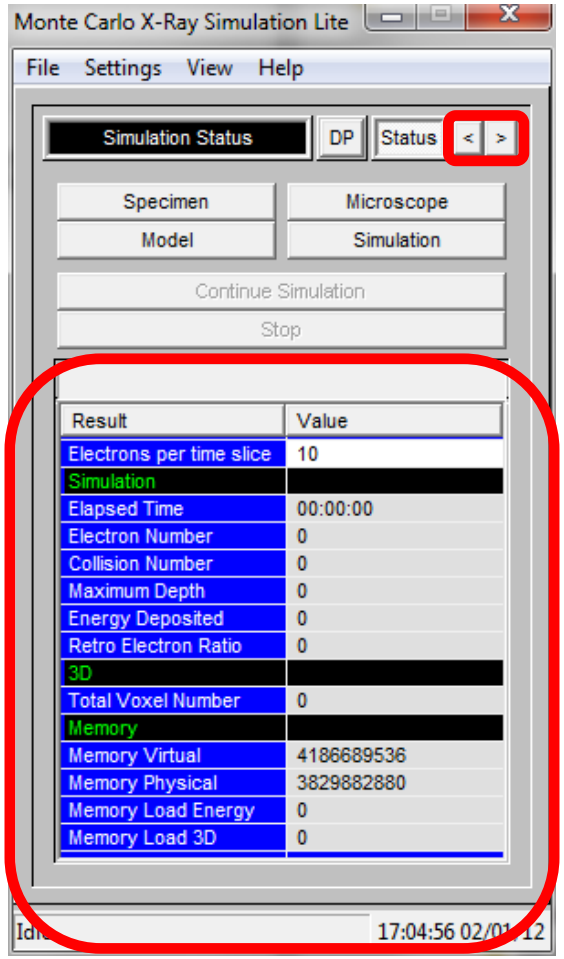
MC X-Ray Lite User Manual

Version 1.2

August 2012

MC X-Ray Lite



Navigate between
main and spectrum simulation
dialogs

Information about the
simulation progress

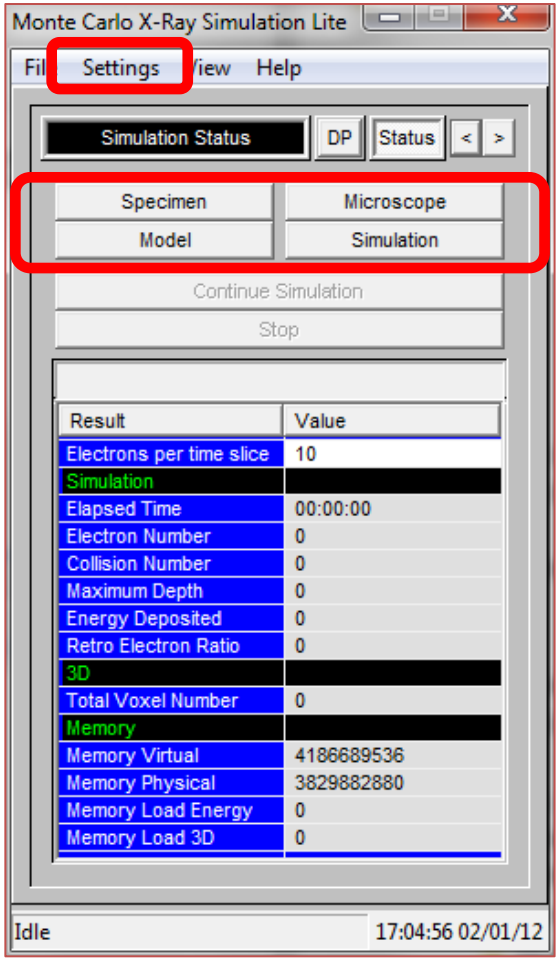
Examples Used

- AlMgBulk5keV.sim
  - AlMg Alloy (bulk) at 5keV.
  - Al 50% weight fraction, Mg 50%.
- AuParticleInC20keV.sim
  - Au nanoparticle (NP) in C substrate at 20 keV.
  - NP diameter 20 nm just below the surface.
- CarbonNanotube_0nm.sim
  - Carbon nanotube at 5 keV.
  - Outer radius 10 nm, inner radius 5 nm, center vacuum.

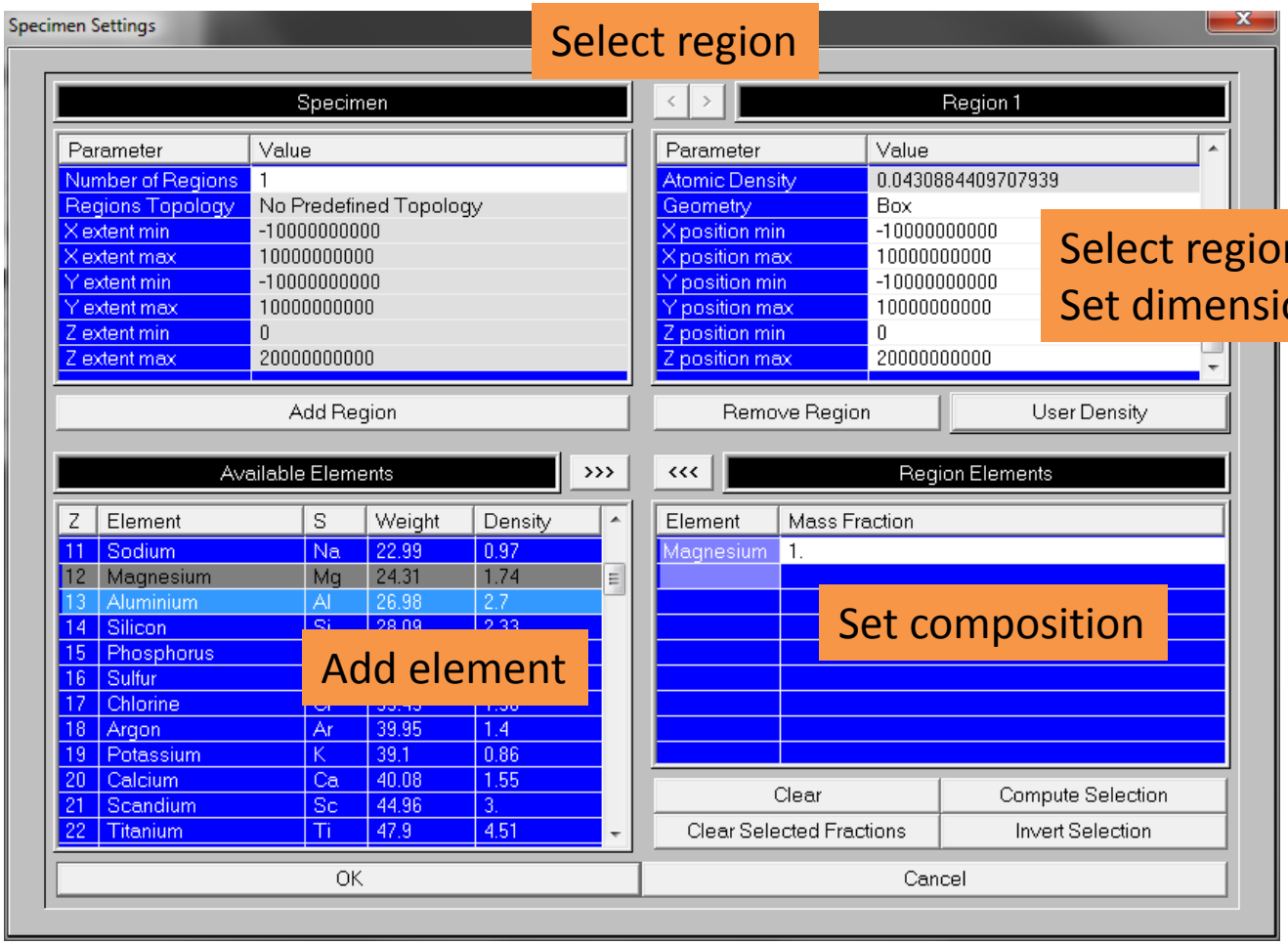
Settings

- Specimen
- Microscope
- Models
- Simulation Parameters

Can be access either by the buttons or the menu

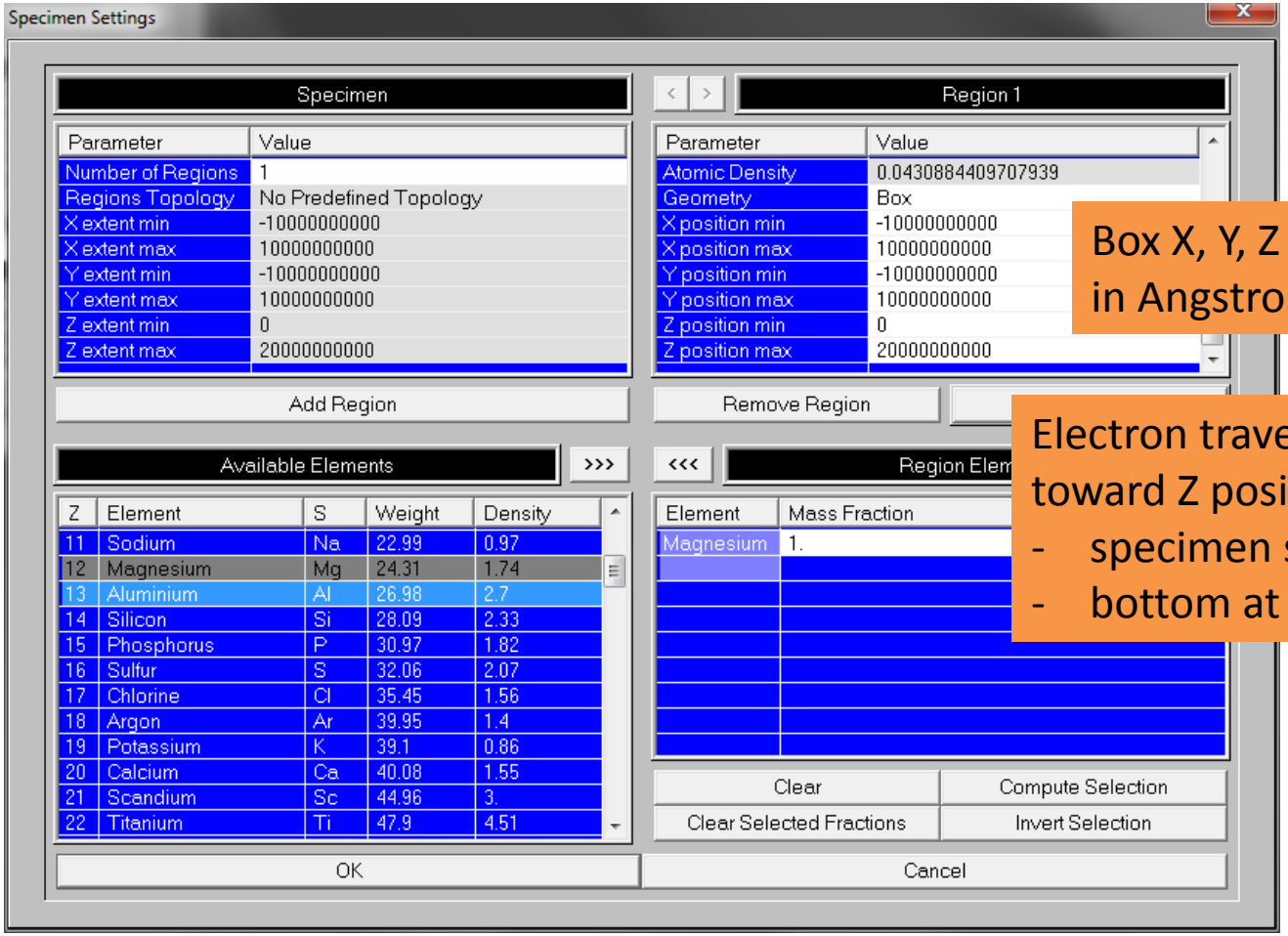


Specimen Settings



The first region have to be a box and no region with z < 0.

