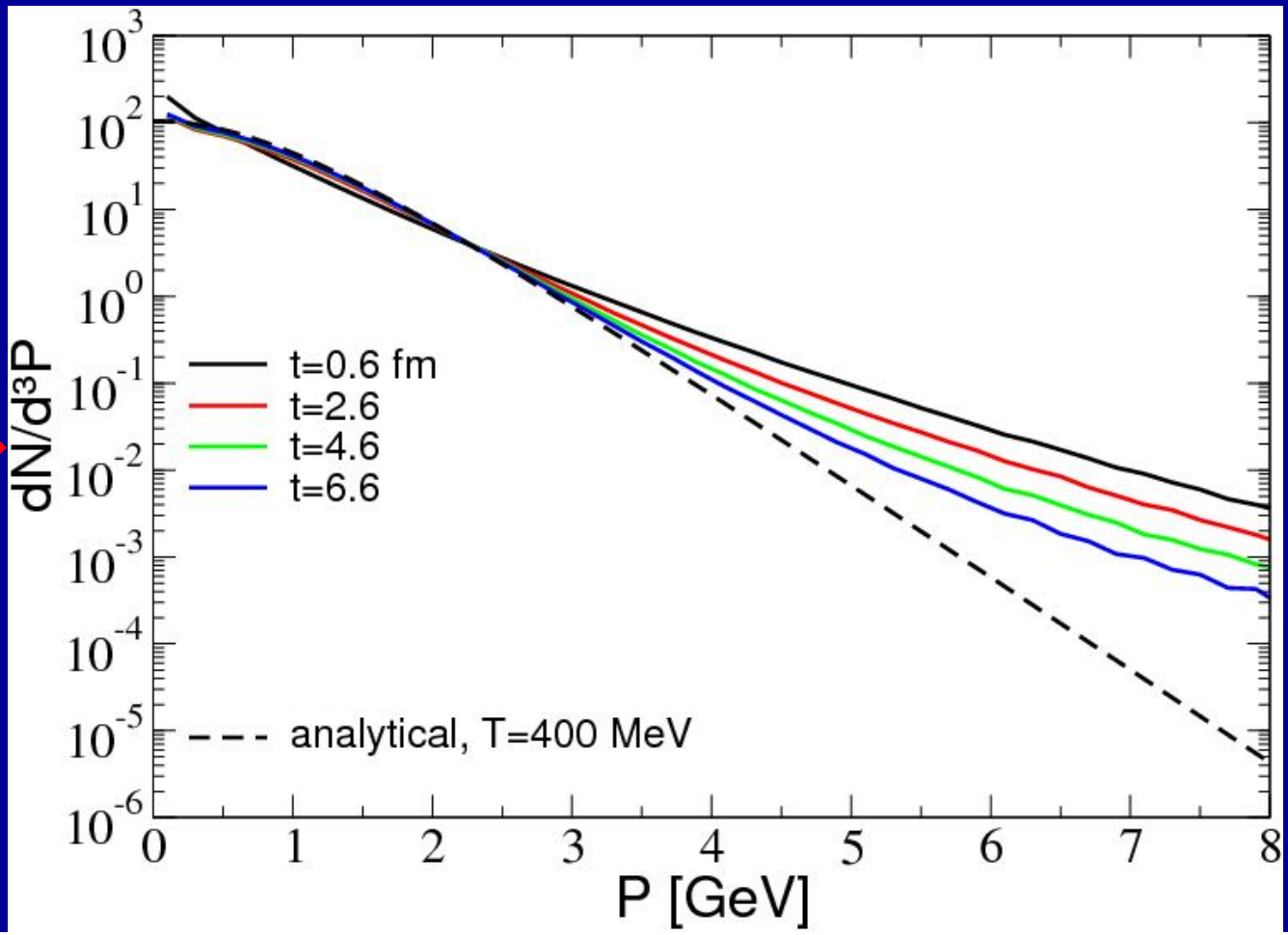

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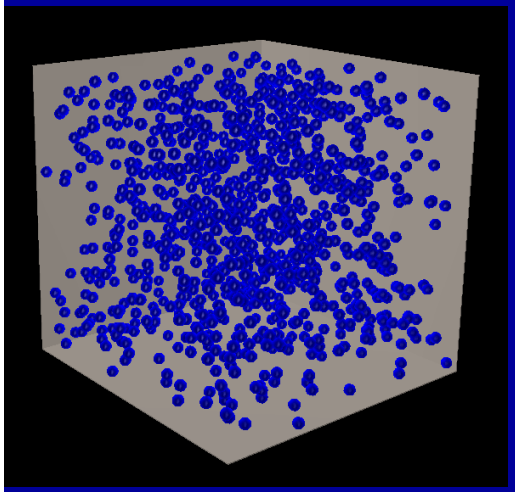

