Elettra Sincrotrone Trieste

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Status of the diffraction beamlines at Elettra

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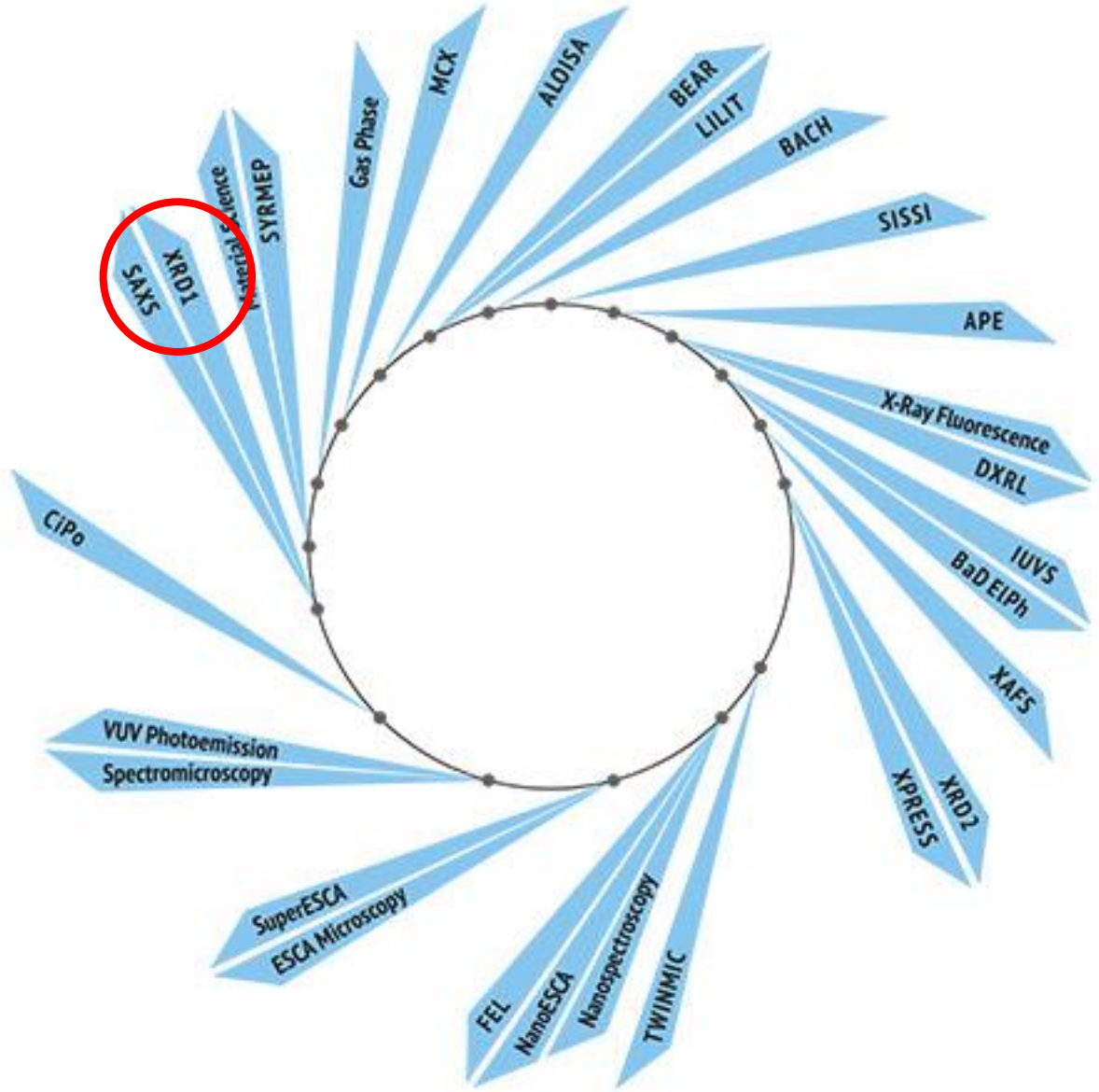
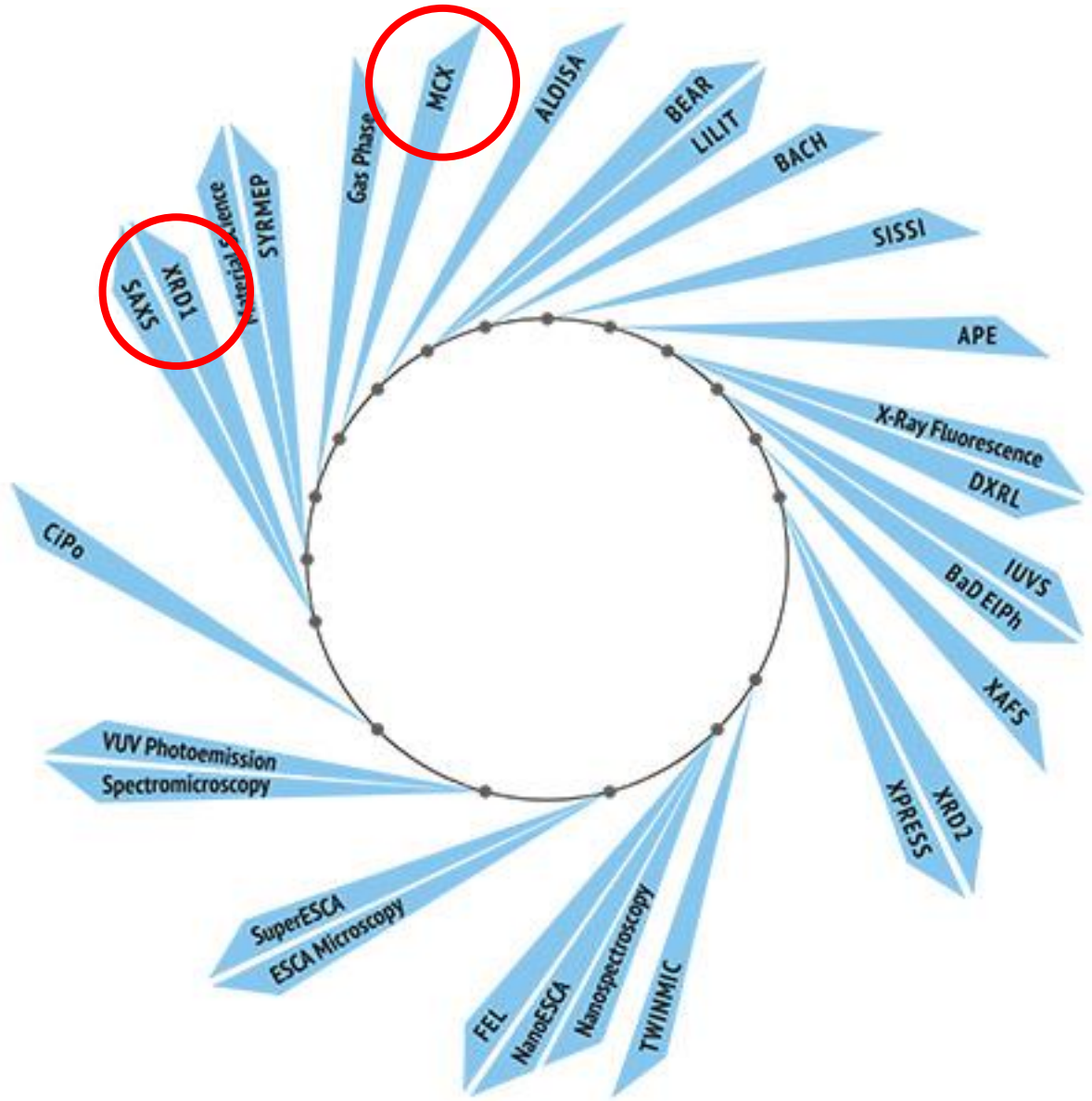
Diffraction beamlines at Elettra



