

# KaonLT Analysis Update

(CoinTime / Beta Leakage)  
(Heep Coin Analysis)

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# Preview

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- Alicia first Noticed the leakage issue in 10.6 GeV BSA analysis (Oct. 2023).
  - Good pi-n ebents had bad beta and CoinTime
- Richard confirmed this issue for Kaon production data
- Nacer checked this for 3.8/4.9 GeV Kaon-LT data (Winter 2018 data)
  - No leakage issue in that data
- Ali started looking at HeeP data for 10.6 GeV and 8.2/6.2 GeV.
  - Issue was only in the 10.6 GeV data
- Check Alicia's talk in Hall C quartely analysis meeting
  - <https://hallcweb.jlab.org/doc-private/ShowDocument?docid=1237>

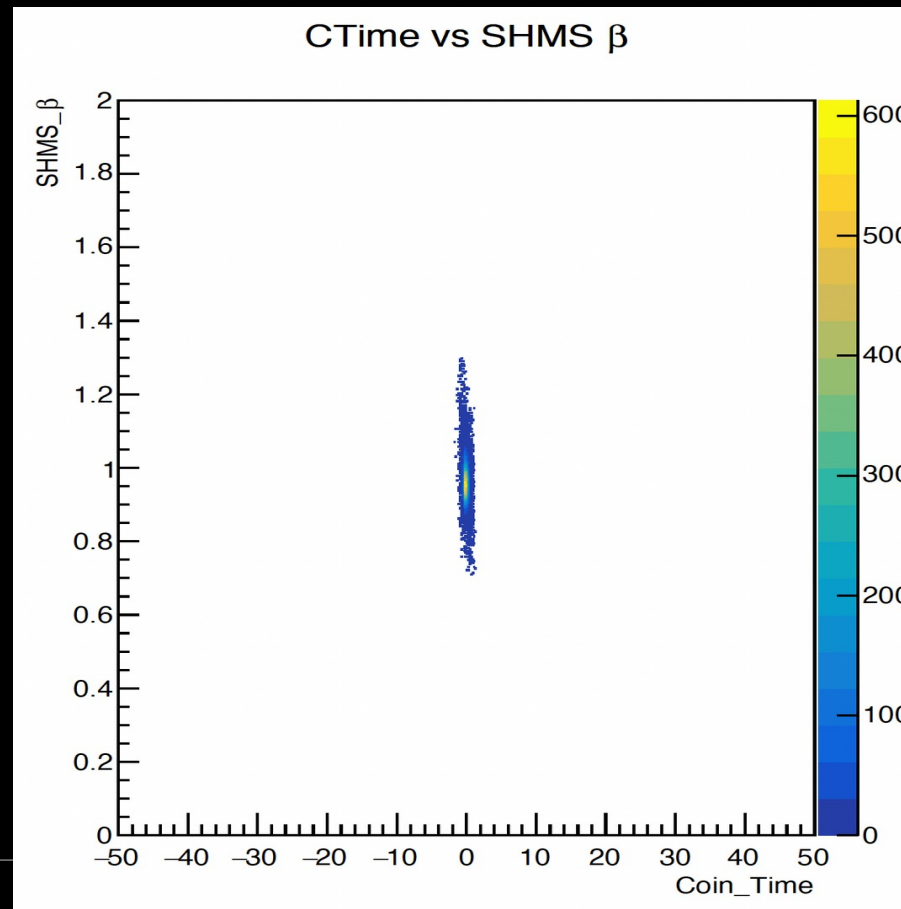
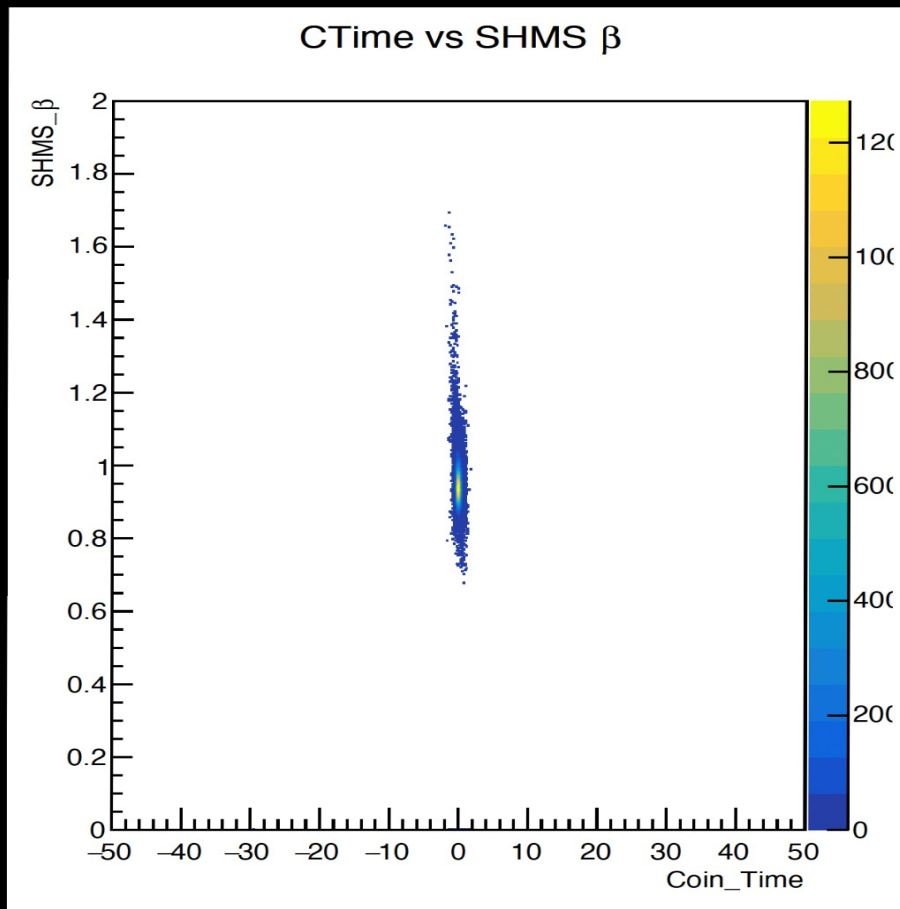
# High Q<sup>2</sup> Heep Coin Data