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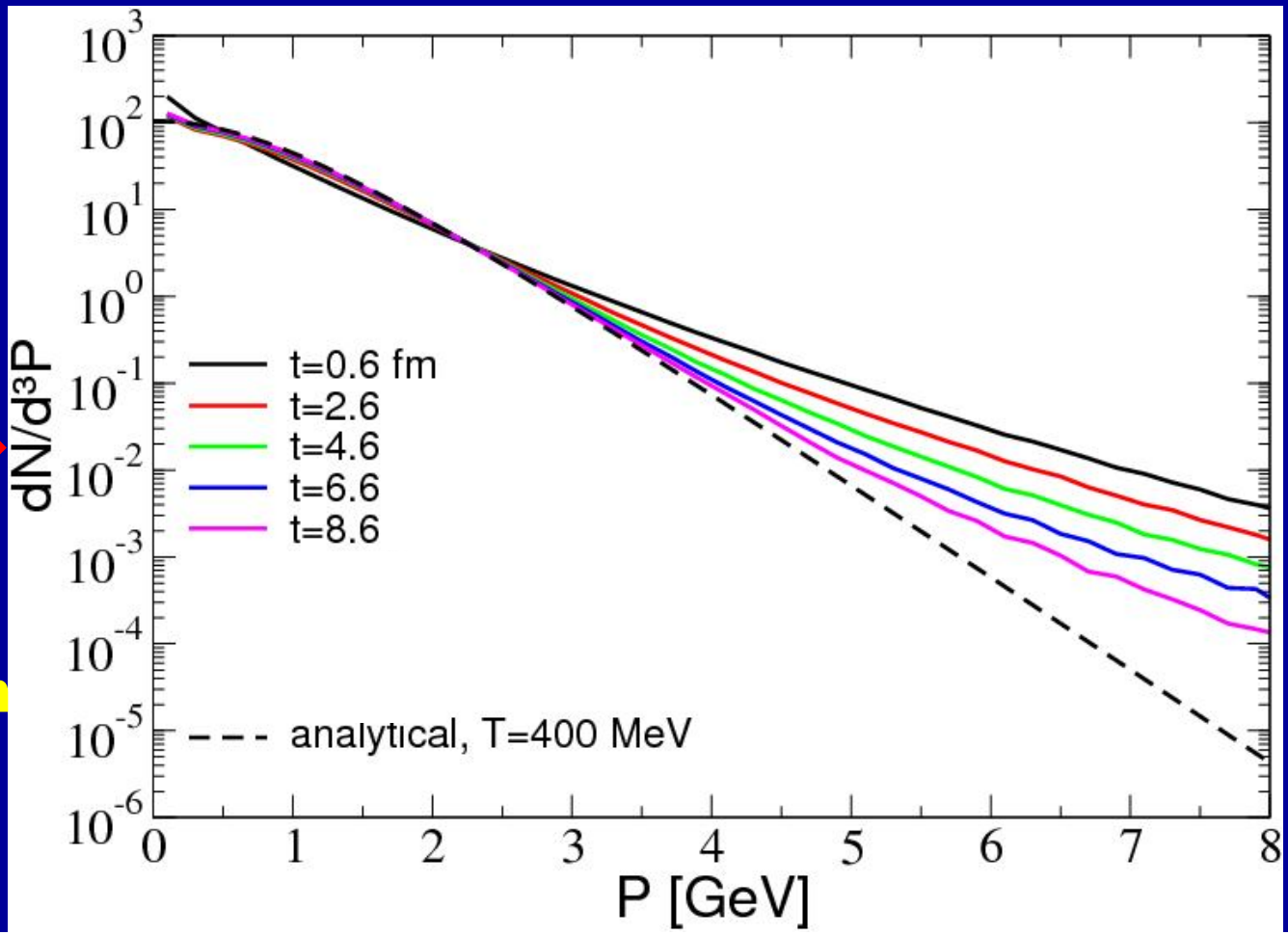

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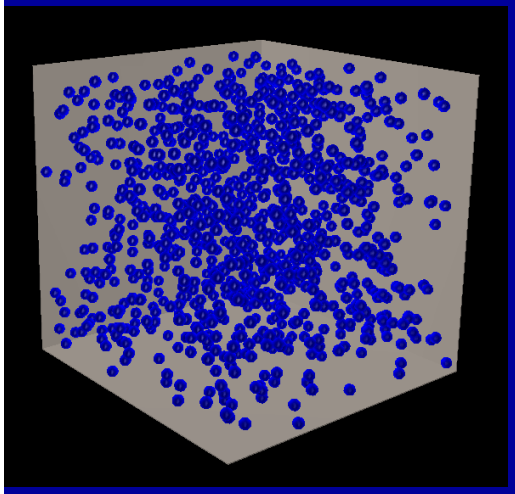

