

EIC_NET

attività a Bologna

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General

- **Studio delle potenzialità di un rivelatore a tempo di volo per l'identificazione di particelle a EIC**
 - ampia esperienza del gruppo di BO con sistemi TOF estesi
 - sistema TOF di ALICE: $\varepsilon > 99\%$, $\sigma < 60$ ps
 - possibile TOF futuro (MRPC, UFSD) con $\sigma = 30$ ps
- **attività di networking / workshops**
 - partecipazione al workshop MCEGs for future ep and eA facilities (Desy)
 - partecipazione al workshop EIC Software Meeting (Trieste)
 - partecipazione al EIC User Group meeting (Parigi)
- **attività di simulazione**
 - partecipazione alle riunioni del EIC Software Working Group
 - inizio studi MC sulle prestazioni di un TOF a EIC (see next slides)
 - milestone: studi preliminari delle accettanze e delle prestazioni per la particle identification con rivelatori a tempo di volo in diverse configurazioni
- **assegnazioni (2.5 k€)**
 - 1.5 k€ per missioni attività di networking
 - 1.0 k€ per missioni attività di simulazione
- **spese e previsioni, so far (2.0 k€)**
 - 1.0 k€ per EIC User Group meeting a Parigi (1 persona)
 - 1.0 k€ per missioni attività di simulazione

inclusive production of Λ_c and charmed baryons at EIC

a physics-case to study the potential of a TOF at EIC

$E_e = 15.9 \text{ GeV}$
 $E_p = 250 \text{ GeV}$
 $\sqrt{s} = 126.1 \text{ GeV}$

$0.01 < |y_{inelasticity}| < 0.95$

Λ_c^+
(+ cc.)

Σ_c^{++}
(+ cc.)

Σ_c^0
(+ cc.)

Production

$|y_{rapidity}| < 2$
 $\mathcal{L} = 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$

Q ² (GeV)	< 1	> 1	[2, 4]	[8, 16]	[32, 64]
σ_{process} σ_{particle} rate	28 μb	560 nb	150 nb	41 nb	8.4 nb
	59 nb	4.8 nb	1.3 nb	490 pb	92 pb
	59 Hz	4.8 Hz	1.3 Hz	490 mHz	92 mHz

Q ² (GeV)	< 1	> 1	[2, 4]	[8, 16]	[32, 64]
σ_{process} σ_{particle} rate	28 μb	560 nb	150 nb	41 nb	8.4 nb
	1.9 nb	160 pb	45 pb	17 nb	3.0 nb
	1.9 Hz	160 mHz	45 mHz	17 mHz	3.0 mHz

Q ² (GeV)	< 1	> 1	[2, 4]	[8, 16]	[32, 64]
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Base settings

- **ep collisions with Pythia 6.4.28**

virtual photon spectrum: *gamma/lepton* machinery

$$E_e = 15.9 \text{ GeV}$$

$$E_p = 250 \text{ GeV}$$

$$\sqrt{s} = 126.1 \text{ GeV}$$

- **tracking in $B = 2 \text{ T}$**

p_T resolution from (ATLAS parameterisation)

efficiency from (ATLAS parameterisation)

with p_T and η dependence

- **barrel TOF detector**

cylindrical surface centred at $z = 0$

$$r = 1 \text{ m}$$

$$L = 3 \text{ m}$$

$$\sigma_t = 30 \text{ ps}$$

- **forward TOF detector**

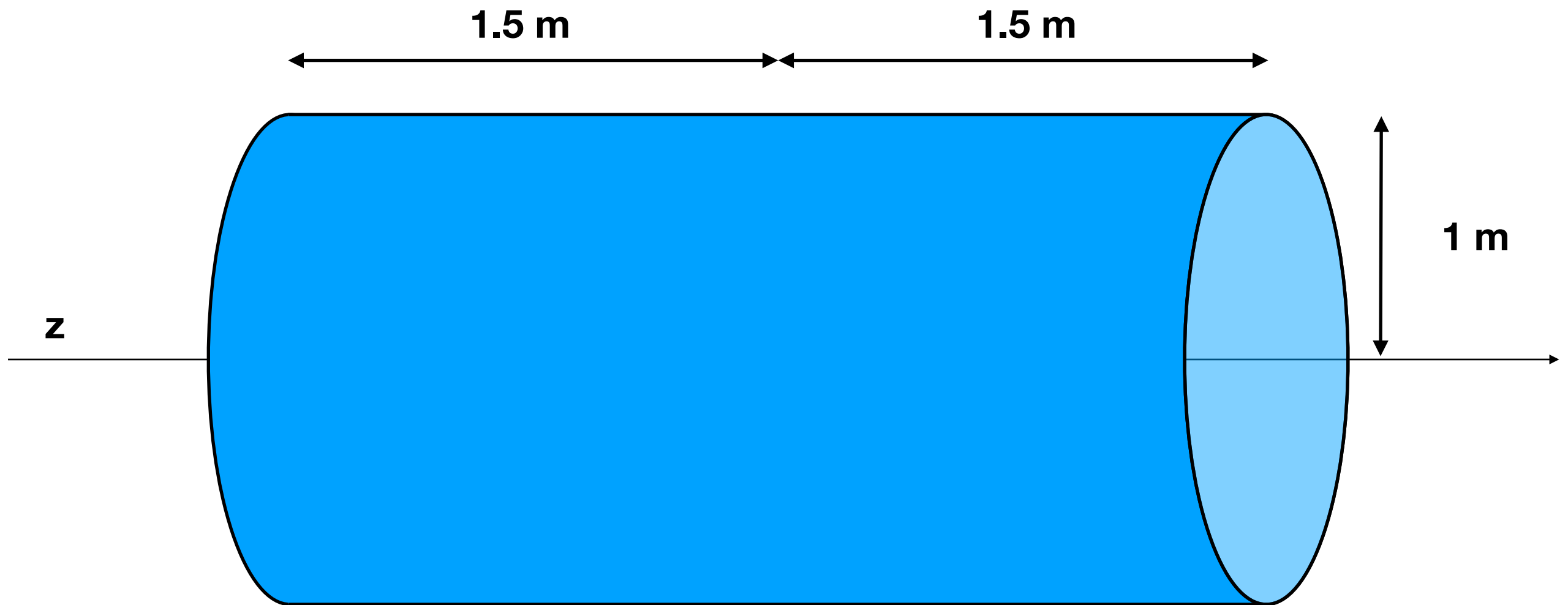
two discs located at $z = \pm 1.5 \text{ m}$

