# Pion tracking for SIDIS

Weizhi Xiong

Syracuse University

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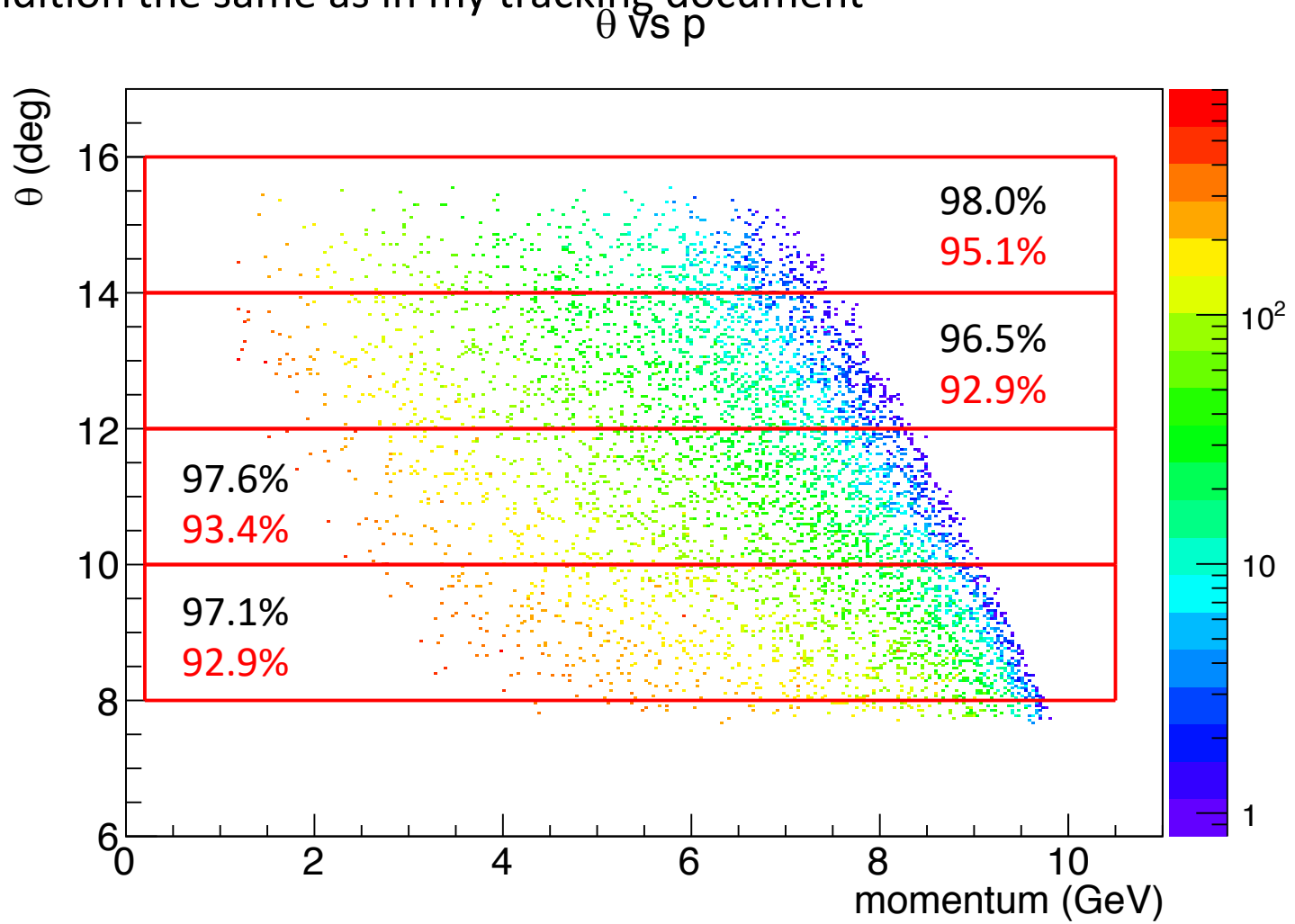
# New changes for pion tracking

