Compton Scattering Effect

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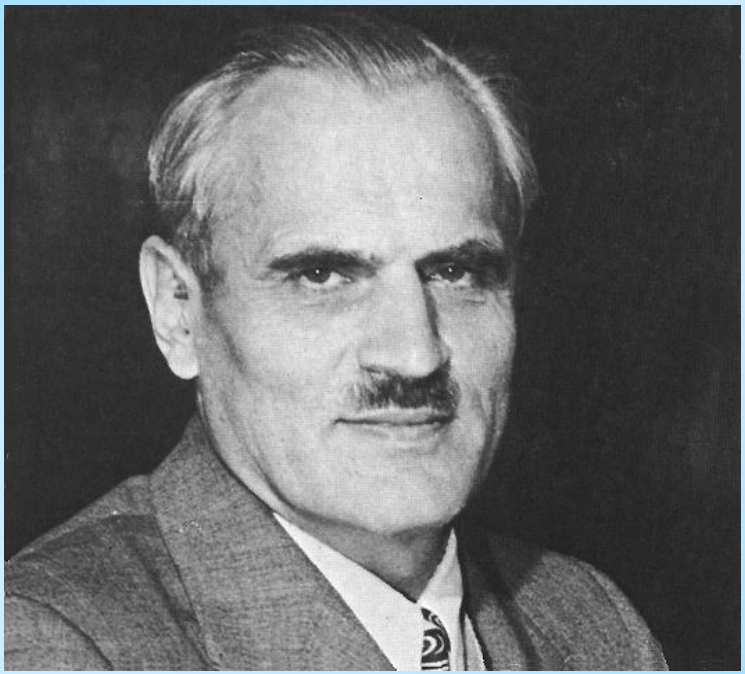
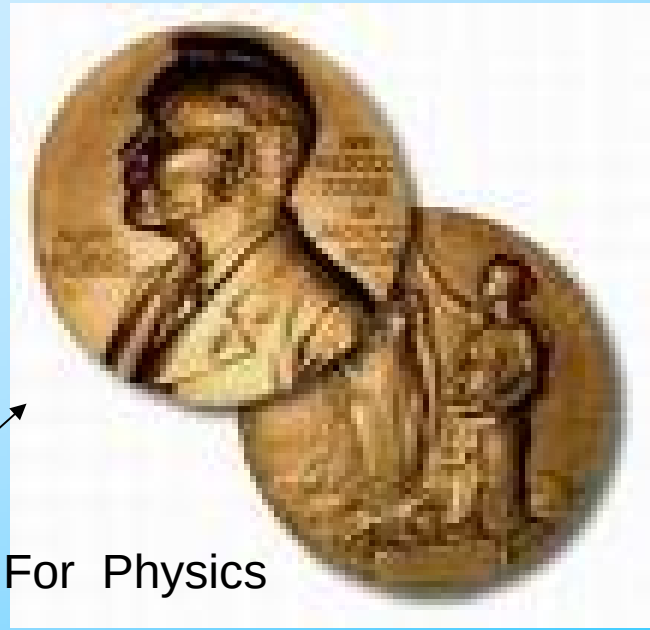
History

- In 1922 Arthur H. Compton was the first to measure photon-electron scattering.
- In 1927 he was awarded the Nobel Prize for clearly proving that light acts as waves as well as particles called photons.

