



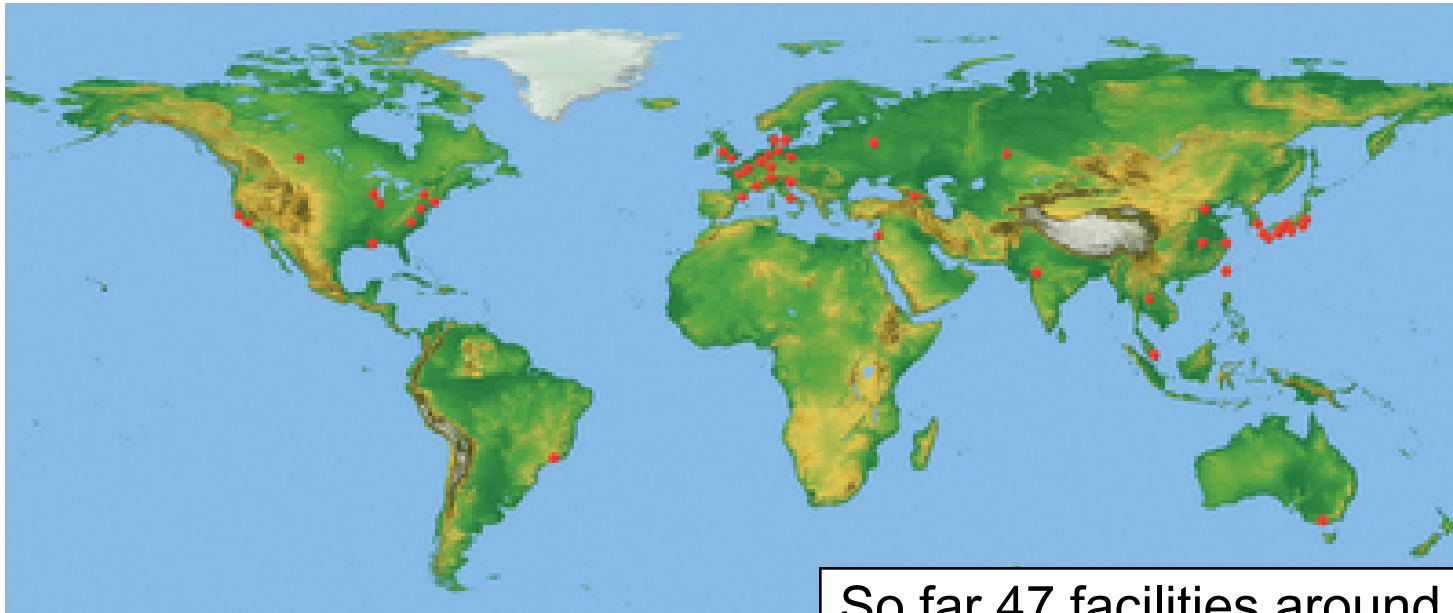
SYNCHROTRON
THAILAND
CENTRAL LAB

Overview of SLRI

ดร. แพร จิรวัฒน์กุล

สถาบันวิจัยแสงซินโครตรอน (องค์การมหาชน)

