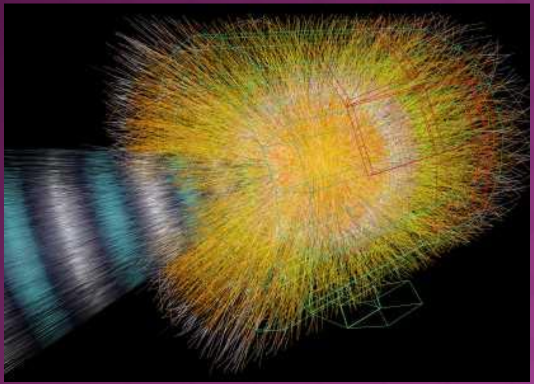
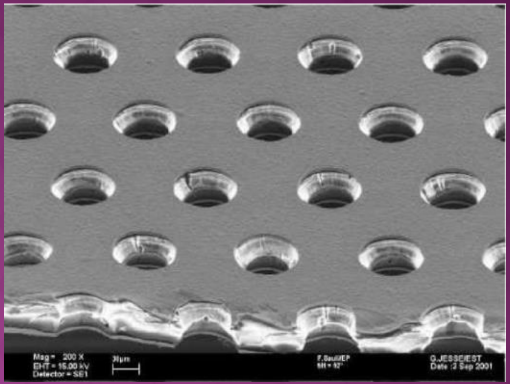
Characterization of GEM detectors, and the way there…



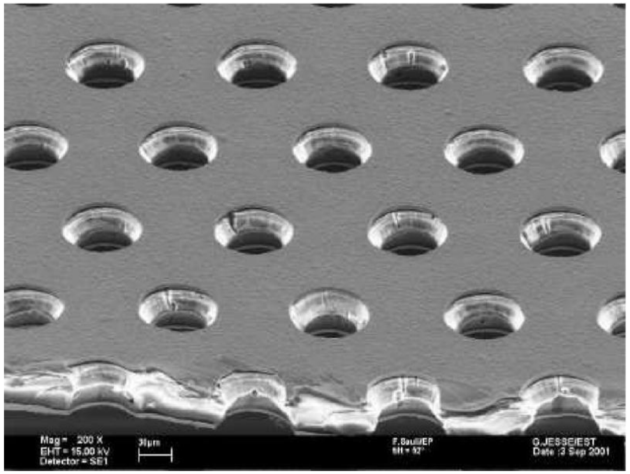


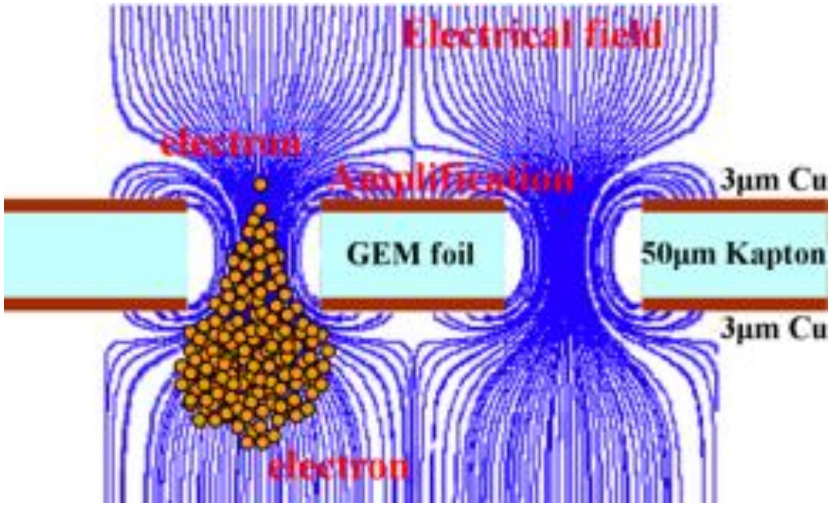
CERN, Summer Student Program 2013

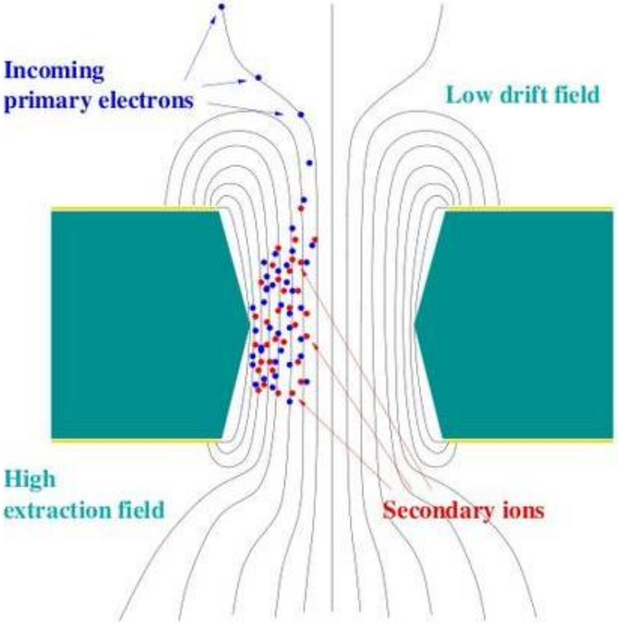
Universidad de Buenos Aires, Facultad de Ciencias exactas y Naturales.