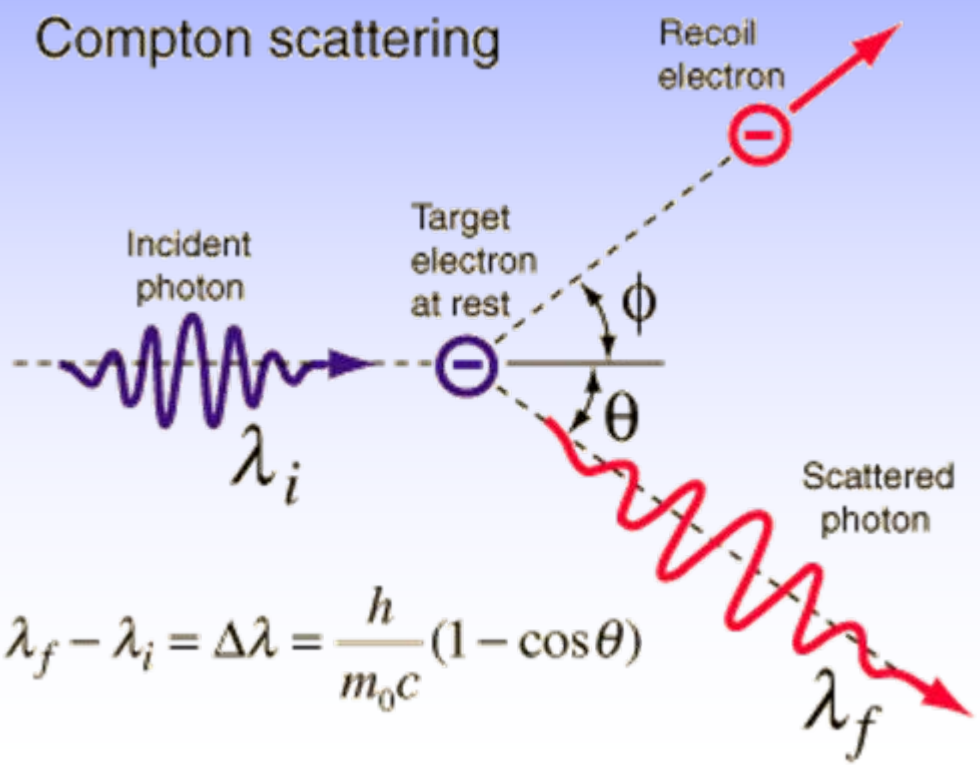




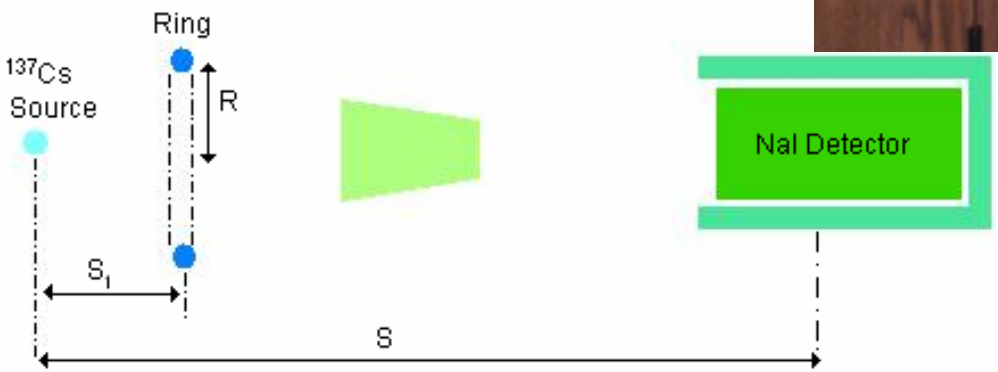
Nobel Prize For Physics

Introduction to the Compton Scattering

- Compton Scattering measures the change in energy of a photon as it scatters at various angles.
- It shows the particle-wave duality of light.