Region Box

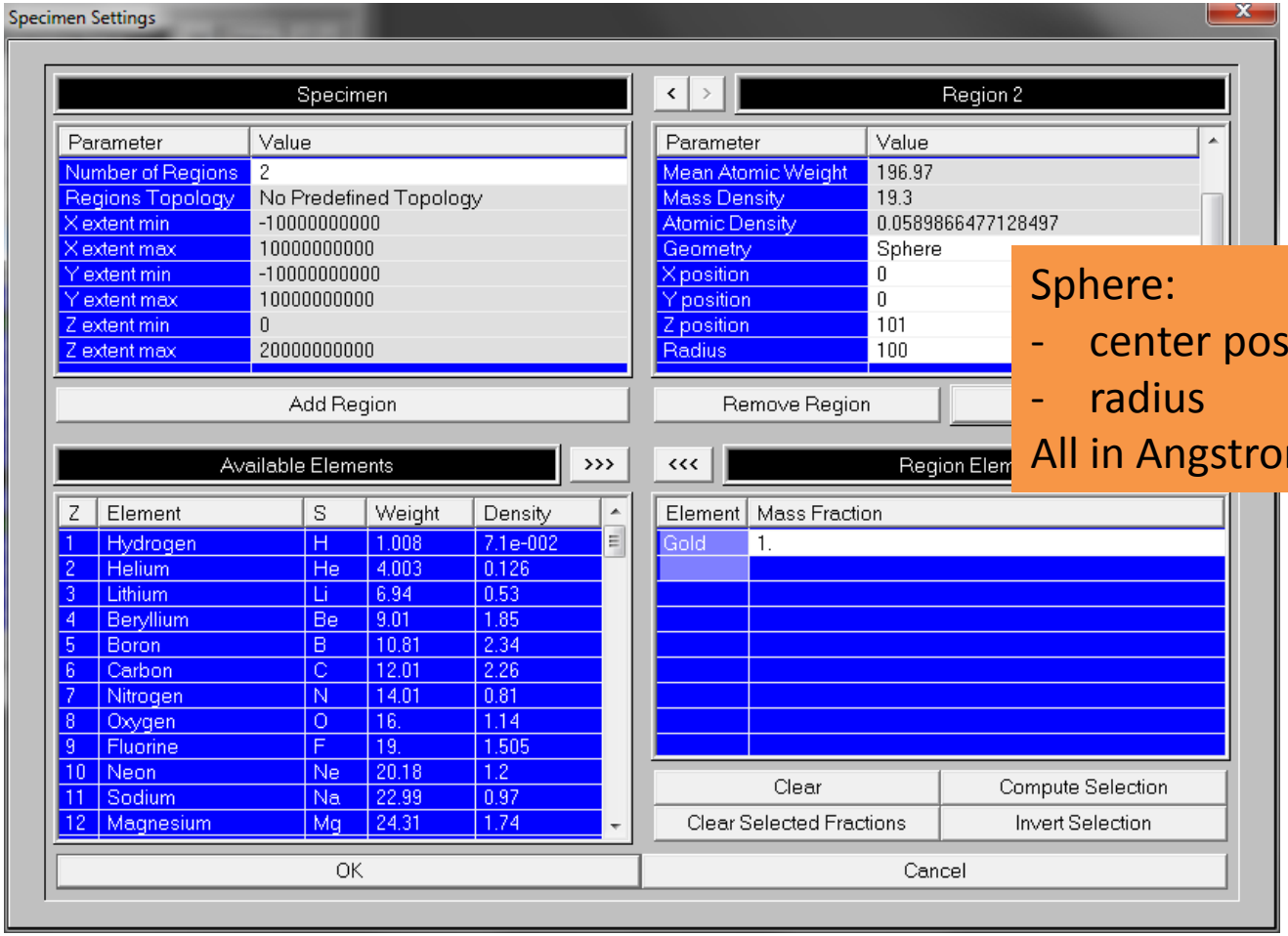


Box X, Y, Z dimensions in Angstrom

Electron travel toward Z positive

- specimen surface at 0
- bottom at 200 A

Region Sphere

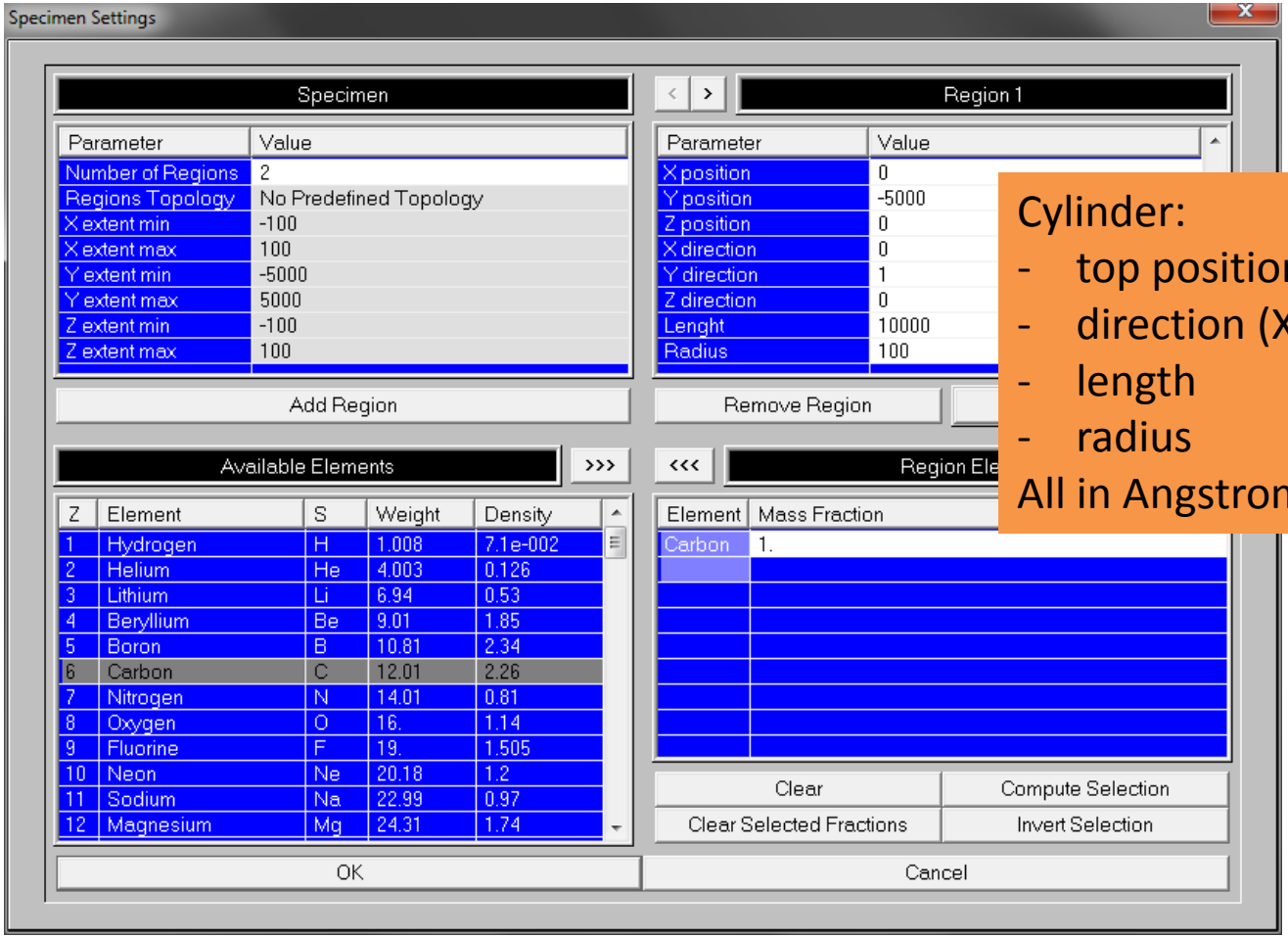


Sphere:

- center position (X, Y, Z)
- radius

All in Angstrom

Region Cylinder

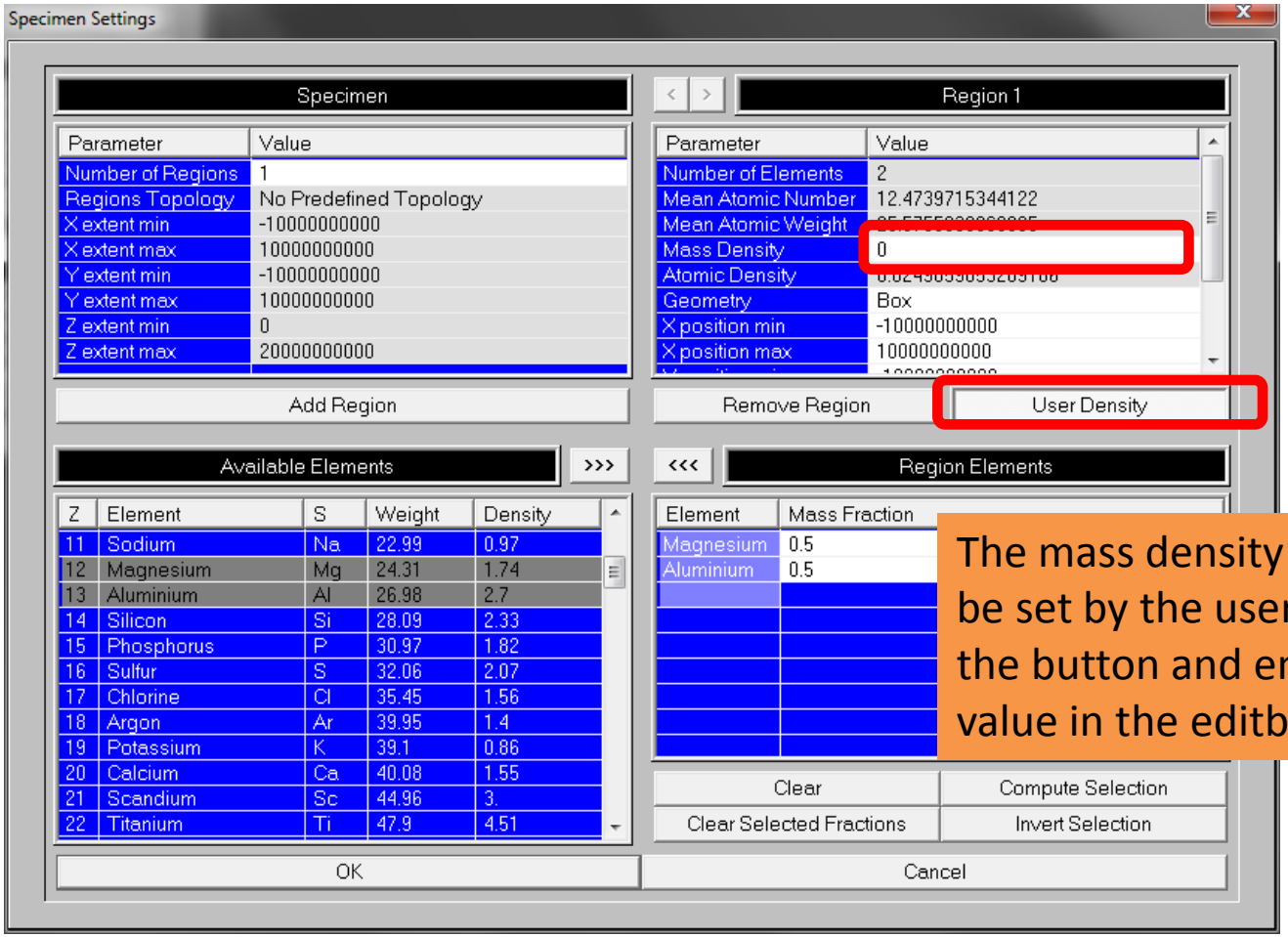


Cylinder:

- top position (X, Y, Z)
- direction (X, Y, Z)
- length
- radius

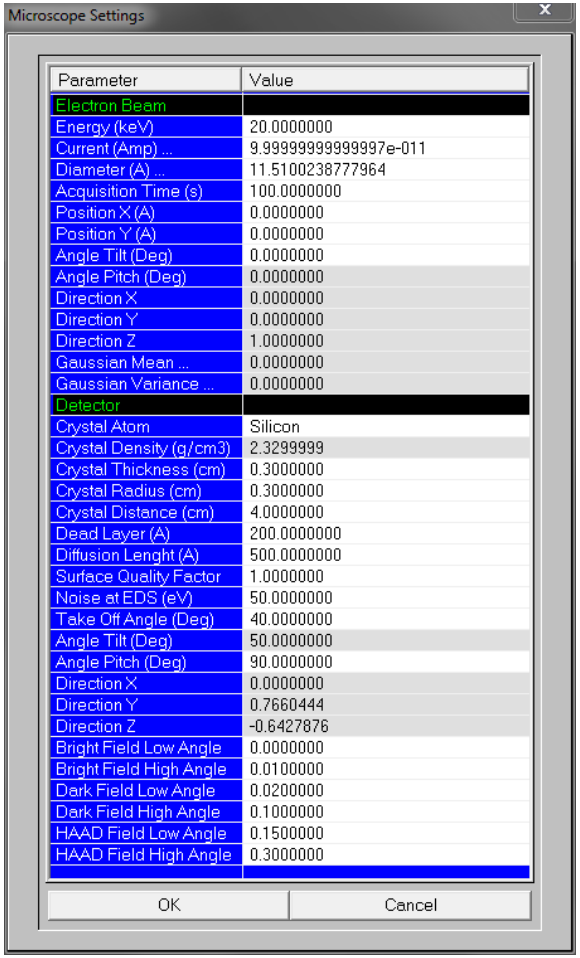
All in Angstrom

Region User Density



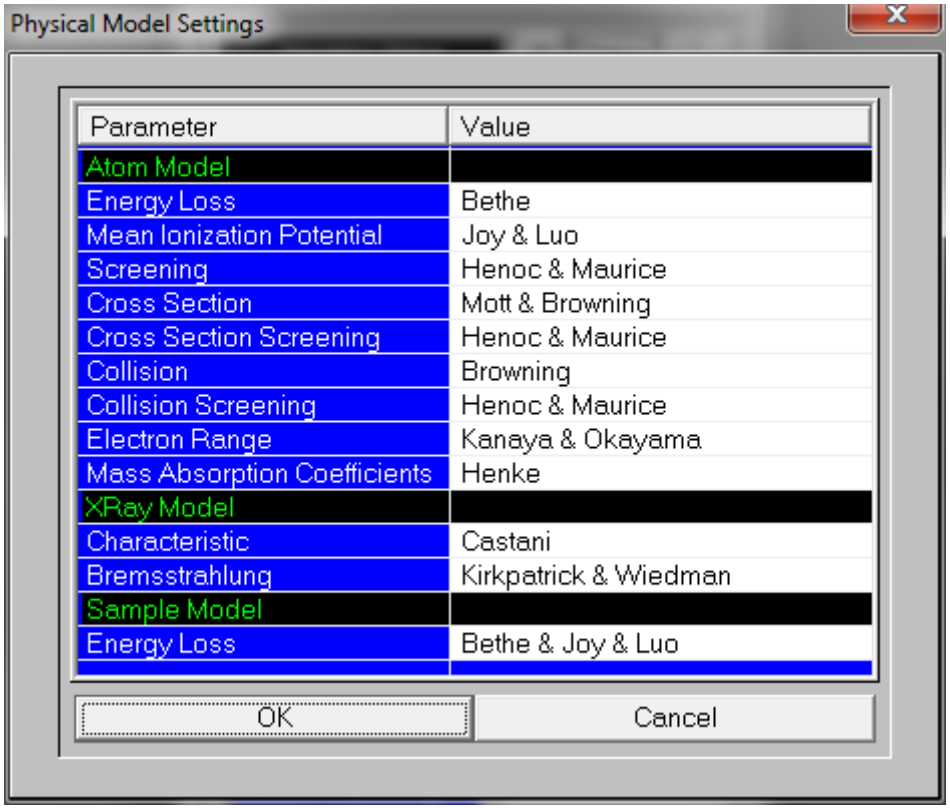
The mass density (g/cm^3) can be set by the user by clicking the button and enter the value in the editbox

Microscope Settings



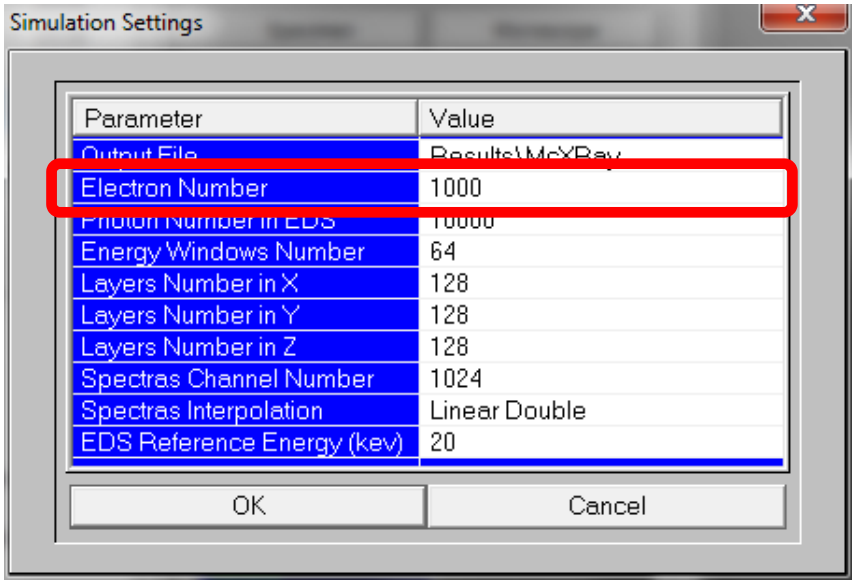
- Electron Beam
  - Incident energy in keV
  - Beam diameter in A
  - Beam X, Y positions in A
  - Beam tilt in degree
- X-ray Detector
  - Take off angle in degree
- Transmitted Electron Detectors
  - All angle in radian

Models Settings



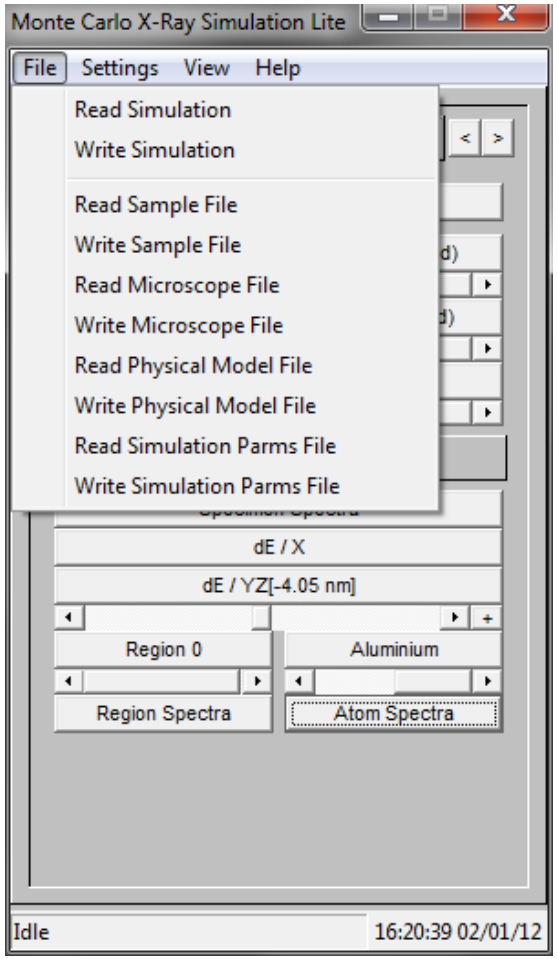
The default models are the best one to use in most simulation

Simulation Parameters



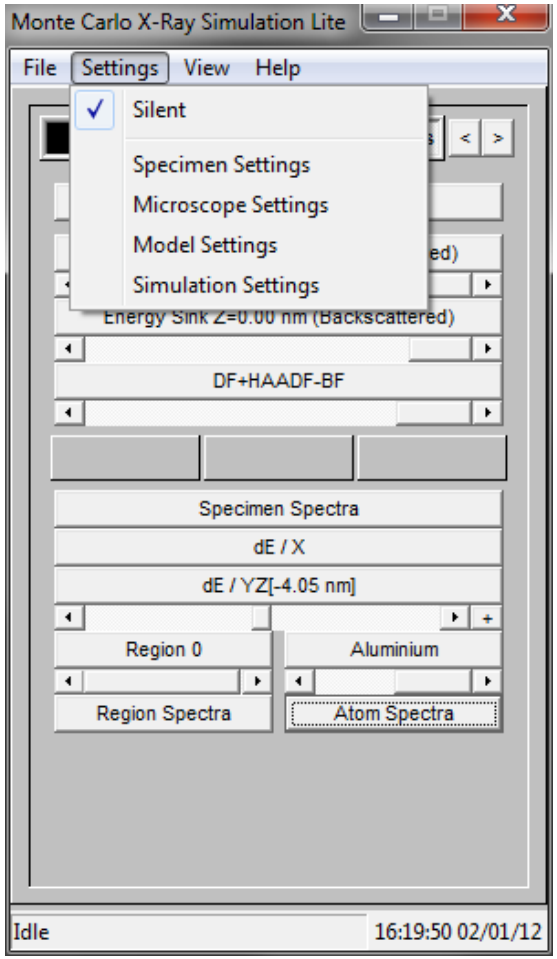
- Set the number of simulated electrons
- Other options are advanced feature, where the default values are good for most simulations

File Menu



Read and write all settings in separate files

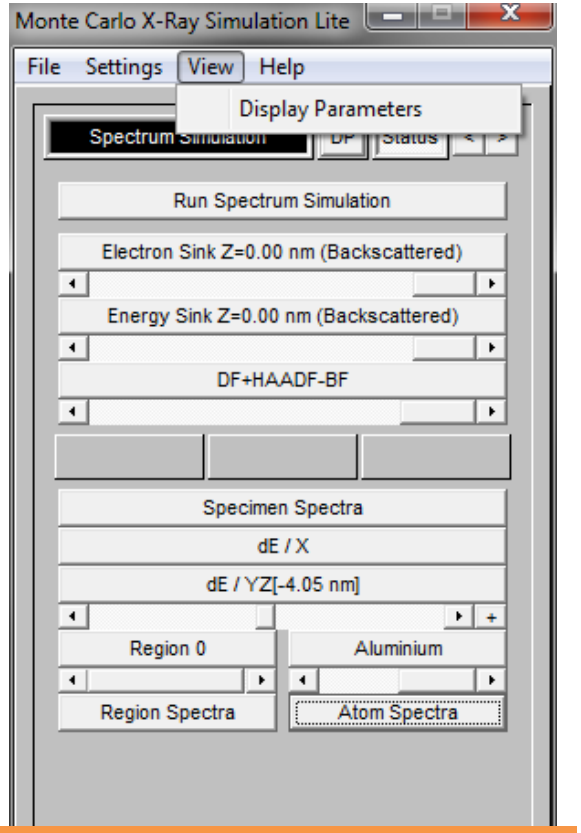
Settings Menu



Can access all settings from the menu

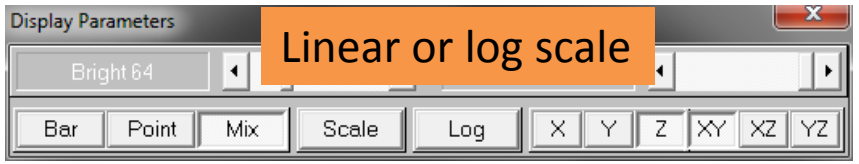
Uncheck Silent to hear a beep when the simulation is finished