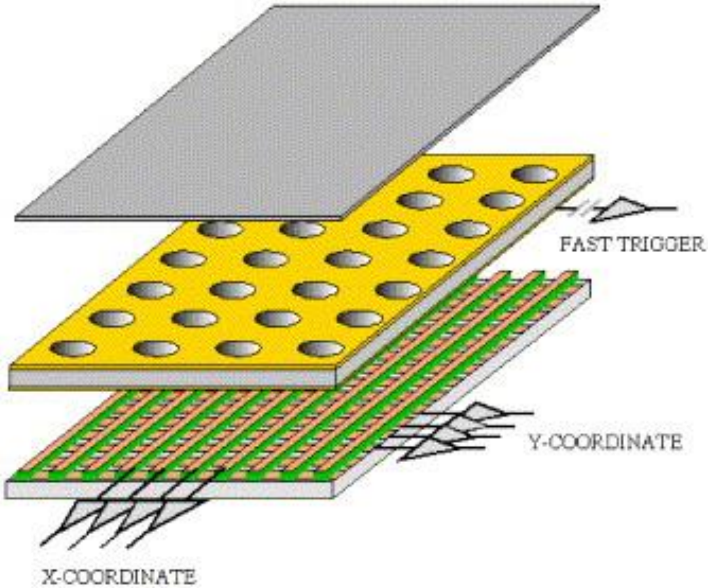
Rodrigo G. Cortiñas

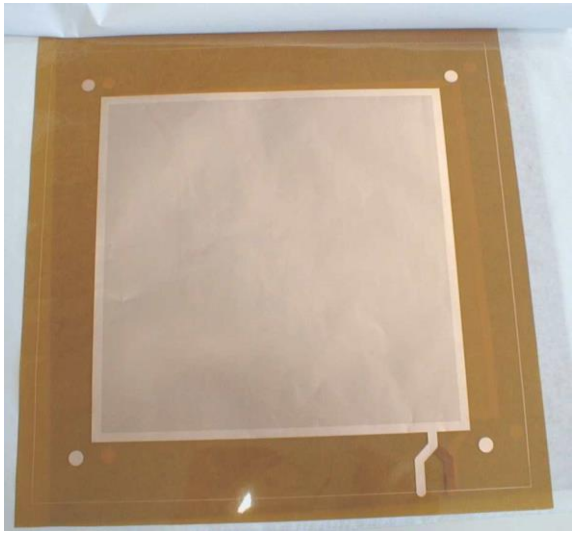
Gas Electron Multiplier

