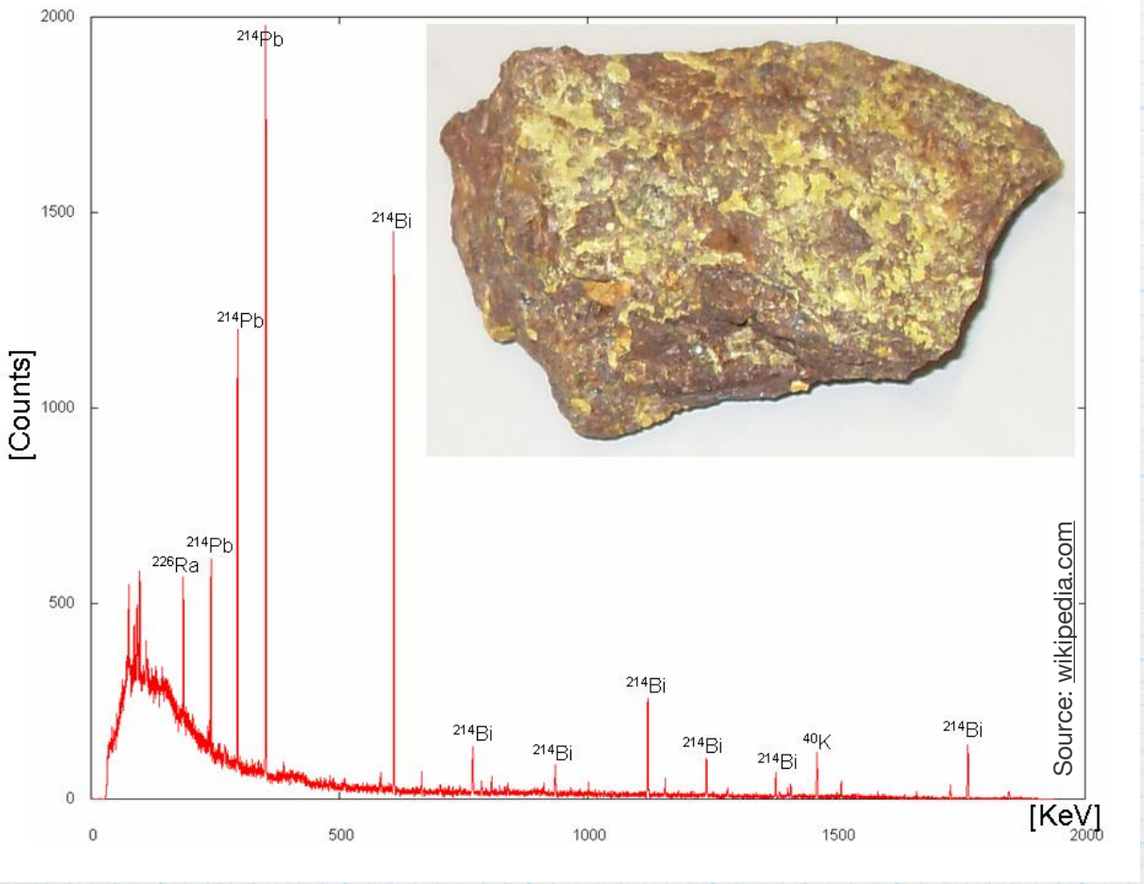
Lesson 7

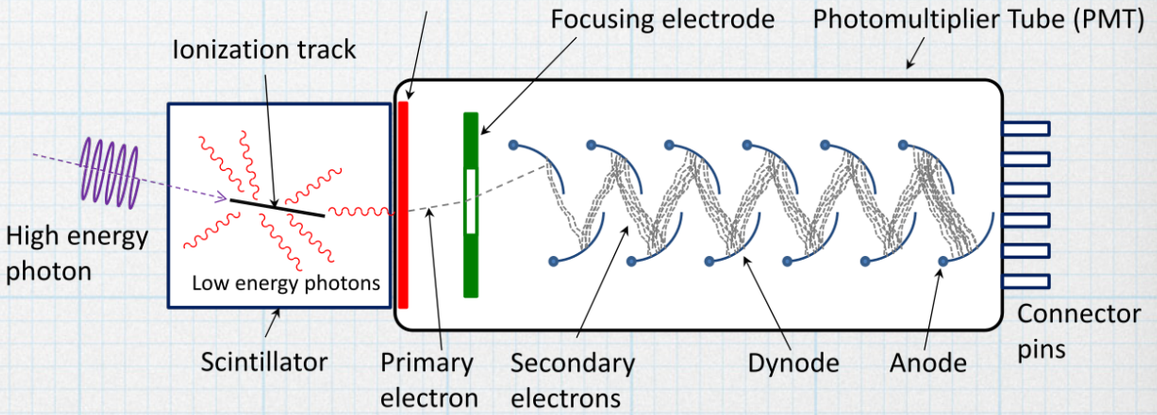
Gamma spectroscopy (simplified)