$$r_{\text{in}} = 50 \text{ cm}$$

$$r_{\text{out}} = 1 \text{ m}$$

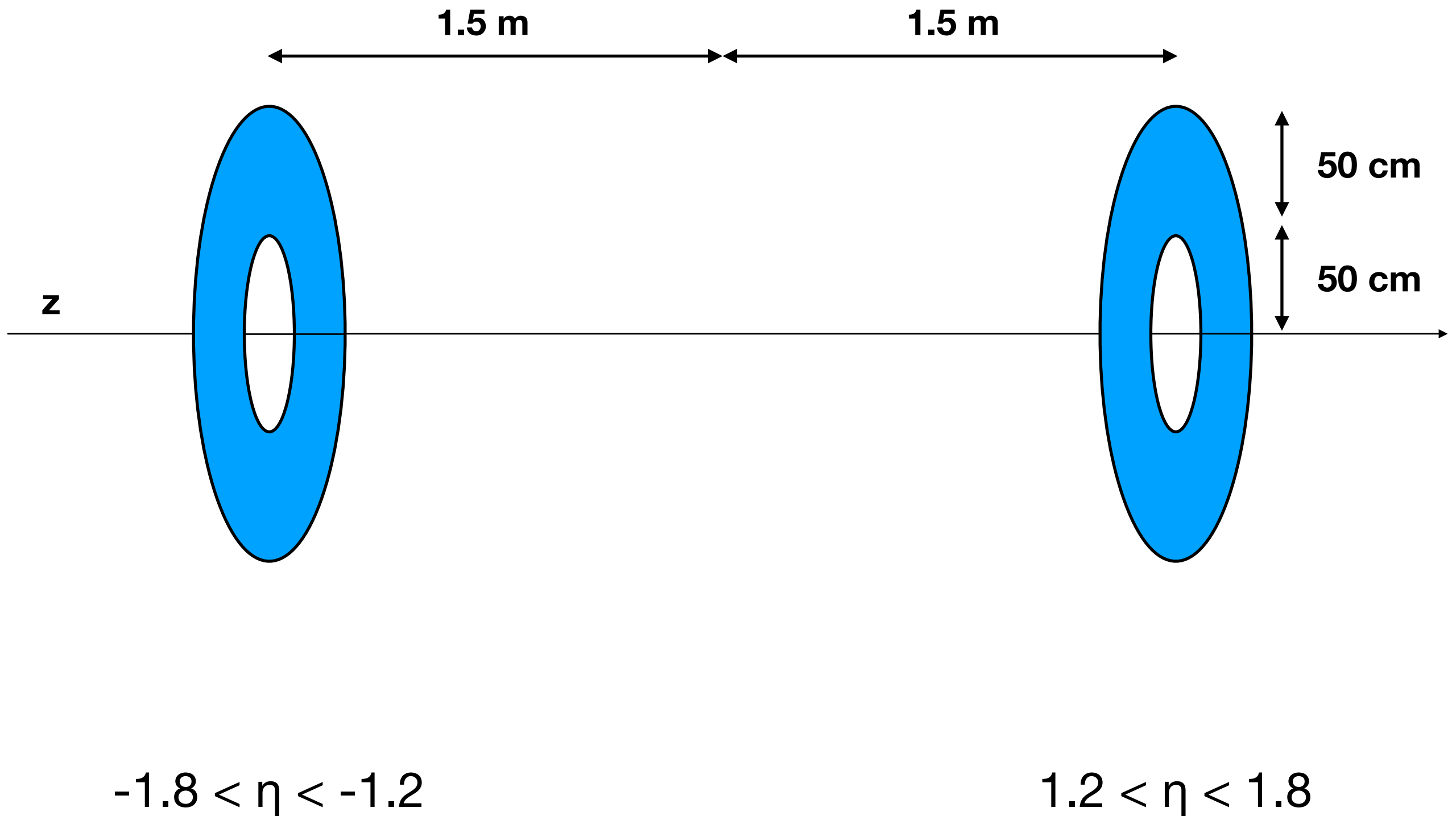
