Inclusive jet cross section at small R

$$\frac{d\sigma}{dp_T} = \int_0^1 \frac{dz}{z}\frac{d\hat{\sigma}}{dq_T}\left(\frac{p_T}{z},\mu\right)\mathcal{J}(z,\mu,\mu_J), \quad \mu \sim p_T, \quad \mu_J \sim p_T R \tag{1}$$

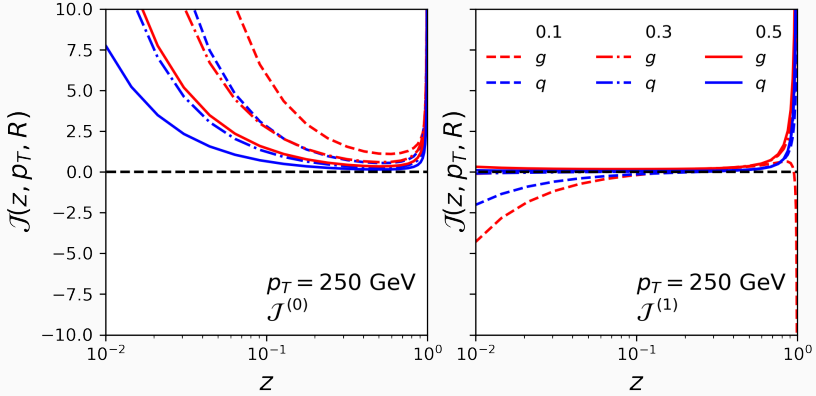
$$\hat{\sigma} = \hat{\sigma}^{(0)} + \hat{\sigma}^{(1)} + \cdots, \quad \mathcal{J} = \mathcal{J}^{(0)} + \mathcal{J}^{(1)} + \cdots \tag{2}$$

Aim to achieve NLO accuracy of hard partonic cross-section $\hat{\sigma}$, and Leading-log (LL) accuracy of the evolved jet function $\mathcal{J}$ in vacuum and medium.

$$\sigma = \underbrace{\hat{\sigma}^{(0)} \otimes \mathcal{J}^{(0)}}_{LO+LL} + \underbrace{\left(\hat{\sigma}^{(0)} \otimes \mathcal{J}^{(1)} + \hat{\sigma}^{(1)} \otimes \mathcal{J}^{(0)}\right)}_{NLO+LL} + \cdots \tag{3}$$

- I have $\mathcal{J}^{(0)}, \mathcal{J}^{(1)}$ in vacuum, and $\sigma^{(0)}$. Missing $\hat{\sigma}^{(1)}$, just get a code, hope it work.
- (N)LO+LL: $\hat{\sigma}^{(0)} \otimes \mathcal{J}^{(0)} + \hat{\sigma}^{(0)} \otimes \mathcal{J}^{(1)}$.
- "NLO"+LL: $\hat{\sigma}^{(0)} \otimes \mathcal{J}^{(0)} + \left(\hat{\sigma}^{(0)} \otimes \mathcal{J}^{(1)} + \text{“}\hat{\sigma}^{(1)}\text{”} \otimes \mathcal{J}^{(0)}\right)$, assuming $\text{“}\hat{\sigma}^{(1)}\text{”} = K_{\mathrm{NLO}}\hat{\sigma}^{(0)}$

The vacuum jet function

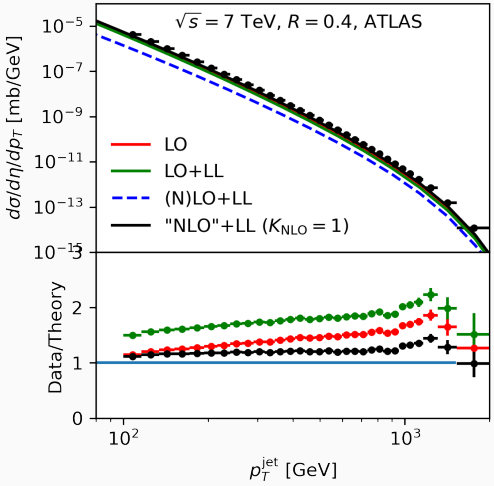


- $\mathcal{J}^{(0)}$ agree with Zhong-Bo Kang, Felix Ringer and Ivan Vitev 1606.06732.
- $\mathcal{J}^{(1)}$ qualitatively similar, but quantiatively different form 1606.06732. I suspect it to be the number of active flavor N_f one assumes.

