Trk, PID, Vtx

C.Zhang/29Nov2024

Trk
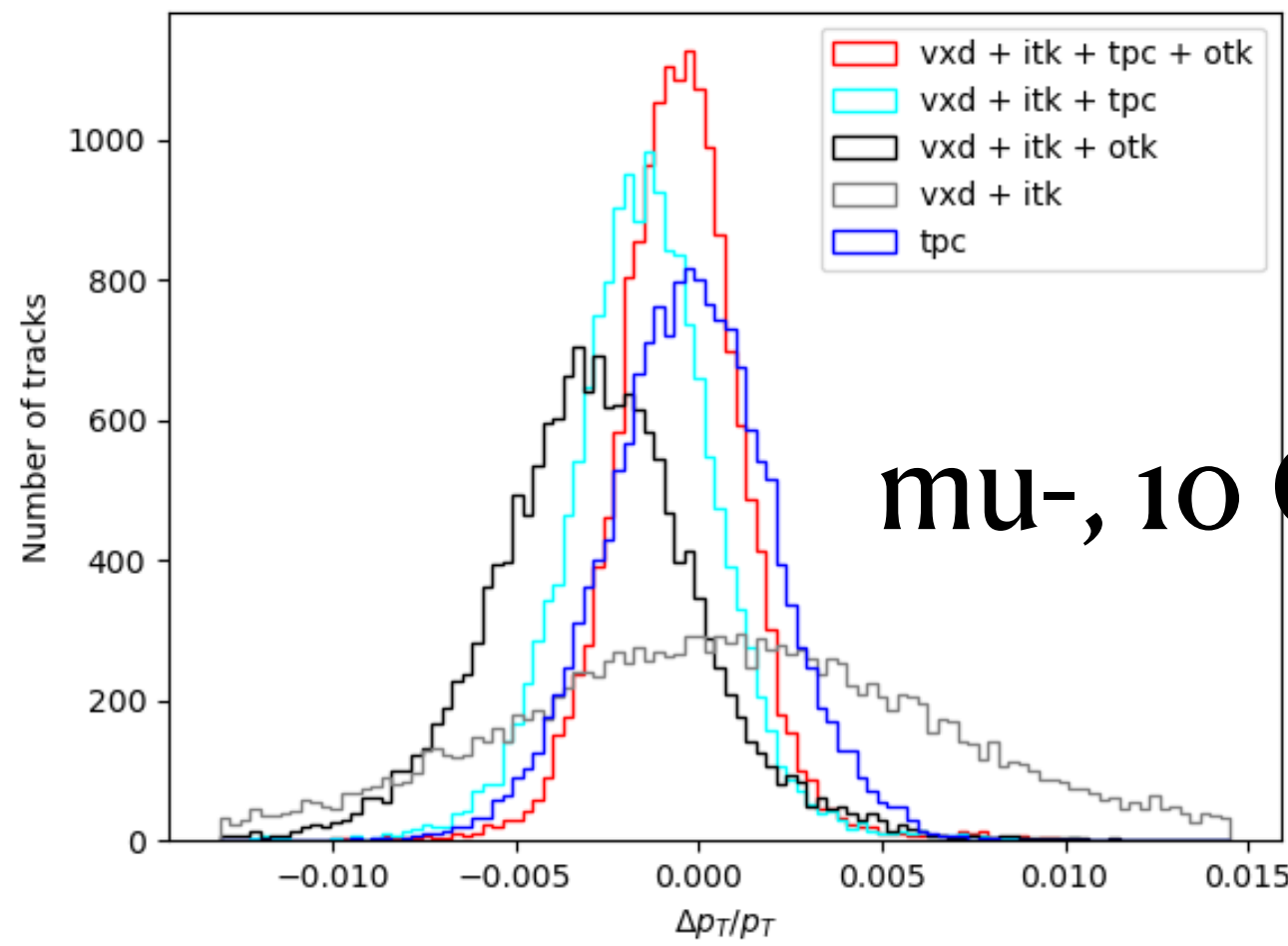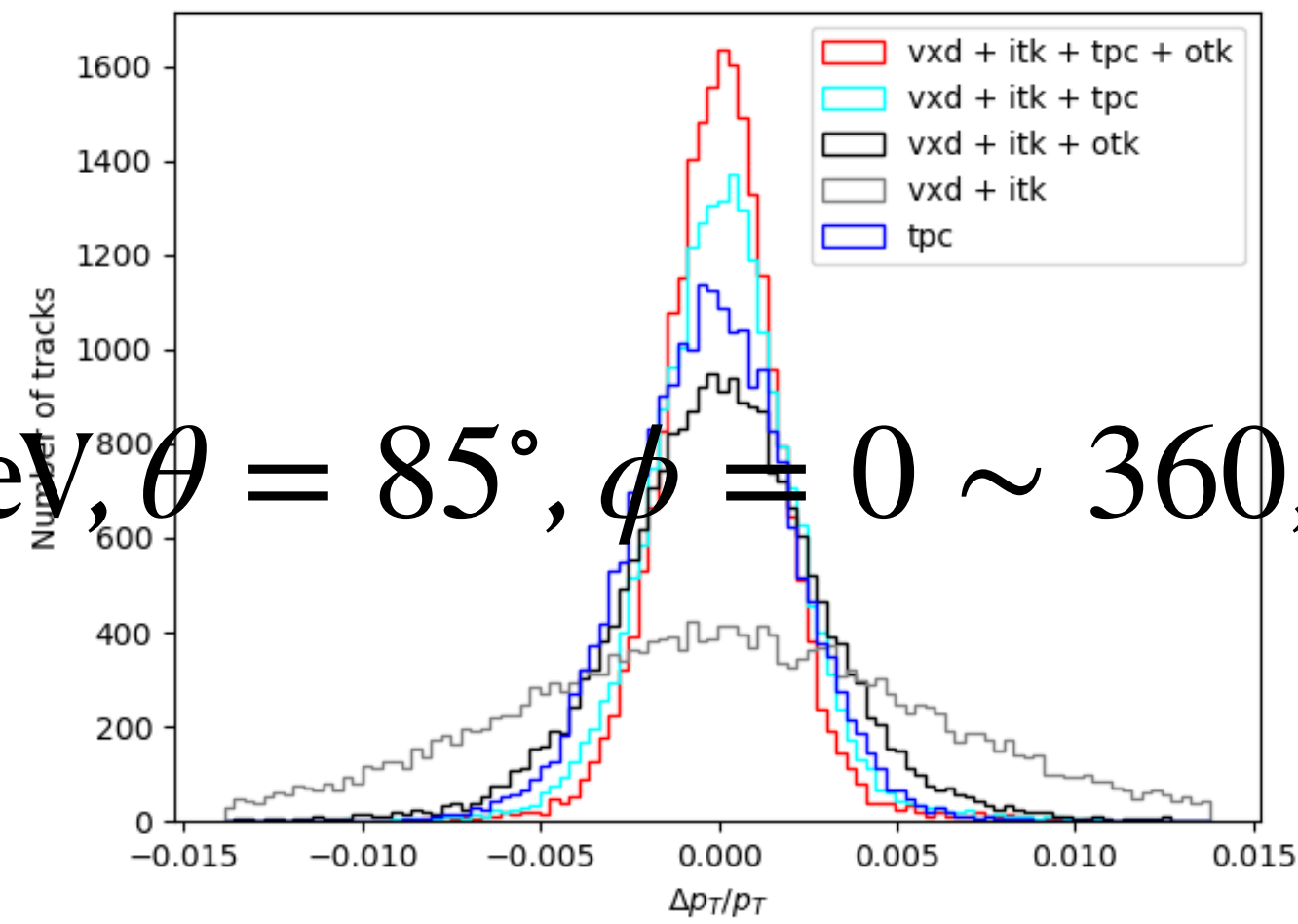
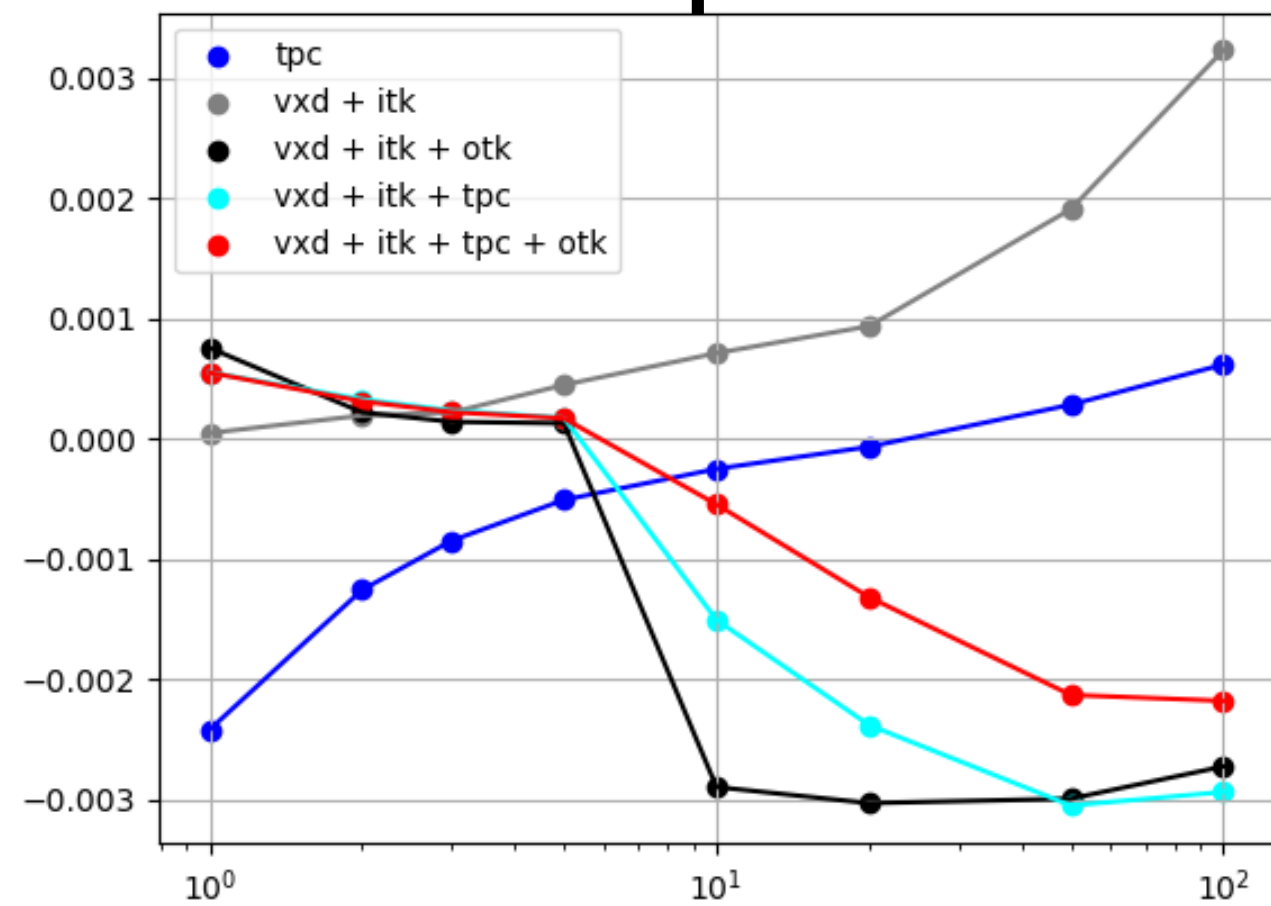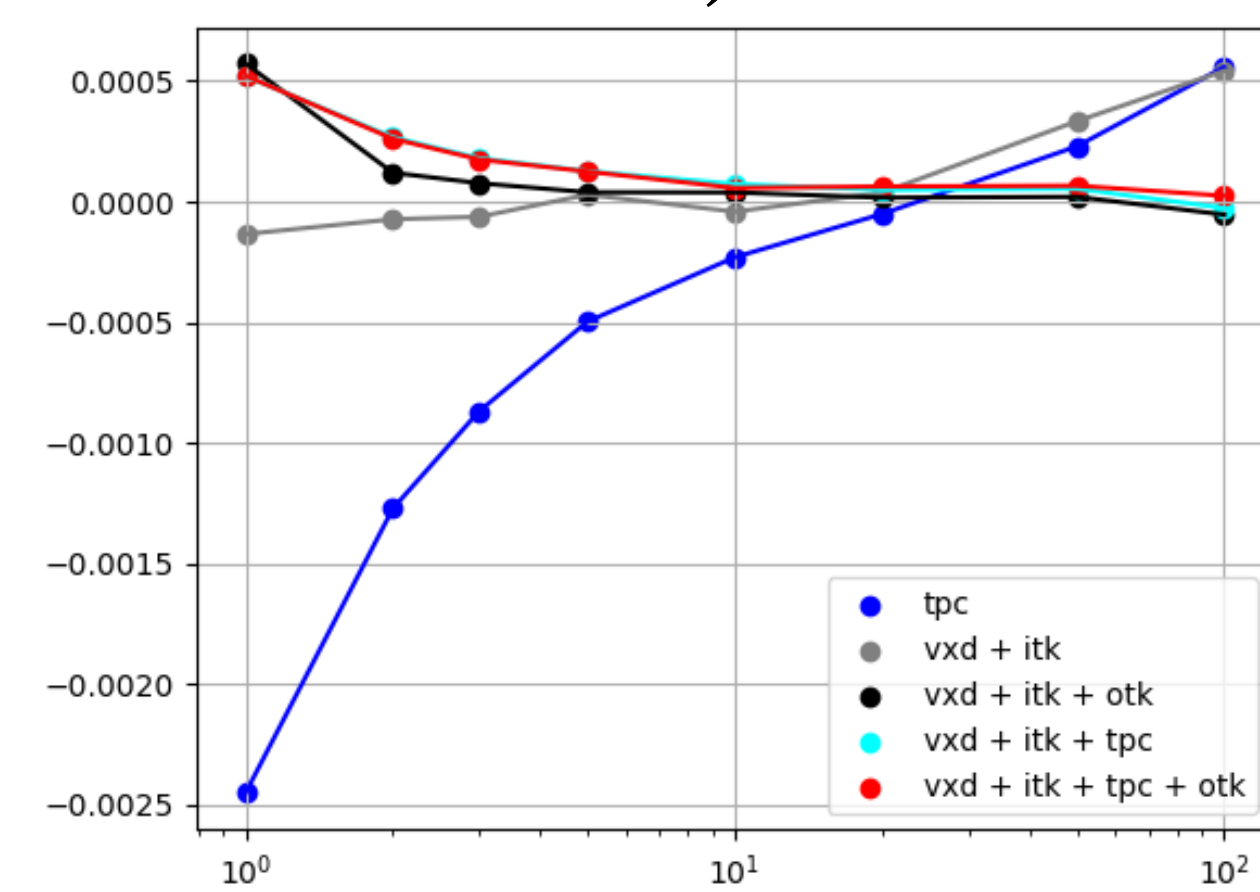$$\text{mu-, 10 GeV}, \theta = 85°, \phi = 0 \sim 360,$$

