Feasibility studies of proton electromagnetic form factors with the $\bar{\text{P}}$ANDA detector

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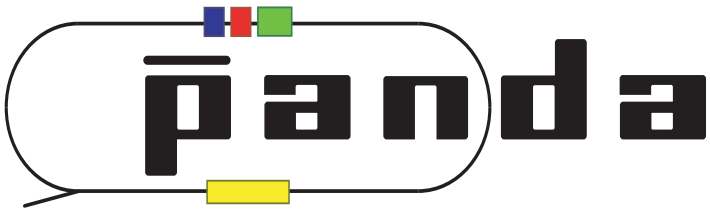
$\bar{\text{P}}$ANDA collaboration meeting
Darmstadt
December 10, 2012



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Outline

Monte Carlo Simulations

$\bar{p}p \to e^+e^-$ (trunk17622)

- $p(\bar{p}) = 3.3[GeV/c] \to s = 8.21[GeV/c]^2$
- $G_E/G_M = 0$
- $N = 0.5 * 10^6$
- PHOTOS *on*/*off*

$\bar{p}p \to \pi^+\pi^-$ (trunk17622)

- $p(\bar{p}) = 3.3[GeV/c] \to s = 8.21[GeV/c]^2$
- $N = 10^7$

Analysis

PID algorithm

- PidAlgoEmcBayes
- PidAlgoMvd
- PidAlgoMdtHardCuts
- PidAlgoDrc
- PidAlgoDisc
- PidAlgoStt

with electron mass hypothesis.

Selection criteria

Valid for all cases

- The event must have only one positive and one negative particle after reconstruction

Applied individually

- **p5:** $P(e^{\pm}) > 50\%$ and $P(\pi^{\pm}) < P(e^{\pm})/10$
- **p6:** $P(e^{\pm}) > 60\%$ and $P(\pi^{\pm}) < P(e^{\pm})/10$
- **p7:** $P(e^{\pm}) > 70\%$ and $P(\pi^{\pm}) < P(e^{\pm})/10$
- **p8:** $P(e^{\pm}) > 80\%$ and $P(\pi^{\pm}) < P(e^{\pm})/10$
- **p9:** $P(e^{\pm}) > 90\%$ and $P(\pi^{\pm}) < P(e^{\pm})/10$
- **p95:** $P(e^{\pm}) > 95\%$ and $P(\pi^{\pm}) < P(e^{\pm})/10$
- **p95:** $P(e^{\pm}) > 99\%$ and $P(\pi^{\pm}) < P(e^{\pm})/10$

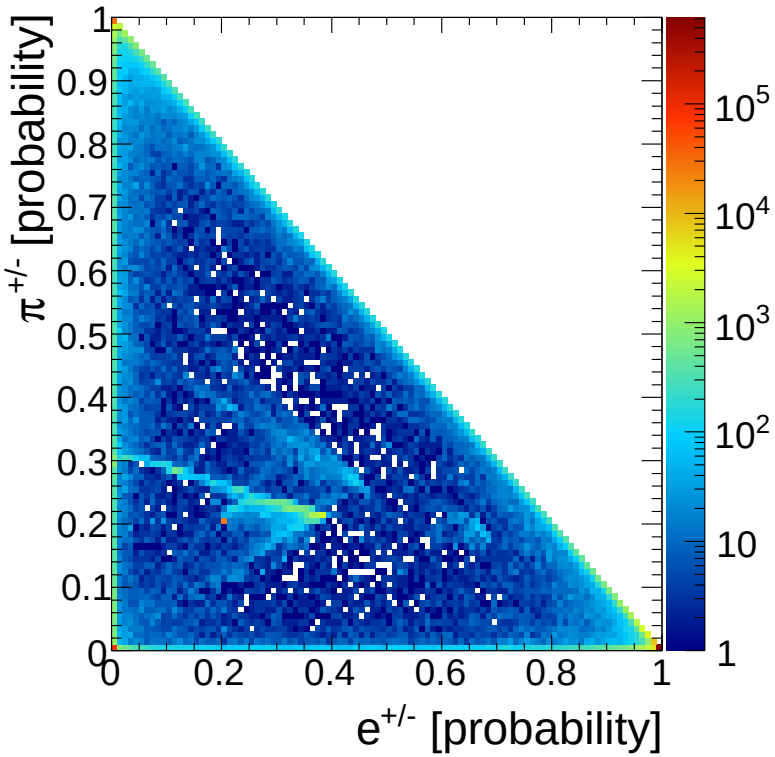
Selection criteria

a2:

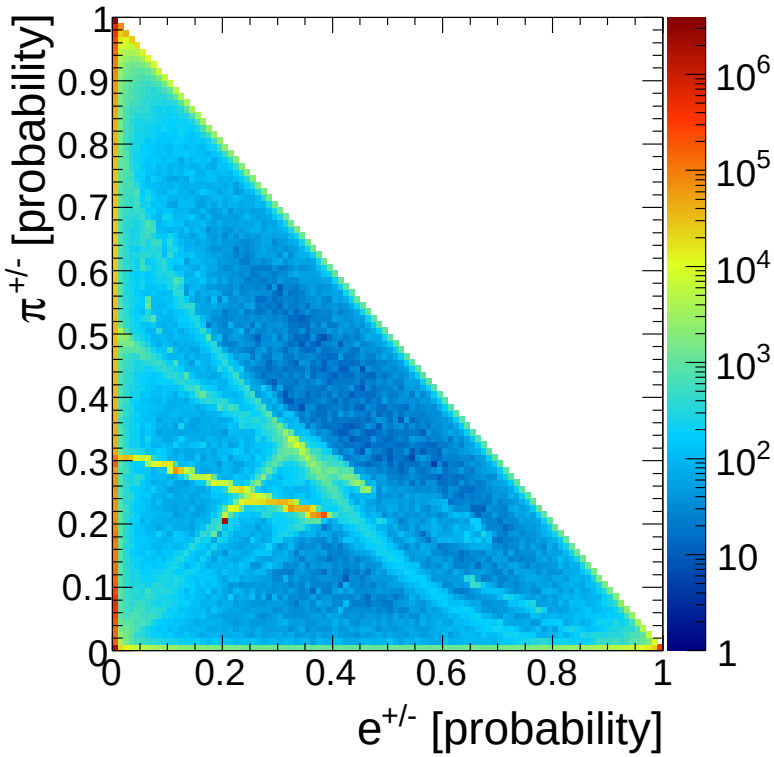
- The event must have only one positive and one negative particle after reconstruction
- $P(e^{\pm}) > 99\%$ and $P(\pi^{\pm}) < P(e^{\pm})/10$
- For both the positive and the negative particle, $E/p > 0.8$ [(GeV)/(GeV/c)]
- $dE/dx_{STT} > 5.6[GeV/cm]$

