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

Second Iteration, More Data

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Outline

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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 + 9702 jobs, each 20-160 hours runtime, 20 GB RAM allocated
  - 5 sets of 9702 tracks were simulated (electron vs positron, 21 theta angles, 21 phi angles, 11 energies 3-13 MeV)
  - Reconstruction lasts around 0.3 seconds per track

Simulation ranges

Spherical angles (θ,φ) with respect to z

θ taken from the equatorial plane xy

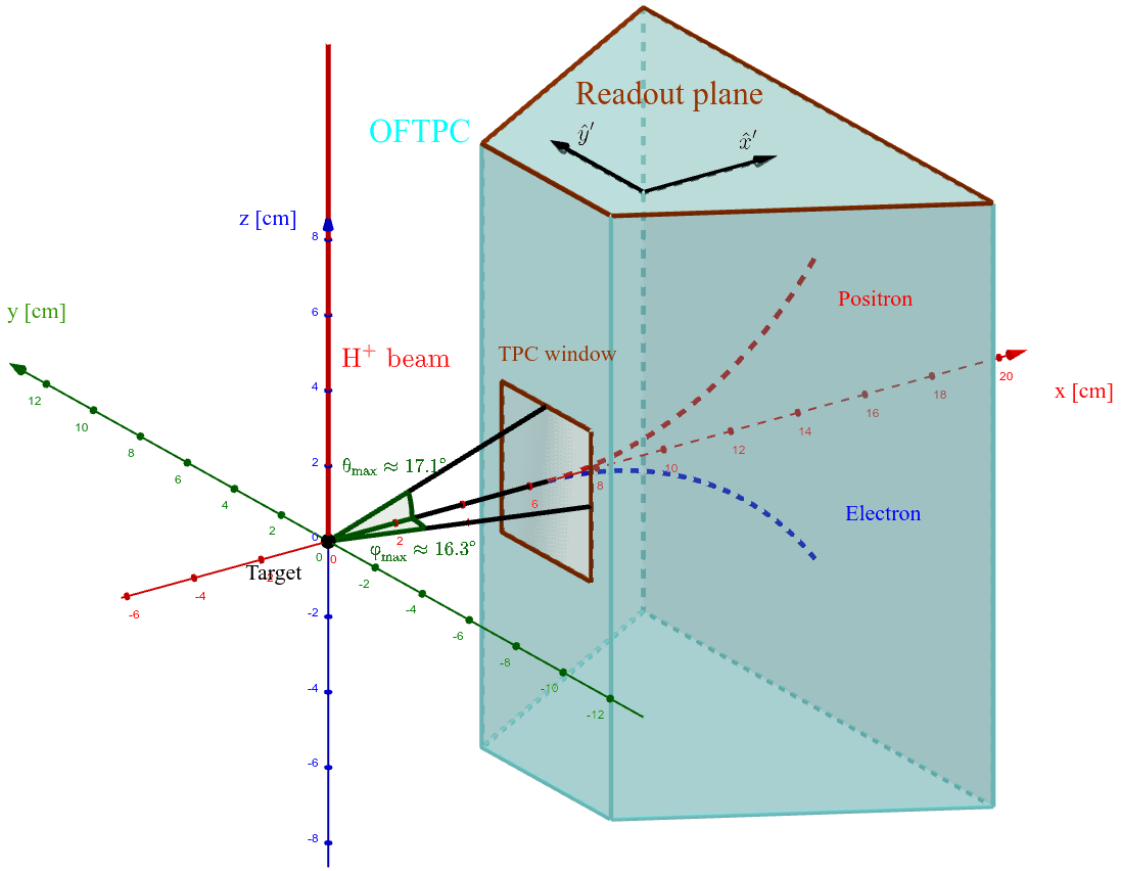

Diagram of the batch simulation parameters:

$\theta \in [-17.1°, 17.1°]$, $\varphi \in [-16.3°, 16.3°]$, $E_{\text{kin.}} \in [3, 13]$ MeV.