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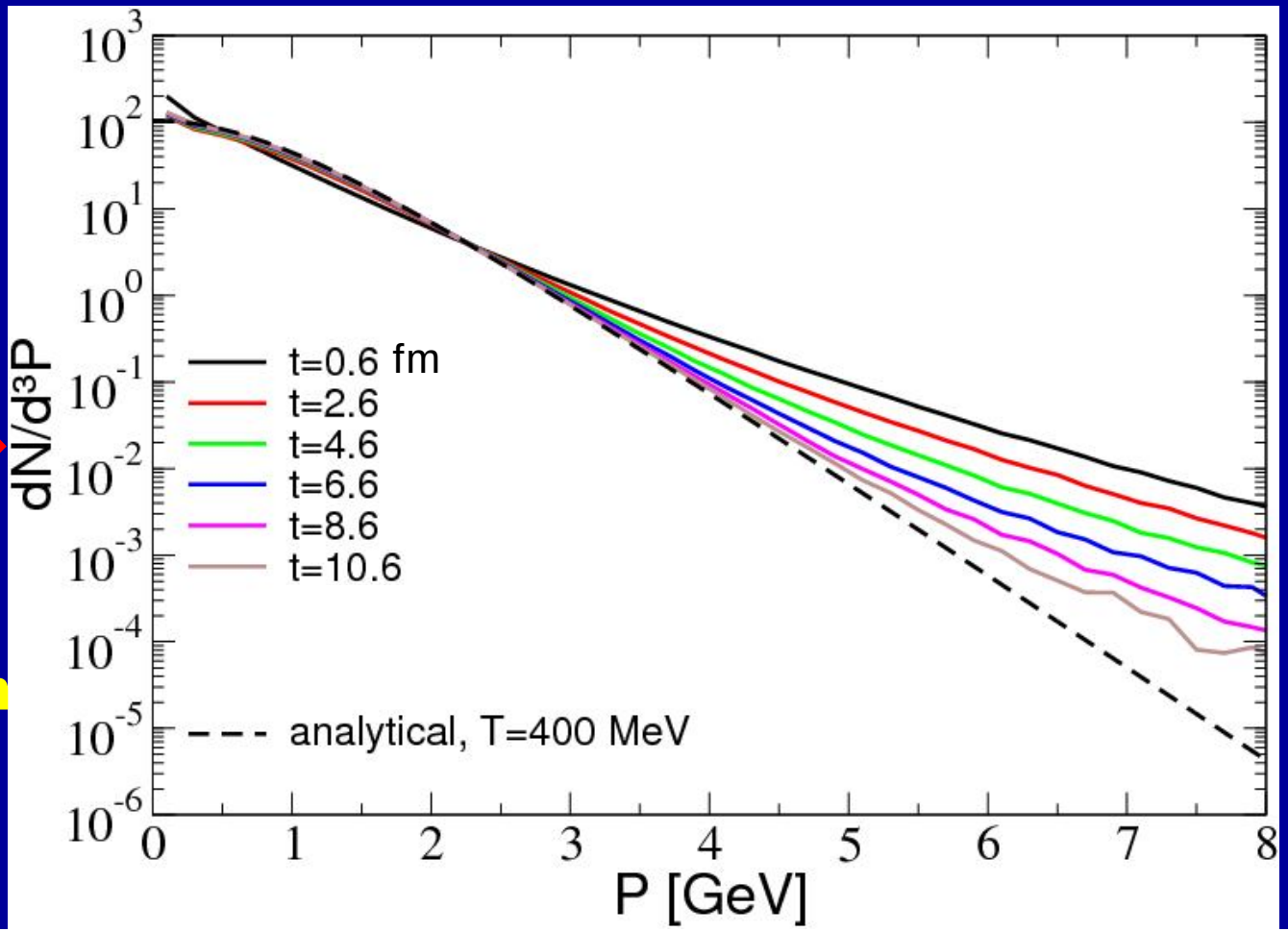

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