

Session 2 - Part 1: Sampling intelligently Field screening with XRF

Mike Young
National Laboratory Manager
Verum Group Ltd

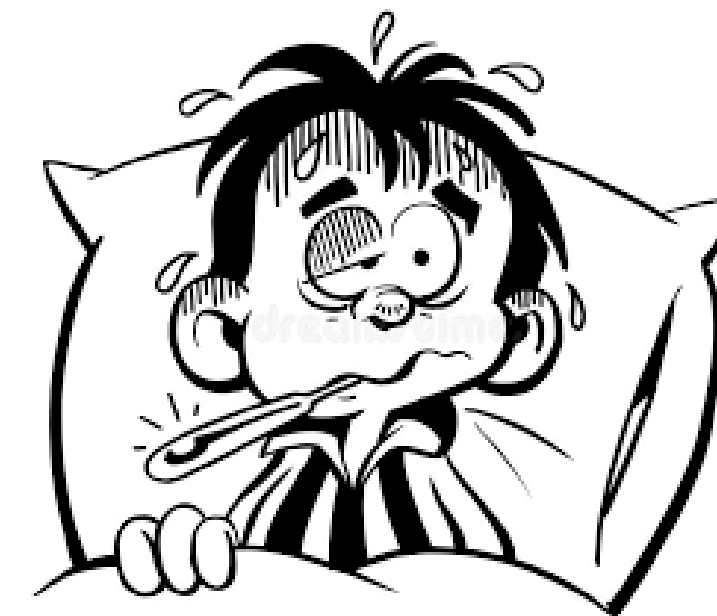
Understand
your end
goal

• Why are you sampling?

Planning your sampling:



- Compliance
- Permission
- Disposal/relocation
- Health – humans/ecological





Understand
your site

•Where and What?



Planning your sampling:

- Potential sources
- What compounds?
- Matrix of interest
- Pathways of transfer
- CSM, PSI, DSI
- Social and Cultural
- Depth
- Targeted or Grid



Communicate



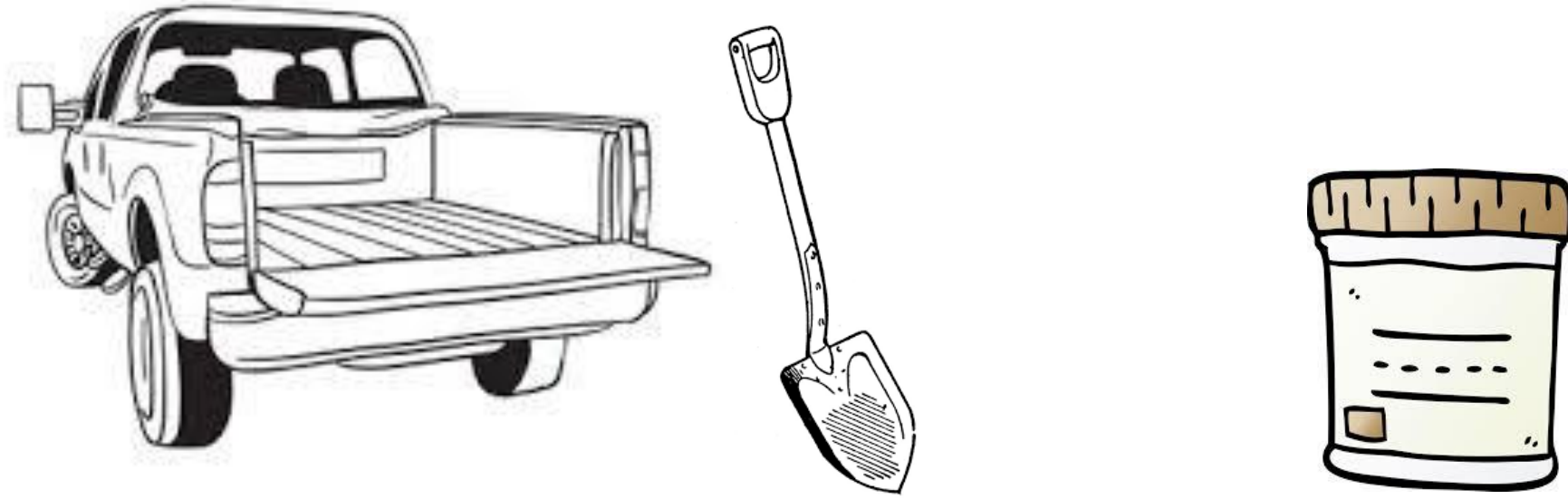
Planning your sampling:

