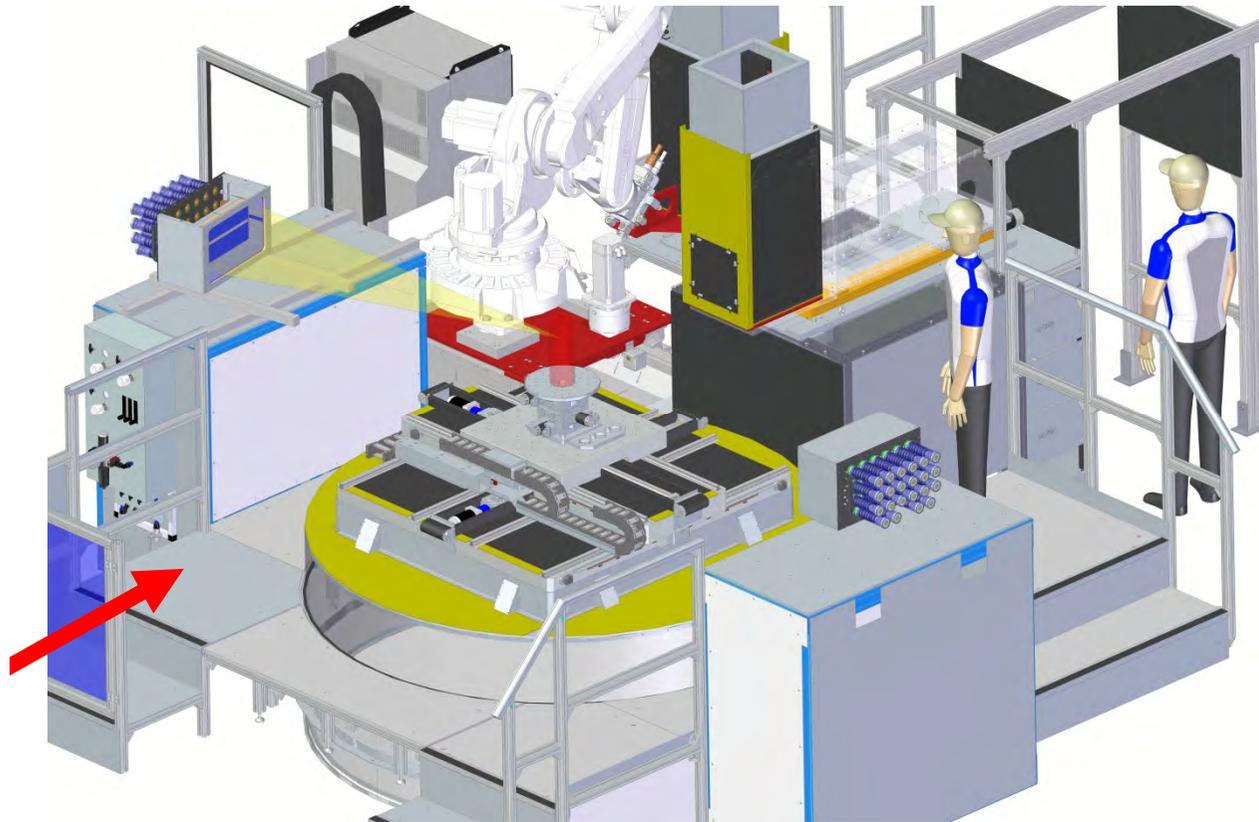
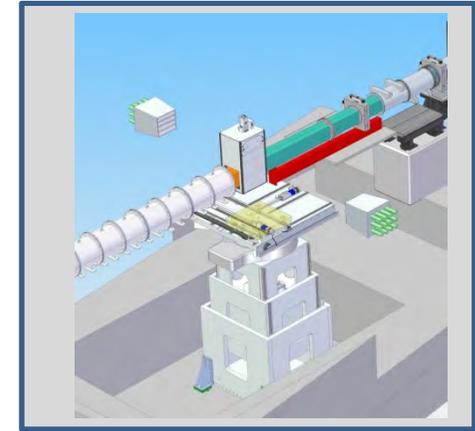


