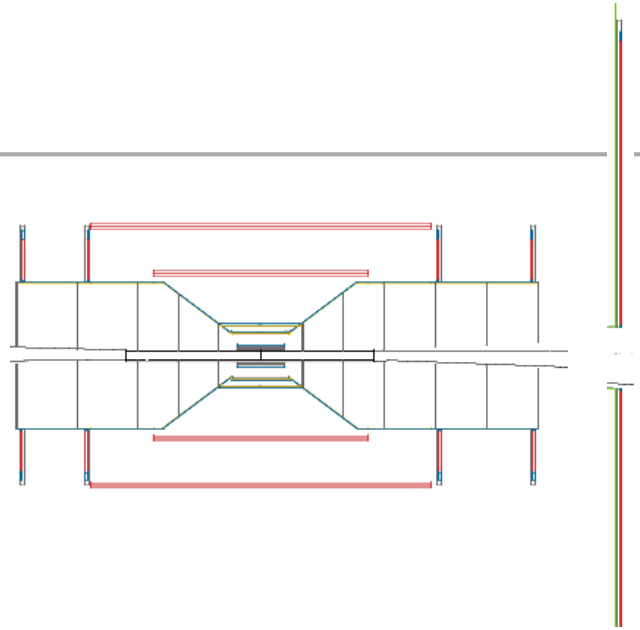
ATHENA tracking performance

- Baseline-2 tracking
  - Hybrid: Si+MPDG
  - Lasted material map included

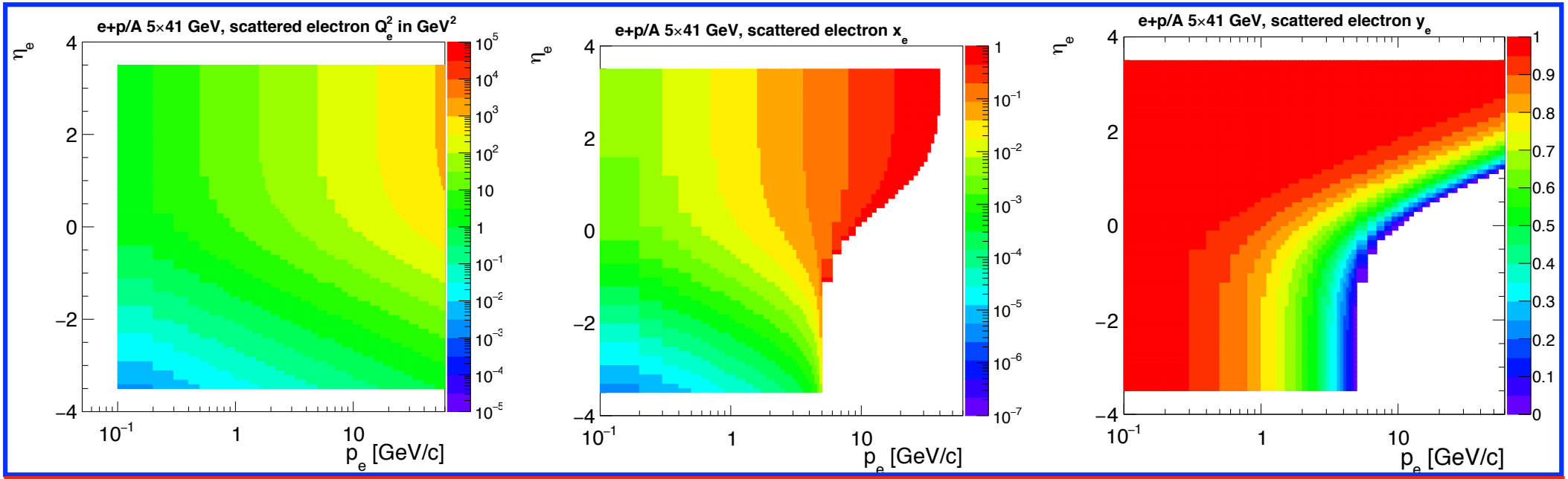


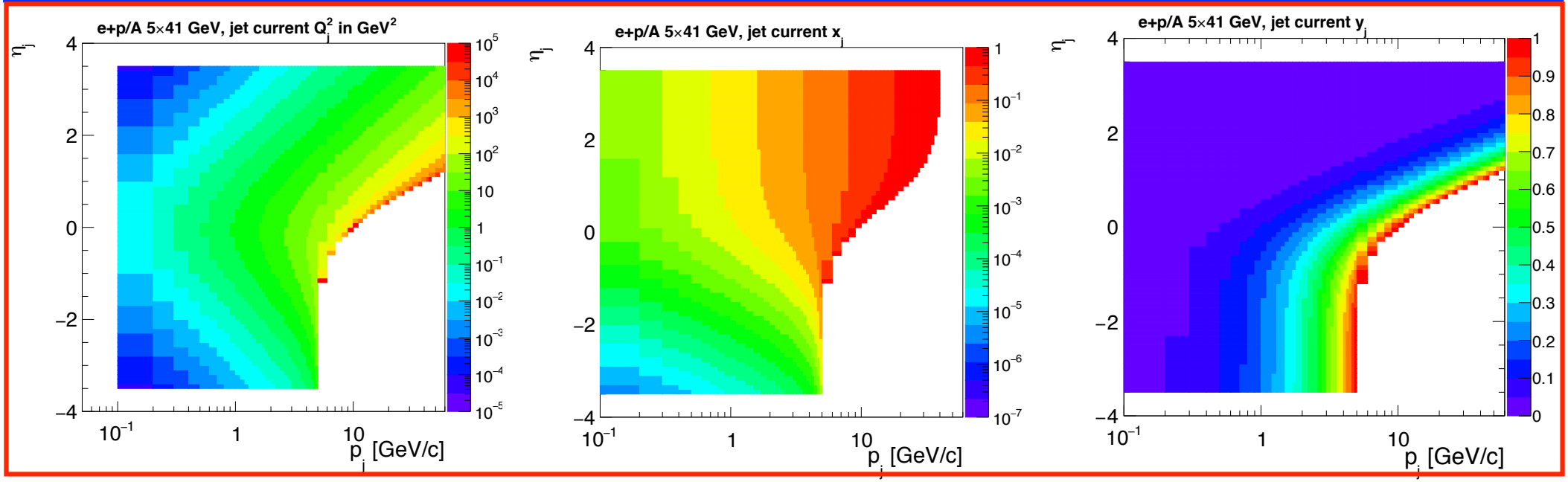
- Simulation events
  - Single pion events
  - Uniform p, ϕ, η distribution
  - p range 0 to 60 GeV, η range -3.5 to 3.5 (can increase to -4 to 4)

	bin_number	eta_low	eta_high	p_min	p_max	pT_min	pT_max
0	1	-3.5	-3.0	0	15	0	5
1	2	-3.0	-2.5	0	15	0	5
2	3	-2.5	-2.0	0	15	0	5
3	4	-2.0	-1.5	0	15	0	10
4	5	-1.5	-1.0	0	15	0	10
5	6	-1.0	-0.5	0	15	0	15
6	7	-0.5	0.0	0	15	0	15
7	8	0.0	0.5	0	15	0	15
8	9	0.5	1.0	0	15	0	10
9	10	1.0	1.5	0	15	0	10
10	11	1.5	2.0	0	15	0	5
11	12	2.0	2.5	0	30	0	5
12	13	2.5	3.0	0	30	0	5
13	14	3.0	3.5	0	60	0	5