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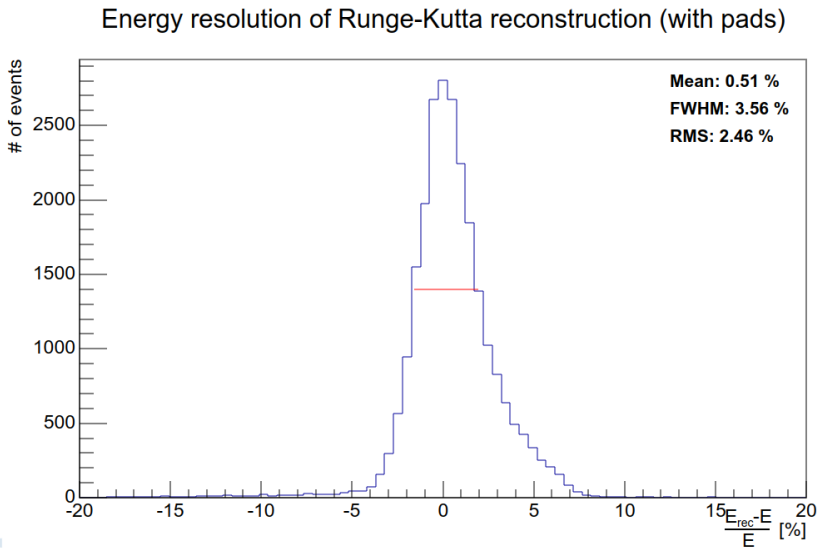
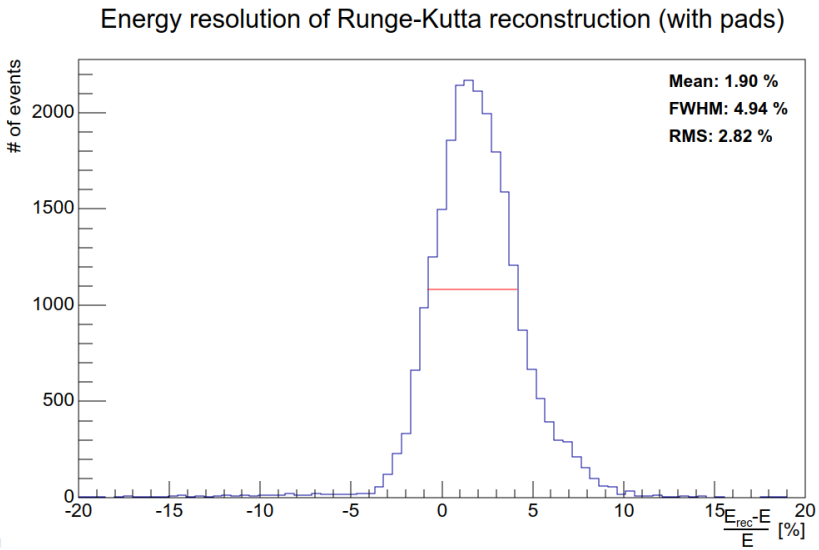
Energy resolution for all tracks

