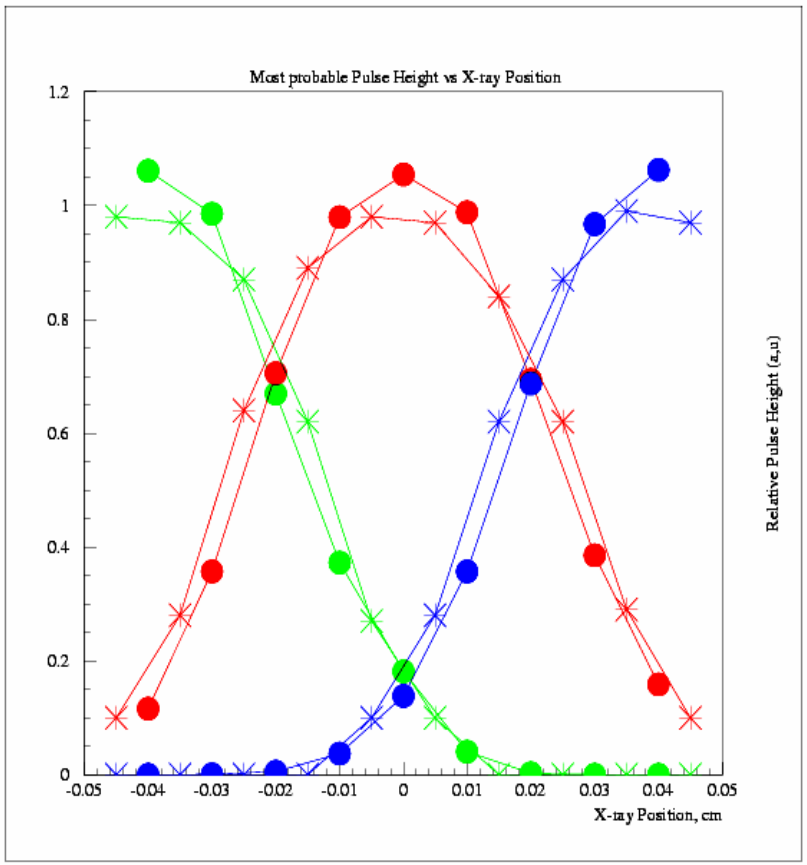
Simulation conditions

1. Detector geometry, Particle (track) propagation in a gas and Magnetic field → GEANT
   - initial parameters to simulate particle space and momentum distributions / values.
2. Number of charge particle “interactions” in a Gas and theirs positions in a space along a particle track
   - average number of interactions / cm is a function of particle $\beta\gamma$.
   - number of ionization e- for each interaction.
3. Diffusion and Drift velocity values are a Function of {Gas, E, B}.
4. “Some model” - to calculate/simulate a GEM transparency.
5. Gas amplification (Polya distribution), and a function of “r-position” inside of the GEM hole
6. “History” of each e-.
   - { diffusion – hole selection – gas amplification – extraction probability - …. – diffusion – pad row and pad selection }
   - “arriving” time on the pad for each e-, FEE t-shaping and noise.
   - “(F)ADC” response, pedestal, threshold to select “active” pads.
   - rectangle and chevron(s) shape of the pad.
7. Ionization cluster (“voxel”) finding and position reconstruction
   - three variants including nonlinearity correction for rectangle pads and track slope correction for chevron pads.
8. Track reconstruction, Linear or Helix fit.

In the case of X-ray we need to simulate the “absorption” position, number of e- and the “width in a space” .

Most probable pulse height from three anode strips (0.04 cm); measurement and simulation



Double GEM Detector from CERN; 10x10 cm², 0.04 cm strips.

- – measurements were done with X-ray tube; 5.4 keV, 0.01 cm collimator, Ar+CO2(20%)

B.Yu at al, IEEE, Nov ,2002

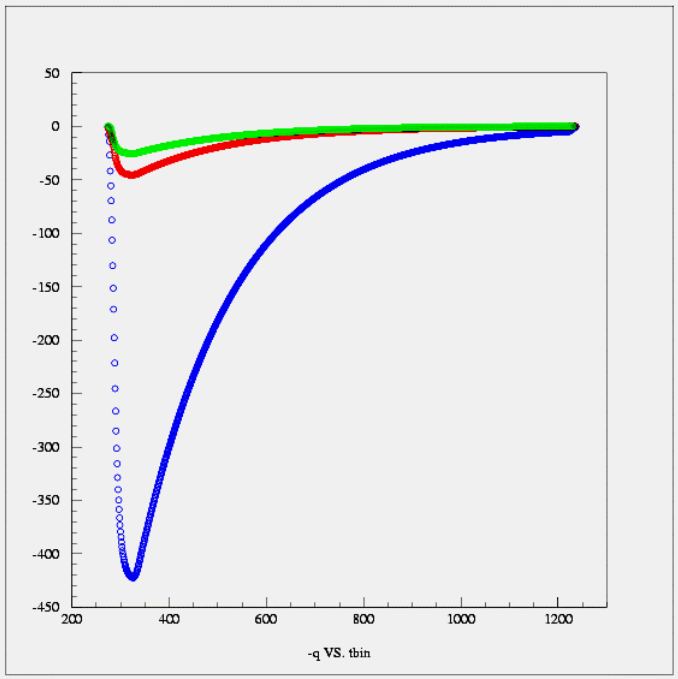
- – Simulation

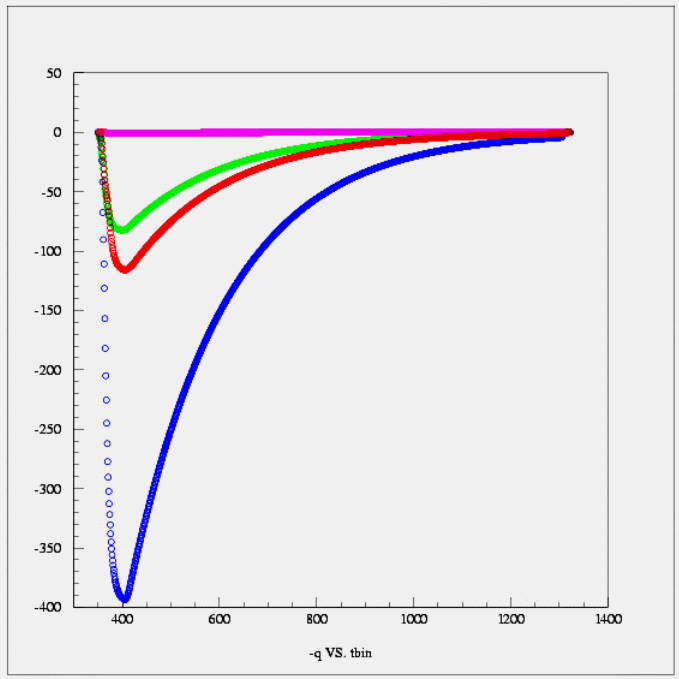
“Energy resolution” (in simulation) = 17%

“Canada Variant” FEE time response simulation

FADC response for fixed pad row and “active” pads (no noise).

ADC channel





t_bins, 5ns/bin