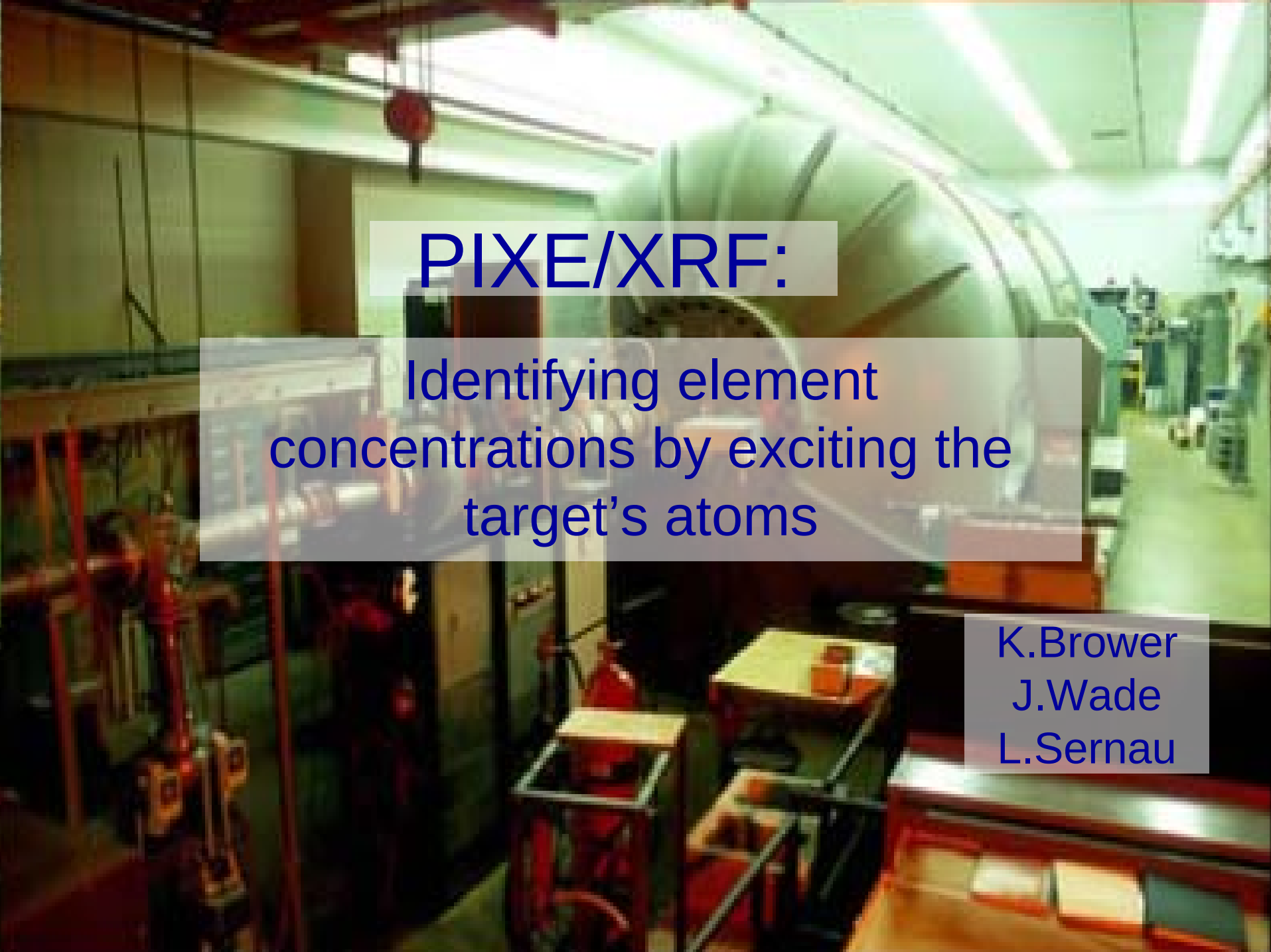

PIXE/XRF:

