# Transmission Spectra Tallium Source

Simulation and Experiment comparison
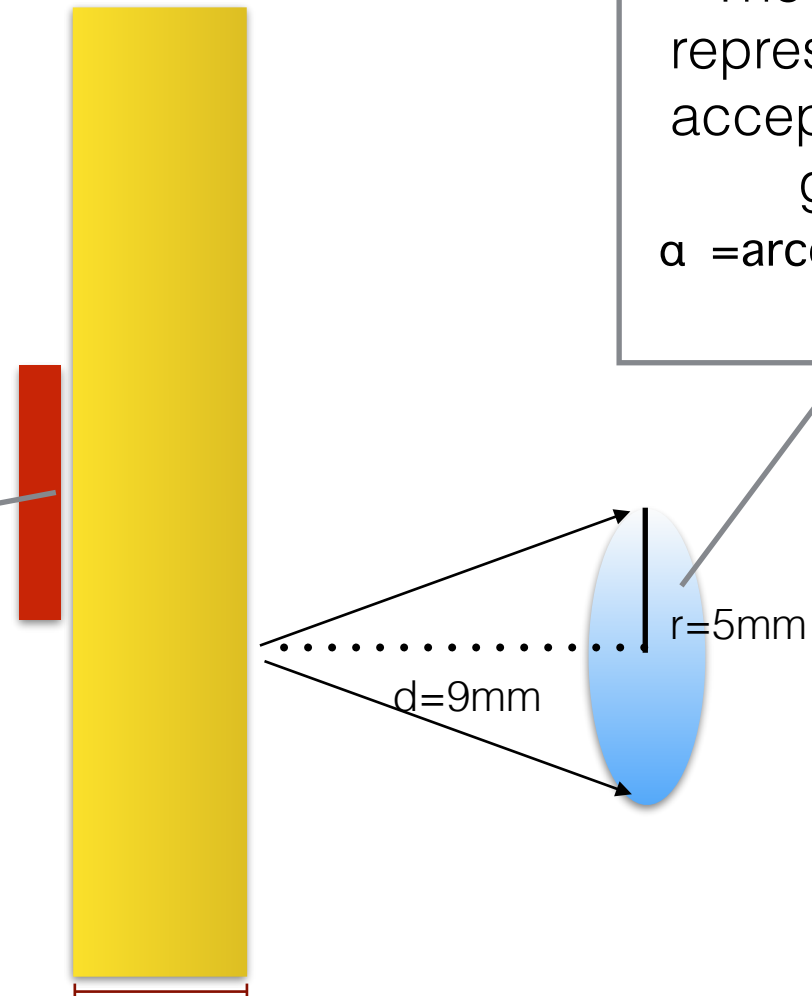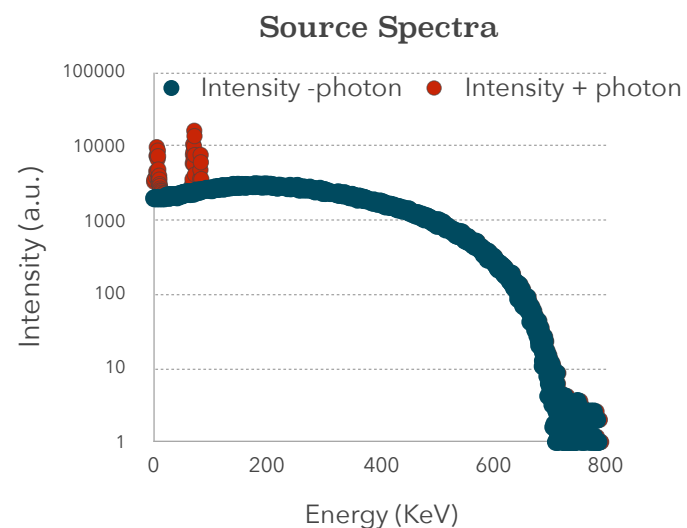
# Simulation Geometry

The source is represented as a cylinder of radius 34mm and height 0,2mm placed at a distance of 0.5mm from the gold foil.
The source is assumed to be isotropic.