Kinematic limits of low beam energy (5x41GeV)

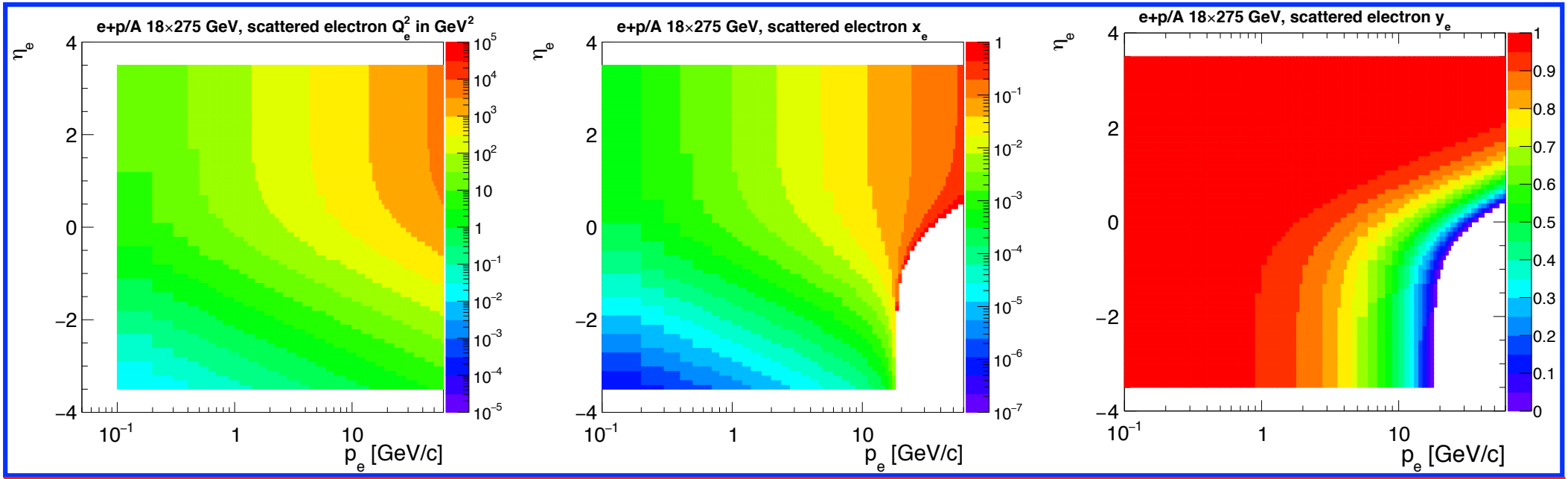
- Kinematic limit for **electron** and **jet current**: $0<x<1$, $0<y<1$, $Q^2>0$