Identifying element concentrations by exciting the target's atoms

K.Brower
J.Wade
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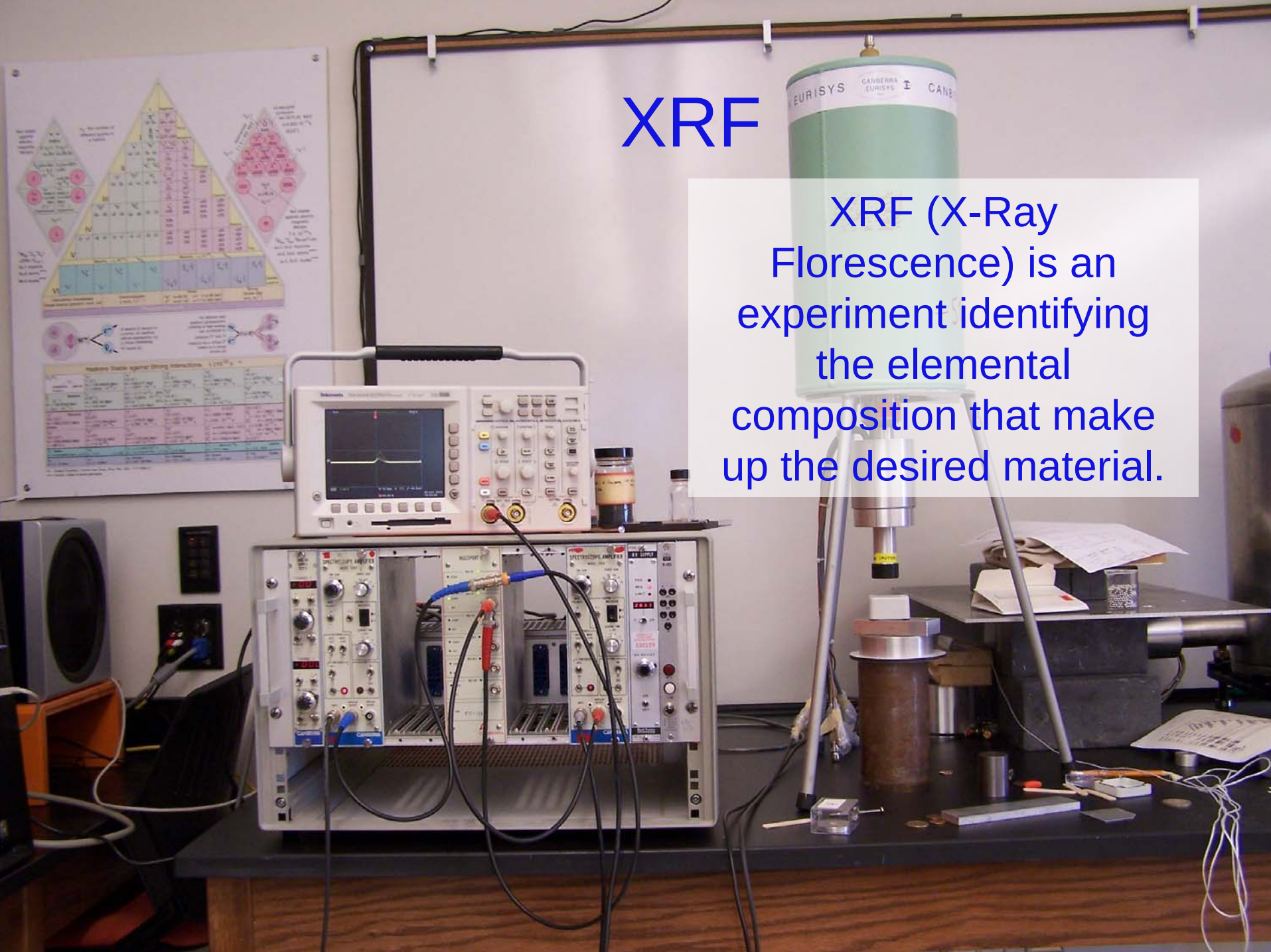
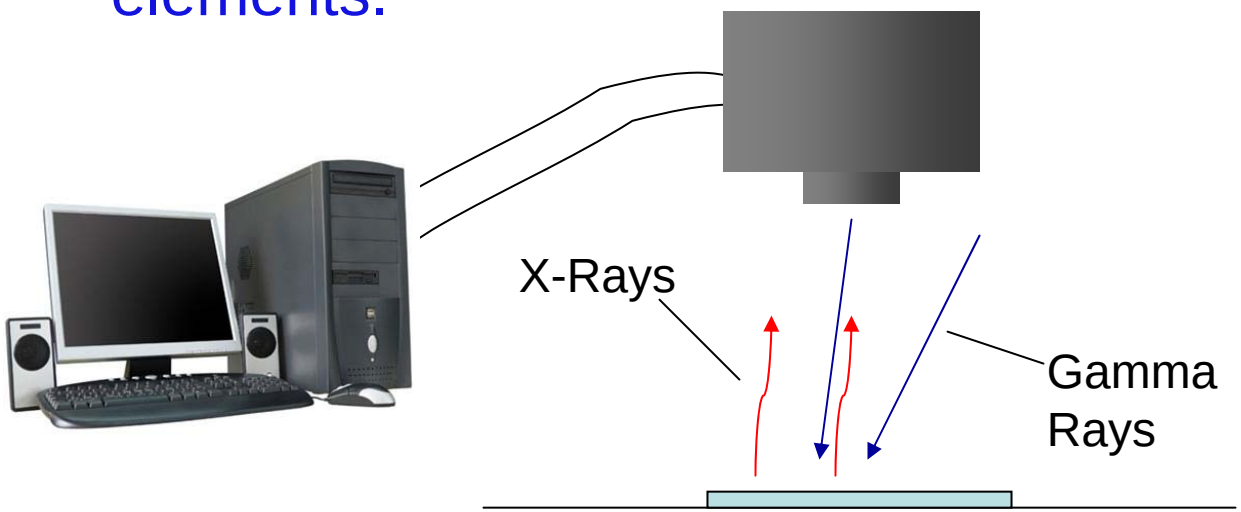

