Energy Resolution of Runge-Kutta Reconstruction of Padded Microscopically Simulated Tracks

First Successful Attempt

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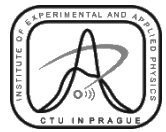
Outline



Outline

Grid-like track simulation

- We use Garfield++ for track simulation
  - Primary relativistic particle simulated using Heed program [1]
  - Secondary ionization electrons simulated using microscopic tracking (uses equation of motion)
- Microscopic tracks were simulated on MetaCentrum to test the Runge-Kutta padded reconstruction
  - 2000 jobs, each 20-160 hours runtime, 20 GB RAM allocated
  - 9702 tracks were simulated (electron vs positron, 21 theta angles, 21 phi angles, 11 energies 3-13 MeV)
  - Reconstruction lasts around 40 minutes

Simulation ranges

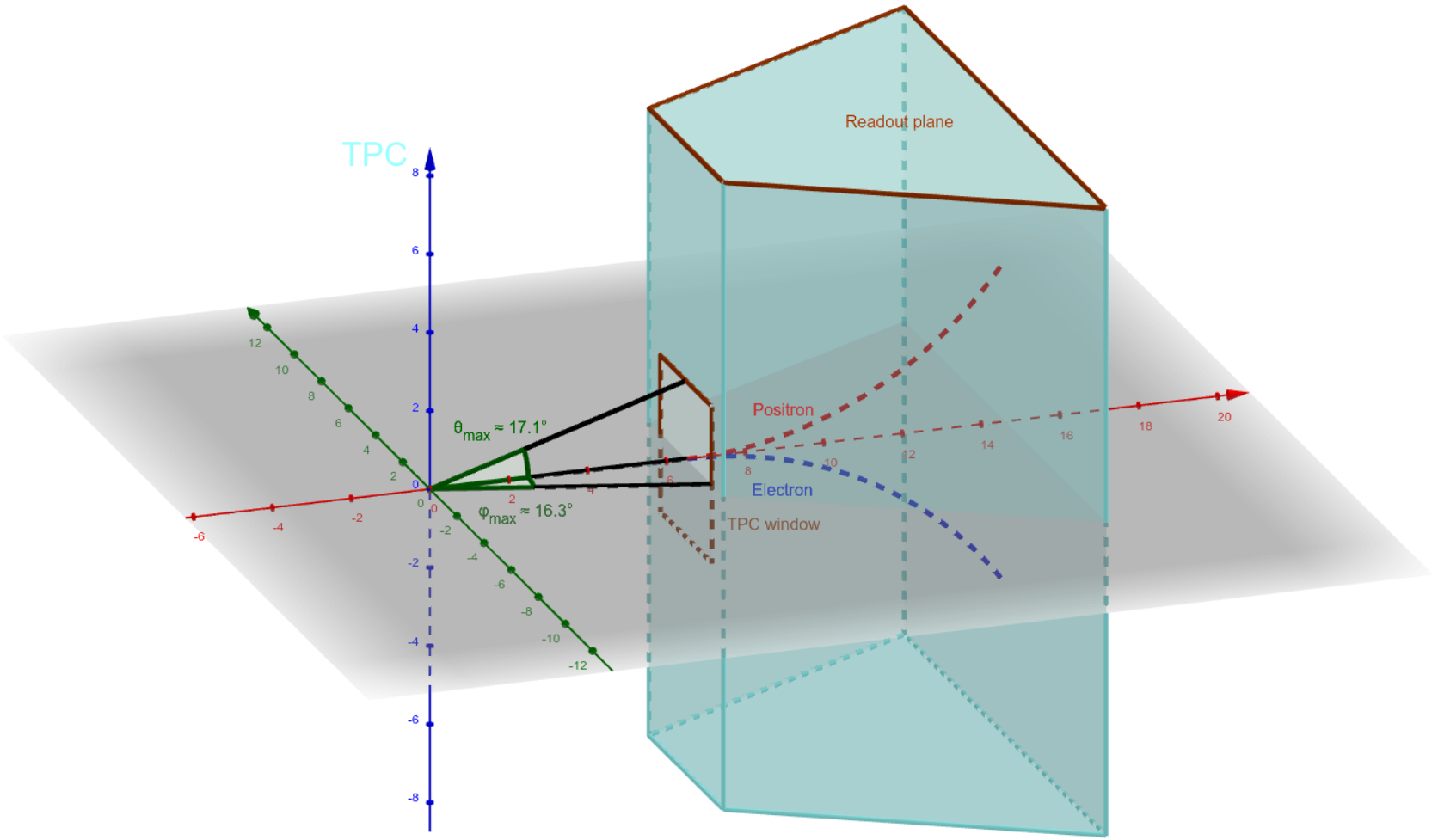
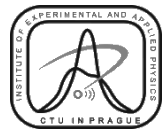


