Status Report of Gas Studies at UVic

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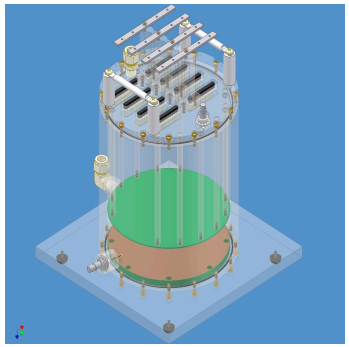
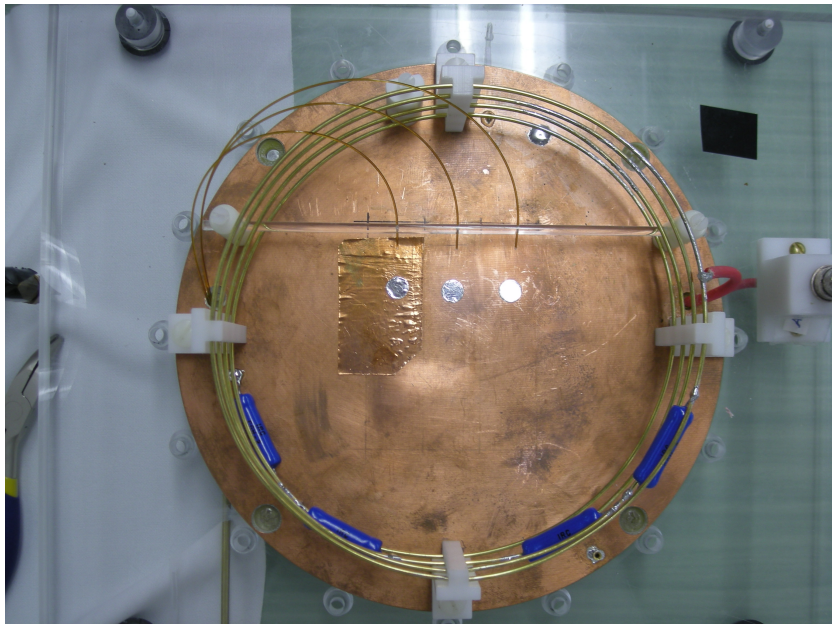
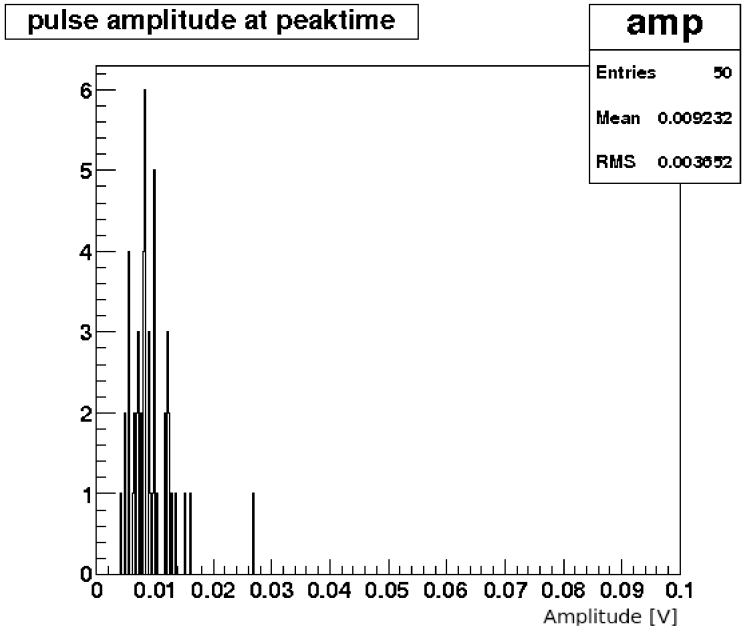
UVic

Gas Gain Studies

- Gas gain measurements made simultaneously with with the laser-photoelectron TPC setup.
- Uses Poisson fluctuations from the photoelectrons







Gas Gain Measurements

- Gas gain measurements made simultaneously with the drift velocity in the laser-photoelectron TPC setup.
- Amplitude (A) exhibits Poisson fluctuations from the photoelectrons, convoluted with exponential gas gain distribution and Gaussian laser intensity fluctuations.
  - Mean no. photoelectrons = Npe = Variance of no. photoelectrons
  - No. of electrons produced via avalanche of one p.e. distributed exponentially with mean Ggas and variance Ggas*Ggas.
  - The laser intensity has a sigma of b
- The conversion from no. of electrons to measured amplitude is Gelec.
- Conversion from no. electrons to voltage A is Gelec[V/e]