XRF
XRF (X-Ray Florescence) is an experiment identifying the elemental composition that make up the desired material.

The XRF experiment

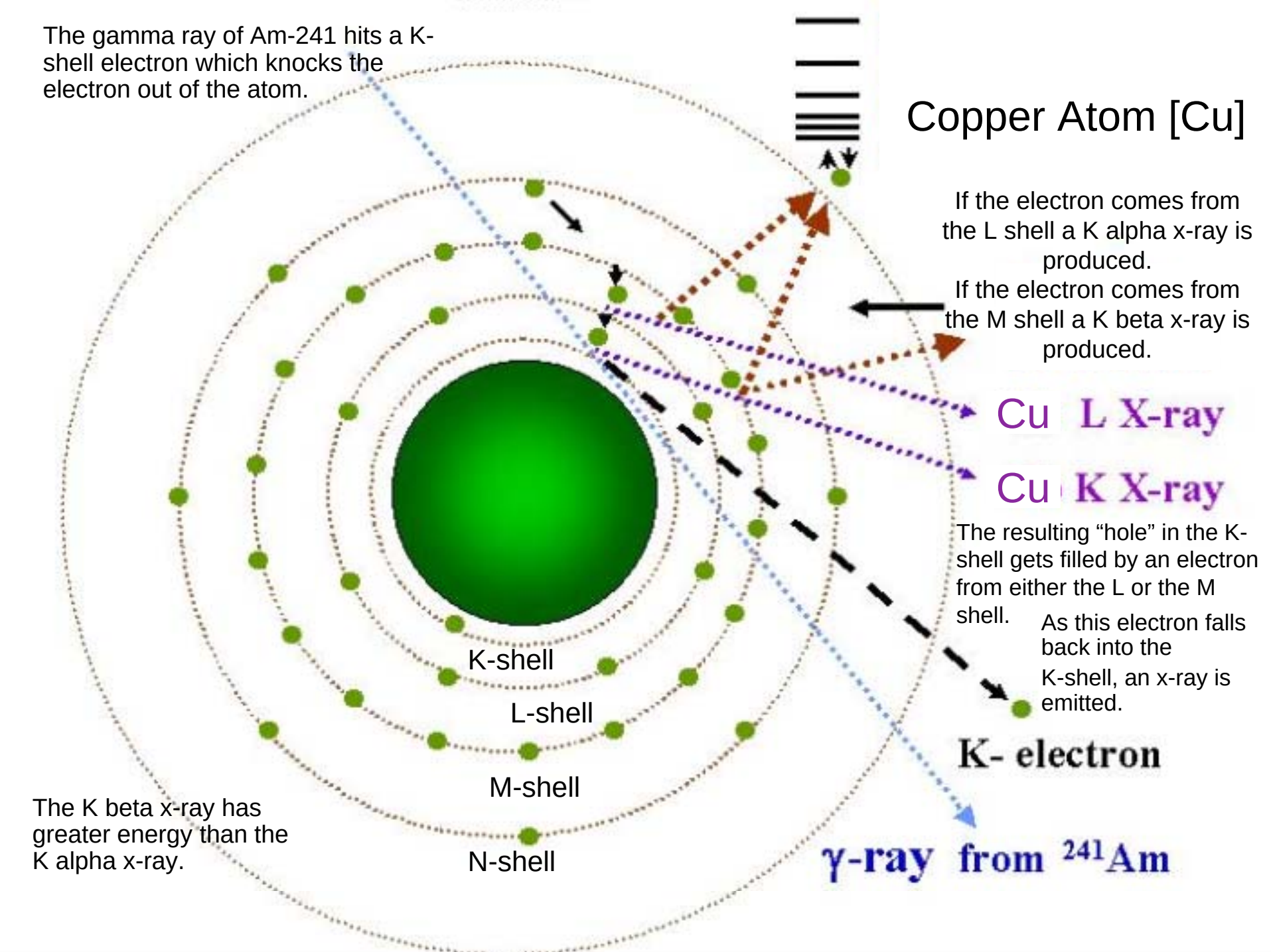
We use a decaying source (Am-241) to excite the target material's atoms.