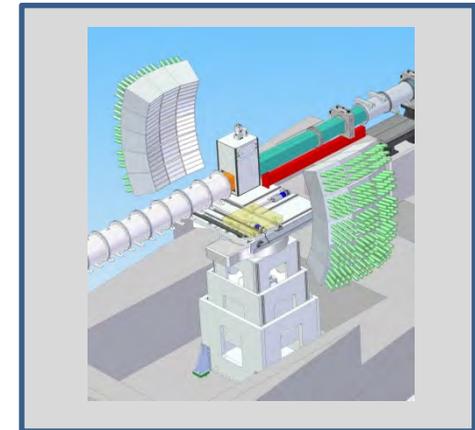
IMAT: as it stands



2016



2017



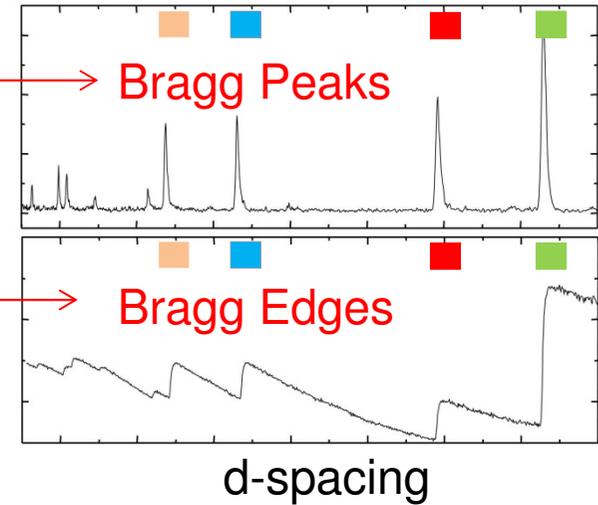
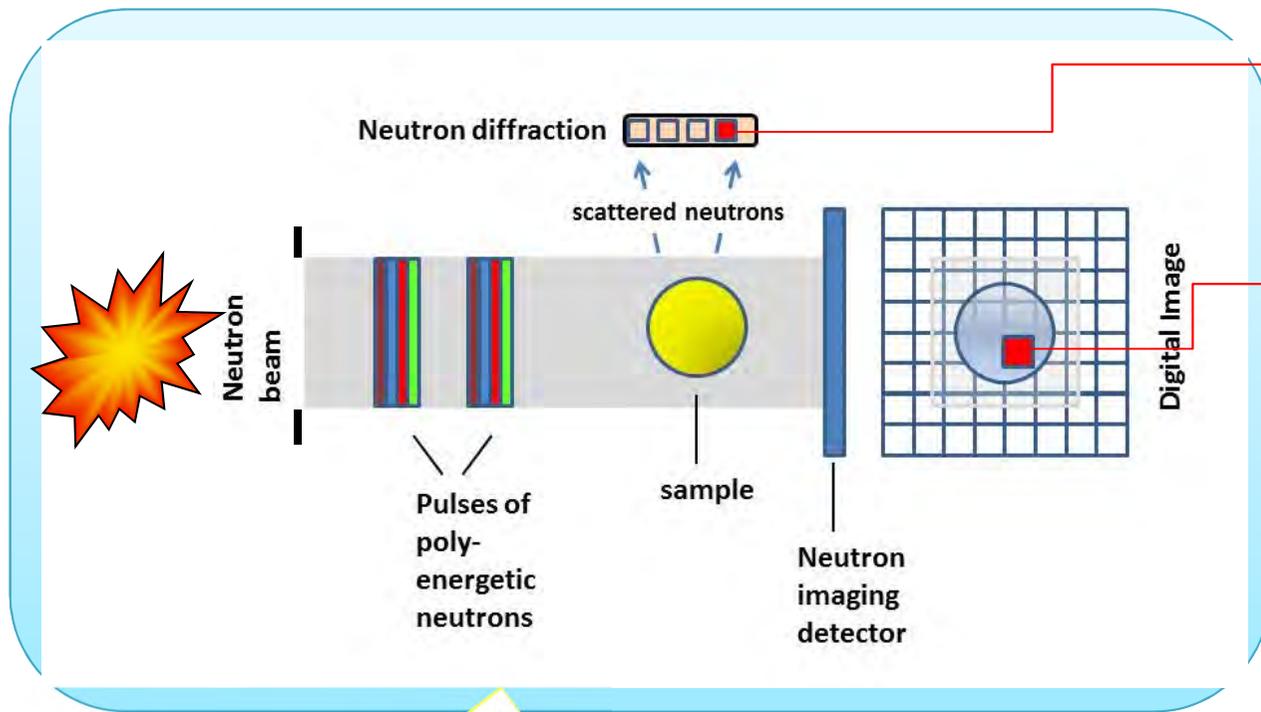
- Conventional neutron radiography and tomography
- Energy-selective imaging
- Diffraction analysis: strain + phase (from 2017)



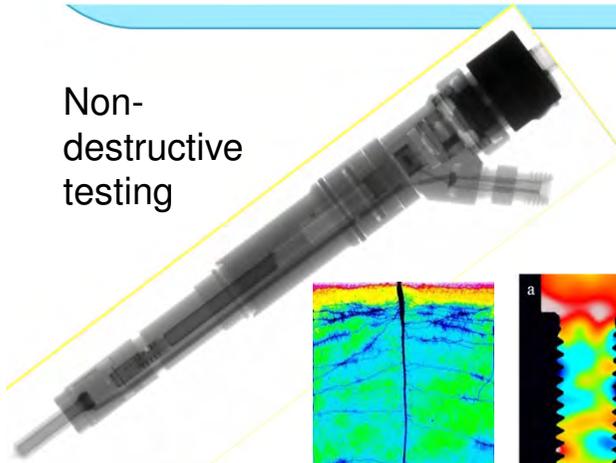
Science & Technology Facilities Council

ISIS

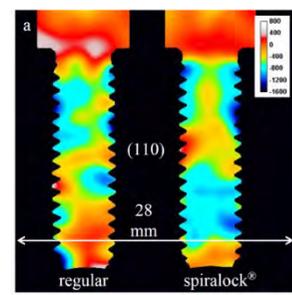
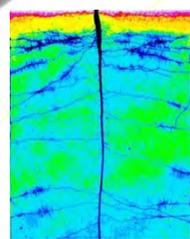
Imaging and diffraction (being commissioned)



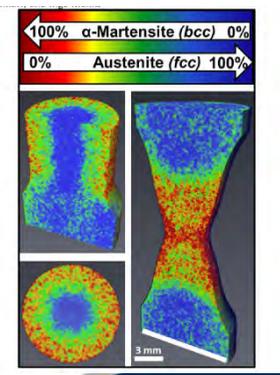
Imaging	
• Field of View	20x20 cm ²
• Resolution	50 μm
Diffraction	
• Resolution	1 mm



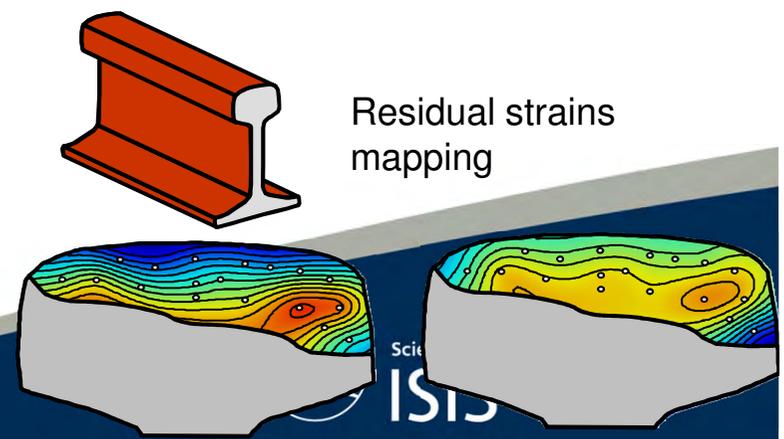
Water/solvent/hydrogen ingress into materials



