PIXE-RBS Beamline in the University of Jordan Van de Graaff Accelerator: Development and Applications

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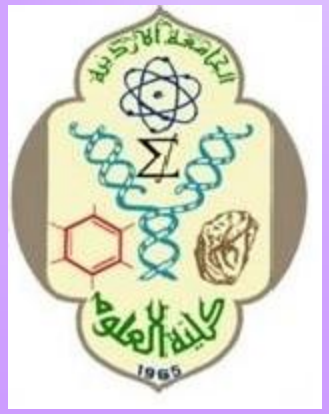

The University of Jordan

Department of Physics

Atomic Physics Lab

Outline

- ***JUVAC***
- ***RBS & PIXE techniques***
- ***PIXE-RBS Beamline***
- ***Results and Discussion***
- ***Development & Applications***
- ***Summary & Future Prospects***

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The University of Jordan Van de Graaff Accelerator

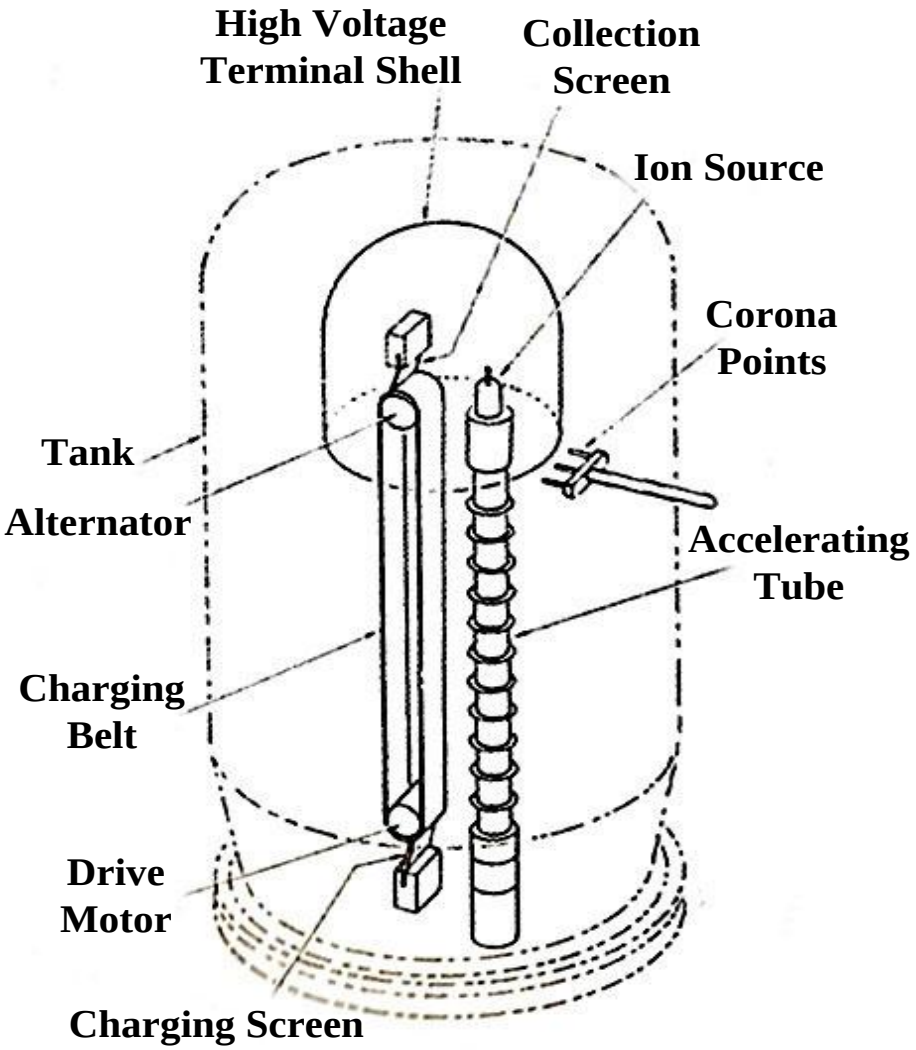
(JUVAC)

JUVAC

- ***Electrostatic Linear Accelerator***
- ***German Grant, GTZ, 1980s.***
- ***Energy 0.3-4.75 MeV***
- ***Ions (H^+, He^{2+}, O^+, N^+…)***
- ***3 Operational Beamlines***

(RBS, COLTRIMS, PIXE-RBS)