Probabilities

e^+e^-

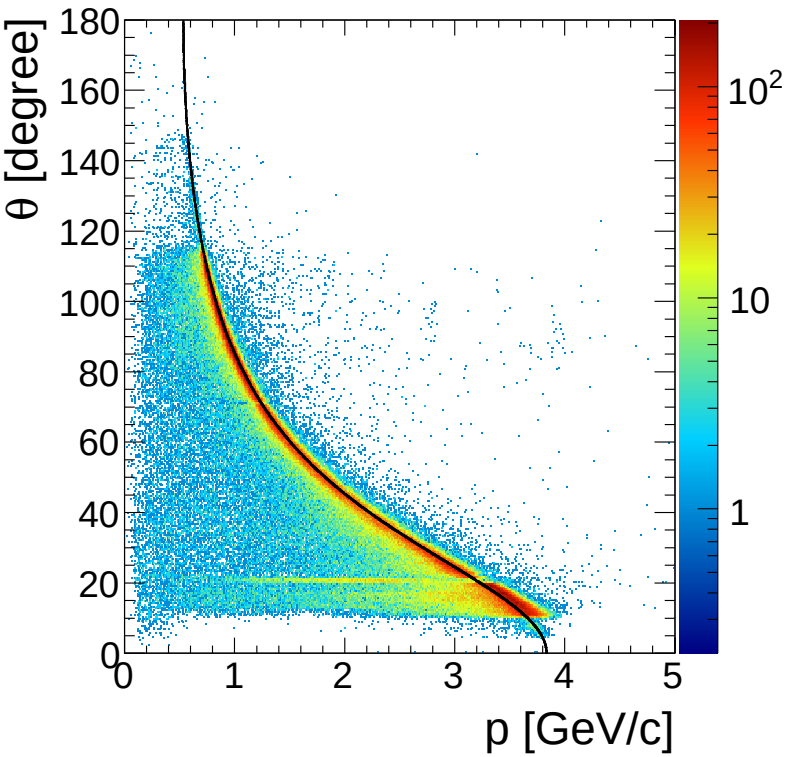


$\pi^+\pi^-$



PHOTOS on/off for e^+e^-

PHOTOS off



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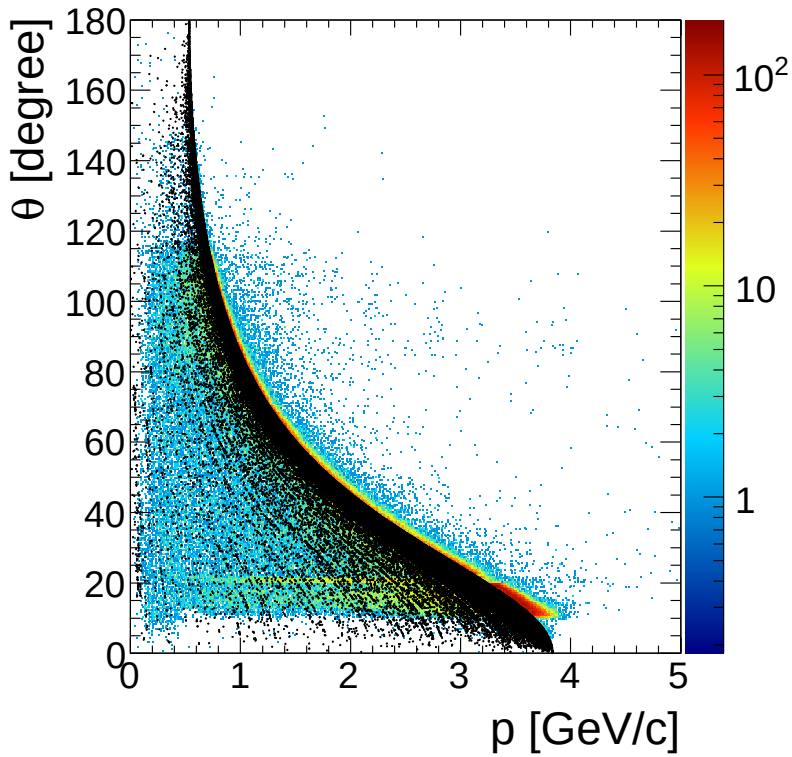
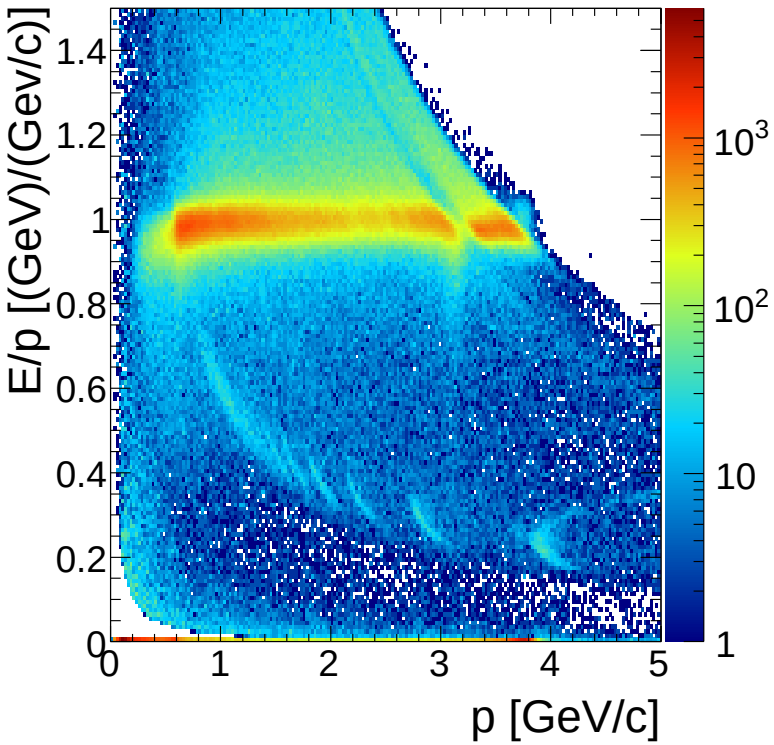
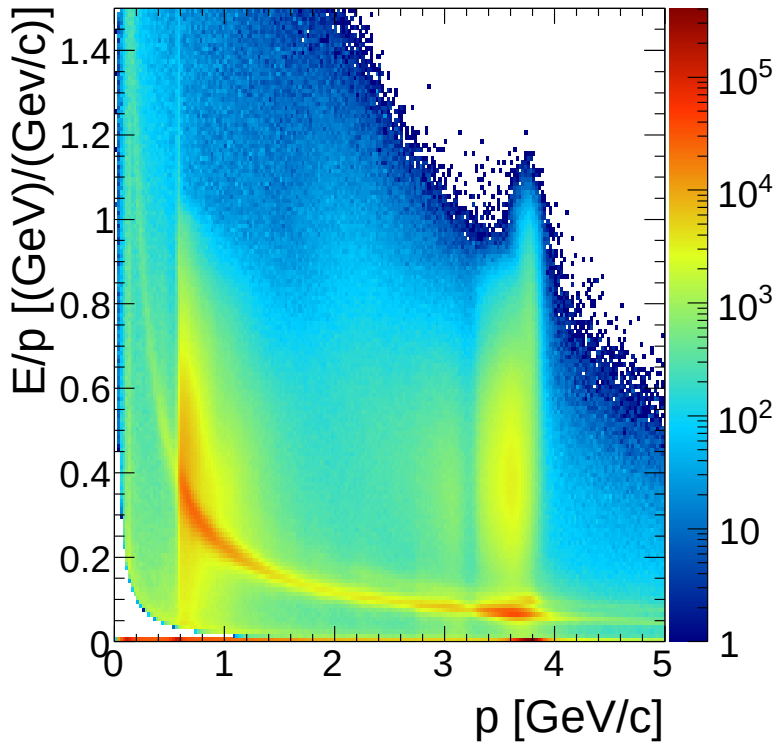