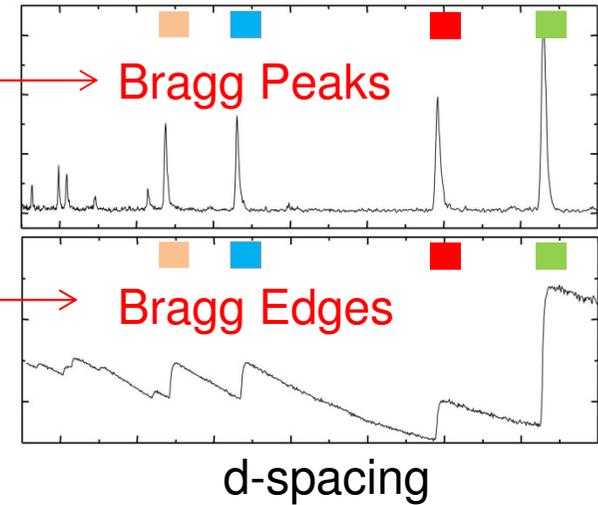
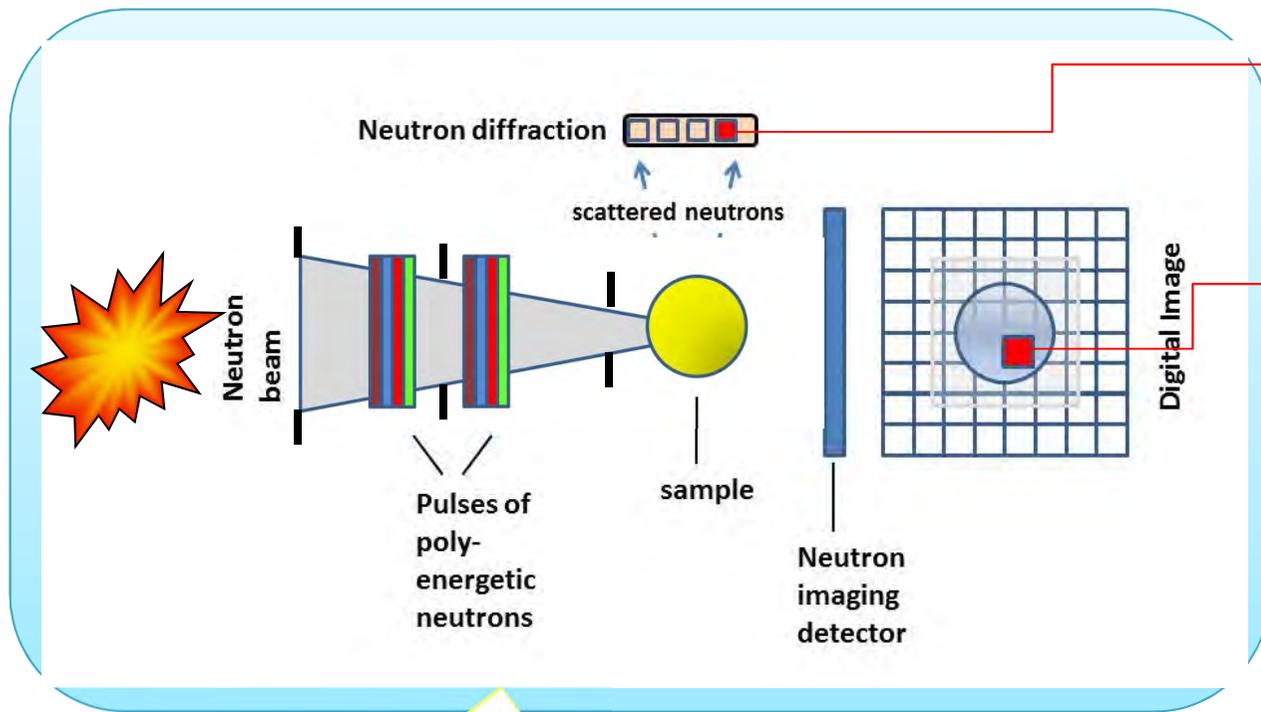
Strain map



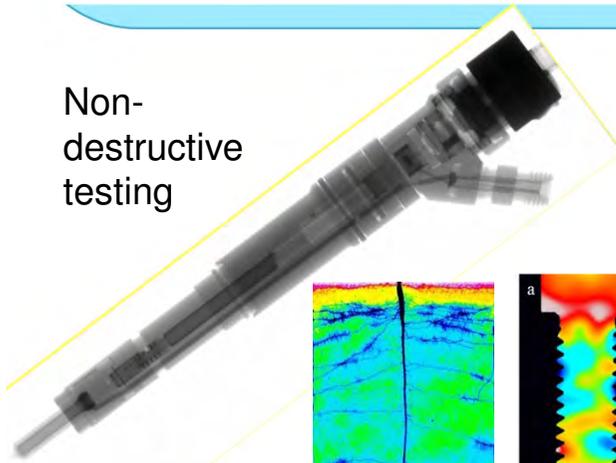
Phase map



Imaging and diffraction (being commissioned)

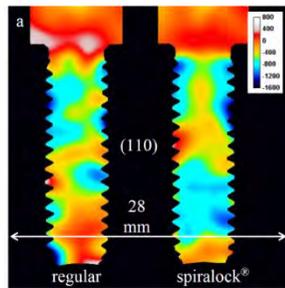
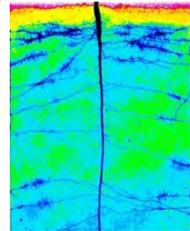