This produces an X-Ray and the computer reads the energy of the detected photons.

The energy of the detected photon allows us to identify the elements.



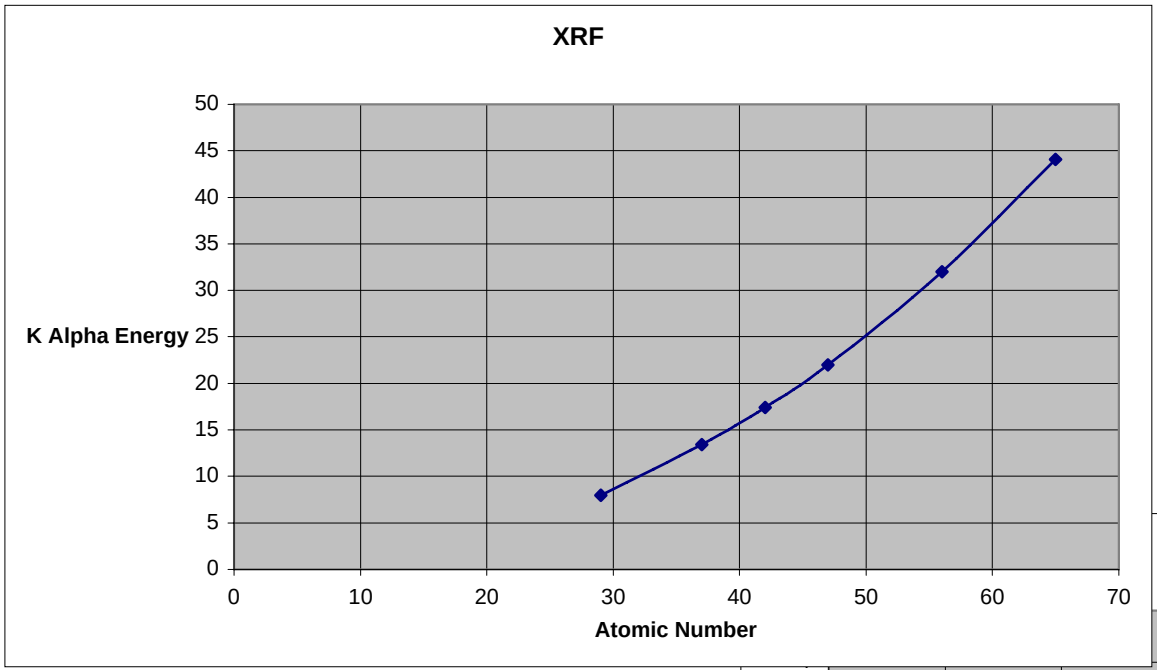
The decaying source (Am-241) produces the gamma rays that excite the target's

