

Update:
impact studies for EIC
unpolarized TMDs and TMD evolution

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Data

Repository: https://github.com/VladimirovAlexey/EIC_YR_TMD

Data by Ralf: /Data4 different PID/acceptance cases

Usual TMD cut: $p_T < 0.25zQ$, $Q > 2$ (and $z > 0.05$ for technical reasons)

	#points	#points after cut
(5×41)	$\sim 11 \cdot 10^3$	$\sim 3 \cdot 10^3$
(5×100)	$\sim 15 \cdot 10^3$	$\sim 4 \cdot 10^3$
(10×100)	$\sim 17 \cdot 10^3$	$\sim 5 \cdot 10^3$
(18×100)	$\sim 18 \cdot 10^3$	$\sim 5 \cdot 10^3$
(18×285)	$\sim 19 \cdot 10^3$	$\sim 6 \cdot 10^3$
		$\sim (20. - 25.) \cdot 10^3$ $\times \{\pi^\pm, K^\pm\}$

► (compare to global analysis) ~ 550 (SIDIS points)



Main questions:

- ▶ Which region of kinematic space is important?
- ▶ Which detector cases are preferable?

Correlation coefficient

$$\rho[f, O] = \frac{\langle O_{\text{th}} f \rangle - \langle O_{\text{th}} \rangle \langle f \rangle}{\delta O_{\text{th}} \delta f} \quad (1)$$

O = observable (cross-section)

f = study function

(completely insensitive) = $0 < |\rho| < 1$ = (utterly sensitive)

Sensitivity coefficient

$$S[f, O] = \frac{\langle O_{\text{th}} f \rangle - \langle O_{\text{th}} \rangle \langle f \rangle}{\delta O_{\text{exp}} \delta f} \quad (2)$$

(no impact) = $0 < |S| \rightarrow (>1)$ large impact

Reminder

SIDIS cross-section in TMD factorization

$$d\sigma = \sigma_0 \int d^2b e^{iq_T b} \left(\frac{Q^2}{\zeta_Q(b)} \right)^{-\mathcal{D}(b,Q)} \sum_q e_q^2 F_q(x,b) D_q(x,b) \quad (3)$$

3 non-perturbative function

All correlated

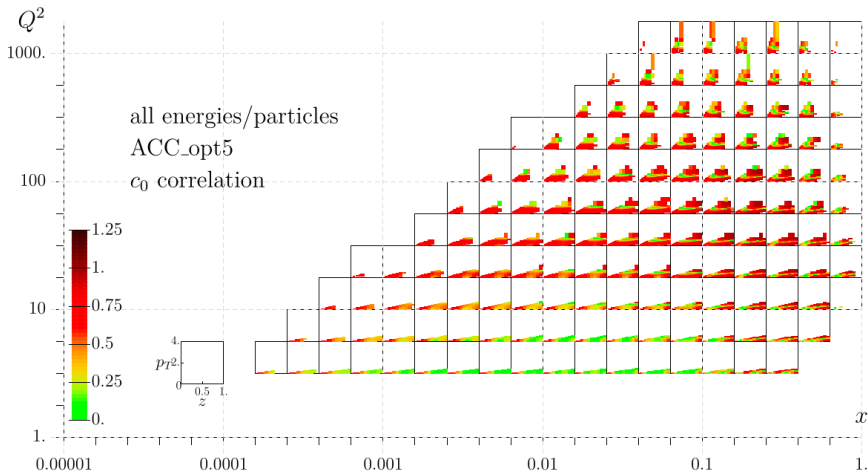
Model-bias

(For computation I used SV19 global extraction with 300-replicas)