View Menu



Open the Display Parameters dialog to adjust the displayed results

Display Parameters

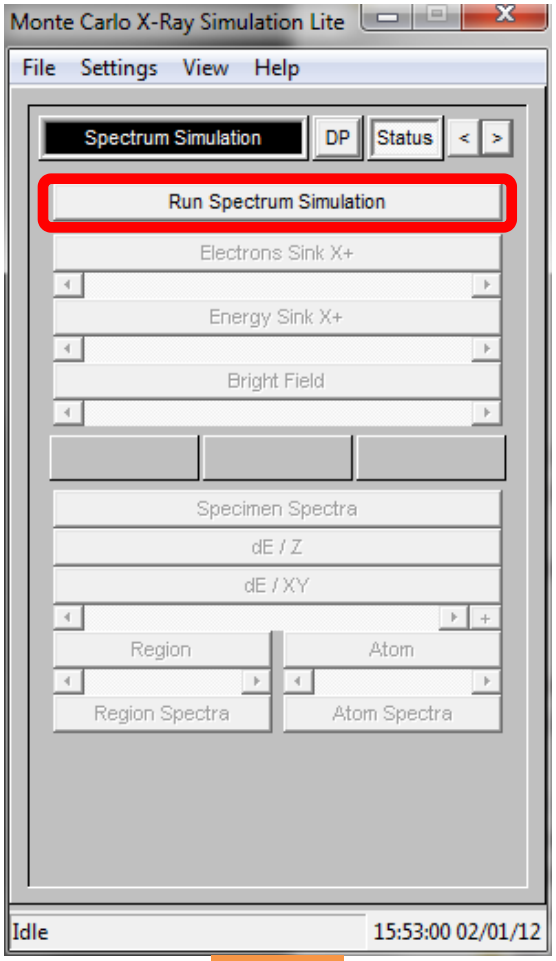


Linear or log scale

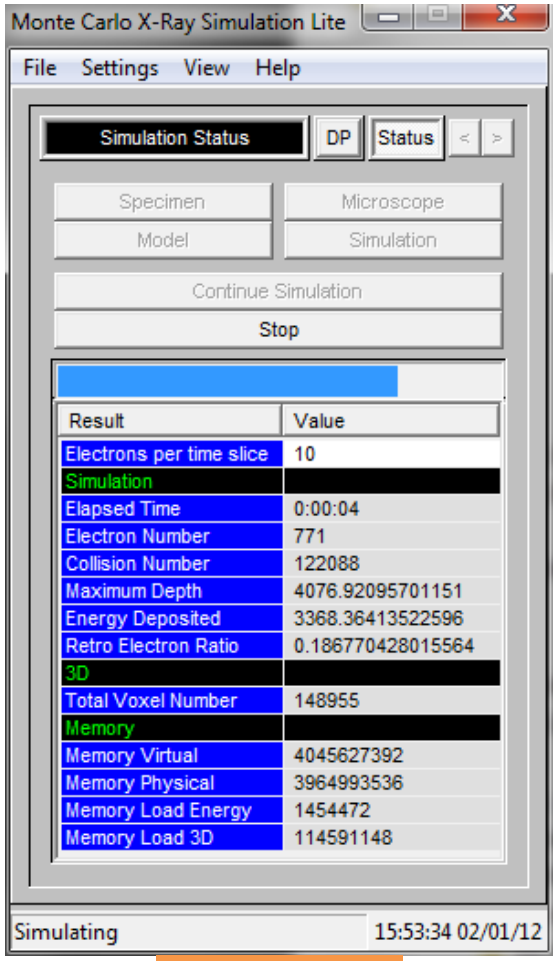
Line type in the graphic

Select the distribution dimension to display

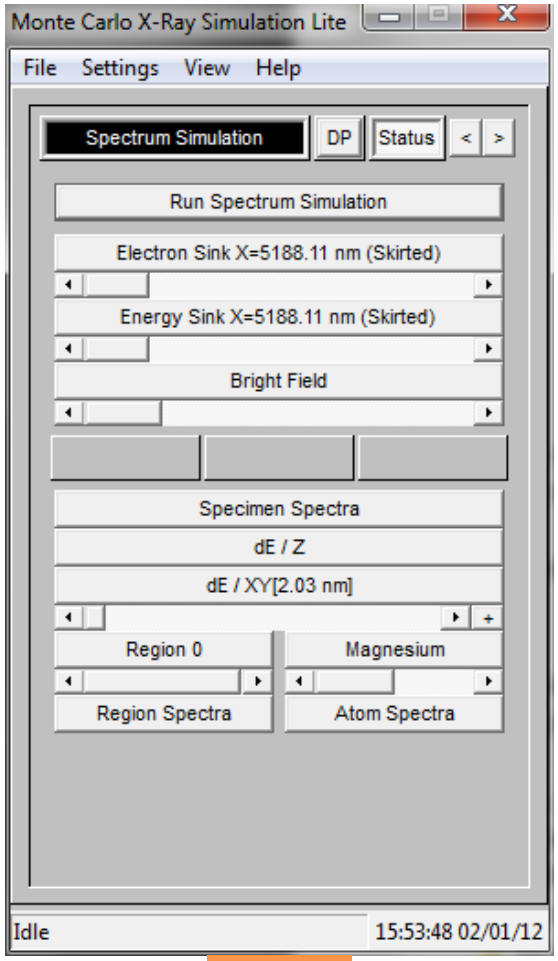
Spectrum Simulation



Start



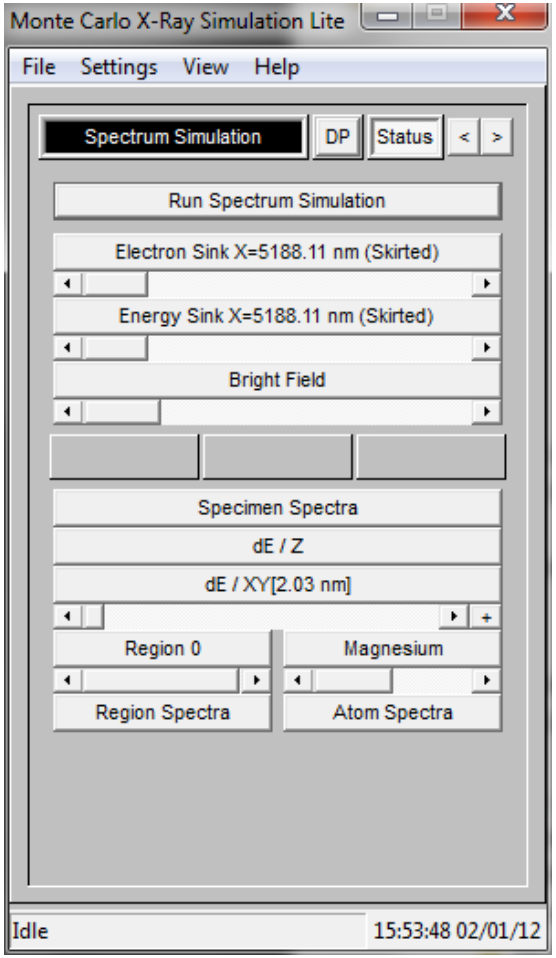
Simulating



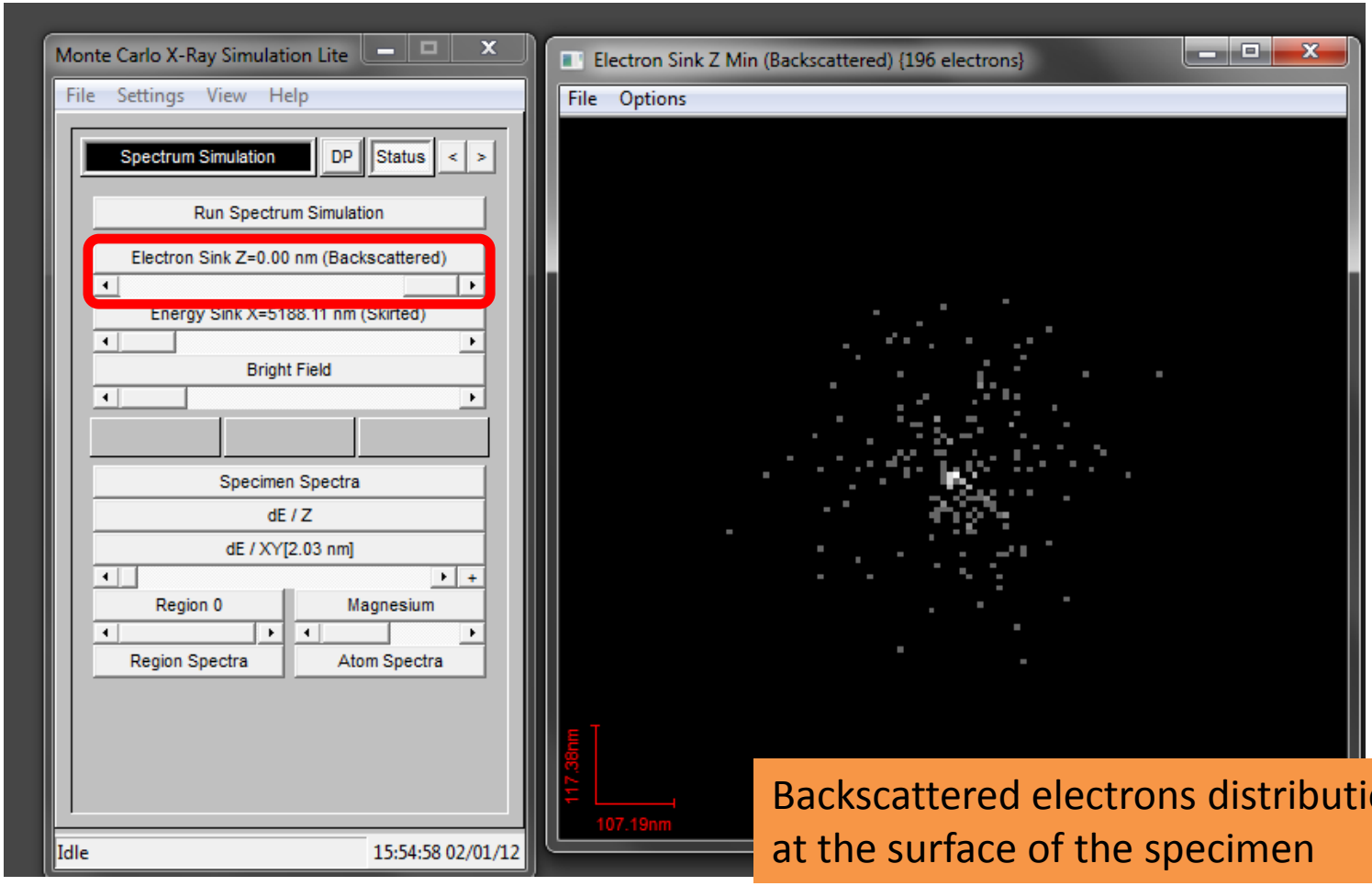
Done

Results

- Click on each label to display the results
- Electron and energy distribution at the specimen surfaces (6)
- Transmitted electrons distribution
- Energy loss distribution
- X-ray spectrum