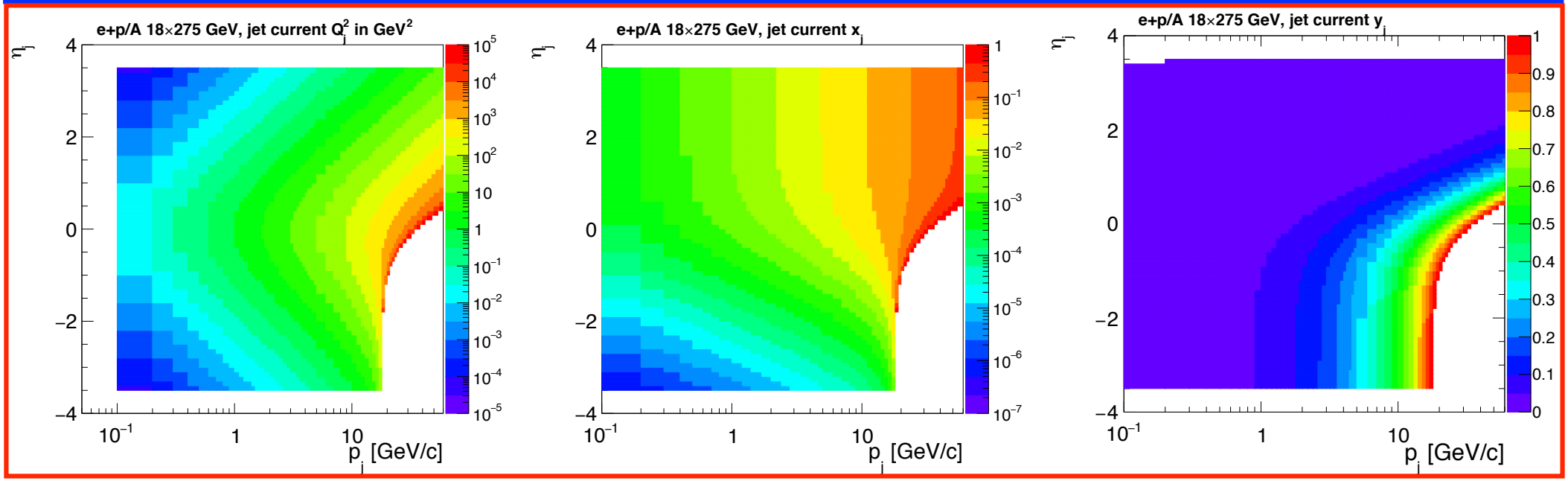




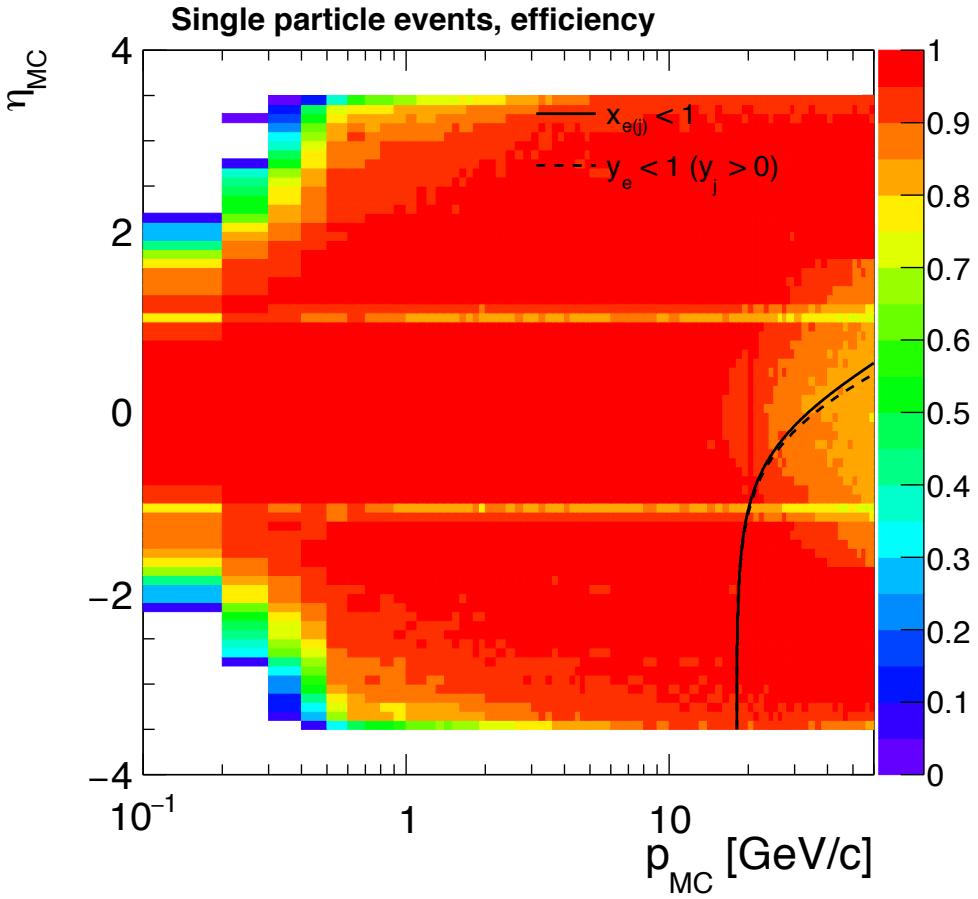
Kinematic limits of high beam energy (18x275GeV)

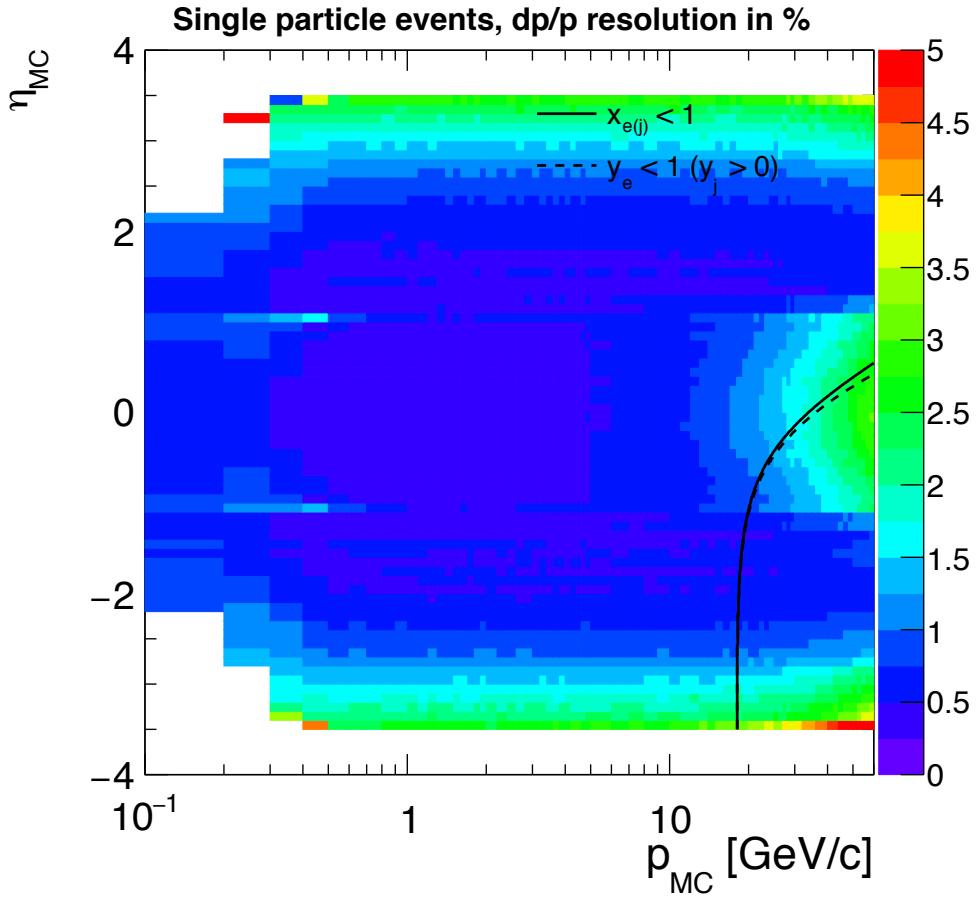
- Kinematic limit for **electron** and **jet current**: $0<x<1$, $0<y<1$, $Q^2>0$