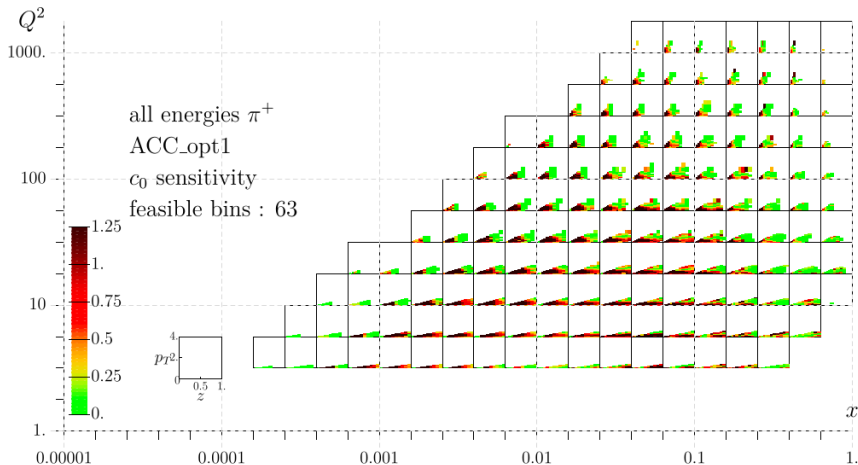
No variation at small-b!