Gamma Spectroscopy

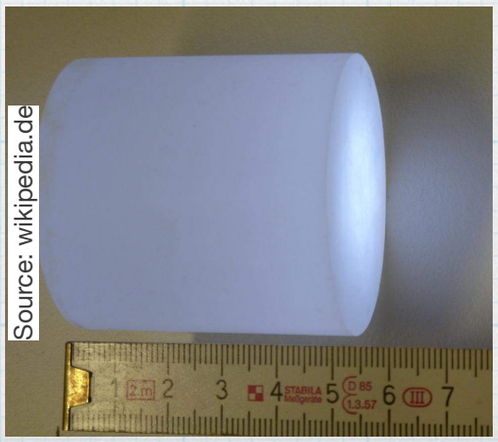
* Study of the energy spectrum of gamma ray sources
* Interpreting the characteristics of the spectrum allows the identification of the radioactive sources in a given sample
* The (absolute and relative) intensity of those characteristic features allows to determine the amount of each of the sources in the sample



Exemple of the spectrum of a sample of natural uranium



Scintillating crystal



Deposited energy

↓

Scintillation light

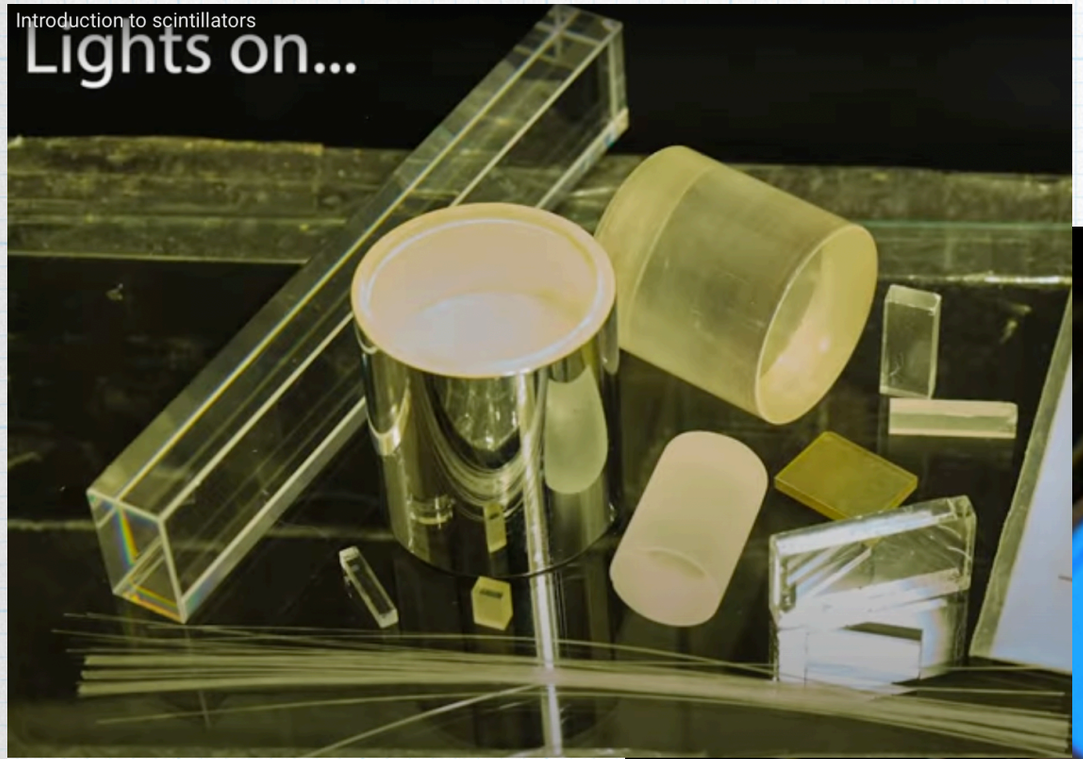
↓

Electrical signal

↓

Spectrum

Scintillators



Details for the simulation

* The structure of this simulation is Crystal.zip
* Create a cylinder of NaI with 5 cm height and diameter, place it in the centre of the world
  * NaI: 15.4% Na, 84.6% I
  * Or use the available NIST material
* Generate primary gammas from (0,0, -20cm) with 662 keV, perpendicularly hitting the base of the cylinder
* Check what is happening event-by-event with /tracking/verbose 1
* Get the spectrum of the total energy deposited in the crystal in each event
  (use SteppingAction and EventAction)
* Interpret the spectrum, identify the various structures you observe
* Increase the energy to 1.33 MeV and 2.6 MeV, interpret the new spectra

For the report...

* Brief summary of what was simulated and the goal
* Most important details in creating the simulation
* Energy spectra for the 3 energies
* Identification and comments on the various observed structures, and association with physical processes