Estimating the rate for d(e,e'p'p')X

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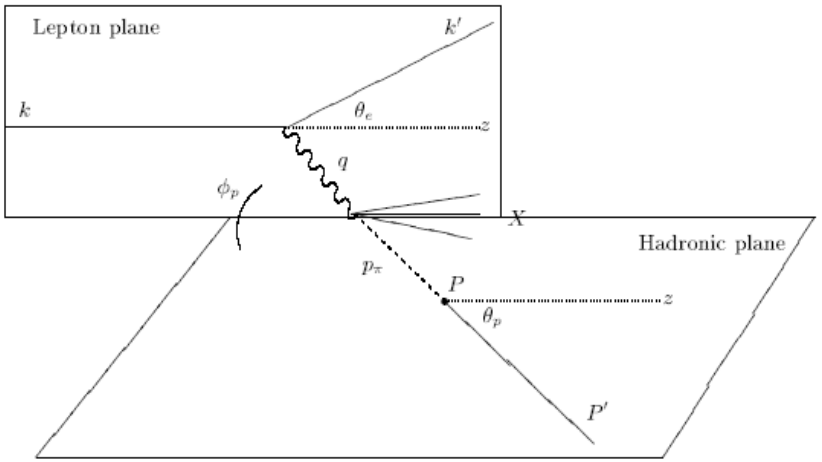
Process used in the model

- Generate a real proton, virtual neutron pair from an at-rest deuteron
- Generate a real proton, virtual pion pair from the neutron with the proton carrying momentum fraction, z, and transverse momentum, p_T
- Calculate the en→e'p'X cross-section using

$$\frac{d\sigma(en\rightarrow e'p'X)}{dx_{Bj}\,dQ^2\,dz\,dp_T^2} = f_{p\pi/n}(z, p_T^2)\,\sigma_\pi(x_{Bj}/(1-z), Q^2)$$

Process of the model



- Deuteron starts at rest
- Spectator proton, p_1, thrown using deuteron nucleon momentum distribution, and flat in $\cos(\theta)$ and ϕ

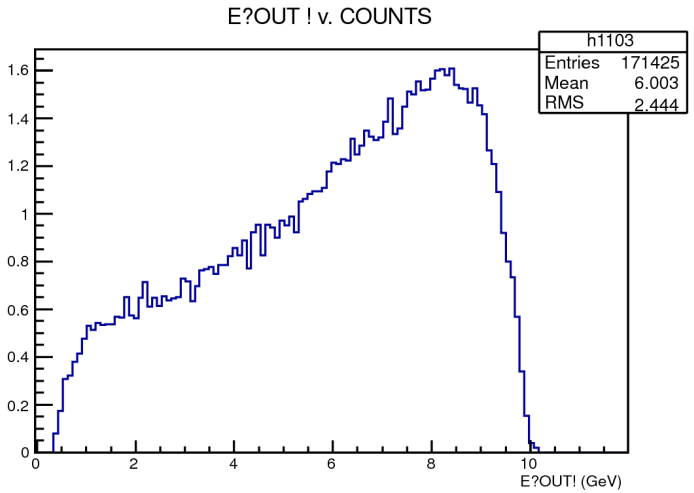
- Electron kinematics (E' and θ_e) are generated flat in Q^2 and x_{Bj}, only keep θ_e in the range (5°,30°); ϕ_e is flat in the range (-12°,12°)
- Fragmentation in the neutron rest frame is thrown flat in p_T and z, and flat in ϕ