- New contributions eliminate silicon trk pT bias a lot
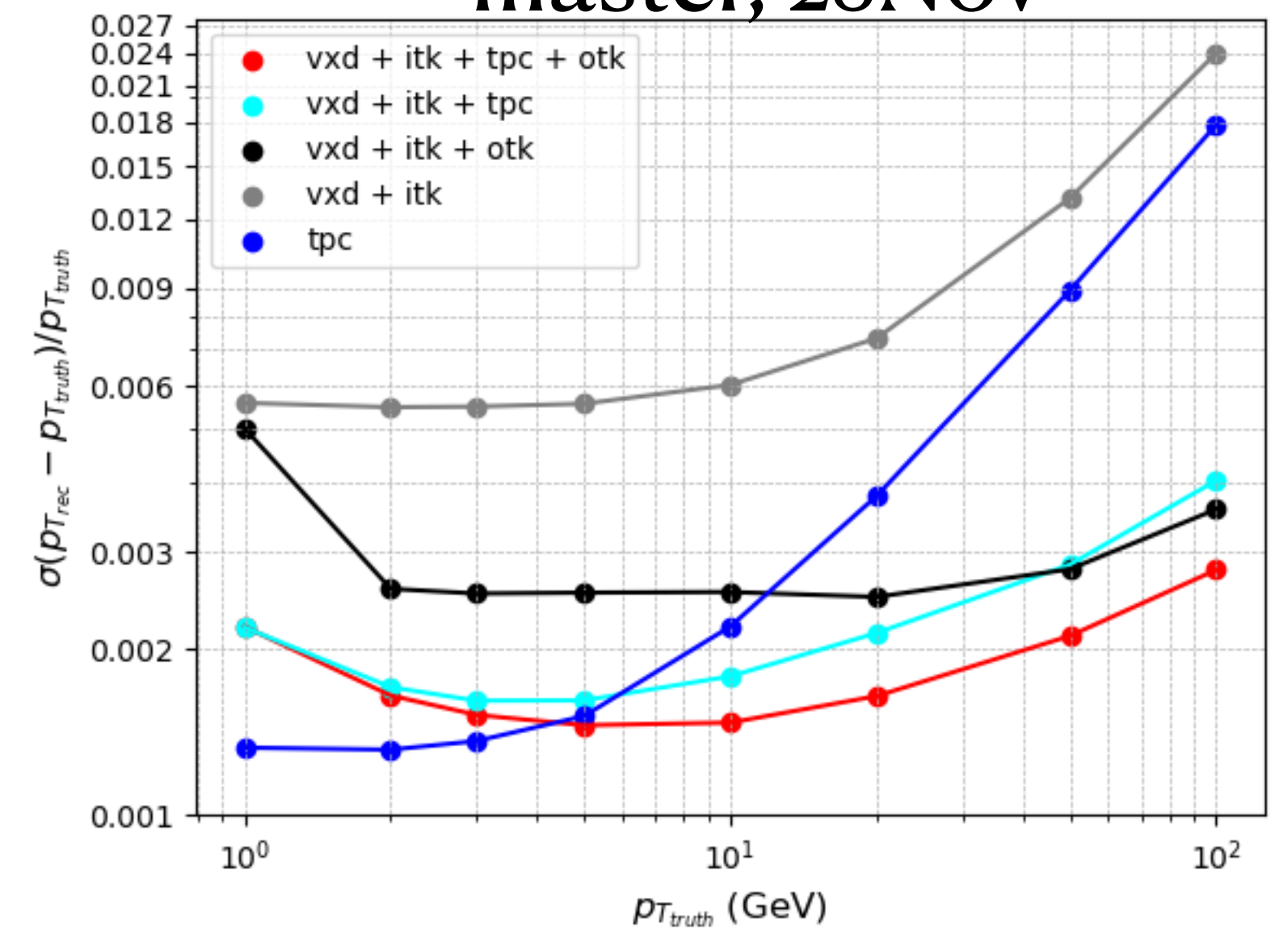
- Resolution issue is there
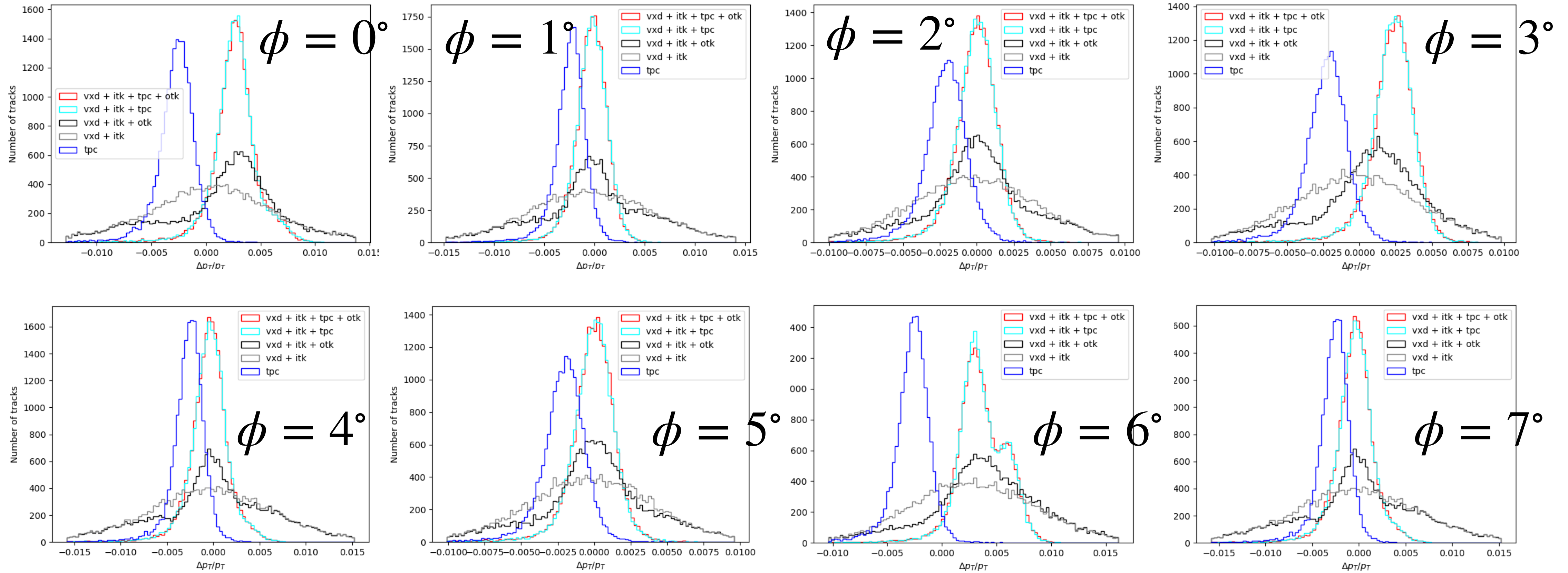
tdr24.10.0

master, 28Nov

master, 28Nov

Trk

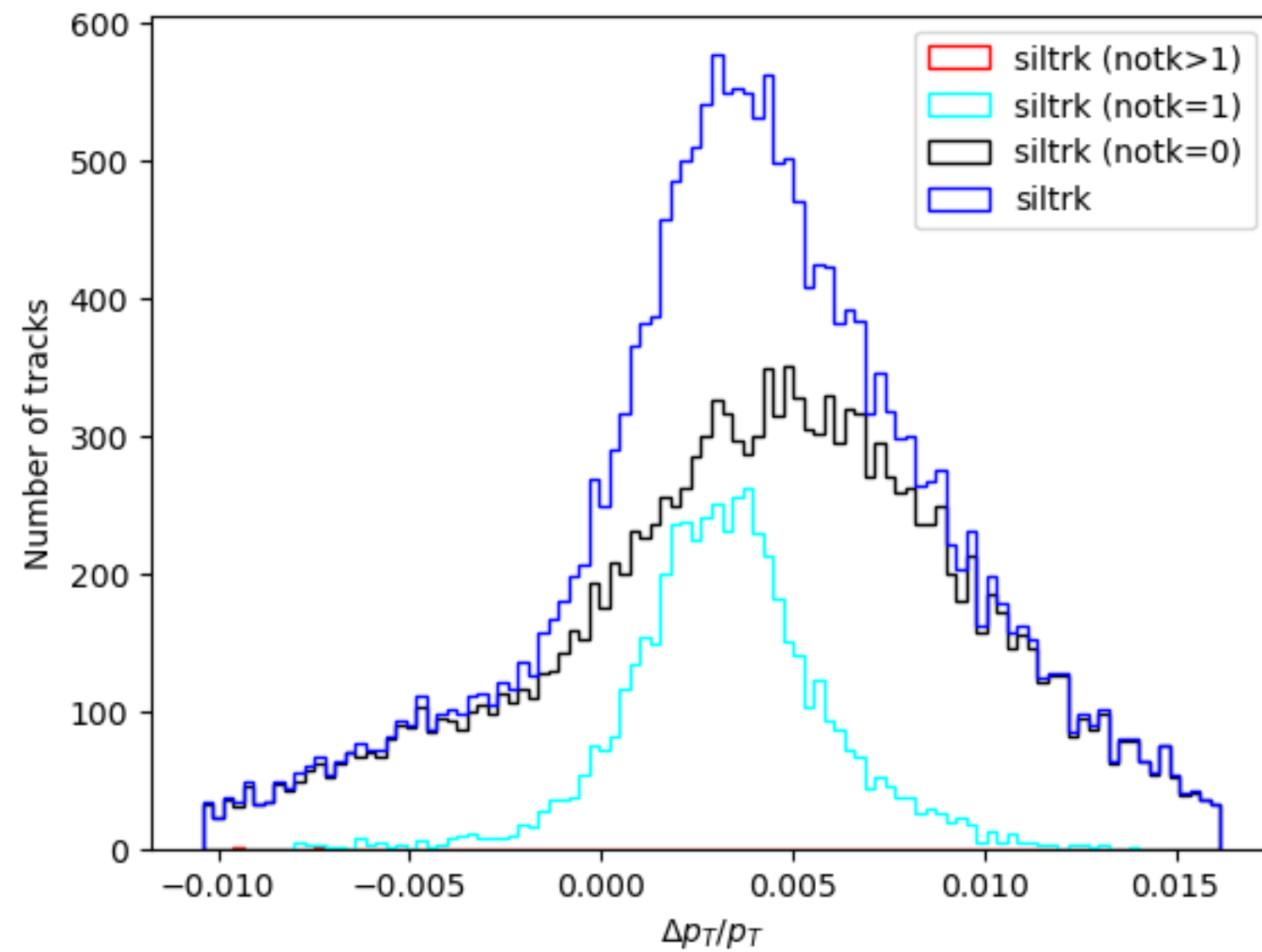- phi scan @ 1 GeV $\theta = 85°$, based on master branch (28Nov)
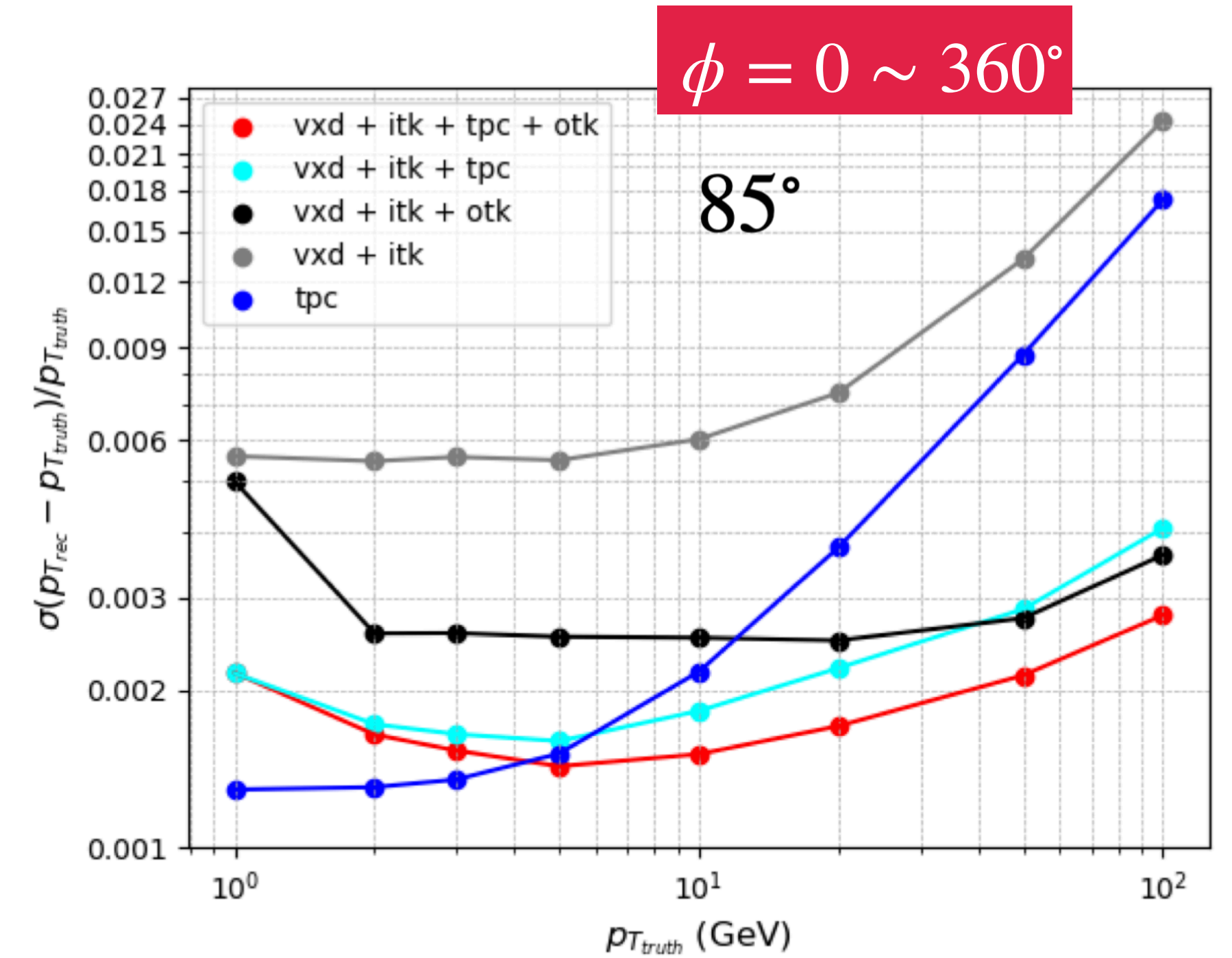