Van de Graaff Accelerator



Chu, *et al.*, 1978

JUVAC Experimental Hall

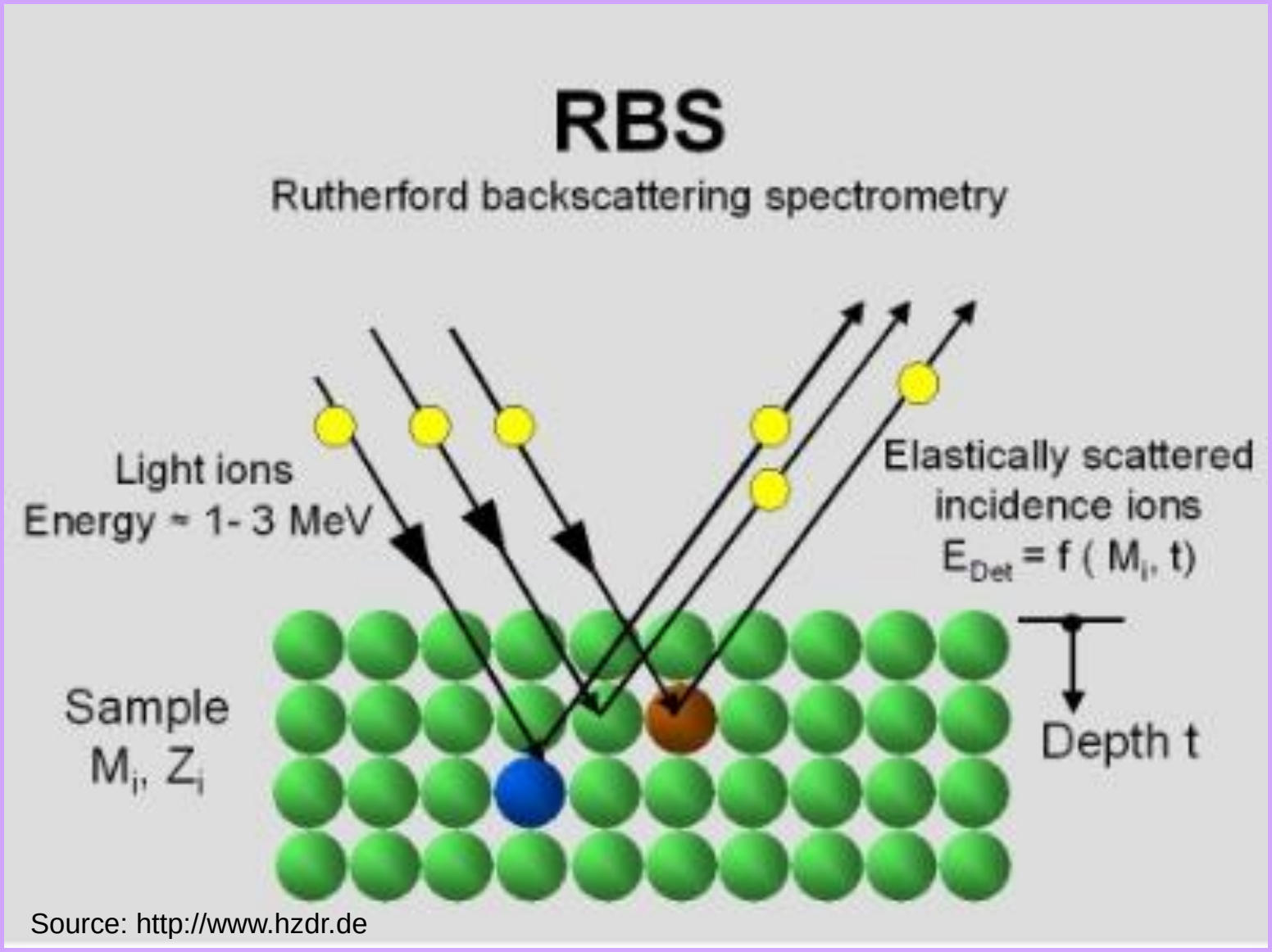
JUVAC Staff

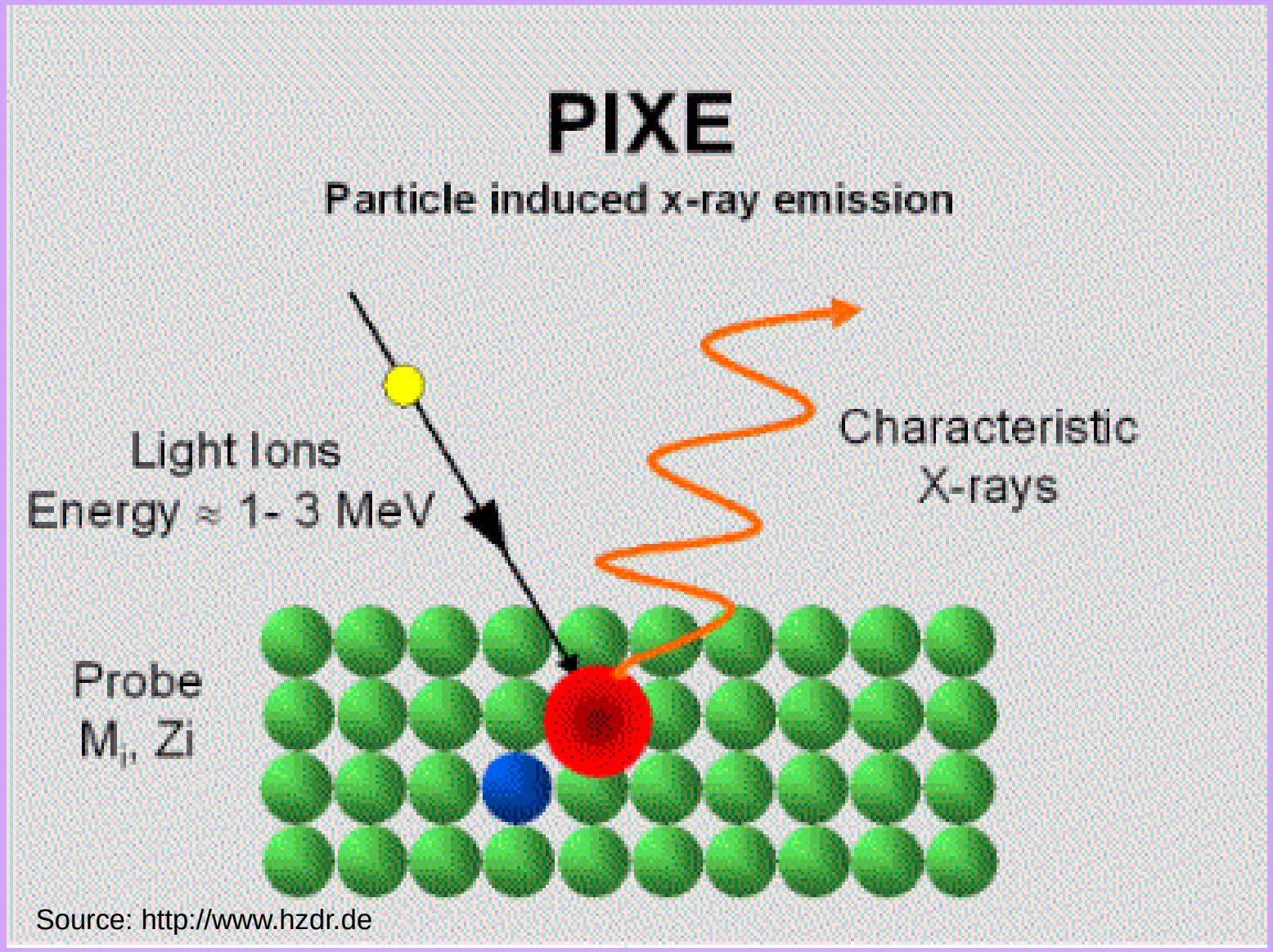
Salem Kharabshah ***Huthifa Abdullah*** ***Samir Farash***


university of Holland


Van de Graaff
Accelerator
Tank

RBS & PIXE Techniques


RBS
Rutherford backscattering spectrometry
Light ions
Energy ≈ 1- 3 MeV
Elastically scattered
incidence ions
$E_{Det} = f(M_i, t)$
Sample
M_i, Z_i
Depth t
Source: http://www.hzdr.de