At the moment the photons radiation is not implemented in TRAX.
The photon component has been than subtracted from the spectra

### Source Spectra



- Intensity -photon
- Intensity + photon

Intensity (a.u.)

100000
10000
1000
100
10
1

0    200    400    600    800

Energy (KeV)

The detector is represented as an acceptance angle given of
α =arcotan(5/9)~30°

r=5mm

d=9mm

Gold foil 20, 40 ,60 um thick.
Density 19,3 kg/m3
Cutoff electron 0,005KeV

# Cross sections

**A full description of the TRAX code and all the information related to the way the interaction of electron on Gold are handled can be found in :** *C.Wälzlein et al. NIM B 320(2014)* **in** *C.Wälzlein et al. Applied radiation and isotopes 83(2014)* **and in** *C.Wälzlein et al. Phys. Med. Biol. 59 (2014).*

**In summary** the cross sections used in the simulations are:

- Ionisation:
  binary encounter cross section according to *Kim and Rudd 1994*

- Excitation:
  experimental cross sections for three single transitions obtained by *Masolov et al 2008* and *Zatsarinnyet al 2008.*
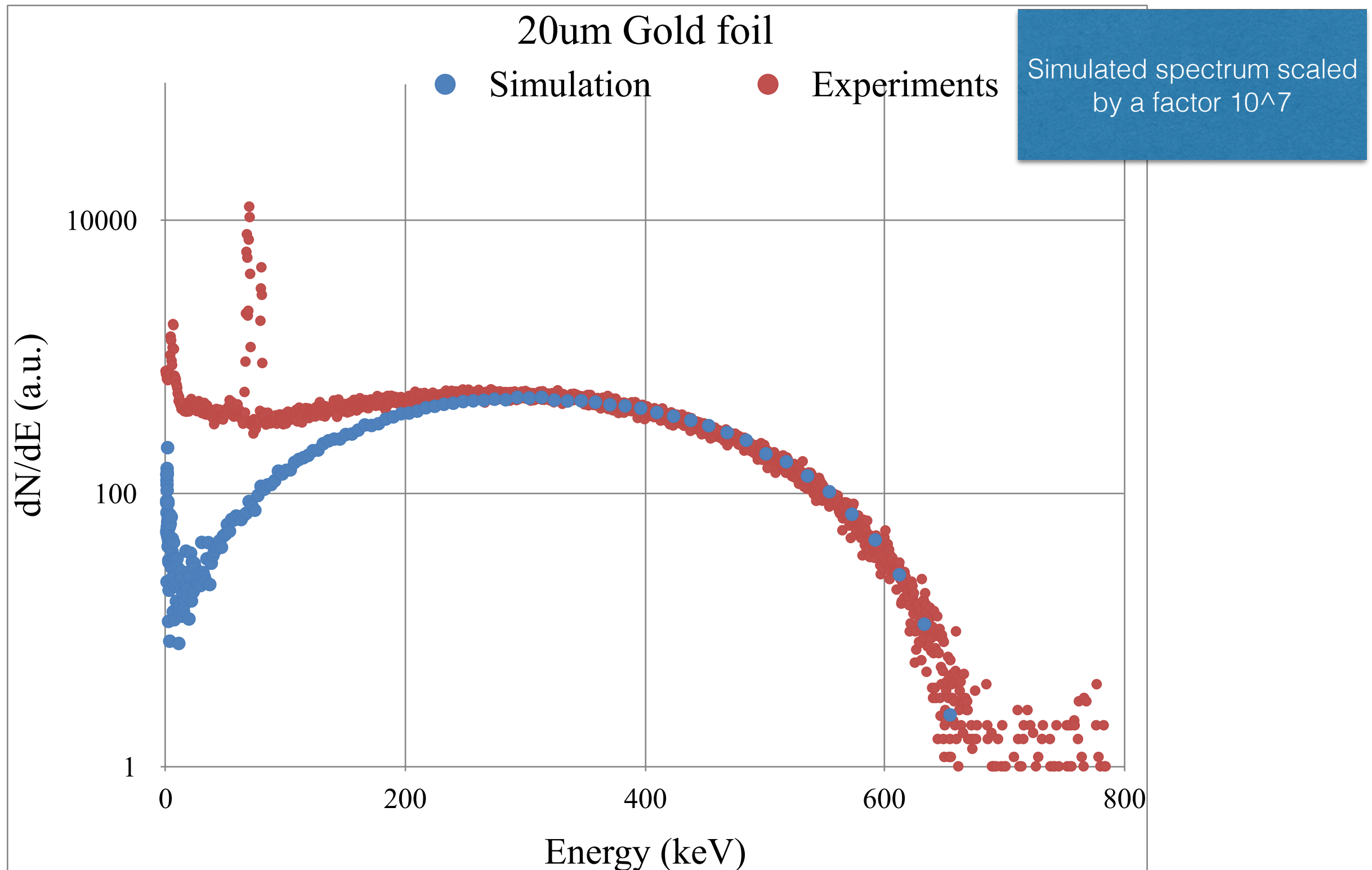
  In addition to this valence electron excitation cross sections the surface plasmon excitation can be accounted by using the formula given in *Quinn (1962)* . ( Not included in the Thallium simulation.)