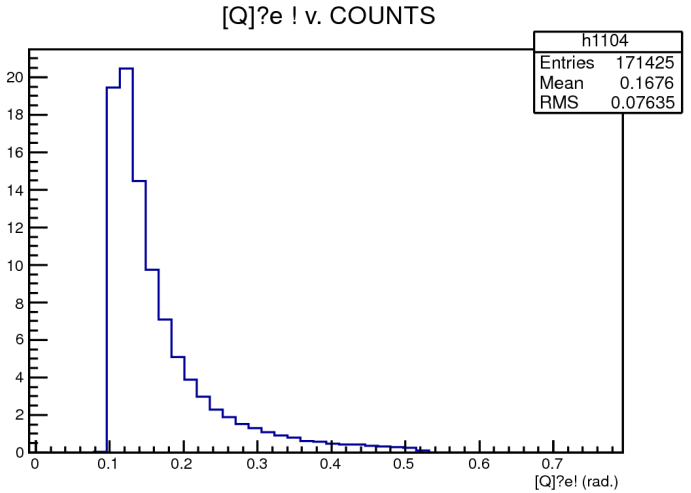
Assumptions and ranges

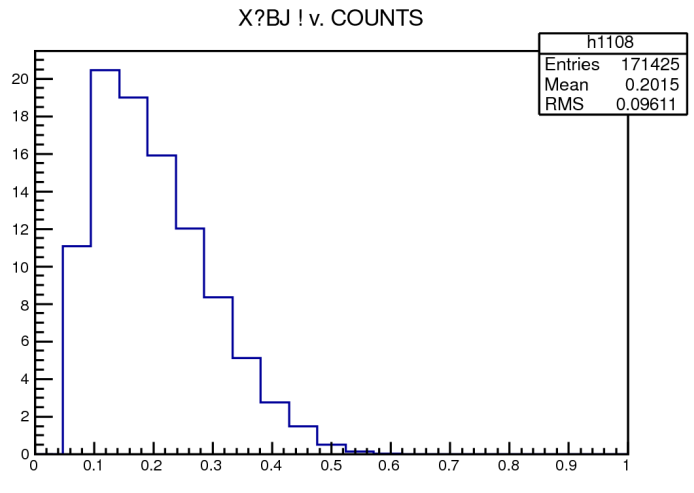
- Use a luminosity of 1.0e37 cm-2s-1 --> (1.0e10 mbarn-1s-1)
- Parameter ranges
  - Q2, 1.0 - 5.0
  - X_A, 0.001 - 0.5
  - P_T, 0.0 - 1.0
  - Z, 0.0 – 1.0
- Cuts
  - 0.05 < P_p1 < 0.50
  - 90deg < Th_p1 < 165deg
  - E_e > 0.25
  - 5deg < Theta_e < 30deg
  - |t_pi| < 0.2
  - x_pi < 1.0
- Rate:

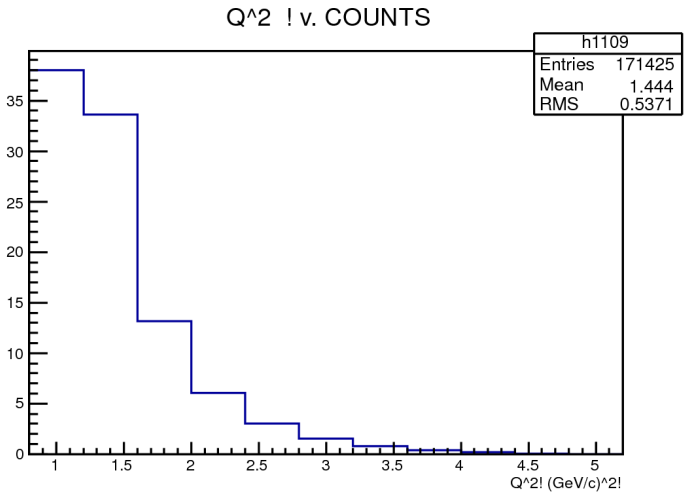
  Sum(sigma)*(Parameter_ranges)*L/N_gen
  ~ 100 Hz