Gas Gain Studies

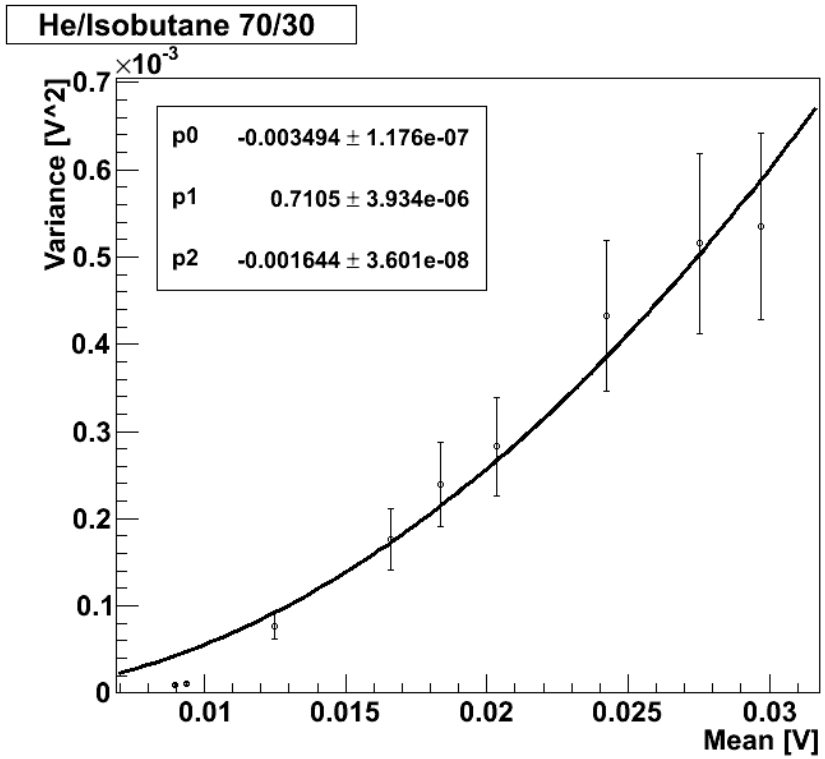
- Expectation value of amplitude=E[A]=Gelec*Ggas*Npe
- Variance from p.e.= V[A]e = $Gelec^2*Ggas^2*Npe$
- Variance from gas gain = V[A]g = $Gelec^2*Npe*Ggas^2$
- Variance from laser = V[A]l =$Gelec^2*$ $(b*Ggas*Npe)^2$

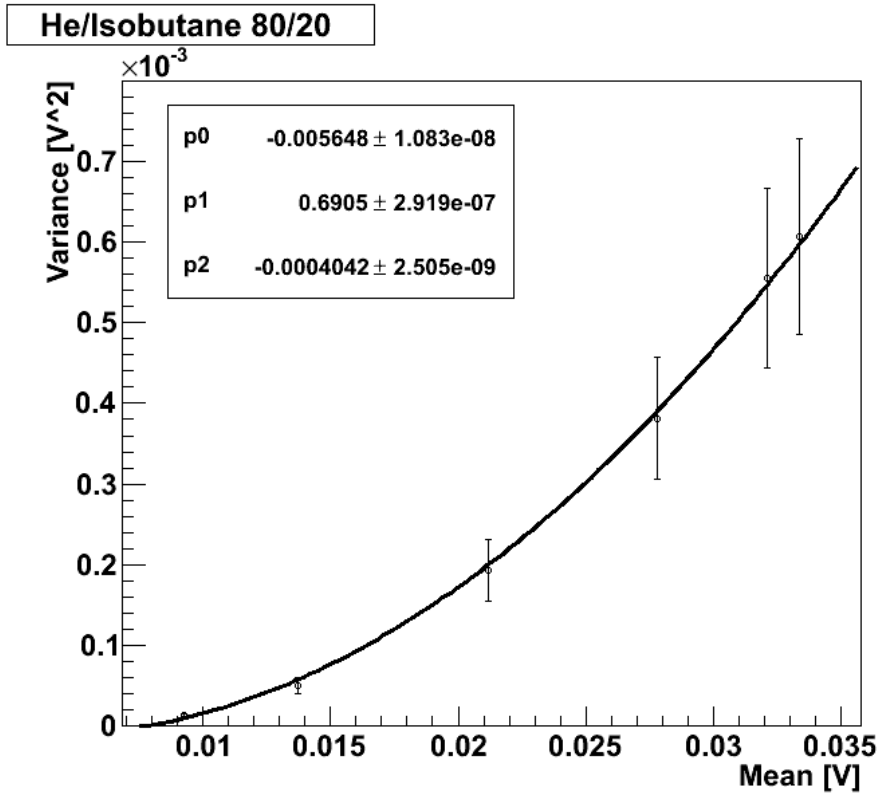
Total Variance is V[A]=V[A]e+V[A]g+V[A]l

$= 2*Gelec*Ggas*(E[A]) + b^2*(E[A])^2$

- Fit quadratic form to V[A] vs E[A] to extract Gelec*Ggas
- Calibrate system with step voltage into capacitor to obtain conversion from charge to voltage amplitude and extract Gelec

e.g. Variance vs. Mean - quadratic term dominates so difficult to extract gain this way





Preparing for new prototypes

- last month have shipped the following from SLAC and Princeton to TRIUMF

- BaBar feedthroughs
- connector boards
- Crimp tools
- W sense wire
- Al field wire (Au)

hypertronic connectors still to come from Colorado