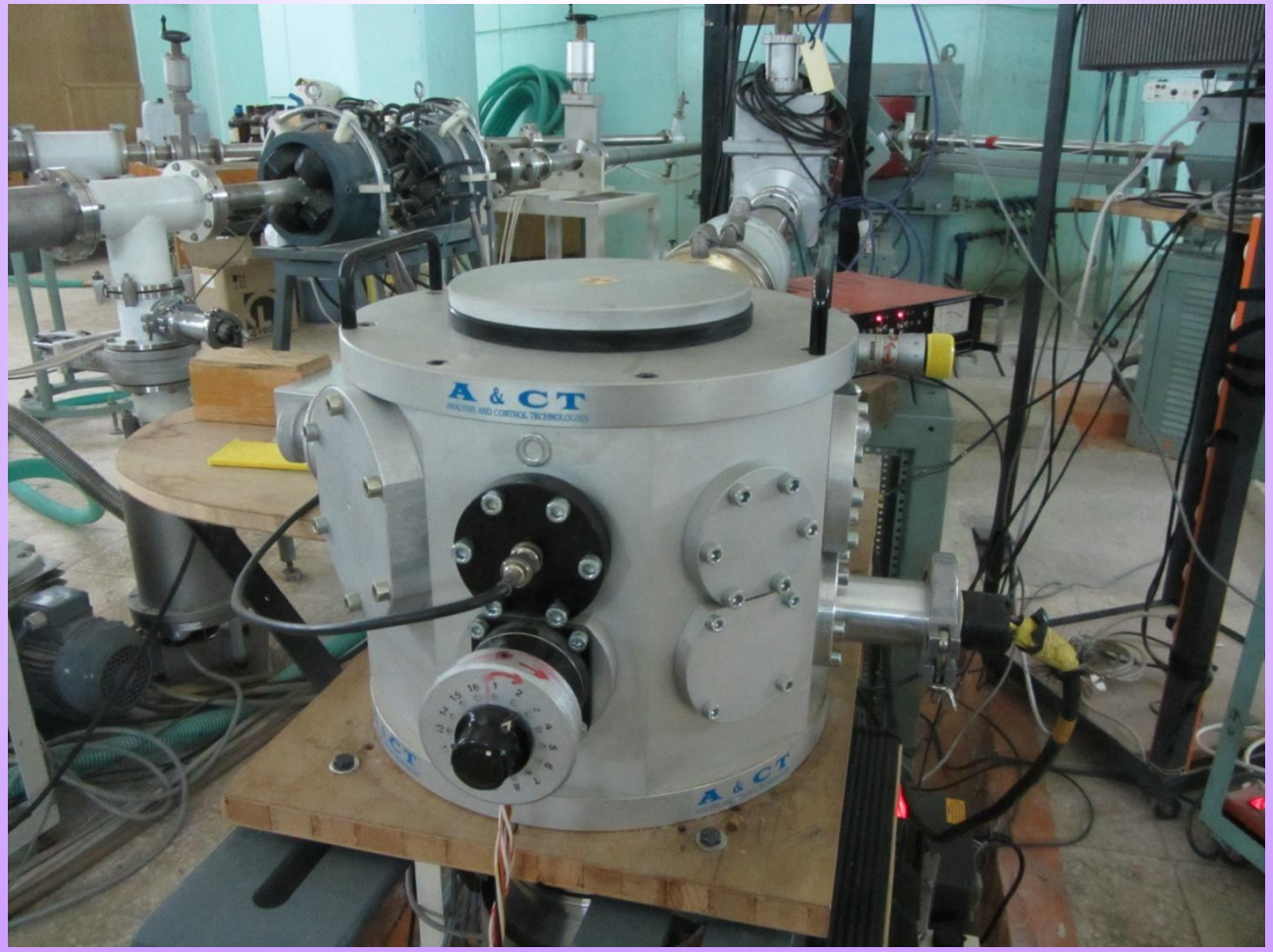

PIXE
Particle induced x-ray emission
Light Ions
Energy ≈ 1- 3 MeV
Characteristic
X-rays
Probe
M_i, Zi
Source: http://www.hzdr.de