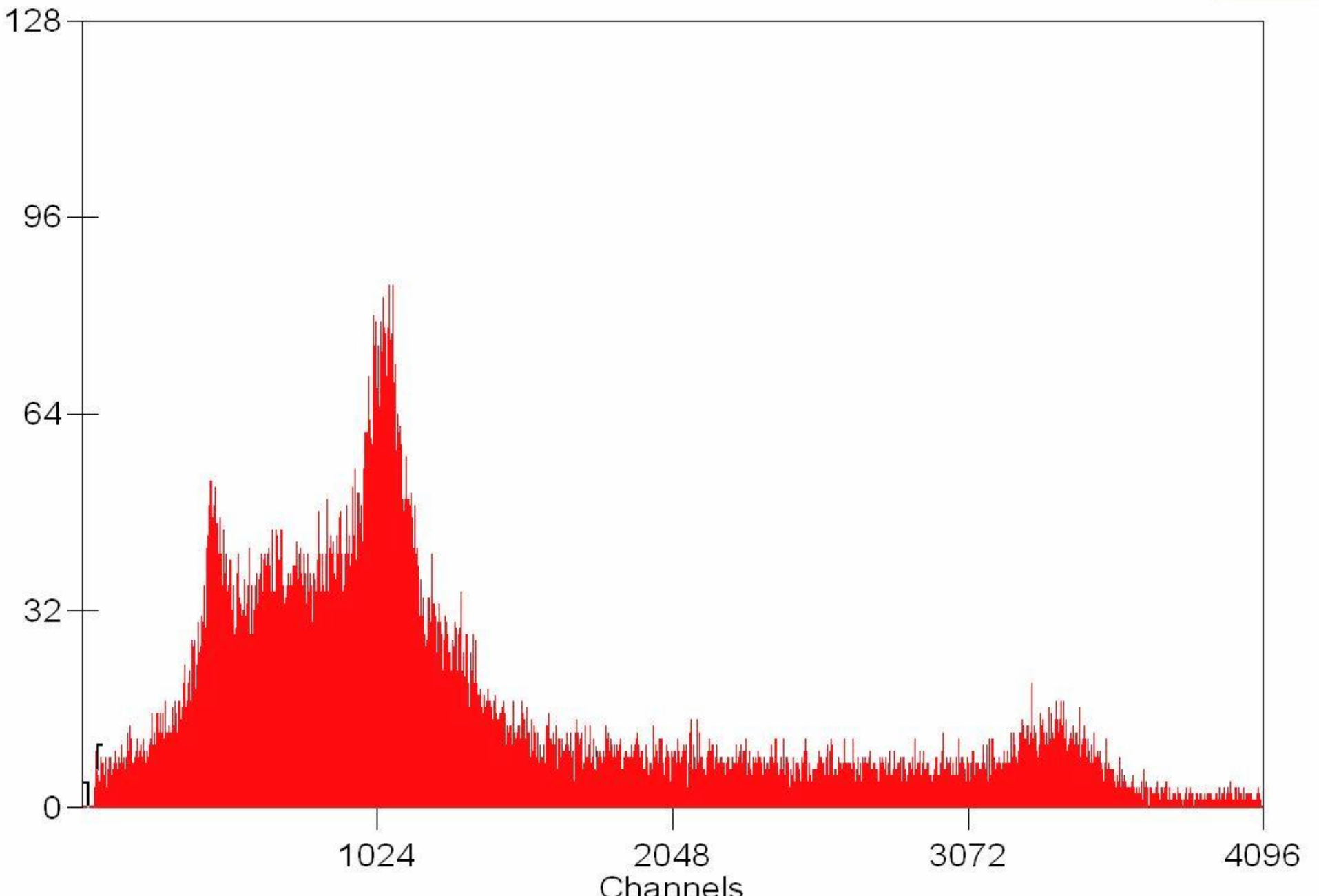


Setup, Directions & Results

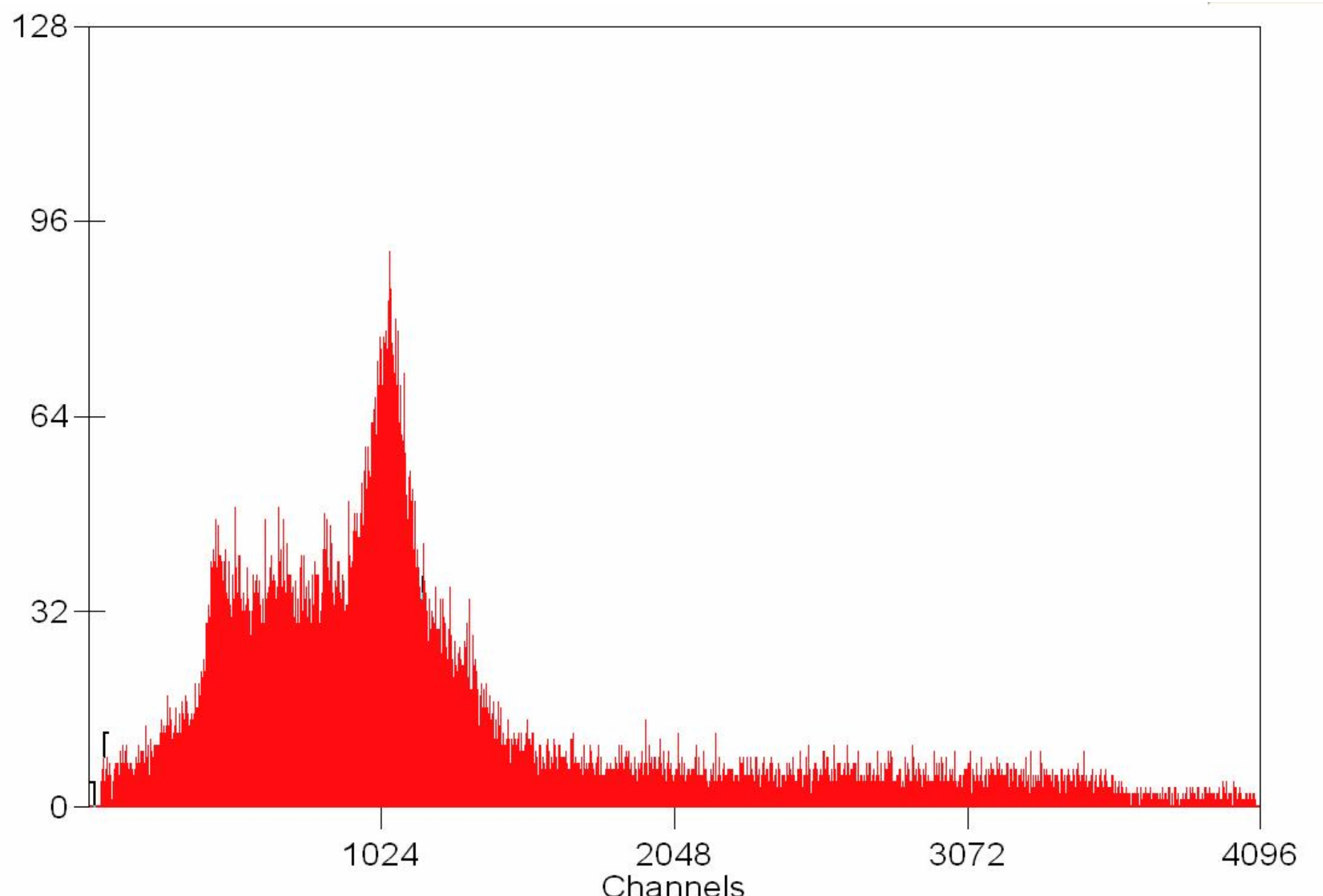


Angle (deg)	15	25	35	45	60	75	90	105	120	135
R(cm)	5	5	7	7	7	10	10	10	10	10
S(cm)	76	60	60	44	30	30	30	30	40	40
S1 (cm)	36	14.7	14.2	11.6	7.6	8.3	3.8	0.7	-3	-6.5
Results (keV)	636.2	596	544.7	499.4	428.5	356.6	314.2	278	216.5	220