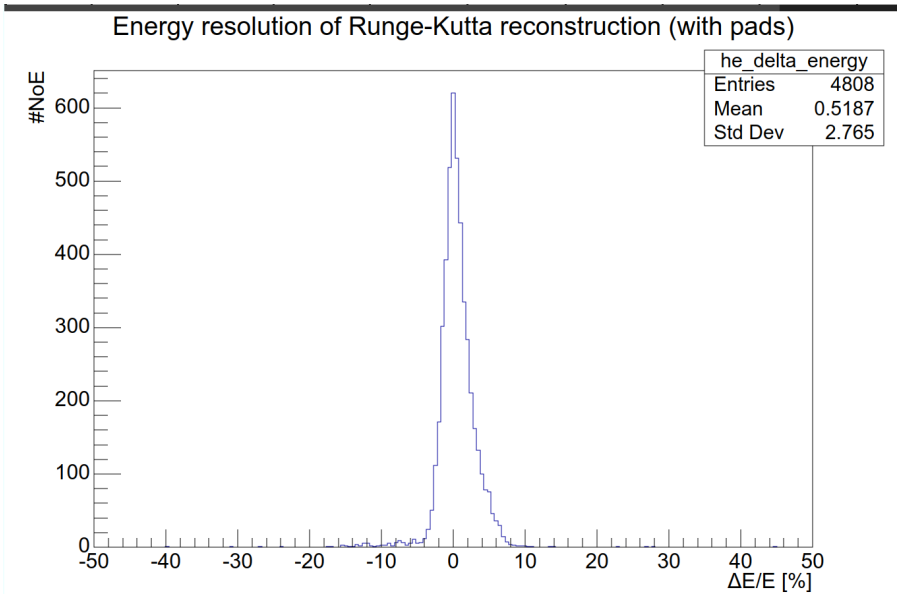
Figure: $\theta \in [-17.1°, 17.1°]$, $\varphi \in [-16.3°, 16.3°]$, $E_k \in [3, 13]$ MeV.