- fultrk with/without otk toggles between 0-0.003

Trk
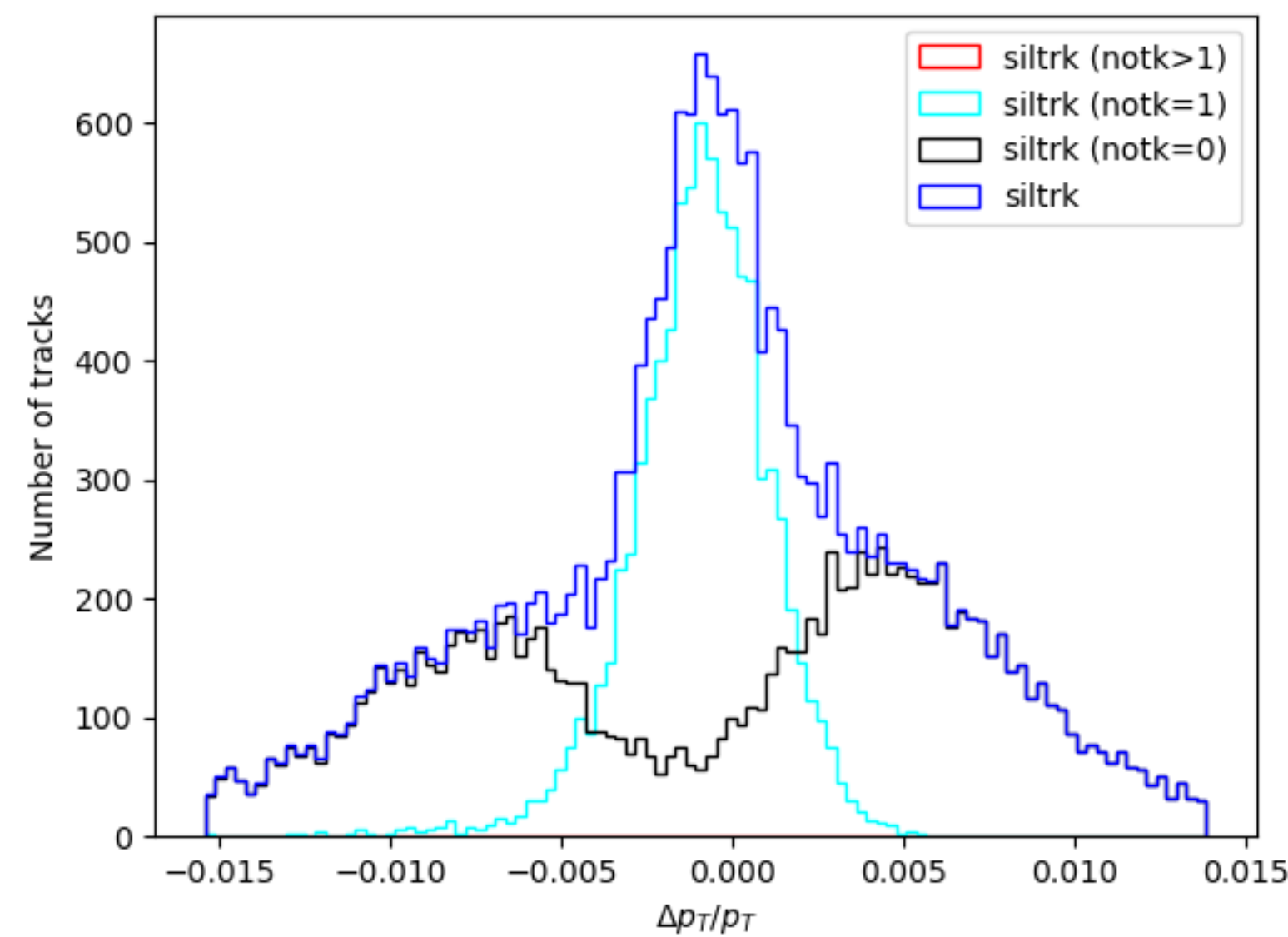
- **A new concern: trk exclusion**

  - pT=1GeV, gray point contaminates black point

  - I mute the otk hits in full-silicon tracking, but some tracks that originally don't have otk hits are still entering the algorithm

85°

$$pT = 1, \theta = 85, \phi = 6$$

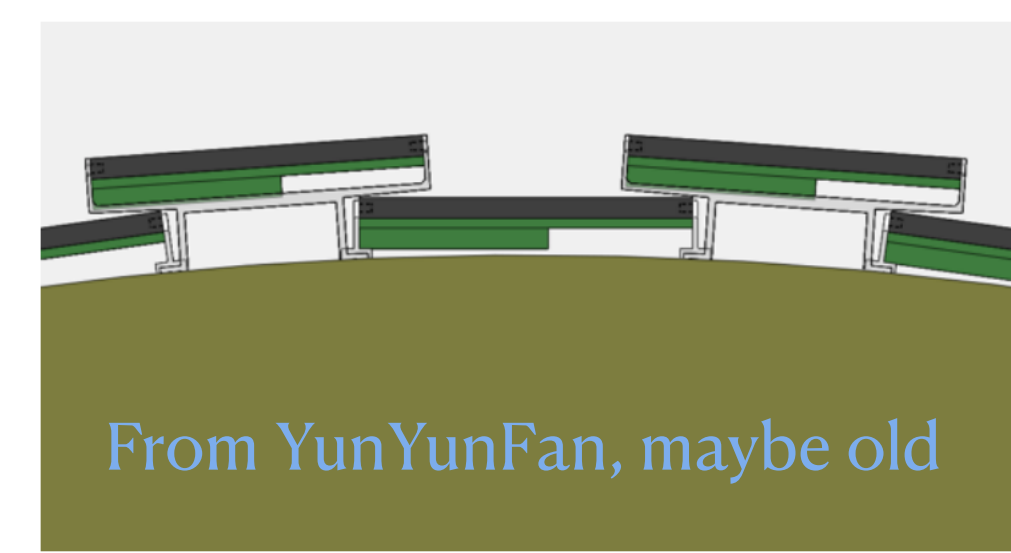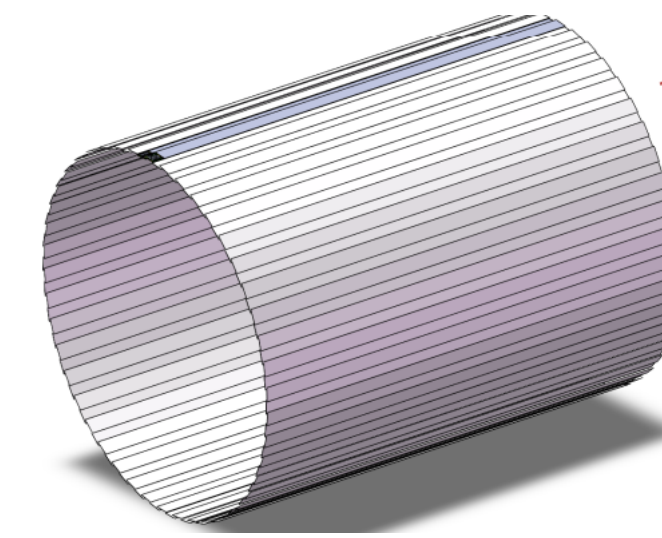$$pT = 1, \theta = 85, \phi = 8$$
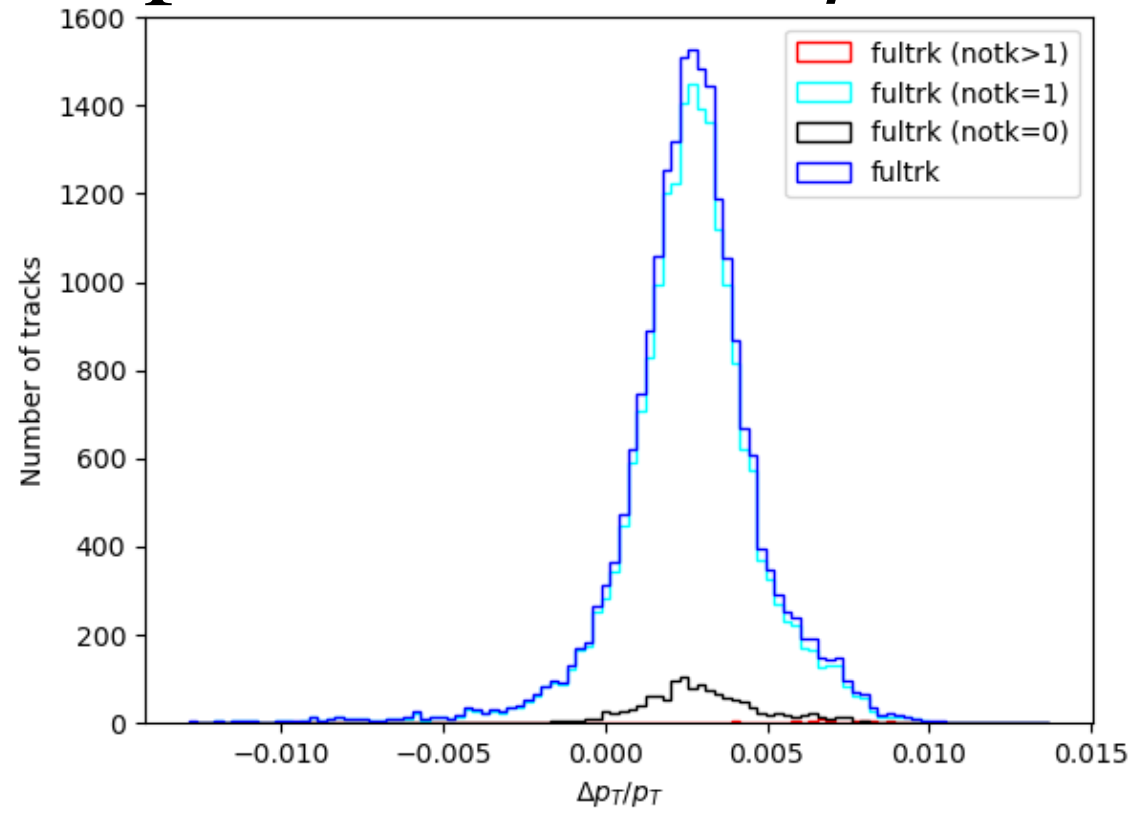