E/p vs p

e^+e^-

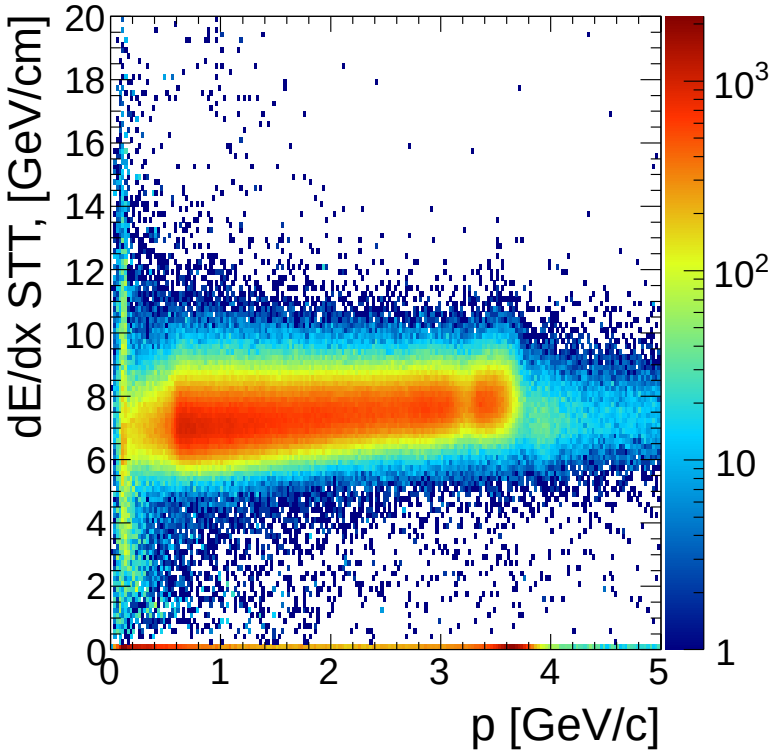


$\pi^+\pi^-$

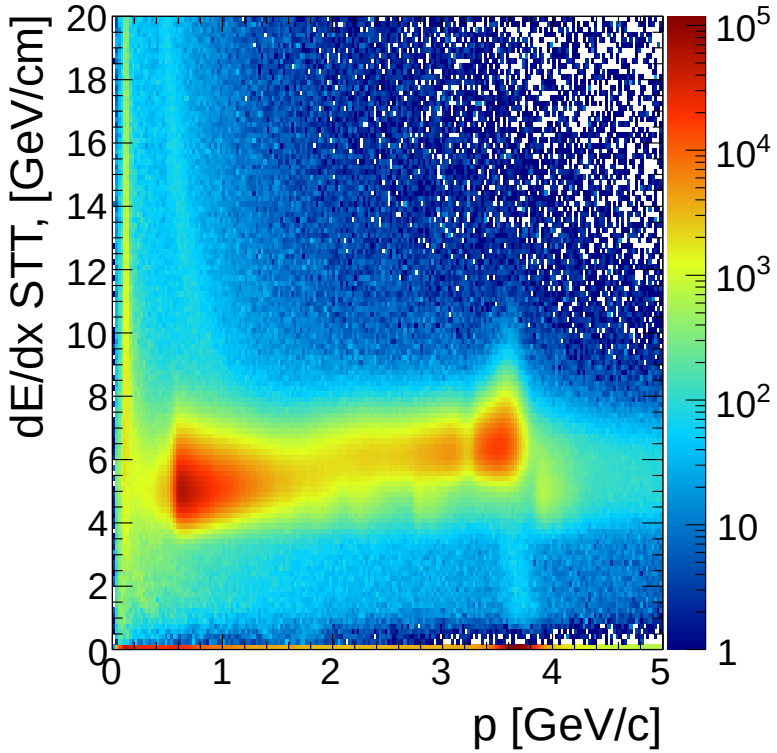


dE/dx_{STT}

e^+e^-

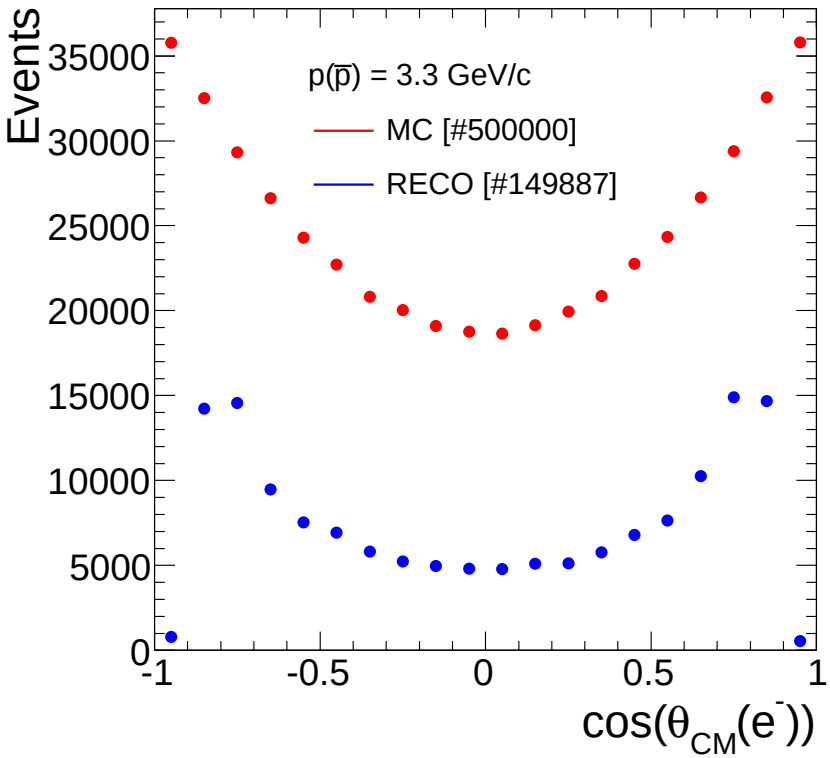


$\pi^+\pi^-$



Angular distribution for e^+e^- [p5]

PHOTOS off



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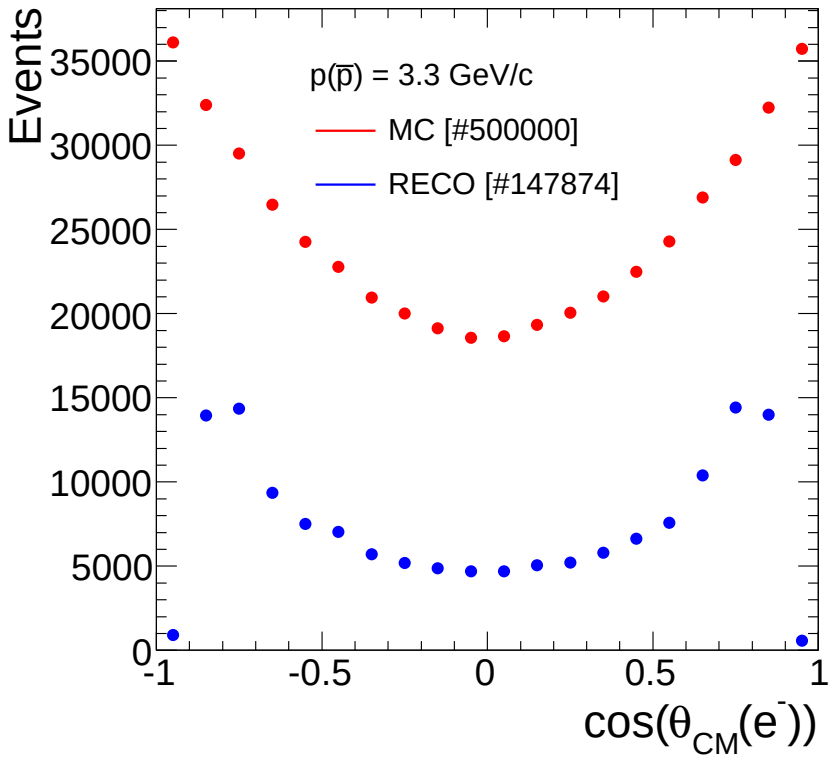
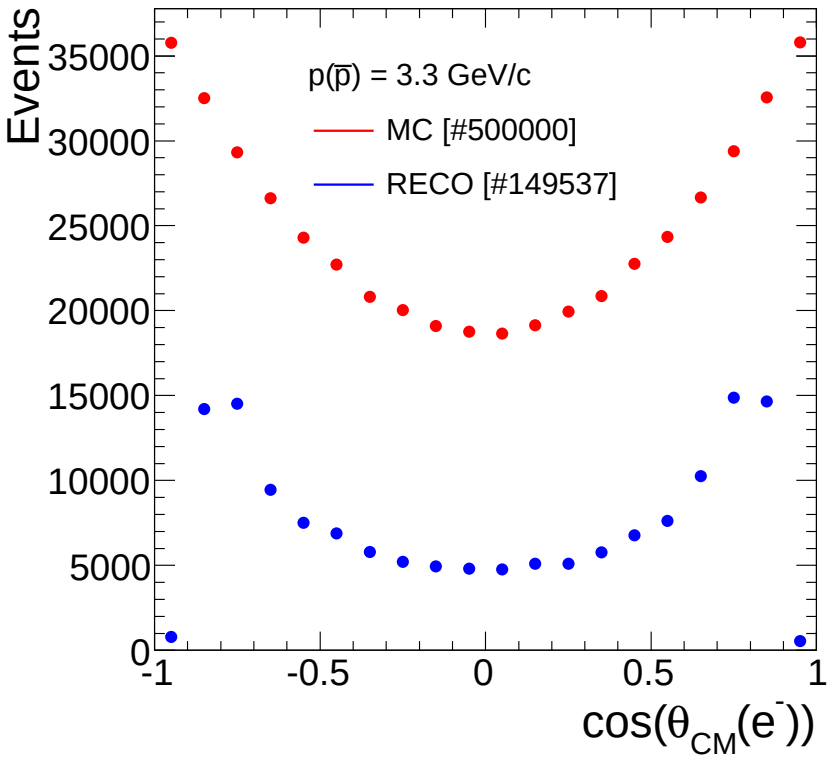


Angular distribution for e^+e^- [p6]