- 6.2 GeV
  - HMS P = 3.57 GeV
  - SHMS P = 3.48 GeV
- 8.2 GeV
  - HMS P = 4.67 GeV
  - SHMS P = 4.37 GeV
- 10.6 GeV
  - HMS P = 6.59 GeV
  - SHMS P = 4.84 GeV

# SHMS Beta v/s CoinTime

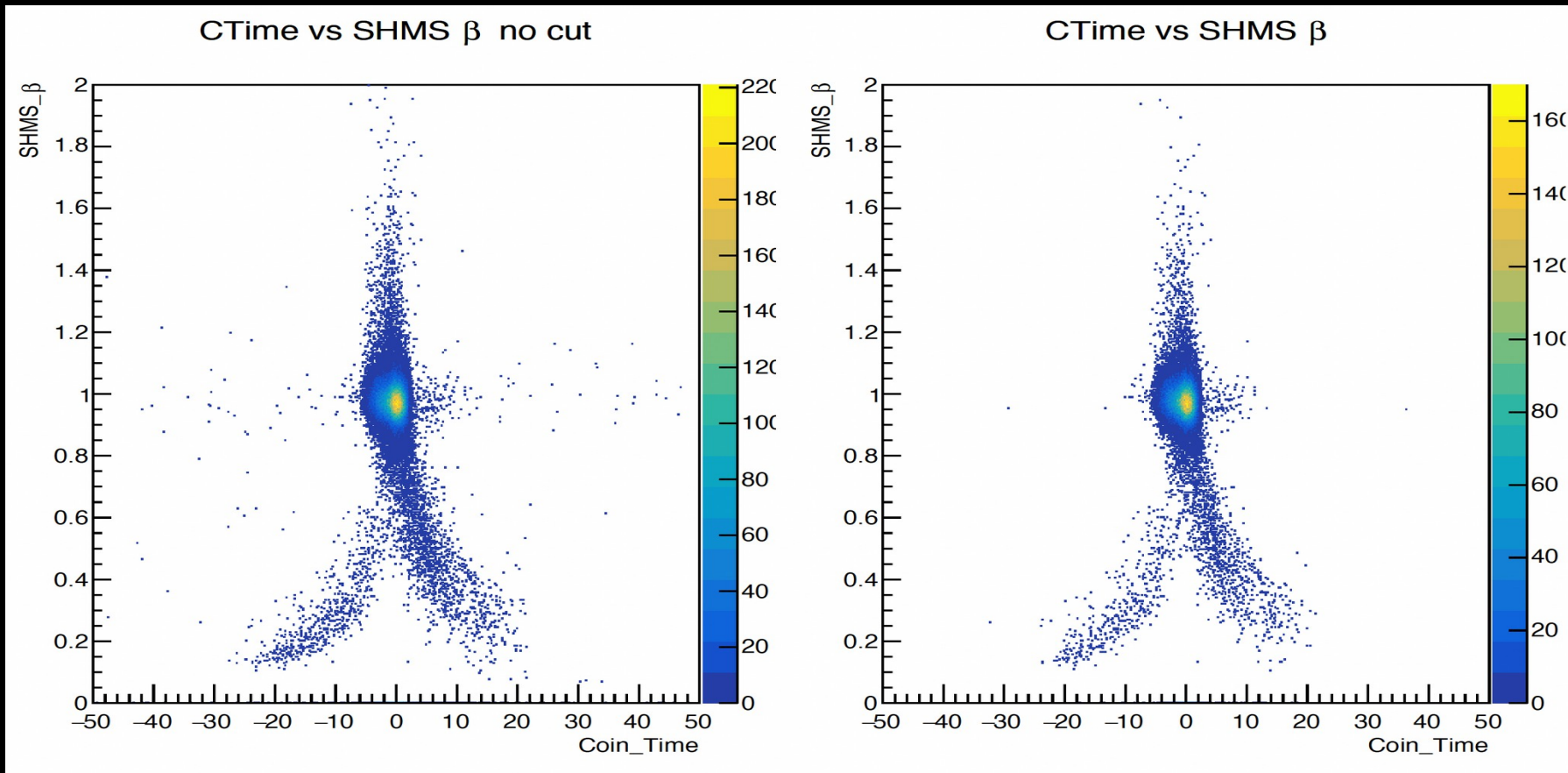
6.2 GeV

8.2 GeV



# SHMS Beta v/s CoinTime

10.6 GeV



# Correction Study

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- Initial Diagnosis
  - Trigger configuration issue
- Everyone suggested to do a beta efficiency study and calculate a correction factor for Normalized yield
  - Worked on the cut dependent study (Used 6.2 / 8,2 GeV data to fine tune beta cut before applying to the 10.6 GeV)
- Final efficiency came out to be ~96%

