



Neutron Imaging Basics & Applications

Co-authors: Tushar Roy, M.R.More, Yogesh Kashyap, Mayank Shukla, Prashant Singh.

Mrs. Shefali Shukla

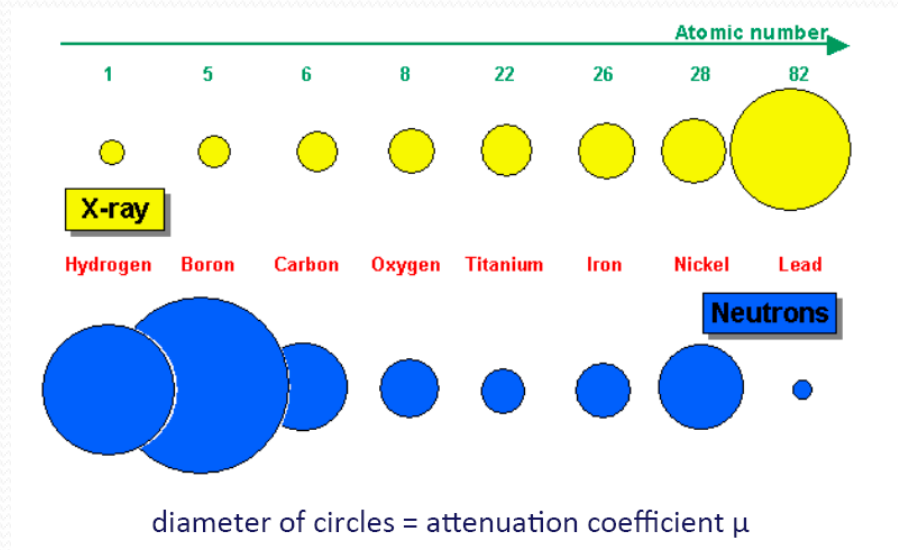
Bhabha Atomic Research Centre, INDIA

Overview

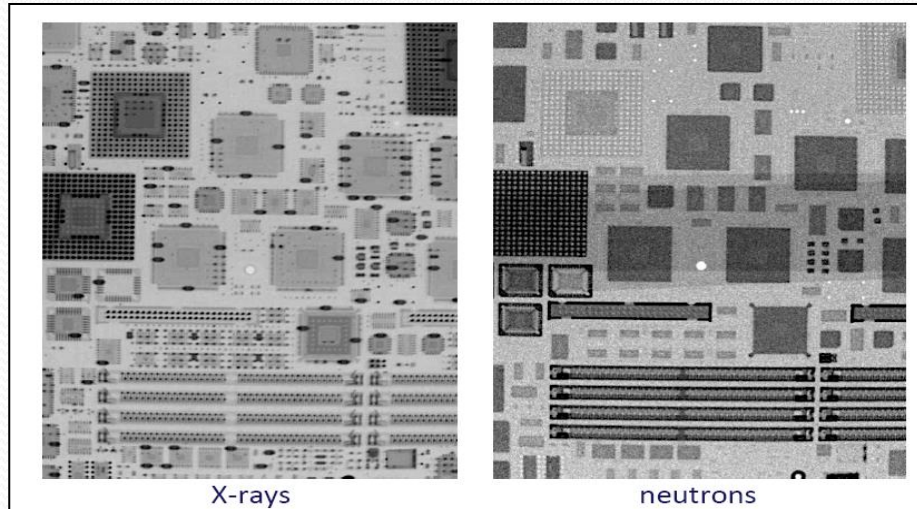
- Comparison of X-rays and Neutrons
- Comparison of Radiography & Tomography
- Neutron Imaging Beamline at DHRUVA
- Some Applications of Neutron Imaging

Why Neutrons ????