PHOTOS off



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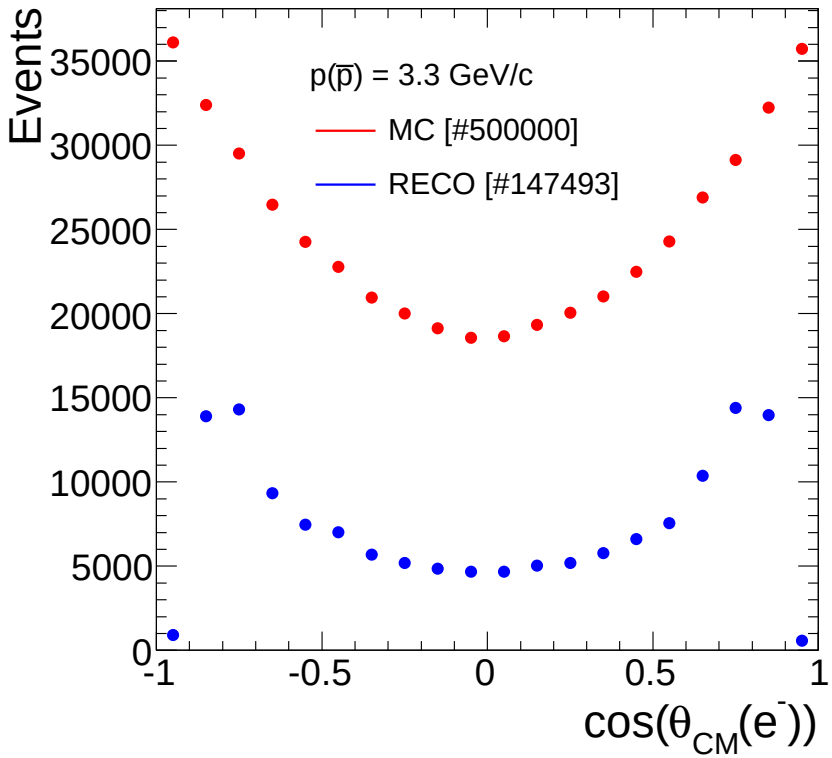
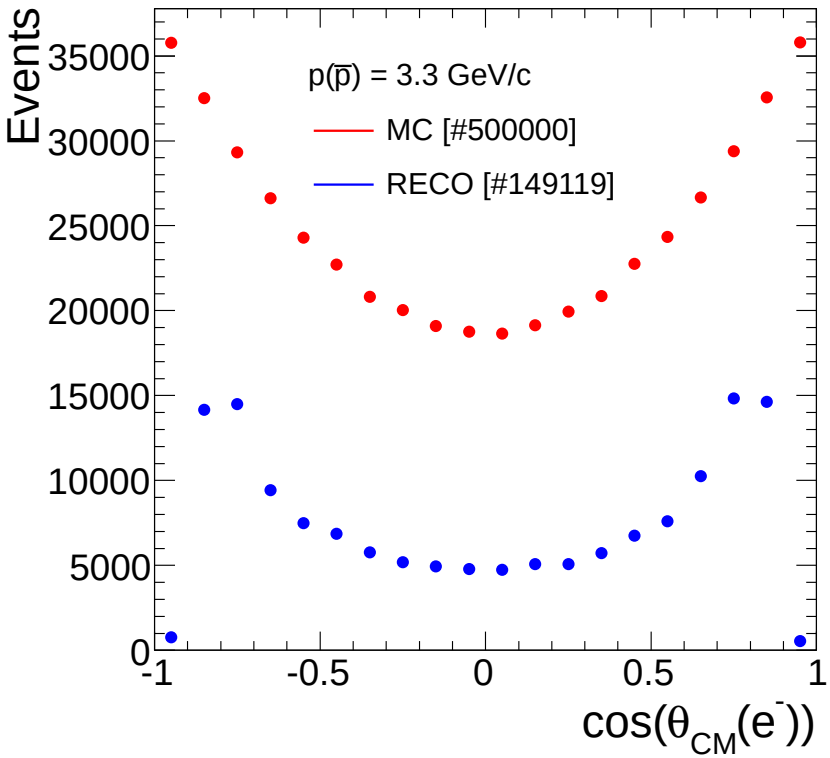


Angular distribution for e^+e^- [p7]

PHOTOS off



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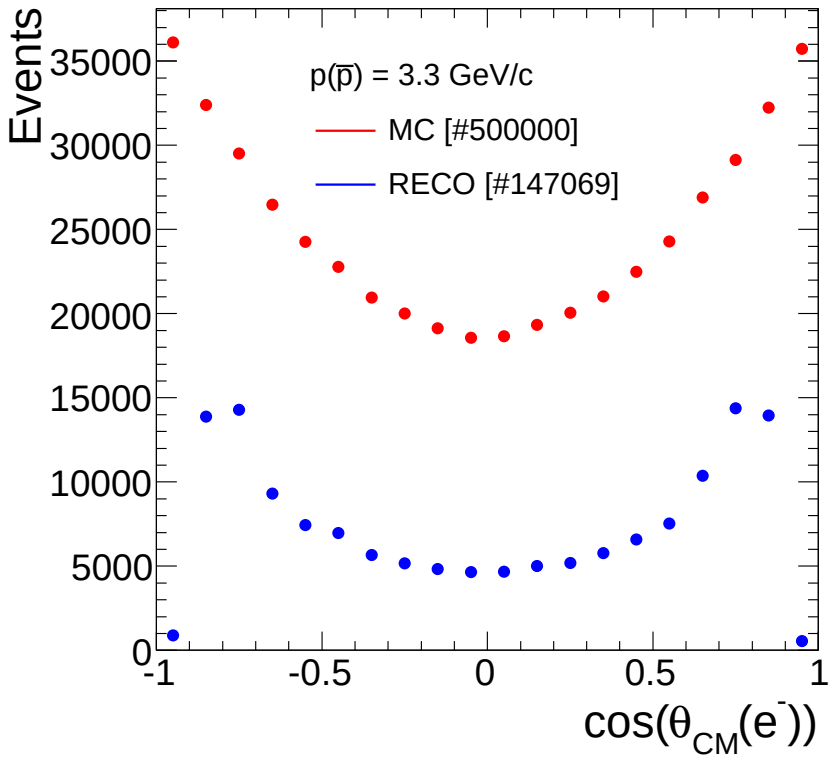
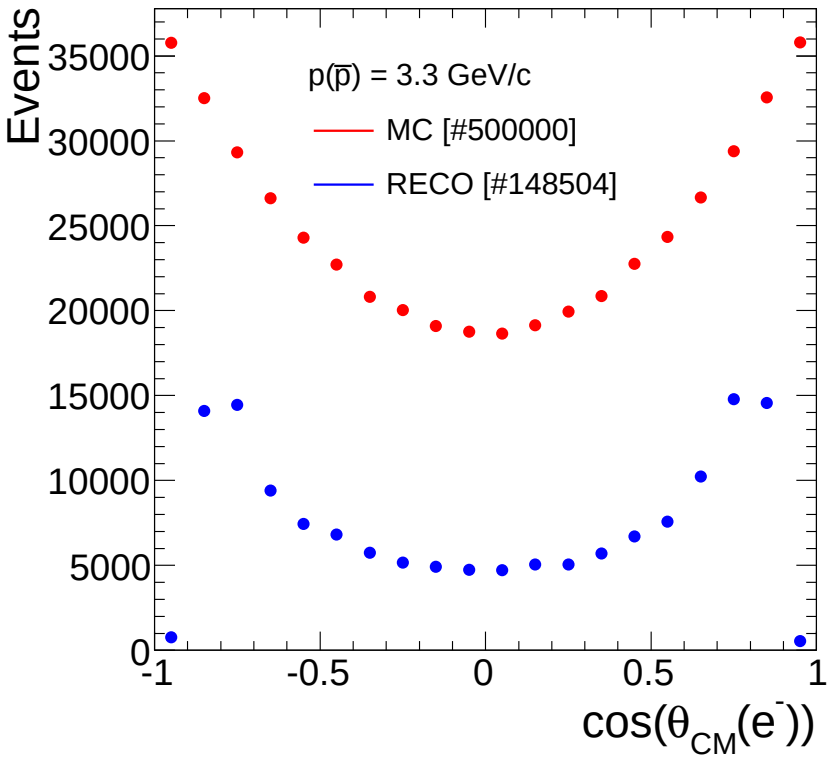


Angular distribution for e^+e^- [p8]

