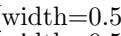
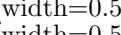
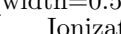
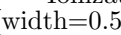
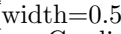
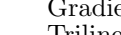
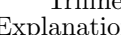



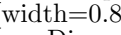
Track Reconstruction The first stage of our reconstruction algorithm is the reconstruction of the track of the primary particle. **First Attempts** at a track reconstruction were made using the standard approach. Here we assume we know the primary particle's direction and use the standard reconstruction with the **Ionization Electron Map** (from now on referred to as *the map*) uses simulation of the drift velocity. The **Discrete Reconstruction** is made using the map, instead of reconstructing the exact position of each electron hit. redReconstruction of one track simulated with microscopic tracking in Garfield++.

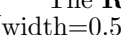
First Attempts redUsing the same method as in standard TPC (calculating  $z$  from the drift time). Gas composition 90% argon and 10% CO<sub>2</sub> atmosphere, fitted with  Dependence of the drift time on the  $z$  coordinate in 90% argon and 10% CO<sub>2</sub> atmosphere, fitted with  First attempt at a track reconstruction using only the drift velocity. This approach works well in a standard TPC.  First attempt at a track reconstruction using only the drift velocity, residues. redSwap for better image.

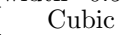
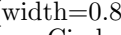
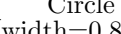
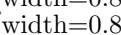


Ionization Electron Map redExplanation of the map. Simulated on MetaCentrum, workload distribution between nodes.  Example of map generation. redSwap for better image, correct coordinates.  Example reconstruction with the map. redSwap for better image, correct coordinates.

Gradient Descent Search redGradient descent search of a point in the original space that gets mapped to the given point.  Example of gradient descent search.

Trilinear Interpolation redExplanation of trilinear interpolation.  Interpolating in the Inverse Grid redInterpolating between known points in the readout space. Gaussian elimination  Selection of the points for interpolation. redCreate better images, use the explanation interpolation.

Discrete Reconstruction redReconstruction with pads and time bins. Maybe testing different pads.  Example of discrete reconstruction.

Energy Reconstruction The second stage of our reconstruction algorithm is the reconstruction of the particle's energy. The **Cubic Spline Fit** is a rejected attempt at the reconstruction of energy. It uses smoothly connected piecewise linear functions. The **Circle and Lines Fit** was chosen as an alternative since this corresponds to the shape of a trajectory of a charged particle. The **Runge-Kutta Fit** uses the 4th order Runge-Kutta numerical integration described in section ???. Initial parameters are determined by the first two points of the track.  Example of a fitted reconstructed track. redSwap for better image.

Cubic Spline Fit redBad attempt at energy reconstruction using cubic splines.  First attempt at a track reconstruction using only the drift velocity. Spline energy reconstruction.  Circle and Lines Fit redEnergy reconstruction with circle and lines fit. Trilinear interpolation of the magnetic field.  Circle and Lines Fit 3D geometry. redSwap for better image.  First attempt at a track reconstruction using only the drift velocity. Circle and Lines Fit in 2D.  Runge-Kutta Fit redSingle parameter fit with 4th order Runge-Kutta simulated track. Future testing with microscopic tracking.  Example of Runge-Kutta fit.

Conclusion redHere or at the end of each section.