- Elastic:
  cross section obtained using the Rutherford cross sections merged with the cross section obtained with the Partial wave expansion method.
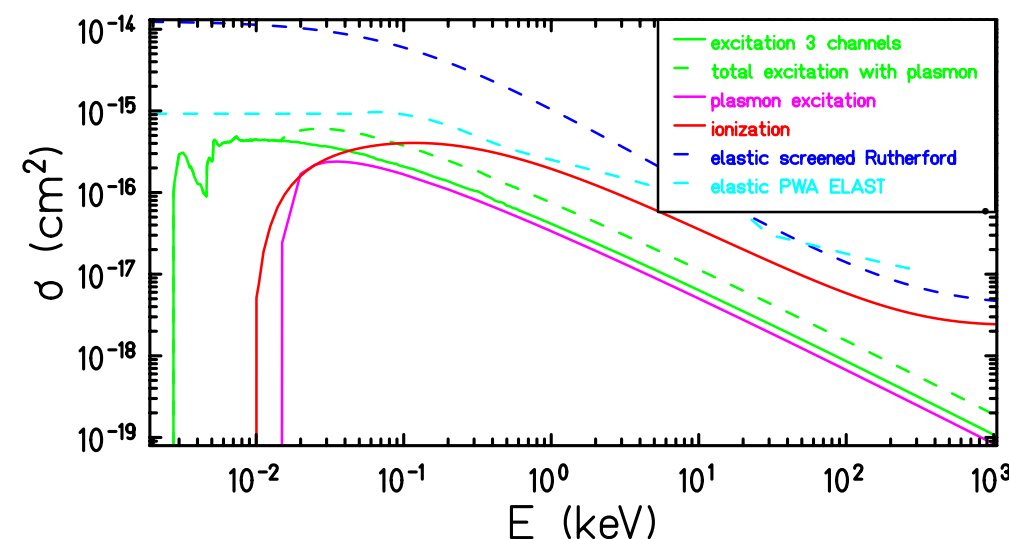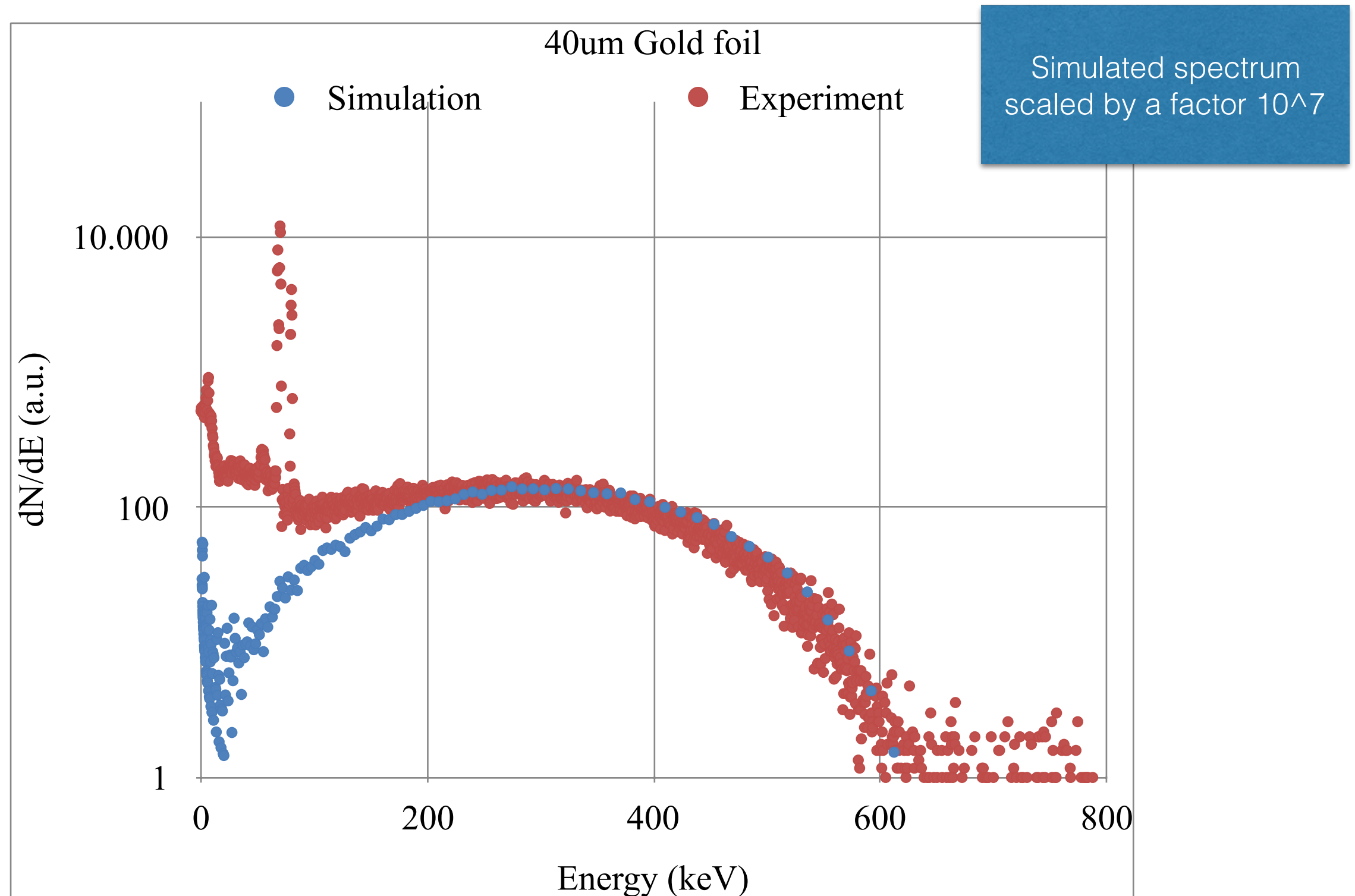