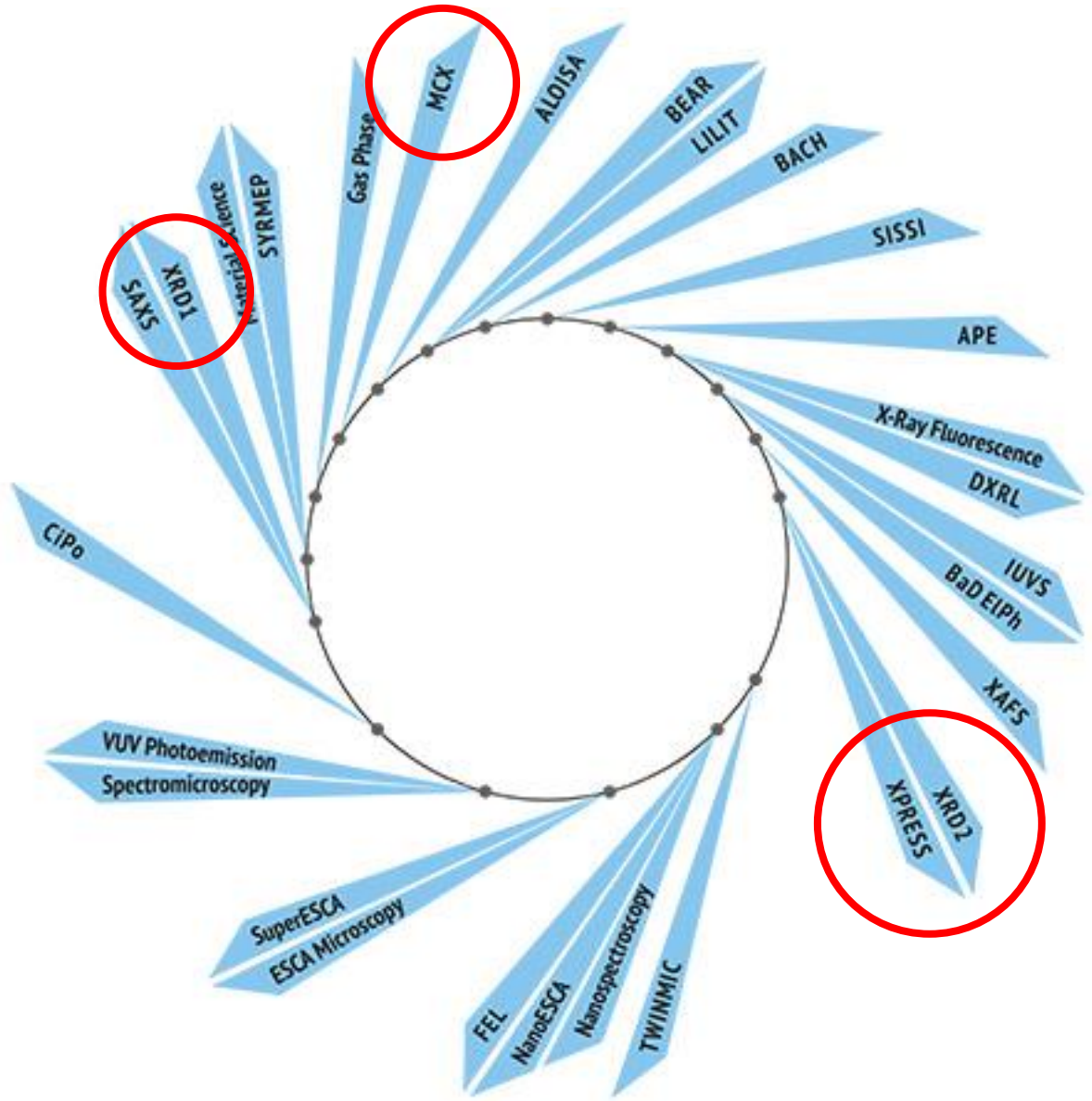
- XRD1 (1997)

Diffraction beamlines at Elettra



- XRD1 (1997)
- MCX (2007)

Diffraction beamlines at Elettra



- XRD1 (1997)
- MCX (2007)
- Xpress (2016)
- XRD2 (2018)

XRD2 – Macromolecular Crystallography

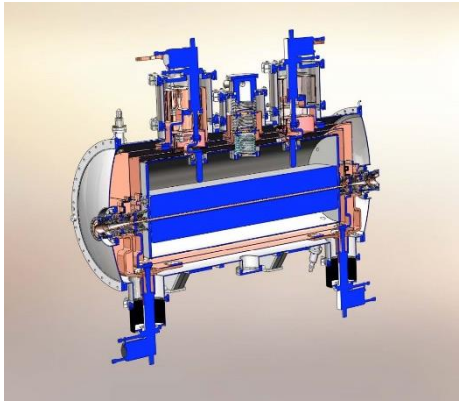
Beamline

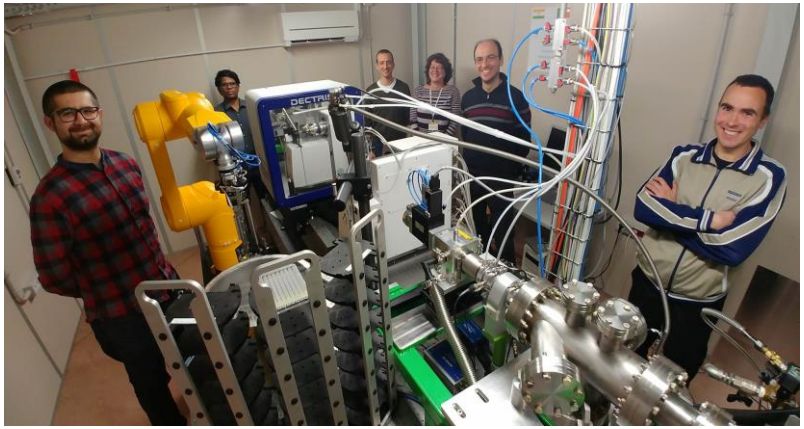
Source: superconducting wiggler

Fully tunable 8-20 KeV (35 KeV)