Plan

Discuss

Adapt



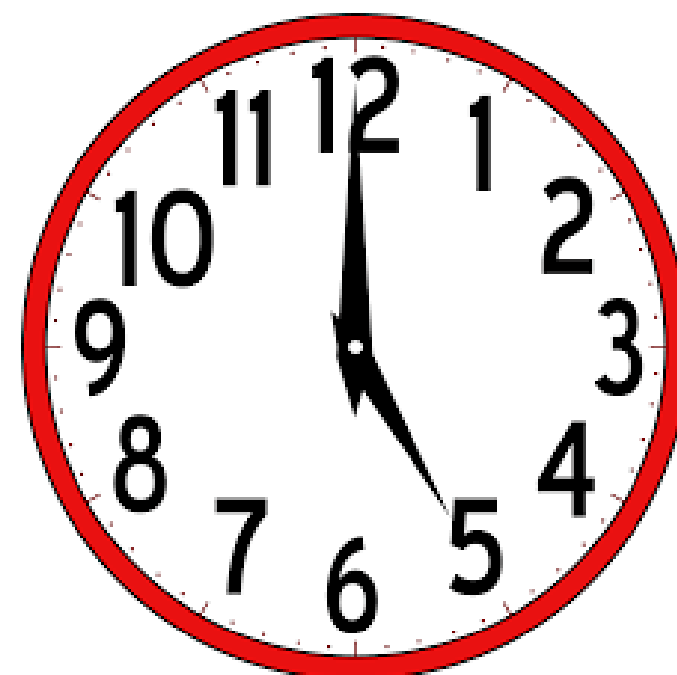
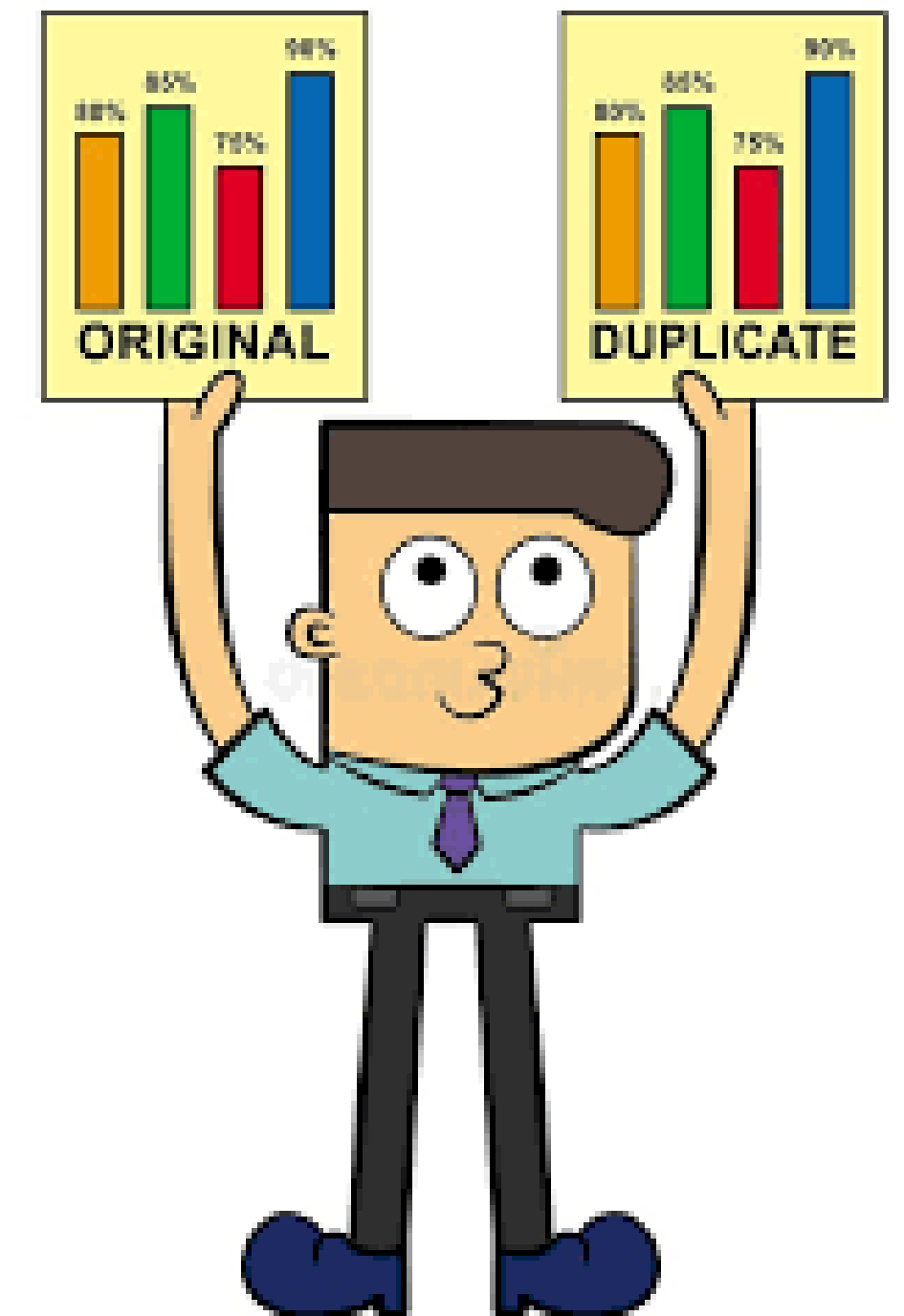