Electrons

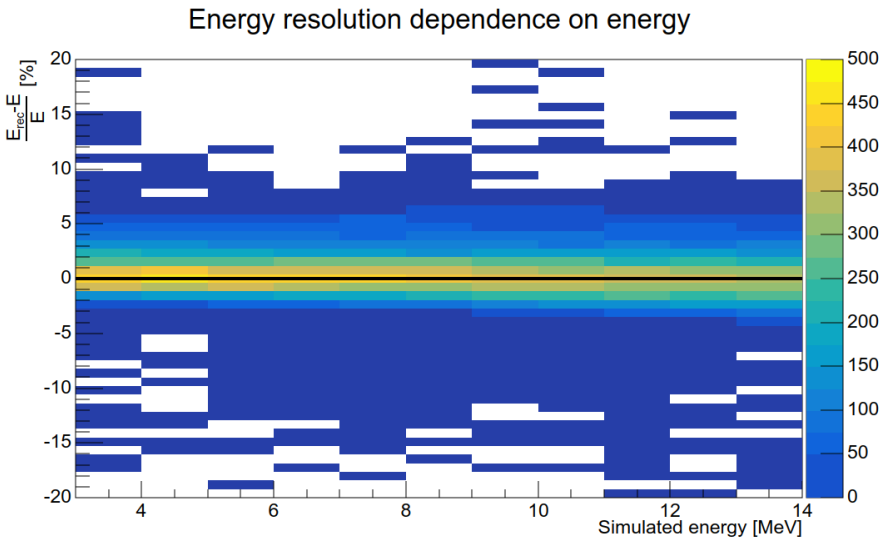


Positrons

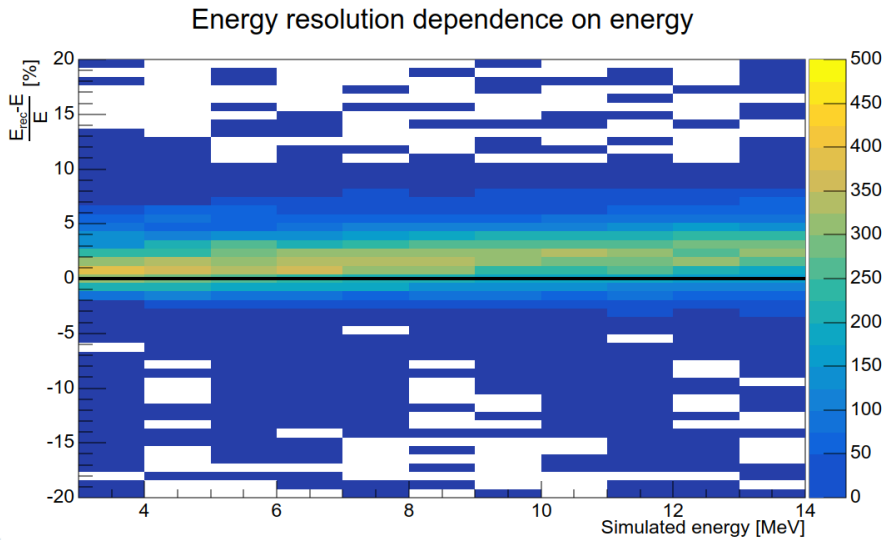


Energy resolution dependence on simulated energy

Electrons



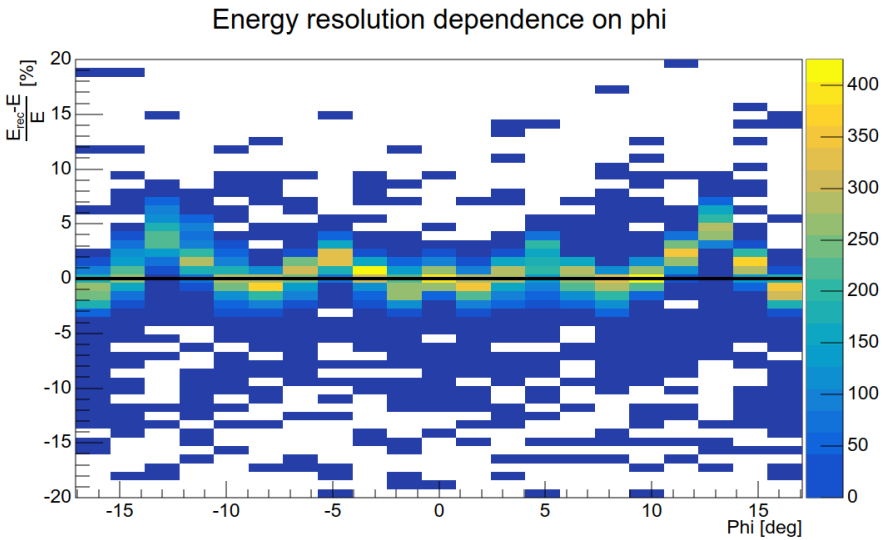
Positrons



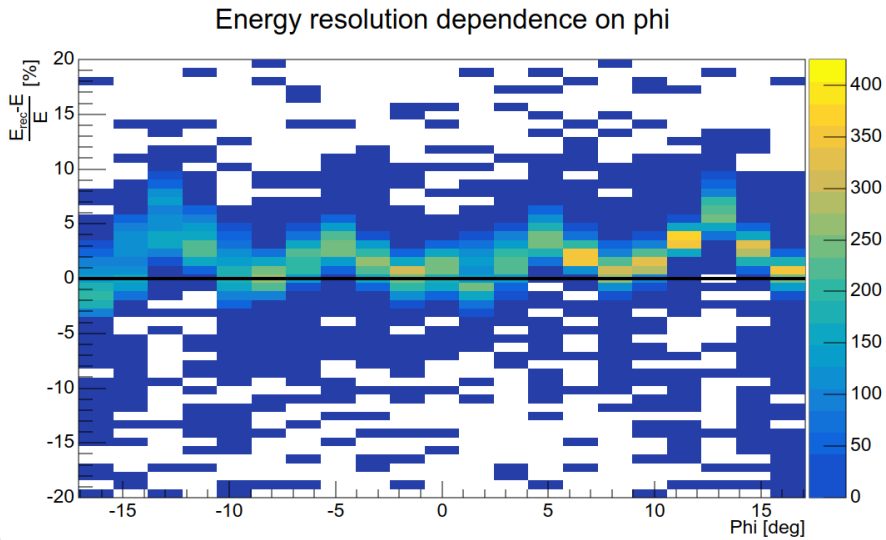
