

Status of CGEM Tracking

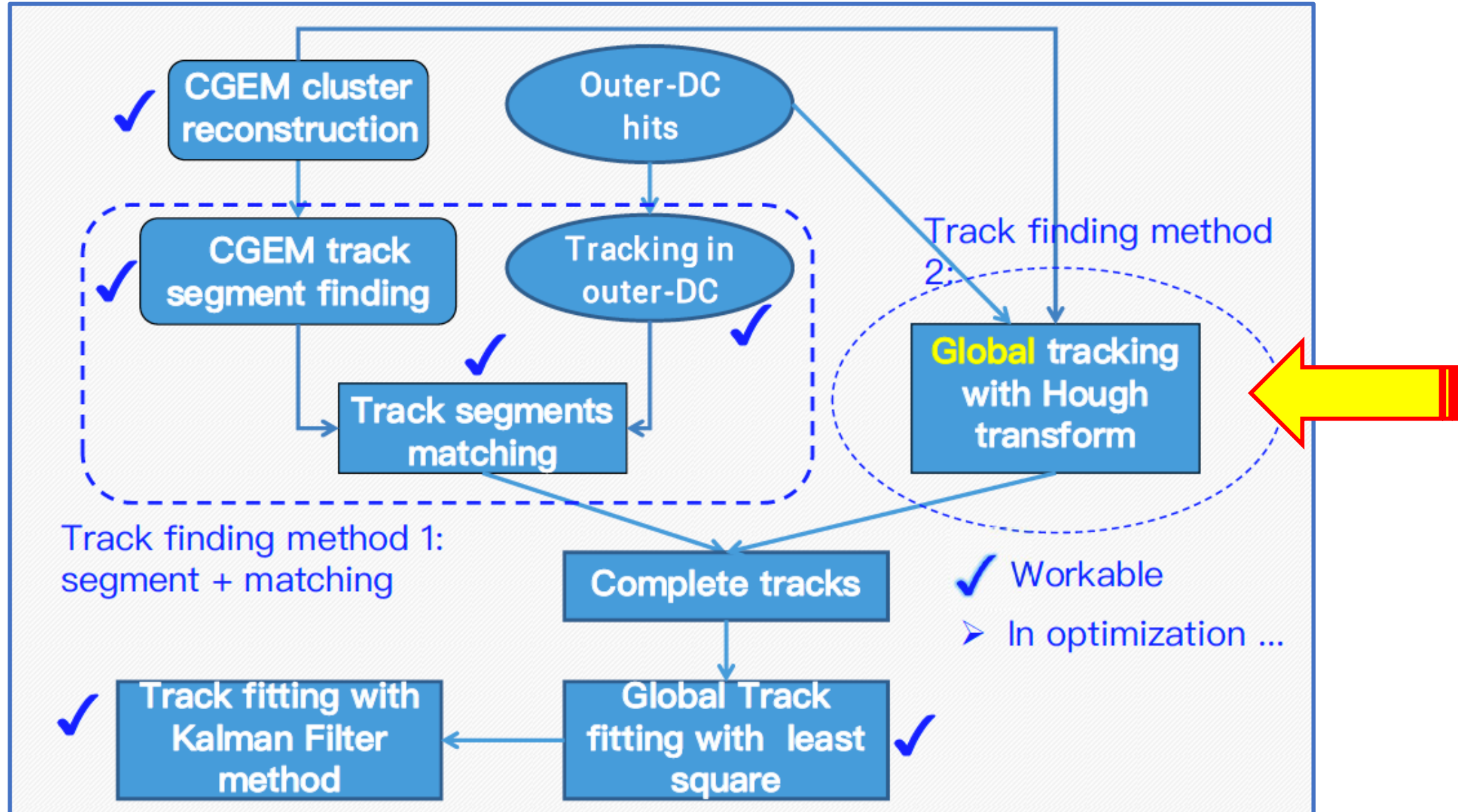
Stefano Spataro

6th November 2020





Global Reconstruction





A che punto è la notte?