PHOTOS off



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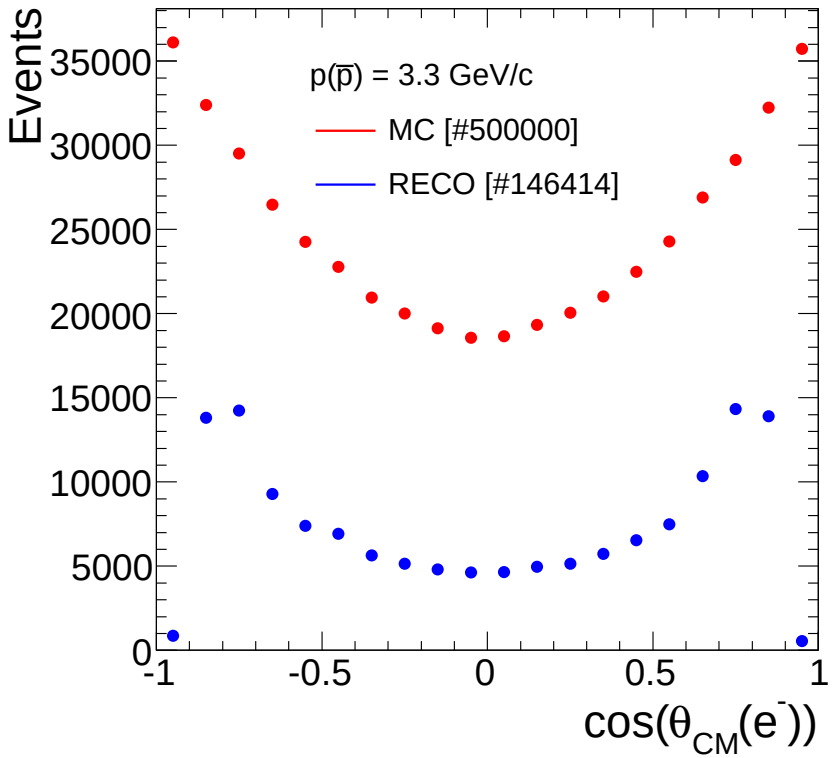
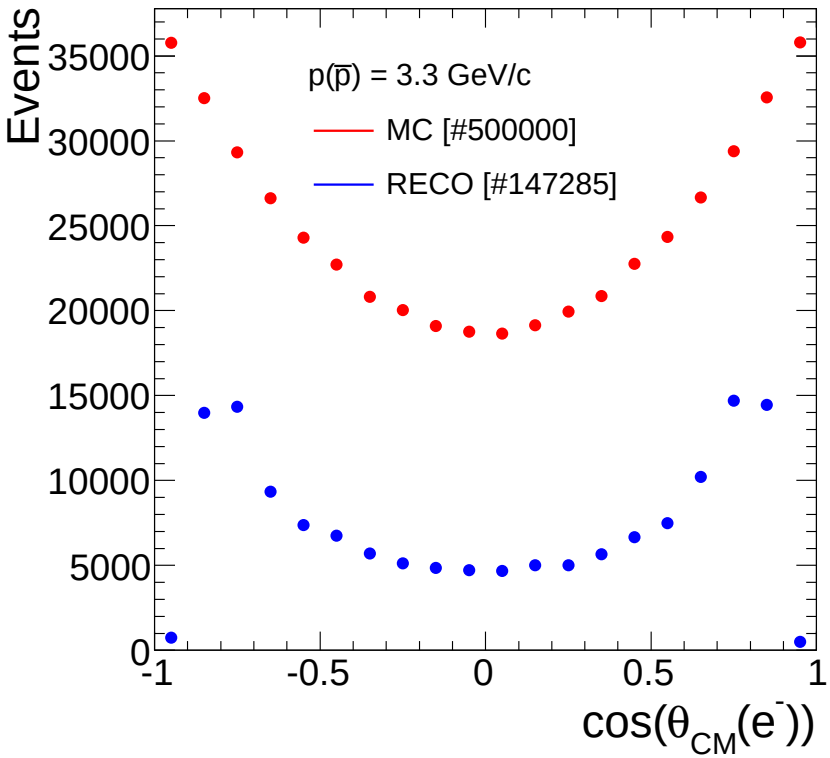


Angular distribution for e^+e^- [p9]

PHOTOS off



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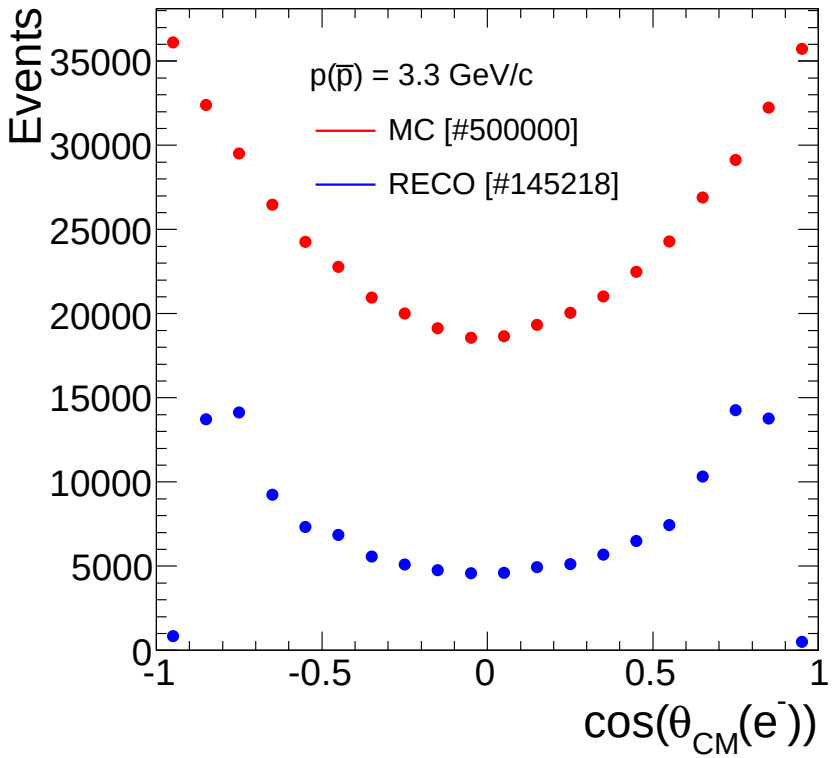
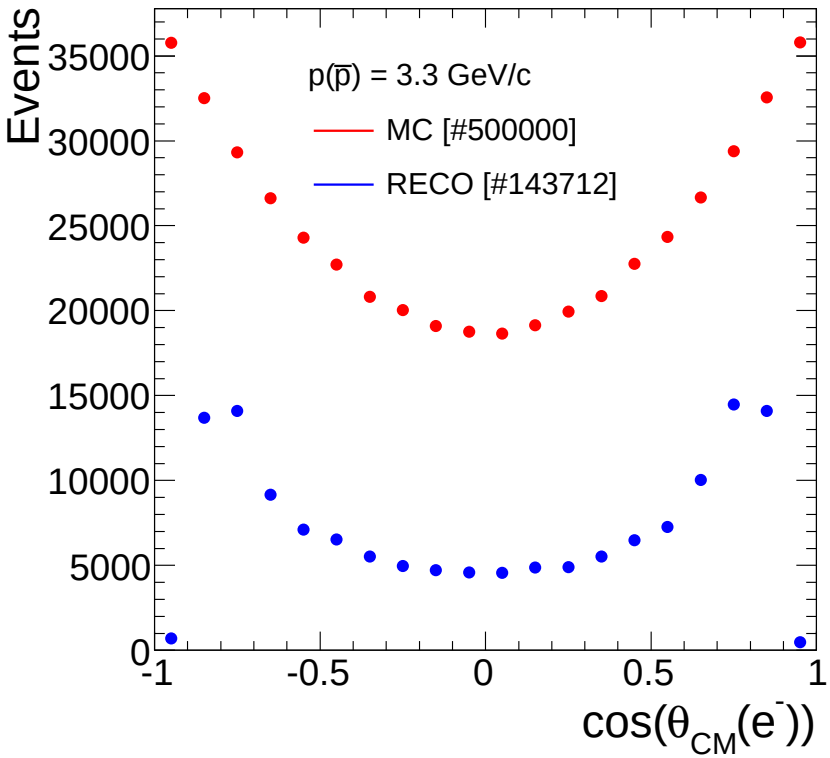


Angular distribution for e^+e^- [p95]