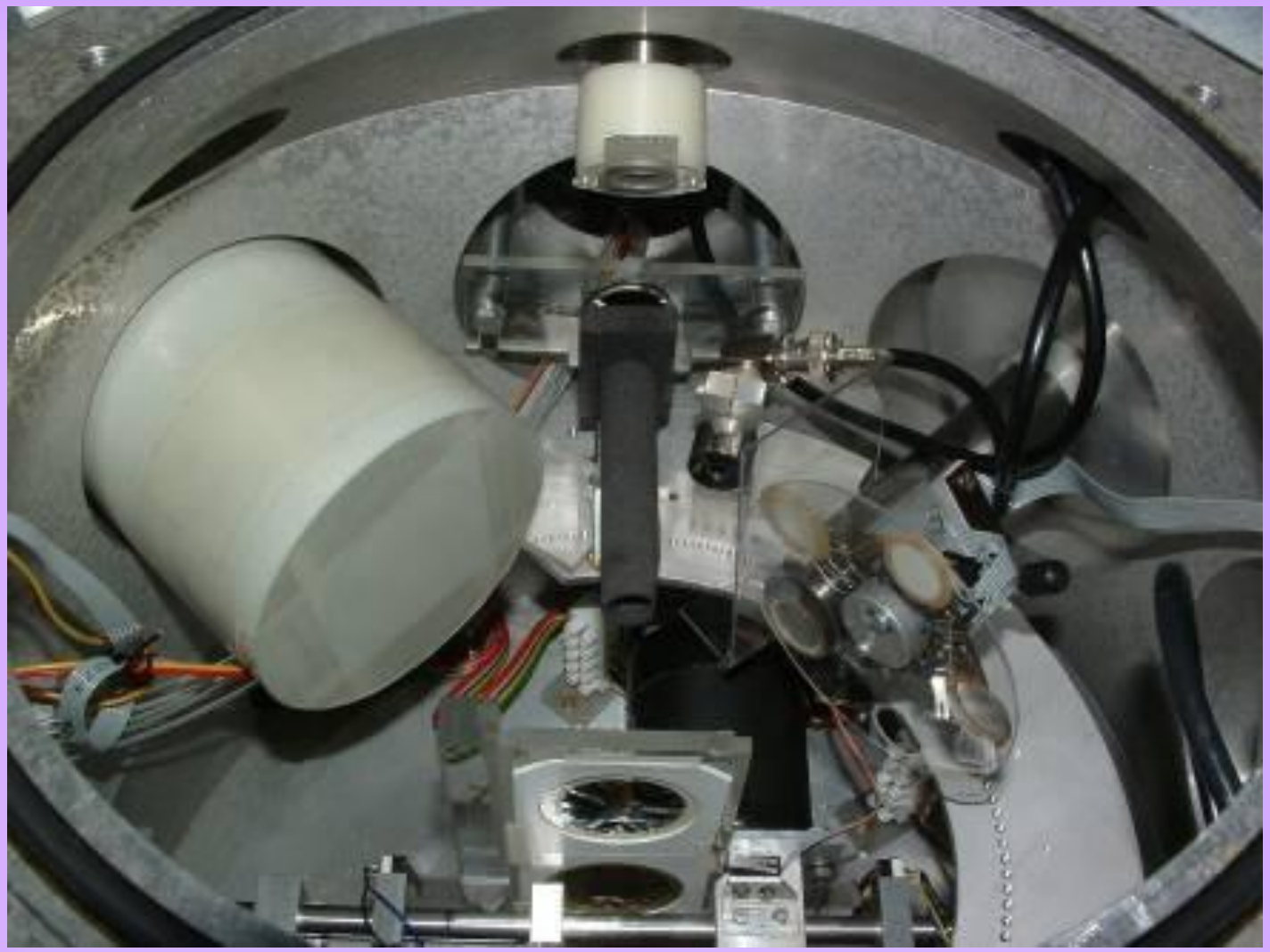
PIXE-RBS Beamline

Motivation

- ***PIXE*** *can be used to detect elements (Na-U),* ***RBS*** *to detect all elements heavier than the projectile ions.*
- ***PIXE*** *is sensitive at the ppm level for most elements.* ***RBS*** *is suitable for profiling.*
- *The necessity of a powerful analytical technique to characterize the elemental content (**simultaneous identification & quantification**) of fine and coarse air particulates.*

PIXE-RBS Beamline @ JUVAC





Development & Applications

PIXE-RBS Beamline Development

- *Modification of the collision chamber of PIXE beamline to combine **PIXE** & **RBS** simultaneously.*
- *Installation of **Si (Li) X-ray detector** and **Gupix** software package (funded by the **IAEA**).*
- *Improving **vacuum** in the collision chamber.*

PIXE-RBS Beamline Applications

- *Material analysis (**stoichiometry** of thin layers).*
- *Environmental studies (analysis of **aerosols** accumulated on filters).*
- ……

Summary & Future Prospects

Summary

- ***RBS & PIXE** are non-destructive techniques to study materials.*
- ***PIXE-RBS** combination allows the determination of depth distribution and concentration from hydrogen to heavy elements.*
- ***PIXE-RBS** combination gives complementary information in aerosols analysis.*

Future Prospect

- *Modification of the collision chamber of **PIXE-RBS beamline** to be used for **gaseous targets**.*

Acknowledgements

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Jordan

Amman


UNIVERSITY OF JORDAN

Thank You

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