Brookhaven National Laboratory

U.S. DEPARTMENT OF ENERGY

Synchrotron Radiation in EicRoot with TPC

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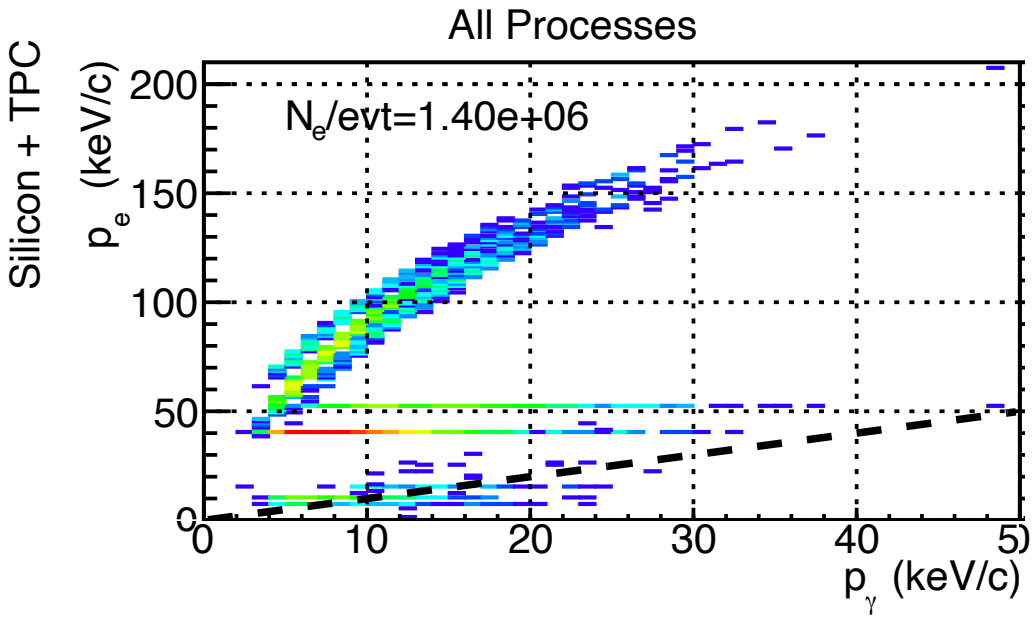
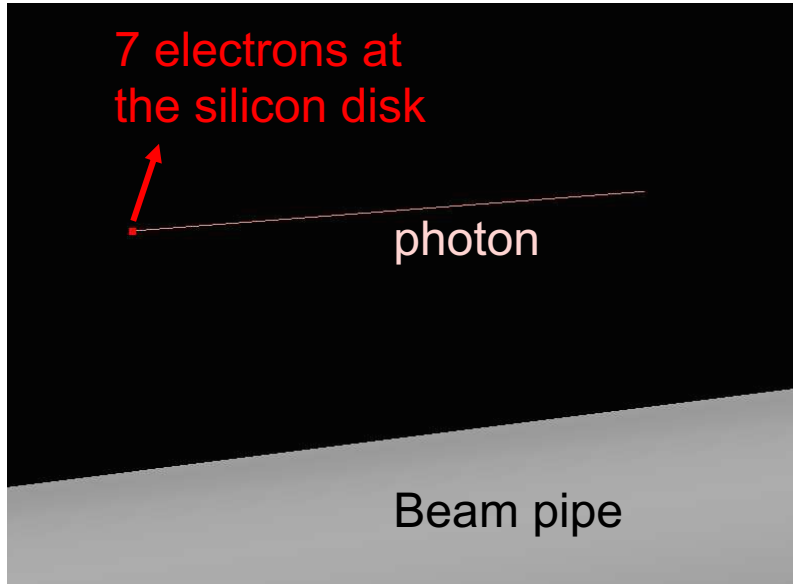
Last Update