PHOTOS off



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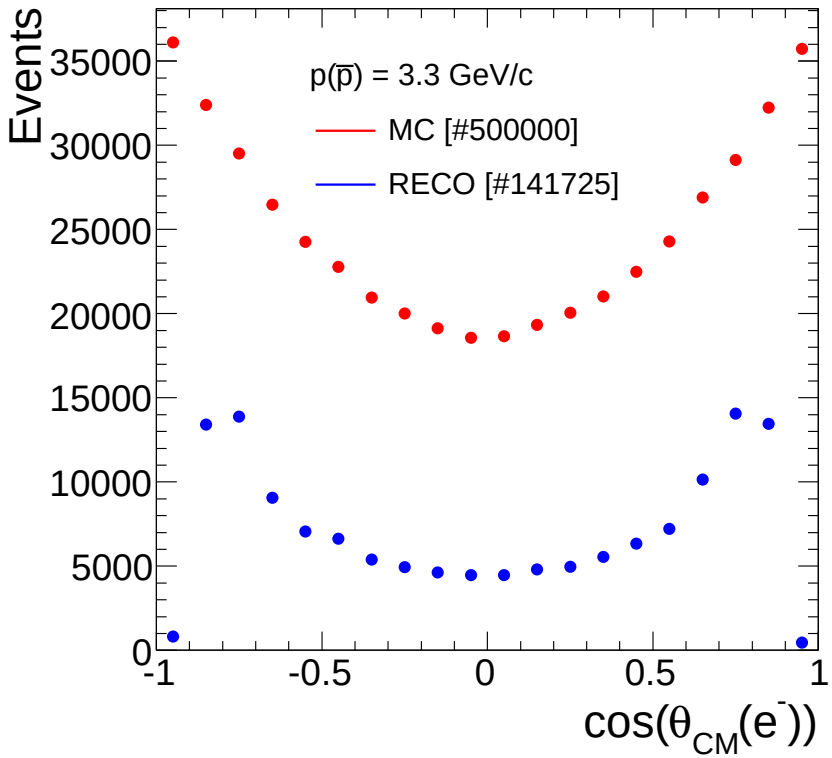
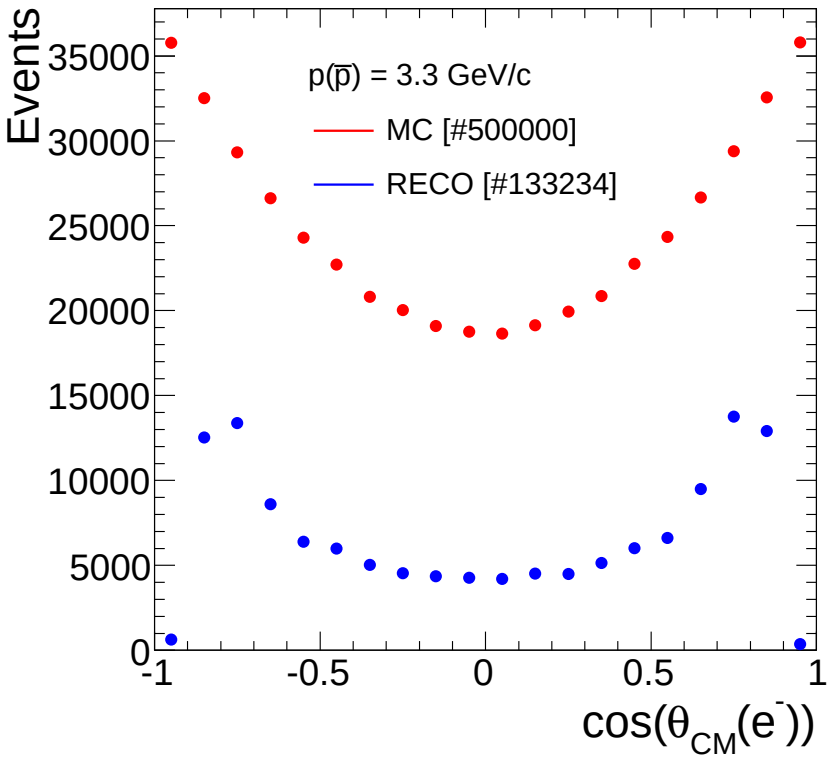


Angular distribution for e^+e^- [p99]

PHOTOS off



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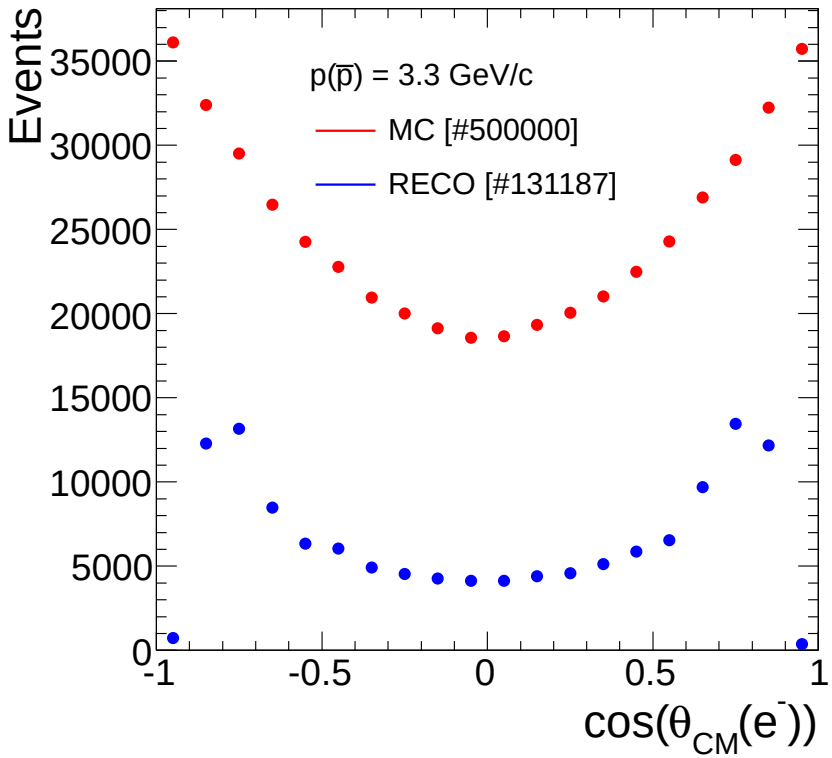
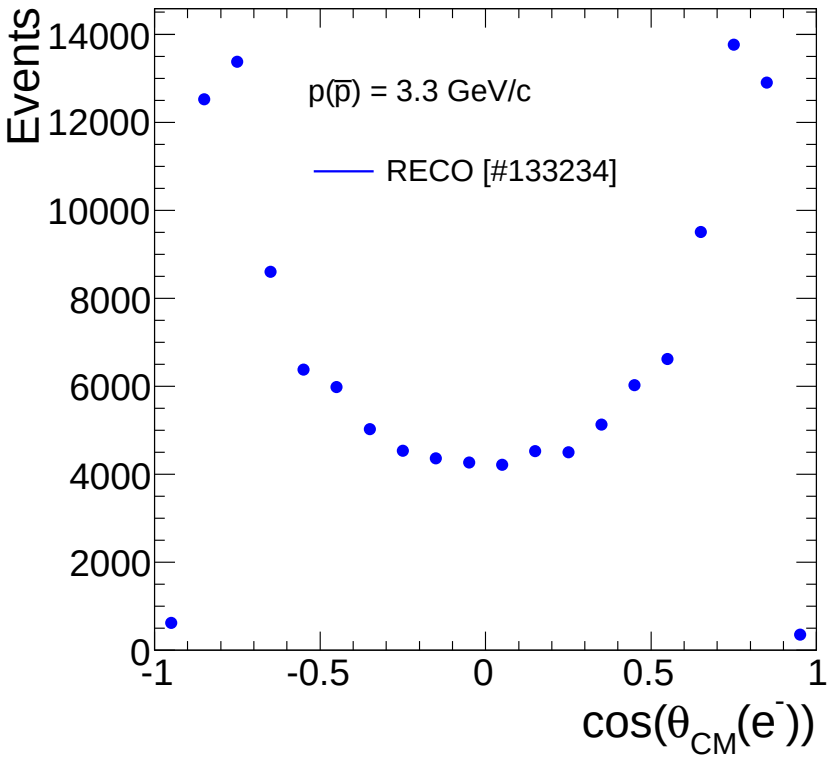
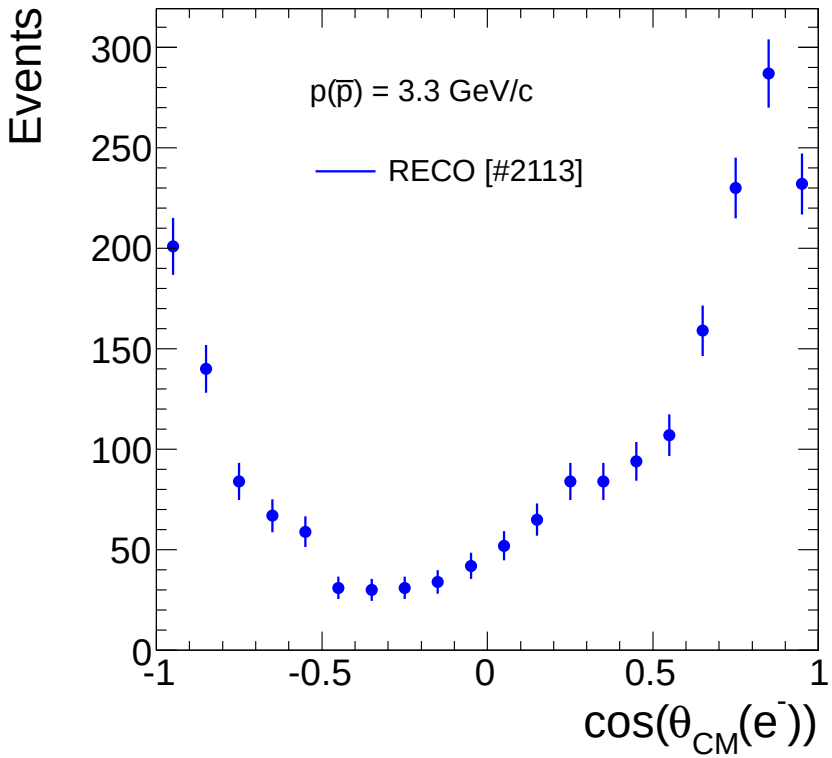