Electron parameters vs rate









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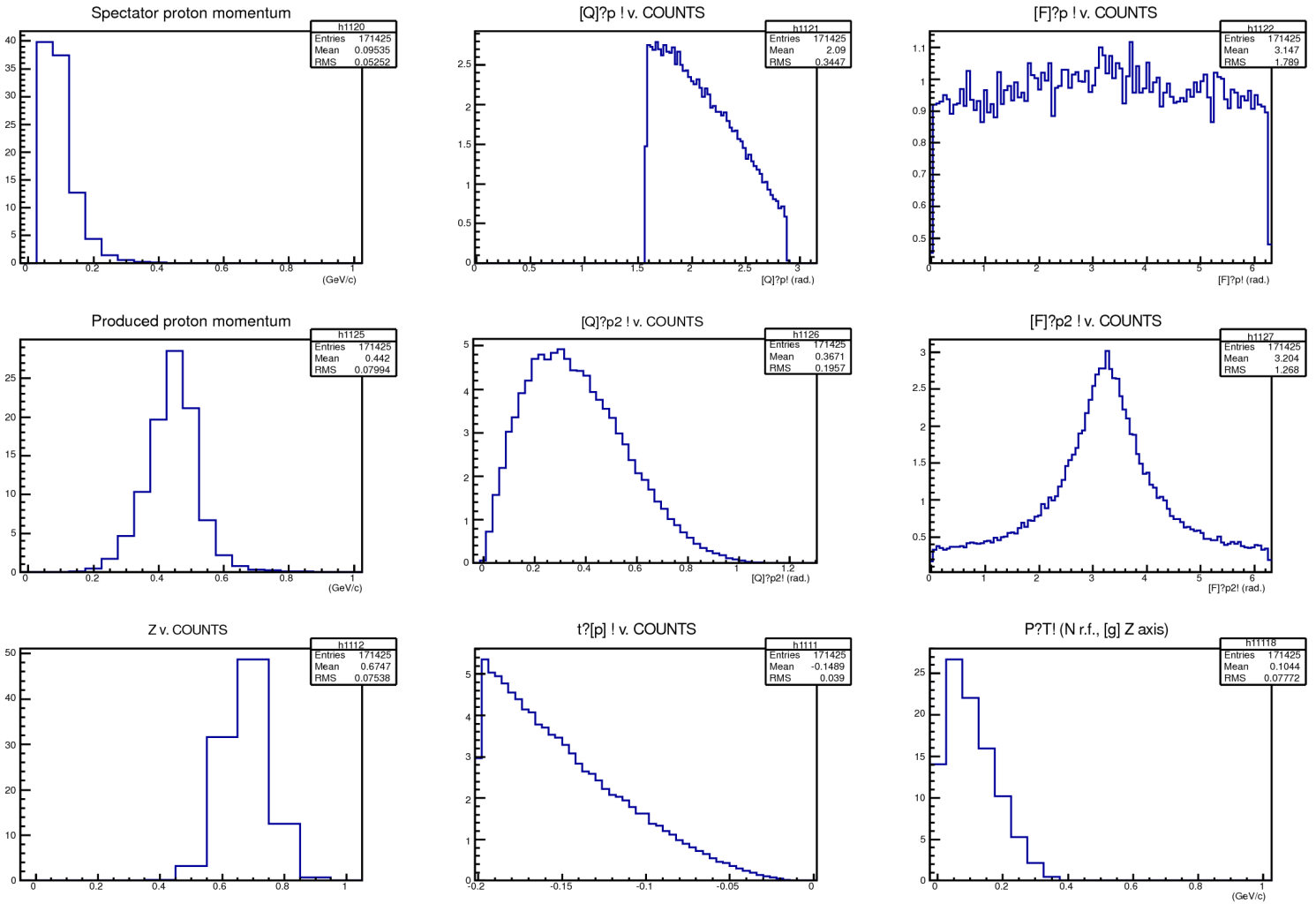
Proton parameters vs rate



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Plans

- Code cleanup and verification of the rate determinations
- Include reasonable limits on proton detection
- Write a stand-alone generator to calculate cross section for other simulations