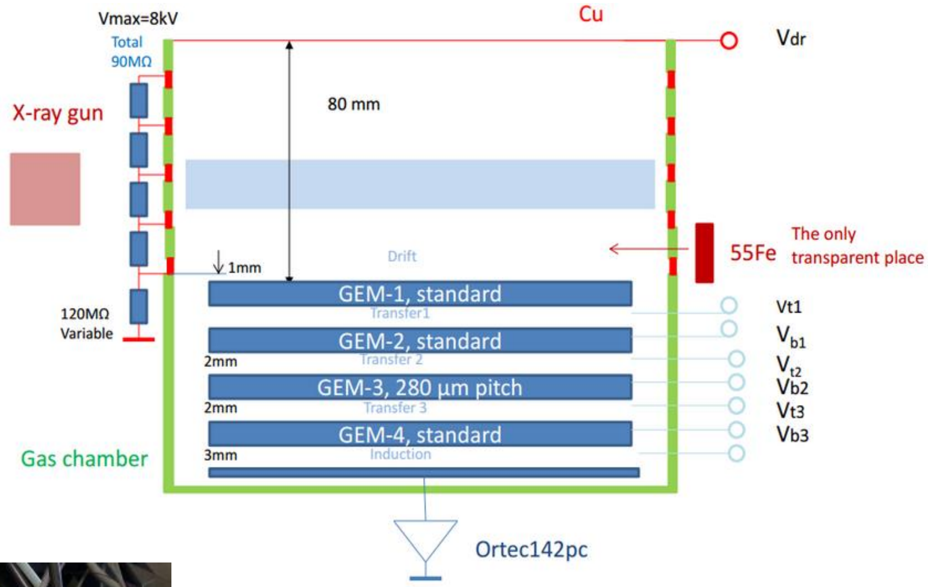


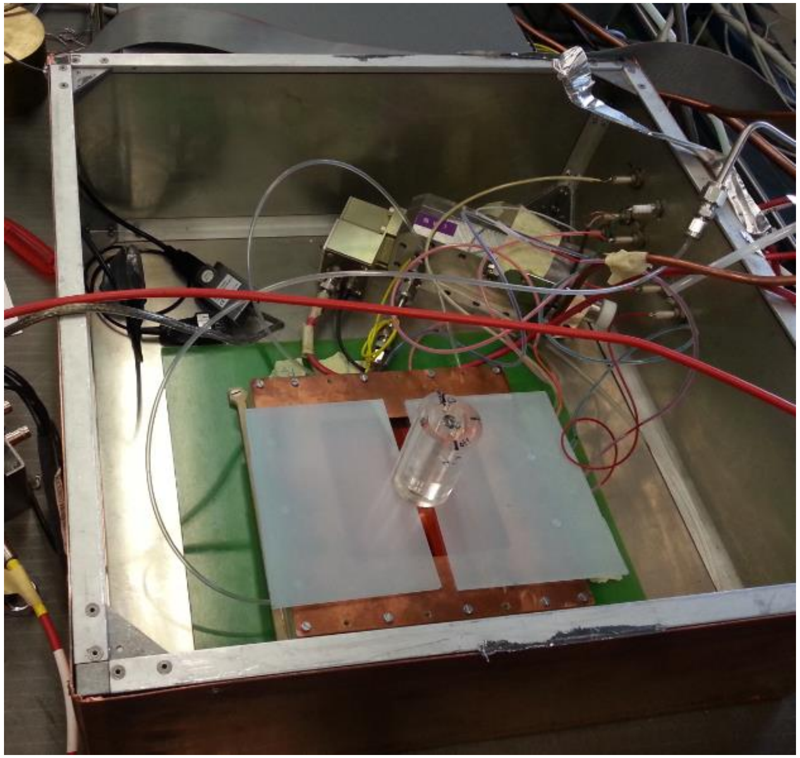








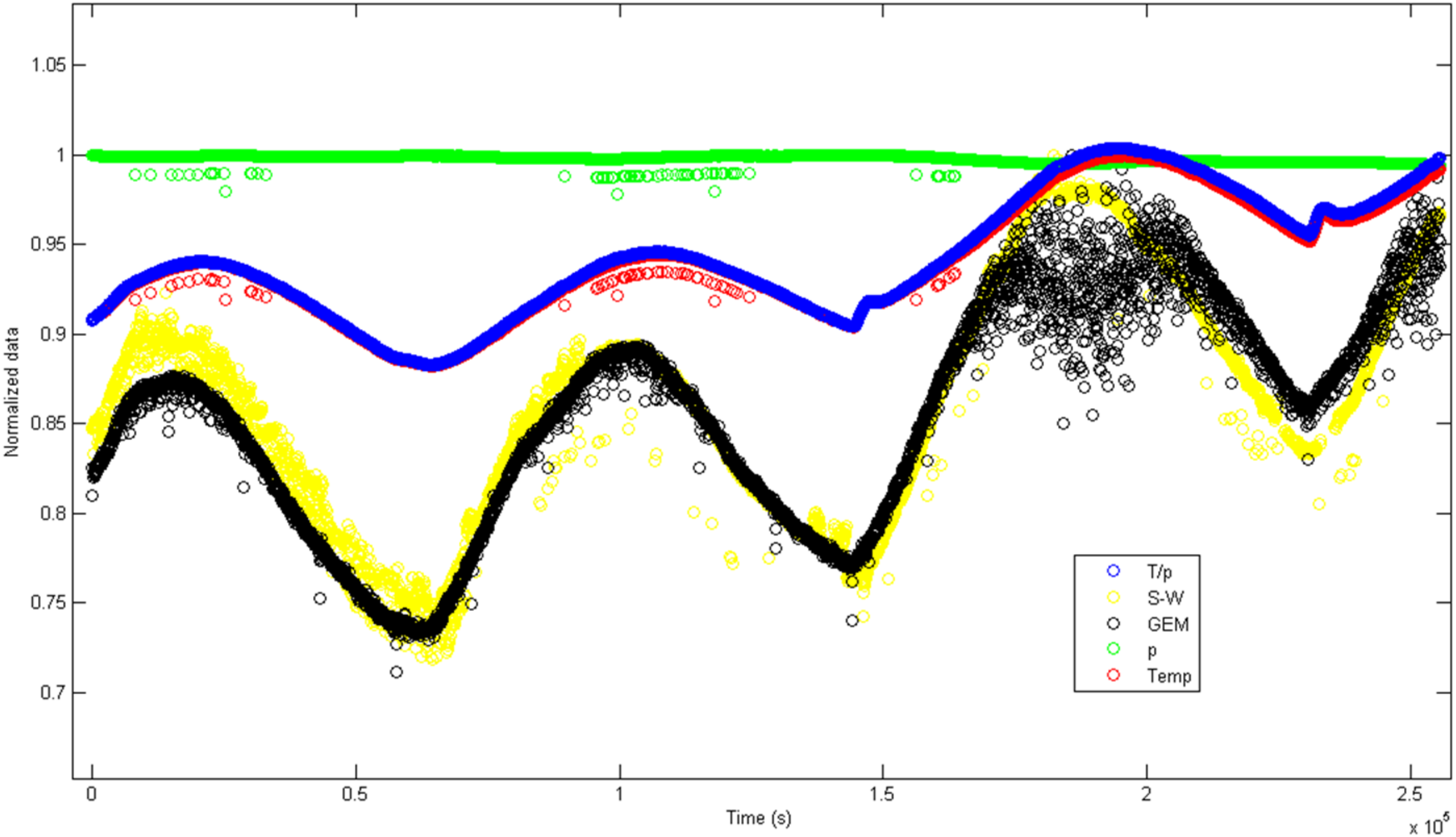