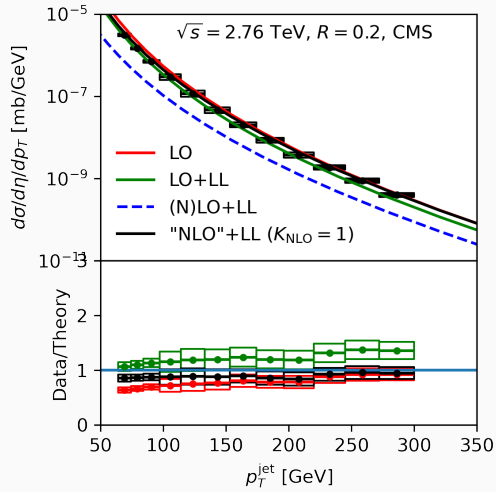
Numerical check of inclusive jet cross section

All calculations assumes a $K_{\mathrm{NLO}} = 1$.

ATLAS, 7 TeV, $pp \to j(R = 0.4)$ 1410.8857



CMS, 2.76 TeV, $pp \to j(R = 0.2)$ 1609.05383.

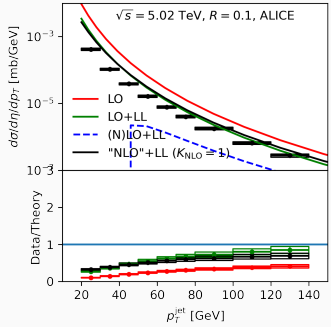


Numerical check of inclusive jet cross section

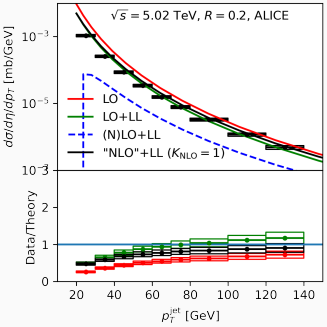
All calculations assumes a $K_{\mathrm{NLO}} = 1$.

ALICE, 5 TeV, 1909.09718

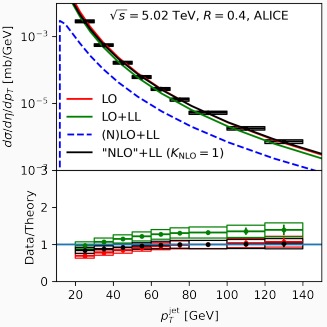
$pp \to j(R = 0.1)$



$pp \to j(R = 0.2)$



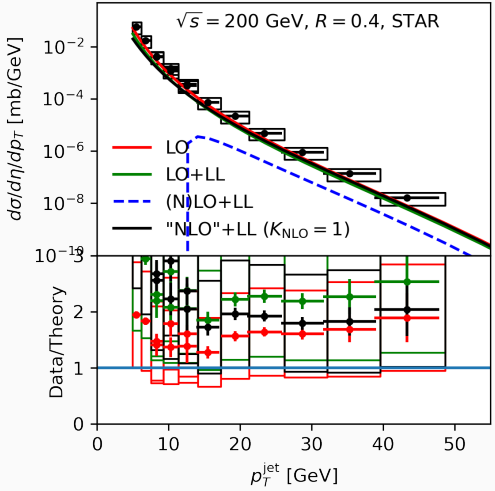
$pp \to j(R = 0.4)$



Numerical check of inclusive jet cross section

All calculations assumes a $K_{\mathrm{NLO}} = 1$.

STAR, 0.2 TeV, $pp \to j(R = 0.4)$
hep-ex/0608030



To do:

- Compute $\hat{\sigma}^{(1)}$ to perform consistent NLO+LL calculaton.
- In medium evolution of jet function. at least at leading order $\mathcal{J}^{(0)} + \Delta\mathcal{J}^{(0)}$.
- Heavy flavor tagging.