1. Secondary electrons' momenta is much higher than the SR photons?

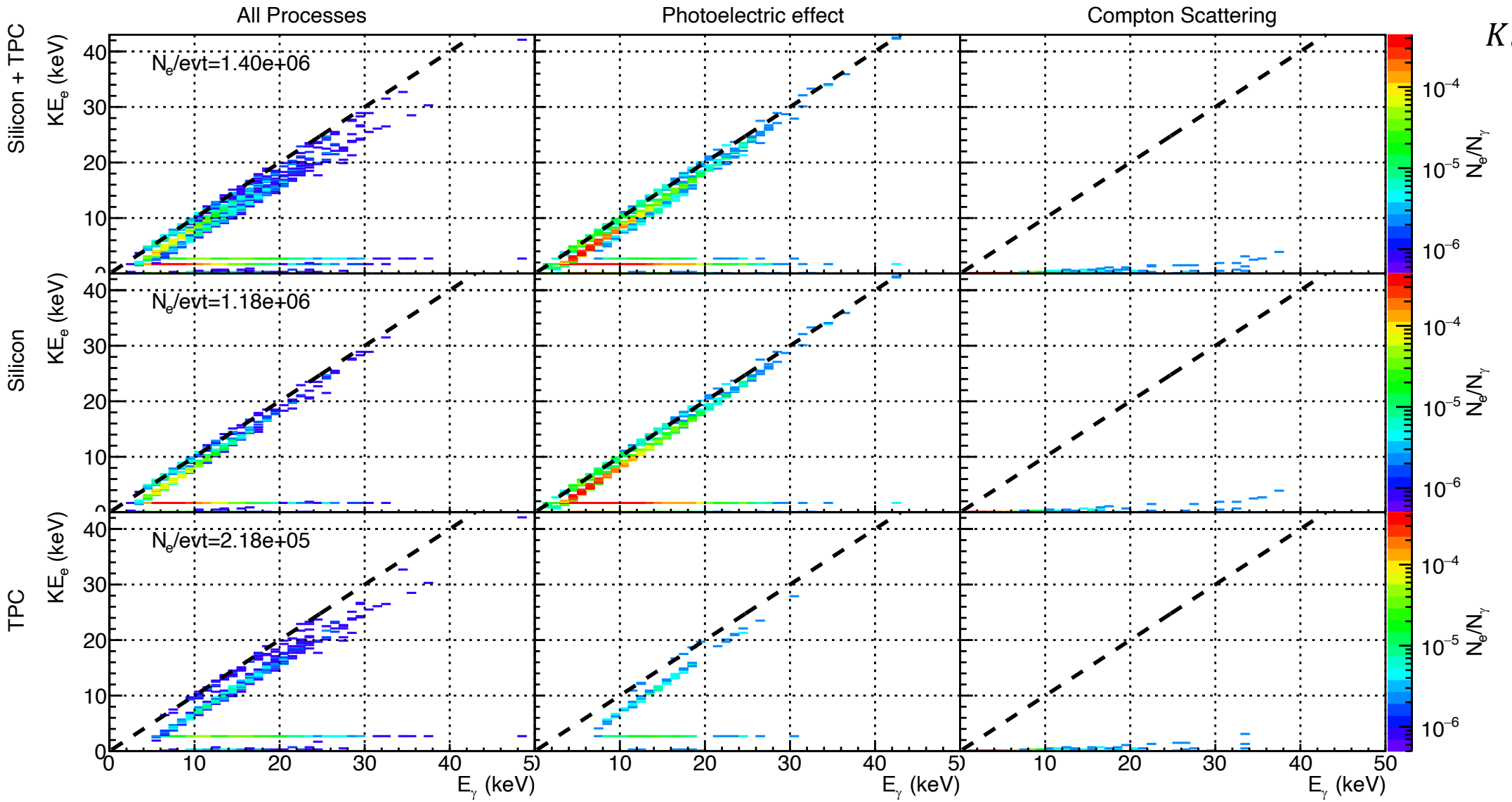
2. The default beam pipe is much smaller than ePIC's