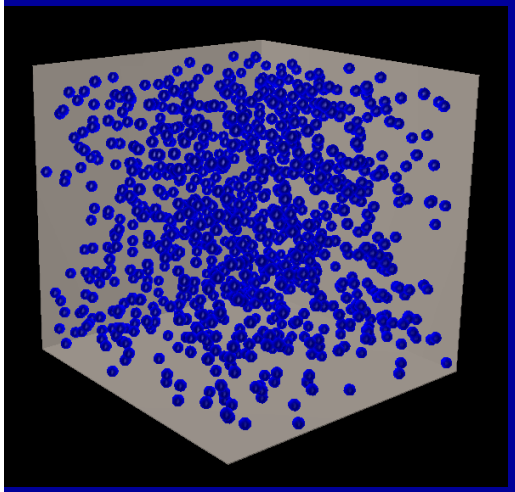

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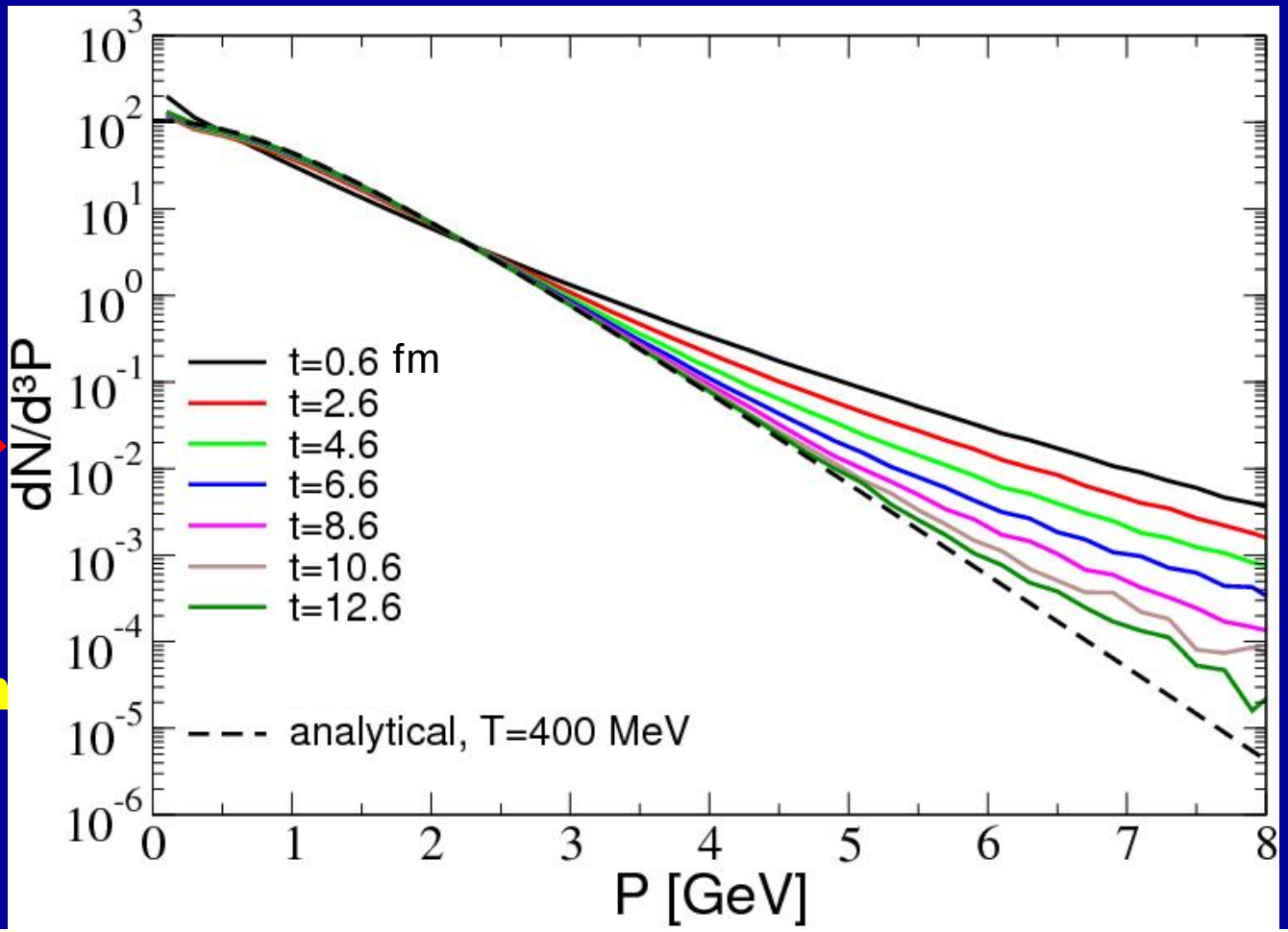