$$\sigma_t = 30 \text{ ps}$$

Barrel TOF

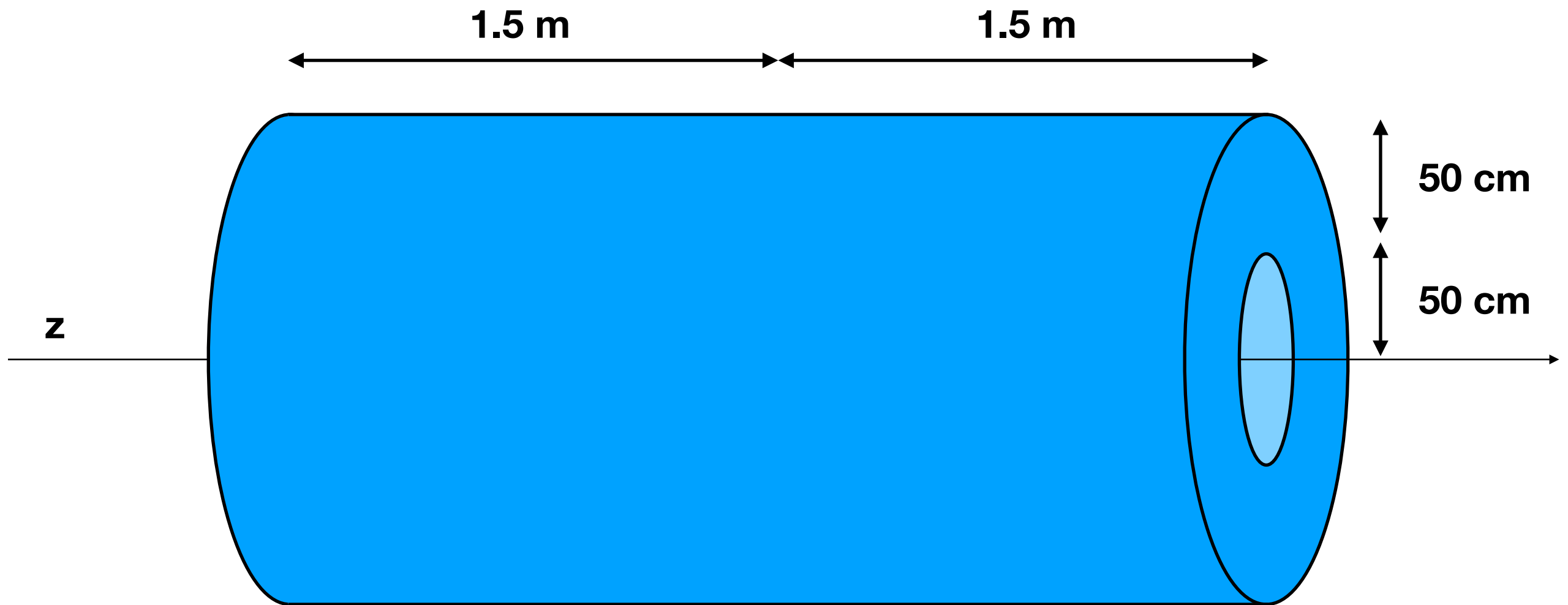


$$-1.2 < \eta < 1.2$$