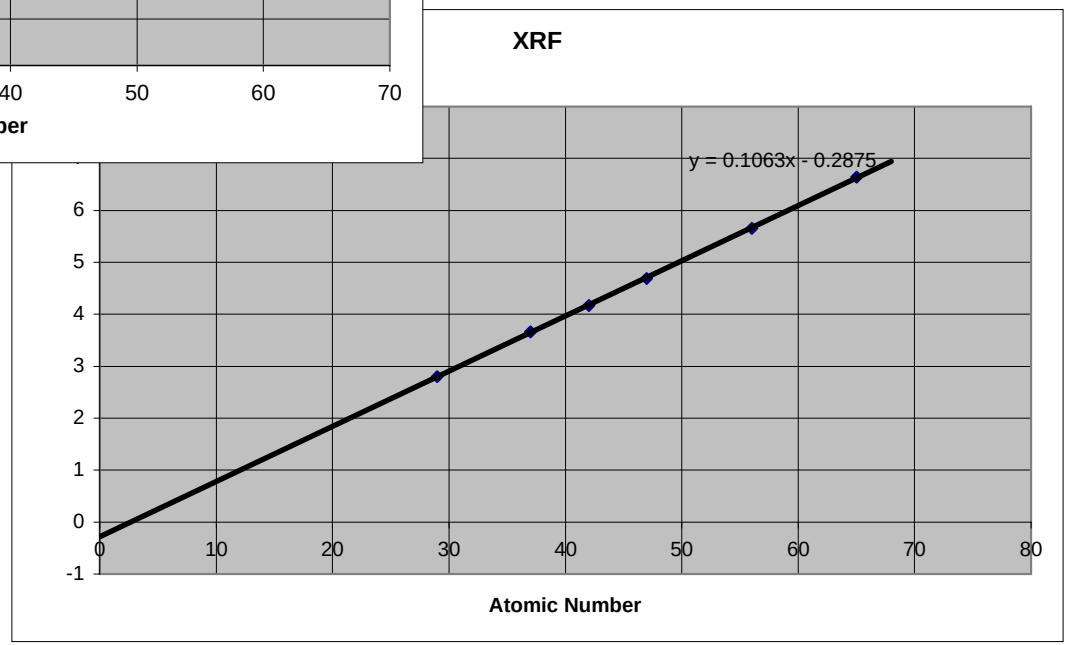

The gamma ray of Am-241 hits a K-shell electron which knocks the electron out of the atom.
Copper Atom [Cu]
If the electron comes from the L shell a K alpha x-ray is produced.
If the electron comes from the M shell a K beta x-ray is produced.
Cu L X-ray
Cu K X-ray
The resulting “hole” in the K-shell gets filled by an electron from either the L or the M shell.
As this electron falls back into the K-shell, an x-ray is emitted.
K-shell
L-shell
M-shell
N-shell
K- electron
γ-ray from 241Am
The K beta x-ray has greater energy than the K alpha x-ray.