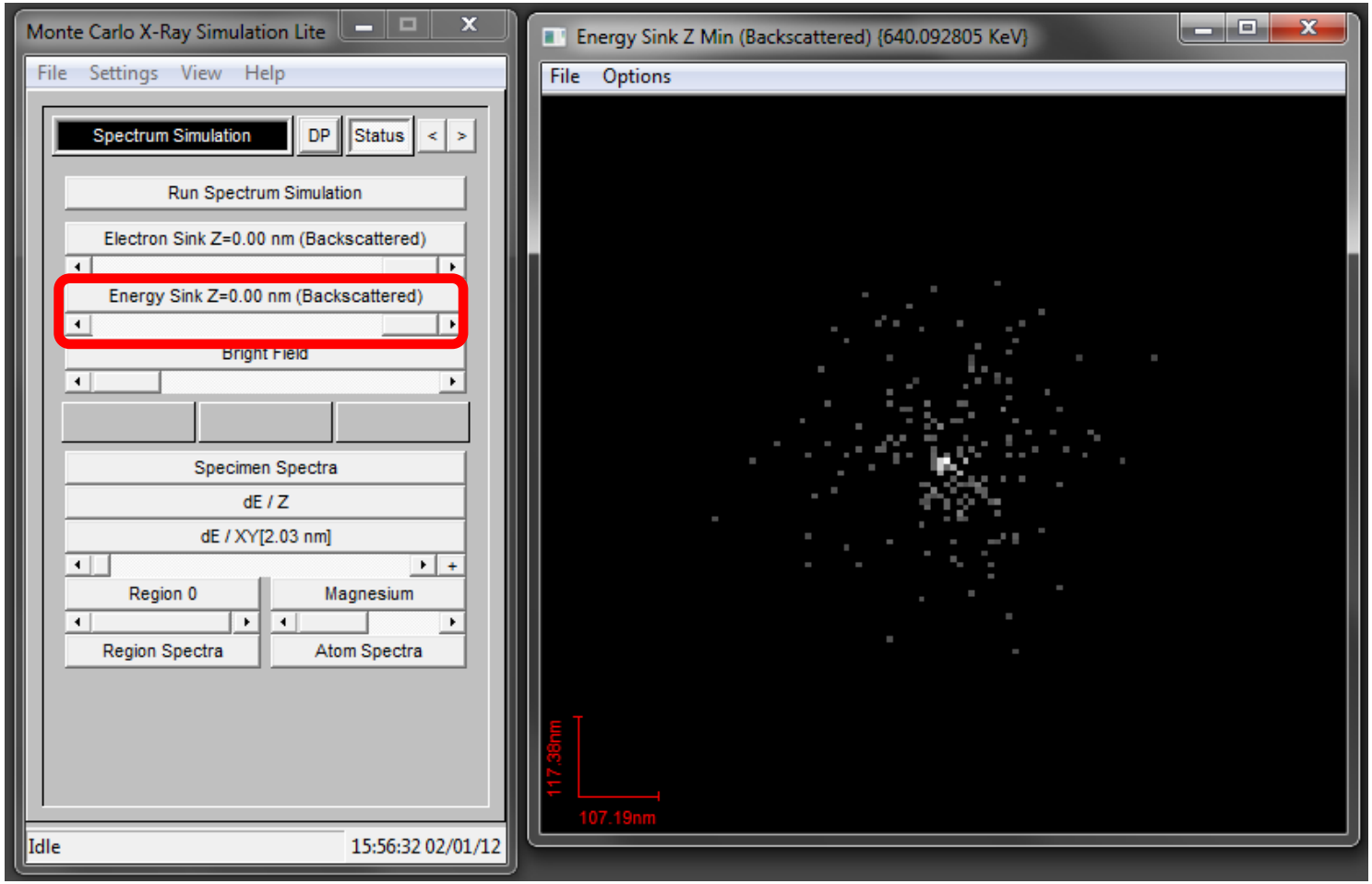


Electrons Sink

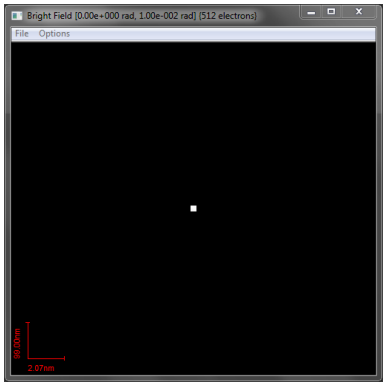


Backscattered electrons distribution at the surface of the specimen

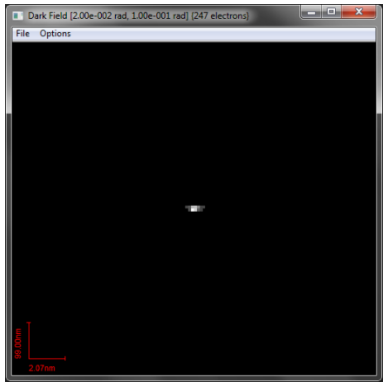
Energy Sink


Monte Carlo X-Ray Simulation Lite
File Settings View Help
Spectrum Simulation
DP
Status
< >
Run Spectrum Simulation
Electron Sink Z=0.00 nm (Backscattered)
Energy Sink Z=0.00 nm (Backscattered)
Bright Field
Specimen Spectra
dE / Z
dE / XY[2.03 nm]
Region 0
Magnesium
Region Spectra
Atom Spectra
Idle
15:56:32 02/01/12
Energy Sink Z Min (Backscattered) {640.092805 KeV}
File Options
117.36nm
107.19nm