Forward TOF

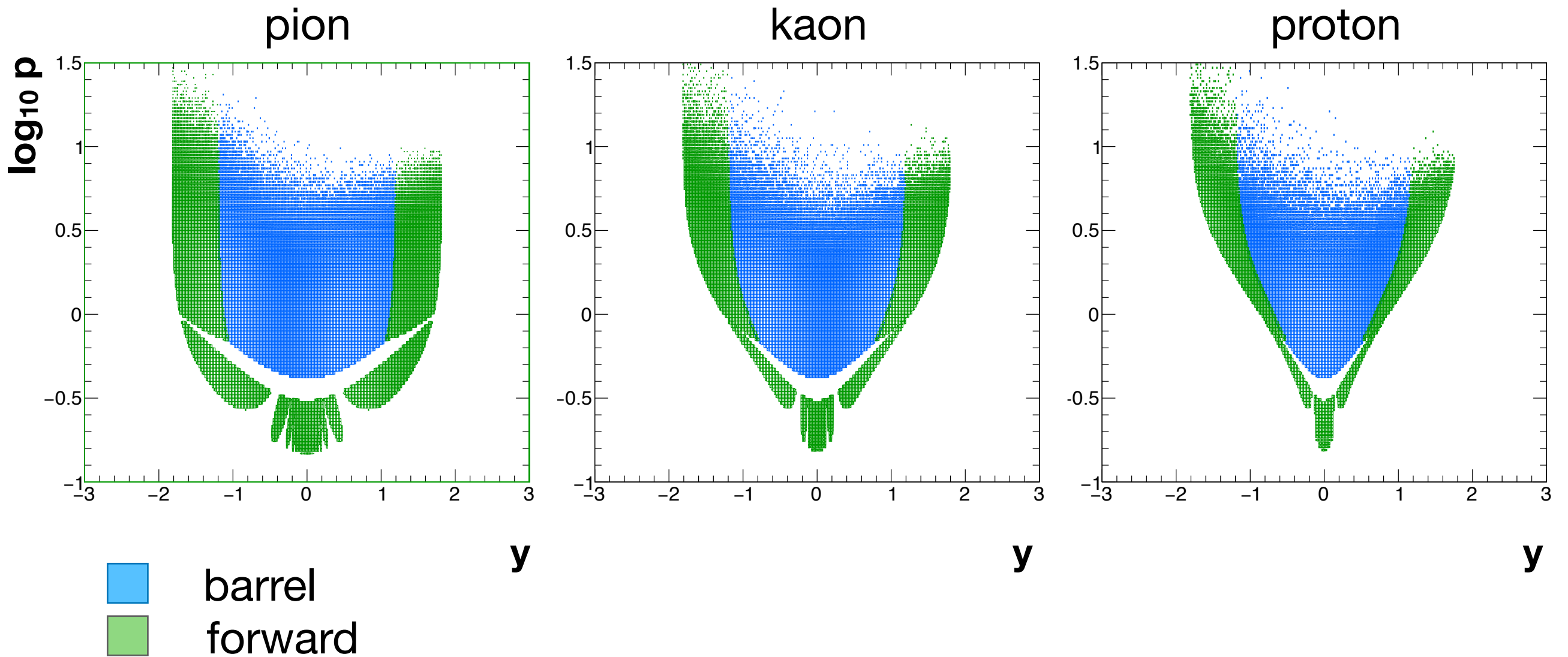


TOF

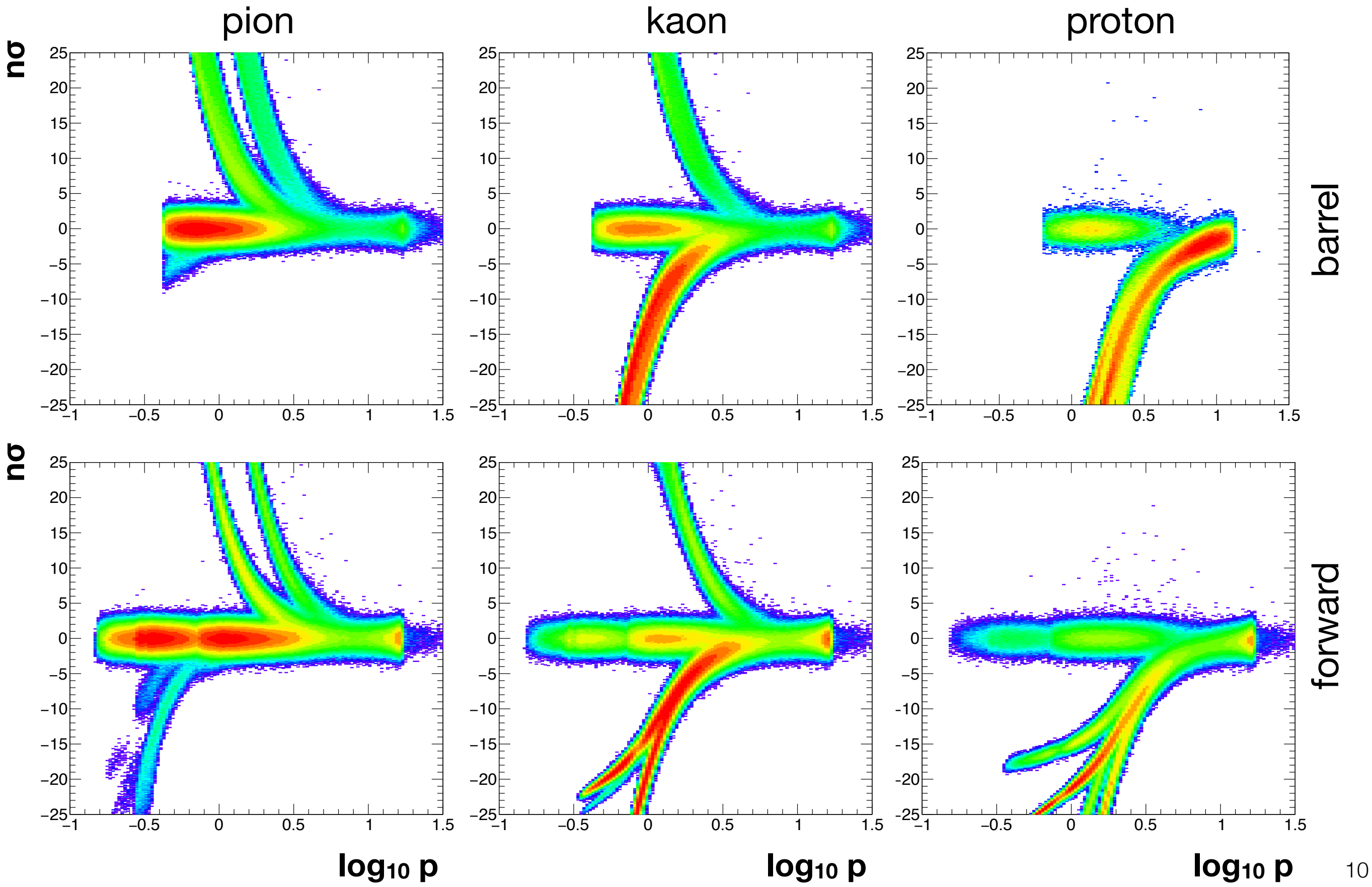


$$-1.8 < \eta < 1.8$$