Optimized for SeMet

Native beam 300 um x 100 um





Diffractometer

MD2→ kappa

Apertures (um)

20, 50, 75, 100

Detector Pilatus 6M

Shutterless

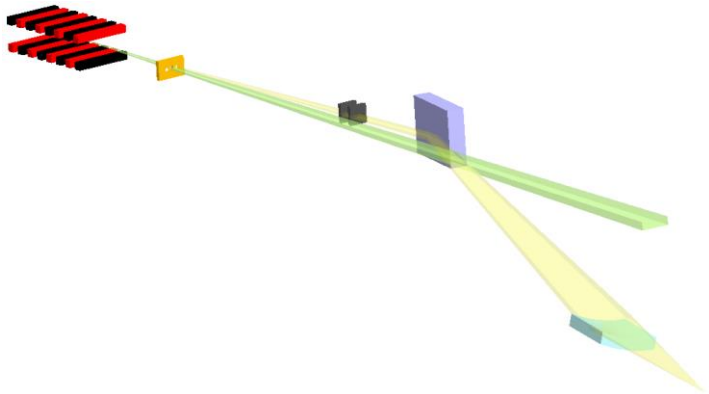
SampleChanger

UNIPUCKS automation

Capacity 188 samples

Dryer , lid, barcode

XPress – High pressure diffraction

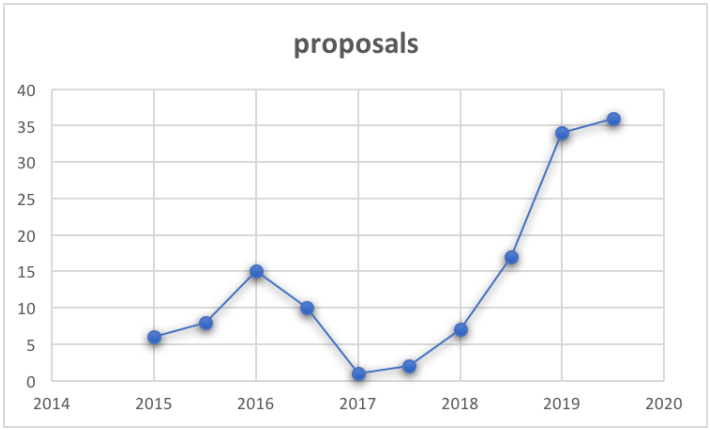


X-ray Energy 25 keV

Acceptance 500*120 μrad^2

Flux in 80*80 μm^2 aperture at sample:

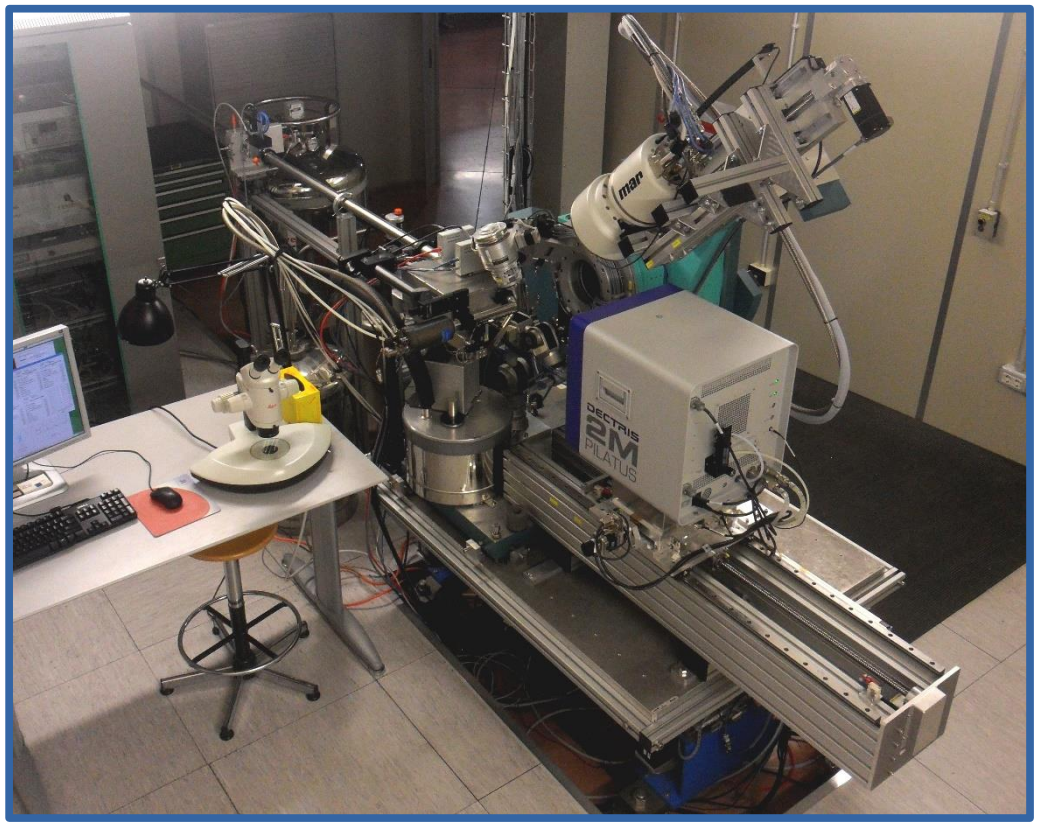
10^{11} ph/s @ 2.4 GeV, 100mA



XRD1 – General purpose diffraction

- Wiggler as source ($5 \cdot 10^{12}$ph/s)
- Wide spectrum 4-21.5 keV
- Beam size: 200μm – 30μm