Planning your sampling:

QA
QC

• Do you have the right tools and processes?

- Decontamination of tools/clothing/sample handling area (eg tailgate)
- Appropriate containers
- Take duplicates.
- Storage – chill samples
- Timely pathway to the lab



M³/s

L/min

pS/m



Planning your sampling:



Field
observations

• What is going
on?

- Field observations
- Screening tools



shutterstock.com · 2627498379



Verum Group



Mā te mahi tahi
Driving impact through collaboration

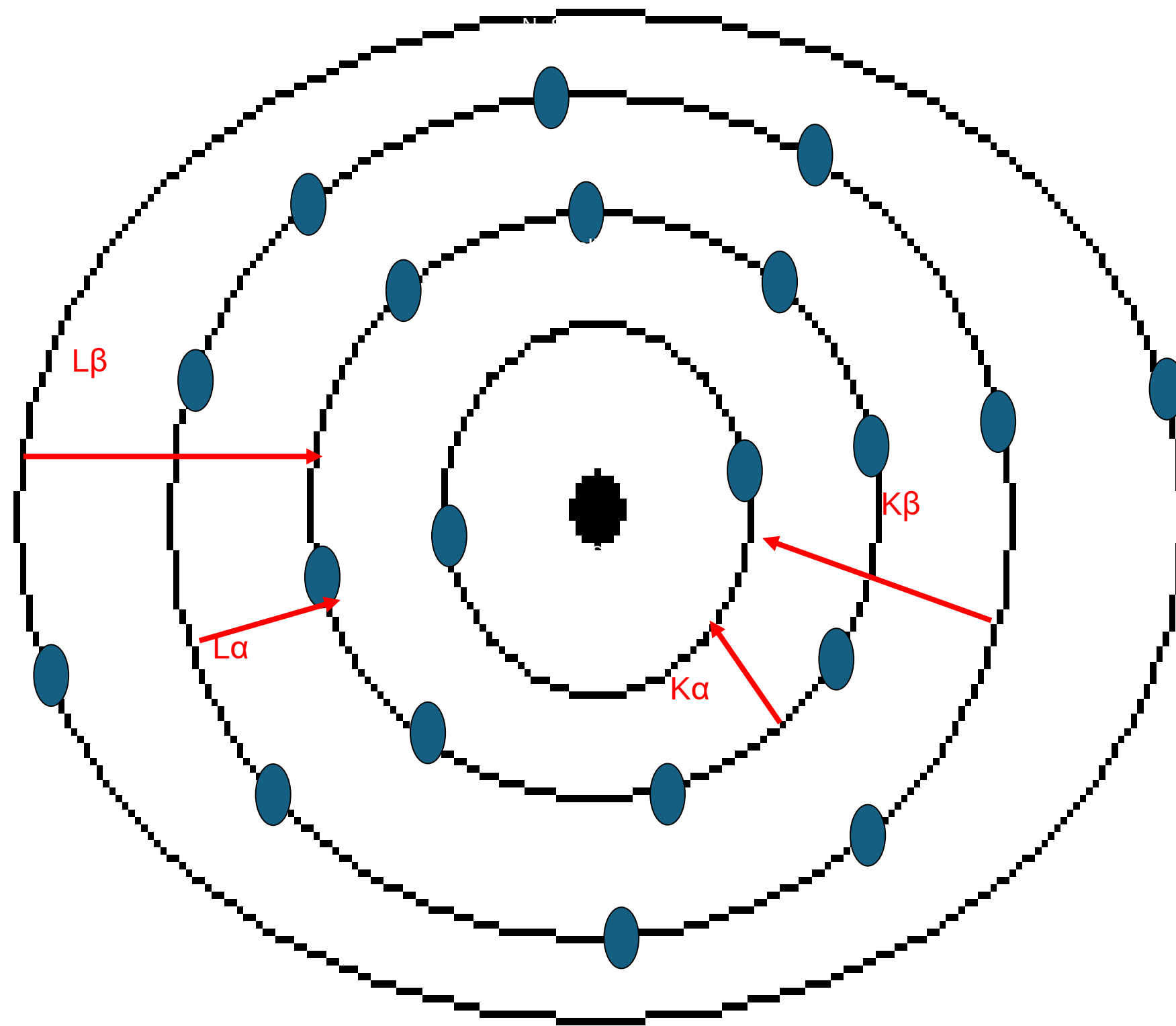
wasteMINZ ALGA

XRF:

- High speed - multielement
- Economical
- Simple to use – Source and User license
- Minimal prep – No waste generated
- Limitations the user must understand



XRF:



- First 3 shells
- Characteristic wave length or energy
- Concentration determined from λ or E
- WDXRF or EDXRF

XRF:

Portable units use EDXRF

- Simultaneous detection
- Compact
- Lower power (typically 1-5W)
- Indicative

Lab units typically use WDXRF

- Bulky
- Precise diffraction crystals
- High power (Verum Group – 4kW)
- Higher precision is possible



Passive – not active unless powered up

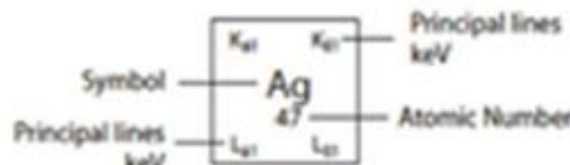
"X-ray tubes have higher radiation output, no intrinsic lifetime limit, produce constant output over their lifetime, and do not have the disposal problems of radioactive sources."
-EPA Method 6200, published 2007

Detection limits – be aware not all elements respond the same



Alloy Analysis:
Elements detected: Magnesium (Mg, Z=12) through
Sulfur (S, Z=16) and Titanium (Ti, Z=22) through
Plutonium (Pu, Z=94).

Please see separate Alloy Analysis LOD Specifications.



Detection limits are a function of testing time, sample matrix and presence of interfering elements.
Detection limits are estimates based on 1-2 minutes test times and detection confidence of 3σ (99.7% confidence).
Interference-free detection limits are intended as guidelines: please contact Olympus Innov-X to discuss your specific application.