Outline

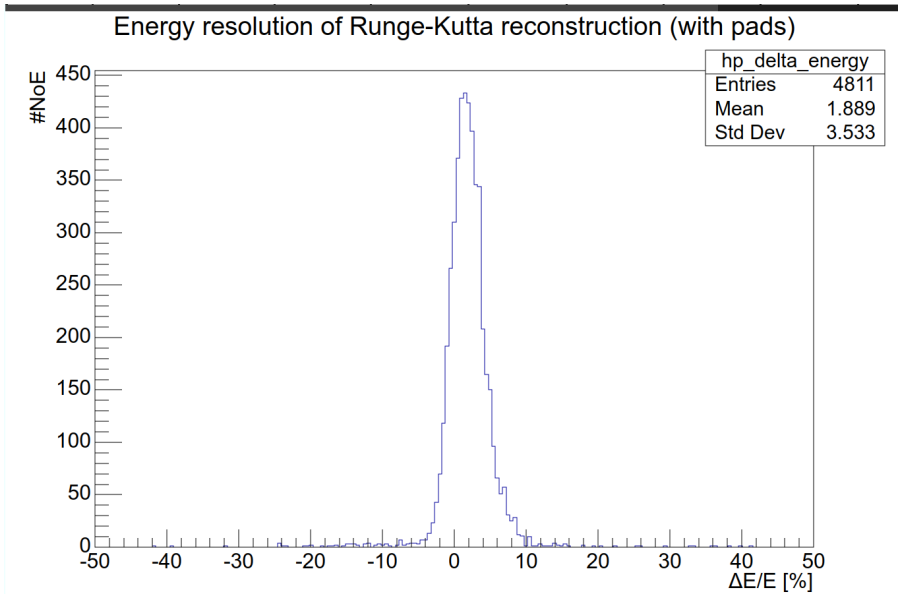


Energy resolution for all tracks

Electrons

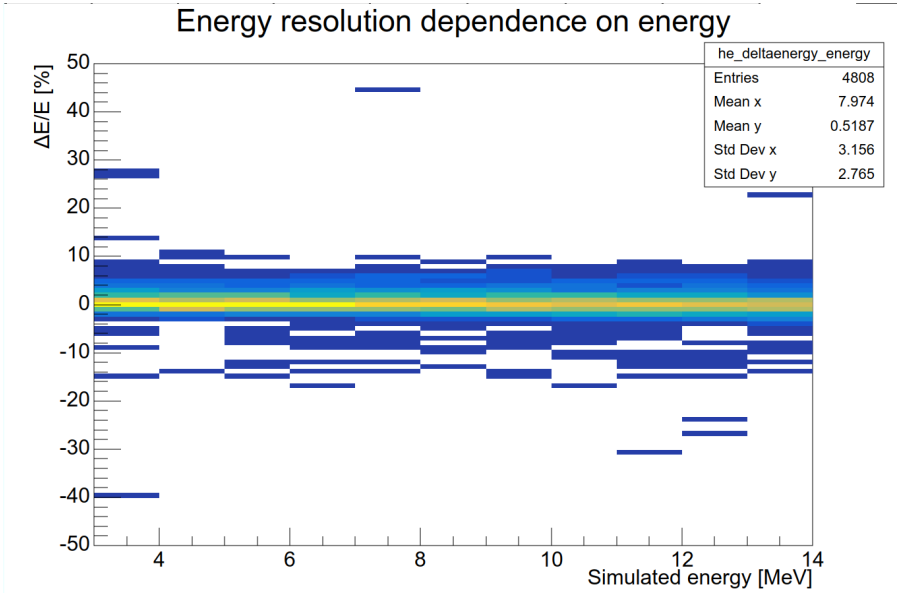


Positrons

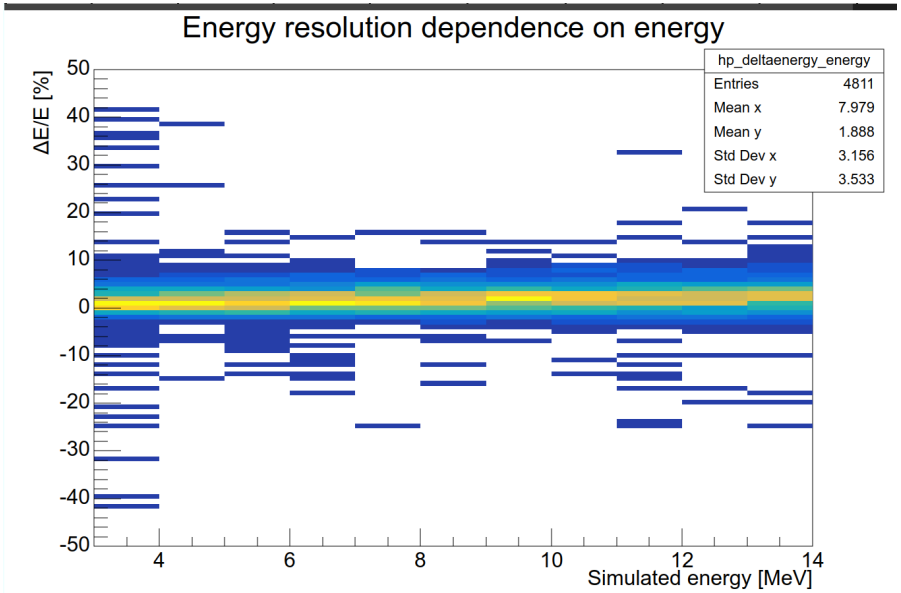


Energy resolution dependence on simulated energy

Electrons



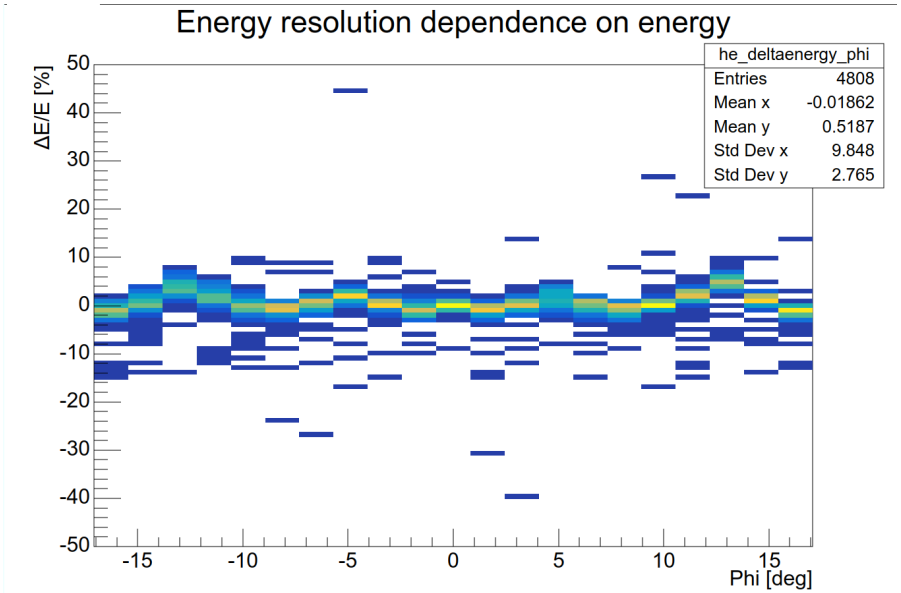
Positrons



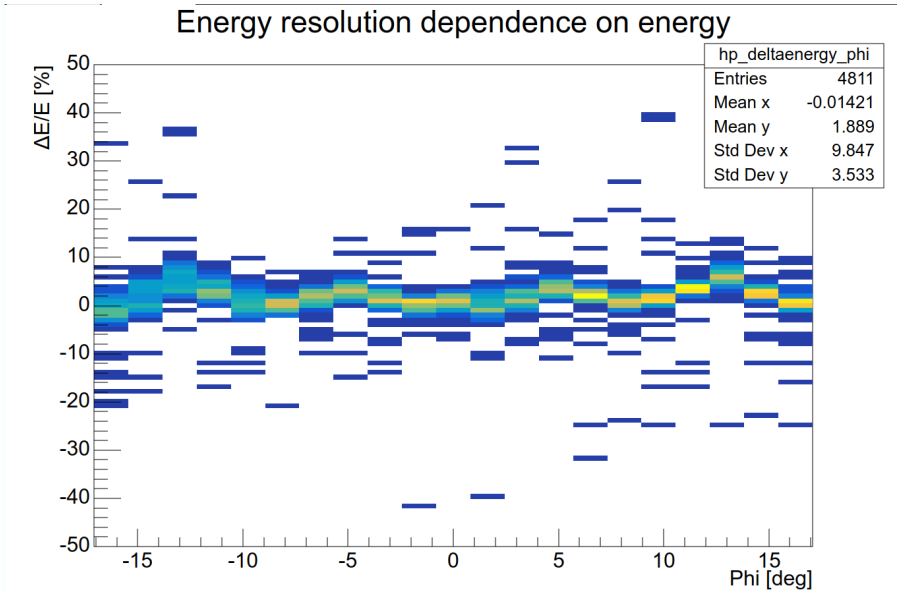
Outline

Energy resolution dependence on phi