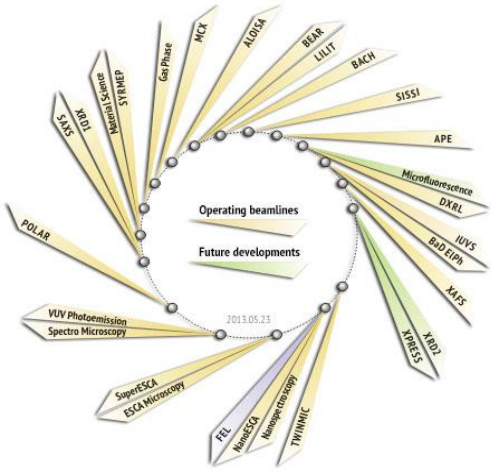
- Huber k-geometry goniometer
- Spine compliant robotic arm for automatic sample mounting,50 samples capacity (ESRF puck)
- Large single photon counting area detector (Dectris 2M)
- 9mm^2 fluorescence detector



- At the present mainly used for: (i) single crystal for molecular structural solution (small molecules, supramolecular chemistry), (ii) grazing incidence diffraction (in-plane and out-of-plane), (iii) material science (phase transitions)

MCX – Powder diffraction

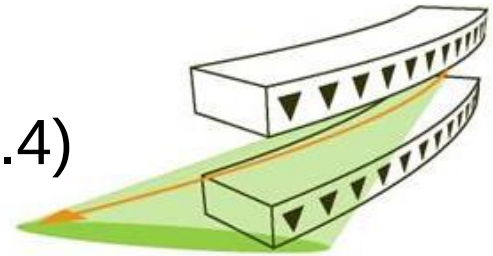
- The Materials Characterization by X-ray diffraction (MCX) beamline allows to perform a wide range of non-single crystal diffraction experiments: grazing angle diffraction and reflectivity, residual stress and texture analysis, phase identification and structural studies and kinetic studies



MCX - Optical scheme

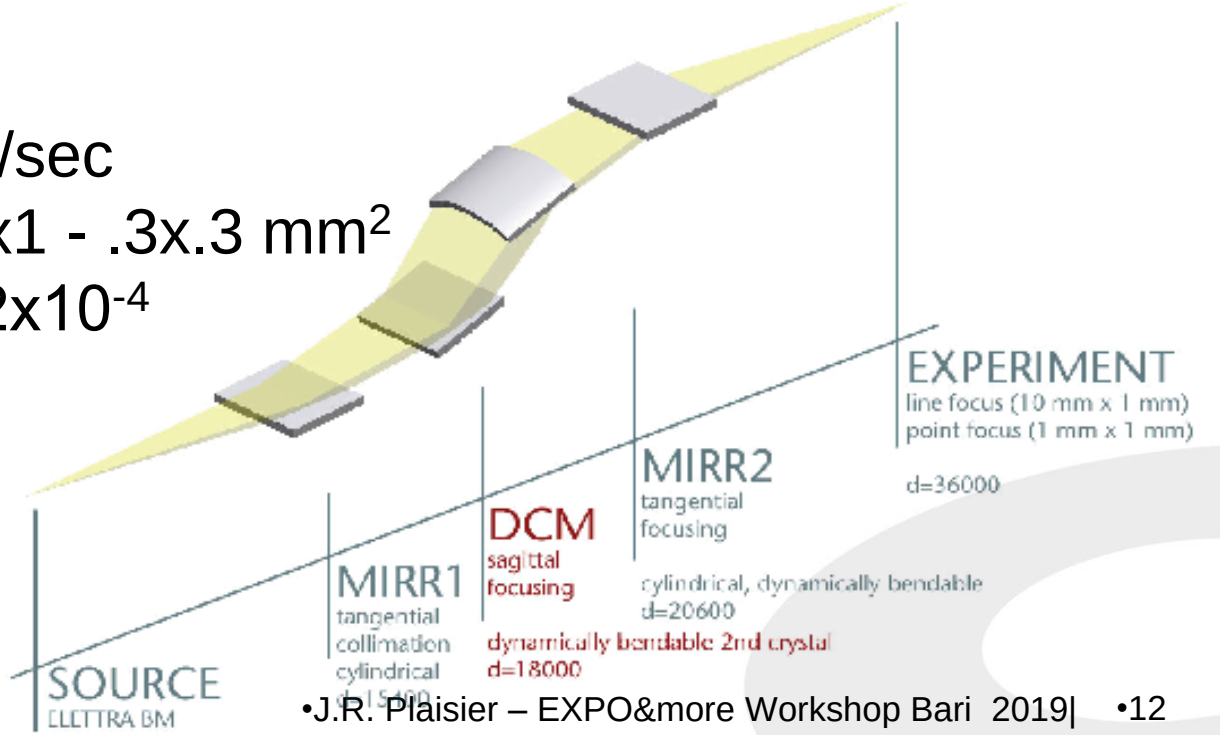
Light Source:

- Bending magnet
- Critical energy : 3.2keV (2.0) , 5.5keV (2.4)



X-rays at sample:

- Energy range : 6-22 keV
- Photon flux : 10^{11} photons/sec
- Beam size at sample : 10x1 - .3x.3 mm^2
- Energy resolution : $\Delta E/E$ $2x10^{-4}$



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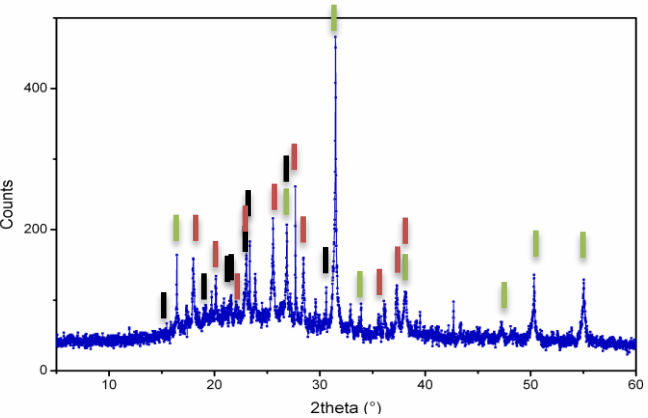
MCX - Experimental station

- Huber 4 circle diffractometer (.0001° precision in 2θ)
- Analyzer crystal / scintillator detection system or CCD
- Transmission geometry, reflection geometry, grazing incidence diffraction
- Temperature control from 100 K to 1273 K
- Fluorescence detector