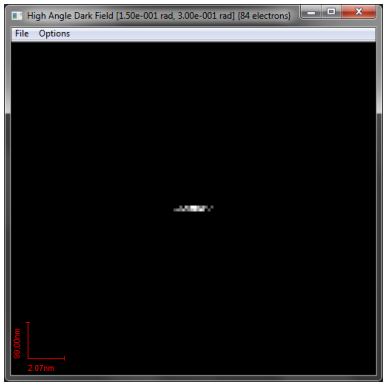
Transmitted Electrons



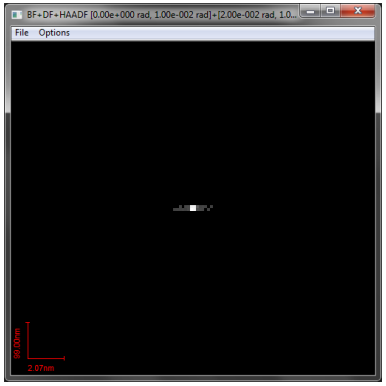
Bright Field



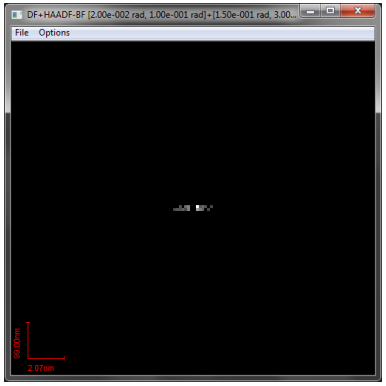
Dark Field



HAADF

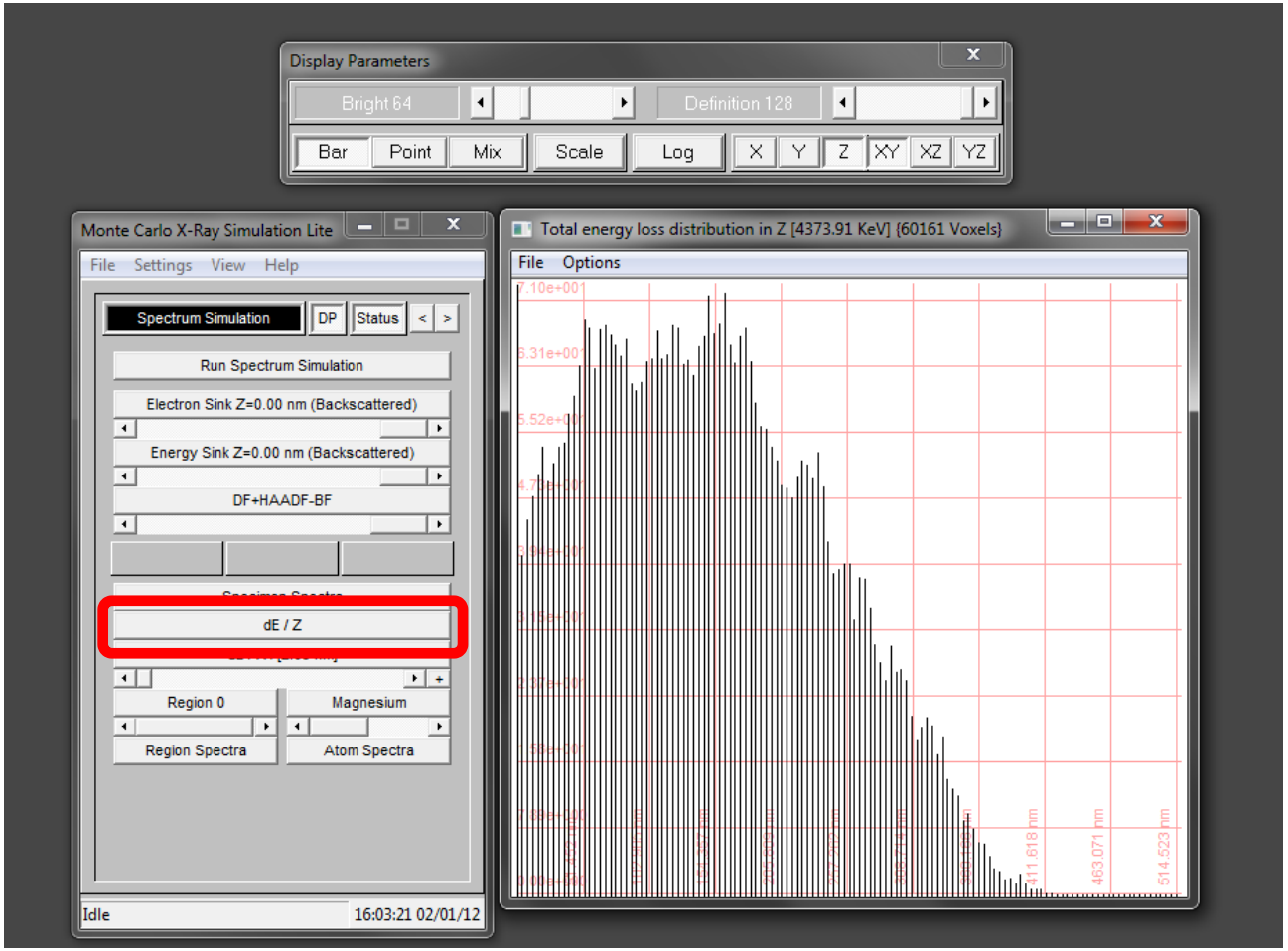


All detectors



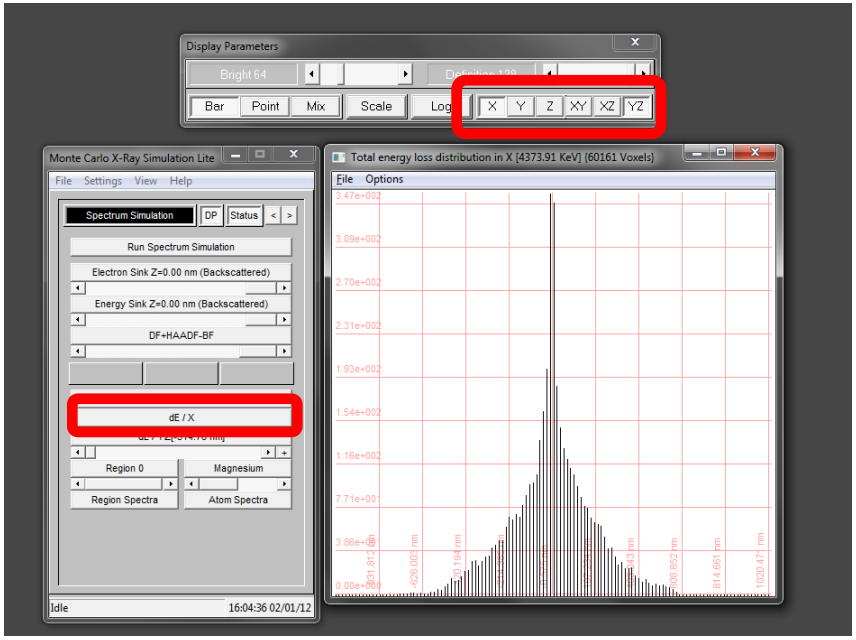
DF + HAADF - BF

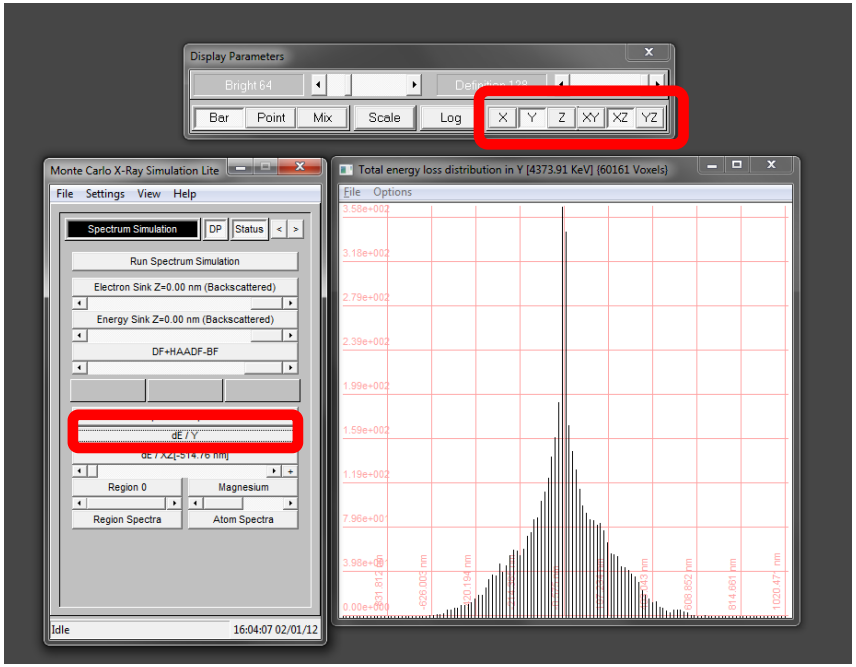
Energy Loss Distribution 1D



Energy loss depth distribution

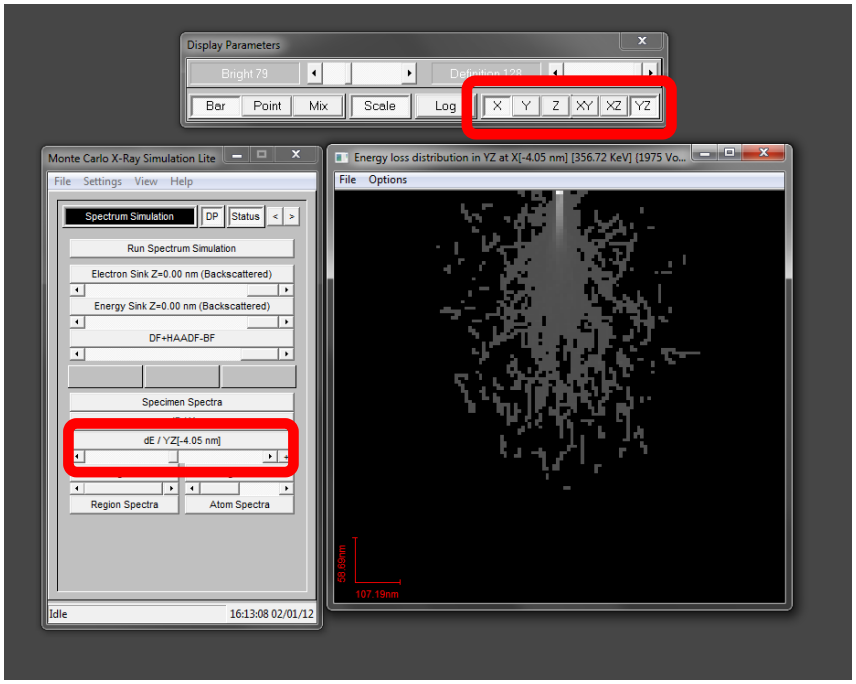
Energy Loss Distribution 1D

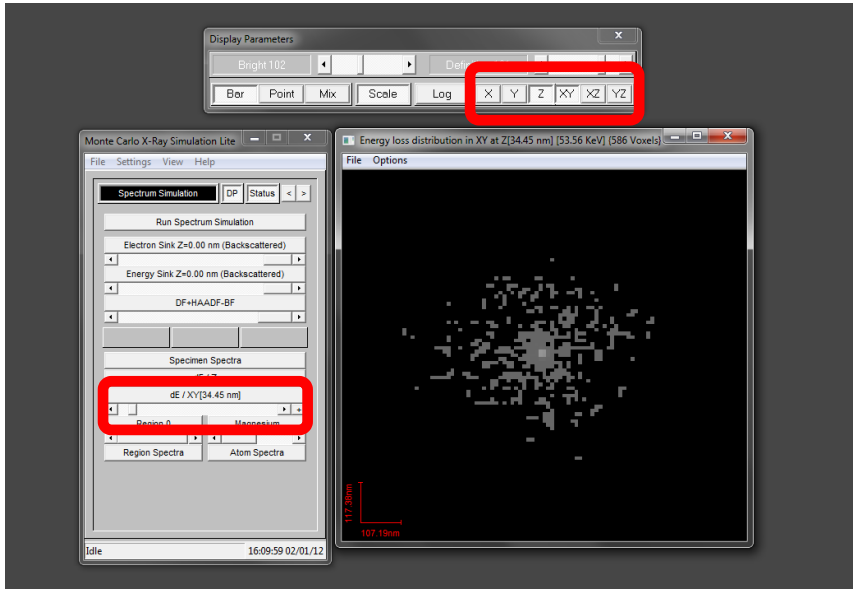




Energy loss lateral distribution

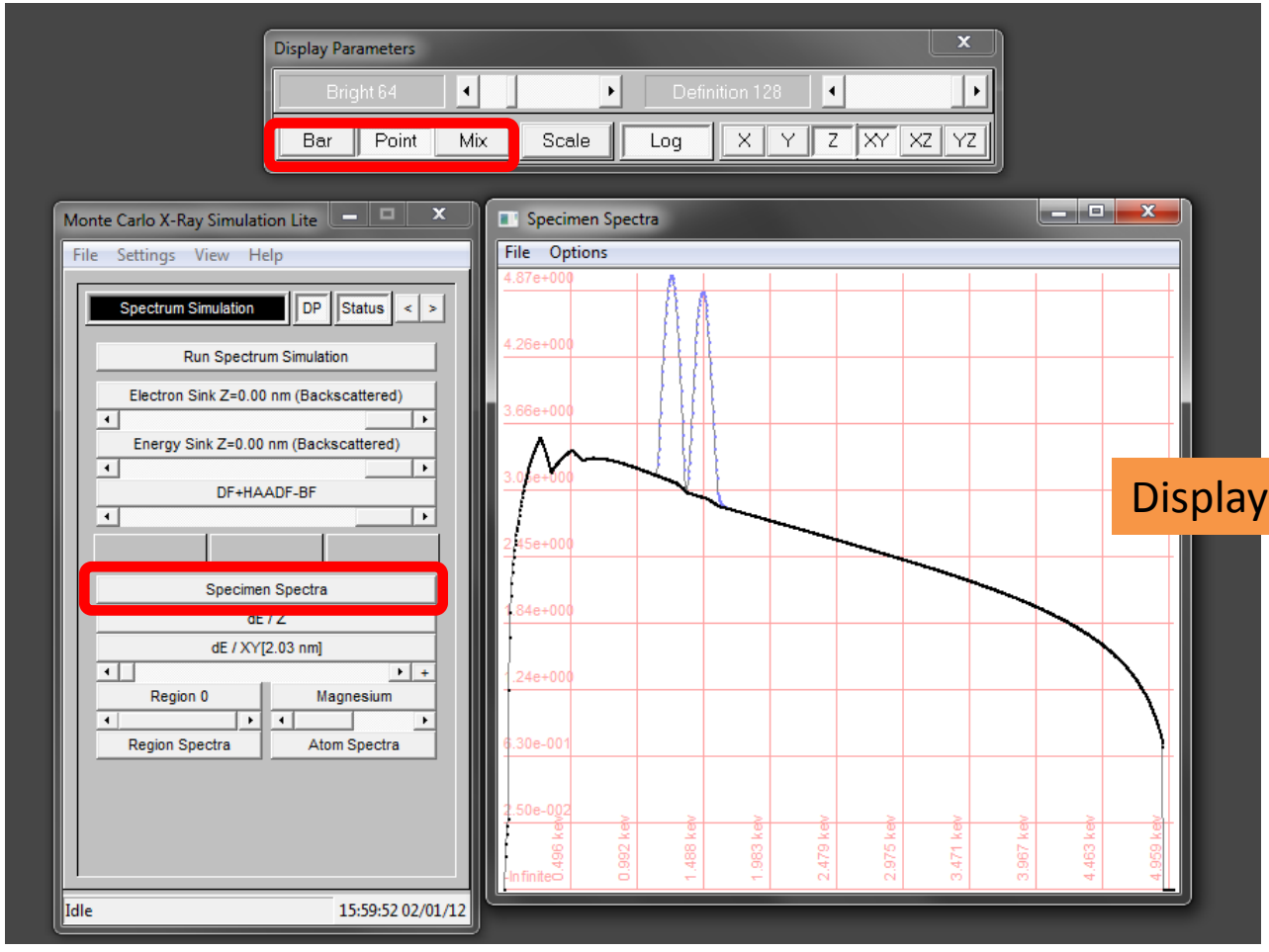
Energy Loss Distribution 2D





Energy loss 2D distribution

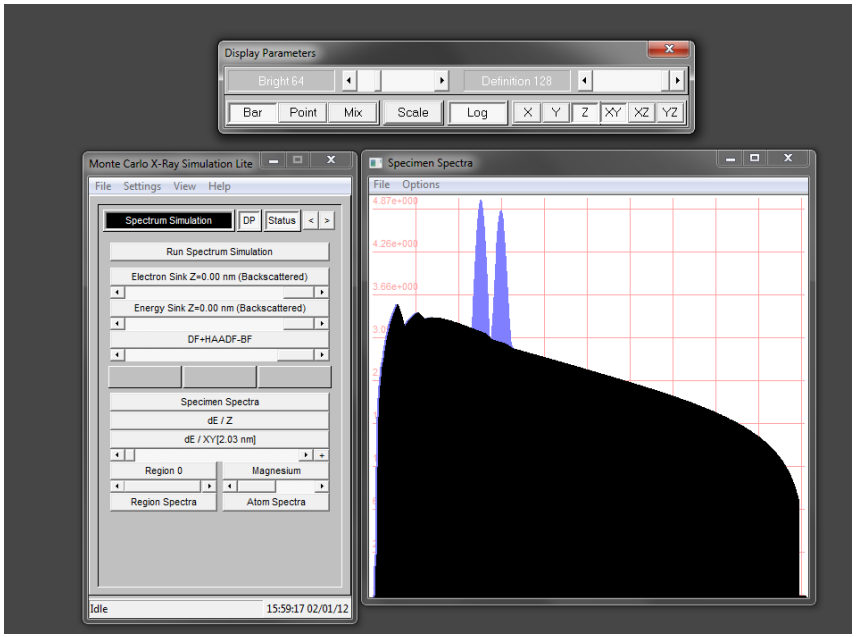
Specimen Spectrum



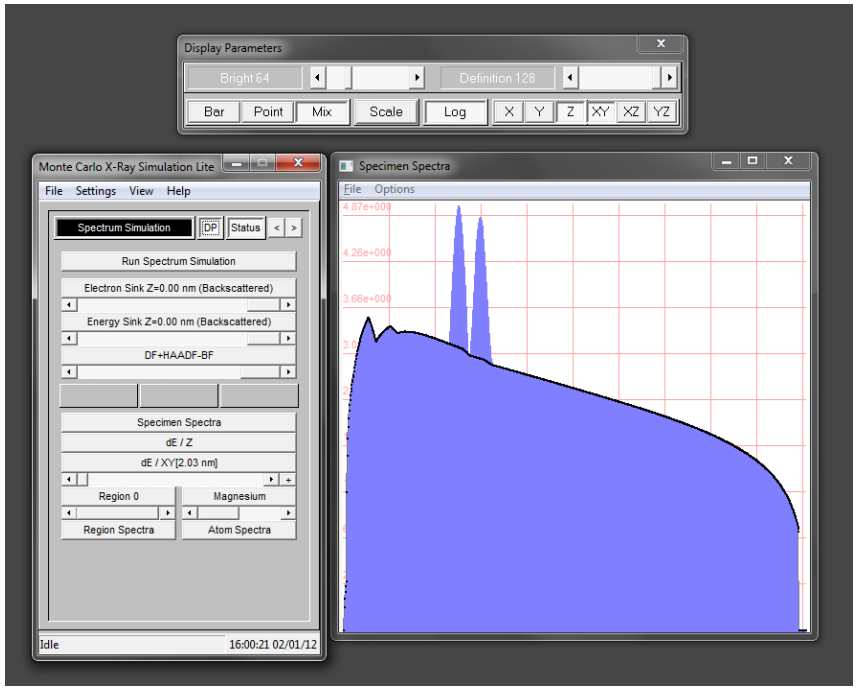
Displayed with points

Complete x-ray spectrum for all elements in all regions
Show also the bremsstrahlung