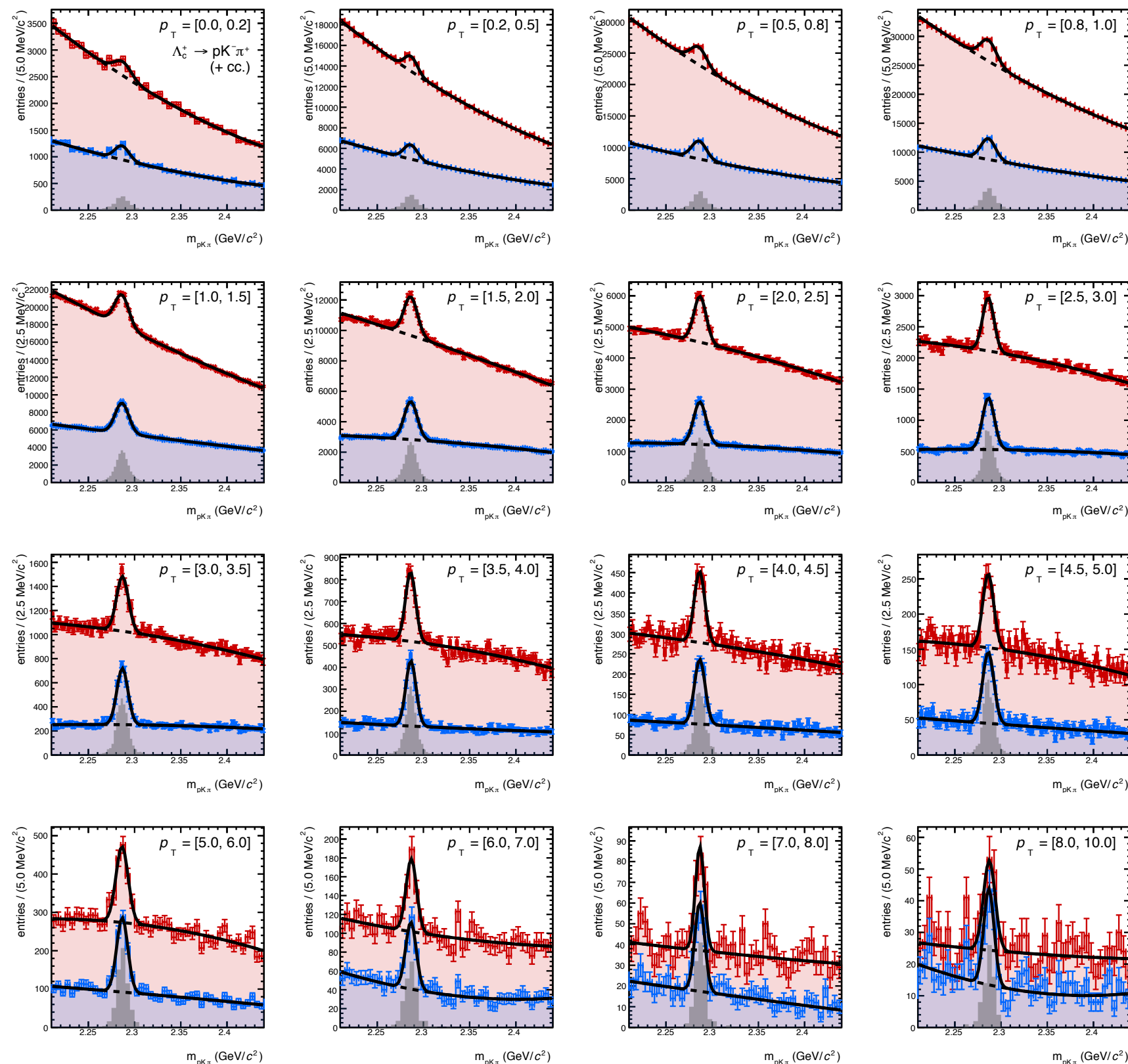
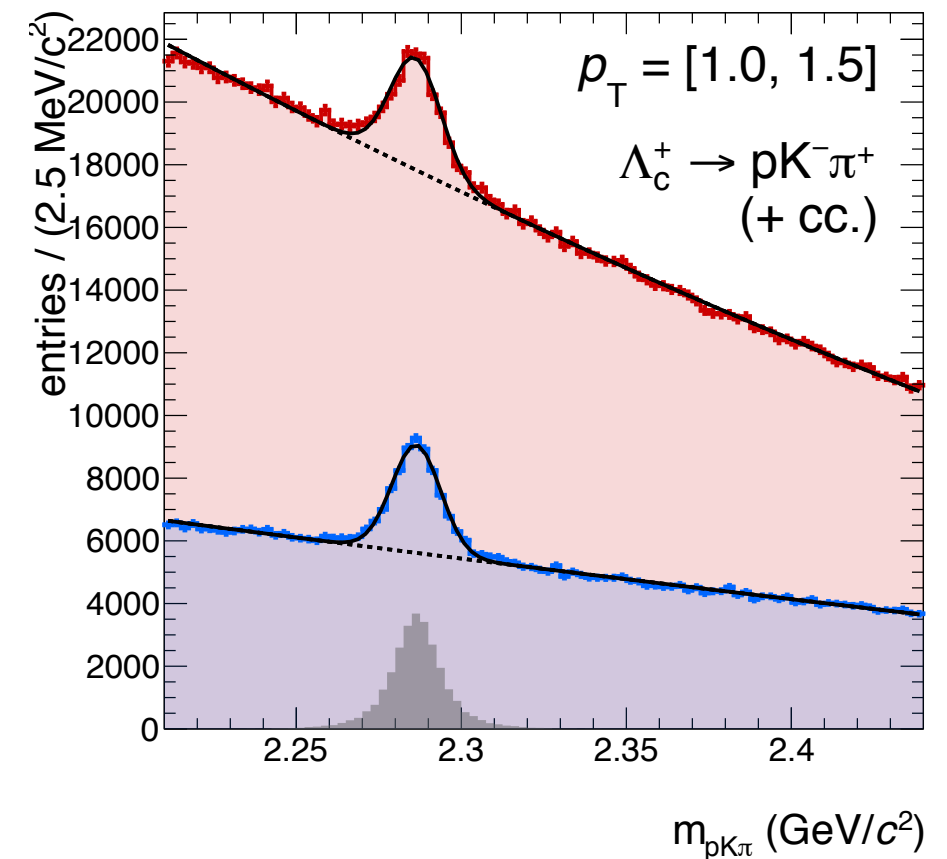
TOF acceptance