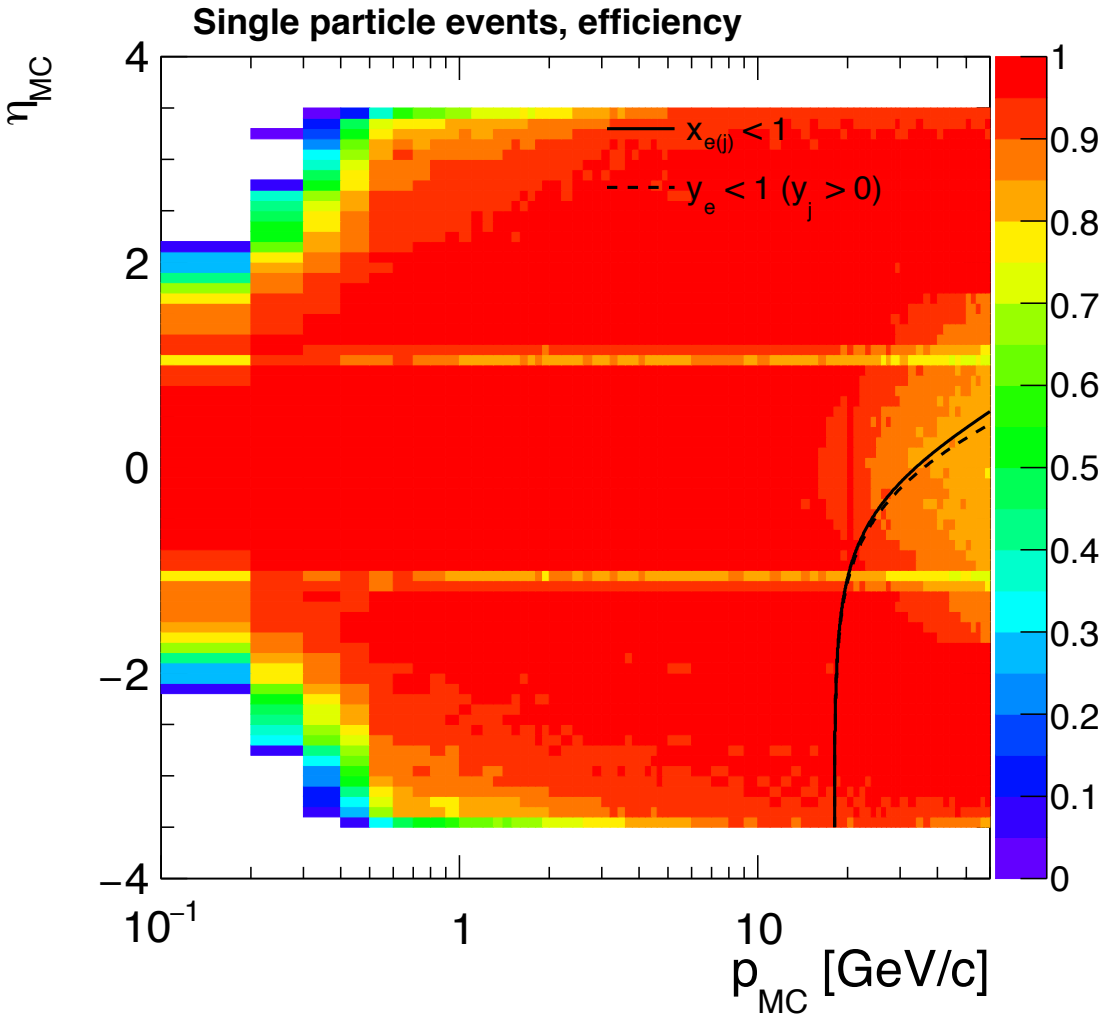
Kinematic limits for tracking performance