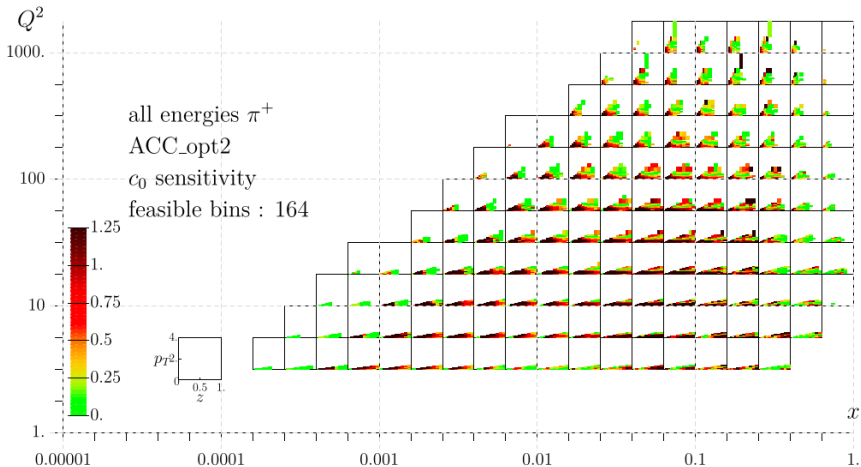
(1-parametric) TMD-evolution



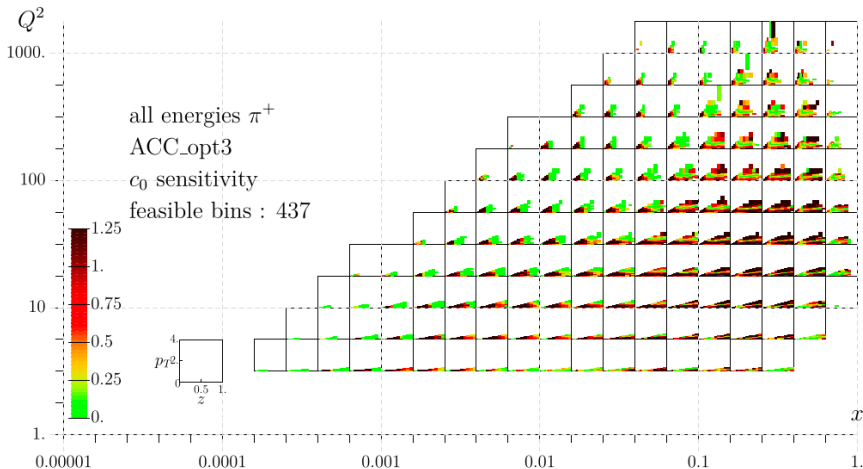
(1-parametric) TMD-evolution



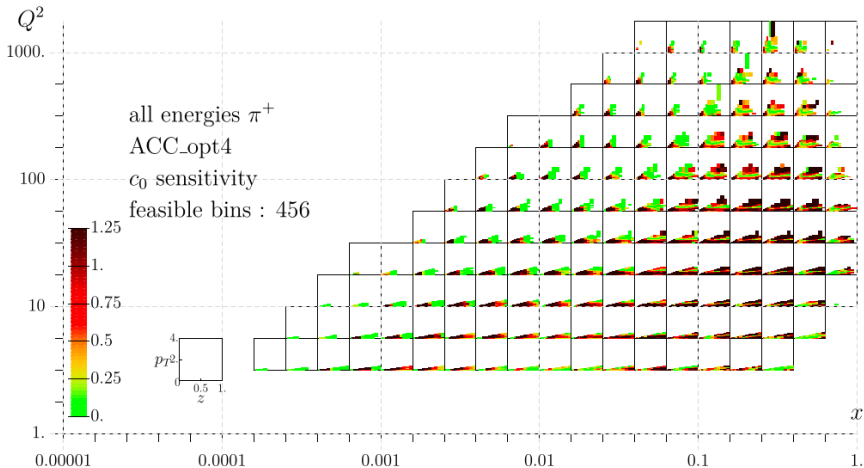
(1-parametric) TMD-evolution



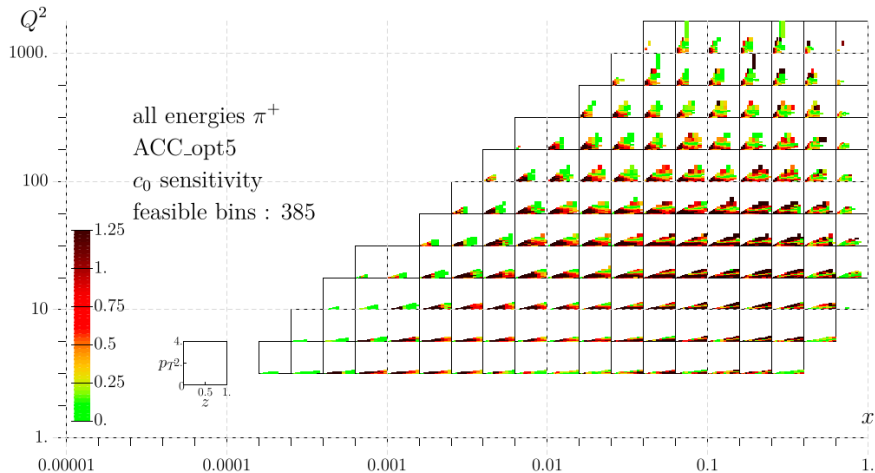
(1-parametric) TMD-evolution

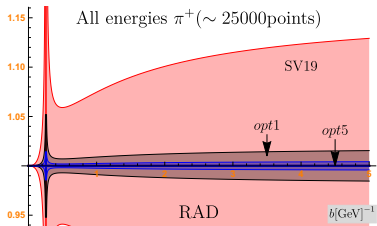


(1-parametric) TMD-evolution

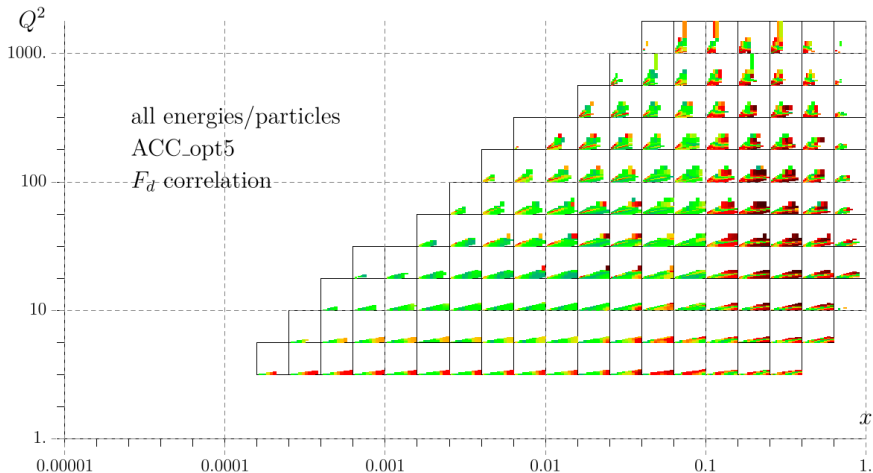


(1-parametric) TMD-evolution

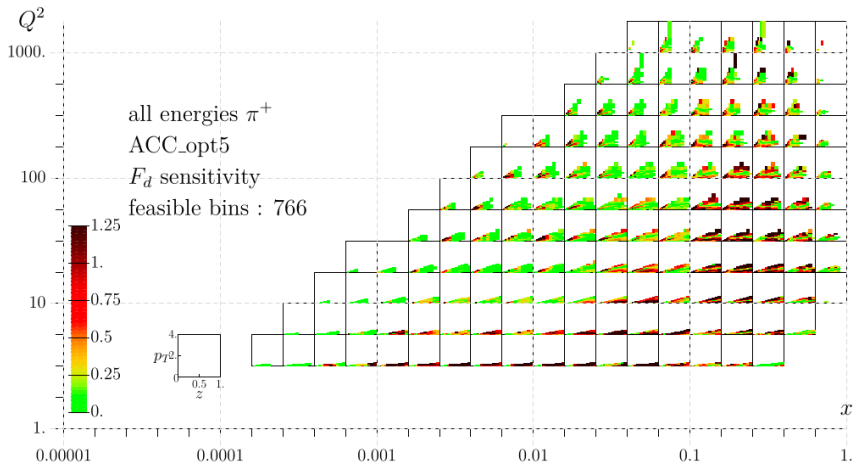




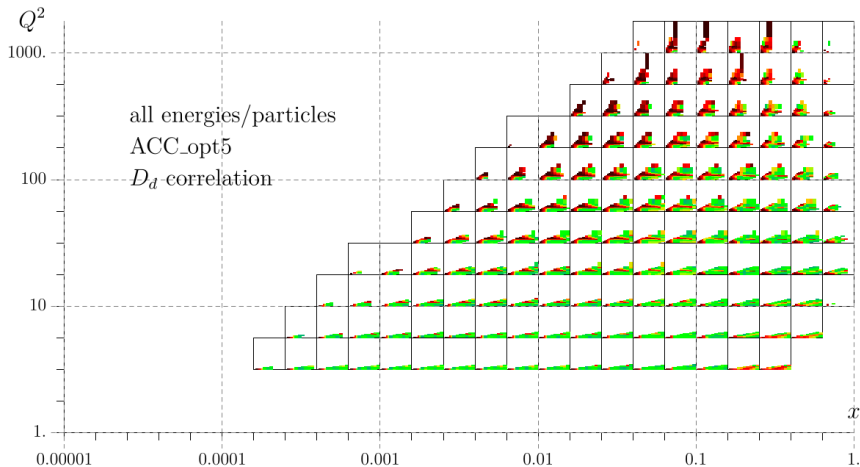