3. How many hits in the TPC?

Kinetic Energy Distributions

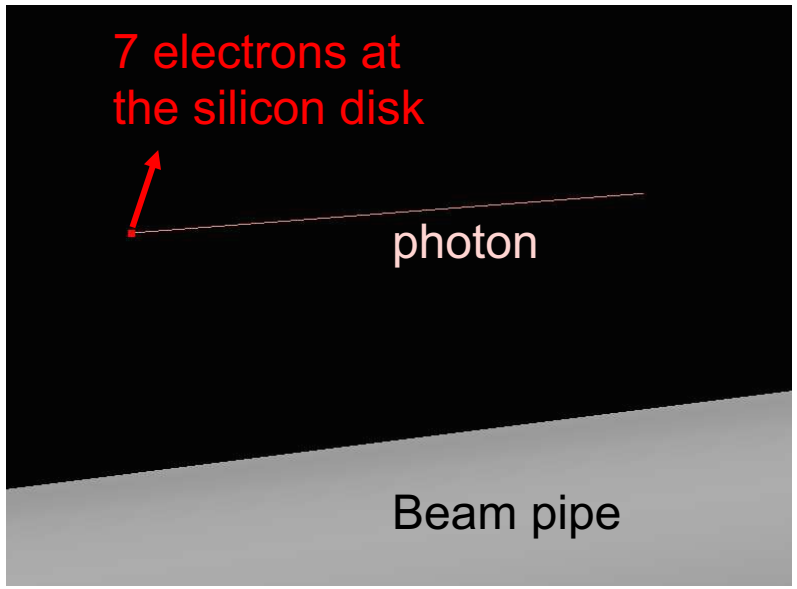
Using the small radius beam pipe

$$K.E. = \frac{p^2}{2m}$$



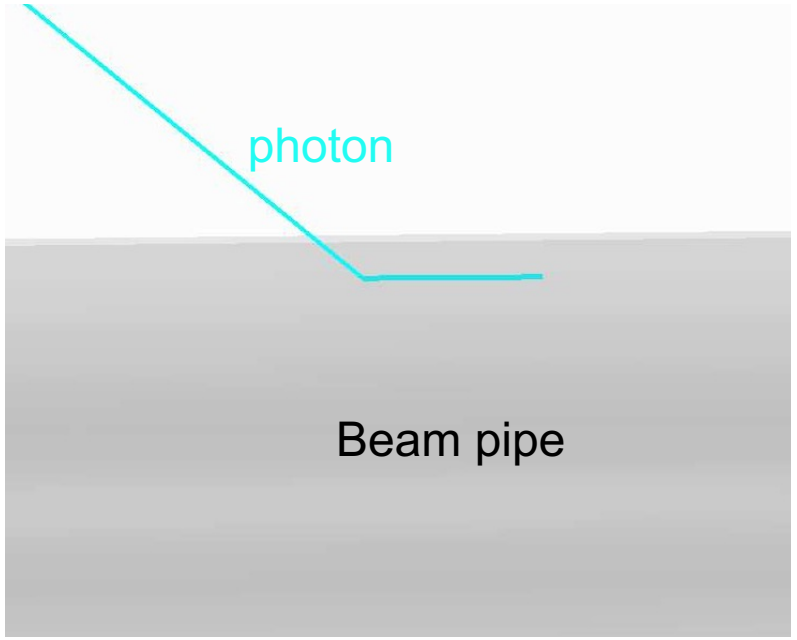
Updated Beam Pipe

Default beam pipe



- r = 1.8 cm
- $t_{beryllium}$ = 800um

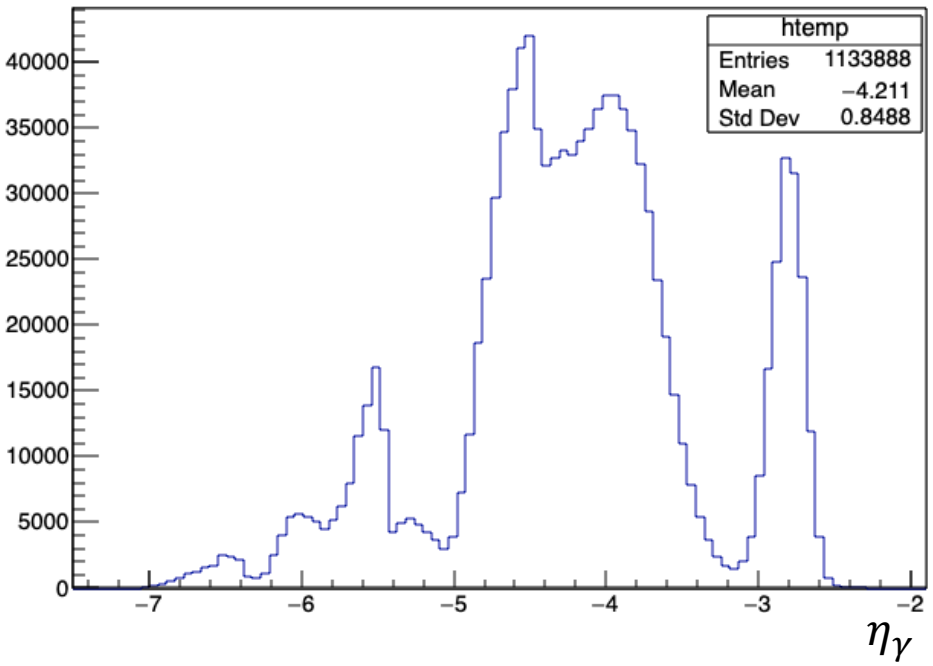
Updated beam pipe



- r = 3.2 cm (slightly larger than ePIC's)
- $t_{beryllium}$ = 800um

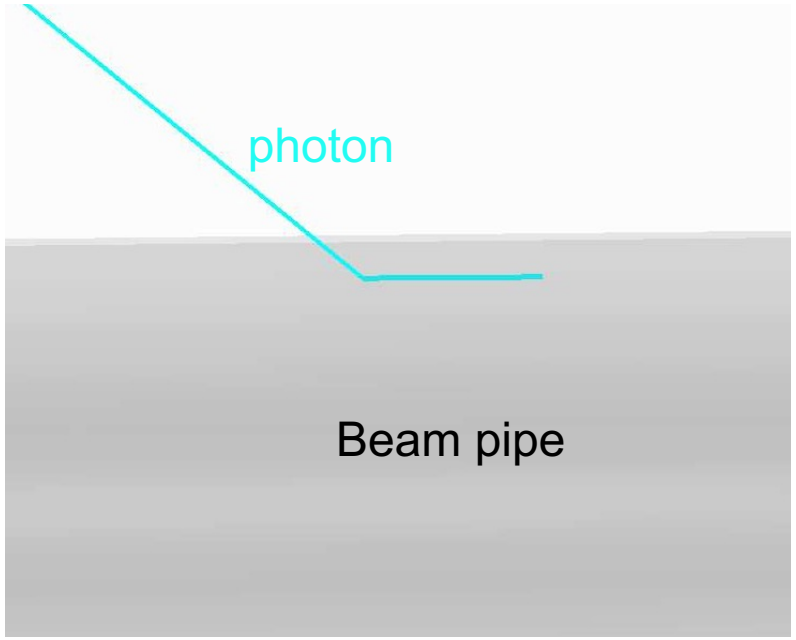