Global Hough Algorithm

- Global Hough transform algorithm: no news since about one year
 - a working version of the packages should be provided before the Spring Festival (January 2020)
 - COVID-19 ==> we lost any news from Huang Zhen
- EB meeting on April 29, 2020
 - Find the last working version uploaded by Huang Zhen to the ihep account
 - Upload it before May 13
 - Increase the manpower
 - Long Li (40%) (3~5 months)
 - Yao Zhong (20%)
 - Lia Lavezzi and Isabella (mainly on test and check)
- May 11, 2020
 - **HoughTransfAlg00-00-14 (CgemBoss)**
 - **TrkFitter-00-00-13 (CgemBoss)**
 - **TrackUtil-00-00-12 (Boss)**



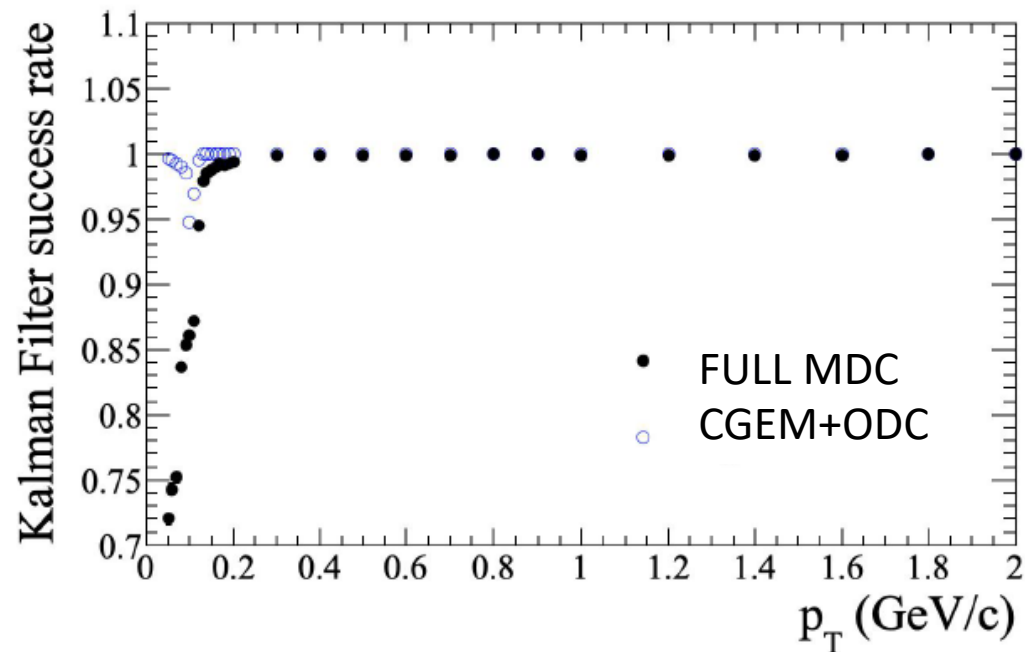
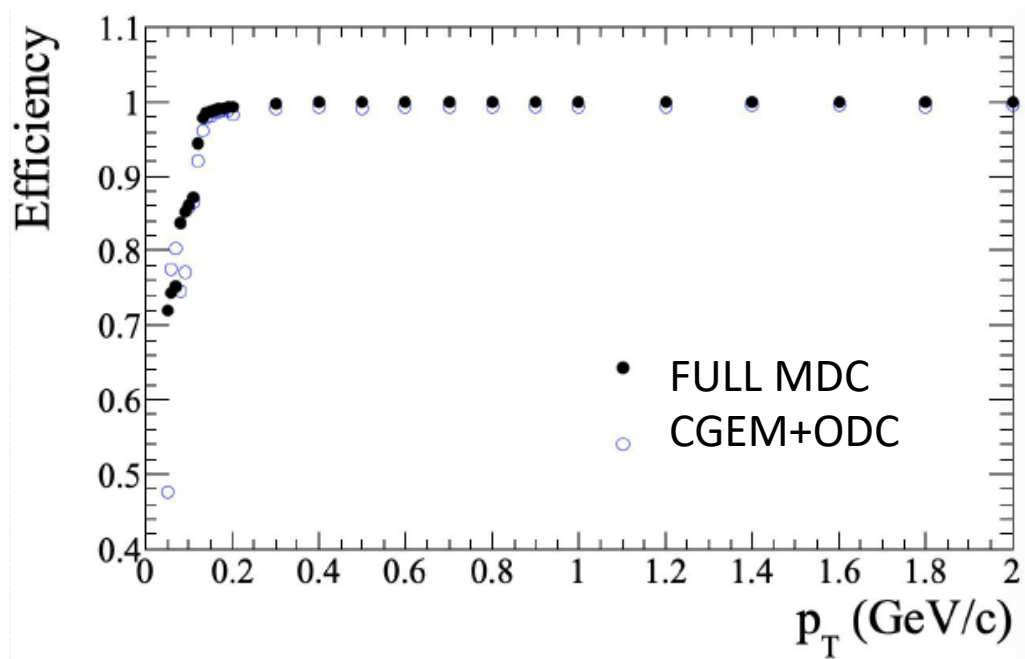


We missed the developer, but we are able to use the code!