Imaging	
• Field of View	20x20 cm ²
• Resolution	50 μm
Diffraction	
• Resolution	1 mm

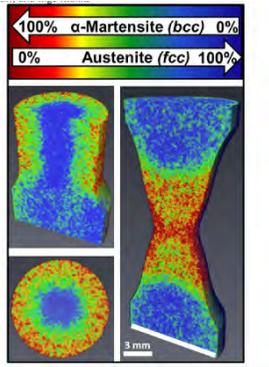


Non-destructive testing

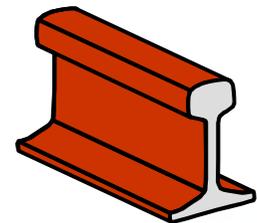
Water/solvent/hydrogen ingress into materials



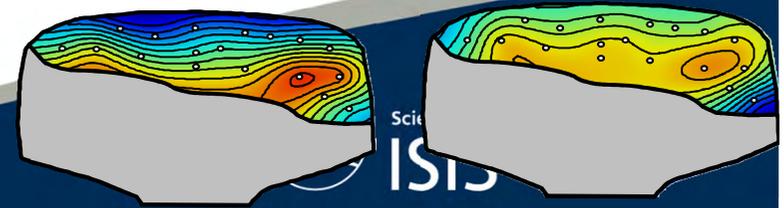
Strain map



Phase map

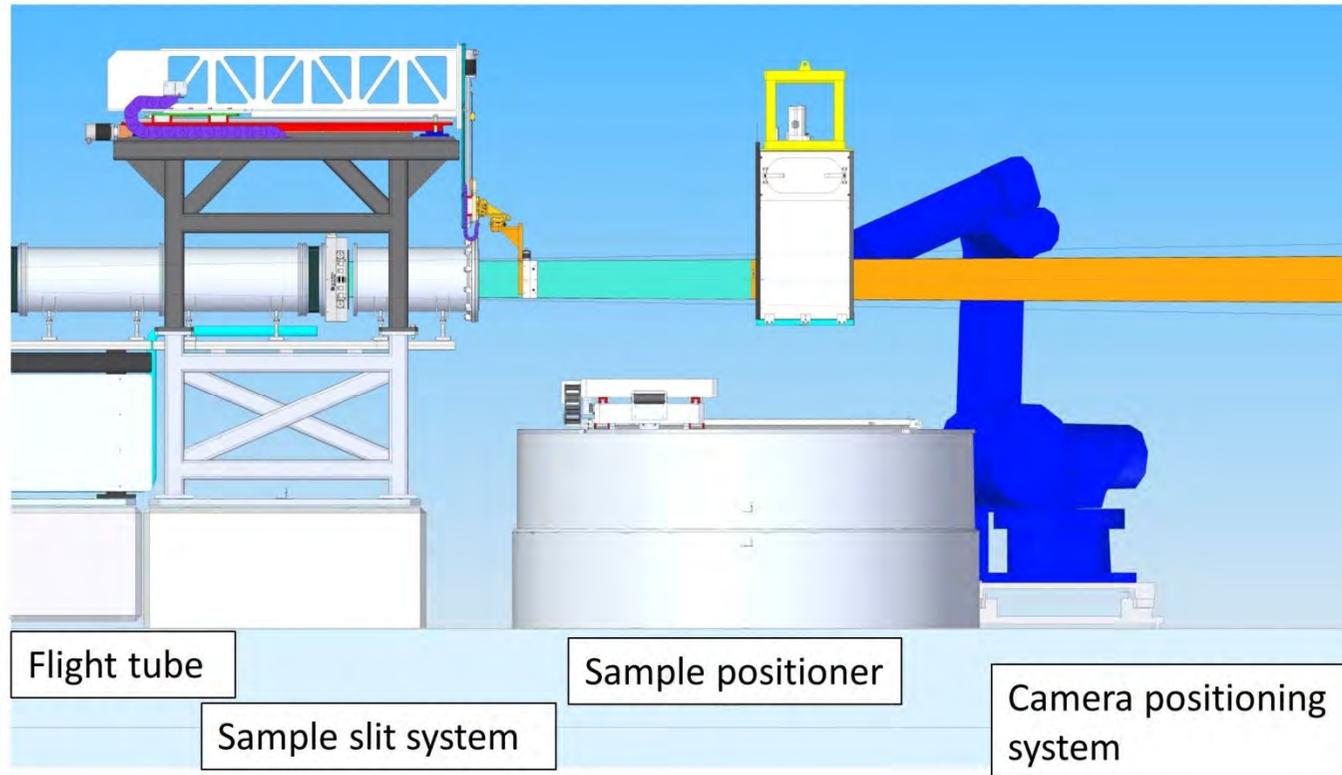


Residual strains mapping



ISIS

IMAT instrument



Specification: imaging

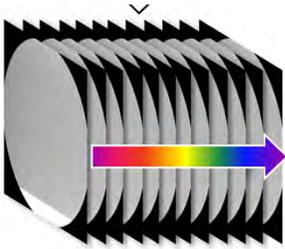
- Field of View: 20x20 cm²
- Spatial resolution: 50 μm
- $\Delta\lambda/\lambda$: <0.8%