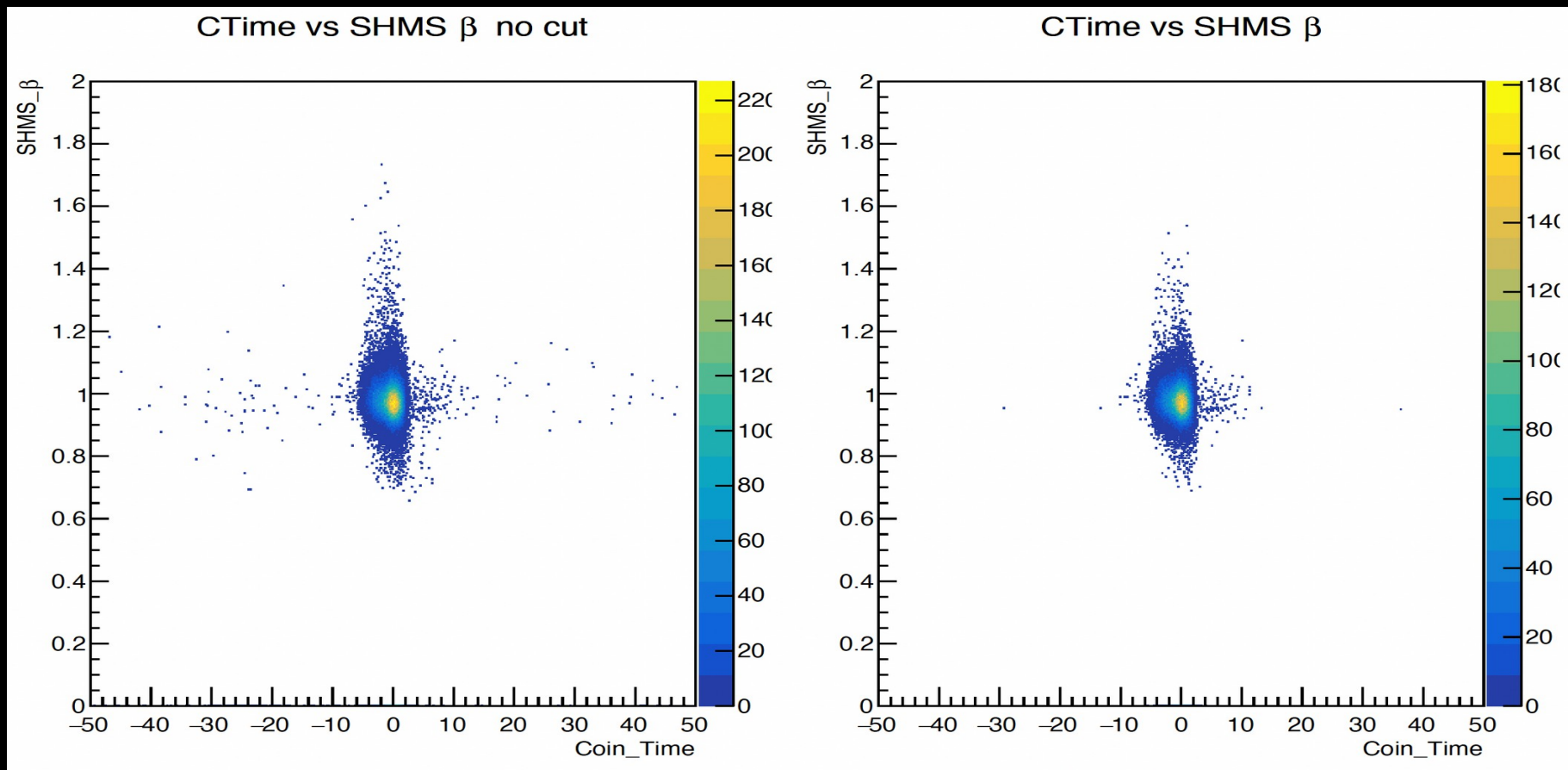
# Time of Flight correction

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- During Alicia's talk at the quarterly analysis meeting, Mark suggested to check the Time of flight correction (ptof\_tolerance).
  - Mark also sent on a write-up on improved hodoscope timing and hit reconstruction algorithm in hcana.
  - [https://hallcweb.jlab.org/DocDB/0010/001055/002/HCANA\\_Hodo\\_changes\\_april2020.pdf](https://hallcweb.jlab.org/DocDB/0010/001055/002/HCANA_Hodo_changes_april2020.pdf)
- Initial test of changing the "ptof\_tolerance" variable from 100 to 2.0 weren't successful.
  - No change in the distribution
- Carefully looked at the tree variables especially "P.hod.TimeHist\_StartTime\_Sigma"
  - After looking at the code in hcana and a lot of scratching head :P
  - The replays weren't using the "phodo\_cuts\_Autumn18.param" file
- A set of dedicated cut files are being used for a range of run numbers.

# SHMS Beta v/s CoinTime (ptof = 2)

10.6 GeV





# Summary and Outlook

- Beta / CoinTime leakage was only visible in 10.6 GeV data (Autumn 2018).
- Issue is resolved by setting “ptof\_tolerance” variable from 100 to 2.
  - For 6.2 / 8.2 GeV, this was already set to 2.0
- The beta efficiency numbers for 10.6 and 6.2/8.2 GeV are now identical.
  - No need to do an efficiency correction.

## Next Steps

- Need to update all the param files and make a pull request.
  - Do a full replay of all data with corrected param files and offsets.