- **This exclusion will be done for all types of tracks**

4

Trk

- **A new concern: OTK double hit**

  - OTK has staircase-like cylindrical surface → double tangential hit

From YunYunFan, maybe old

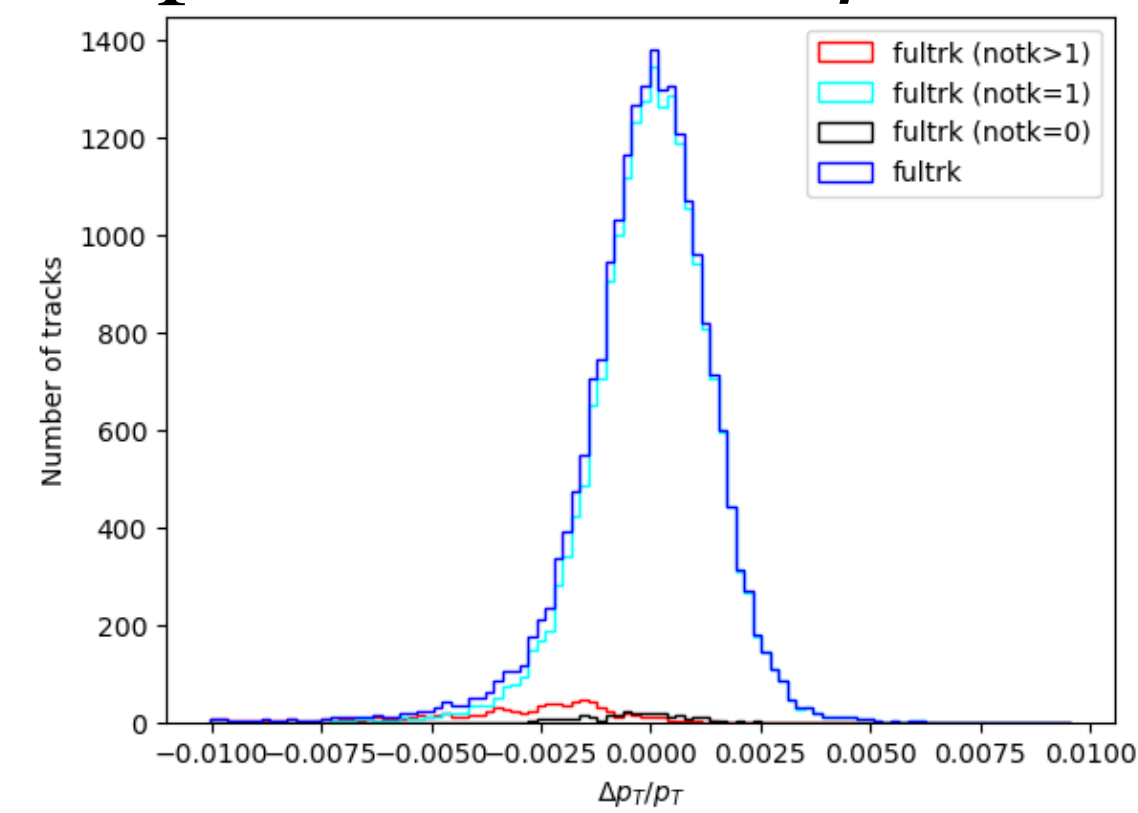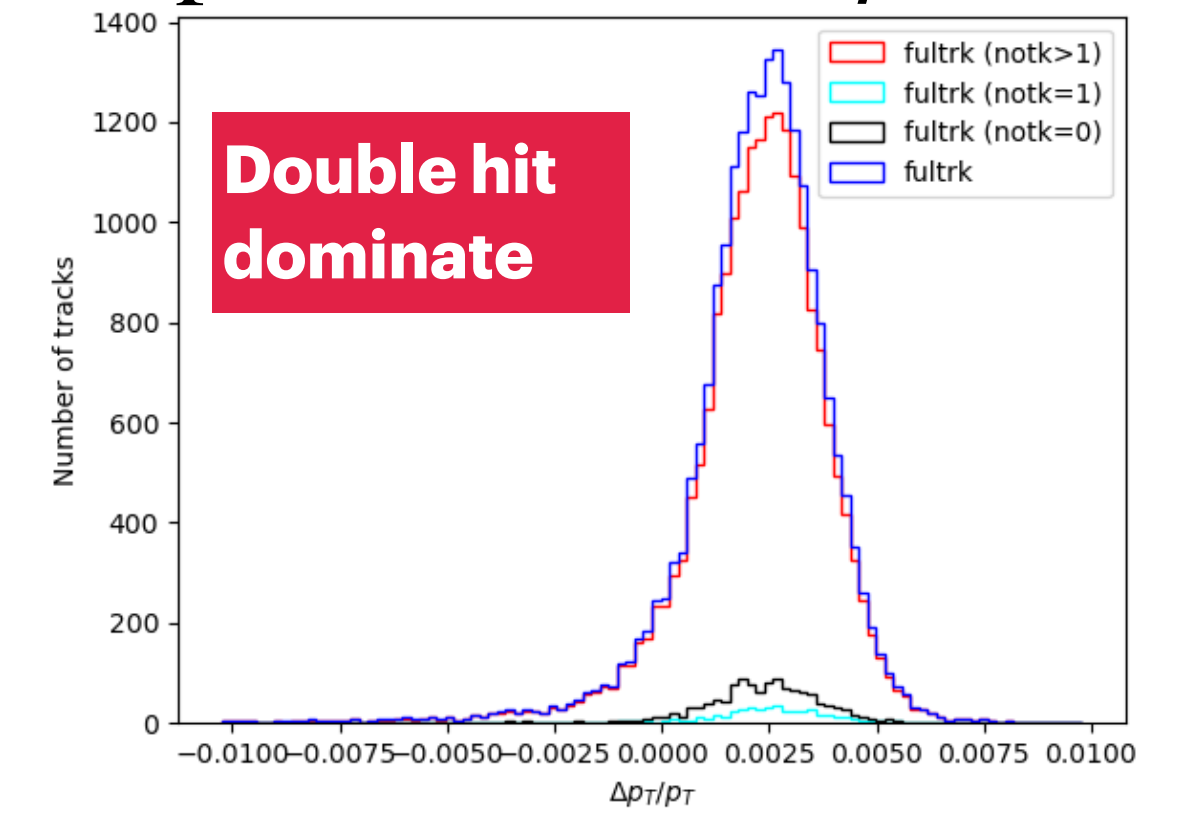$pT = 1, \theta = 85, \phi = 0$

$pT = 1, \theta = 85, \phi = 1$

$pT = 1, \theta = 85, \phi = 2$

$pT = 1, \theta = 85, \phi = 3$

Double hit dominate

$pT = 1, \theta = 85, \phi = 4$

Double/ single split

$pT = 1, \theta = 85, \phi = 5$

$pT = 1, \theta = 85, \phi = 6$

Double/signle exchange

$pT = 1, \theta = 85, \phi = 7$

Double hit disappear
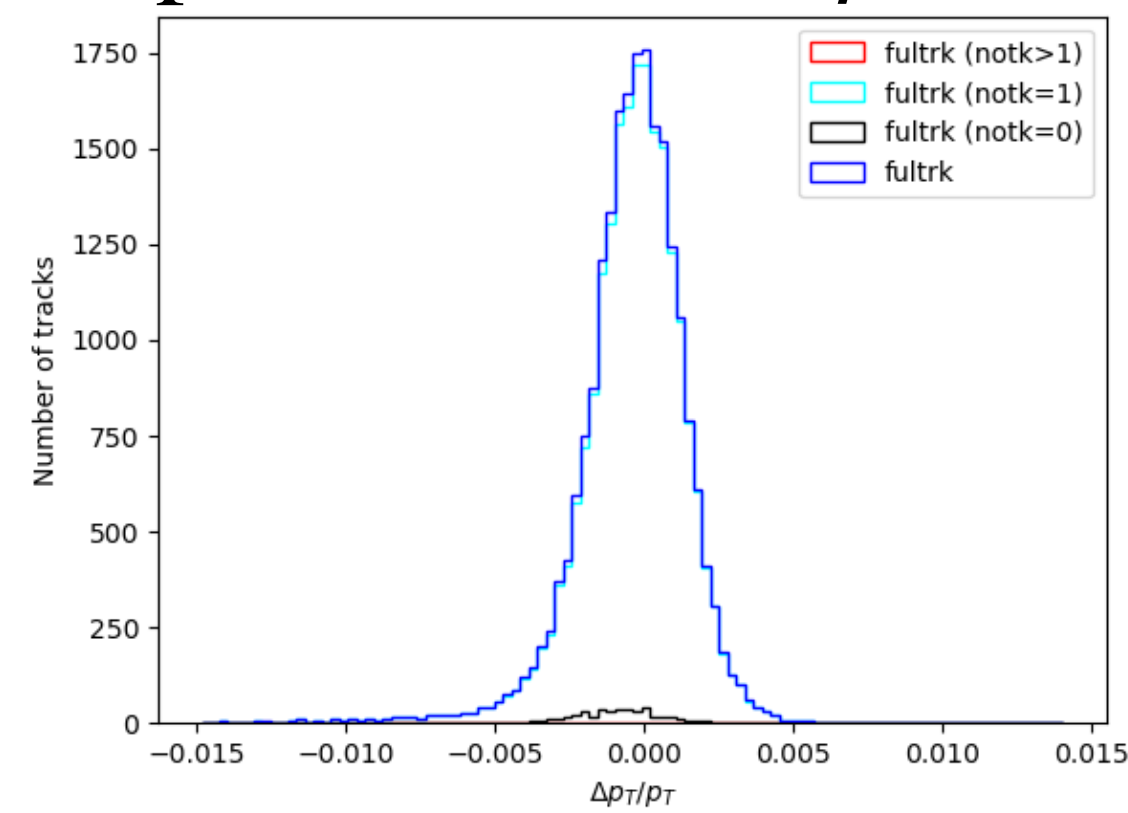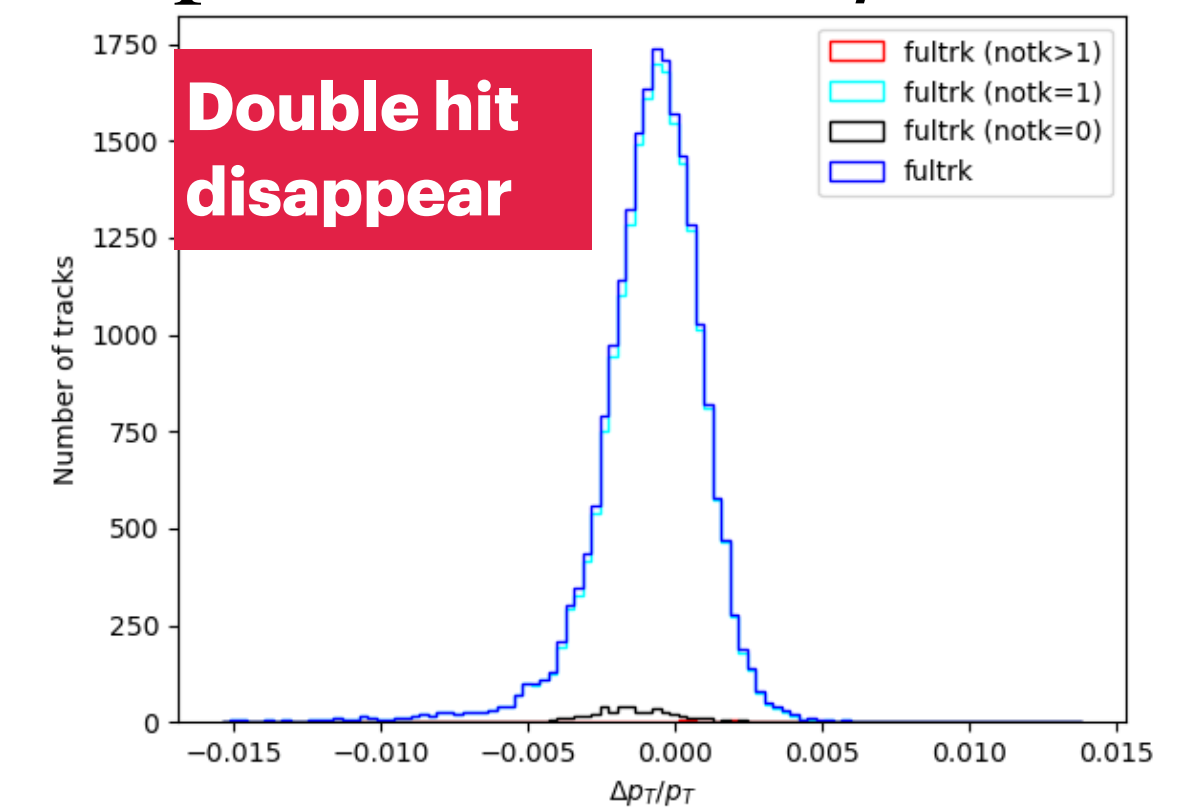
Trk