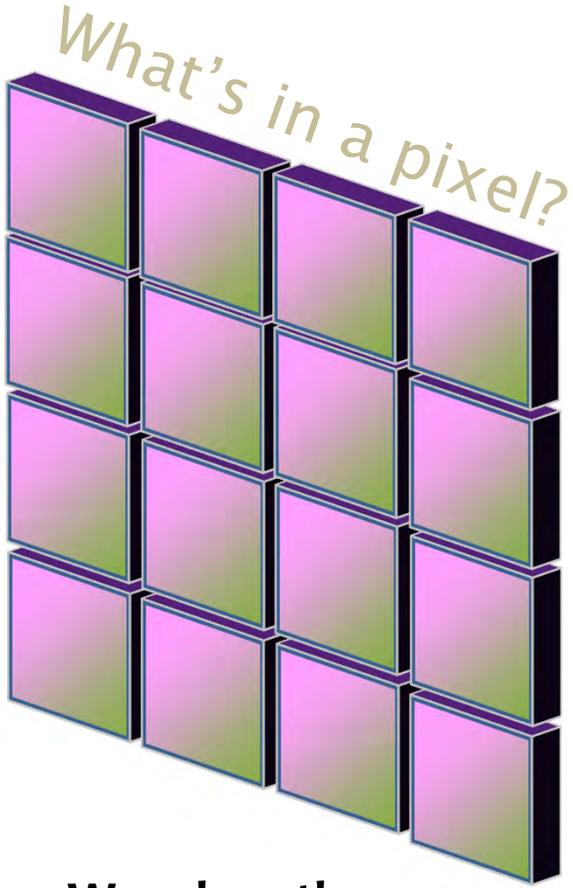
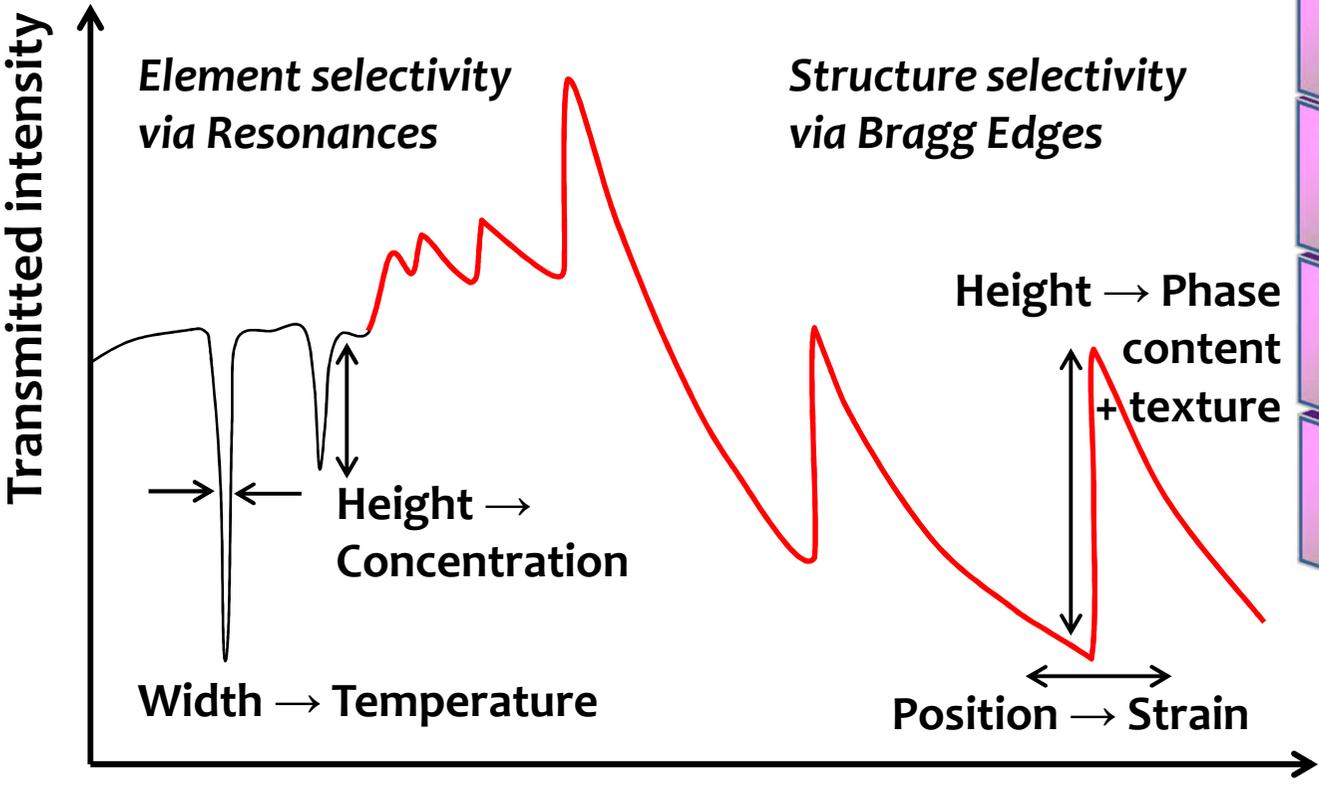
Science & Technology Facilities Council

ISIS

Energy-selective imaging

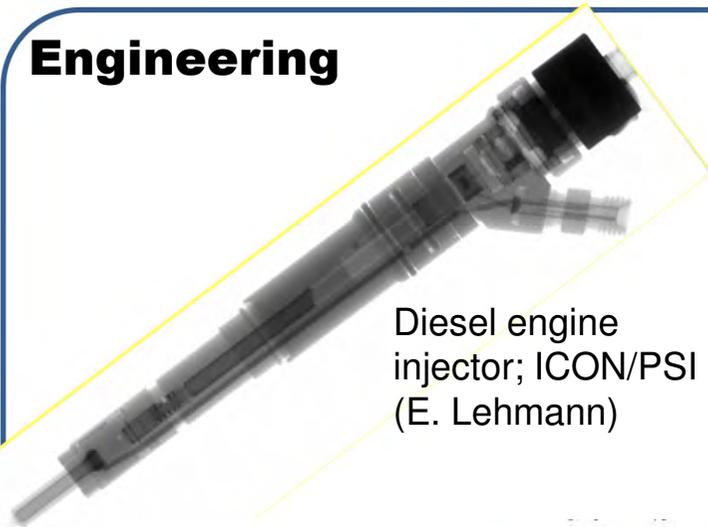


Time=energy stack of radiographies

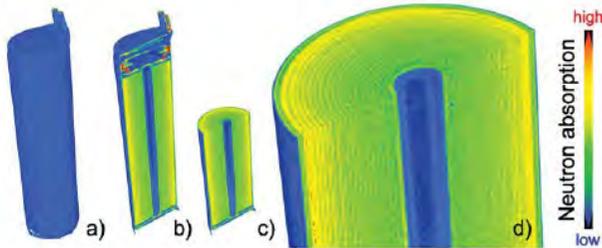


'Conventional' neutron radiography and tomography: **non-destructive testing**

Engineering



Diesel engine injector; ICON/PSI (E. Lehmann)