PID performance

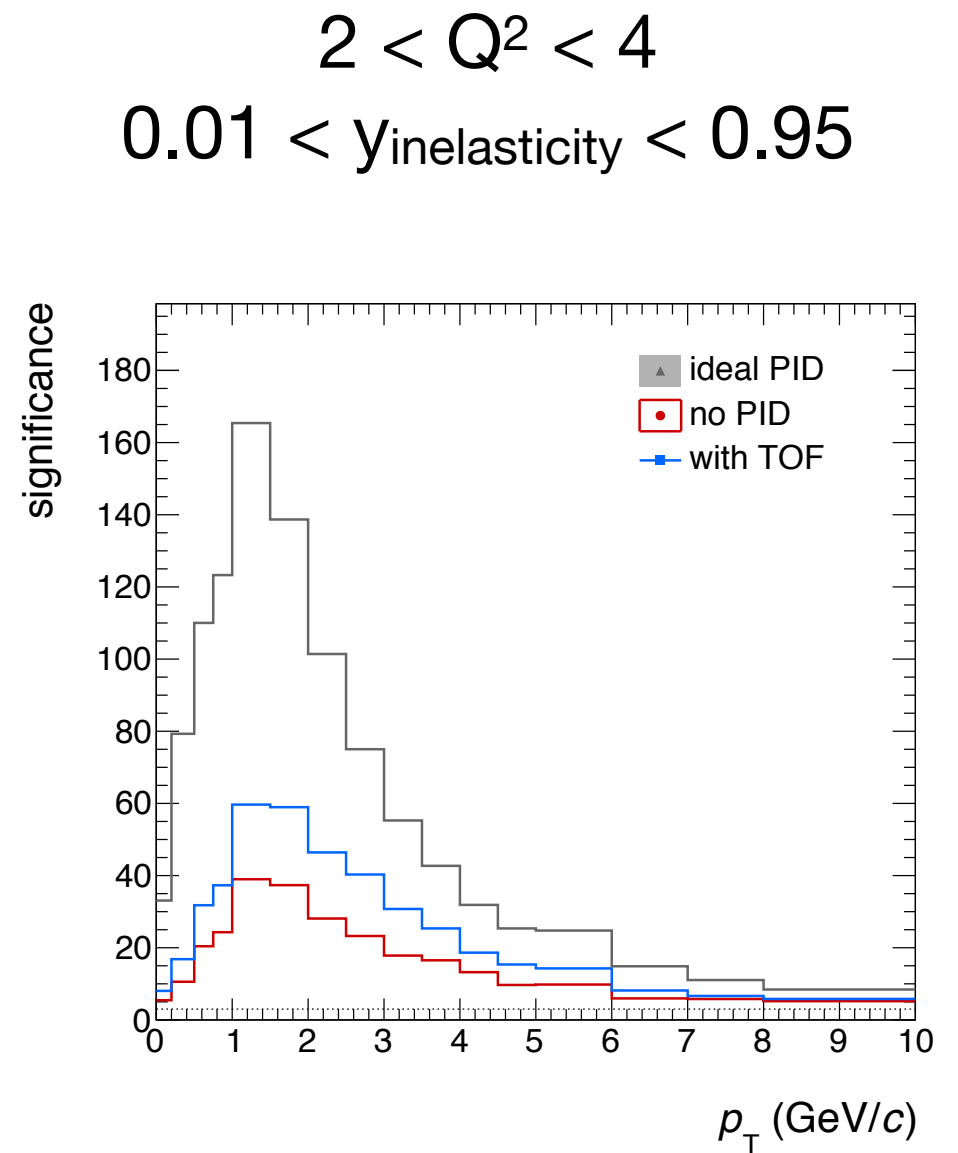
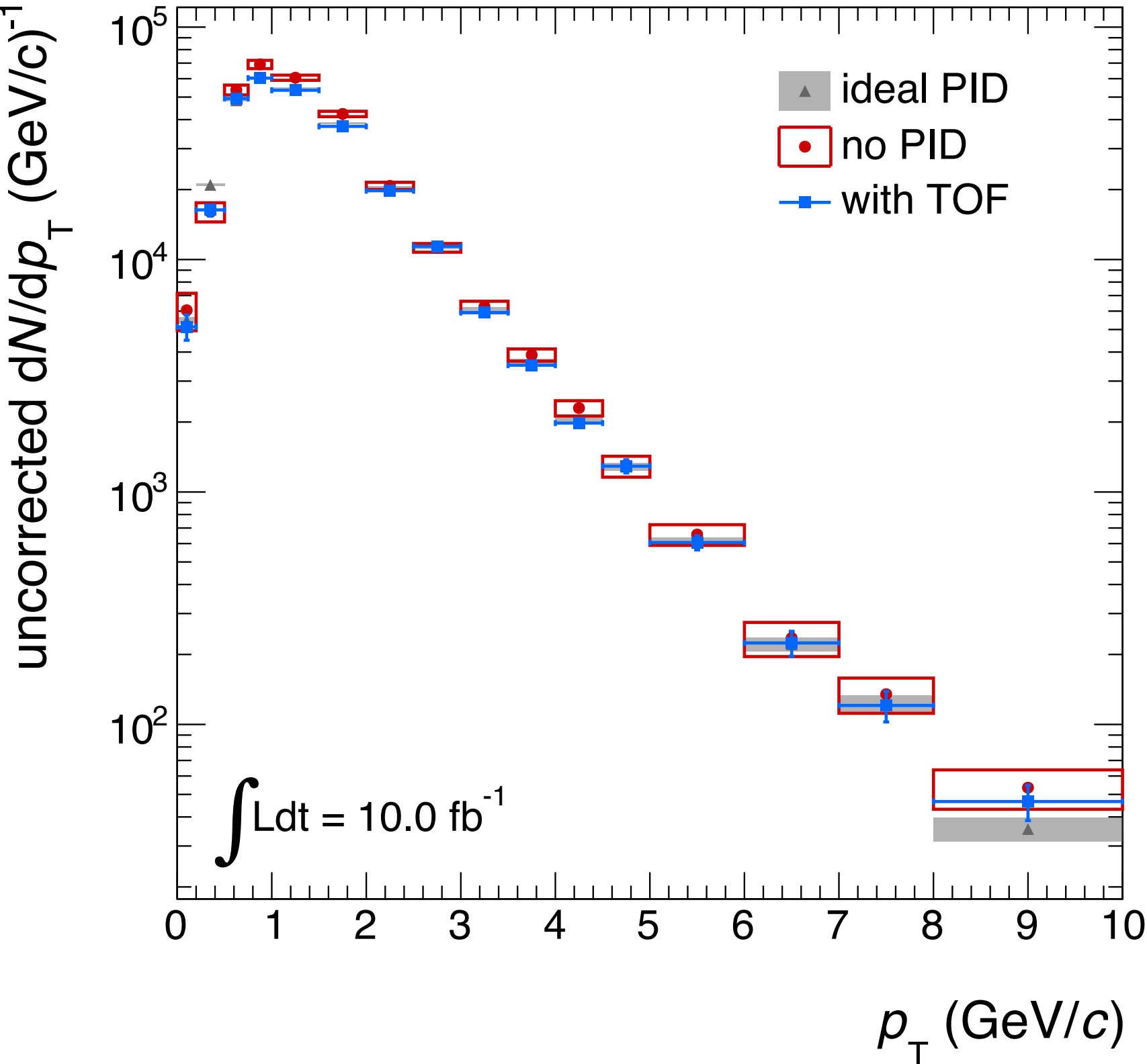