XRF RESULTS

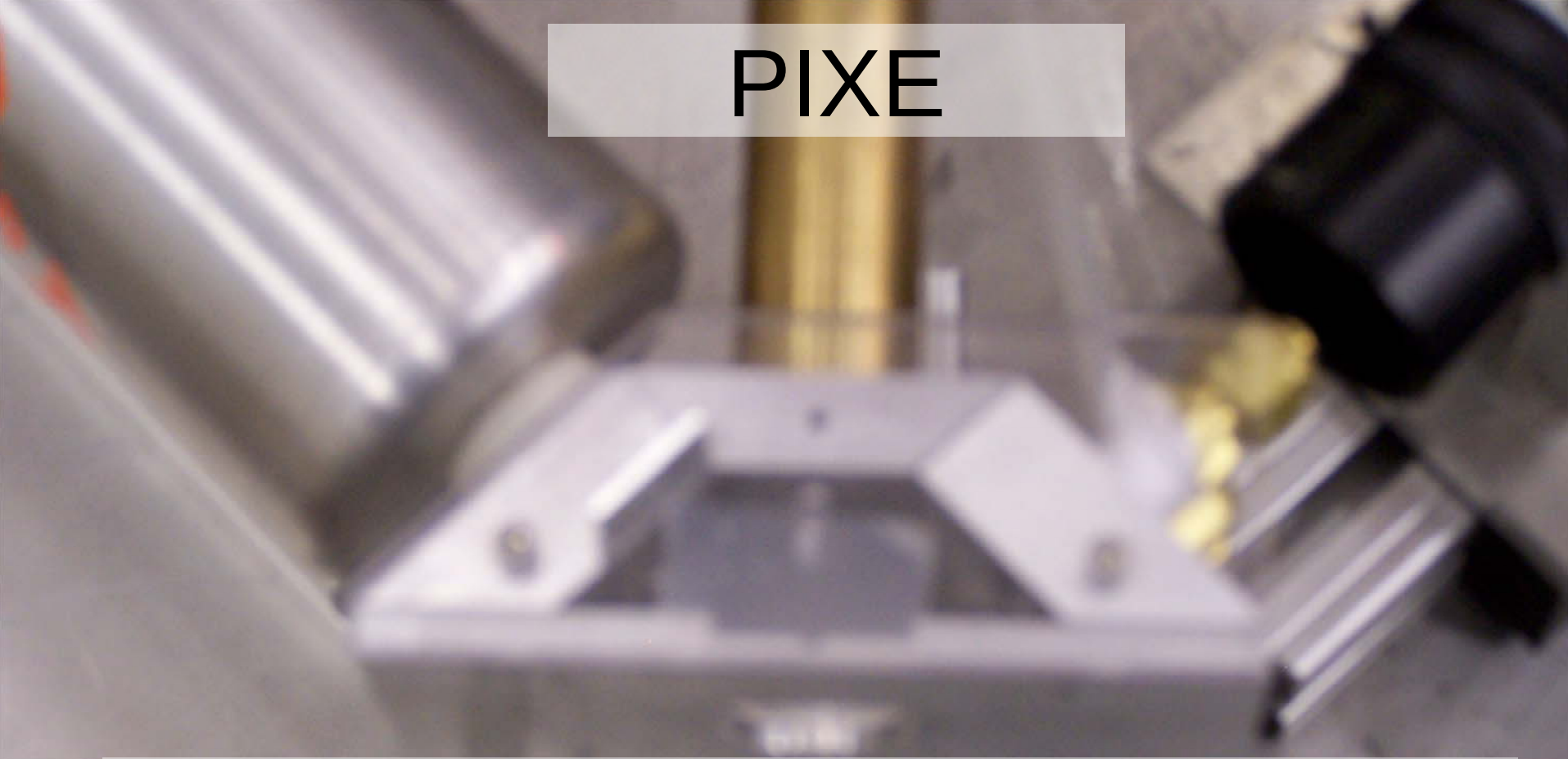
Target (Atomic #)	Energy: K-alpha(keV)	Energy: K-beta(keV)
Cu(29)	8.0	8.9
Rb(37)	13.4	14.9
Mo(42)	17.4	19.6
Ag(47)	22.0	24.9
Ba(56)	32.0	36.3
Tb(65)	44.1	50.2

PLOT XRF RESULTS





PIXE



PIXE (Proton Induced X-Ray Emission) is similar to XRF, but uses a Proton beam instead of gamma rays to stimulate X-Ray emission.