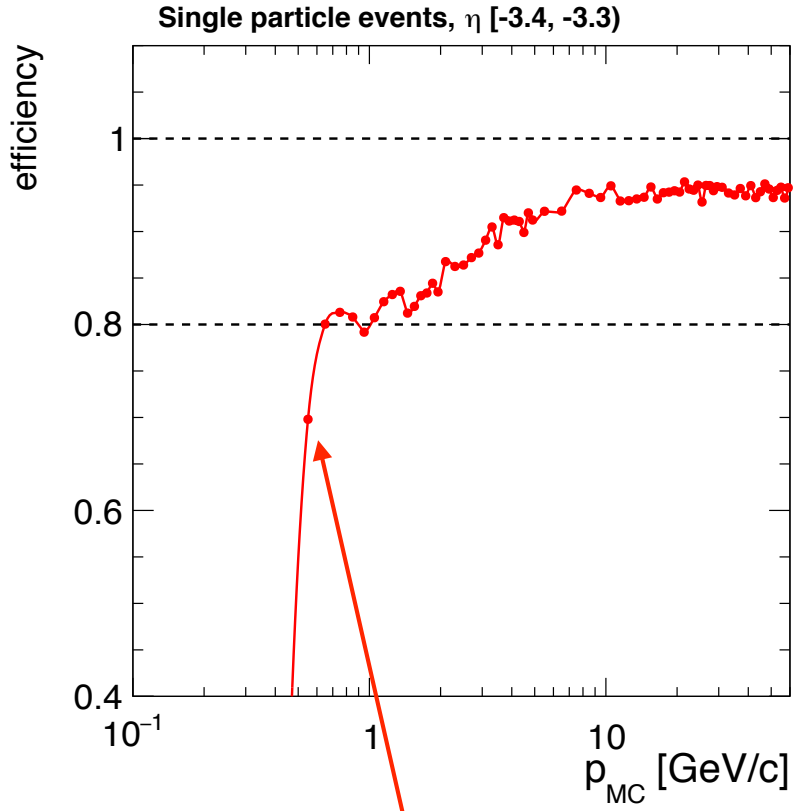




Efficiency decrease towards low p

- Require at least 3 hits, and hit $\chi^2<40$

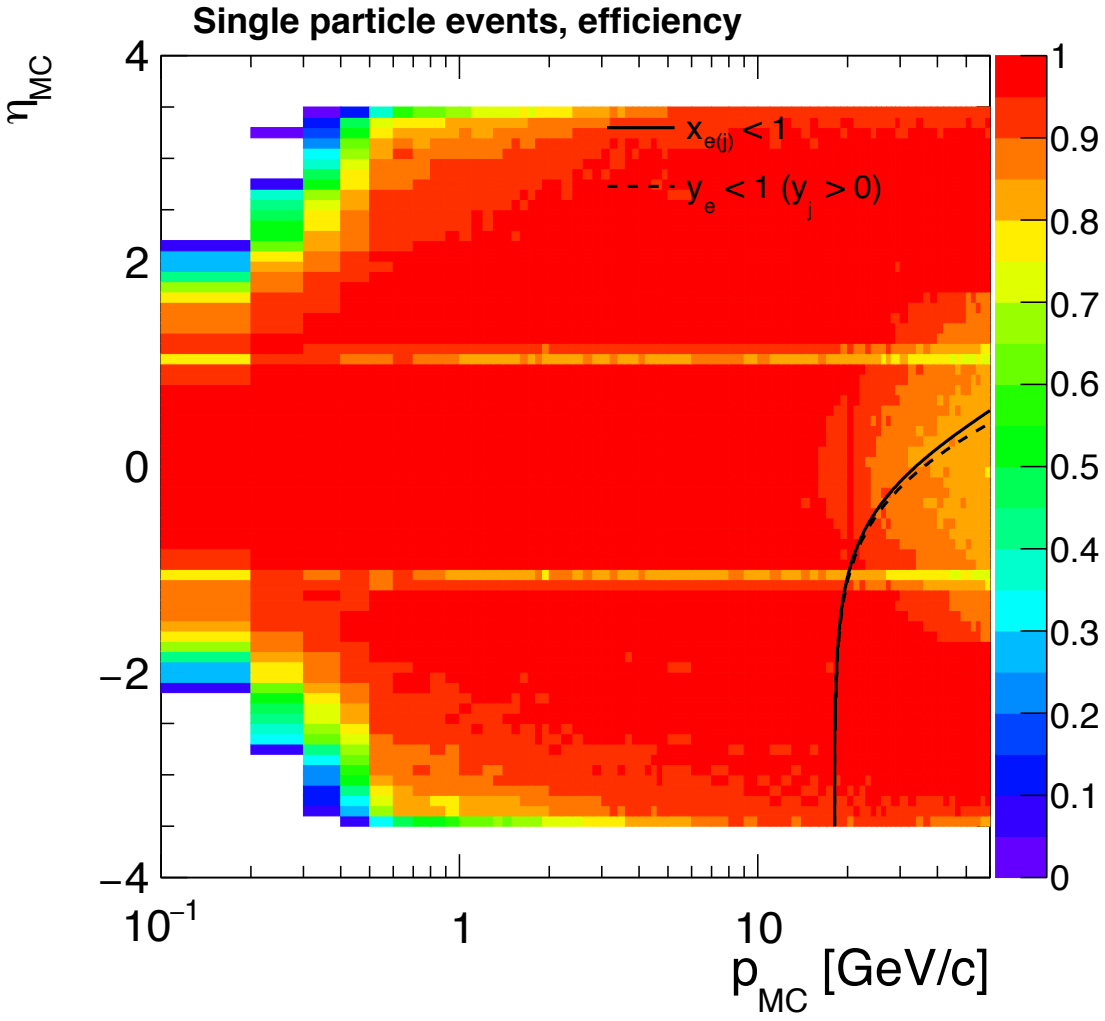


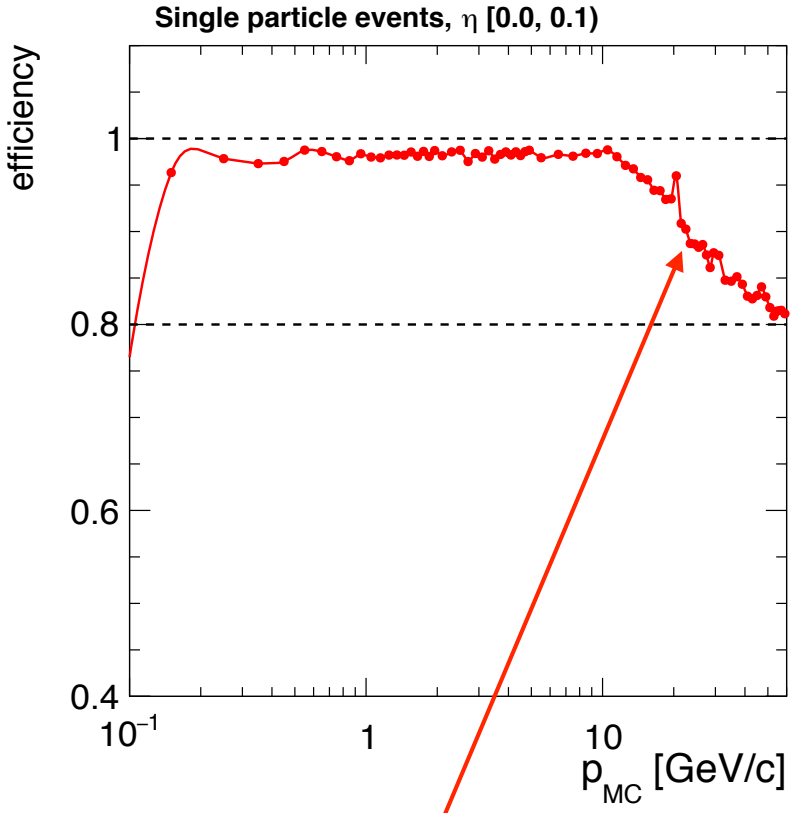


# of hits decrease towards lower p

Efficiency decrease towards high p

- Require at least 3 hits, and hit $\chi^2<40$

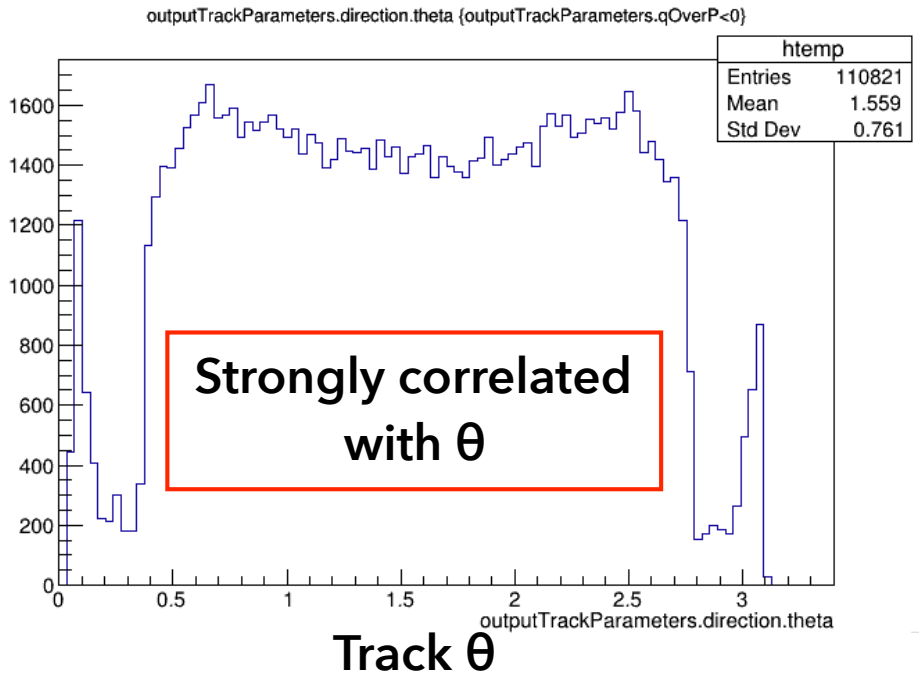


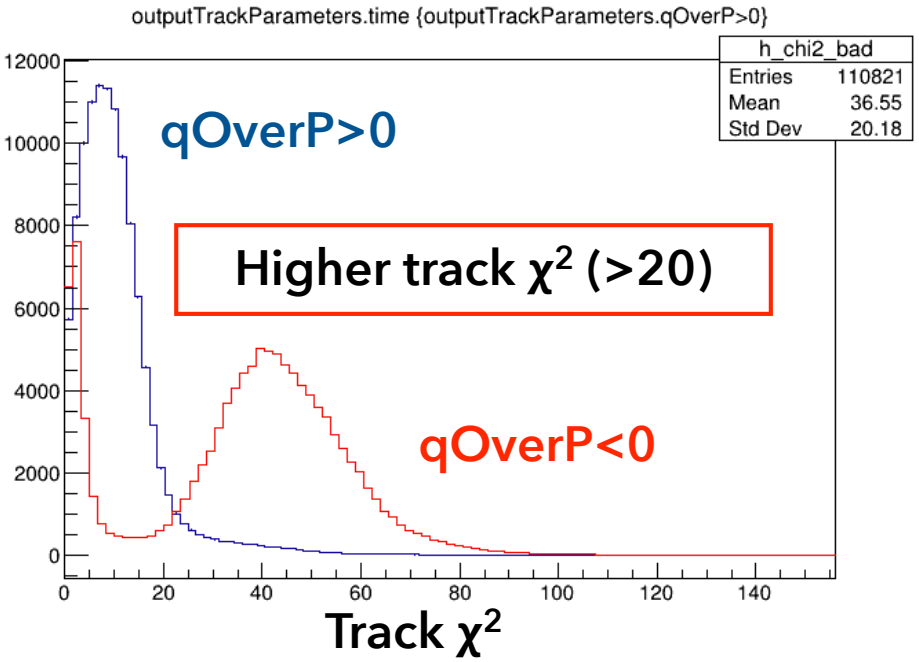


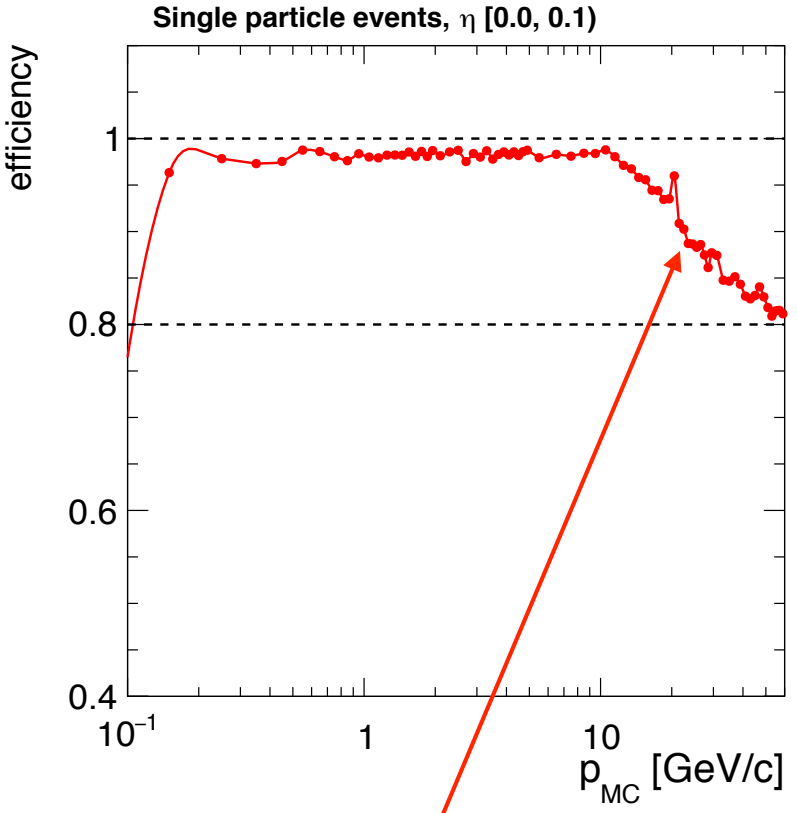
Charged reconstructed to the opposite side

More than 70% of the tracks has 9 hits

Efficiency decrease towards high p