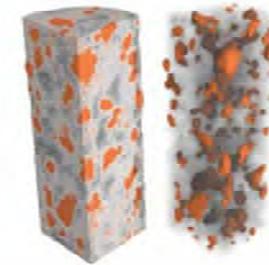
Li battery tomographies on ANTARES/FRM-II Munich (A. Senyshyn)

Cultural Heritage



14th century bronze with flowers (E. Lehmann, PSI)

Geology



Mineral core samples; Conrad/HZB (N. Kardjilov)

Palaeontology



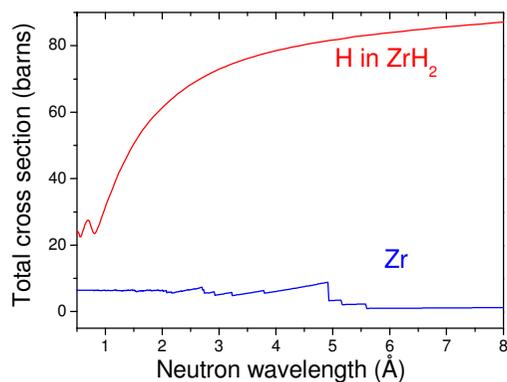
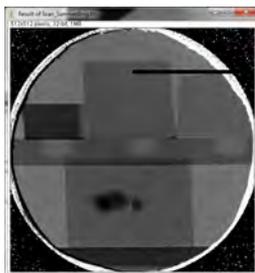
From: U. Leeds/ Neutrograph-ILL

'Conventional' neutron radiography and tomography: hydrogen / water

Engineering

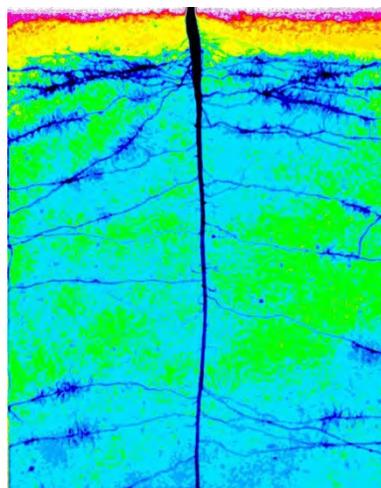
- H in metals (steel, Zr)
- H-embrittlement
- H-blisters

Hydrogen diffusion in zirconium



Agriculture

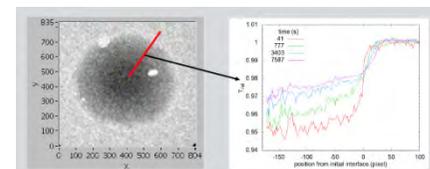
- Water flow in soil and roots
- Capillary transport



A. Carminati, U Leipzig
Data NEUTRA@PSI

Soft matter

- Water ingress into porous matter (nanoporous media, polymers, gels, ...)



H. Hermes, PCCP 17 (2015)

Spatially and time-dependent determination of diffusion of solvents through complex matter matrices:

- Water transport through compacted clay

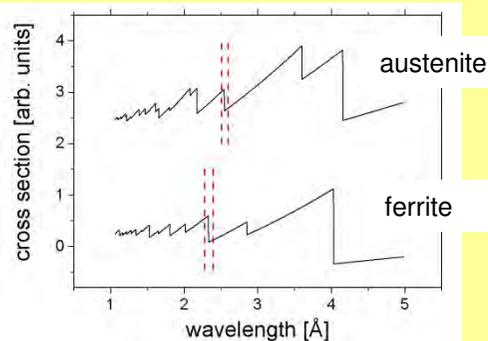
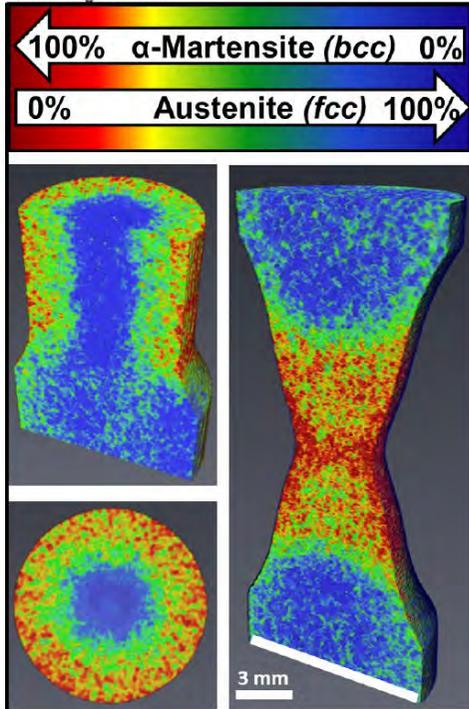
N. Skipper, UCL London

Energy dependent neutron tomography

3D Mapping of Crystallographic Phase Distribution using Energy-Selective Neutron Tomography

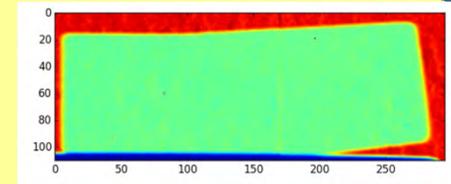
Robin Woracek, Dayakar Penumadu,* Nikolay Kardjilov, Andre Hilger, Mirko Boin, John Banhart, and Ingo Manke