Outline

Energy resolution dependence on phi

Electrons

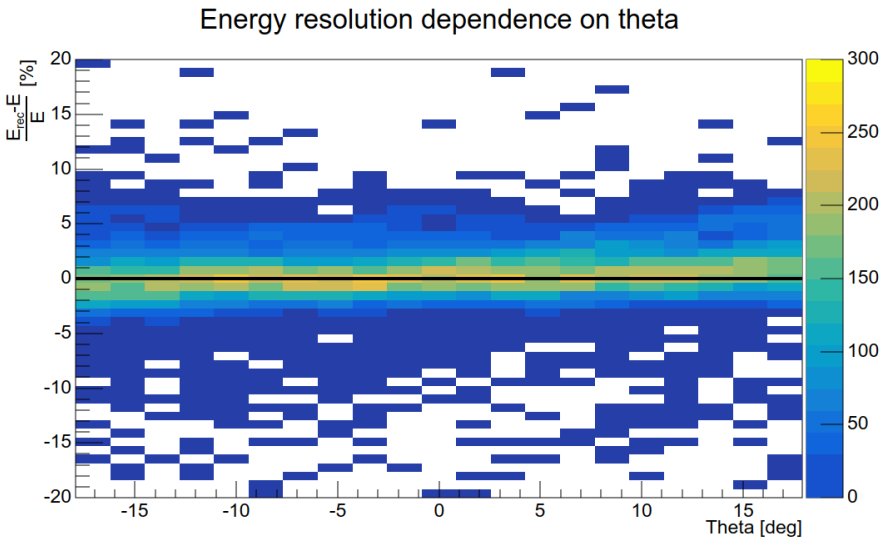


Positrons

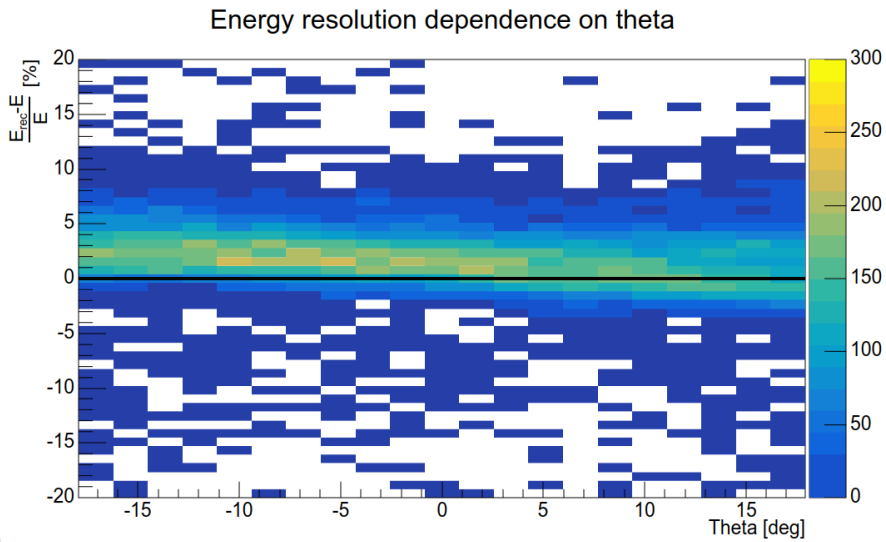


Energy resolution dependence on theta

Electrons



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.