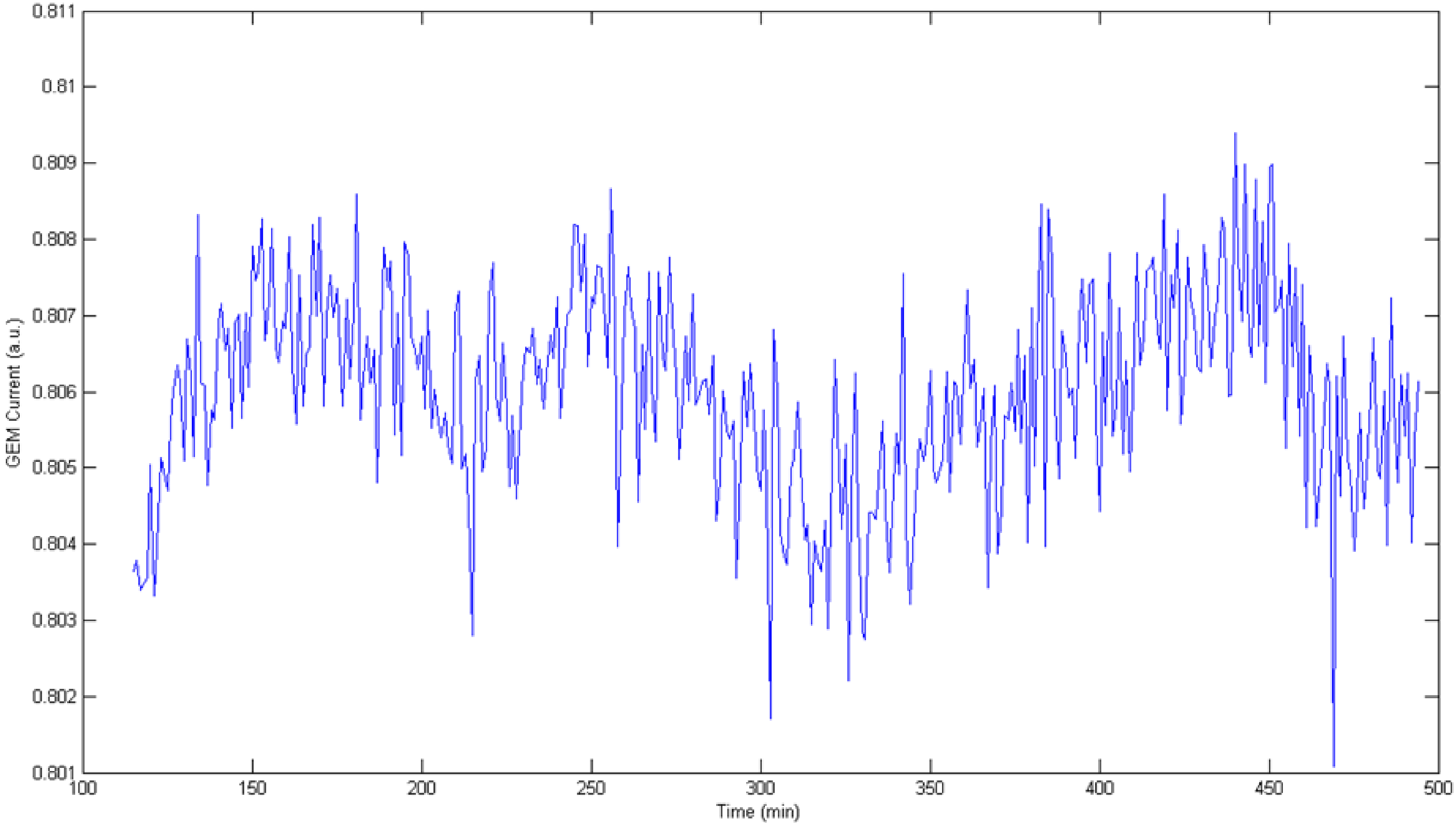
Variables

- Pitch
- Shape of holes
- Applied voltage
- Radiation intensity
- Gas composition (Ne, Ar…)
- …