What is ongoing:

- Code testing, debugging and improvements(?)

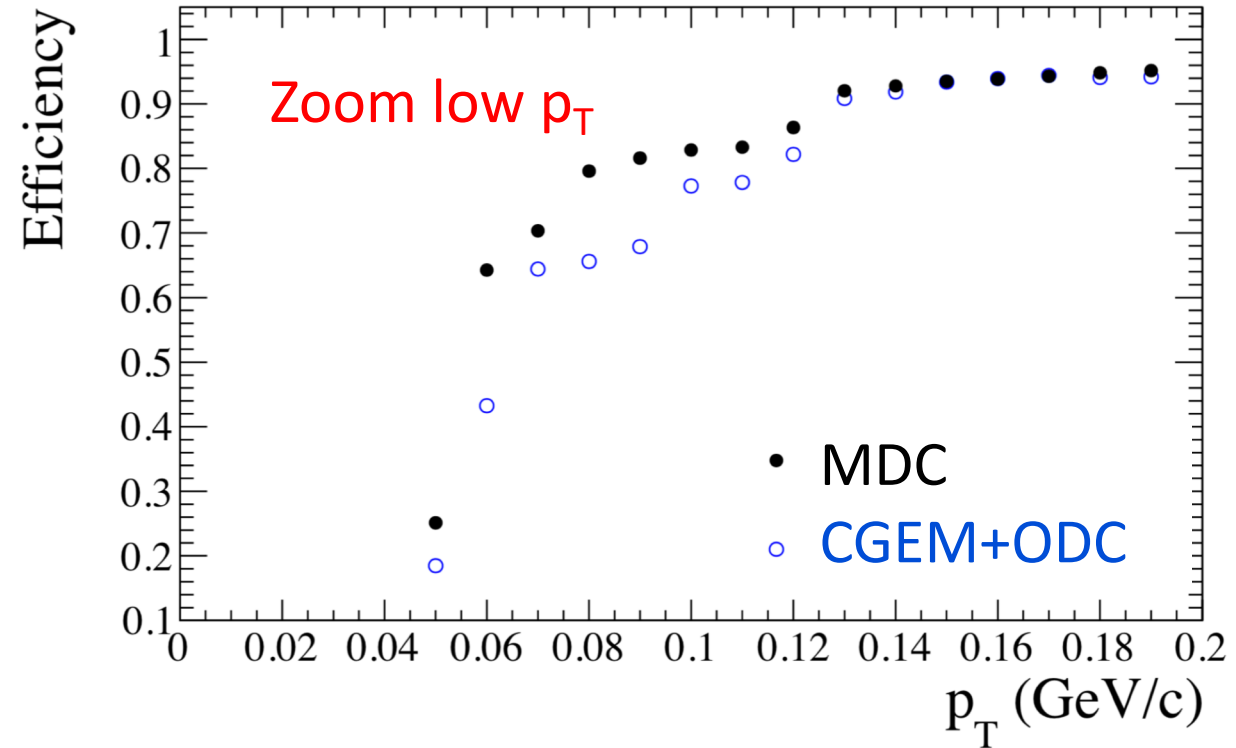
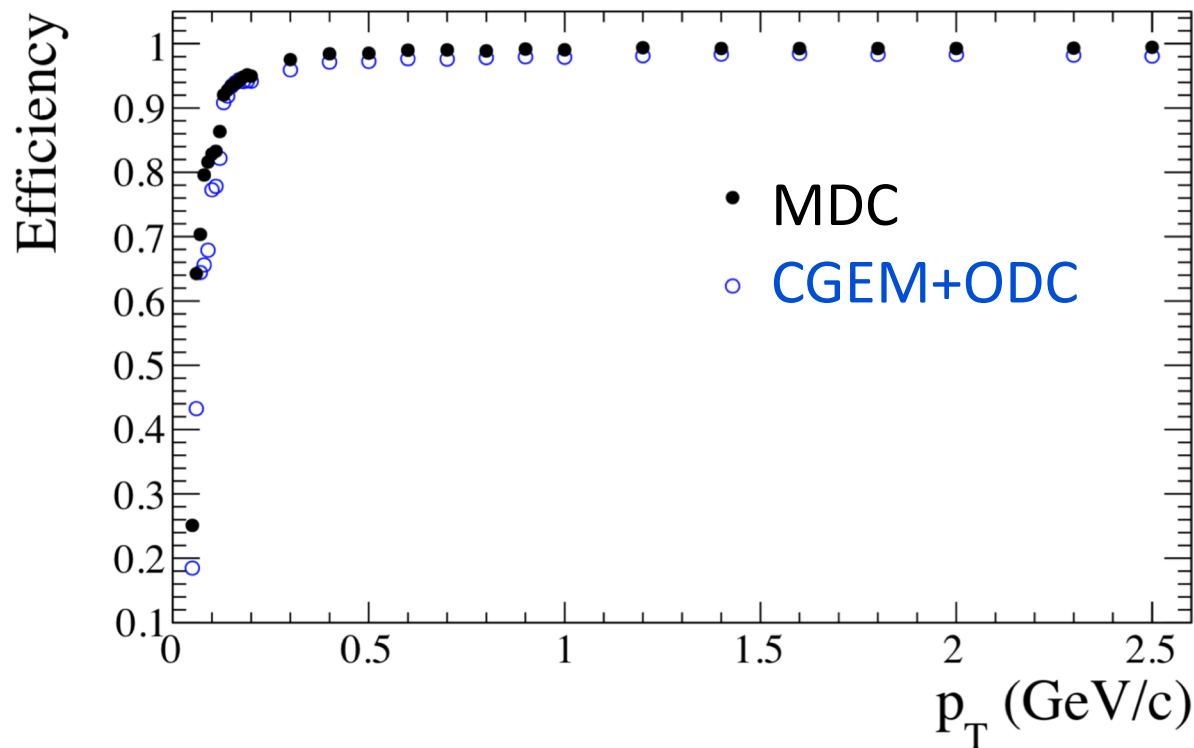
Single muons, “new” results, comparison with full MDC