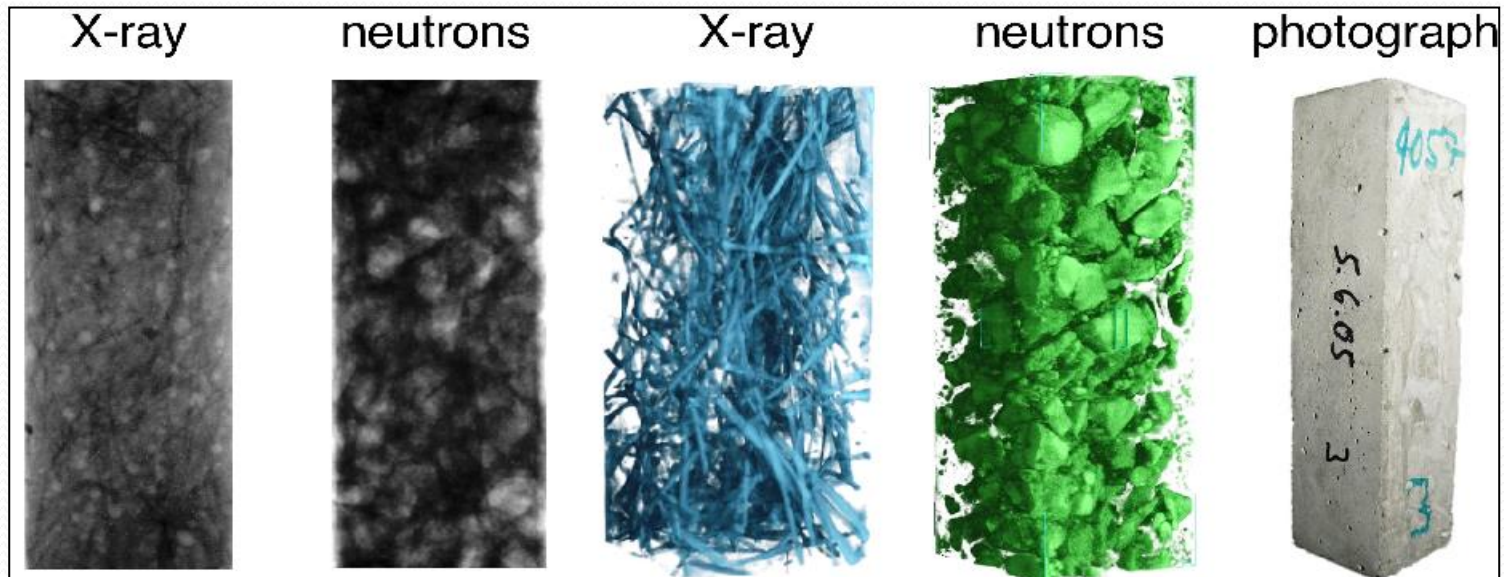
- Neutrons have very different scattering and absorption property compared to X-ray
- Whereas X-ray interaction is dependent on electron density of the material, neutrons interact with the nuclei. Therefore neutrons can be used to image low Z materials enclosed inside a high Z material..... This cannot be done using X rays !!
- Neutrons can be used to image radioactive materials as neutron imaging is not sensitive to intense gamma ray background.
- Neutrons have small magnetic moment which can be used to probe magnetic properties of materials
- Interaction cross section of neutrons for different isotopes of same element is different : they can be used for isotopic differentiation