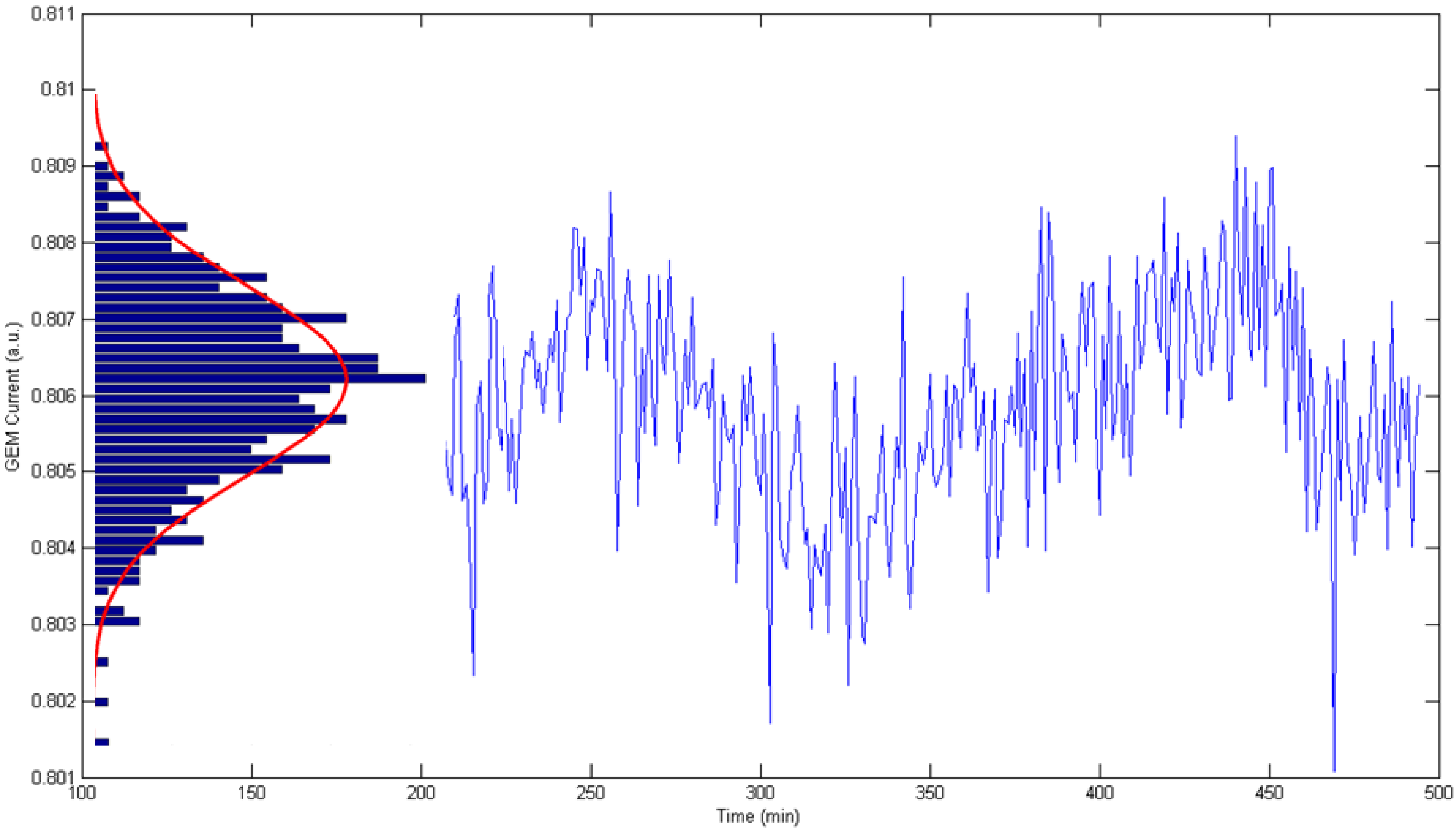
Measurements Stability



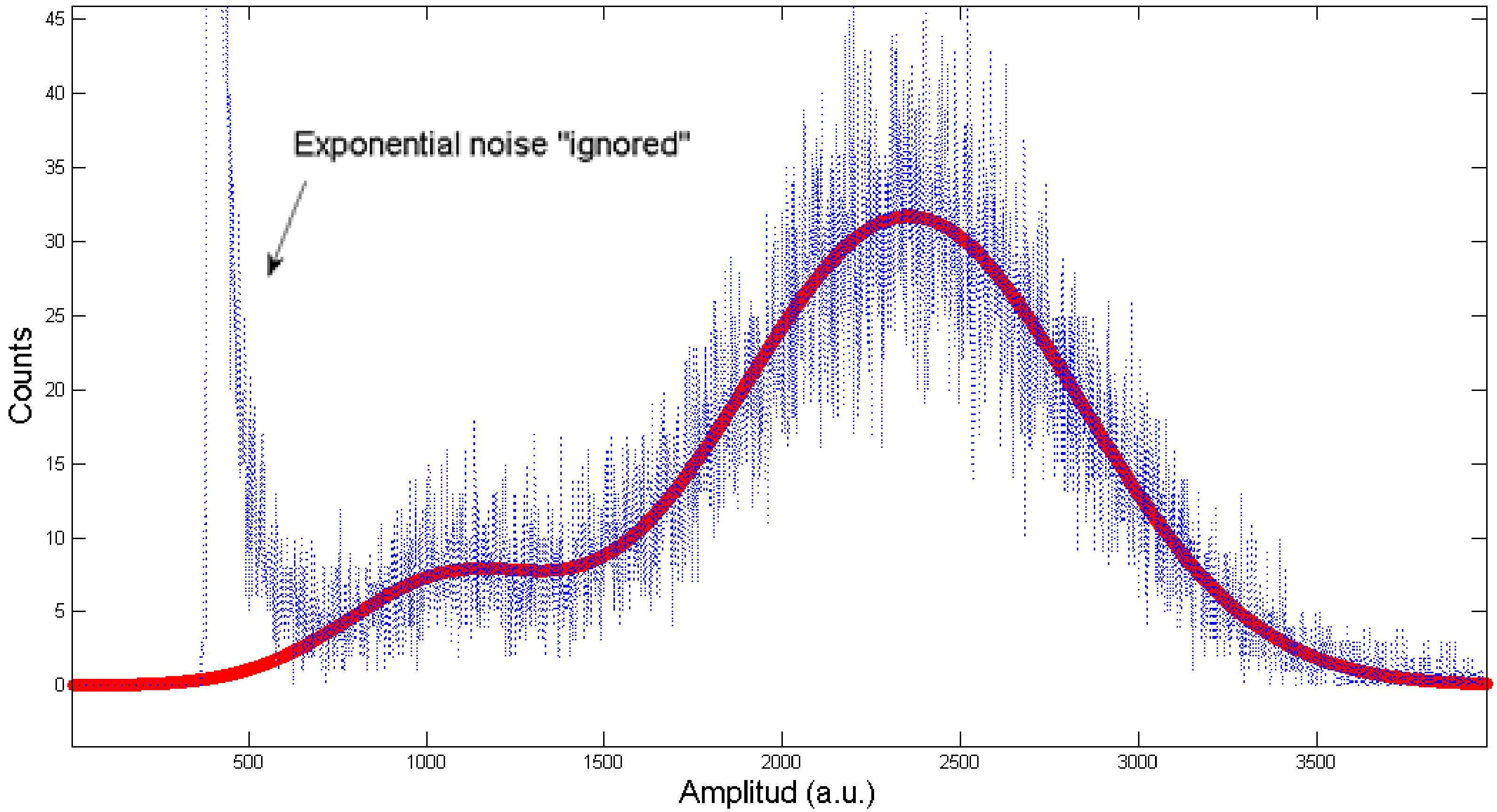
Measurements Stability



Measurements Stability



Energy Resolution

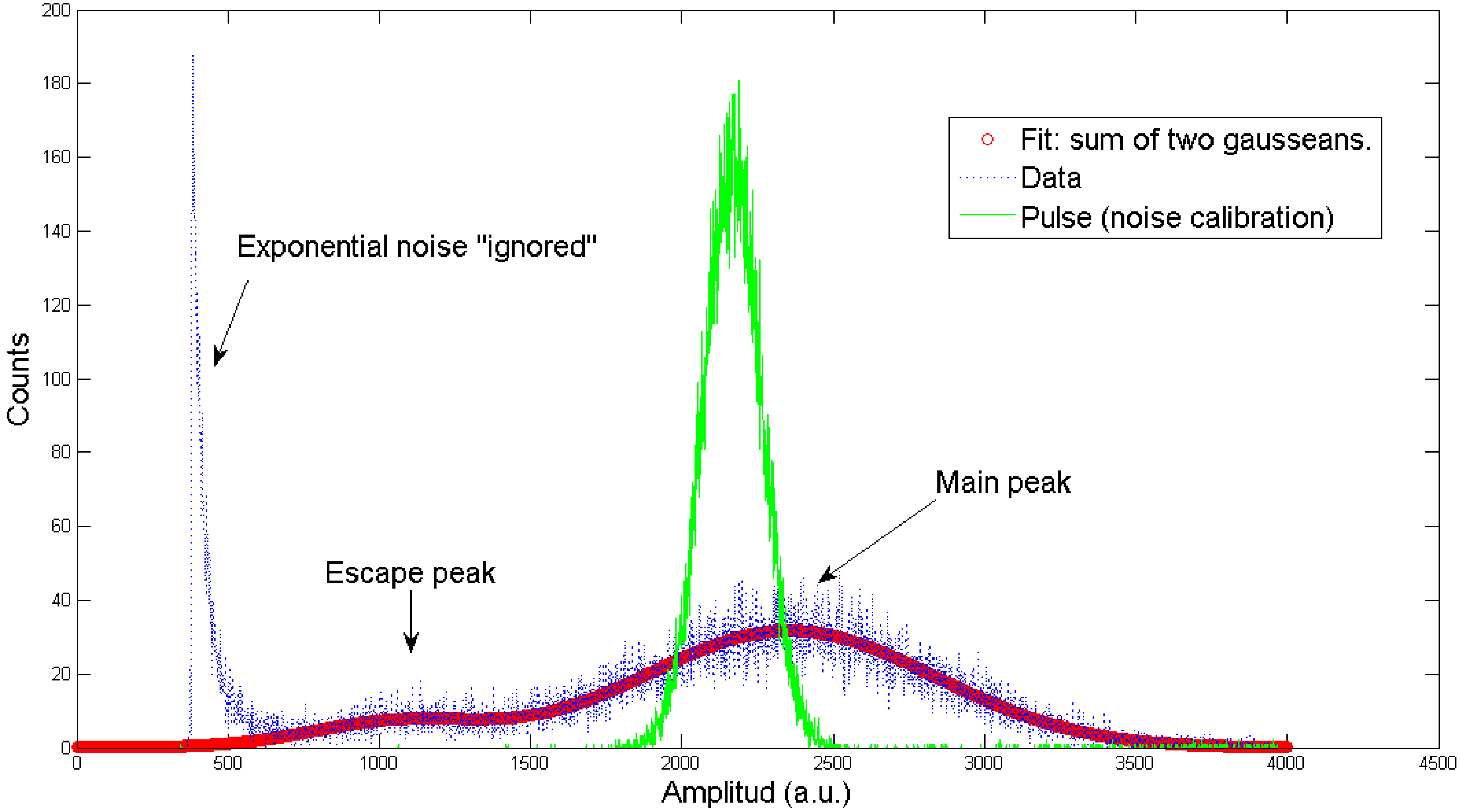


(~ momentum or ~wave number of striped electrons)