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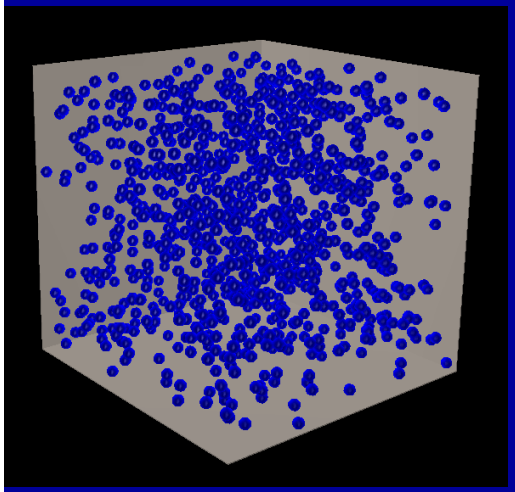

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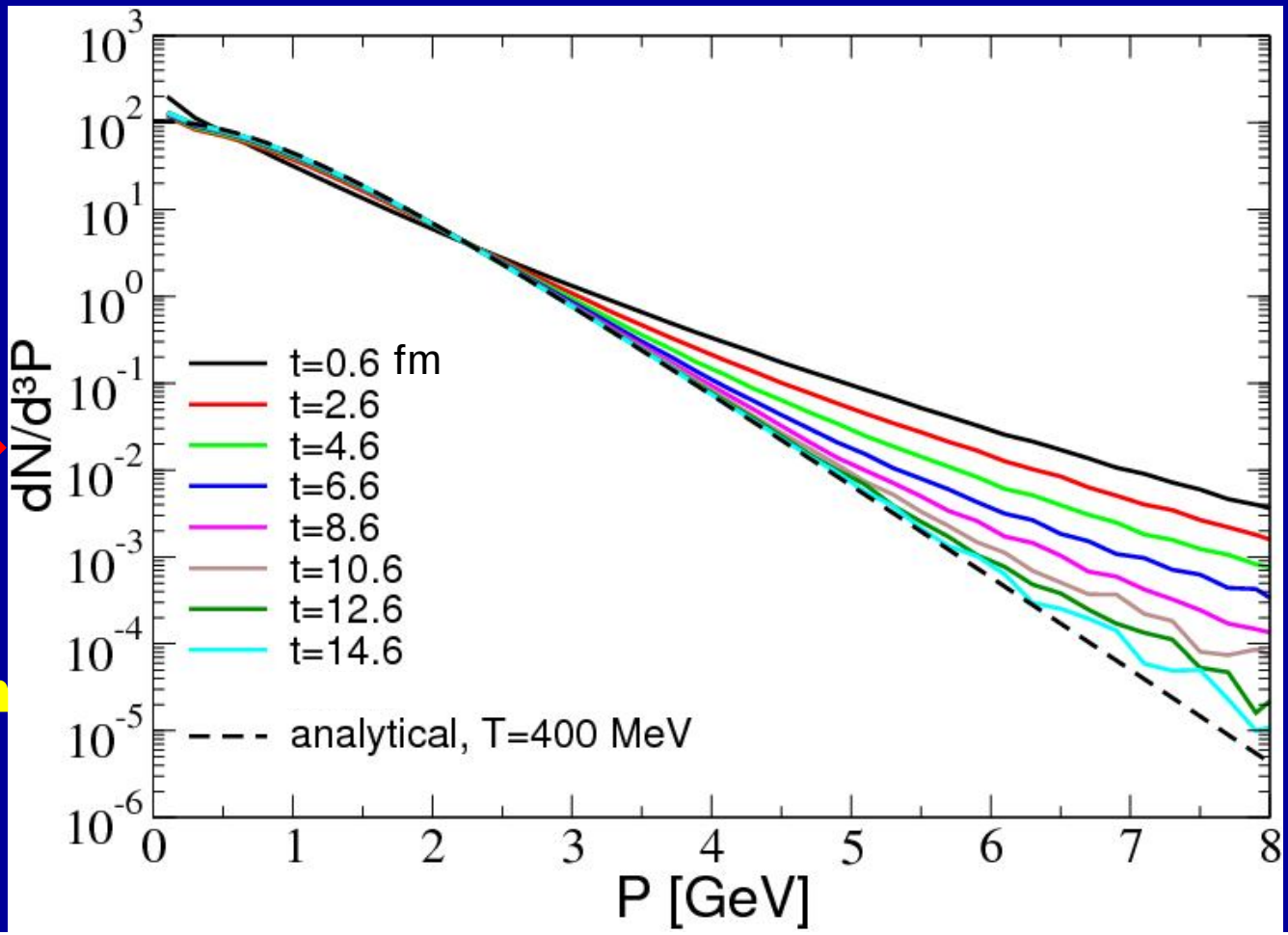

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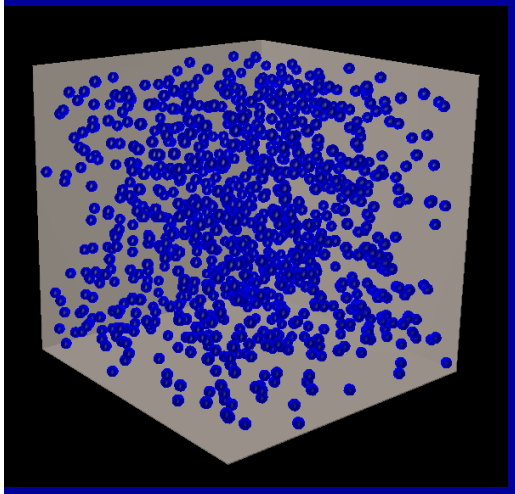

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