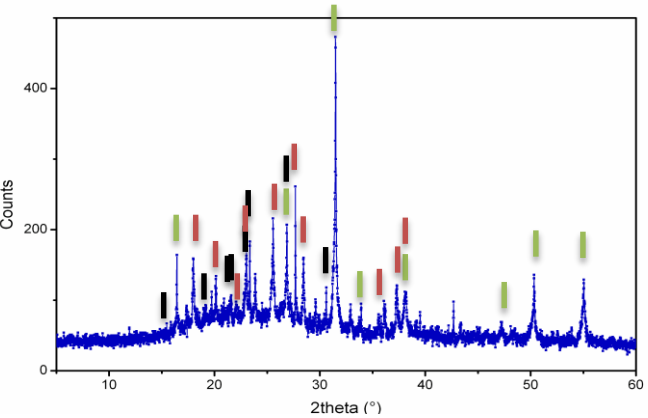
Diffraction experiments at MCX

Phase Identification

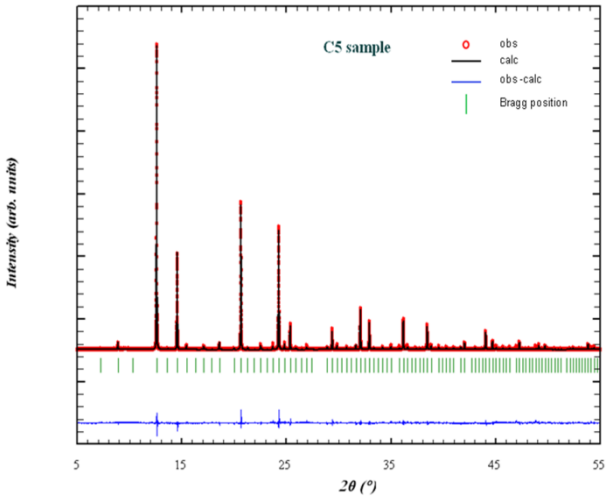


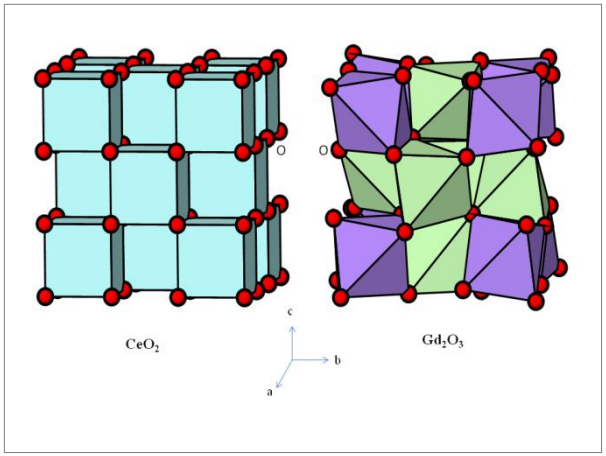
Diffraction experiments at MCX

Phase Identification



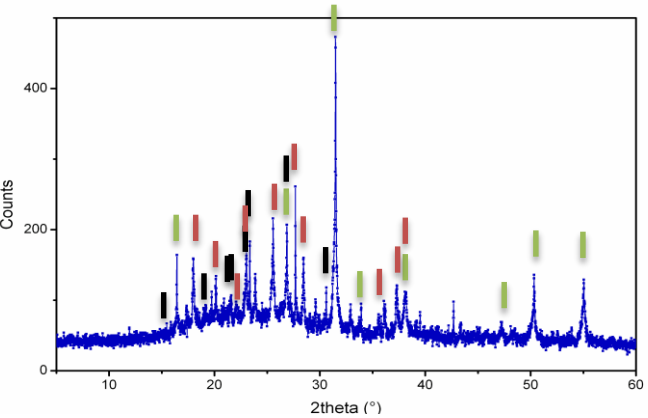
Structure Determination



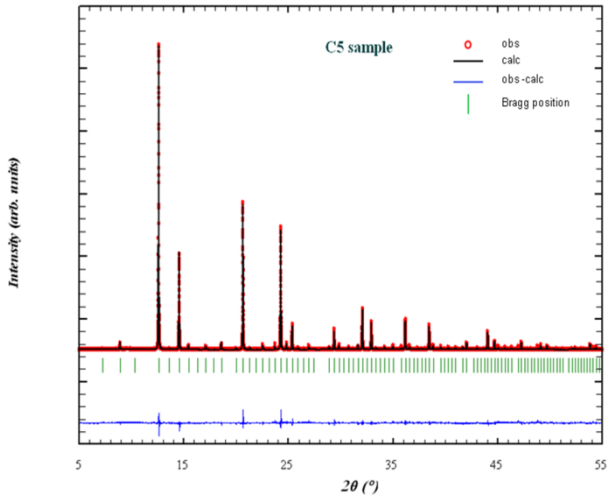


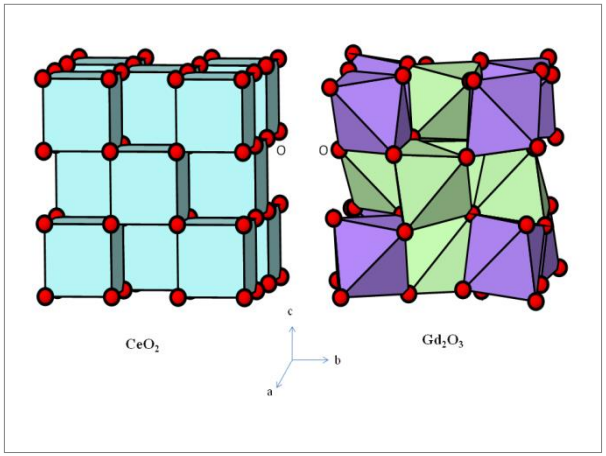
Diffraction experiments at MCX

Phase Identification

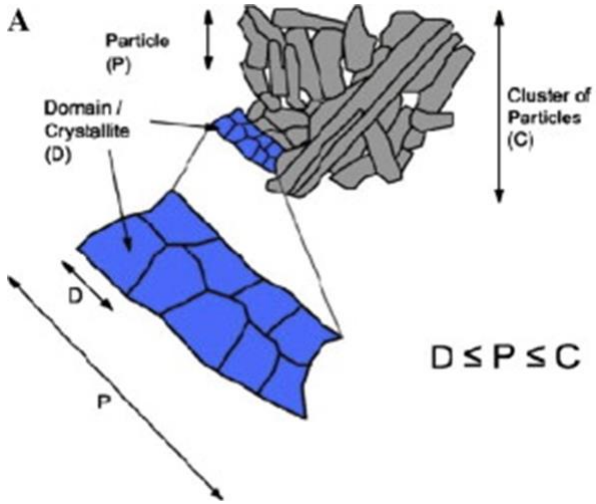


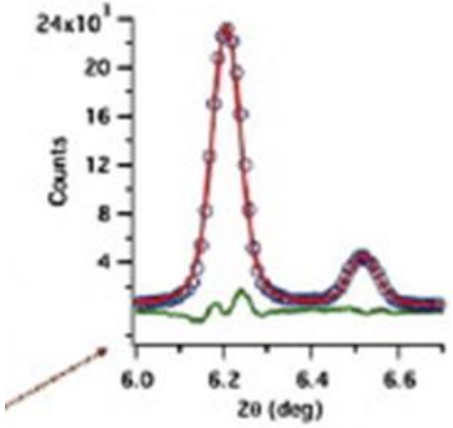
Structure Determination