- Summary & To do

  - Full-silicon, trk exclusion & dbl. hit play roles at 1GeV

  - Complete-trk,

    - Dbl. hit issue is more important

    - Trk exclusion is negligible

  - Hit level surgery will be done for all curves

  - Performance parametrisation

    - $\sigma_{1/pT} = a \oplus \dfrac{b}{pT}$

    - $\sigma_{d_0} = \sqrt{a^2 + b^2 \cdot GeV^2/(p^2 \cdot sin^3(\theta))}$
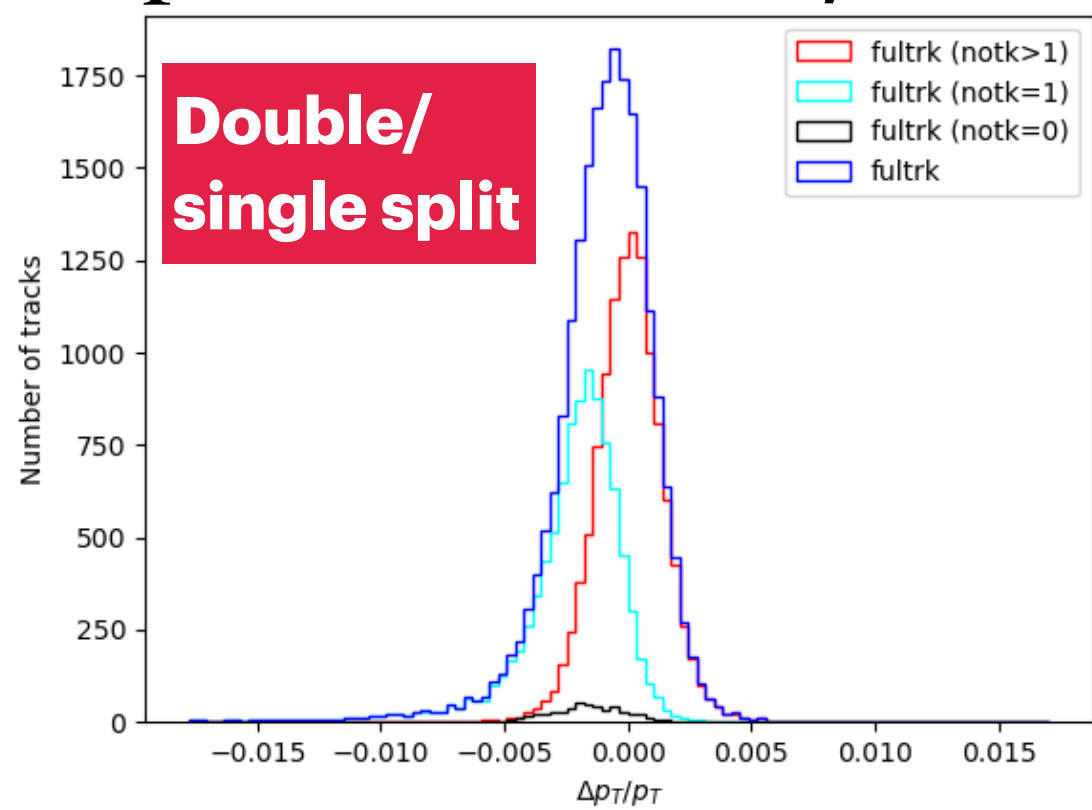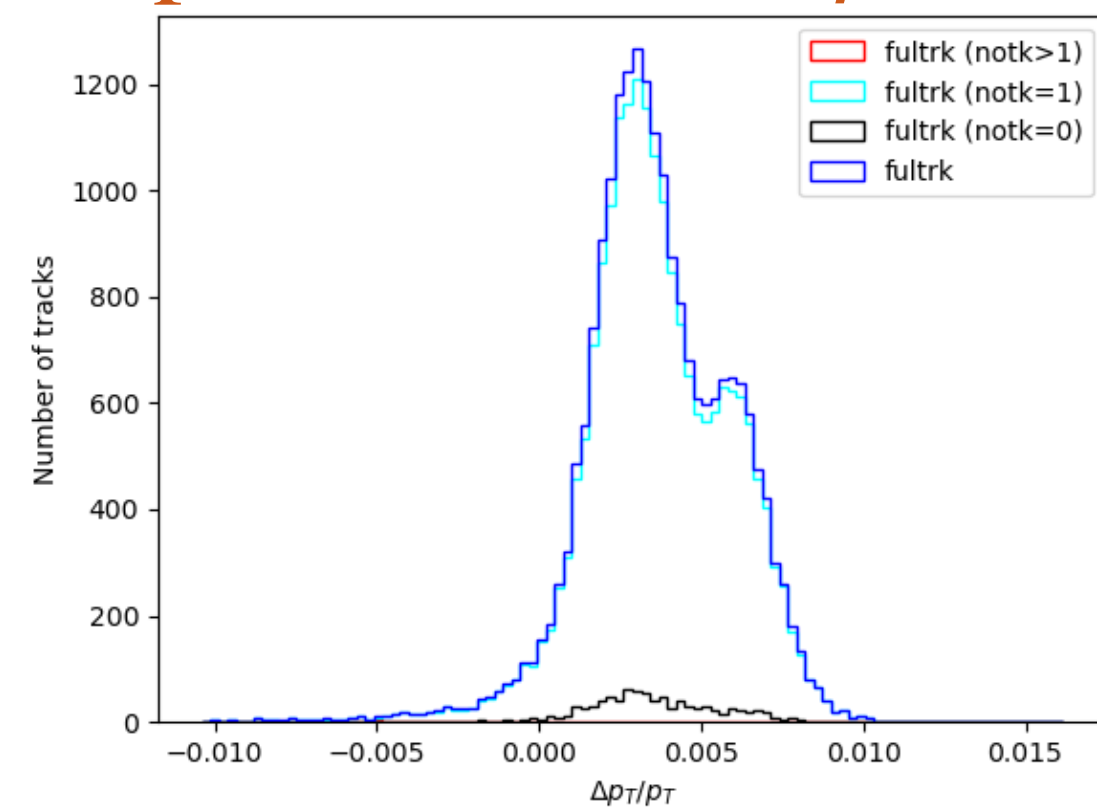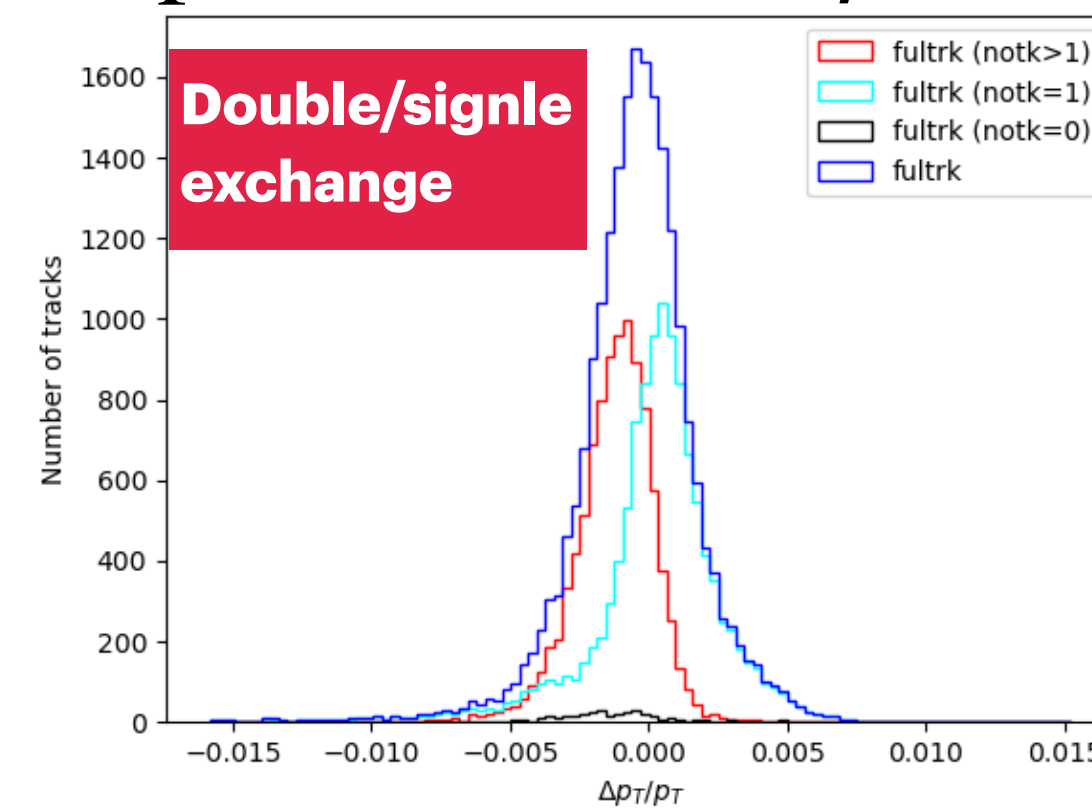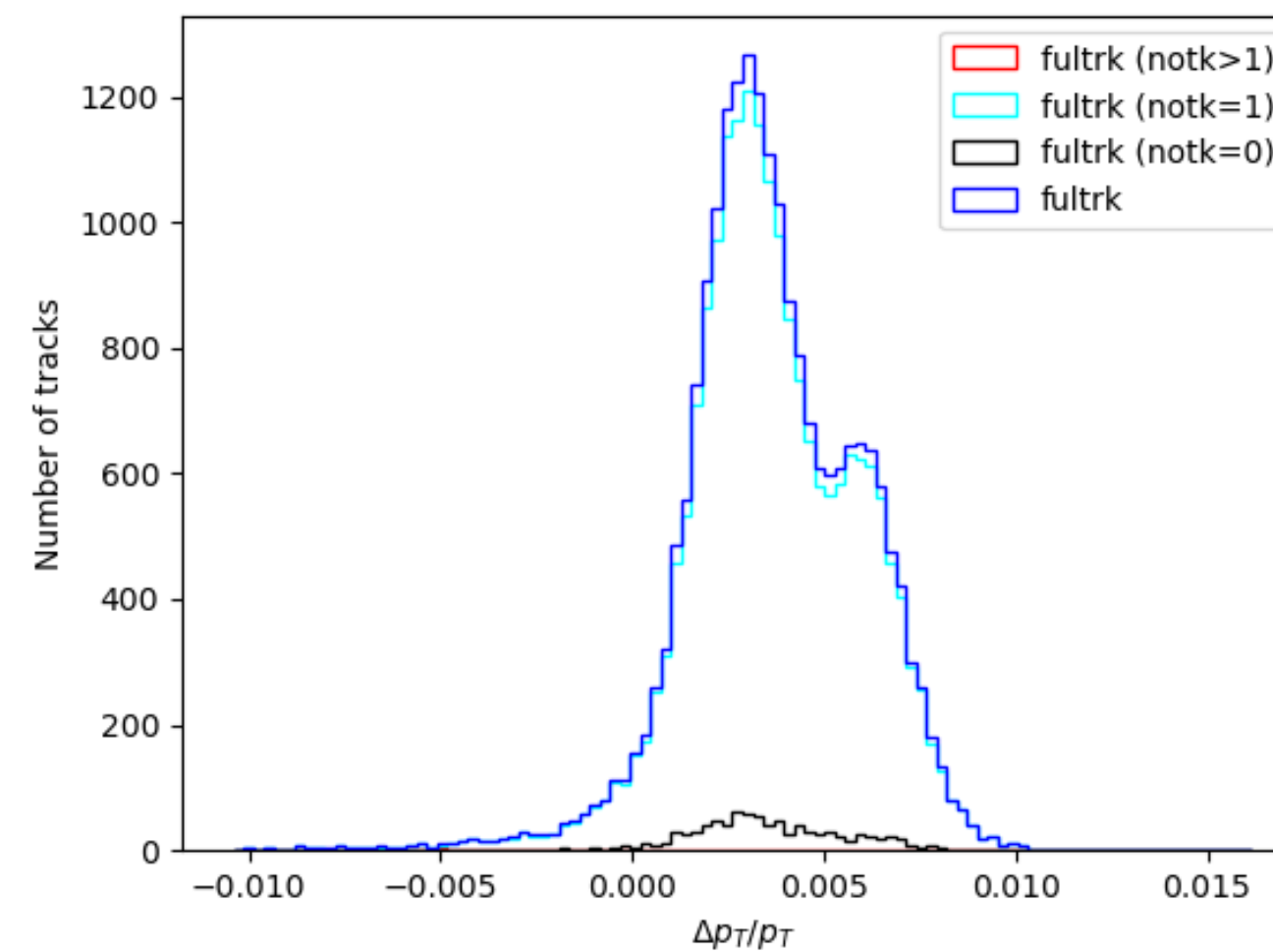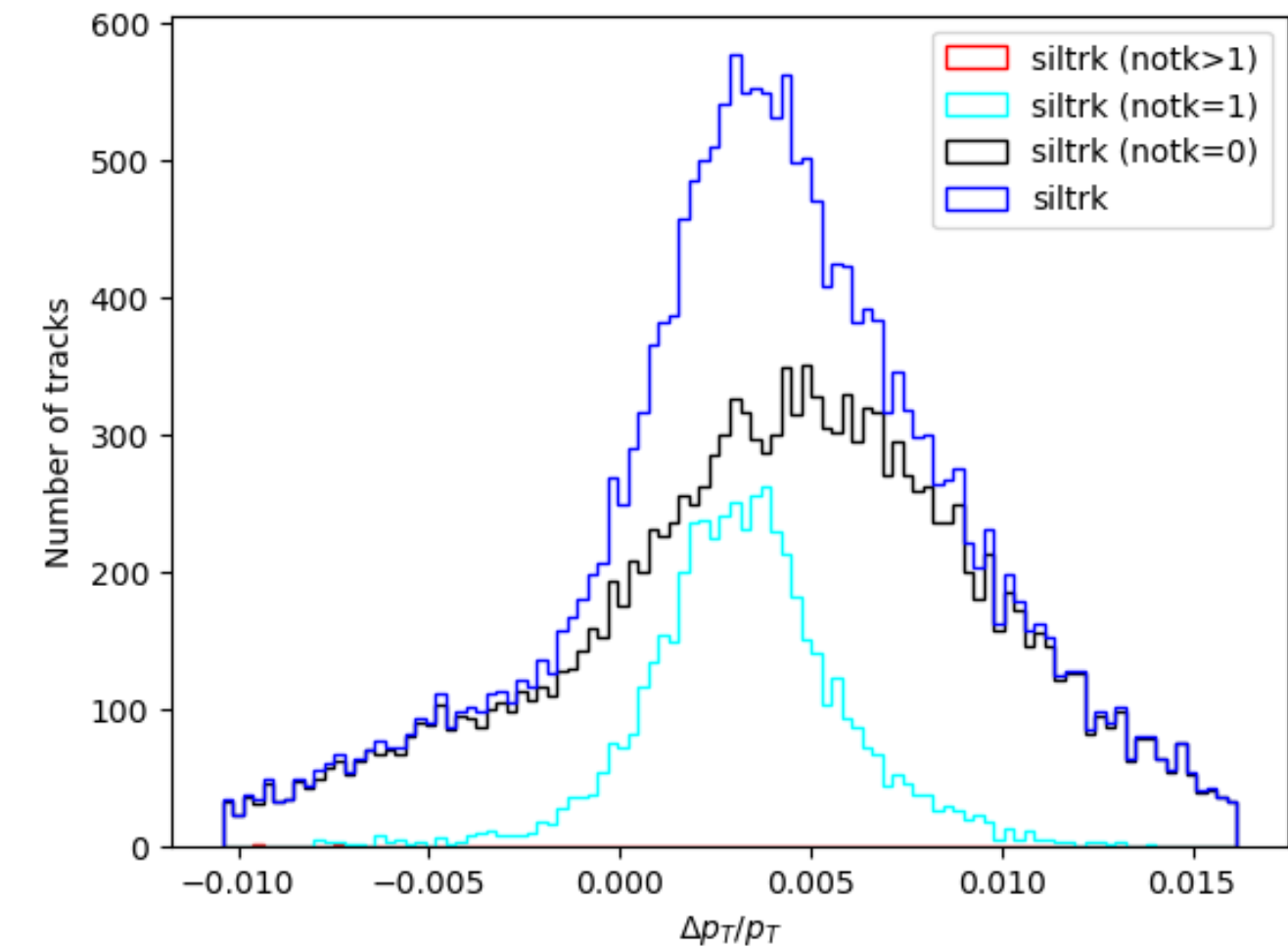
  - Zhuhao, Nazima