uTMDPDF $F(x, p_T/z/2)$

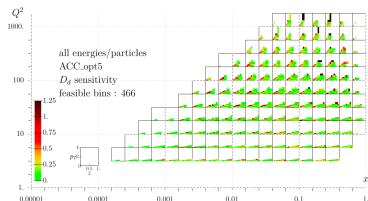
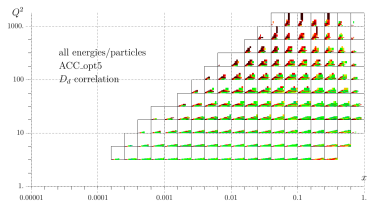
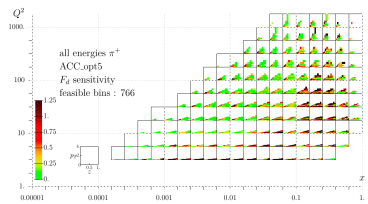
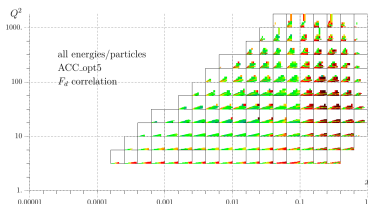
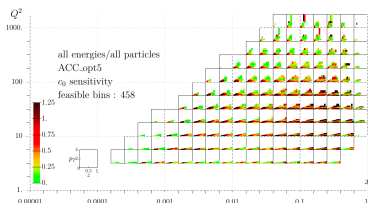
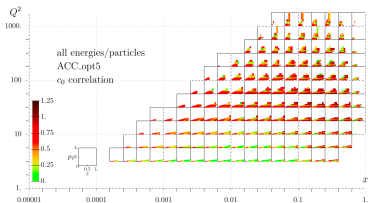


uTMDPDF $F(x, p_T/z/2)$



uTMDPDF $D(z, p_T/z/2)$
 Model is tuned at low-right conner





- ▶ Obviously EIC will pin down TMD evolution
- ▶ For better impact-study the model needs more parametric freedom (especially at large- b)
- ▶ Next step: Polarized cases