Electrons

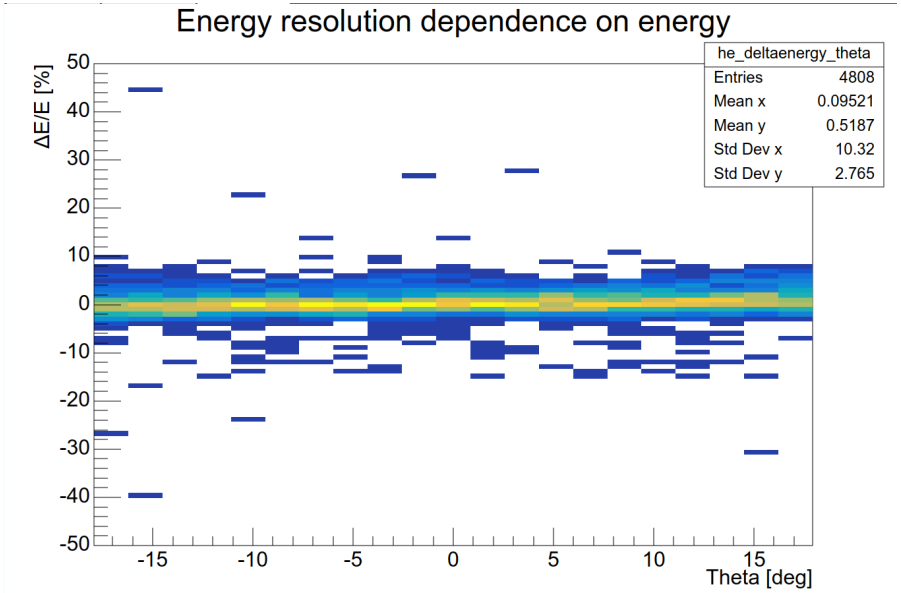


Positrons



Energy resolution dependence on theta

Electrons



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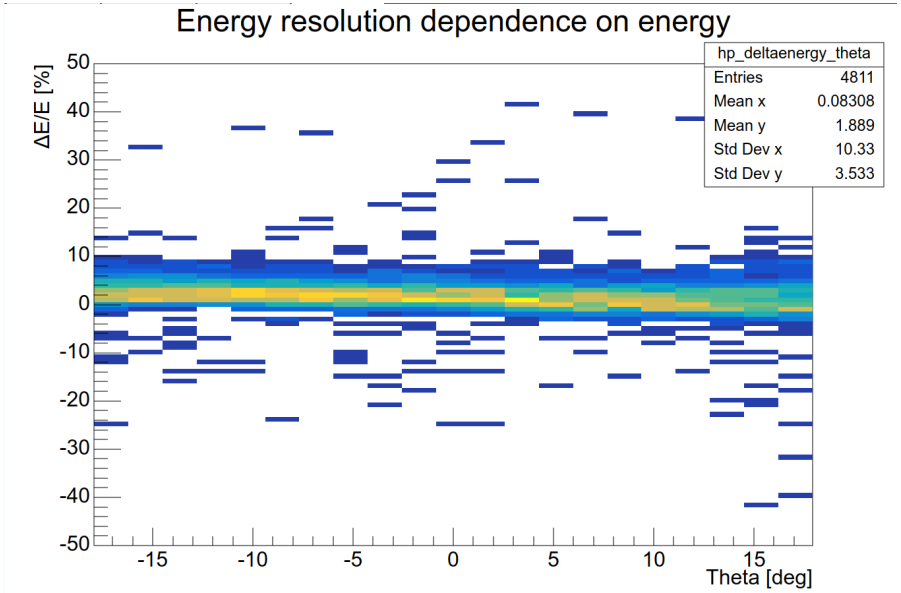
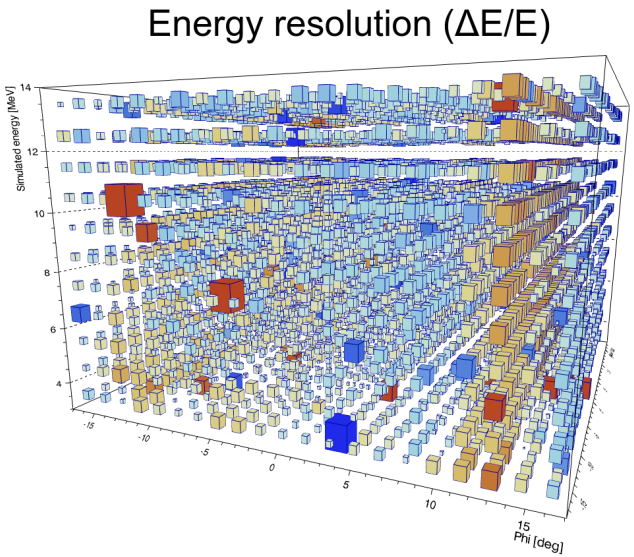


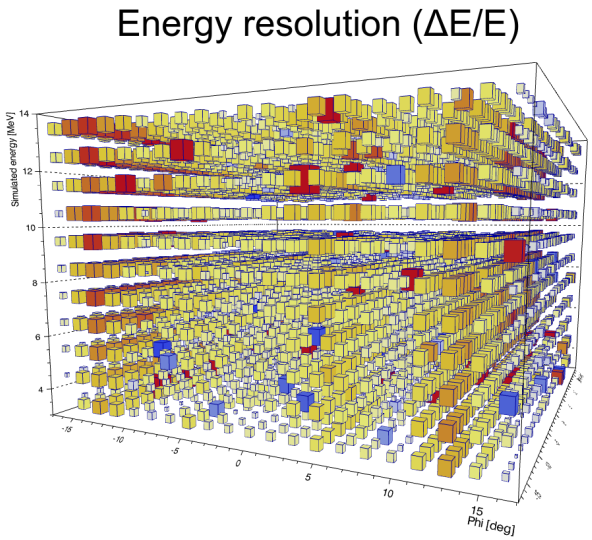
Outline

All track parameters (phi, theta and simulated energy)