Specimen Spectrum

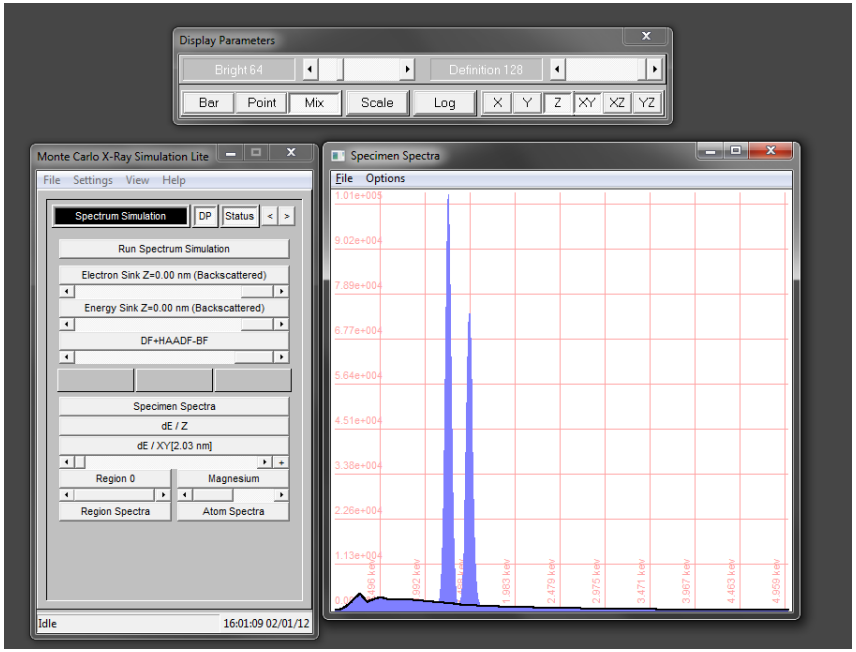


Displayed with bars

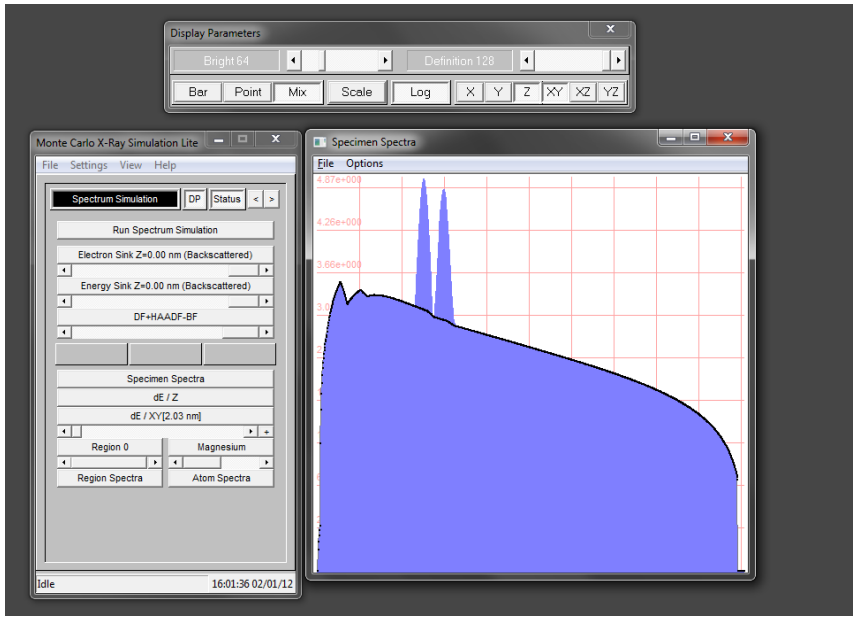


Displayed with points and bars

Specimen Spectrum

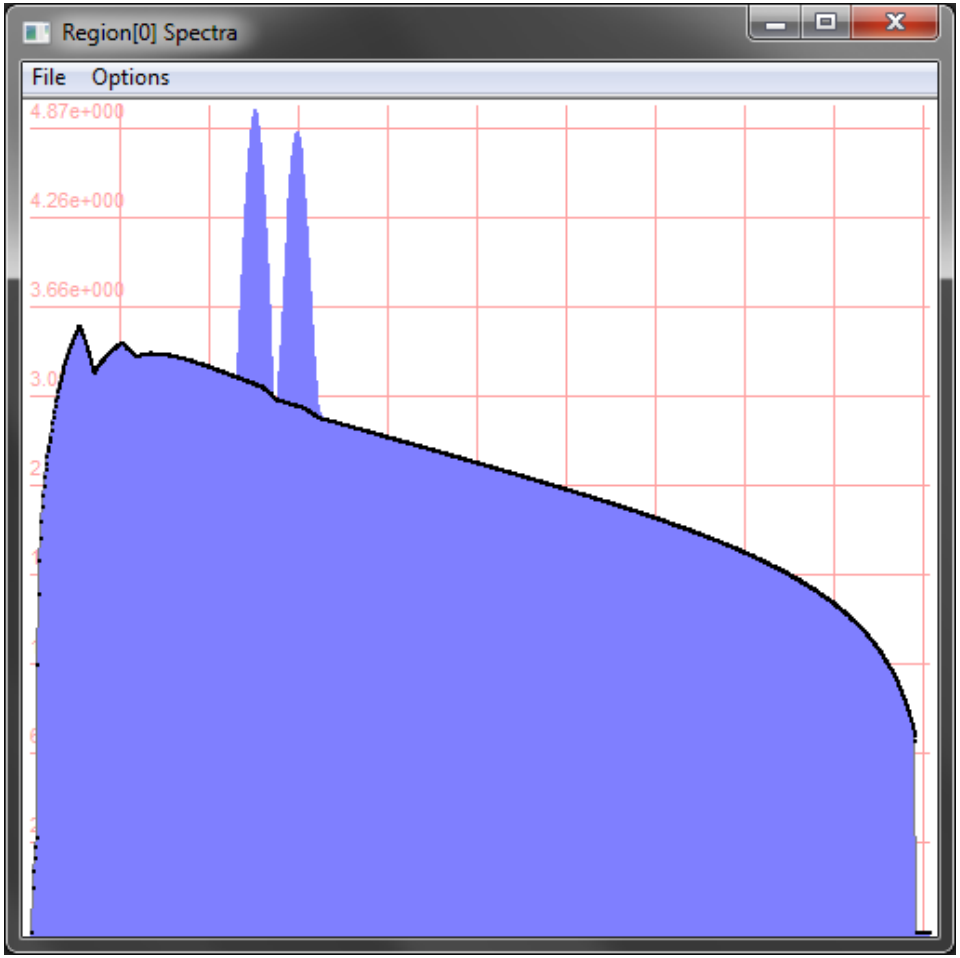


Linear scale



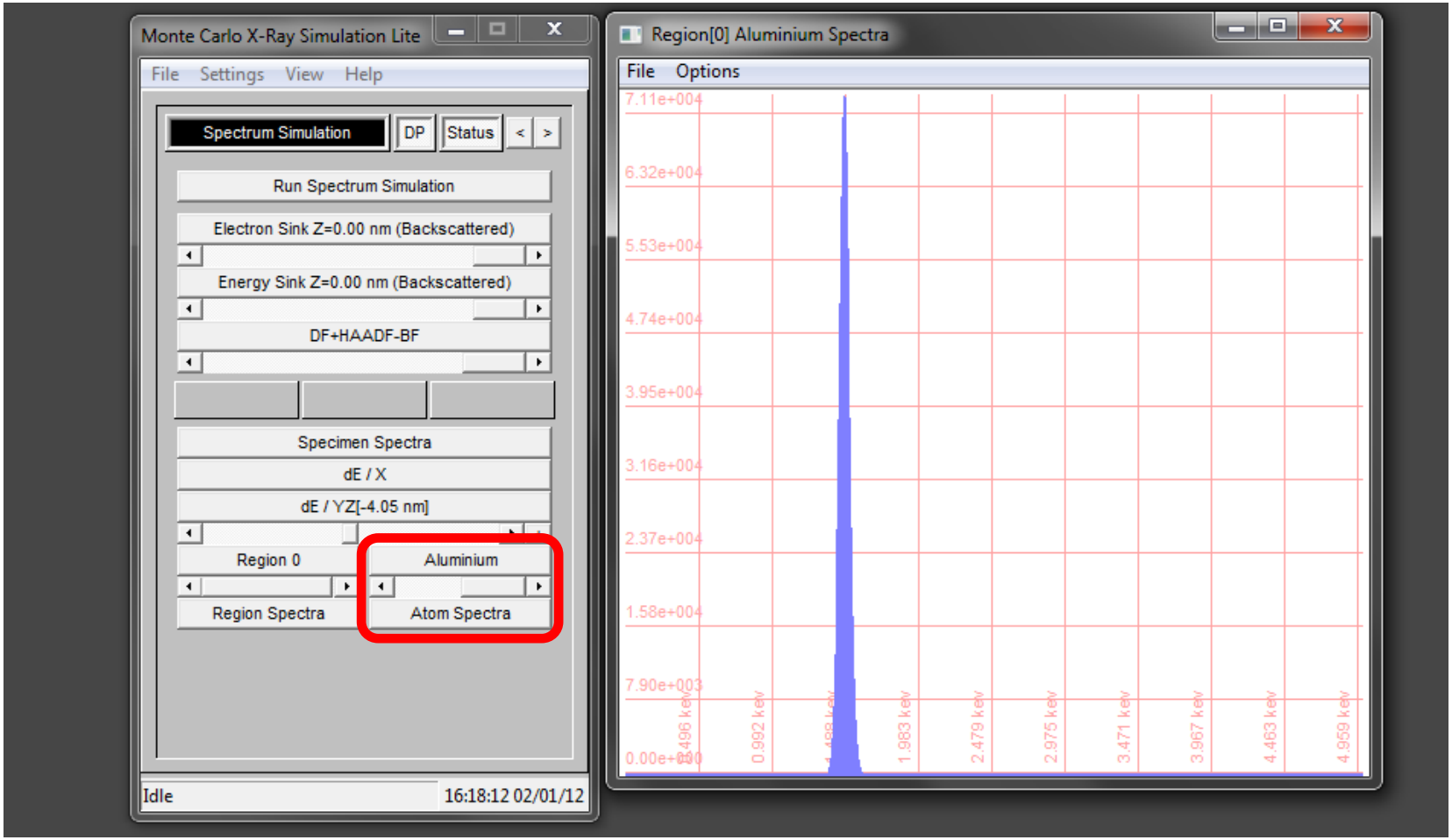
Logarithmic scale

Region Spectrum



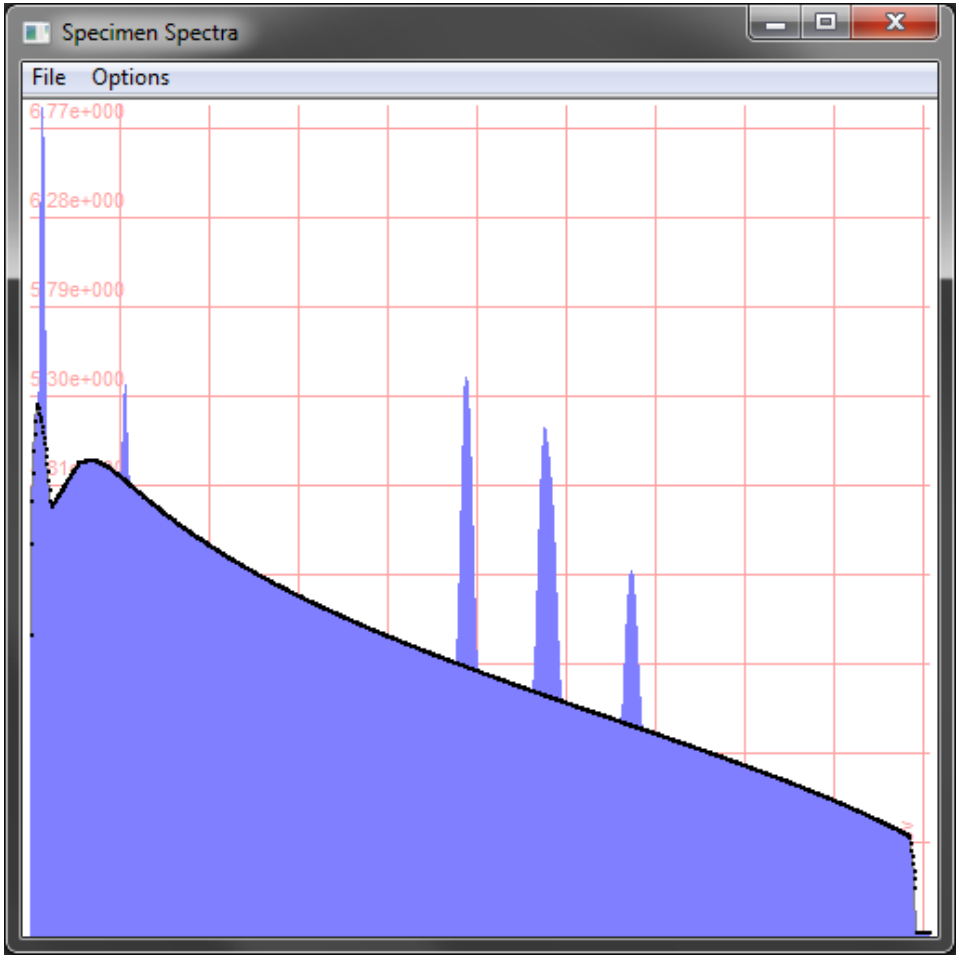
Display spectrum for each region

Atom Spectrum

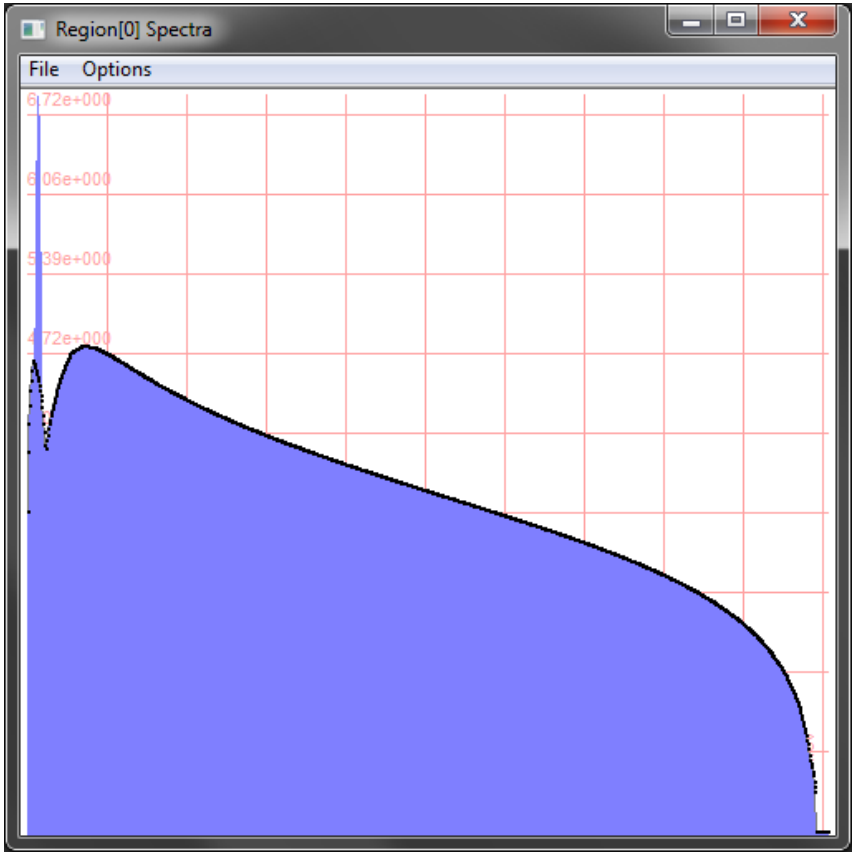