Global Tracking Characterization

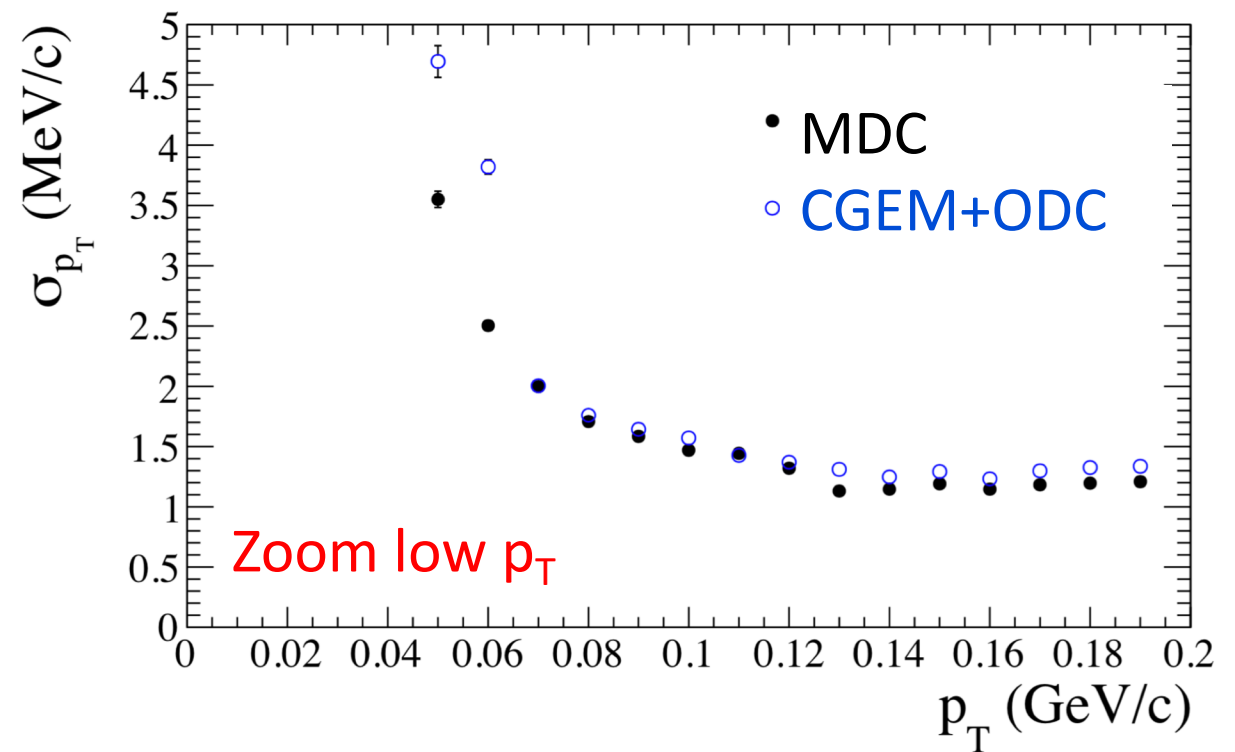
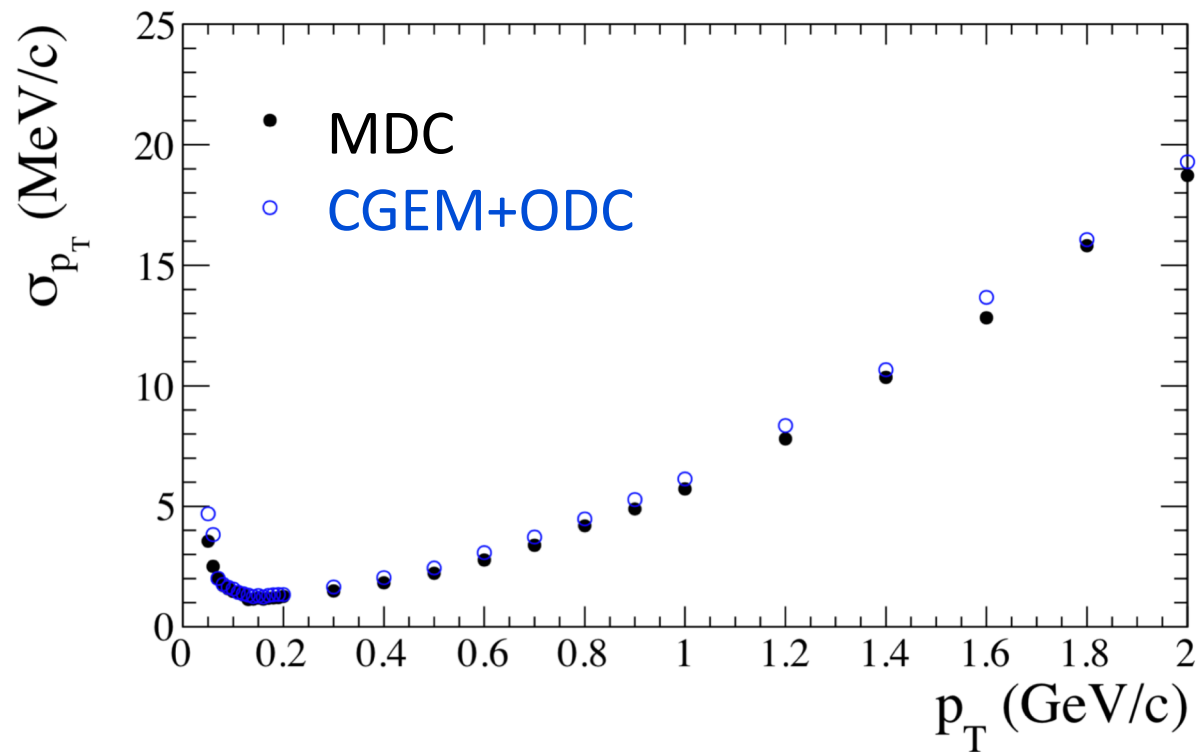
Single pion Efficiency



Efficiency comparable to MDC case, a bit lower at low p_T , there is room for improvements