Electrons



Positrons



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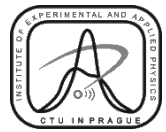
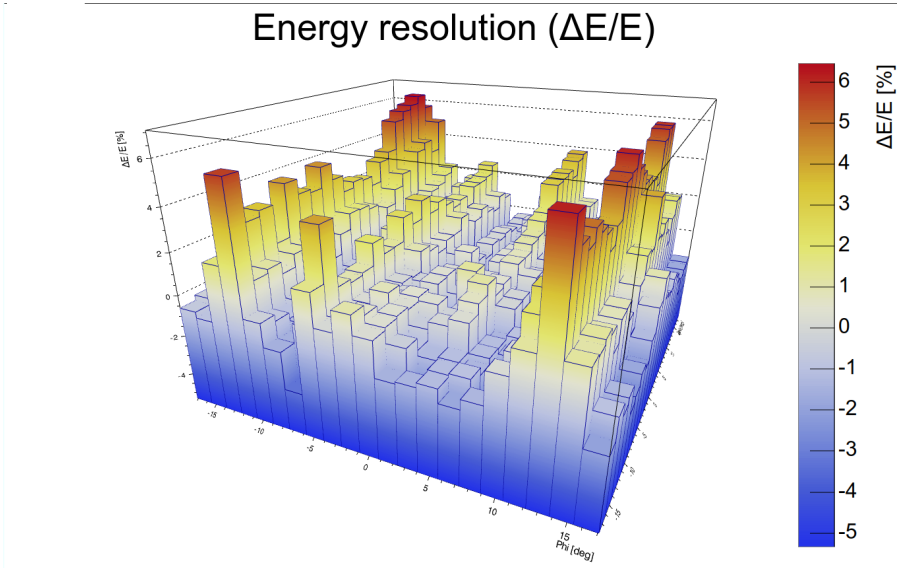


Theta-Phi cut average bias

Electrons



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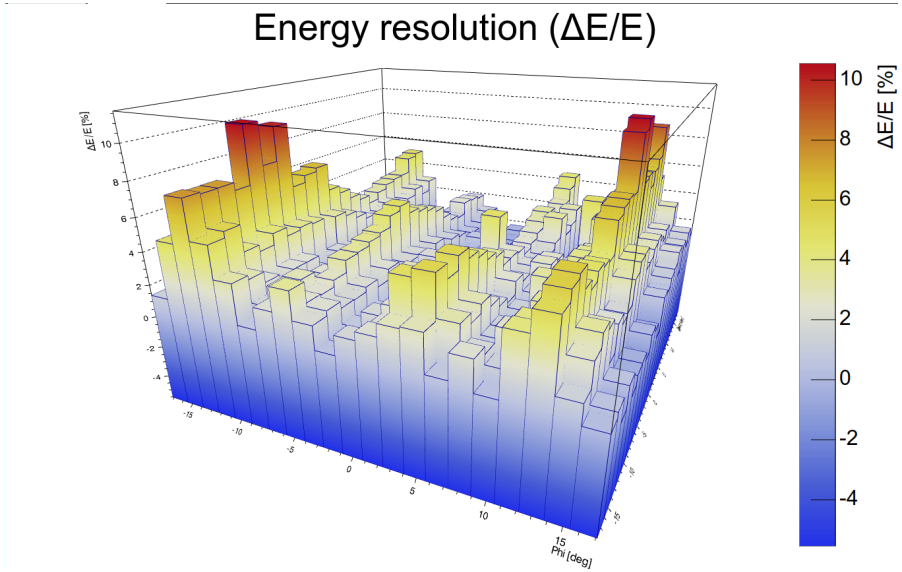
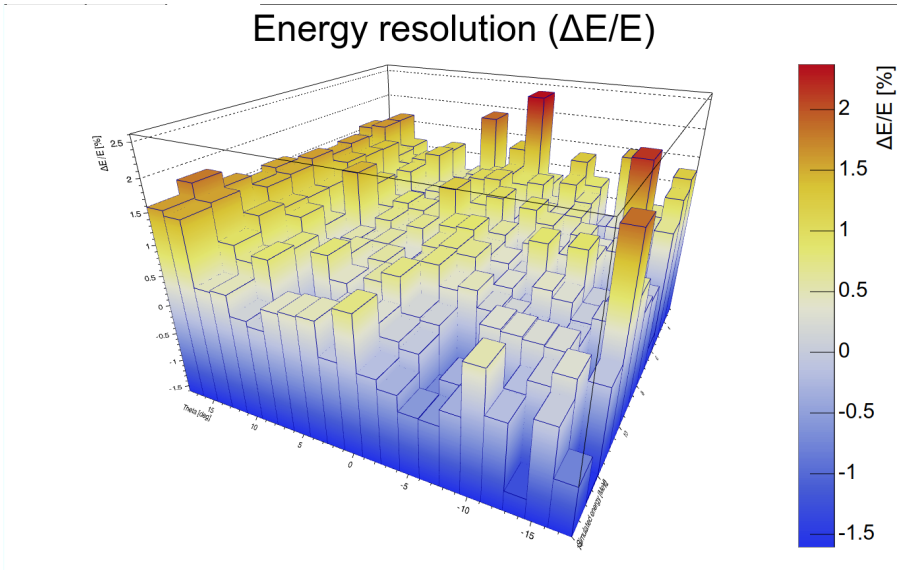