Display spectrum for each atom in a region

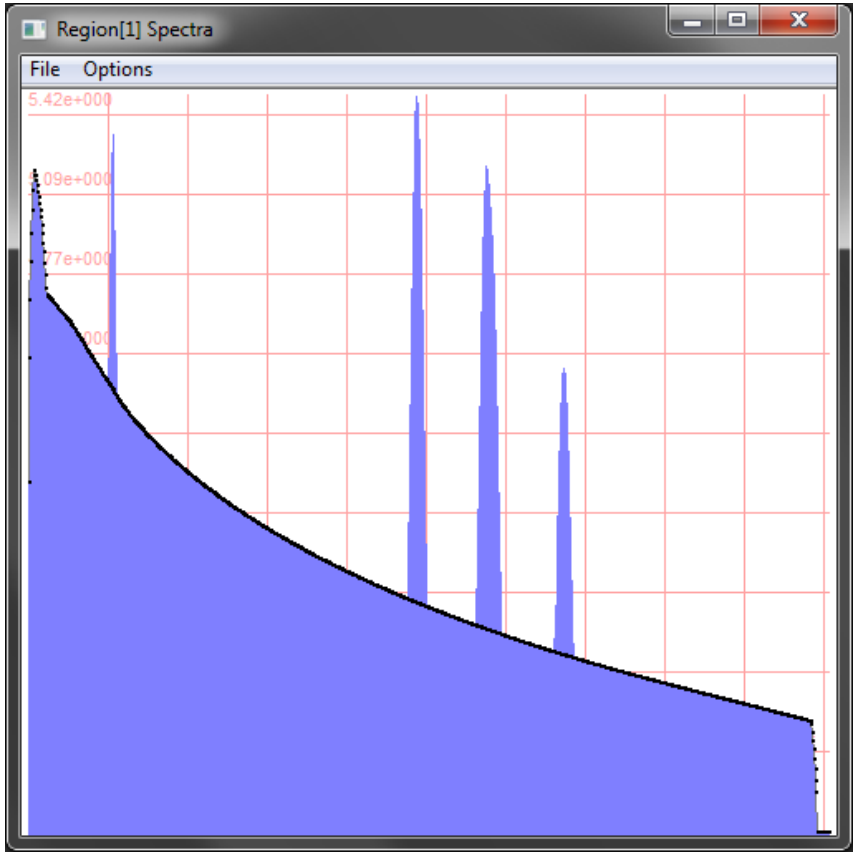
Au NP in C Specimen Spectrum



Au NP in C Region Spectrum

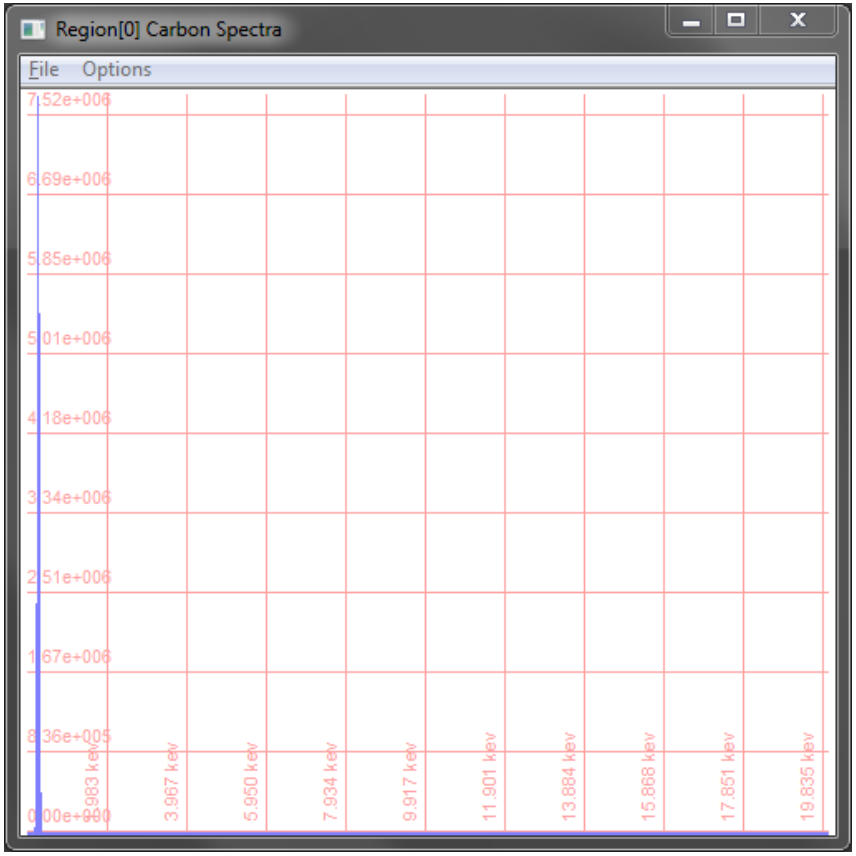


C Substrate

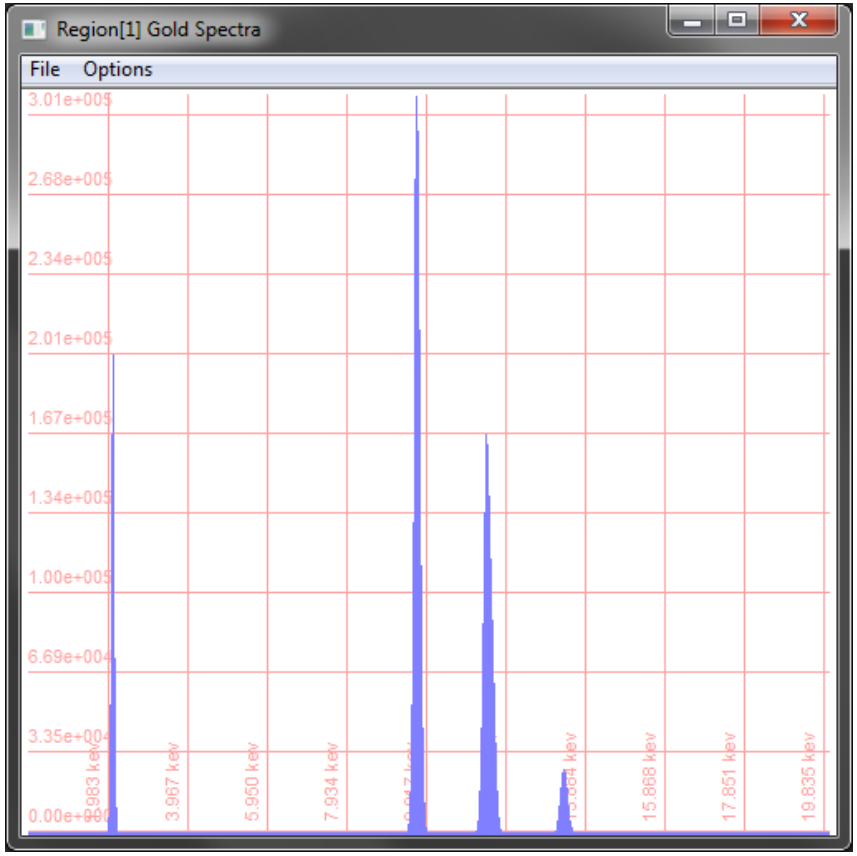


Au NP

Au NP in C Atom Spectrum



C Substrate

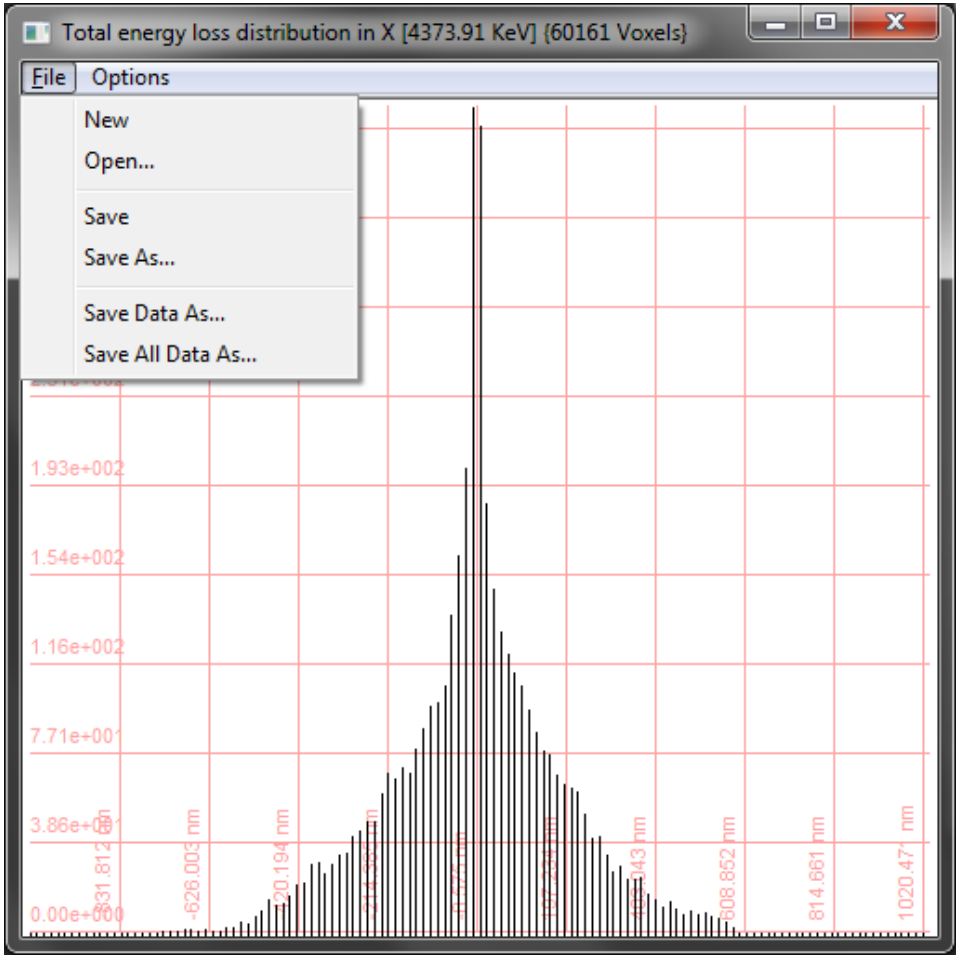


Au NP

Display Results File Menu

Save the graphic
In a bitmap file

Save the data
in a text file



Display Results Options Menu