Neutrons and X-rays : Complimentary Techniques

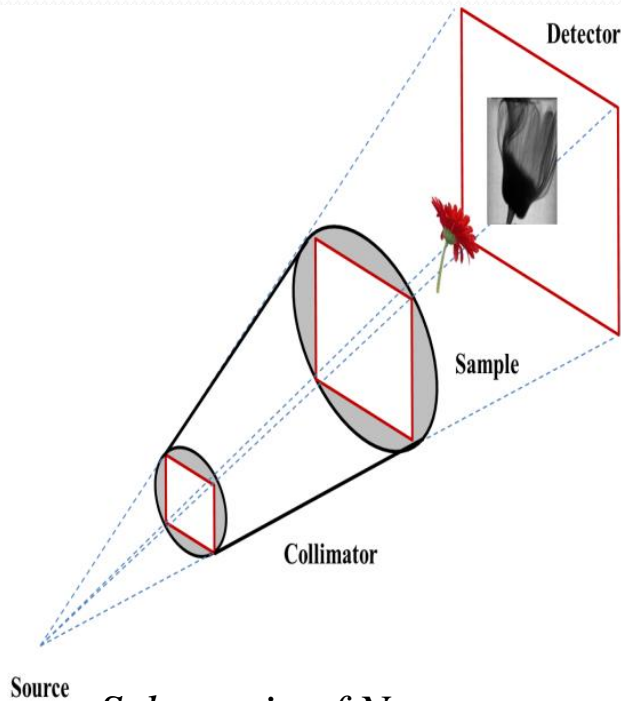


Neutron and X-ray radiography of a motherboard

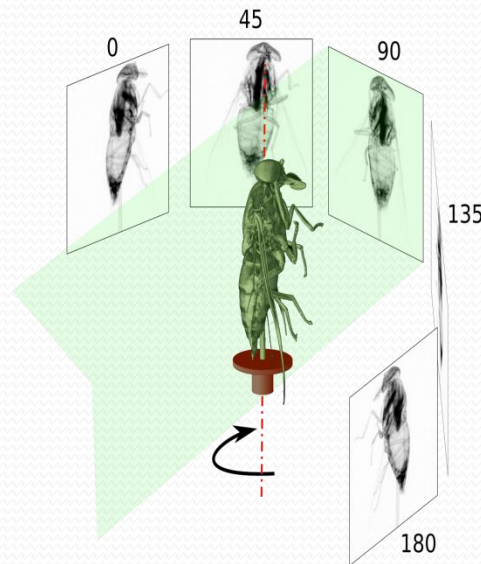


Neutron and X-ray tomography of a concrete sample

Neutron Radiography (2D) vs. Neutron Tomography (3D)



Schematic of Neutron Radiography

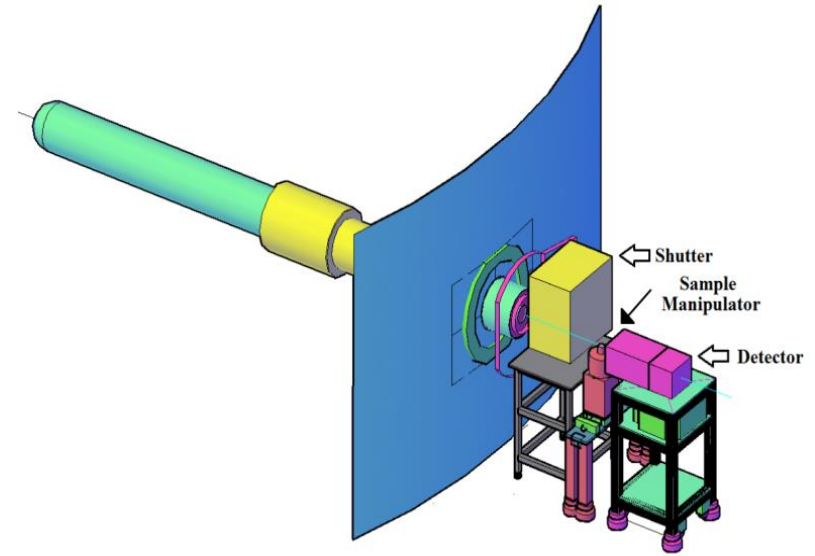


Schematic of Tomography Data Acquisition



Reconstructed 3D volume of the object obtained from tomography

Neutron Imaging Facility at DHRUVA Reactor



FEATURES:

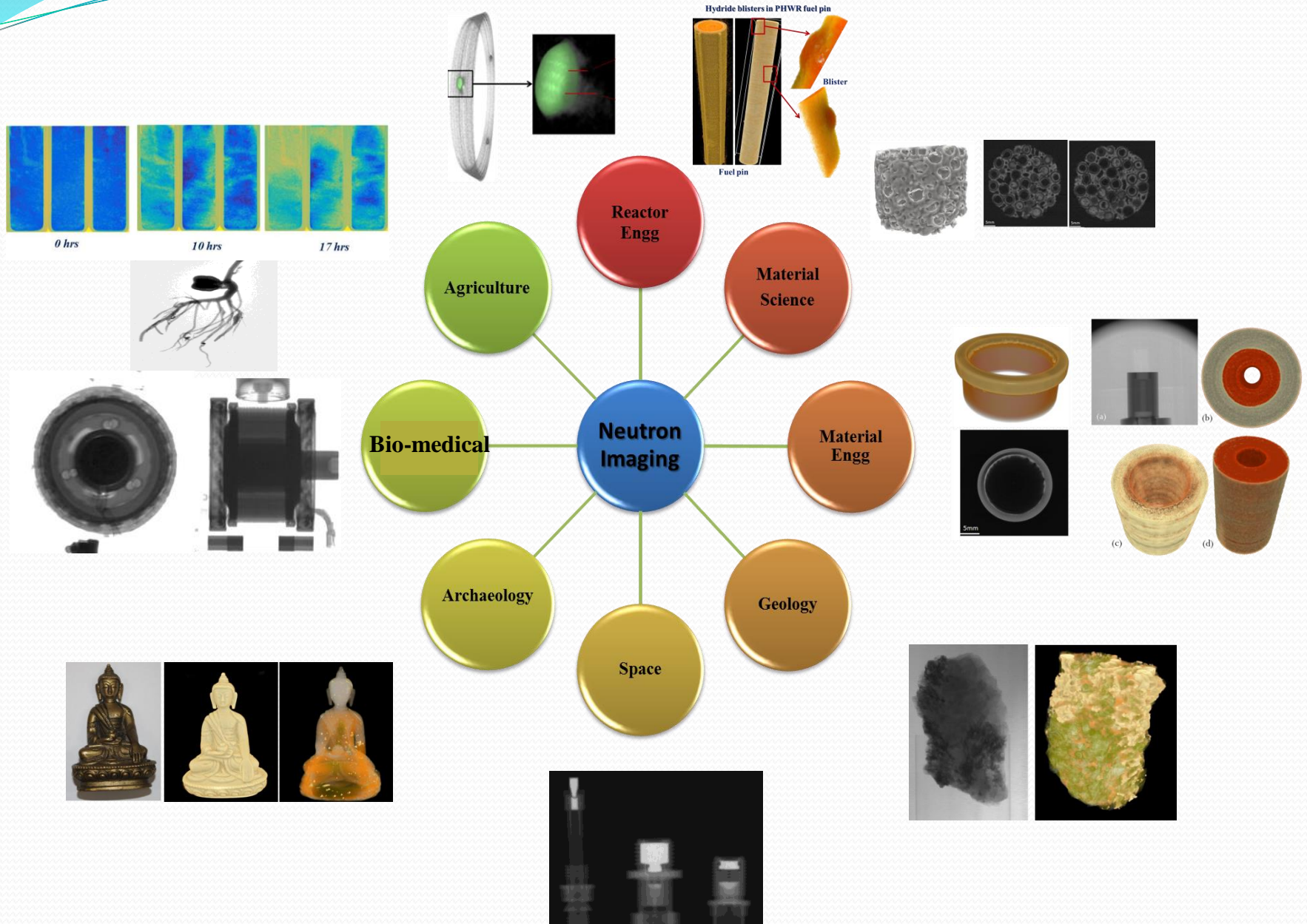
- Thermal Neutron Flux: 4×10^7 n/s-cm²
- L/d (collimation) :160
- Cadmium ratio :250
- Beam diameter:120mm
- Spatial Resolution:100 micron

EXPERIMENTAL FACILITIES

AVAILABLE

- *Neutron Radiography*
- *Neutron Tomography*
- *Neutron Phase Contrast Imaging*
- *Real time imaging for transient events*

Application Areas of Neutron imaging



Thank You

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