Theta-Energy cut average bias

Electrons



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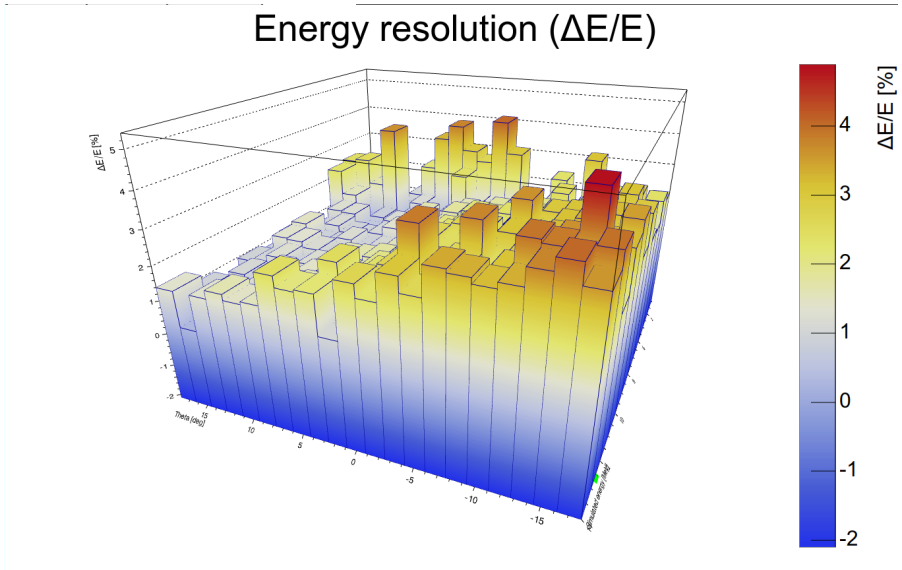
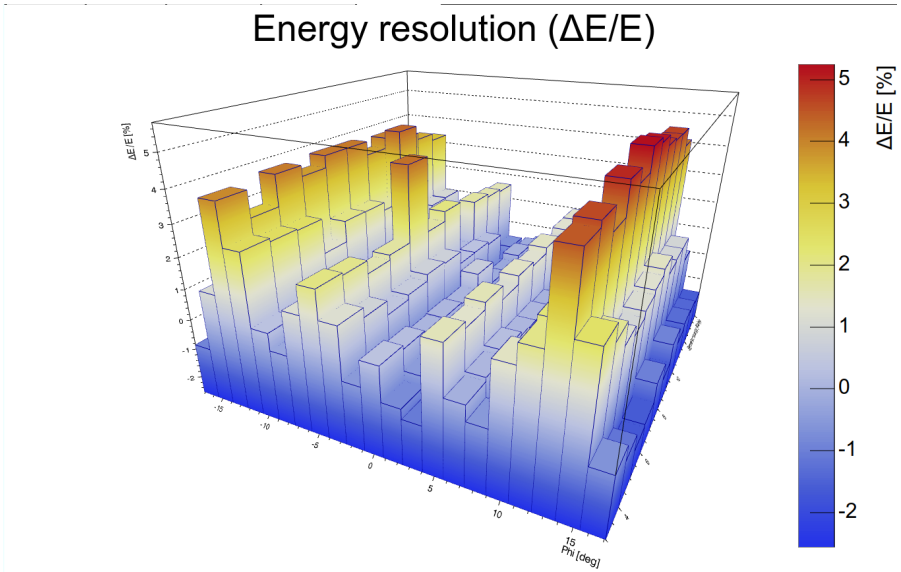
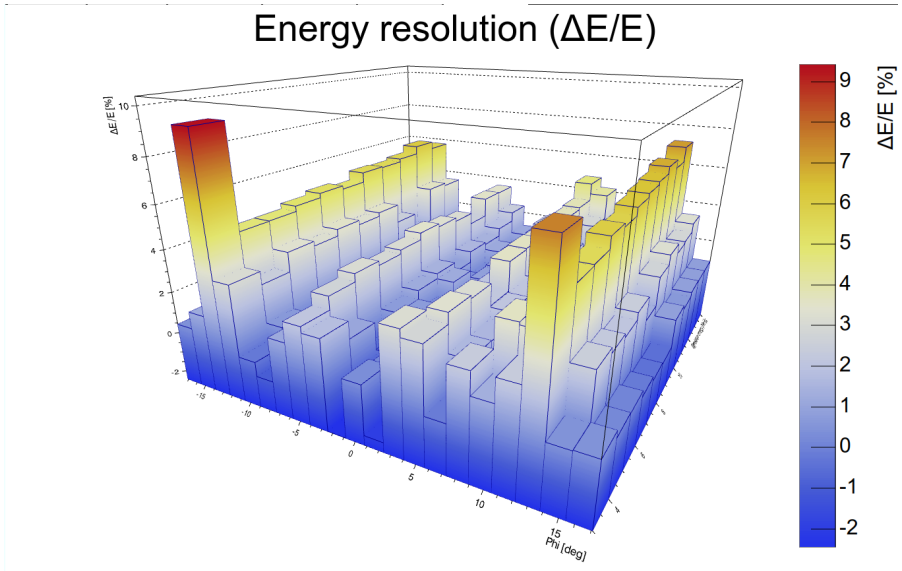