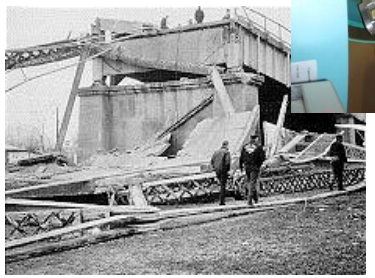
Line Profile Analysis

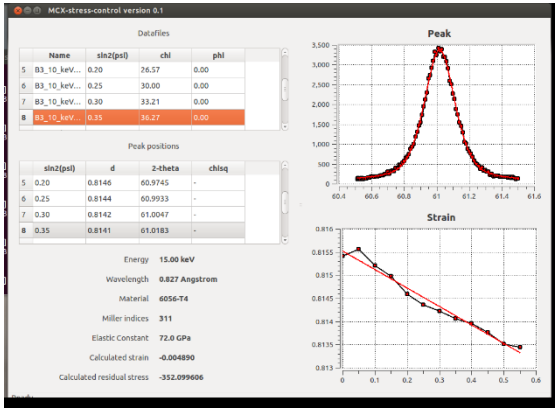




Diffraction experiments at MCX

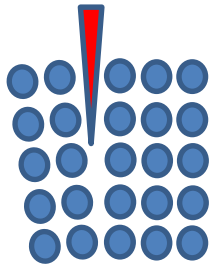
Residual Stress Analysis

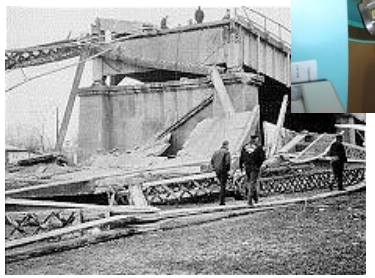


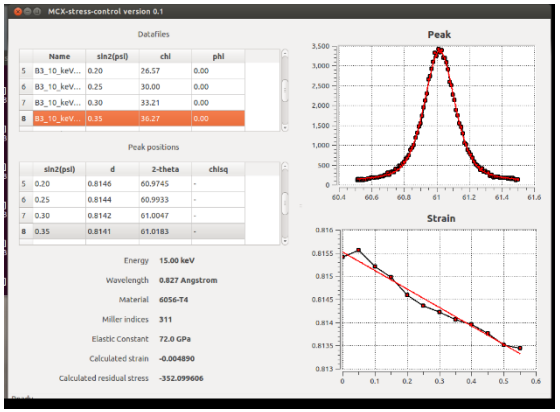


Diffraction experiments at MCX

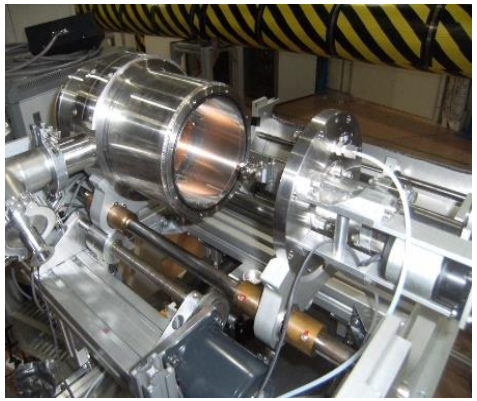
Residual Stress Analysis

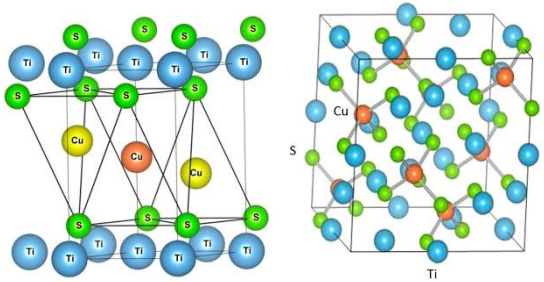


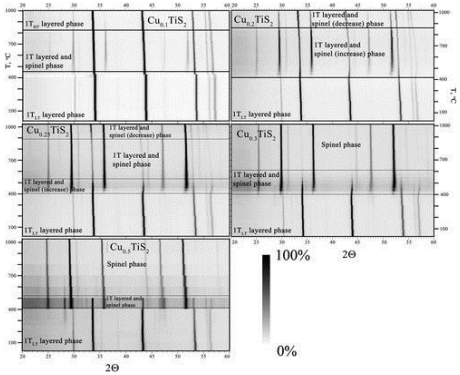




Non ambient conditions

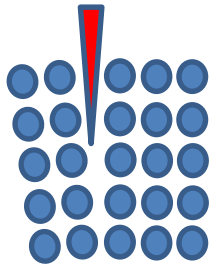