Synchrotron Facility



So far 47 facilities around the world



Spring 8

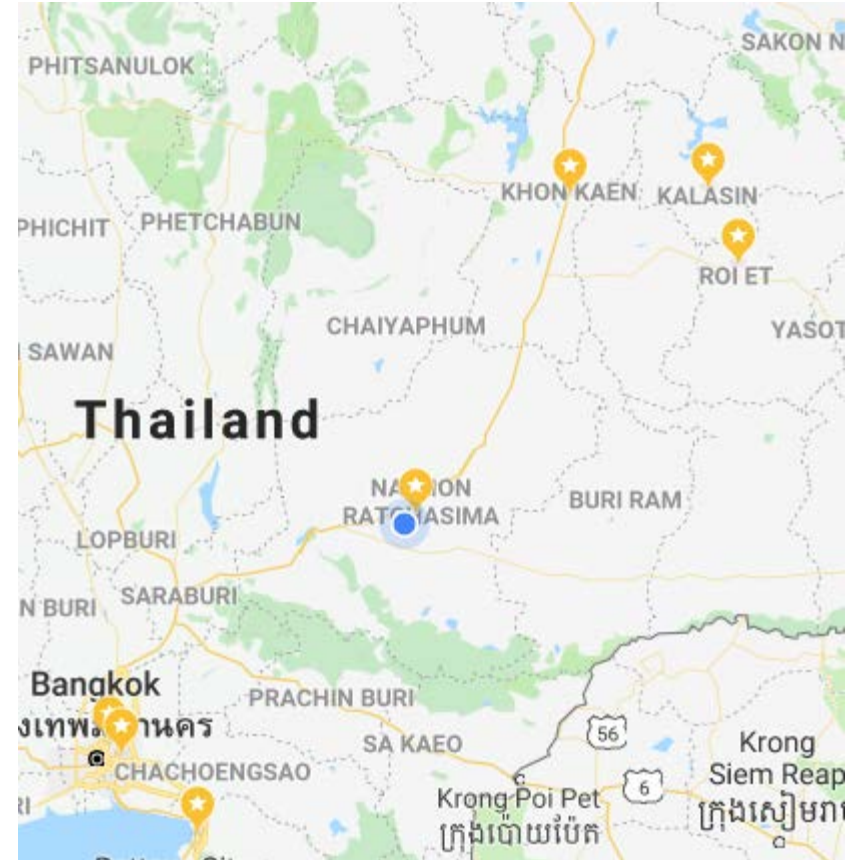


ESRF

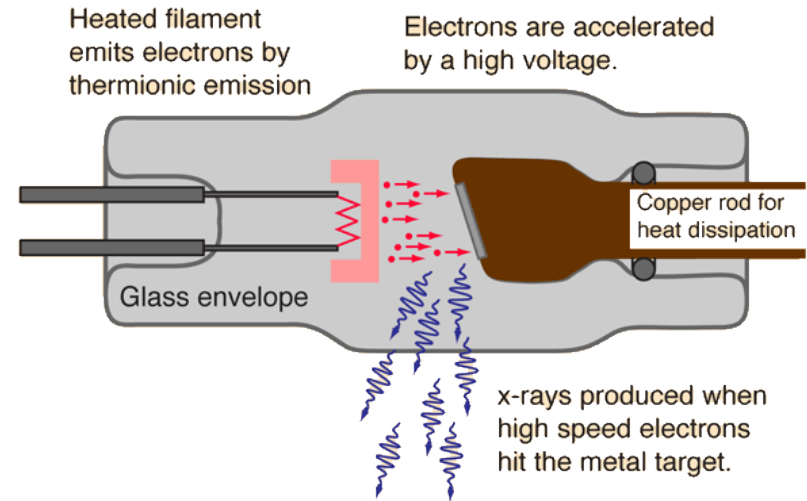
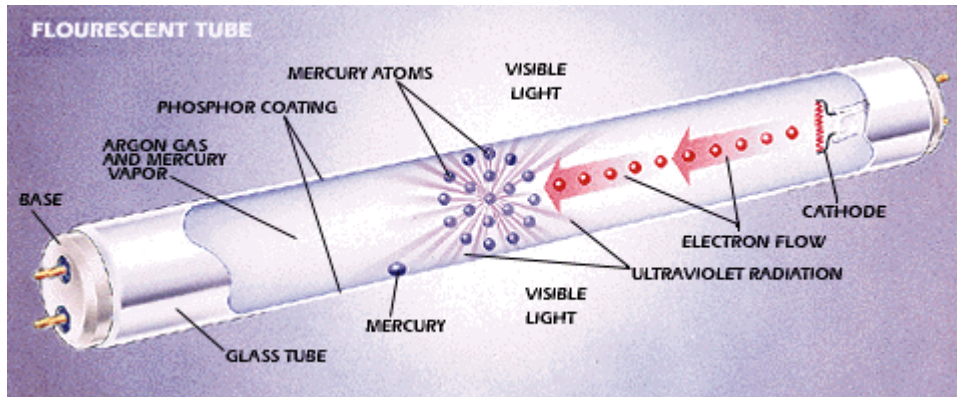


APS

Synchrotron Light Research Institute (Public Organization)



Light from bound electrons

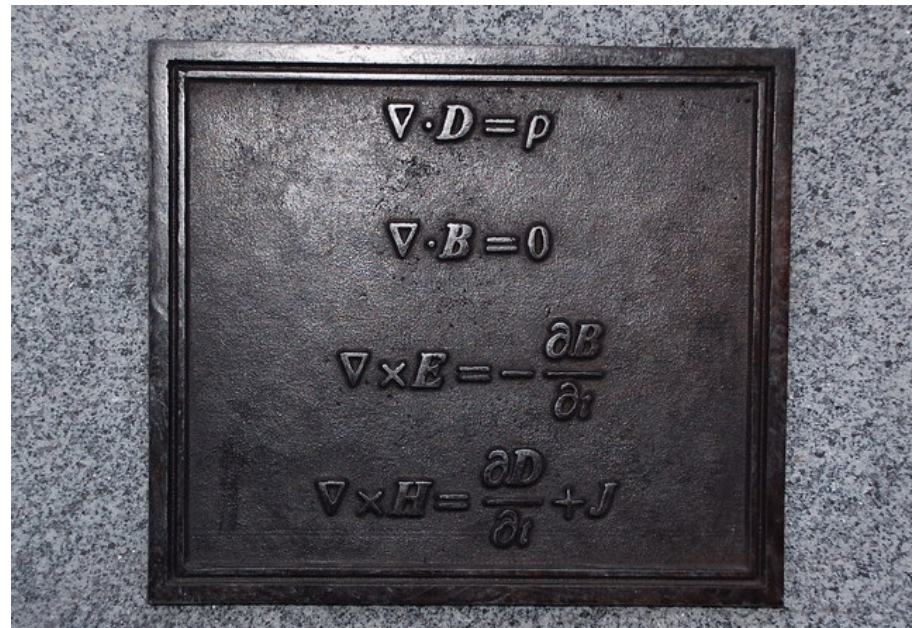


- Single photon energy
- Low in intensity

Light from free electrons

- Continuous energy
- Defined direction
- High intensity

Maxwell's equation 1873



“Accelerated charges emit light.”