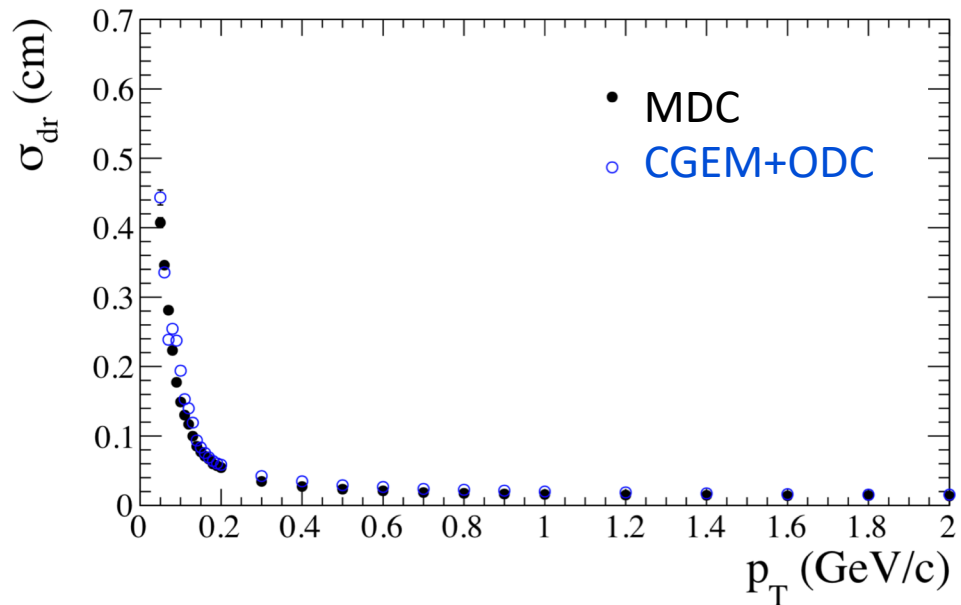
Single pion Momentum Resolution



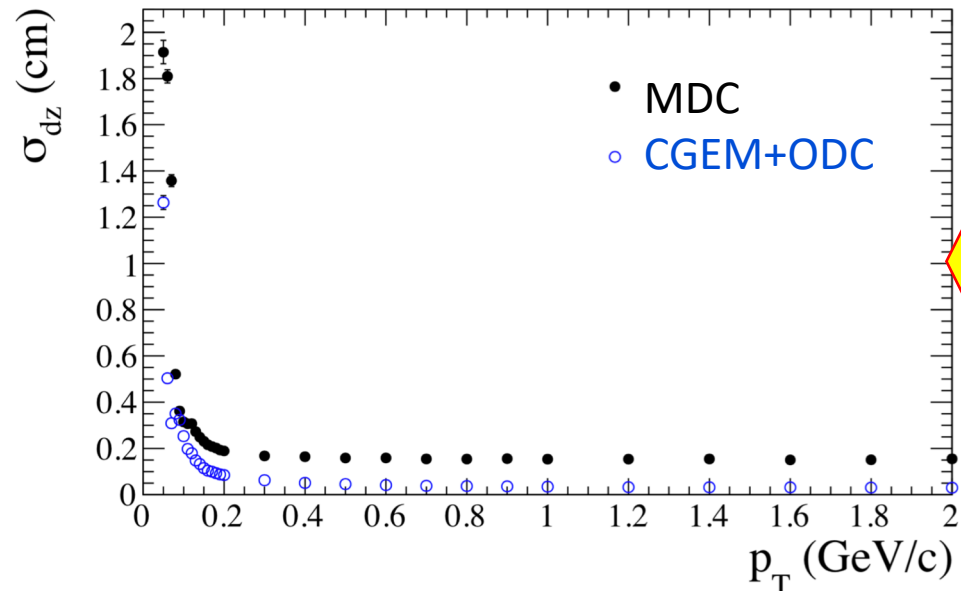
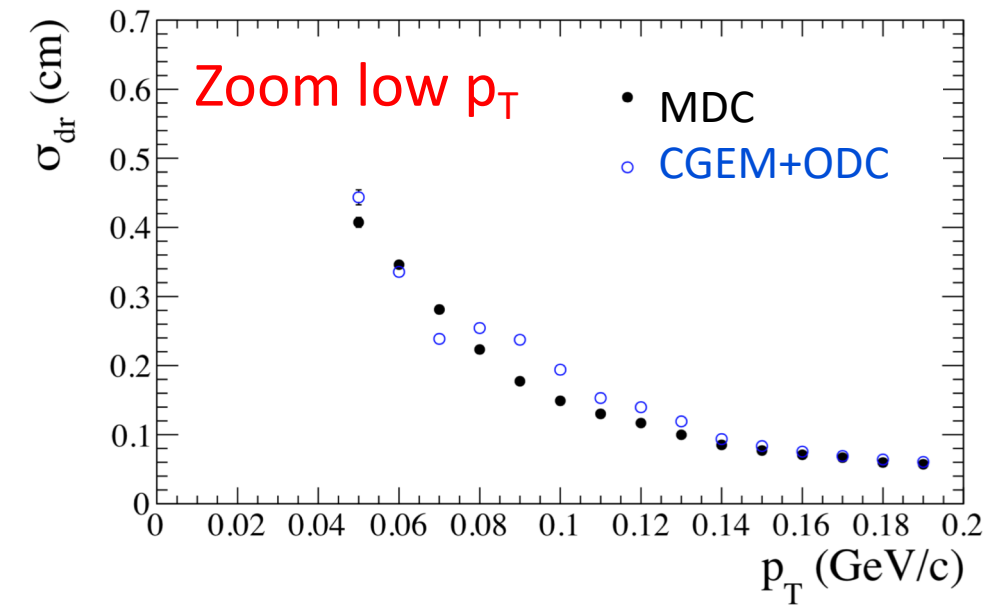
Resolution comparable to MDC case, a bit worse at low p_T , there is room for improvements