- Starting from SPD instead of FAEC
  - 60 phi segments, each phi segment has 4 types of SPD detectors with different sizes (10cm, 20cm, 30cm and 45cm in radial direction)
  - No position reconstruction, so when we project the track on SPD, we have to cut at least the size of the detector
  - No energy information
  - Pion track can be very low energy such as 600 MeV
- Pion signal in GEM is about 200eV smaller than electron's, which peak at 600eV. Need to increase the gain of the chamber in order to ensure reasonable pion detection efficiency
- Pion and punch through the shielding, need to apply some cut to remove these events

# Effect of increasing gain on electron tracking

- Stat uncertainty of single track efficiency and accuracy about 1.5% level
- Increasing the chamber gain actually increases the overall performance slightly
- 100% bg, all condition the same as in my tracking document

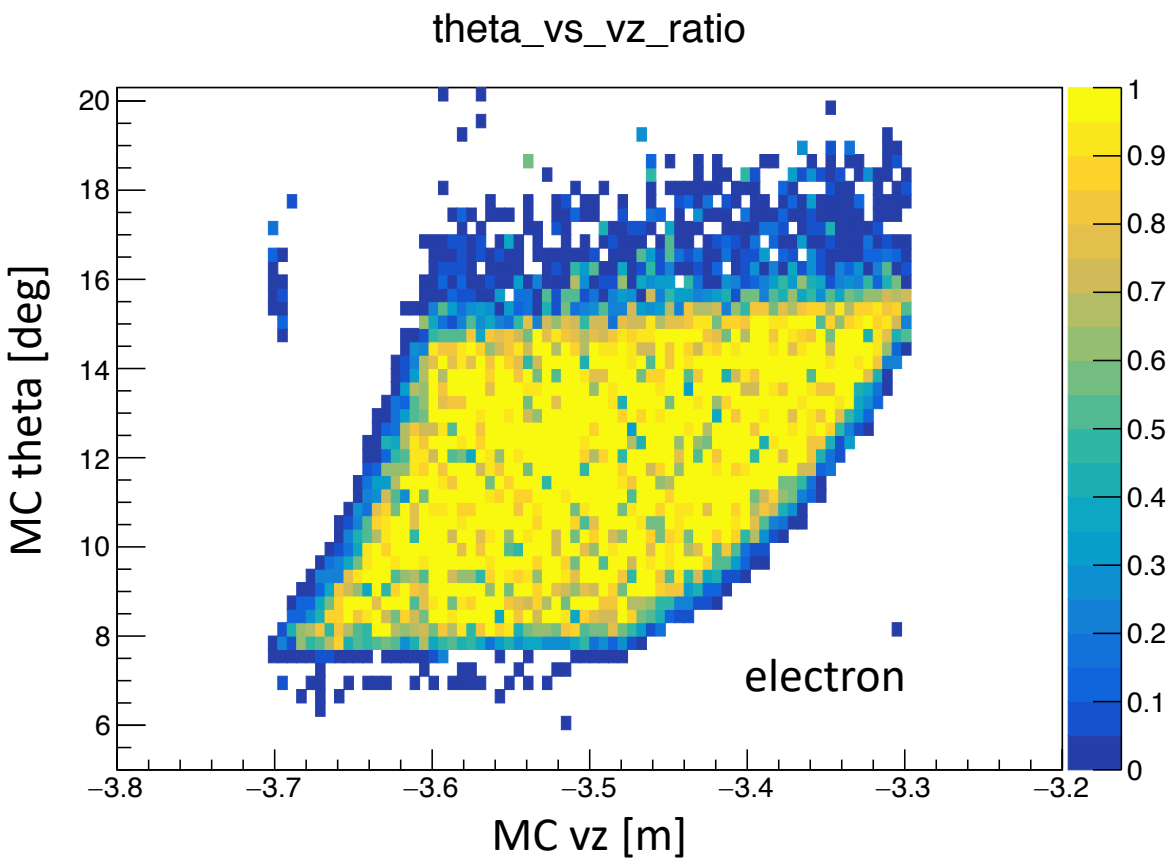


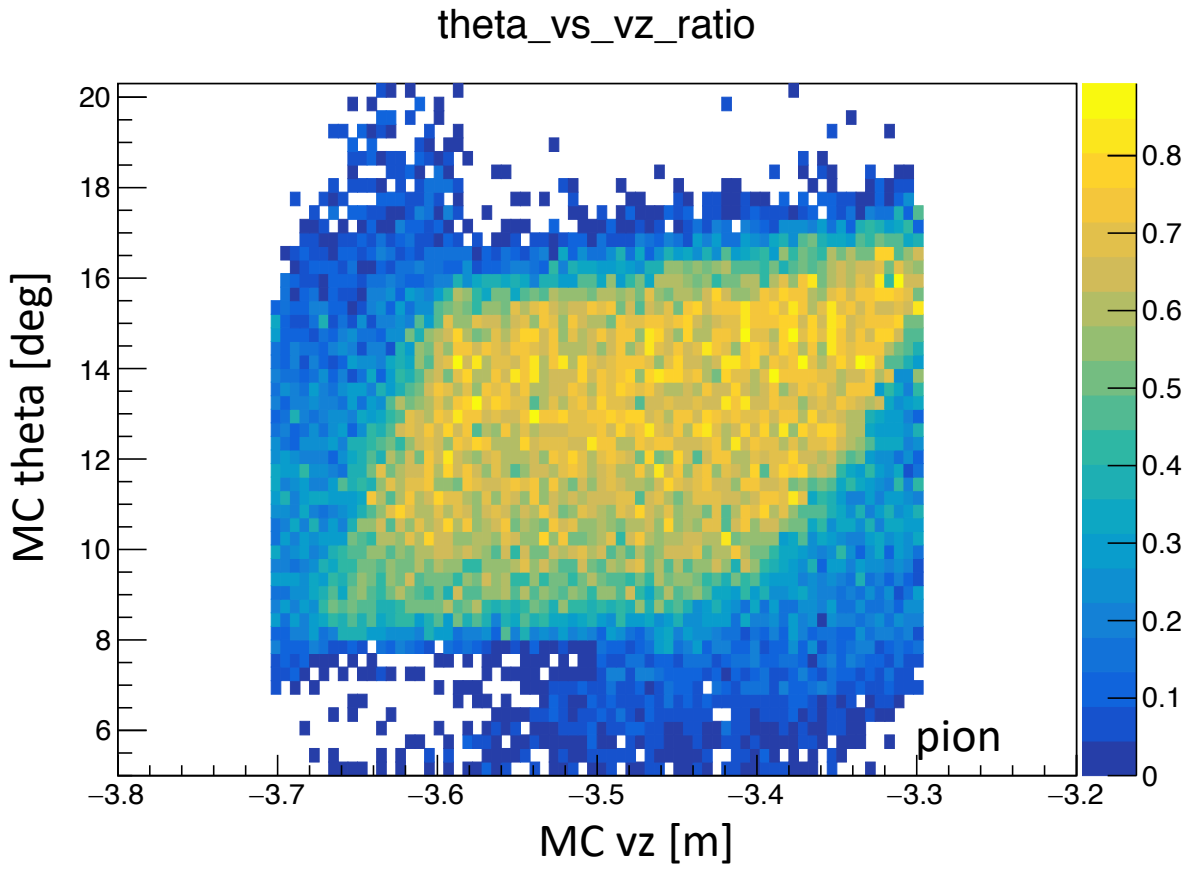

Black number is single track efficiency

Red number is single track accuracy