$$(f * g)(t) \stackrel{\text{def}}{=} \int_{-\infty}^{\infty} f(\tau)\, g(t-\tau)\, d\tau$$

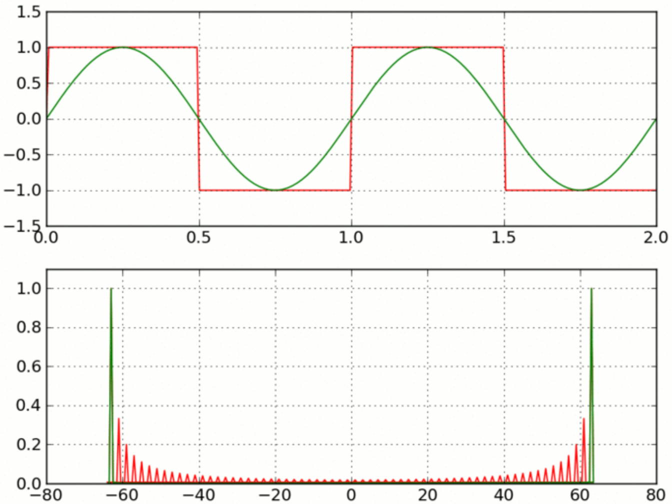
Output=f*g=Signal*Noise

$$\sigma_{Out} = \sqrt{\sigma_{Signal}{}^2 + \sigma_{Noise}{}^2}$$



$Z(w)??$

$$Z_O = \left[i\,w\,L + \left(\frac{1}{R} + i\,w\,c \right)^{-1} \right]$$