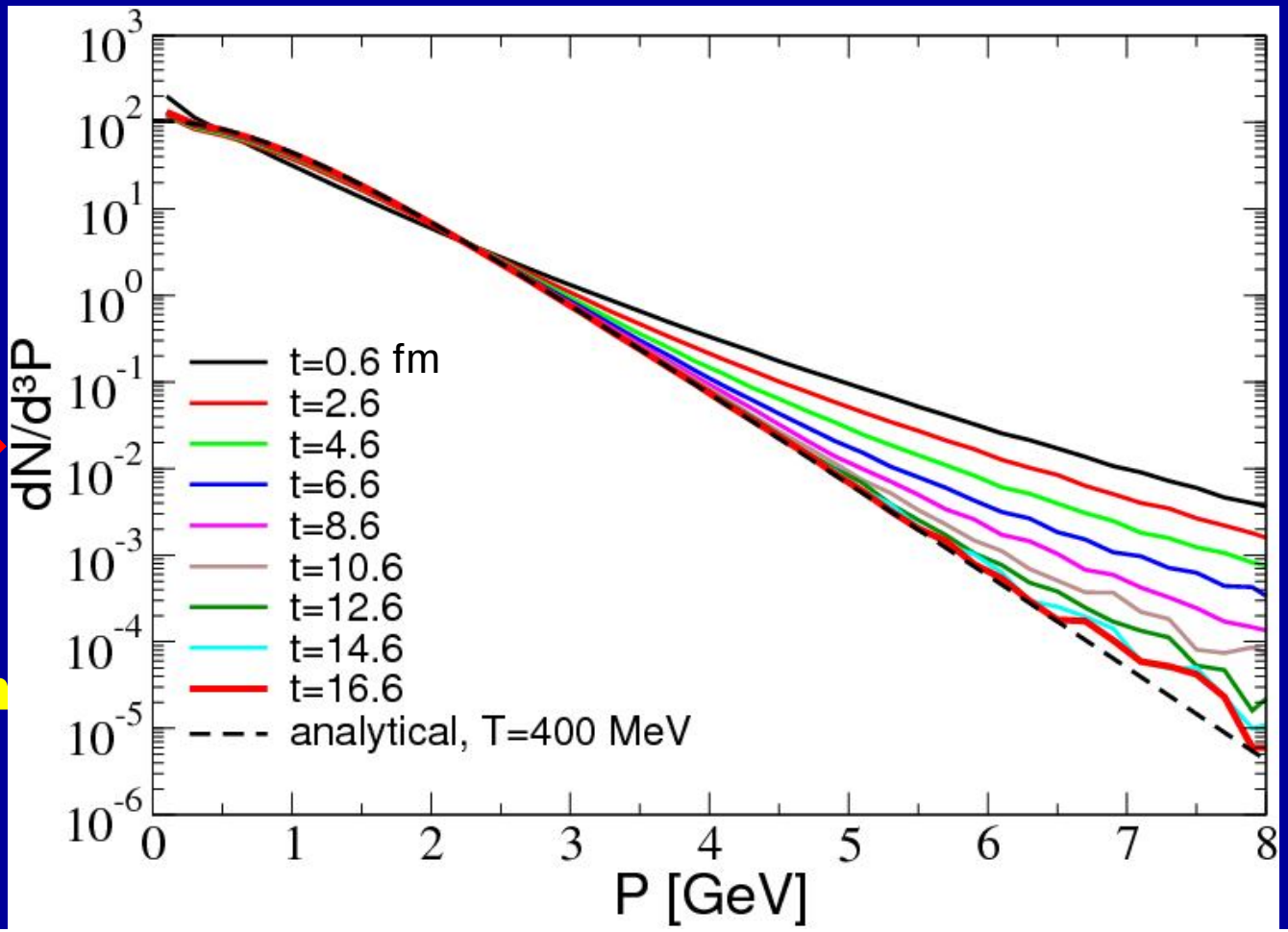
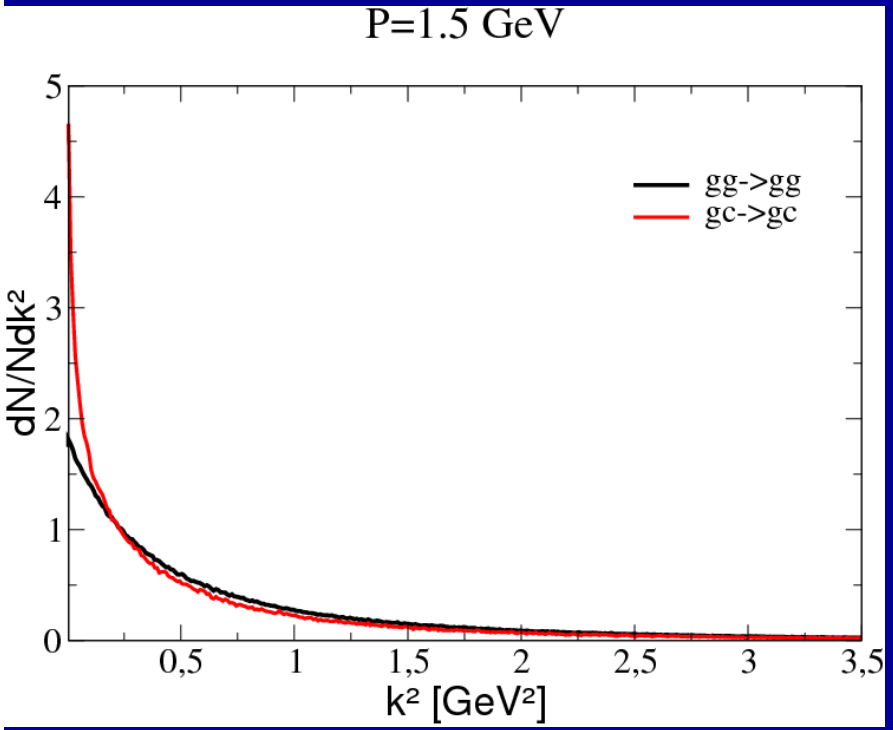
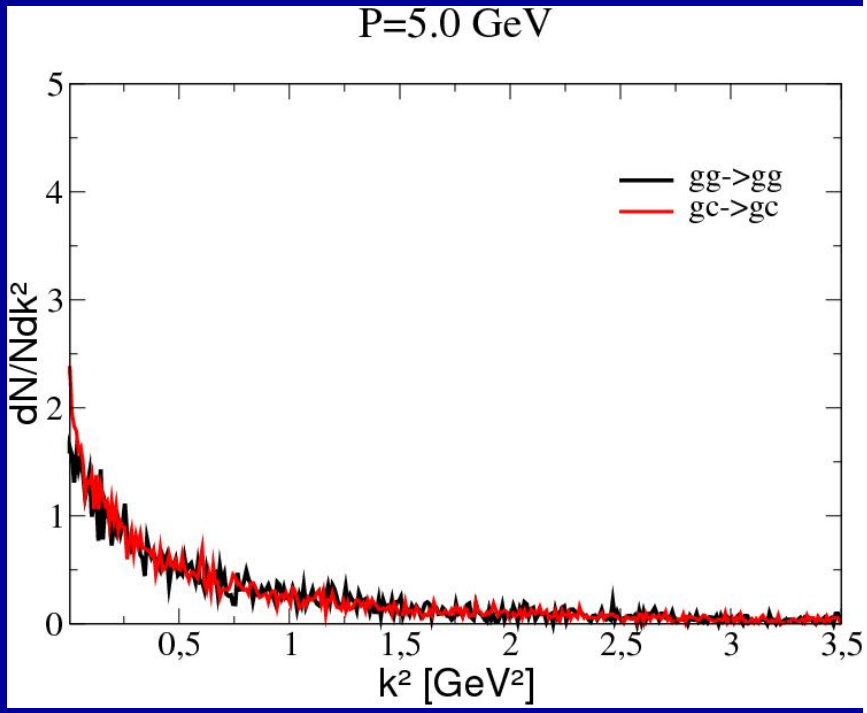


Momentum transfer

Distribution of the squared momenta transfer k^2 for fixed momentum P of the charm





The momenta transfer of gg->gg and gc-> gc are not so different