Data; HZB Berlin

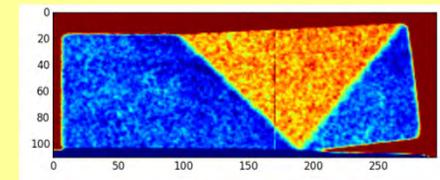


Twin mapping in NiMnGa shape memory alloys

S. Kabra (ISIS)
A. Tremsin (Berkeley)

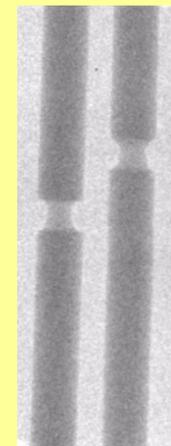
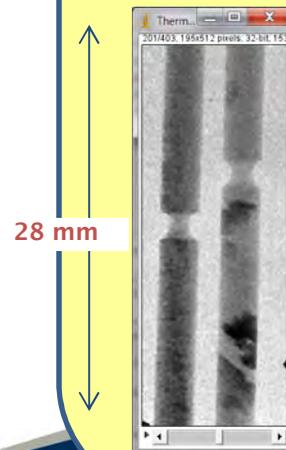


'standard' white beam

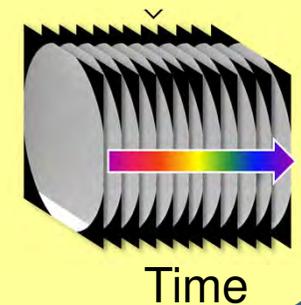


monochromatic

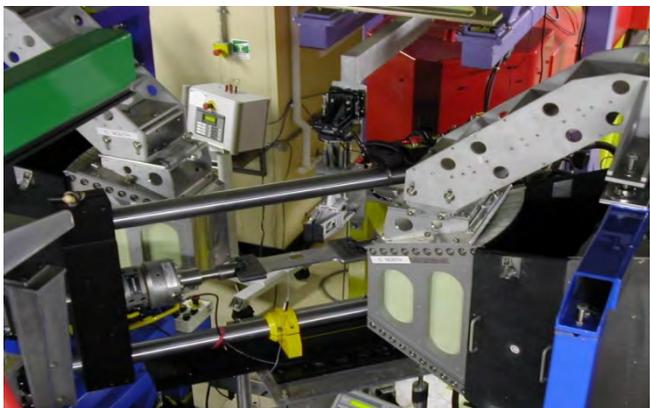
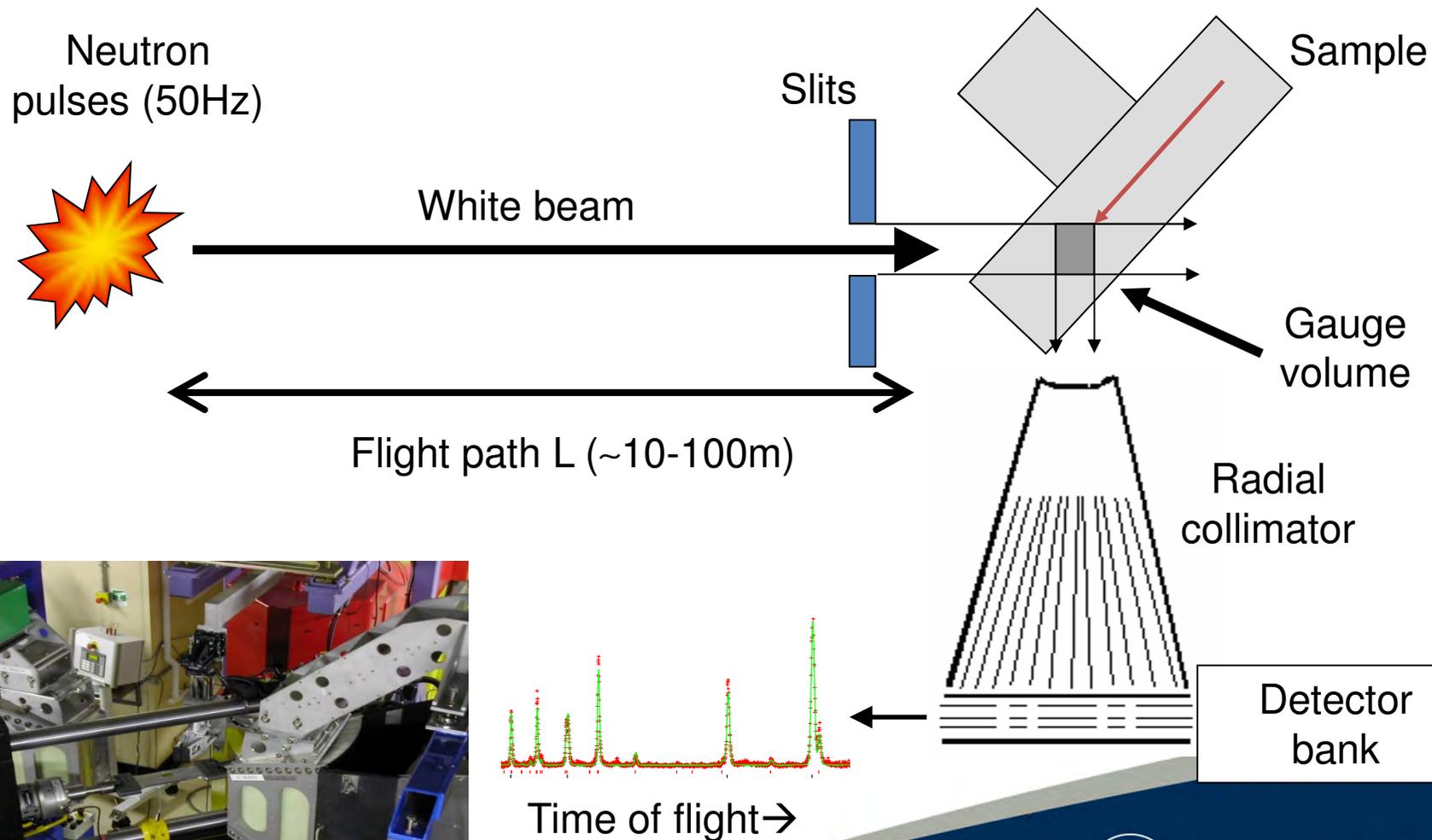
Grain tracking