Angular distribution for [p99]

e^+e^-

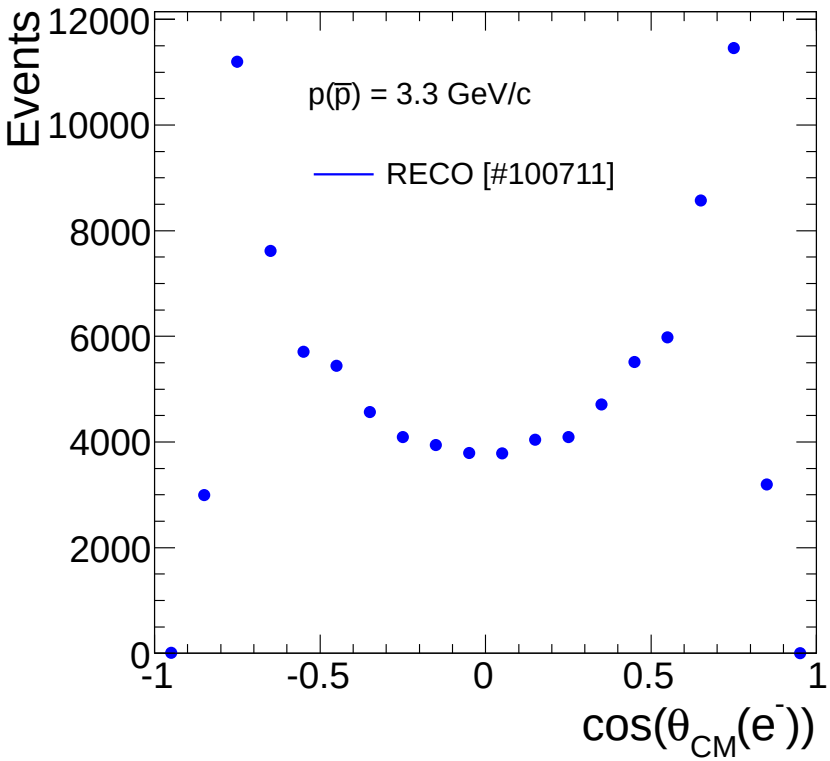


$\pi^+\pi^-$

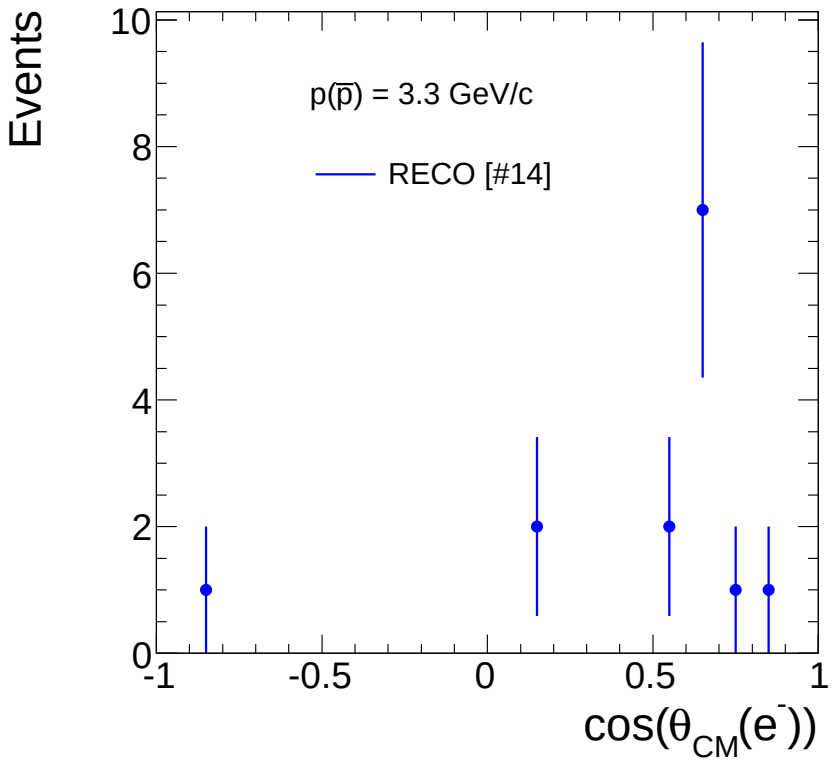


Angular distribution for [a2]