SR Photon Pseudorapidity

Initial pseudorapidity



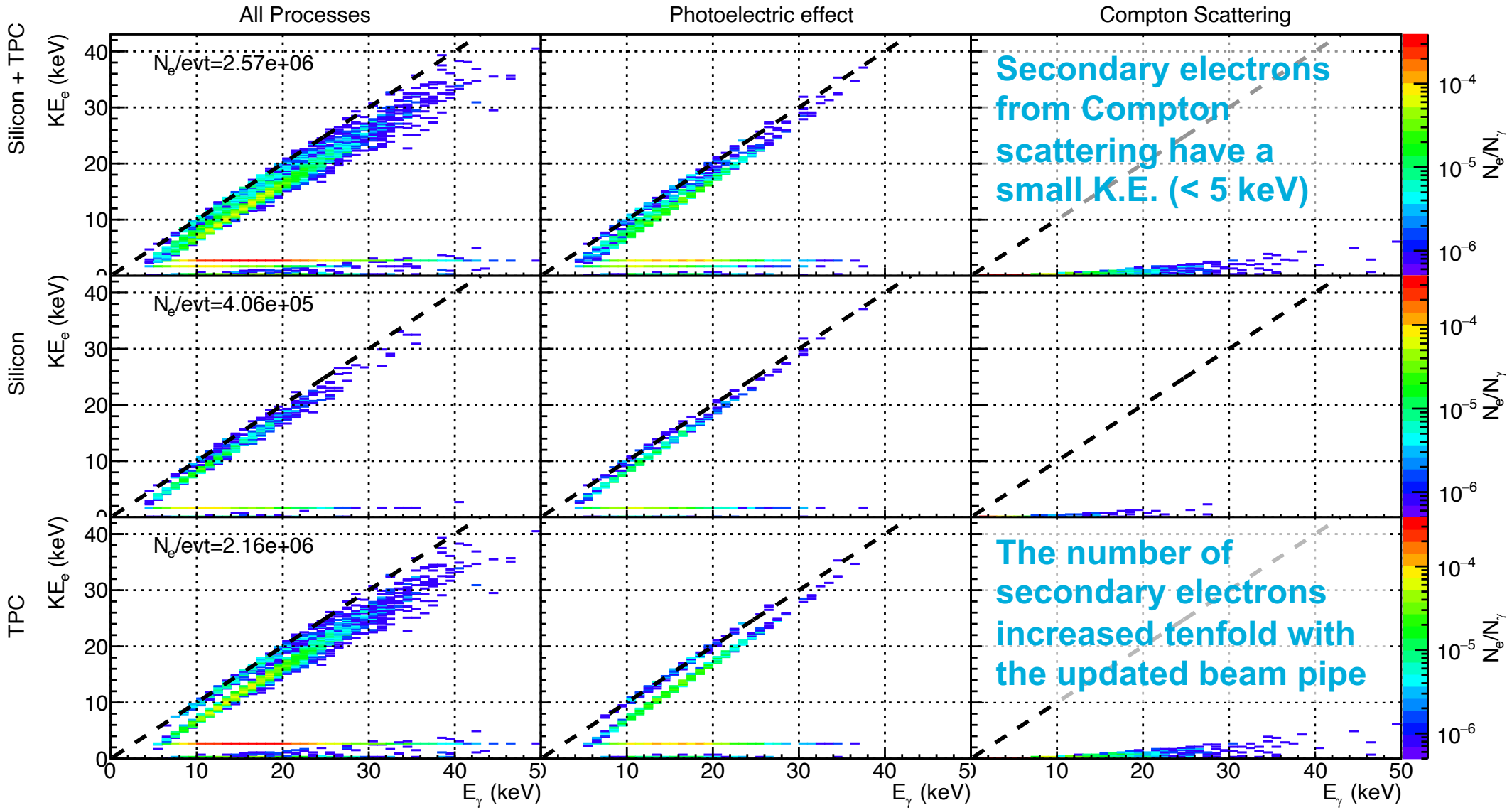
Very backward

Updated beam pipe

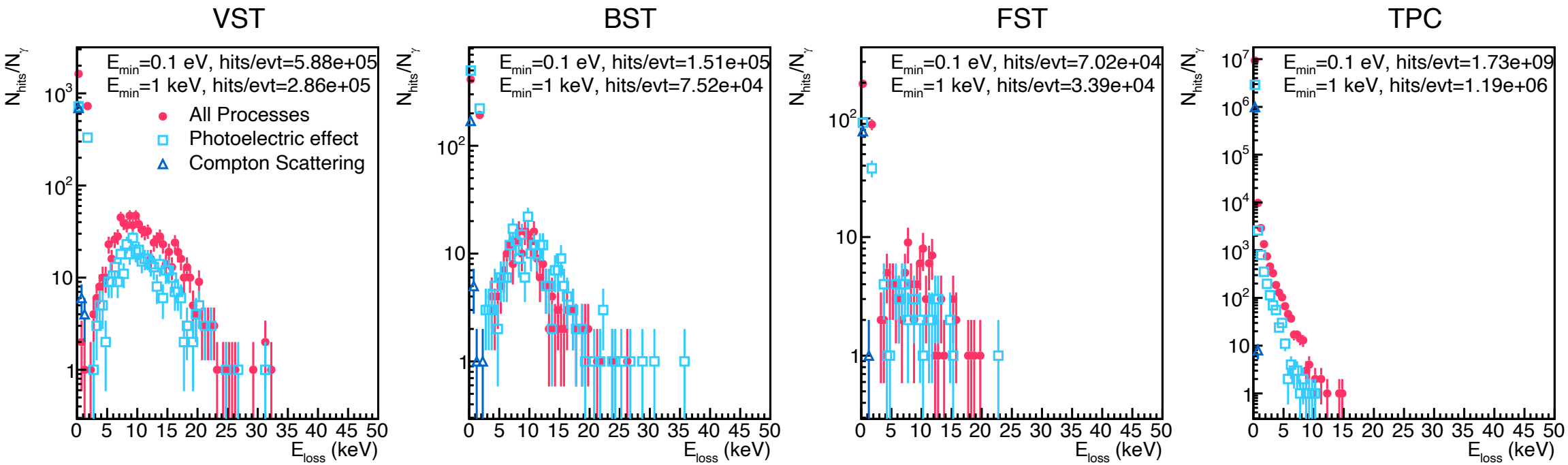


The SR photons are scattered toward the central pseudorapidity
→ More secondary electrons in the detectors

Kinetic Energy Distributions with the Updated Beam Pipe



Energy Loss of the Secondary Electrons



- 1.73×10^{9} hits in the TPC
- Photoelectric effect gives most of the hits

Summary

- Solved the high kinematics secondary electron question
- Updated the beam pipe in the simulation to match ePIC's
  →Leads to 10 times more secondary electrons
- 2.16×10^{6} secondary electrons generated in the TPC due to synchrotron radiation photons per event
- 1.73×10^{9} hits inside the TPC per event
  (with 0.1 eV energy cut off)
- To-do
  - SR: implement gold coating on the beam pipe
  - TPC size
  - Beam gas
  - Angular resolution