Λ_c — all processes, low Q^2


$$2 < Q^2 < 4$$
$$0.01 < y_{\text{inelasticity}} < 0.95$$

$$\int \mathcal{L} = 10 \text{ fb}^{-1}$$

$$125 \text{ d } (\mathcal{L} = 10^{33})$$

Λ_c — all processes, low Q^2

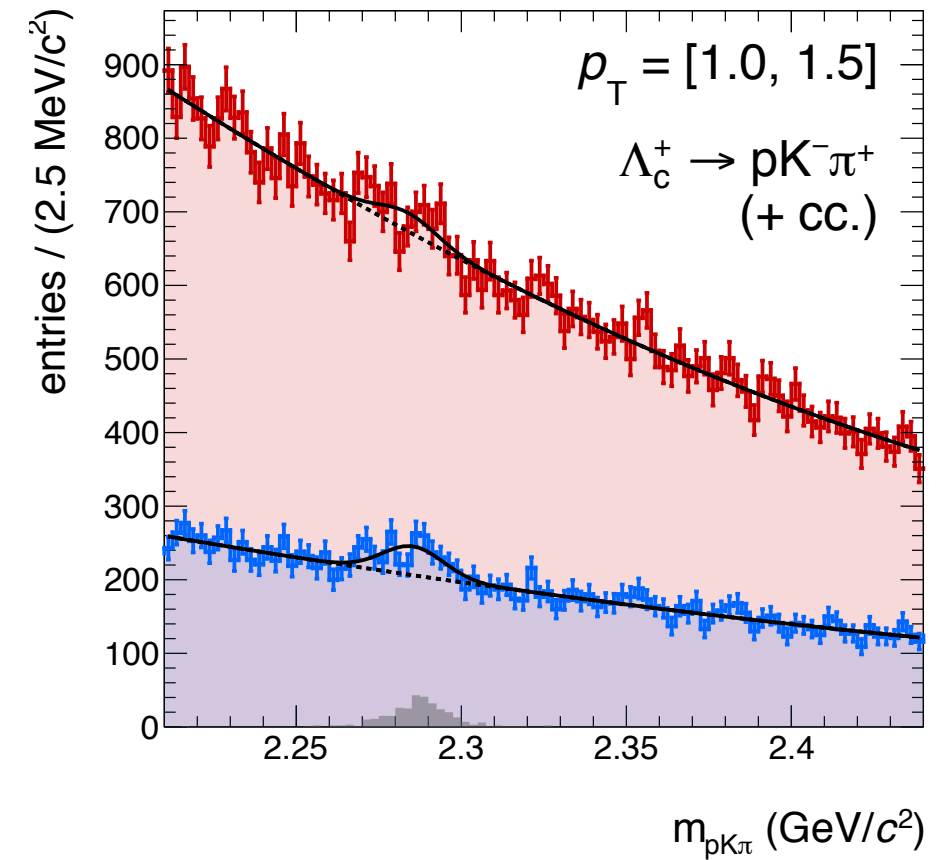
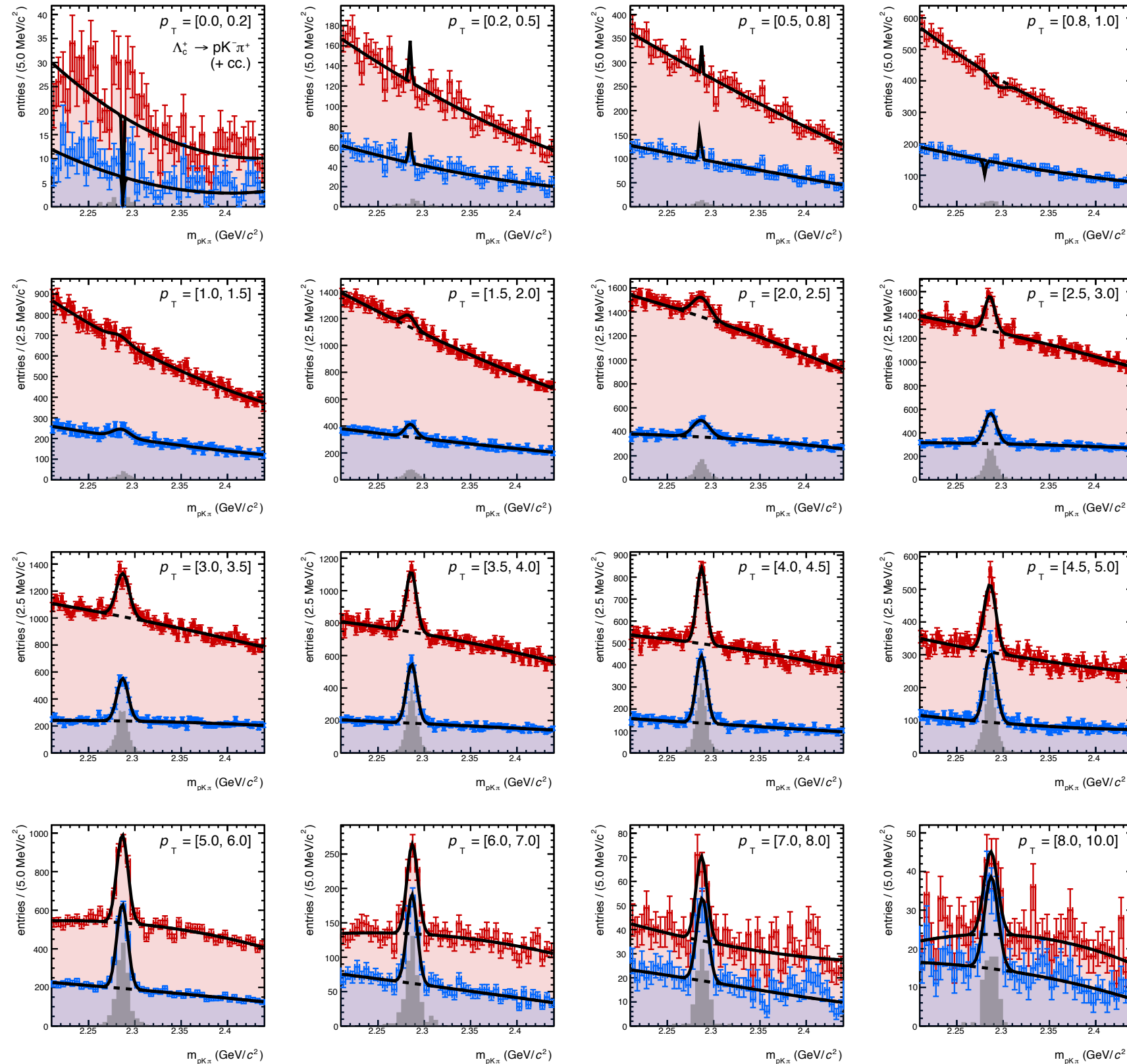


$\int \mathcal{L} = 10 \text{ fb}^{-1}$
 125 d ($\mathcal{L} = 10^{33}$)