e^+e^-

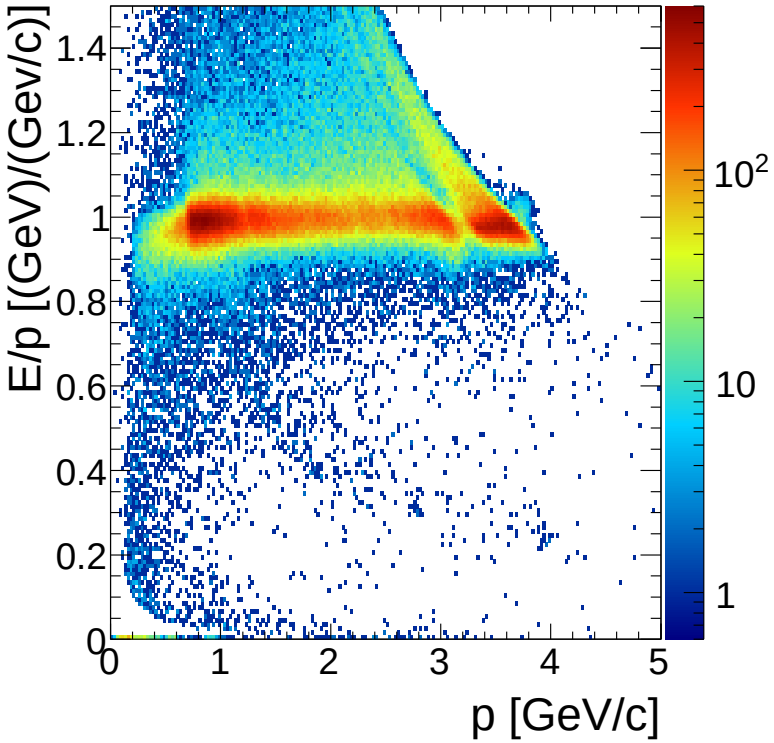


$\pi^+\pi^-$

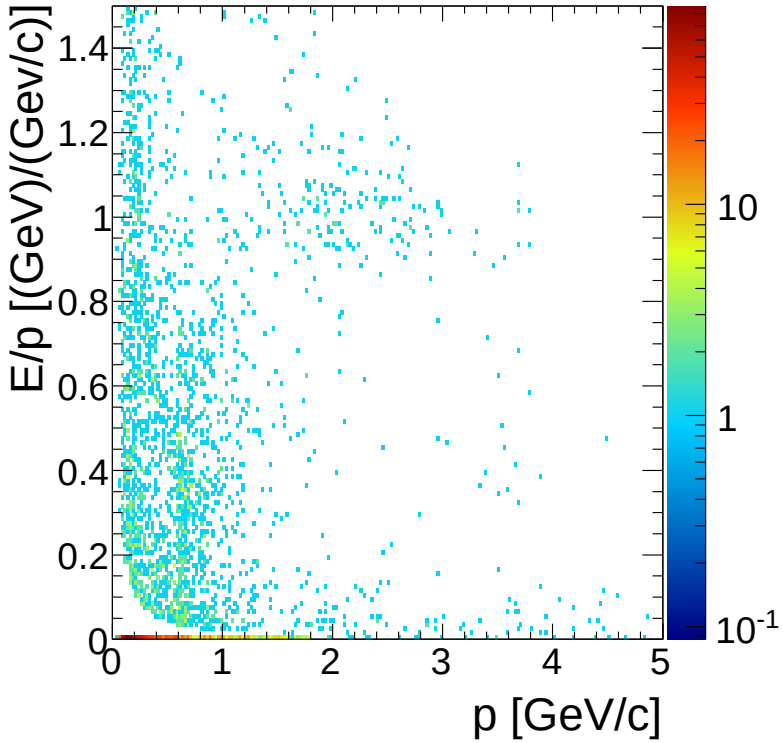


E/p vs p after [p99]

e^+e^-

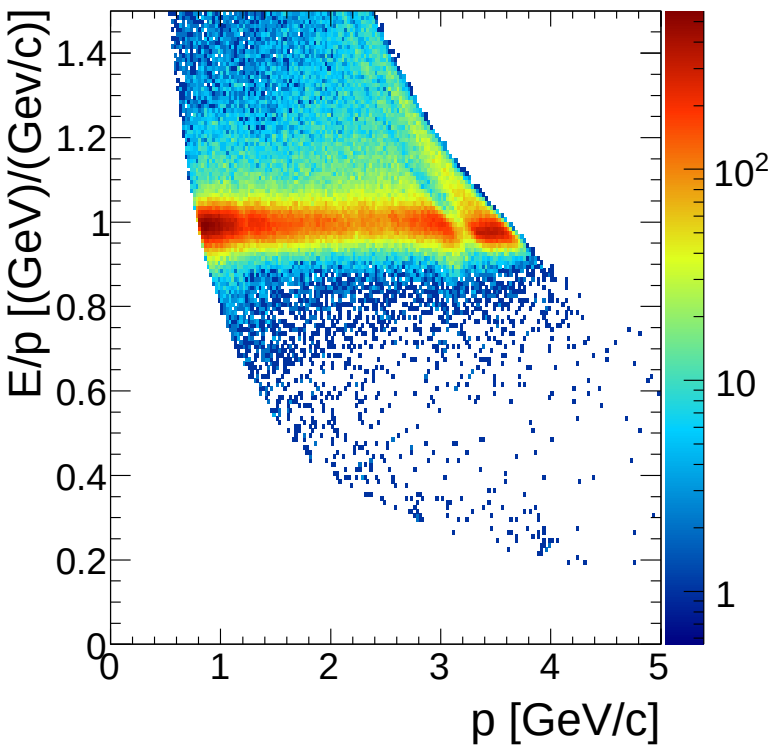


$\pi^+\pi^-$

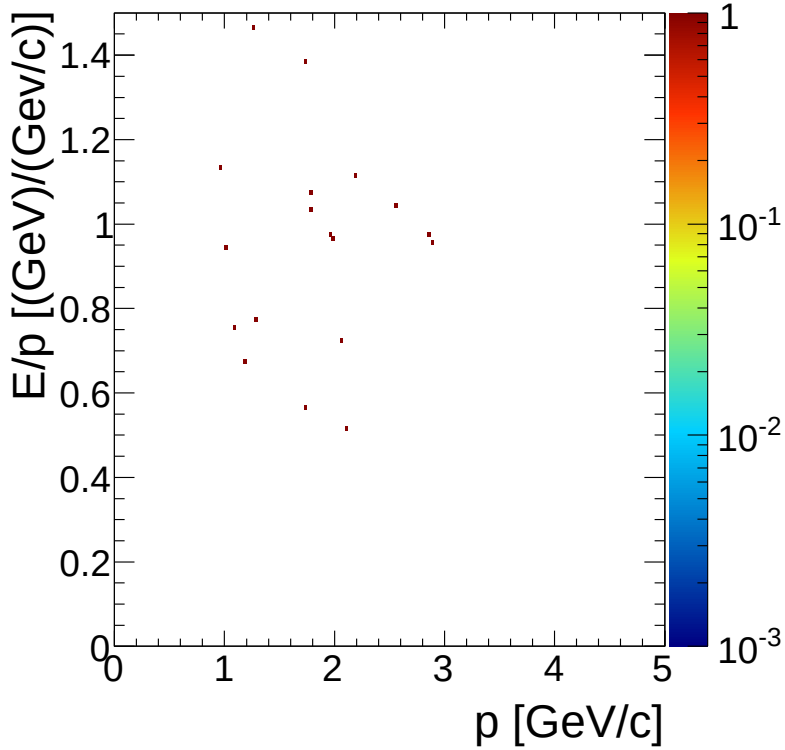


E/p vs p after [a2]

e^+e^-

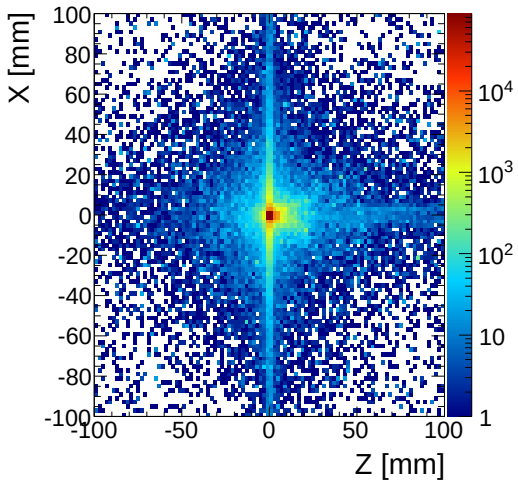


$\pi^+\pi^-$

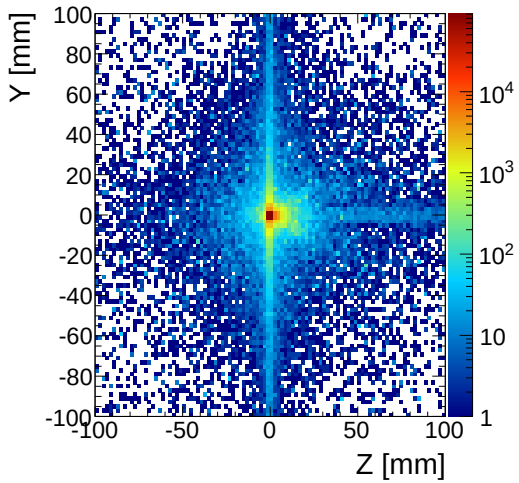


Vertex fitting

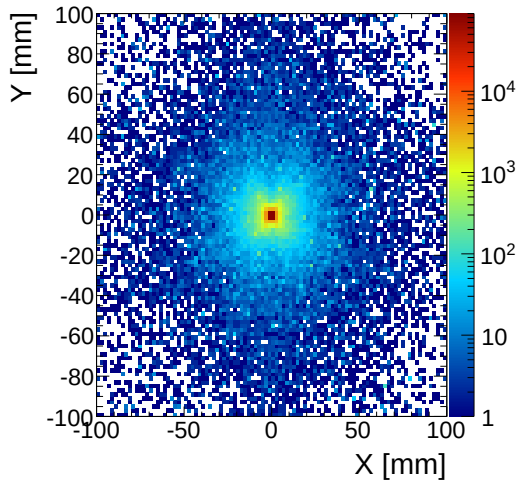
ZX



ZY



XY



Outlook

- Produce 10^8 background events
- Put kinematic fitting into selection criteria
- Apply broad spectre of selesction criteria both to signal and background
- Study of the background residuals after selection
- Implementation of the pion event generator with PHOTOS support