M. Azeem/ P. Lee
Manchester Univ.



Basic diffractometer design (pulsed source)

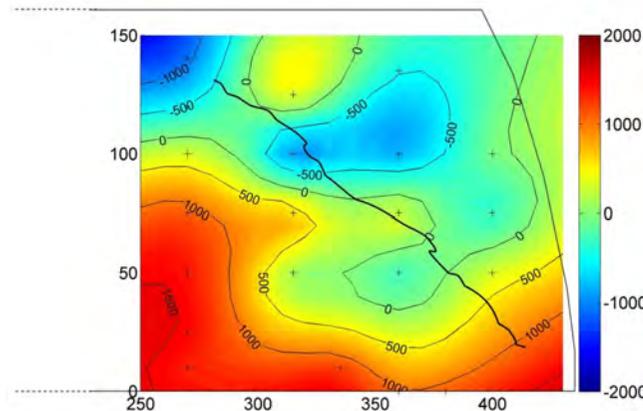


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Residual stress in castings

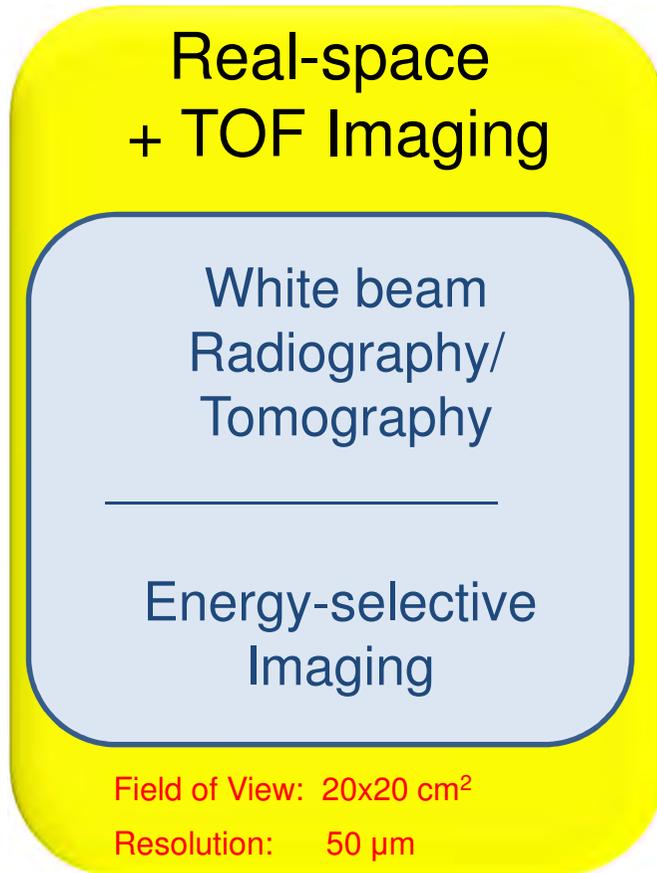
- Contributes to both **distortion** during machining and **fatigue** during service



- E.g. cast magnesium block, stresses were high enough to cause internal cracks in casting



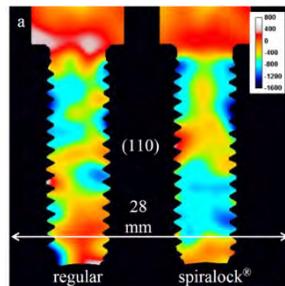
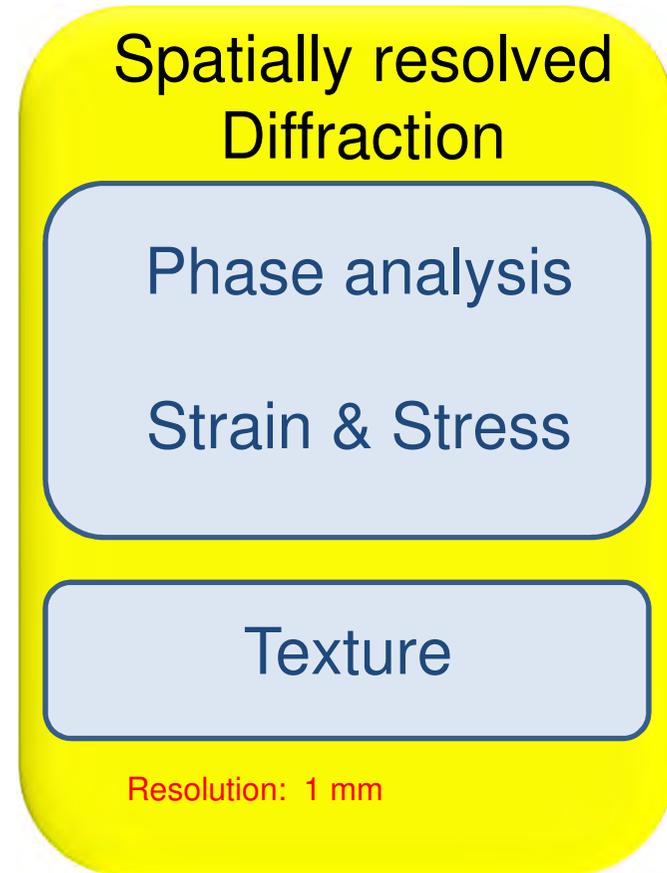
IMAT Methods



“Tomography
guided”
diffraction



Interprete
images



Mapping
“microstructures”