Λ_c — all processes, high Q^2

$$32 < Q^2 < 64$$

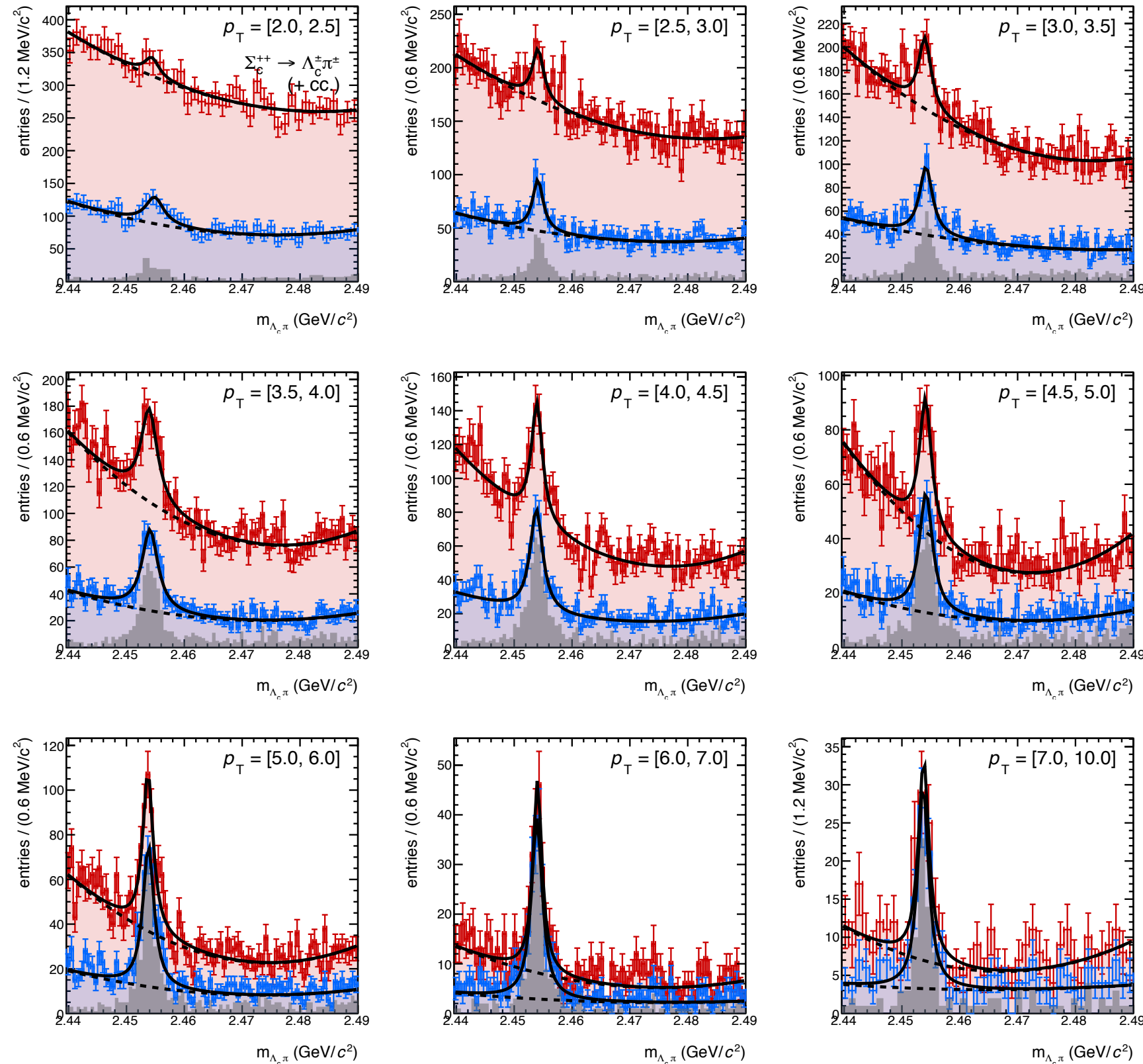
$$0.01 < y_{\text{inelasticity}} < 0.95$$



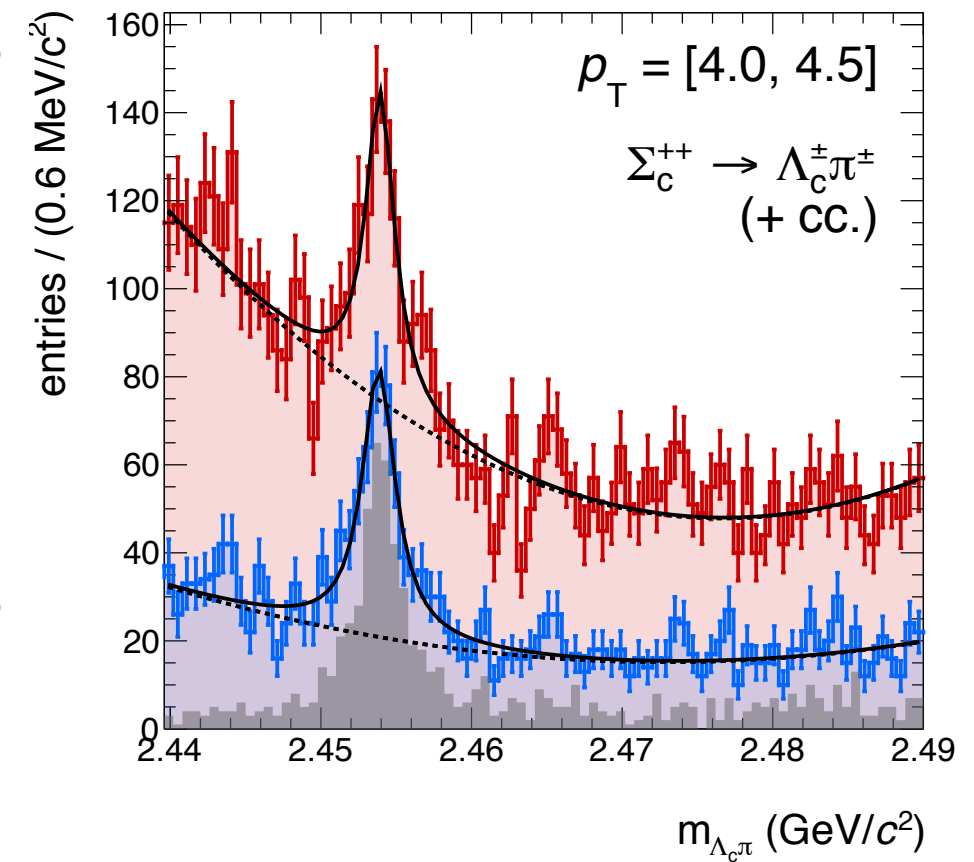
$$\int \mathcal{L} = 10 \text{ fb}^{-1}$$

$$125 \text{ d } (\mathcal{L} = 10^{33})$$

Σ_c — all processes, high Q^2



$32 < Q^2 < 64$
 $0.01 < y_{\text{inelasticity}} < 0.95$



$\int \mathcal{L} = 100 \text{ fb}^{-1}$
 $3.5 \text{ y } (\mathcal{L} = 10^{33})$