Phi-Energy cut average bias

Electrons



Positrons



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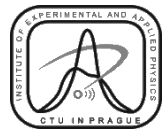
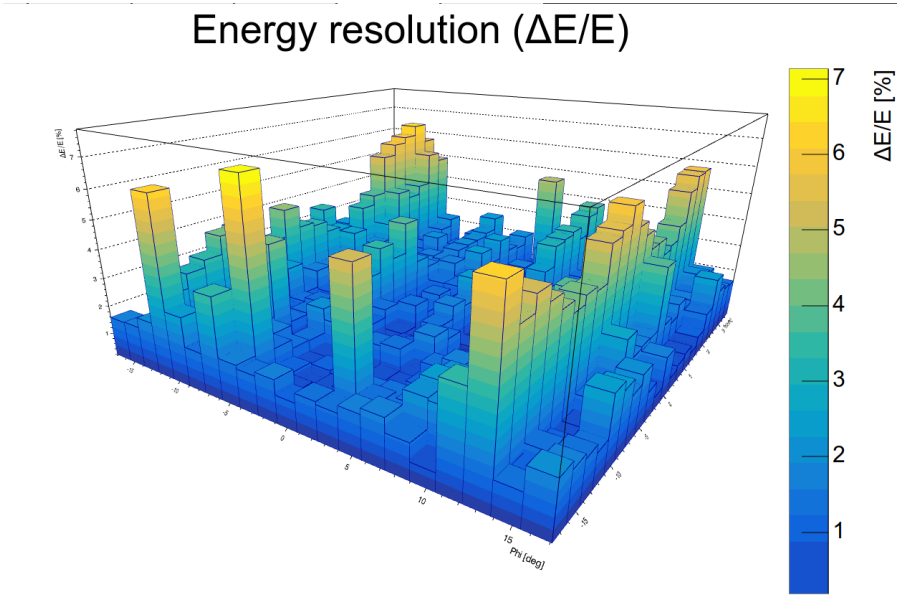


Theta-Phi cut average error

Electrons



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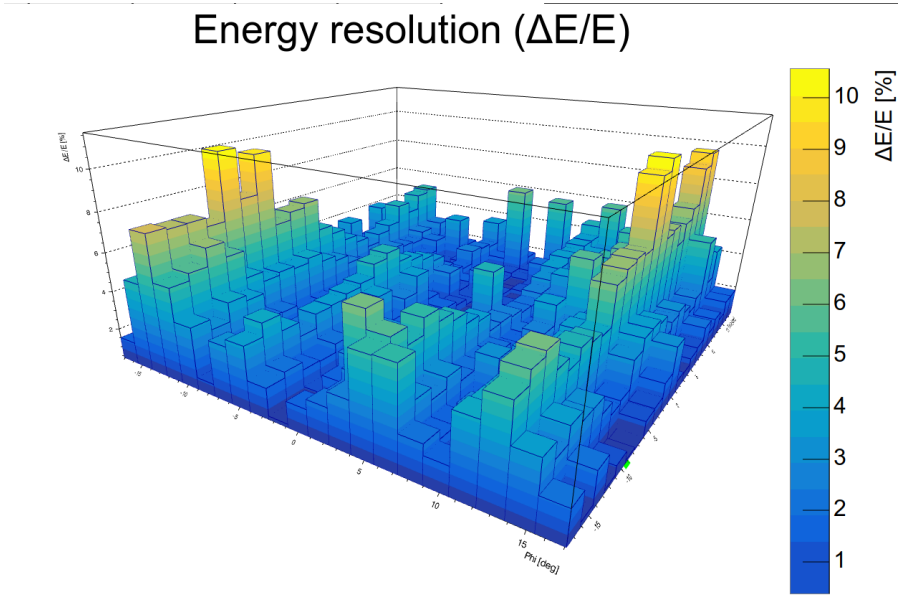

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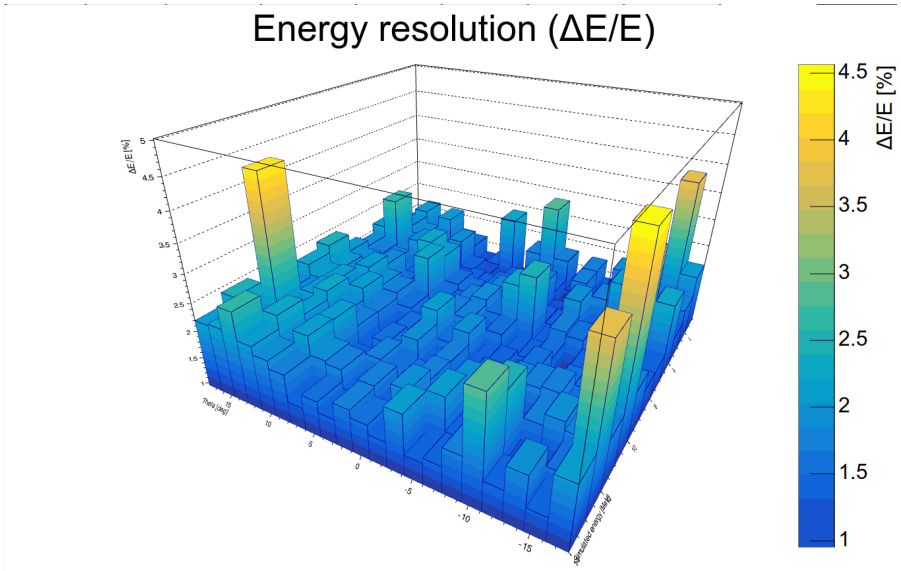
Electrons