$$pT = 1, \theta = 85, \phi = 5$$
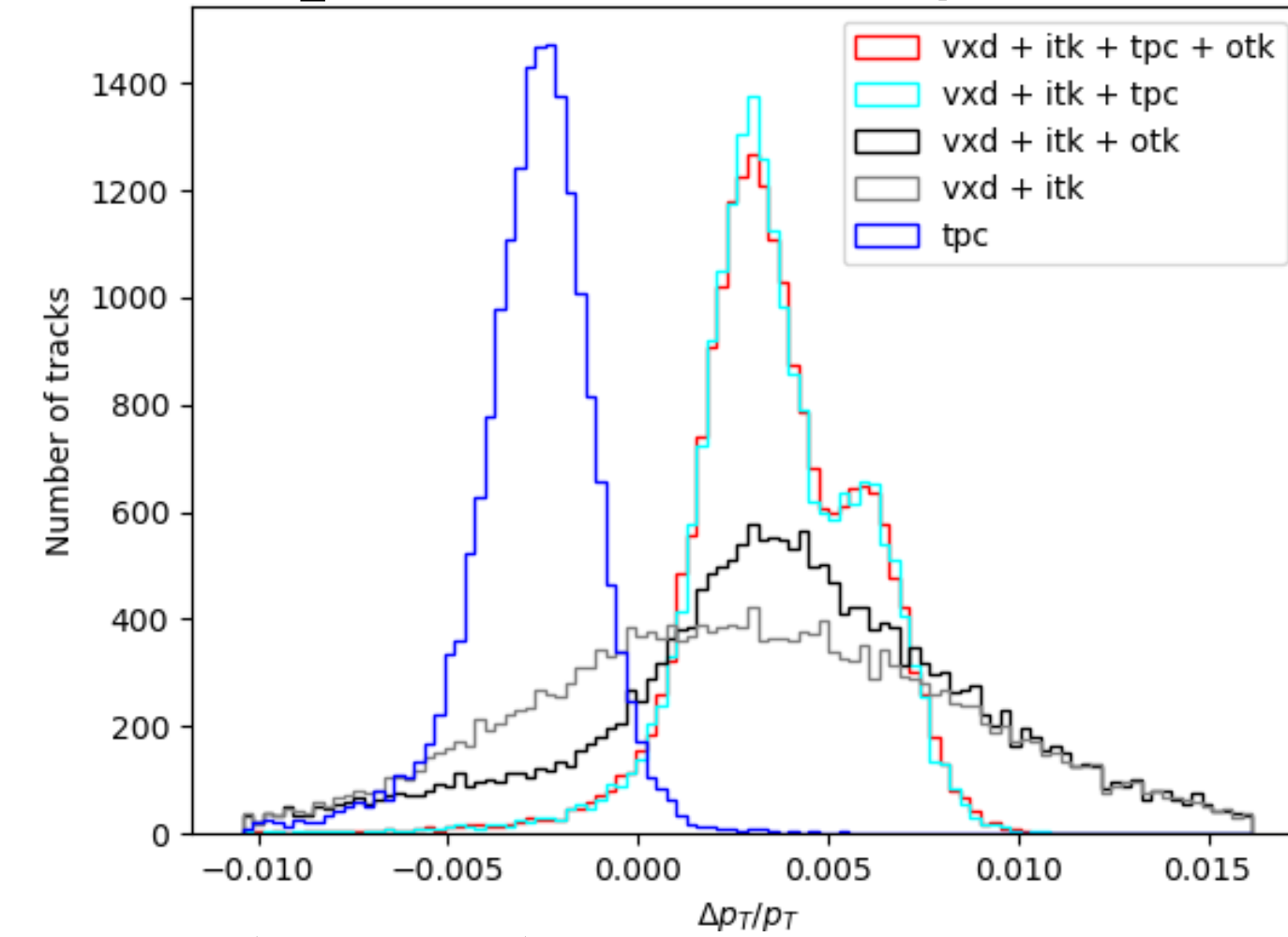
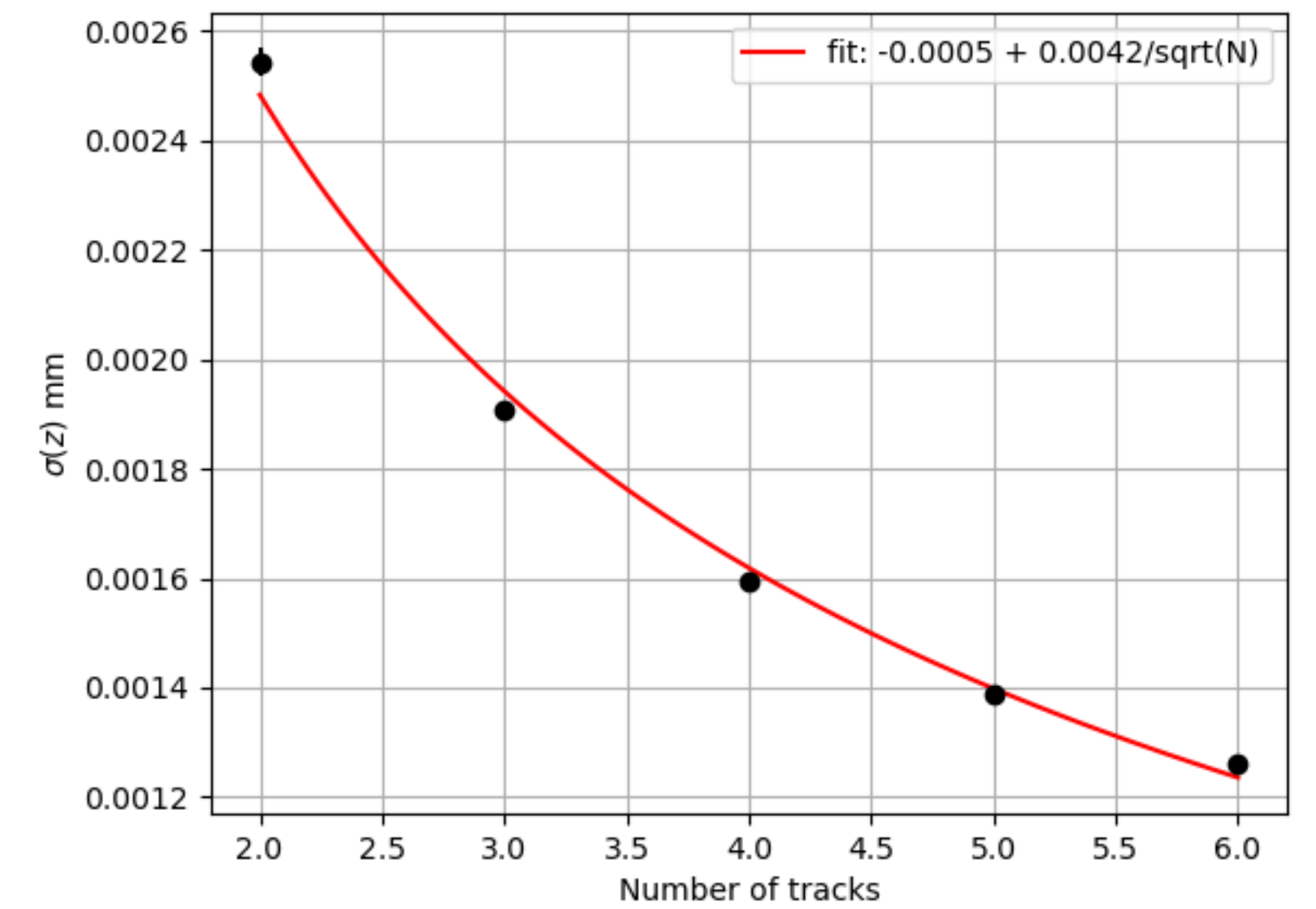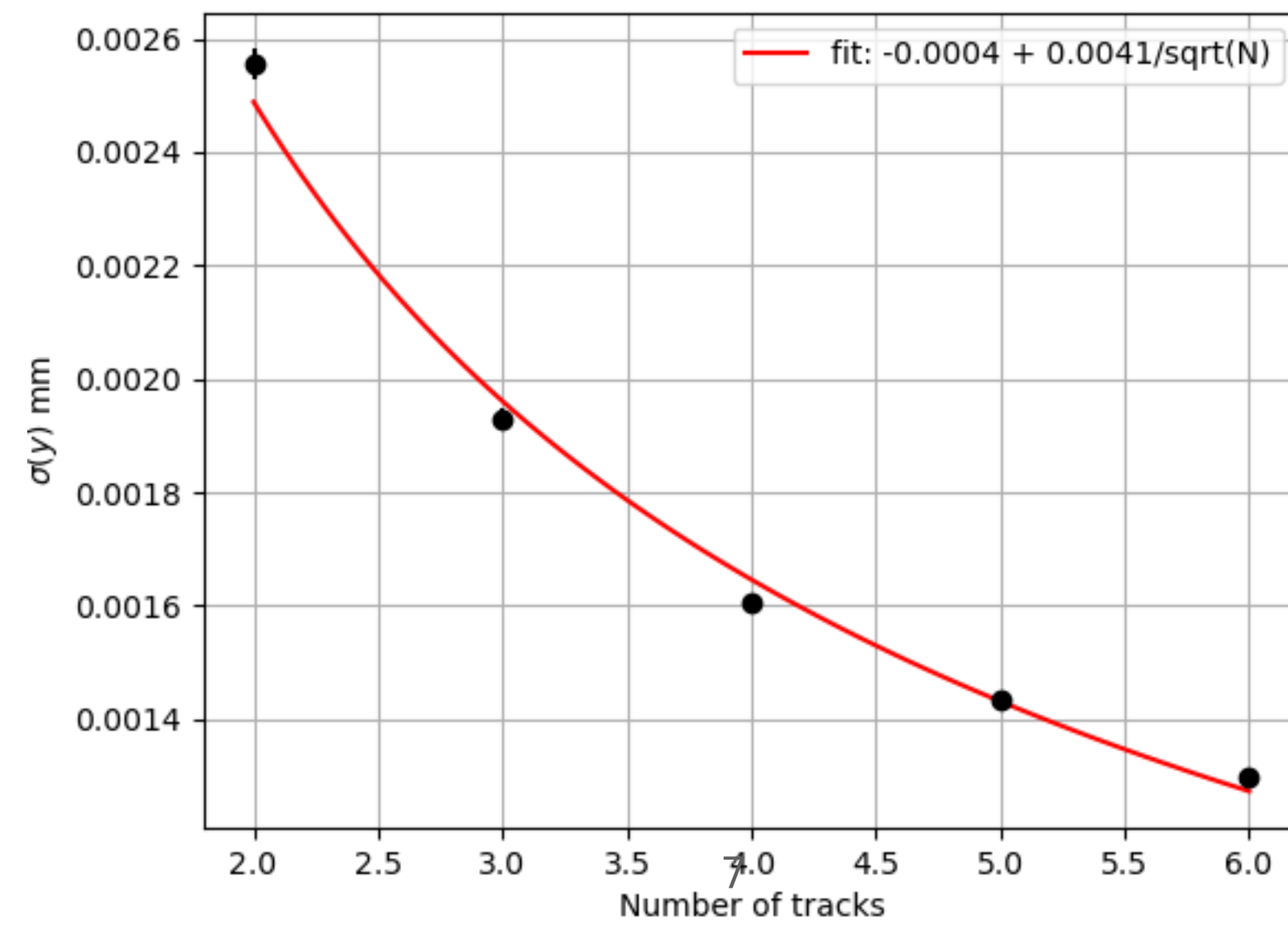$$pT = 1, \theta = 85, \phi = 5$$

$$pT = 1, \theta = 85, \phi = 5$$

complete-trk no otk (light-blue in the top plot) != black in the bottom left plot

I am making a wrong line for complete-trk without otk ???