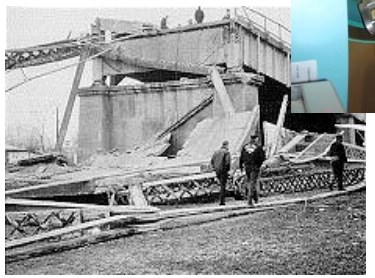


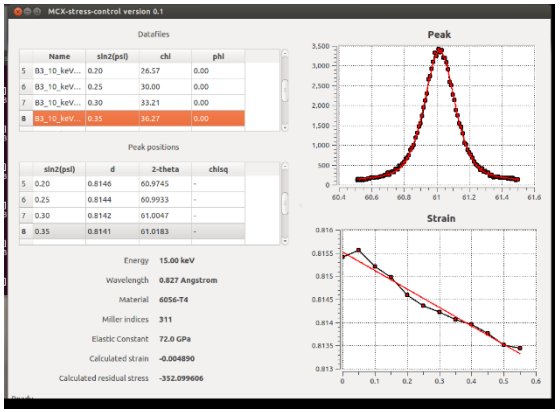


Diffraction experiments at MCX

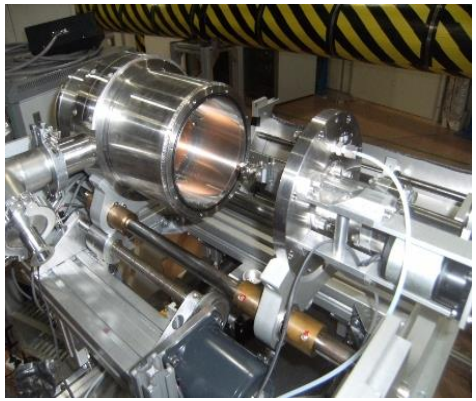
Residual Stress Analysis

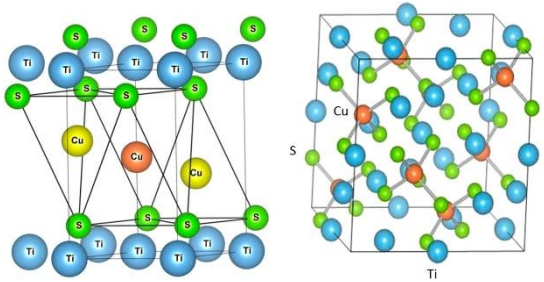


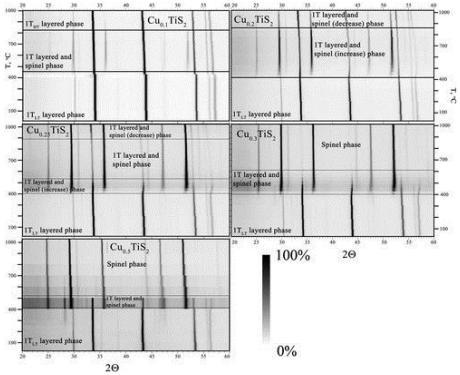




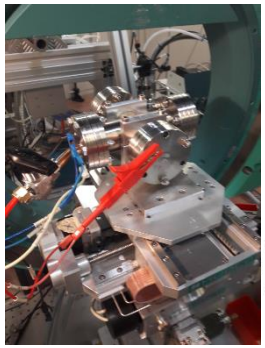
Non ambient conditions

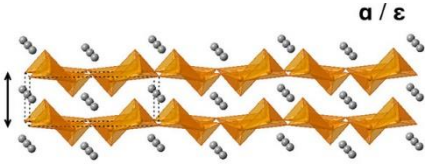


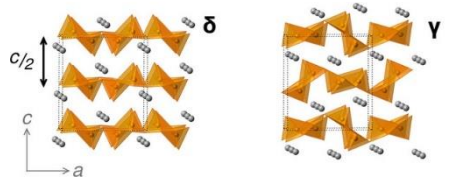


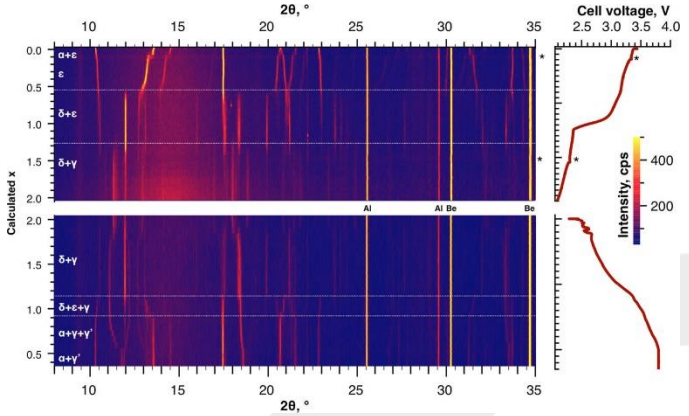


Operando









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MCX and EXPO?