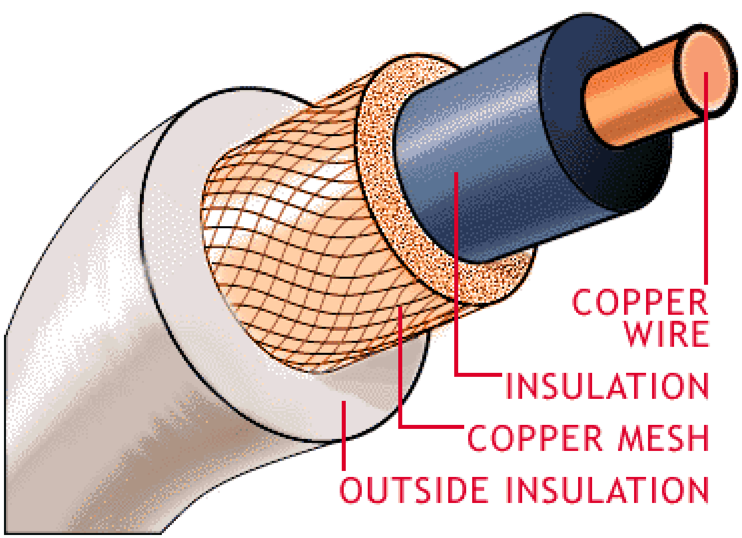


$$x_{\text{square}}(t) = \frac{4}{\pi} \sum_{k=1}^{\infty} \frac{\sin\left(2\pi(2k-1)ft\right)}{(2k-1)}$$

$$= \frac{4}{\pi} \left(\sin(2\pi ft) + \frac{1}{3}\sin(6\pi ft) + \frac{1}{5}\sin(10\pi ft) + \cdots \right)$$