In progress…
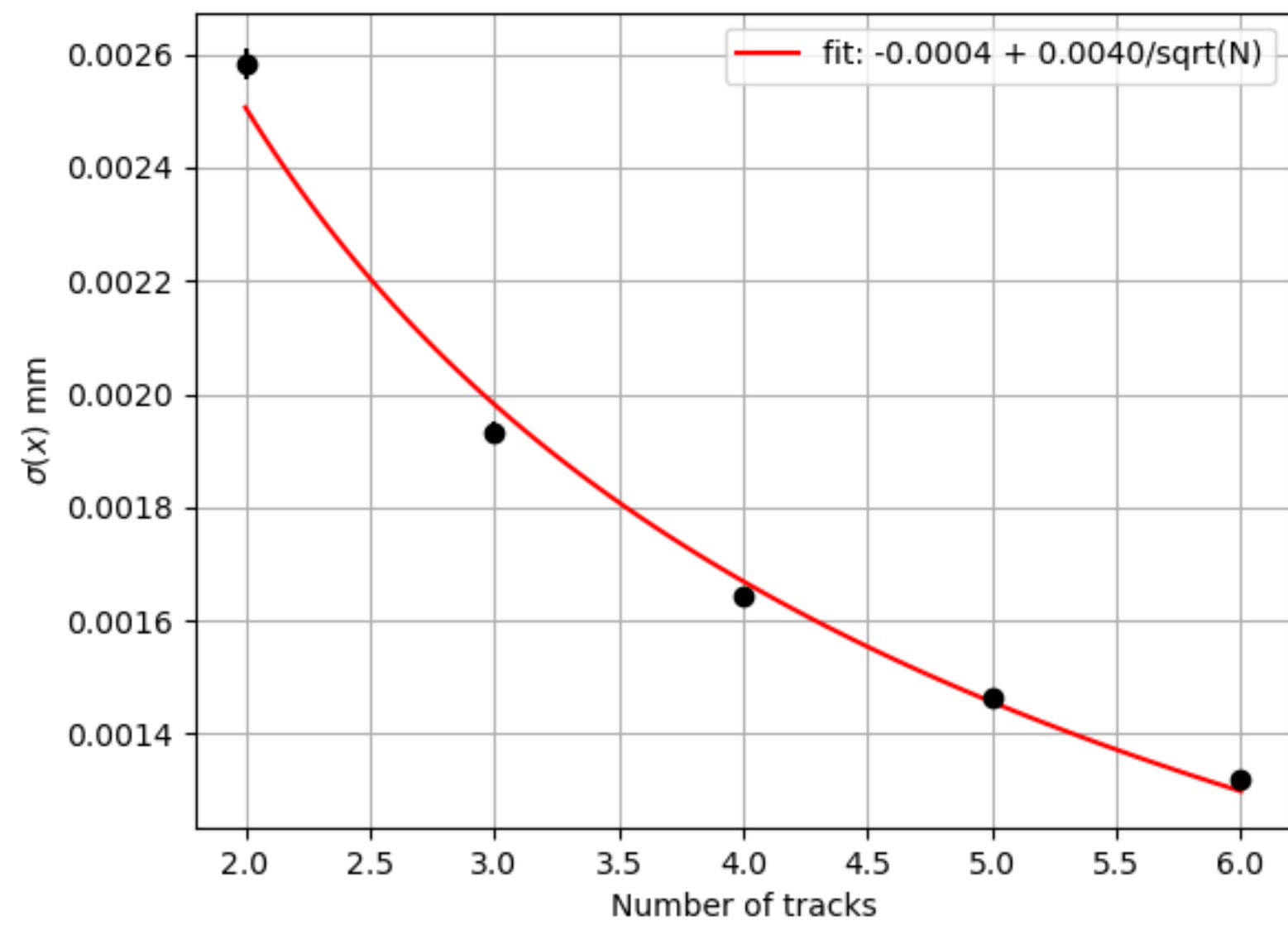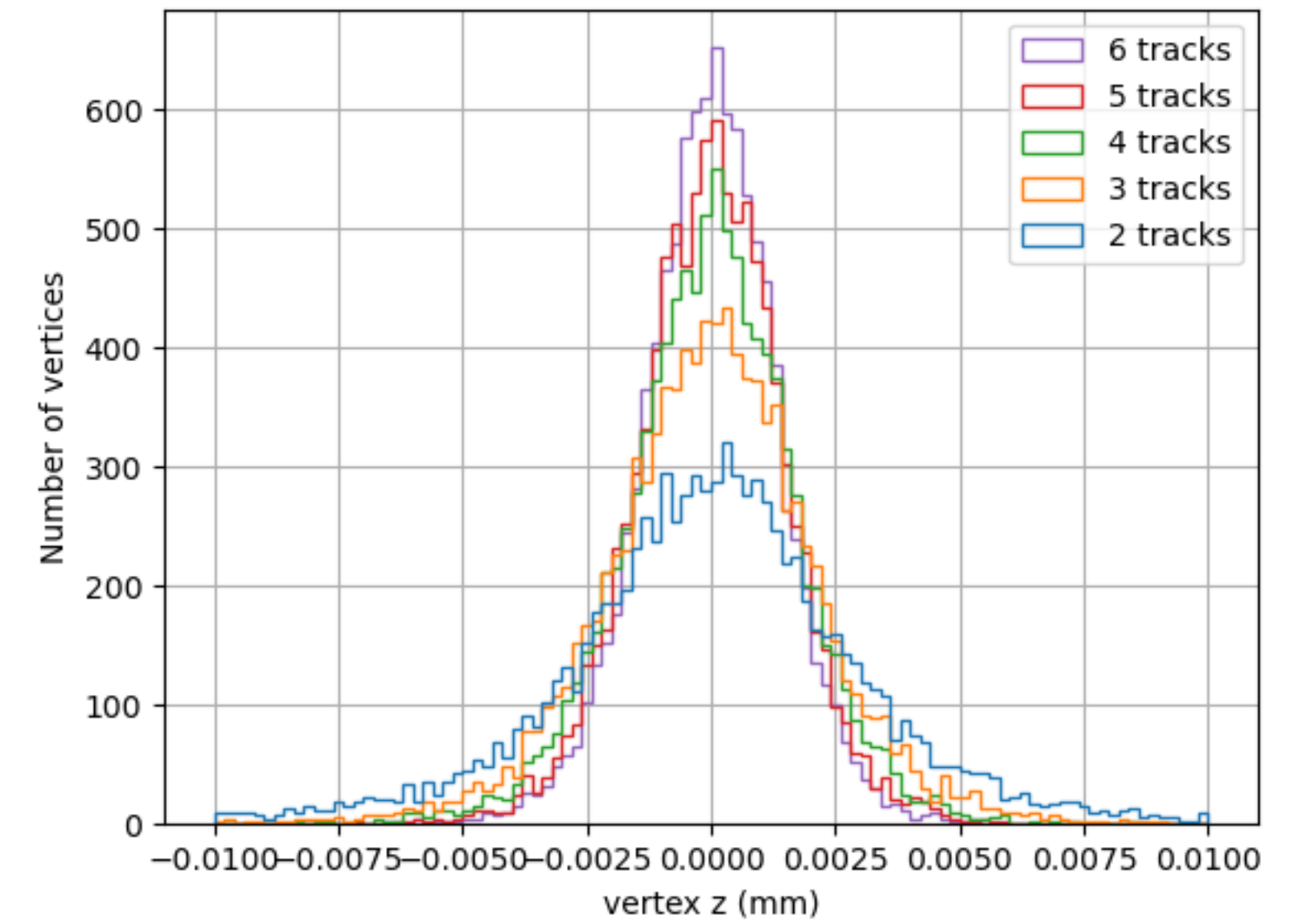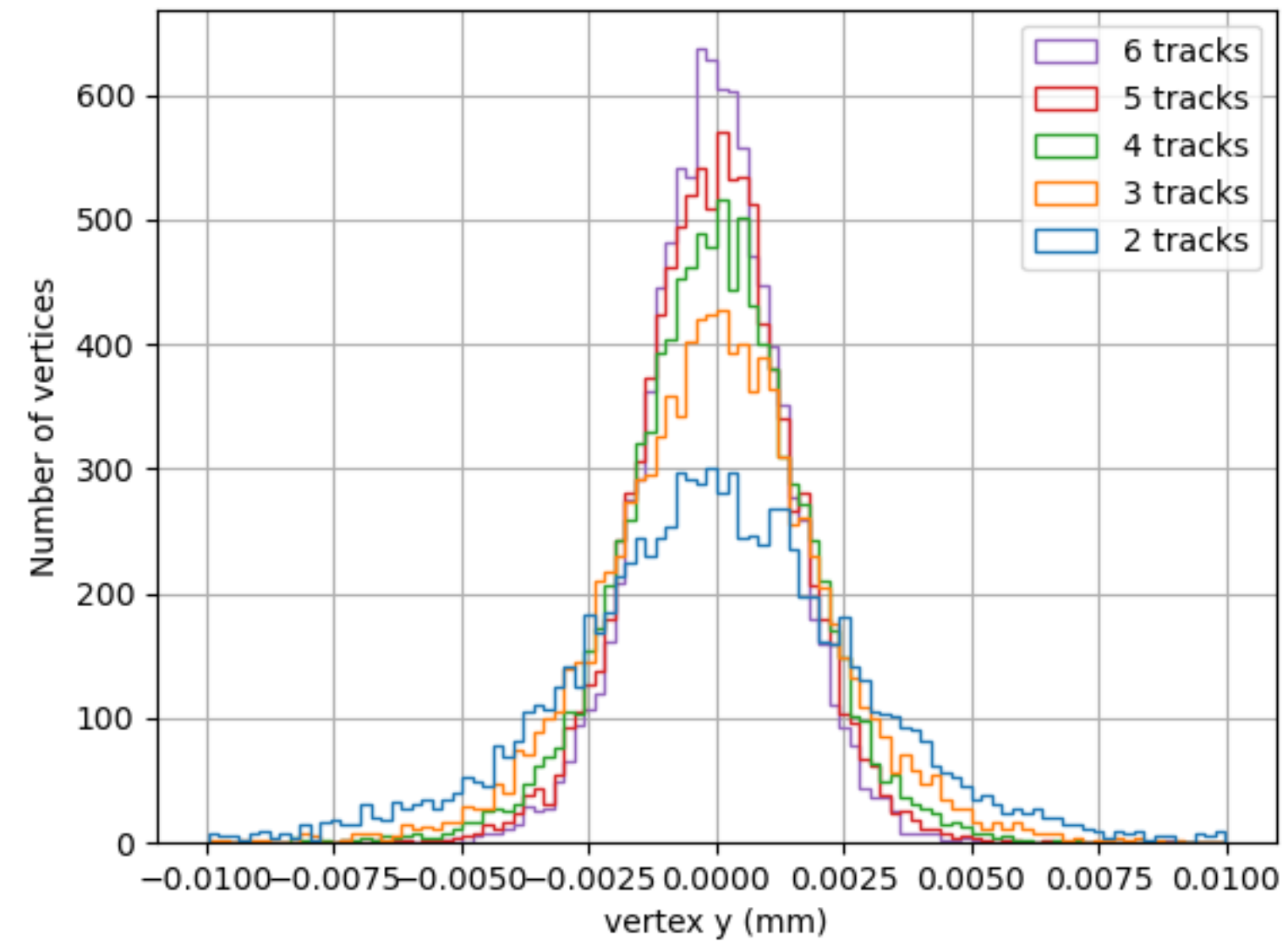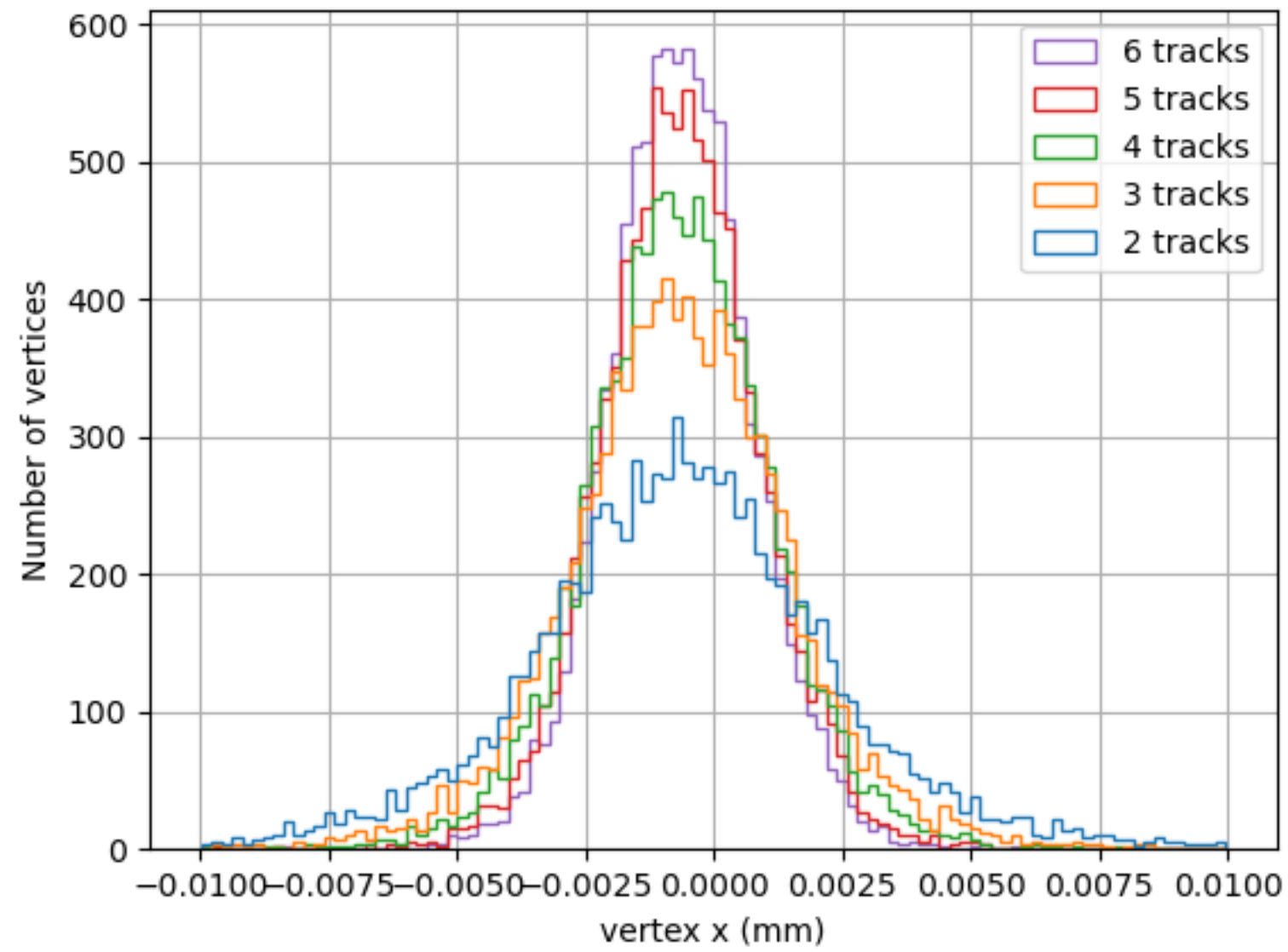
Vertex with ACTS