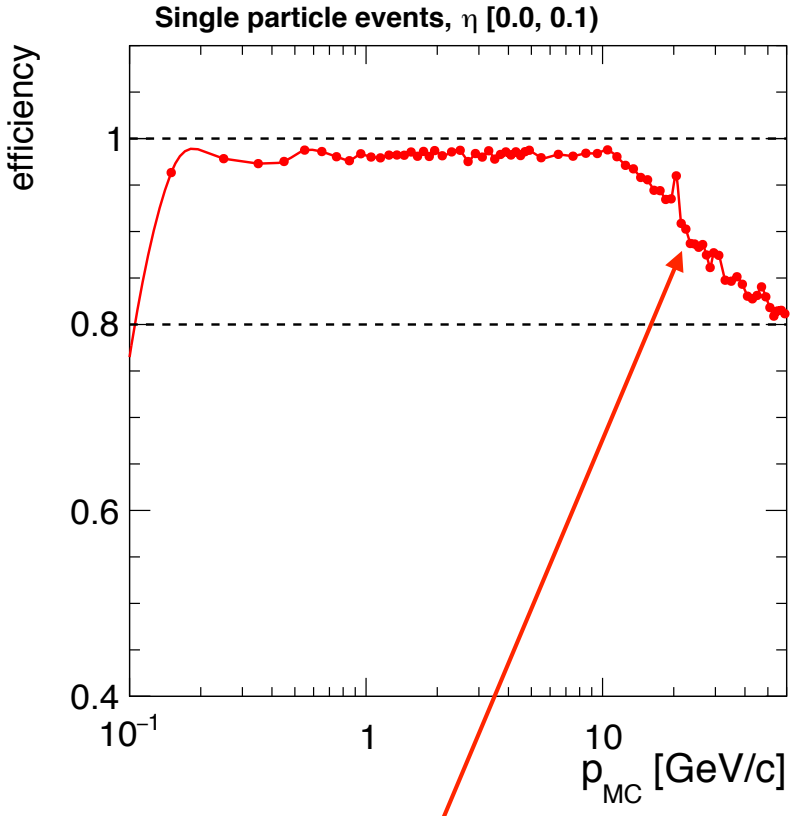


Charged reconstructed to the opposite side

More than 70% of the tracks has 9 hits

Efficiency decrease towards high p

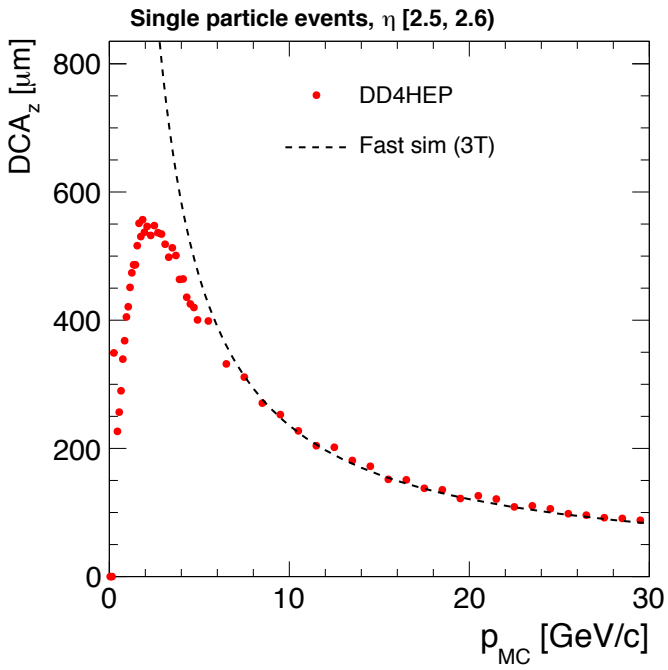
- Efficiency drop at high p seems to be reconstruction problem
  - Hits map doesn't show dead area
  - Raw hits on tracker look reasonable
- Should be able to be fixed by fine-tuning the track reconstruction algorithm
- **Checked again the previous acadia output with χ^2<25 cut**
  - Efficiency is ~98% at 50GeV and η~0
- Re-run reconstruction with χ^2<25 cut