$$Z_o = \left[i\,w\,L + \left(\frac{1}{R} + i\,w\,c \right)^{-1} \right]$$

$$F[\delta(t)] = A \int \delta(t) e^{iwt} dt = A$$

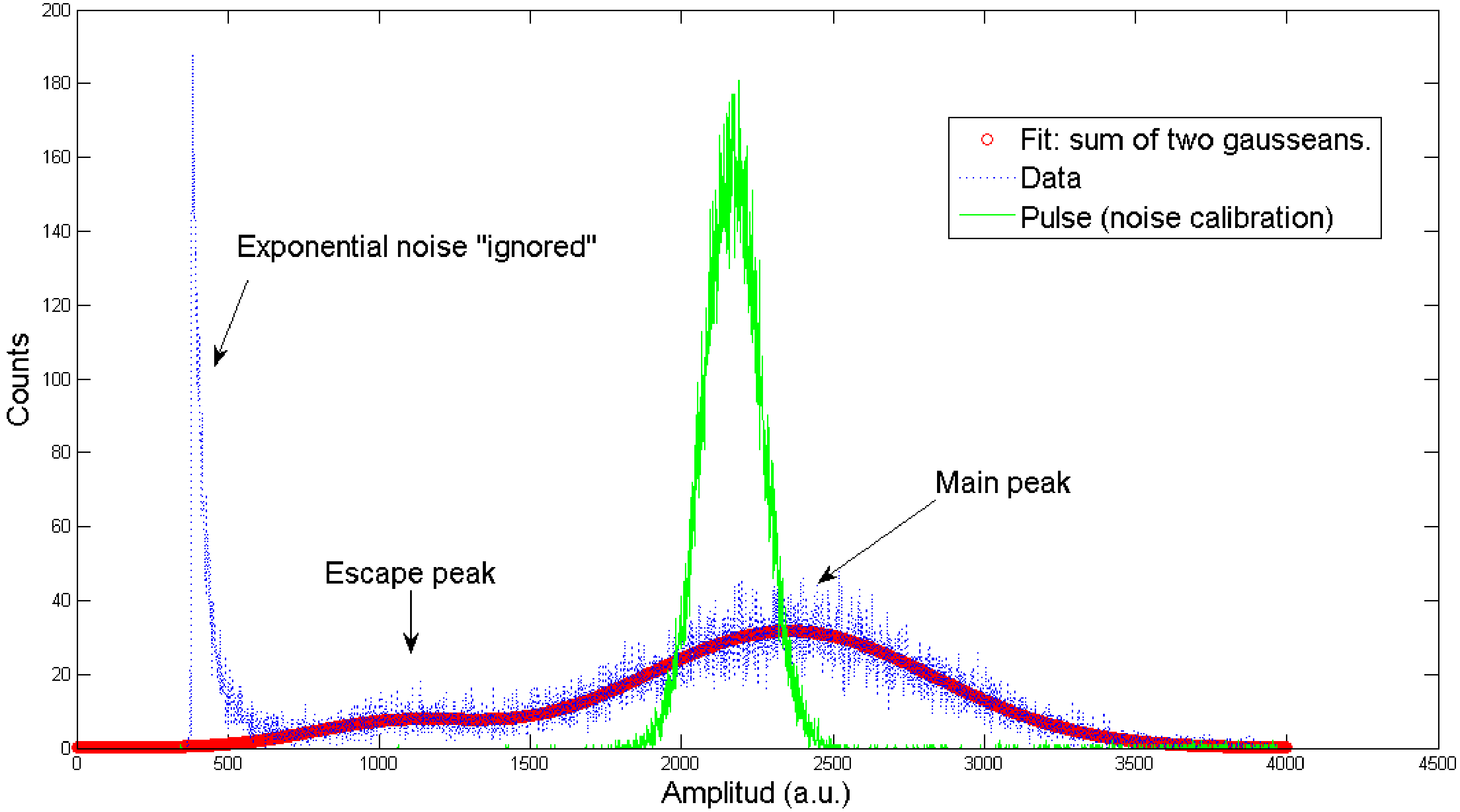


$$\delta(x) = \int e^{itx} dt$$

$$\delta(x) = \int Cos(tx) dt$$

Output=Signal*Noise

$$\sigma_{Out} = \sqrt{\sigma_{Signal}^{\ 2} + \sigma_{Noise}^{\ 2}}$$



$$\begin{matrix} \text{If my signal is a Gaussian} \\ \text{If the noise is Gaussian} \end{matrix} \quad \Rightarrow \quad \text{The outcome is a Gaussean}$$

$(\nLeftarrow)$

("fallacy of the converse")

GRACIAS

THINGS I LEFT OUT BECAUSE OF LACK OF TIME… (OR SUGGESTED QUESTIONS):

- Why GEM?
- What is a single wire?
- Which radioactive sources do we use for testing?
- Where does the Power Bar live?
- Security measurements for radiation
- Why two Gaussians in energy resolution?