cross section electron on Gold implemented on TRAX
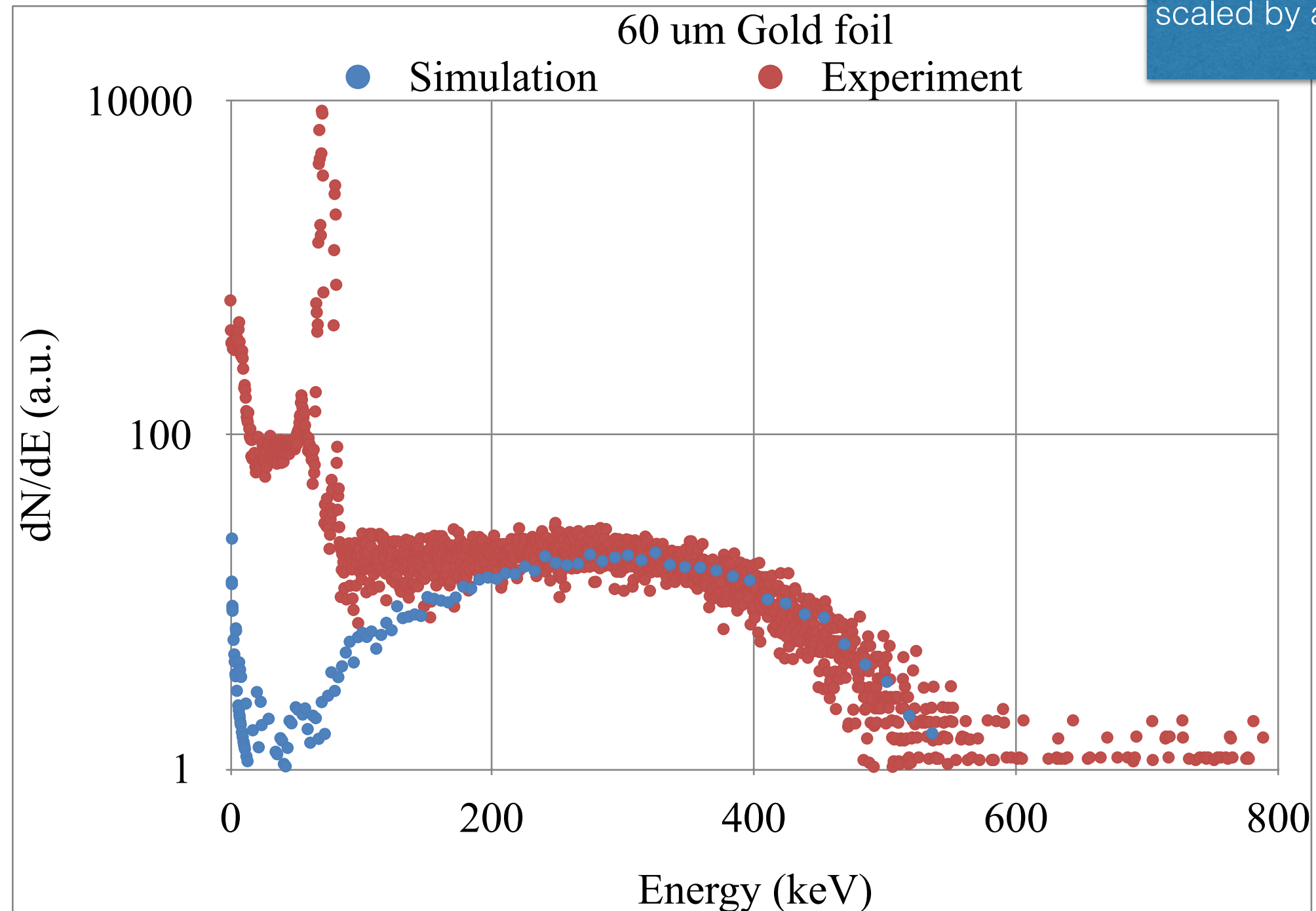*C.Wälzlein et al. Phys. Med. Biol. 59 (2014).*
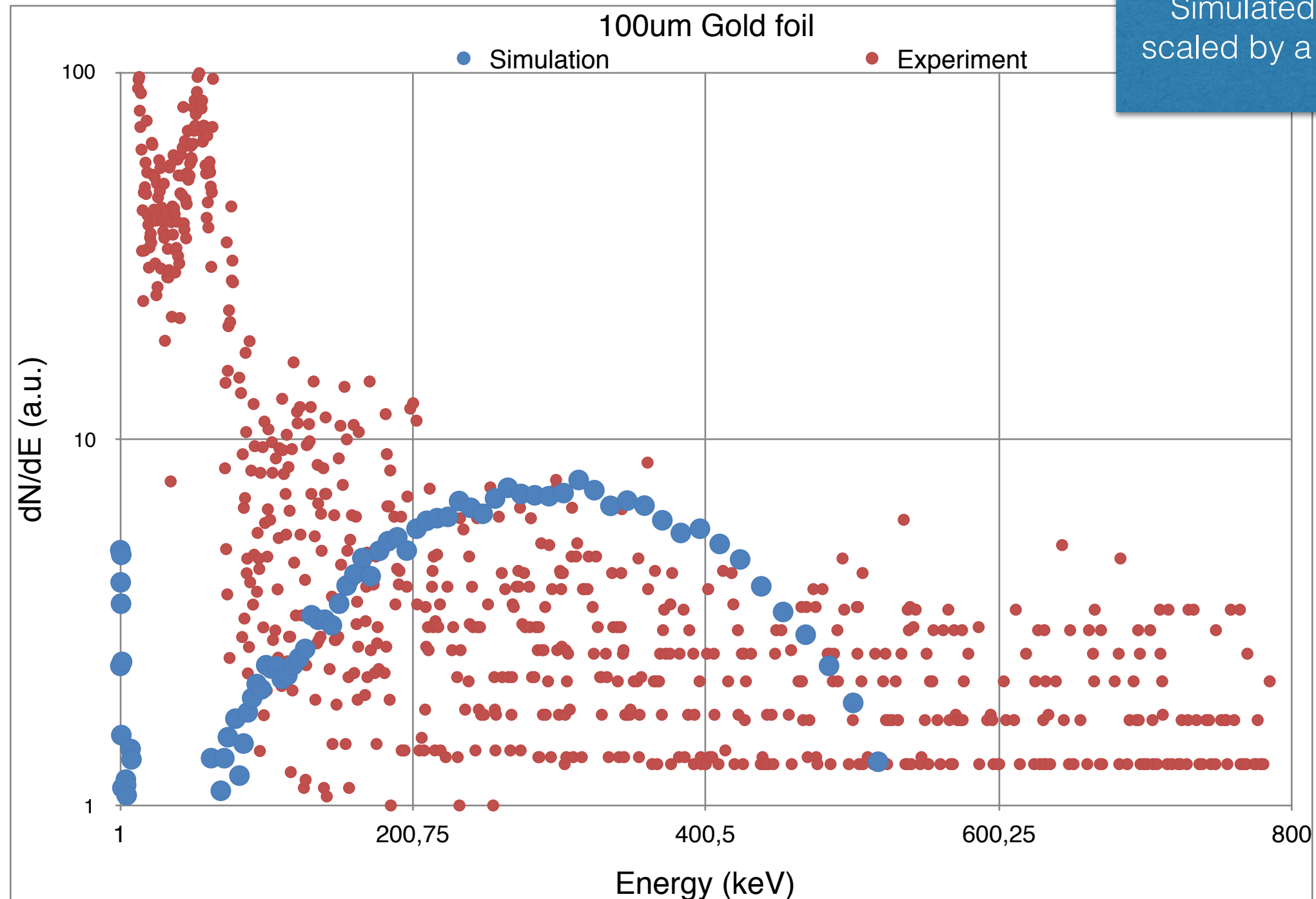
# 20μm Gold



20um Gold foil

● Simulation    ● Experiments

Simulated spectrum scaled by a factor 10^7

# 40μm Gold



40um Gold foil

Simulation   Experiment

Simulated spectrum scaled by a factor 10^7

# 60µm Gold



Simulated spectrum scaled by a factor 5x10^6

# 100μm Gold



100um Gold foil

● Simulation  ● Experiment

Simulated spectrum scaled by a factor 10^6