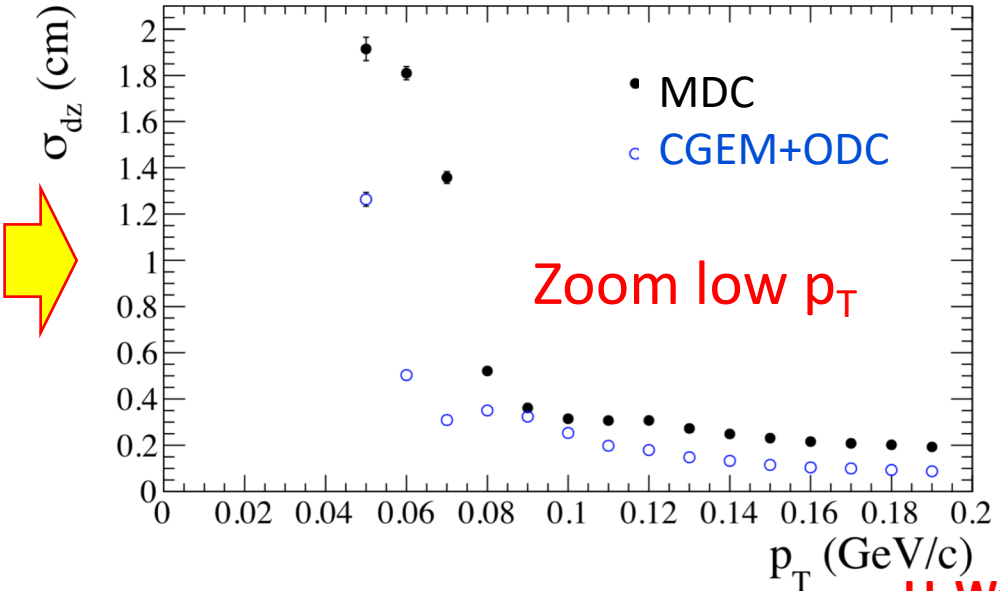
Global Tracking: Vertexing



Single pion



Much
Better
!





- We need to better understand the code at higher multiplicities
- More performance checks