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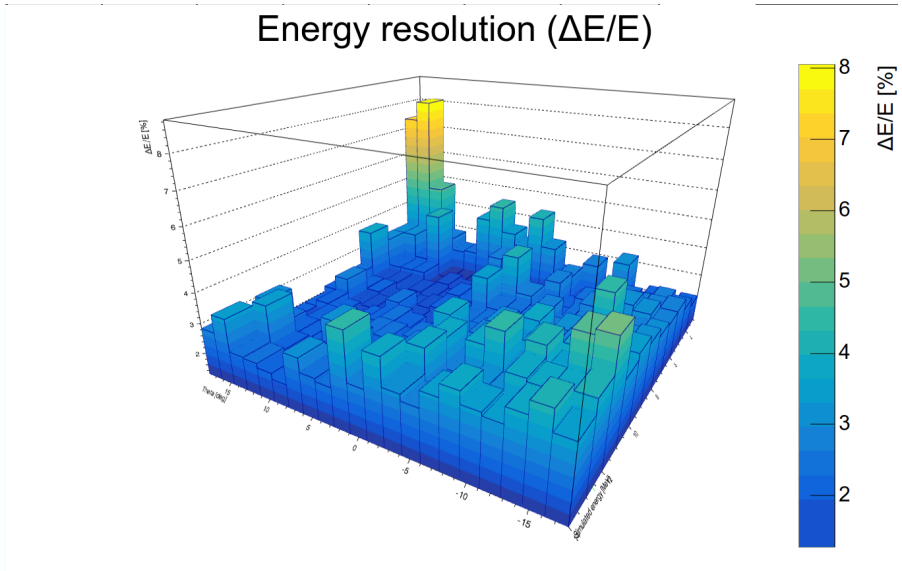

Phi-Energy cut average error

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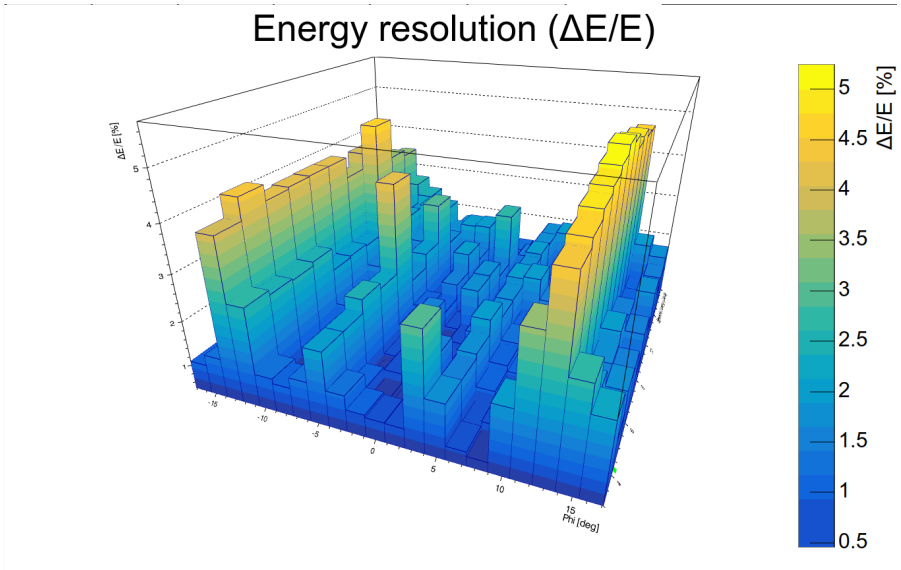
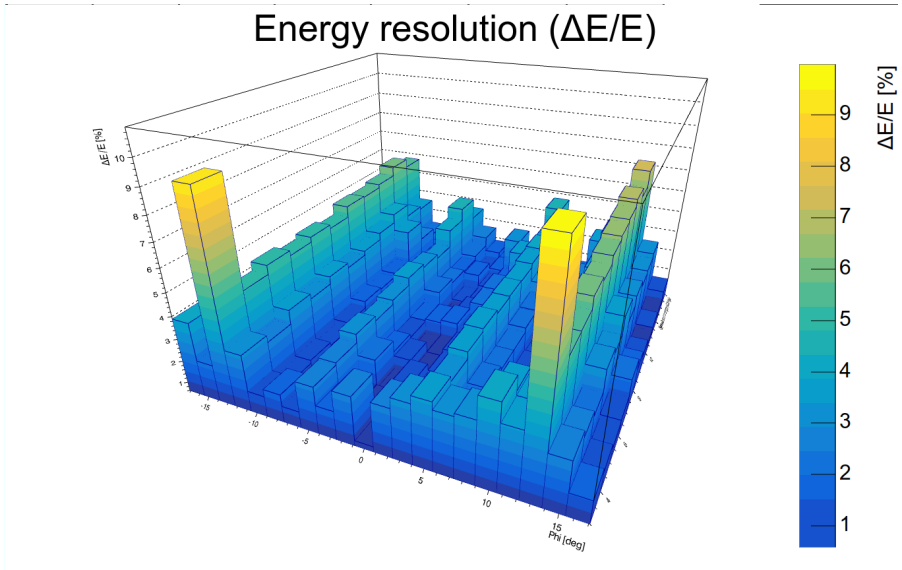
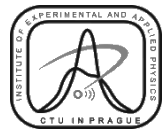


Positrons



Thank you for your attention.



References I

[1] I. B. Smirnov.
Modeling of ionization produced by fast charged particles in gases.
Nucl. Instr. Meth. A, 554:474–493, 2005.