PIXE SAMPLES+ RESULTS

Germanium

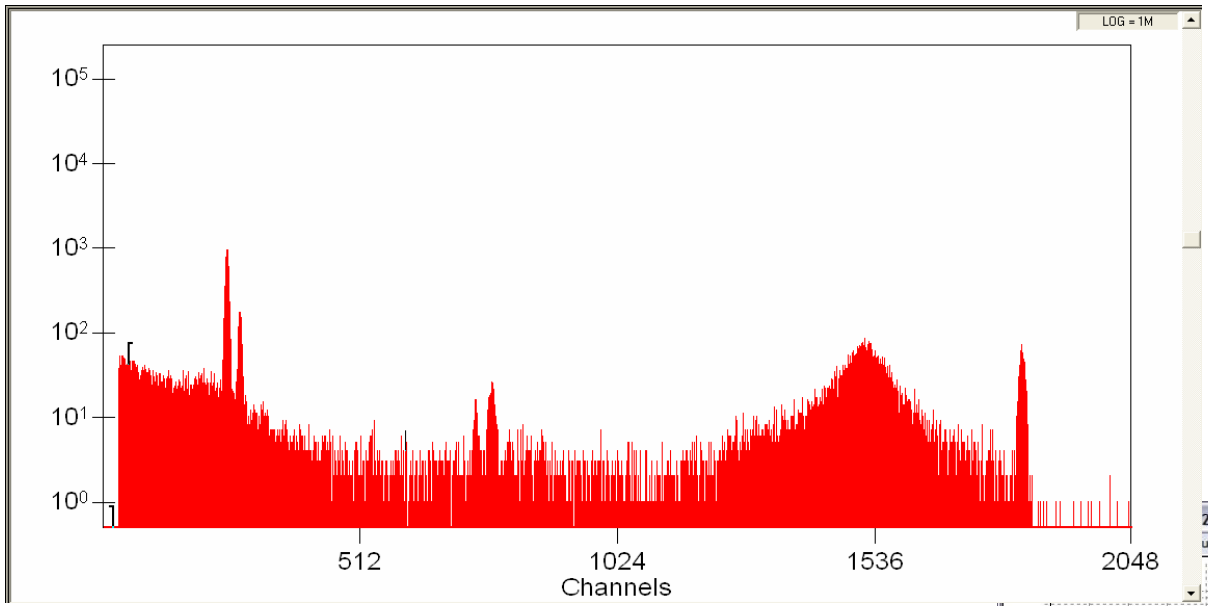
Calcium

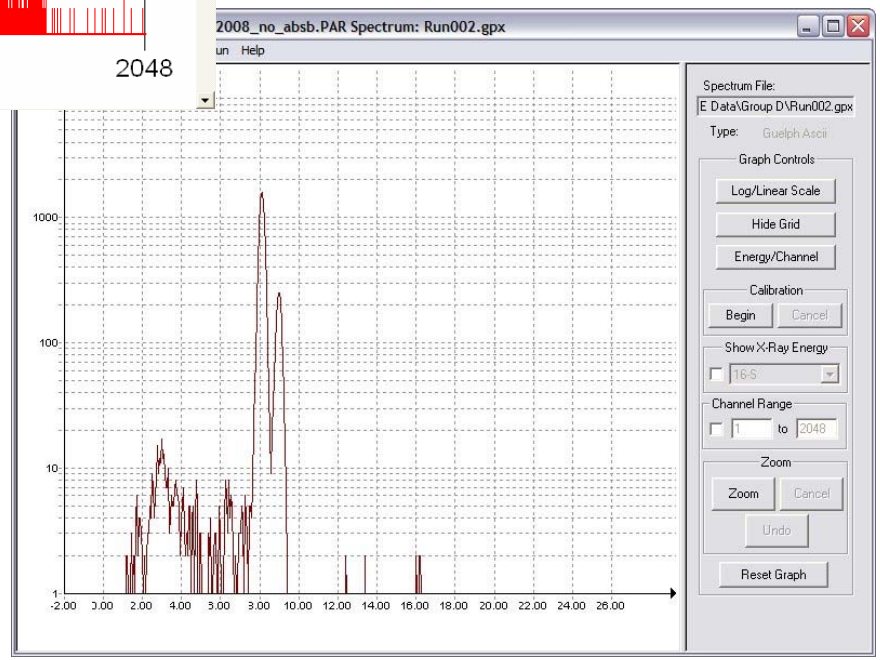
XRF / PIXE

- The XRF experiment uses Gamma Rays from the decaying source (Am-241) to excite the target's atoms.
- The PIXE experiment uses a Proton Beam to excite the atoms of the target.
- The PIXE is also more accurate than the XRF experiment. Because PIXE uses a beam instead of a decaying source, its results are not tainted with background "noise". This noise is the energy that is emitted from the decaying source.

Comparing XRF / PIXE data

Copper results from the XRF versus PIXE.





Summary

With the XRF and PIXE experiments we analyzed samples of different materials to determine their elemental composition.

Both experiments were very interesting and provided us with new information pertaining to our physical world.