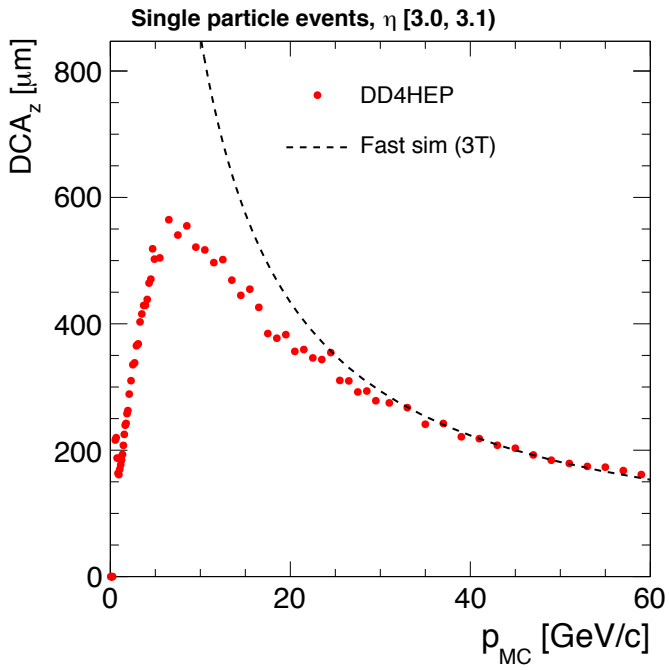


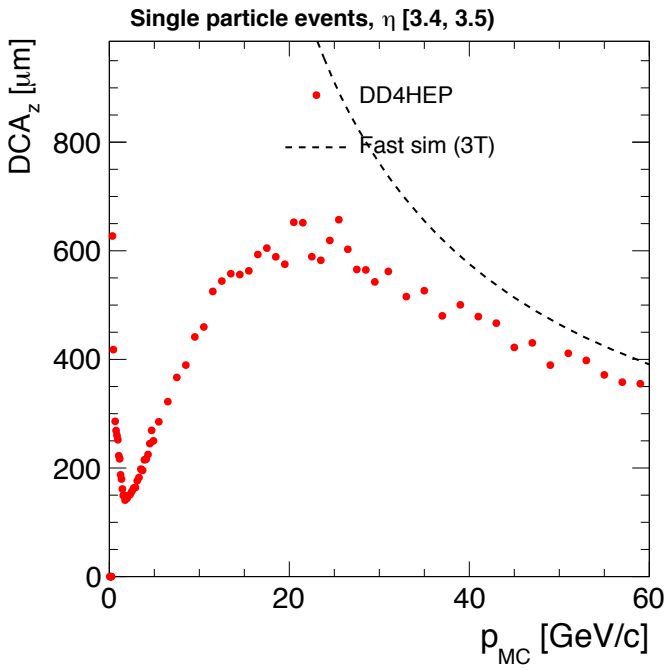
Charged reconstructed to the opposite side