$$\psi(3686)\pi^+\pi^-\text{J}/\psi\rightarrow\pi^+\pi^-e^+e^-$$

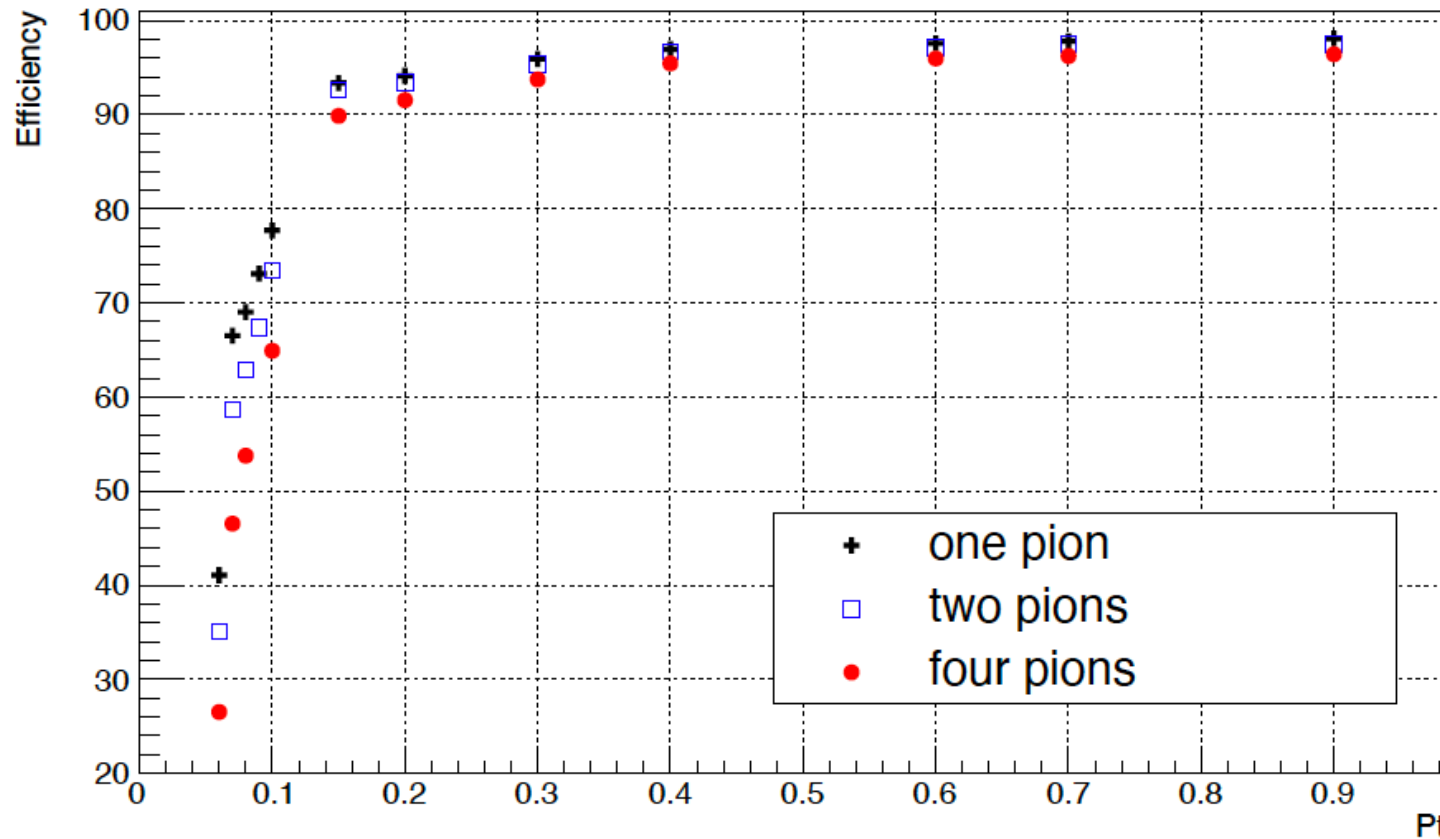
Event selection flow	FULL MDC	1 st Hough Import	Hough after fixes
Ntrack $\geq$ 4	75.89%	$(69.81\pm0.46)\%$	$(69.09\pm0.46)\%$
$\pi^+ + \pi^- + e^+ + e^-$ selection ①	59.76%	$(52.80\pm0.50)\%$	$(53.55\pm0.50)\%$
Loose J/ ψ mass cut ②	57.50%	$(50.11\pm0.50)\%$	$(50.86\pm0.50)\%$
4C fit($\chi^2 < 60$)	38.19%	$(26.14\pm0.47)\%$	$(32.08\pm0.47)\%$

- ① $\pi^+ + \pi^- + e^+ + e^-$ selection: PID by momentum, $p < 0.8\text{GeV} \rightarrow \text{pion}$,
 $p > 0.8\text{GeV} \rightarrow \text{electron}$, $|dr| < 1.0\text{cm}$, $|dz| < 10\text{cm}$, $|\cos\theta| < 0.93$, total charge = 0
- ② Loose J/ ψ mass cut: m_{ee} in $(2.5, 4.0)\text{GeV}/c^2$, $m_{\pi\pi\text{-recoil}}$ in $(2.5, 4.5)\text{GeV}/c^2$, m_{total}
in $(3, 5)\text{GeV}/c^2$



Multi-pion Efficiency

(Fixed transverse momentum)



Slight decrease in efficiency by increasing the number of tracks (at percent level)



Da parte cinese l'aumento di manpower è relativo:

- Lo sviluppatore originale non contribuisce più, nessuna informazione è stata data
- I due nuovi (Long Li e Yao Zhong) che dovrebbero lavorare sul tracciamento lo fanno sporadicamente e non seguono i meeting (ultima presentazione fatta da LL il 10/09/2020)

Da parte nostra:

- Isabella ha cominciato la caratterizzazione con eventi a molti tracce, la situazione è migliore che nella versione "antica", ma occorrono miglioramenti del codice
- Lia è ancorata al tracciamento dei cosmici, non ha ancora cominciato



Conclusions



Several activities in the past months

Global tracking code now available, released, under tests

Good single particle performances, benchmark channels must be studied

More manpower involvement would be appropriated,
but it seems Chinese activities are going into some other tasks