Vertex with ACTS

- Negative bias on vertex(x)

  - Input d_0 has bias

  - Based on tdr21.10.0, should be much better when switching to master branch

- Expect x, y measurements have narrower spread, but they are the same as z

- $\sigma_{vtx} \propto \dfrac{1}{\sqrt{N_{trk}}}$ starts from N=2, $\sigma_{vtx(N_{trk}=2)} = \sigma_{d_0}$

mean, $Rec(d_0)$ vs. θ

mean, $Rec(d_0)$ vs. θ

PID

To confirm this ratio

Kaon: 42262

Pion: 351647

Proton: 17940

- Spend too much time on
  $p = 12\text{GeV}, \cos\theta = 0.3$, but it is not representative

  - PID performance with Zqq events

- Code for connecting PID and TOF has been developed, under testing...
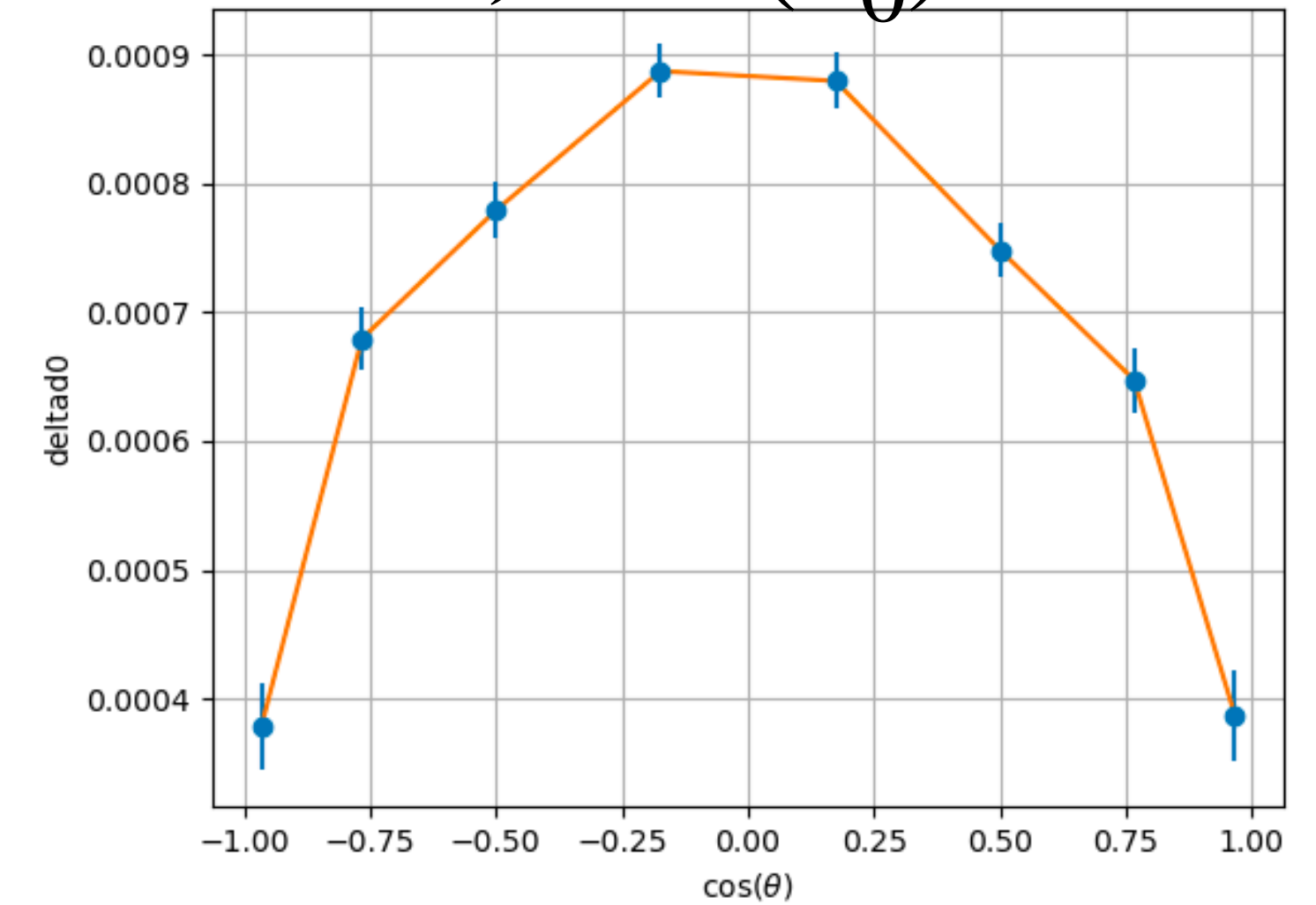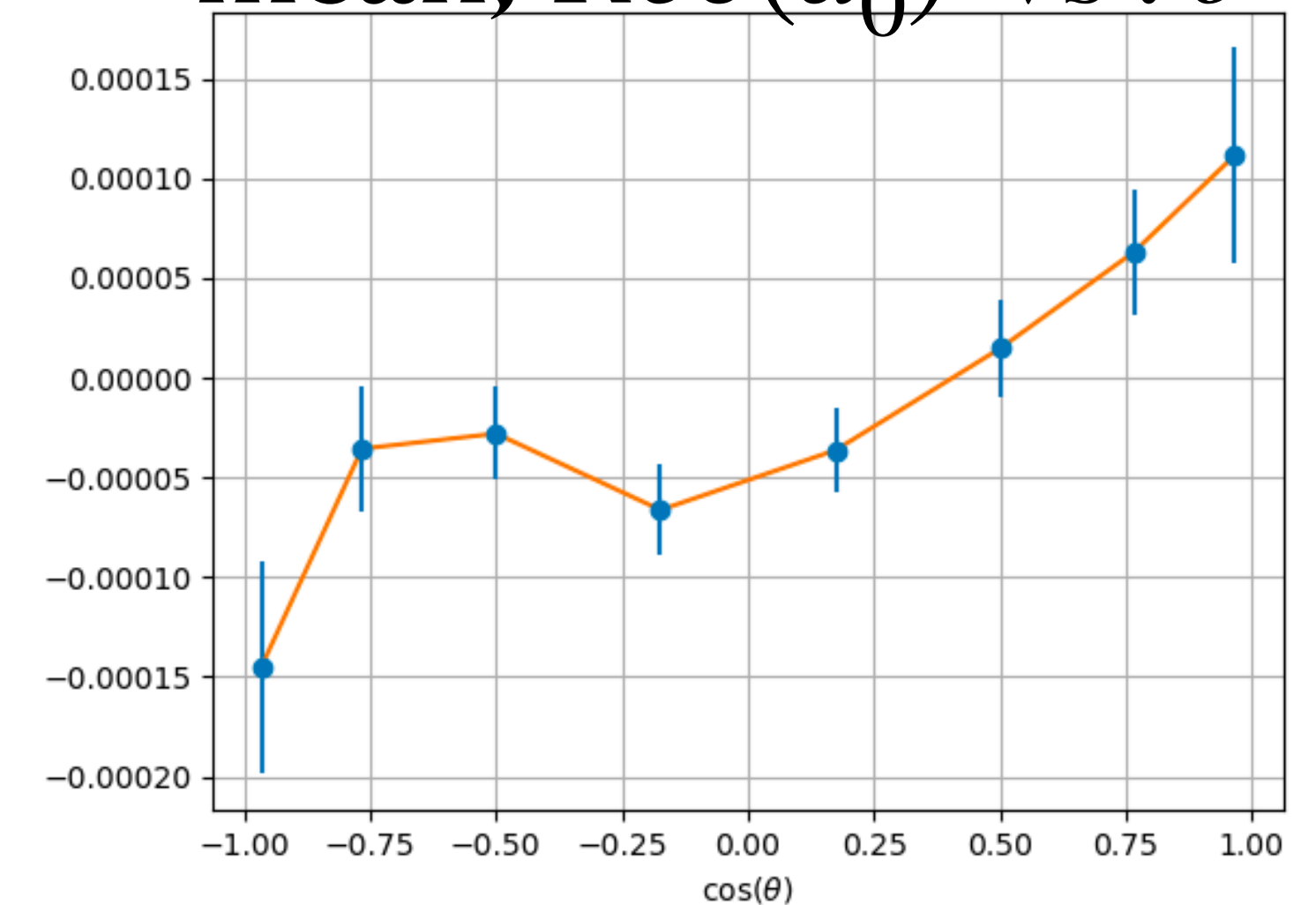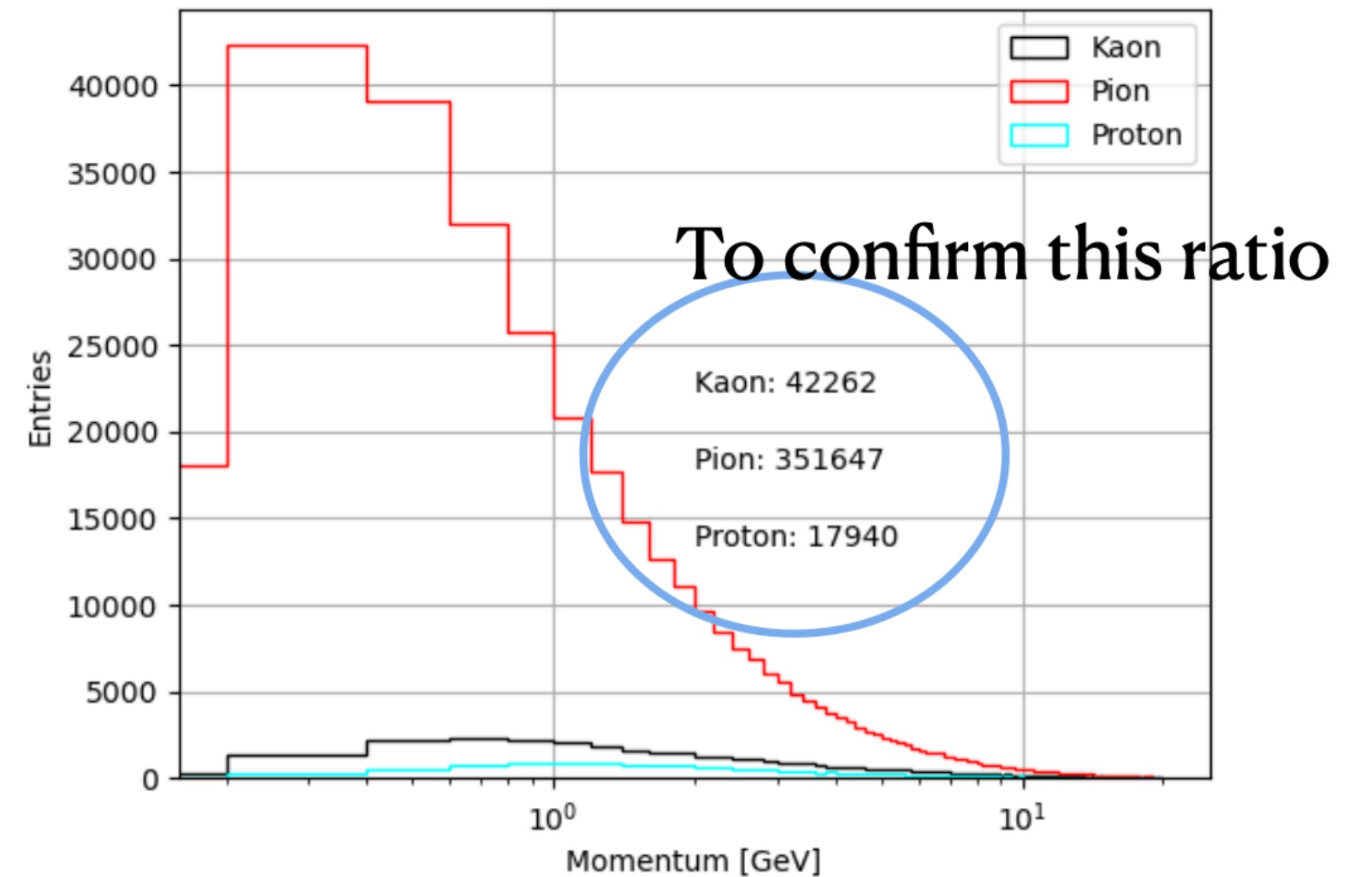
  - Discussed with FY.Guo, decide to writing one plugin which can be configured inside/outside PFA

```
68  +    if ( m_method == "TPC" ){
69  +      if ( !_hasTPC ){
70  +        debug() << "TPC PID information is not available, skip event " << _nEvt << endmsg;
71  +        _nEvt++;
72  +        return StatusCode::SUCCESS;
73  +      }
74  +      FillTPCPID(pfocol, dqdxcol, pidcol);
75  +
76  +    } else if ( m_method == "TPC+TOF" ) {
77  +      if ( !_hasTPC && !_hasTOF ){
78  +        debug() << "TPC or TOF PID information is not available, skip event " << _nEvt << endmsg;
79  +        _nEvt++;
80  +        return StatusCode::SUCCESS;
81  +      }
82  +      FillTPCTOFPID(pfocol, dqdxcol, tofcol, pidcol);
83  +
84  +    } else {
85  +
86  +      debug() << "PID method: " << m_method << " is not implemented yet" << endmsg;
87  +
88  +    }
89  +
90  +    _nEvt++;
91  +        9
92  +    return StatusCode::SUCCESS;
93  + }// end execute
```