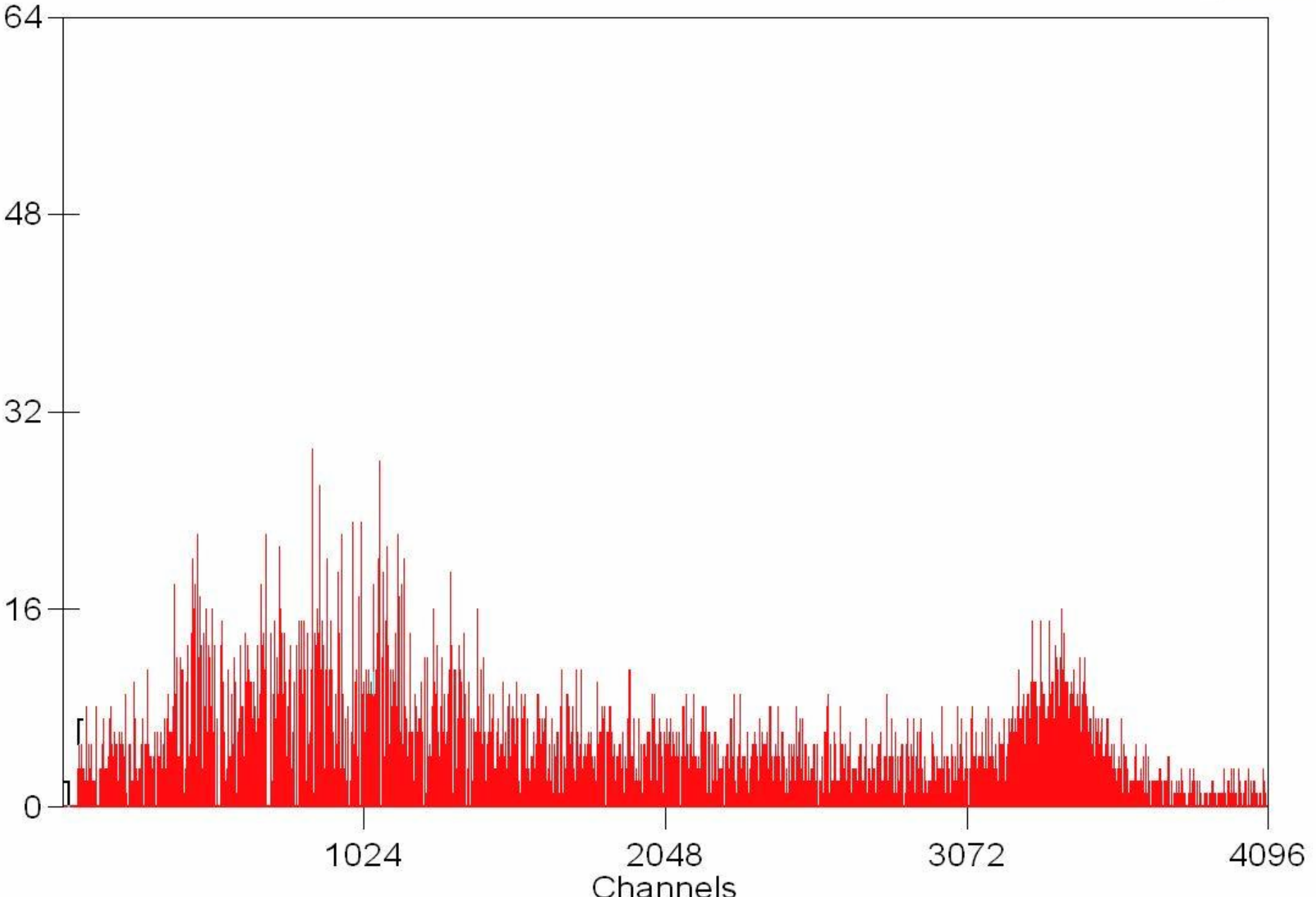
Trial 1



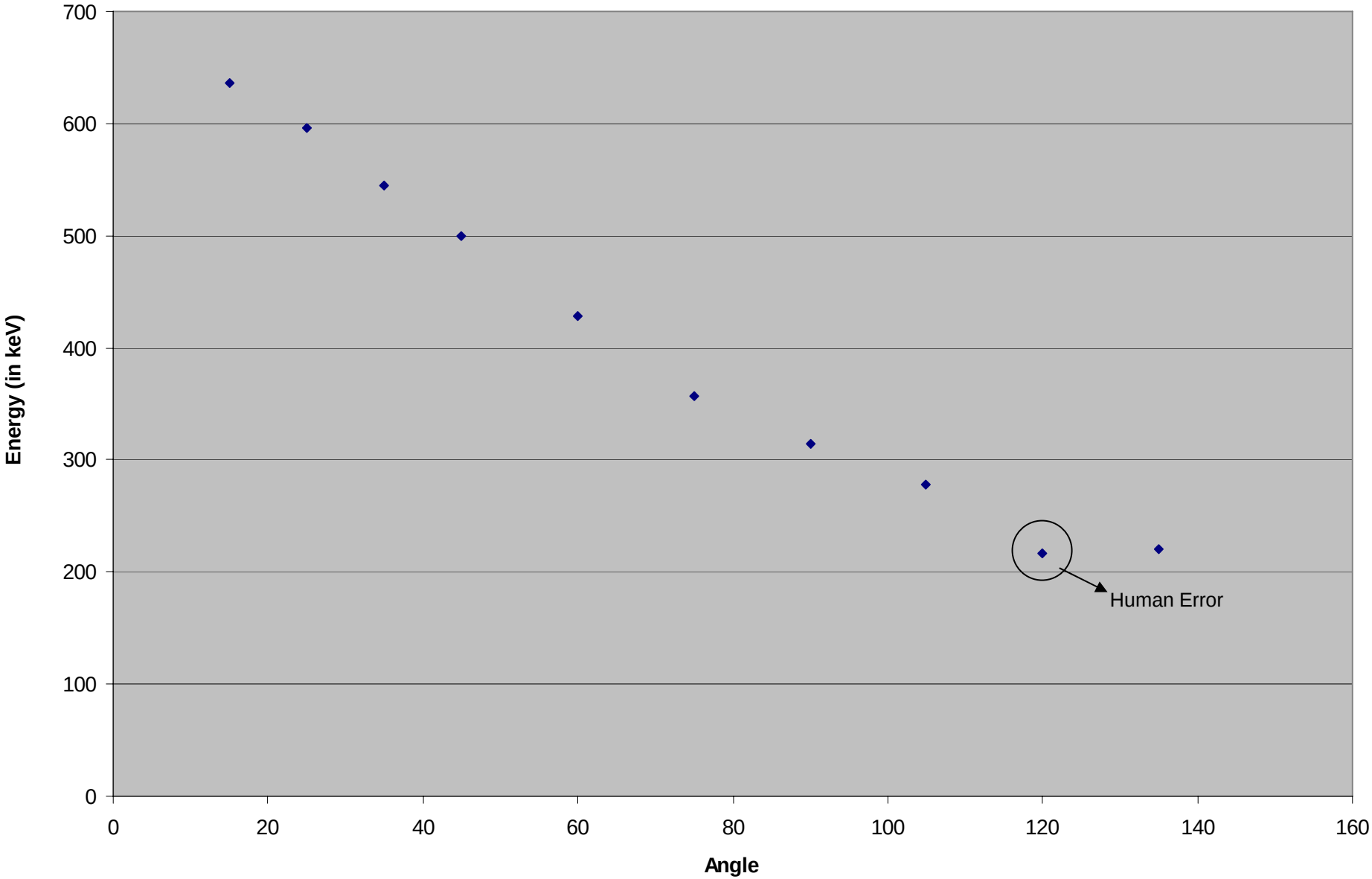
Background Radiation



Stripped Graph



Energy as a Function of the Scattering Angle

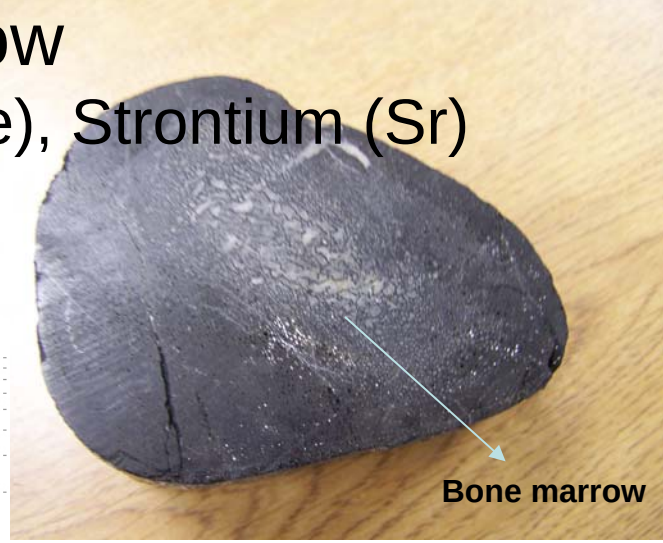


PIXE

Proton Induced X-ray Emission

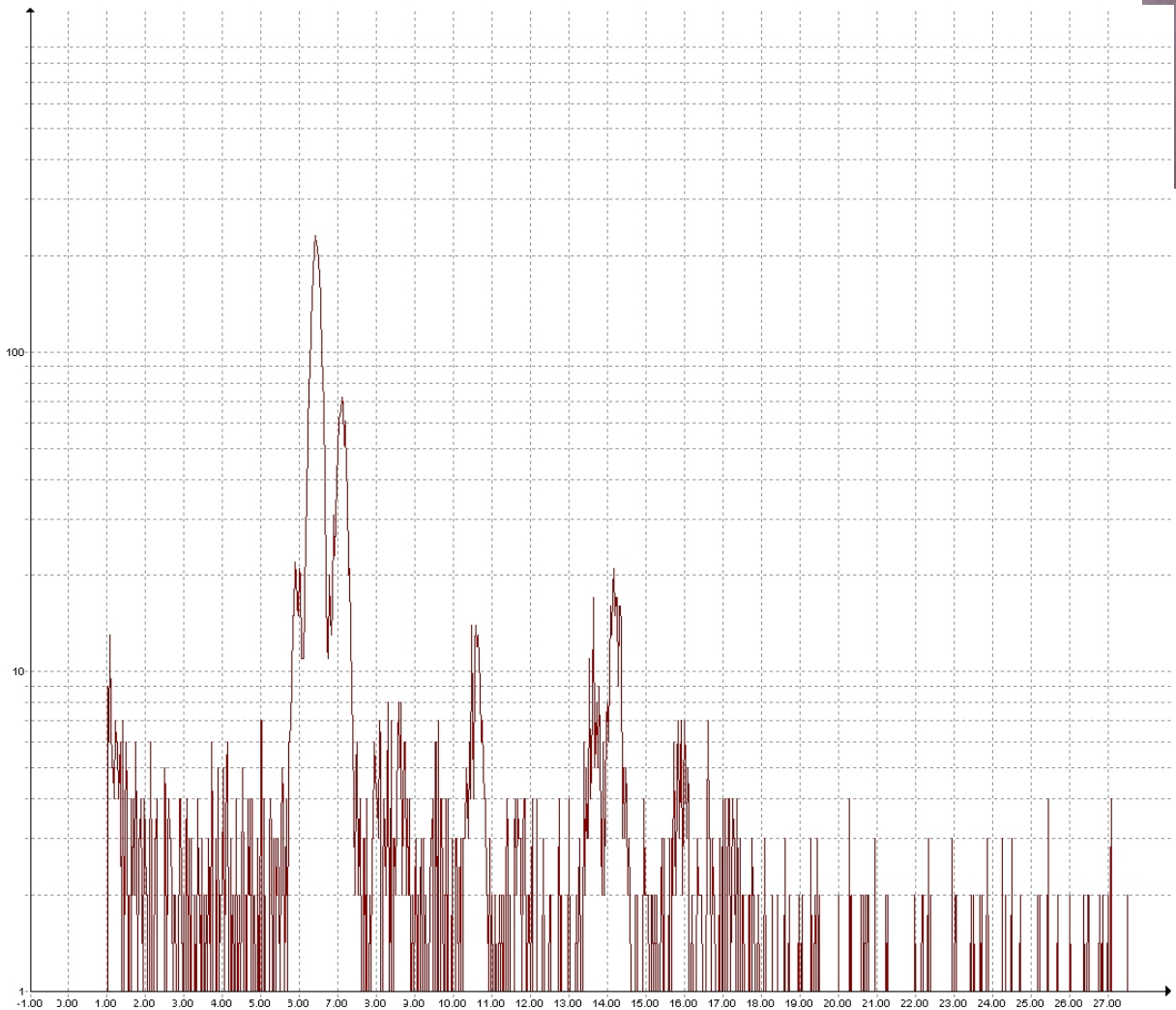
Dinosaur Bone Marrow

- Phosphorus (P), Calcium (Ca), Iron (Fe), Strontium (Sr)



Side of Dinosaur Bone (with absorber)

- Manganese (Mn), Iron (Fe), Arsenic (As), Strontium (Sr), Uranium (U)



Blue Striped Rock

Stripe:

- Iron (Fe), Titanium (Ti), Copper (Cu), Silicon (Si)

Without stripe:
Iron (Fe), Copper (Cu)

Summary

- By comparing the energy of scattered photons using the Compton Scattering Effect, we showed that light has a particle nature.
- The Compton effect shows itself in the spectra of any photon detector.
- With PIXE we compared different sides of samples to see the composition at various points.