Vanta pXRF table



XRF:

Interference - can be physical or chemical

- Water
- Sample
- Instrument position
- “Matrix” effects



XRF:

Matrix effect – two-fold

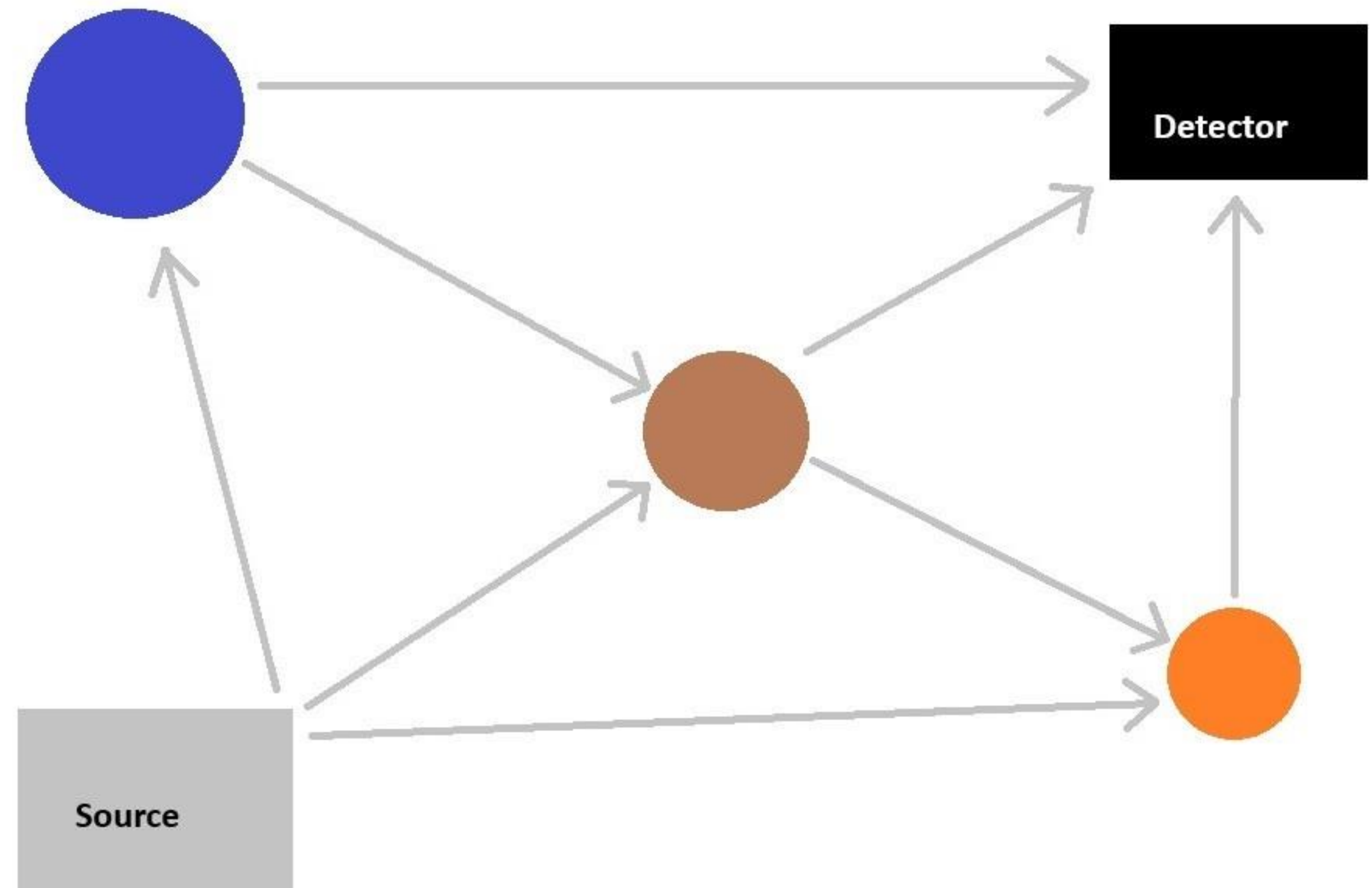
Line overlap

$K\beta$ of Z-1 and $K\alpha$ of Z

- Instrument resolution 70eV
- $K\beta$ - $K\alpha$ 20eV apart

Composition

- Lighter - Heavy elements
- Proximity
- SSCS



XRF:

	F	Na	Al	Ash 80%
Multiement Raw Data	43.66	6.94	20.97	C 10%
Matrix Correction Applied	31.81	8.15	25.00	
	-27%	+17%	+19%	