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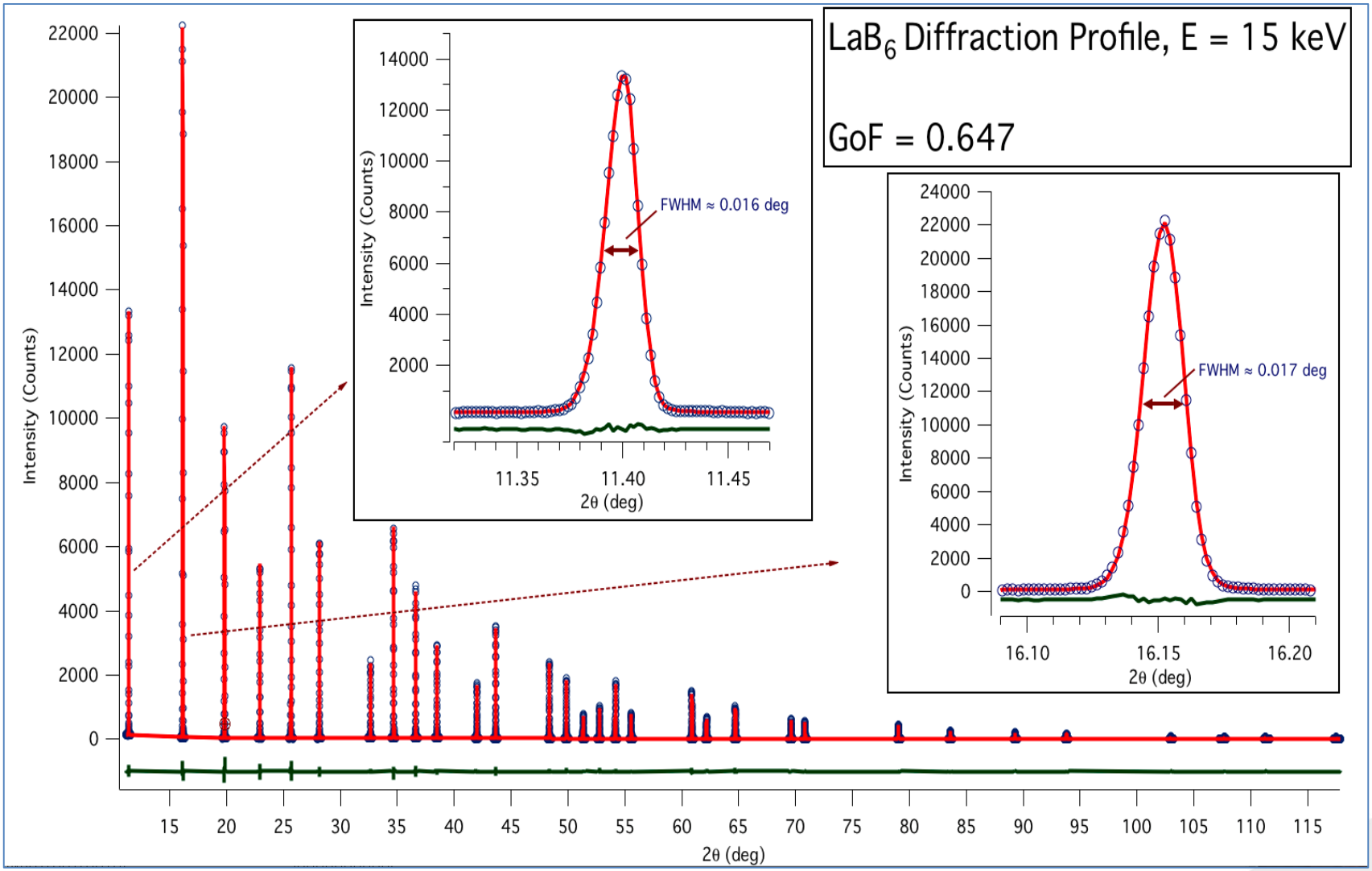
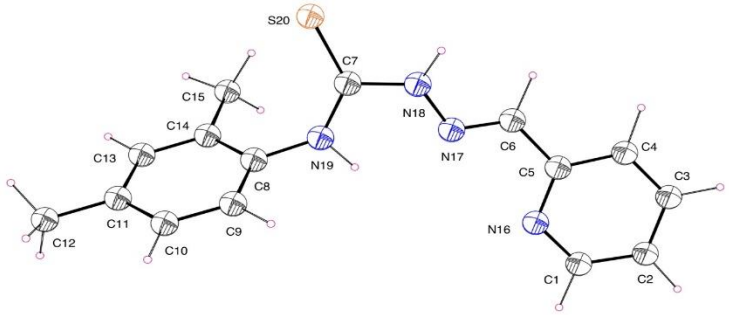
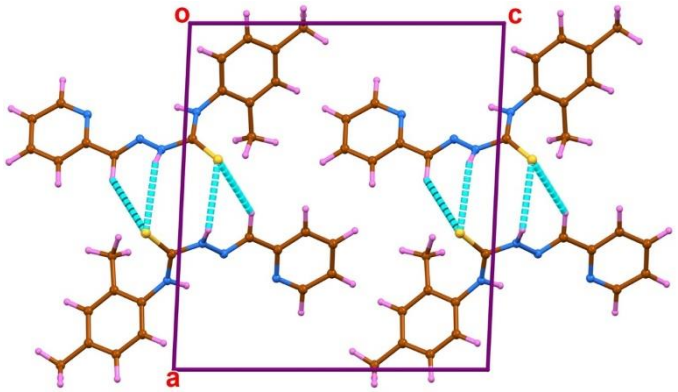
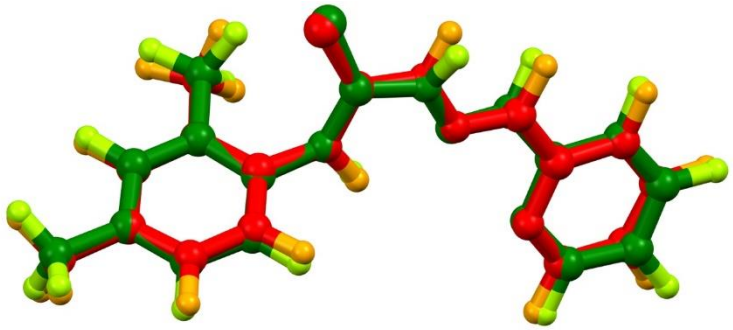


MCX and EXPO?







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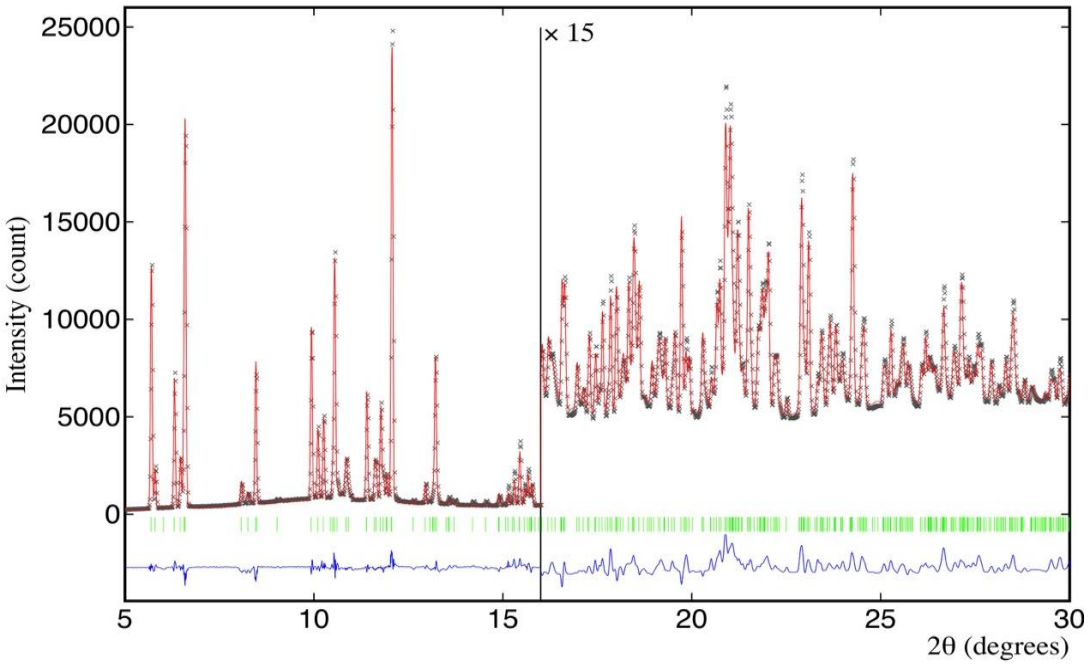

Chemical formula	$C_{15}H_{16}SN_4$
a, b, c (Å)	14.1186(5), 7.9535(2), 13.3615(7)
b (°)	92.8285(2)
V (Å^3)	1498.58
Z	4
Space group / system	C2 / Monoclinic
Radiation type	Synchrotron, λ = 0.7 Å
2q values (°)	$2q_{min}$ = 5°, $2q_{max}$ = 30°, $2q_{step}$ = 0.01°
R_{wp}, R_p, R_{exp}, S	0.0655, 0.0455, 0.0338, 1.937
No. of data peaks/parameters	356/45

Elettra Sincrotrone Trieste

General info

- Deadline for proposals every six months: March 15th and September 15th
- For more info visit our website:
  - www.elettra.eu/elettra-beamlines/mcx.html
- Contact us!
  - jasper.plaisier@elettra.eu
  - lara.gigli@elettra.eu
  - mattia.gaboardi@elettra.eu

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