# Possibility of accepting an event

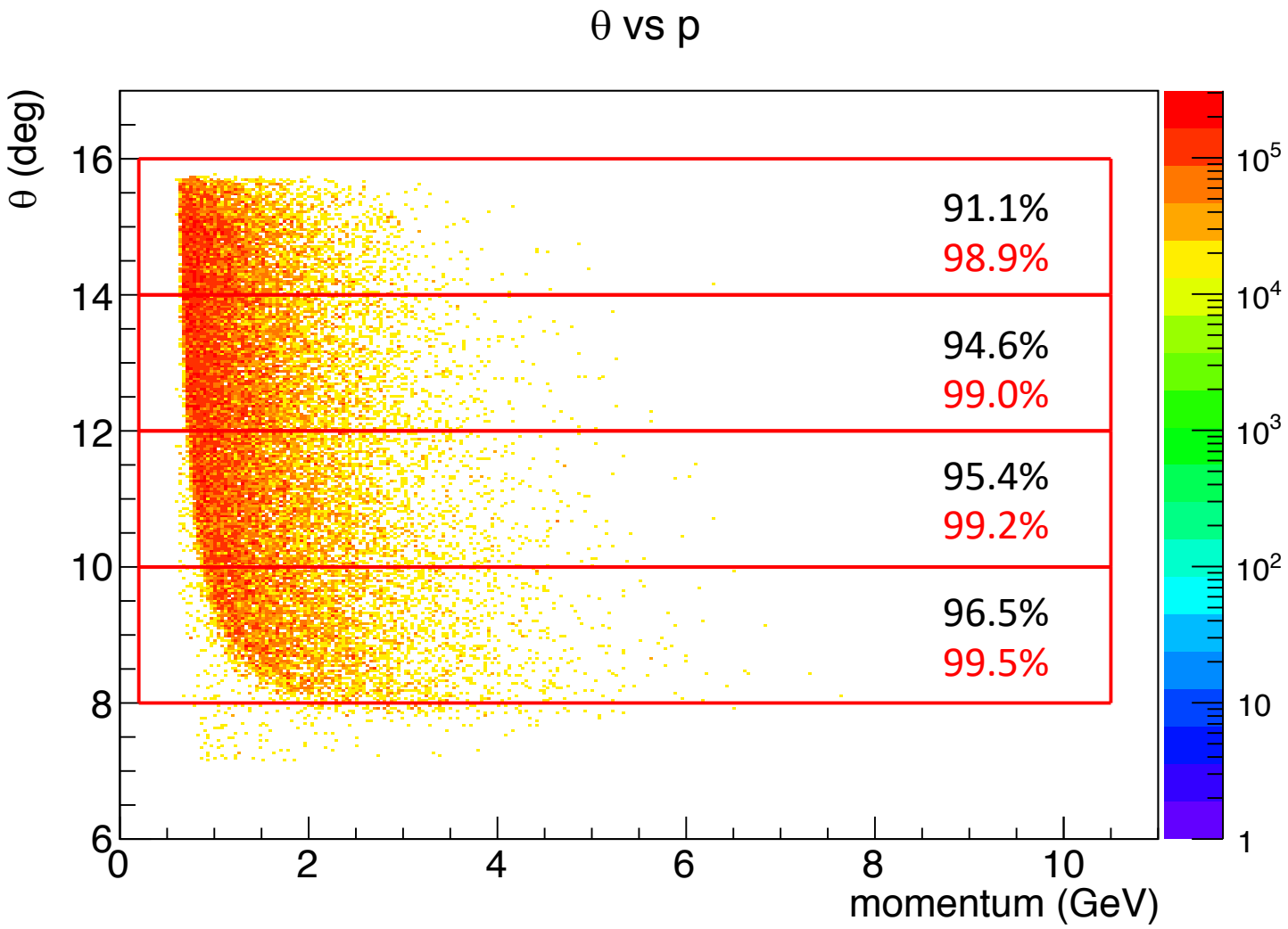
- By accepting I mean: the track must hit the SPD and all GEMs in the forward angle region, and must have at lest 600 MeV



# Pion tracking efficiency

- This is with 0% bg, just to show that the code is working, stat uncertainty is about 0.1% to 0.2%



# Pion tracking efficiency

- Only have very limited stat for 100bg digitization at the moment, stat uncertainty around 2.6%
- Performance very marginal, but have a few ideas to improve