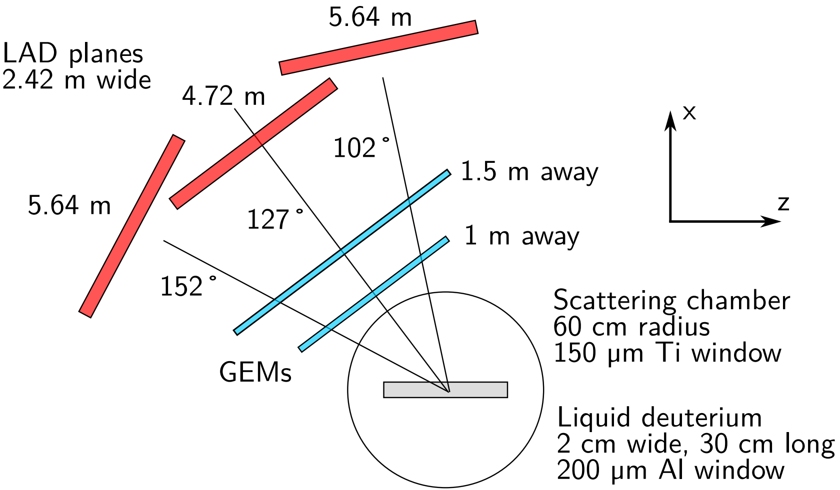
LAD (not-a-)Toy Monte Carlo

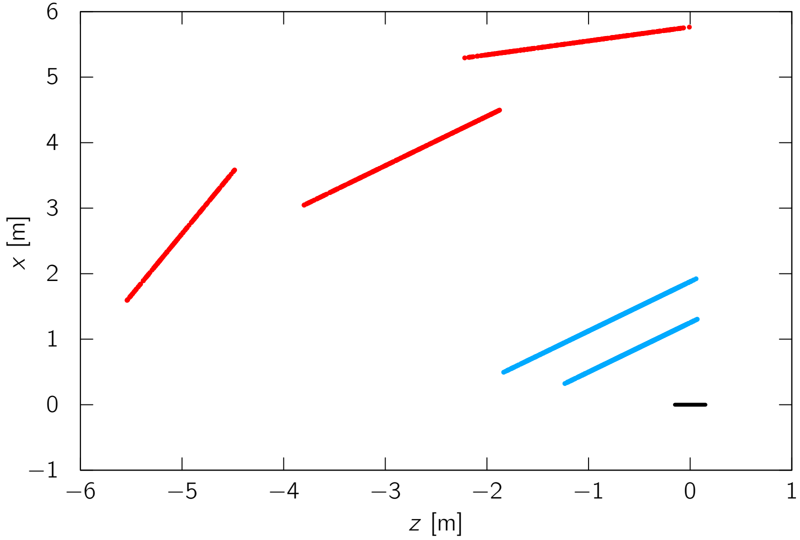
1. $(e, e' p_{\mathrm{rec}})$ events generated according to Wim Cosyn's calculation
2. Vertices generated within extended target cell
3. Tracks propagated with no magnetic field
4. Angular deflection from multiple scattering from material
5. Reconstruction of events based on hit positions / timing

Geometry

This is my best-informed guess. It is easy to update any numbers.



Hit positions in simulation



Multiple scattering

From the PDG

$$\sigma_\theta = \frac{13.6\ \text{MeV}}{\beta p}\sqrt{\frac{2x}{X_0}}\left[1 + 0.038\log\left(\frac{x}{X_0}\right)\right]$$

Material	Thickness	x/X_0
Liquid D_2	1 cm	0.0013
Target wall	200 μm	0.0022
Scattering chamber window	150 μm	0.0042
Thin GEMs	–	0.0030
Reg. GEMs	–	0.0050
THICK GEMs	–	0.0100

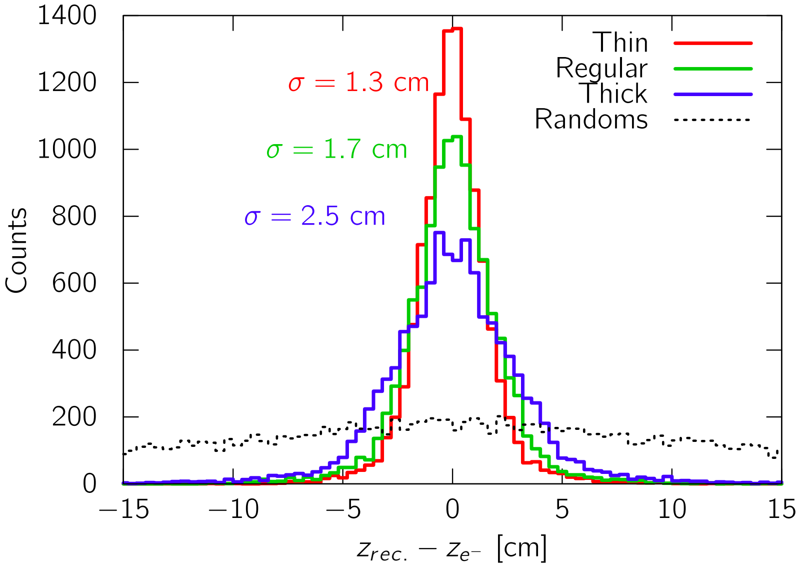
Simulation accounts for incidence angle of tracks through material.

Reconstructed Vertex Resolution

Further assumptions:

- GEMs have 500 μm position resolution in each direction
- Vertex reconstructed by straight line between GEM hits to $x = 0$
  - LAD hit position ignored for now
- Ignored vertex resolution of HMS and SHMS for now

Reconstructed Vertex Resolution



Background rejection power

What fraction of the random background survives a $\pm 2\sigma$ vertex cut?

GEMs	30 cm Target	20 cm Target
Thin	16%	24%
Regular	21%	31%
Thick	31%	44%

What comes next?

This simulation is ready to go, once geometry is double-checked.

- Count-rates, given spectrometer settings
- Optimize spectrometer settings given signal/bkg rates
- Optimize GEM placement

Suggestions very much appreciated!