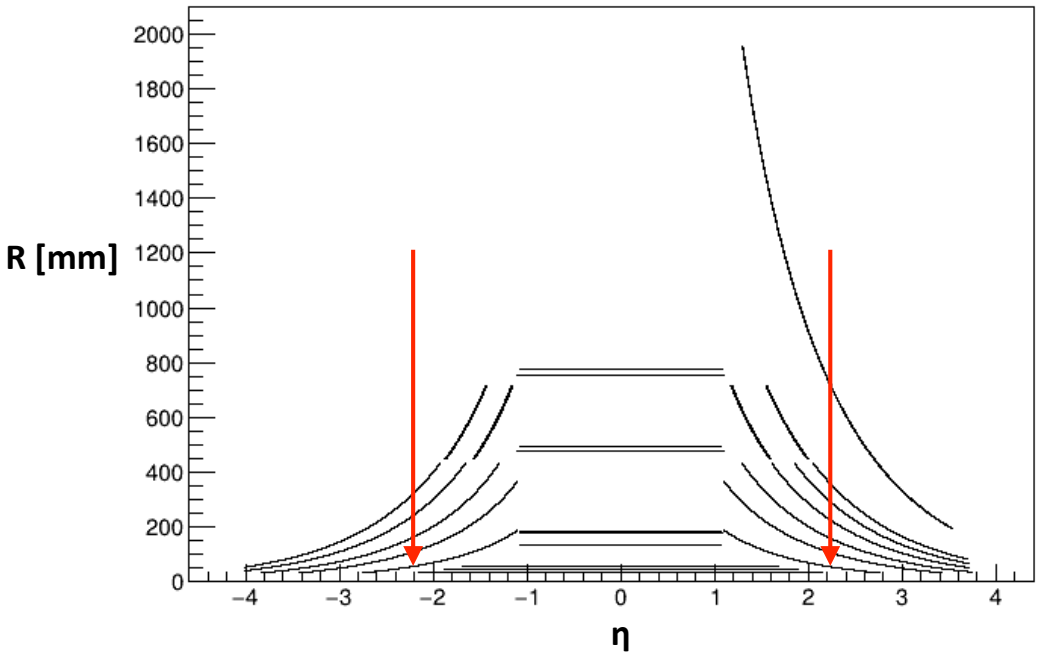
More than 70% of the tracks has 9 hits

DCA_z performance with baseline2







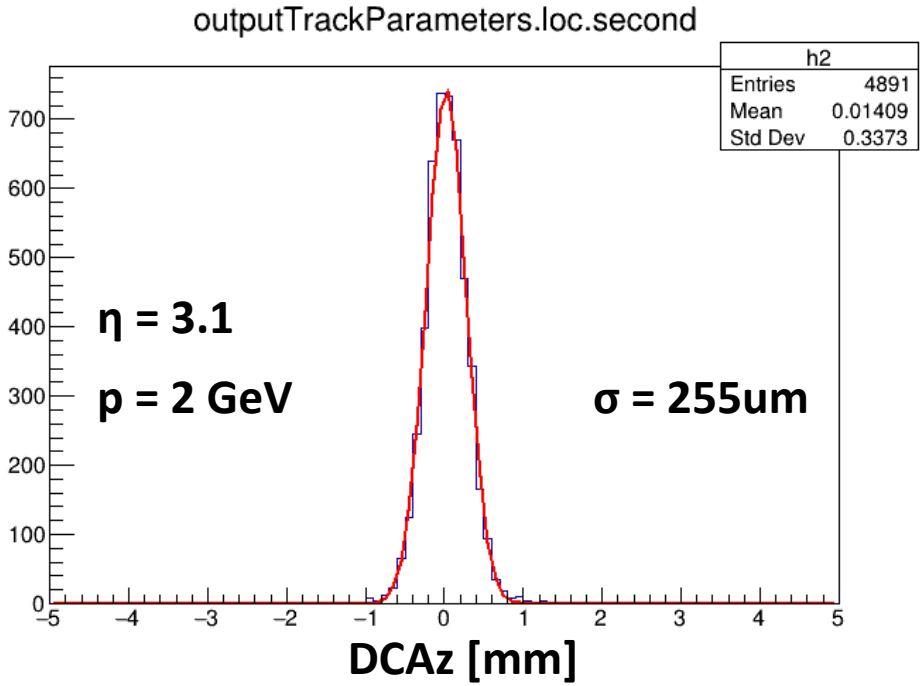


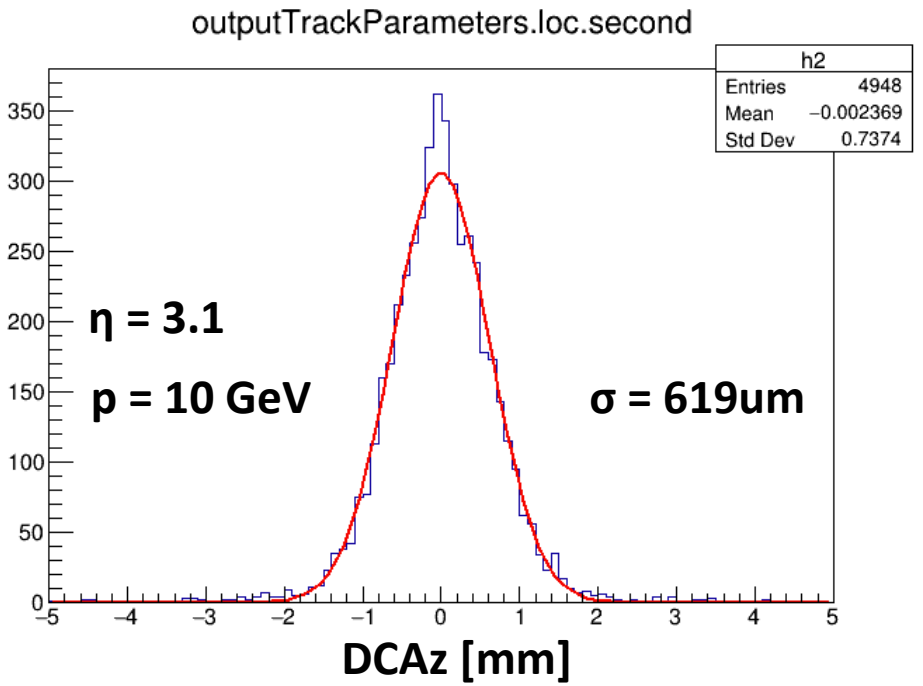
The decrease of DCA_z shows up when tracks starts missing the vertexing layers

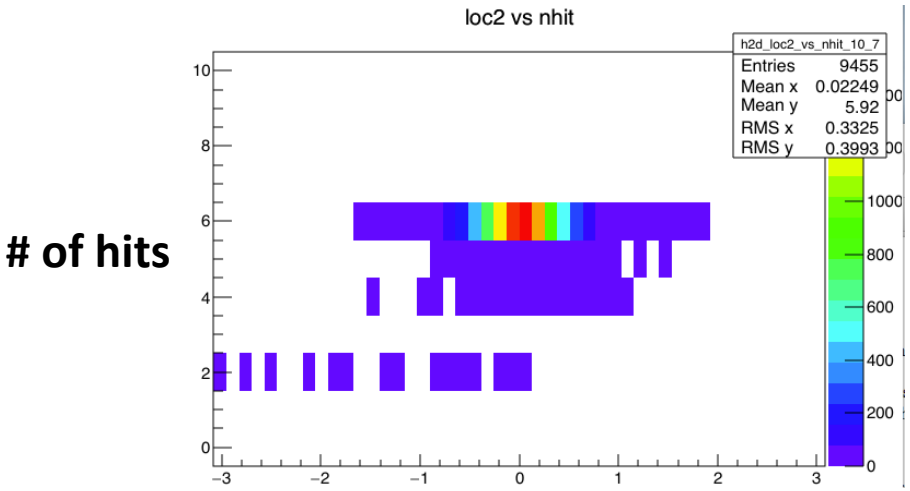
Backward shows same effects

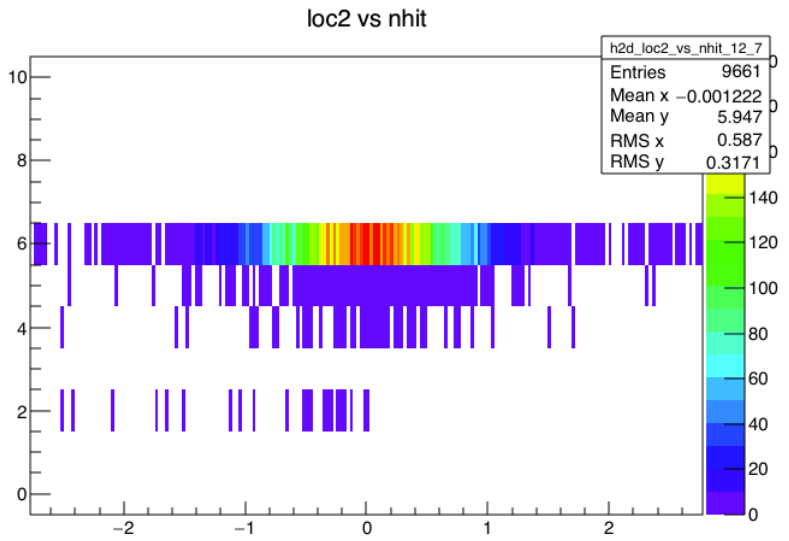
DCA_z performance with baseline2

- DCA_z distribution looks like gaussian in low p









What do I know so far…

- The small DCA_z are related to tracking missing the vertexing layers
  - Puzzled by the p dependence
  - No clear # of hits correlation
  - Not sure if it's more reconstruction algorithm-related or detector geometry related or both
- For proposal
  - Cut off the region which is not well-understood? Or just keep it as it is?

ϕ dependence of DCA_z distribution

- The small DCA_z are related to tracking missing the vertexing layers
  - ϕ dependence of DCA_z observed for the turning-over range (disapearing toward high p and mid rapidity)
  - no ϕ dependence of $DCA_{r\phi}$