Light from free electrons

Have we seen this phenomenon before?

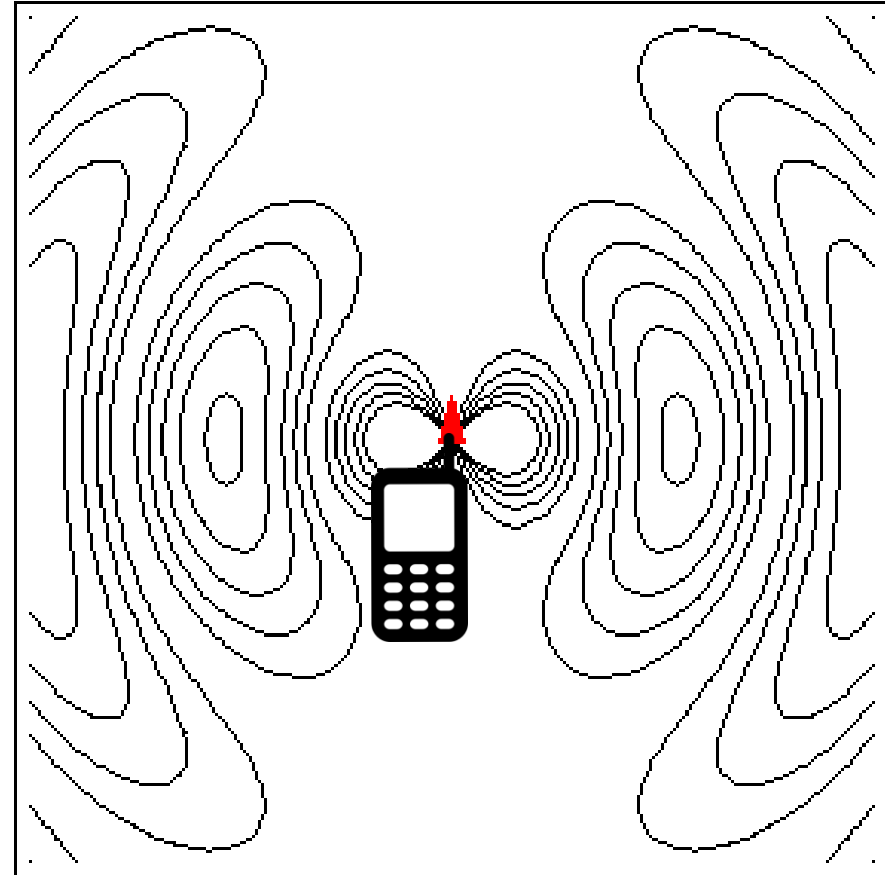
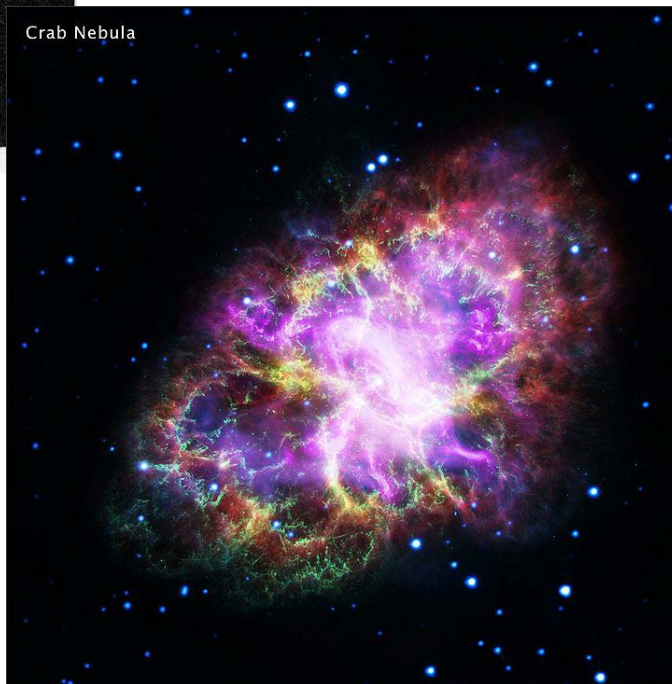
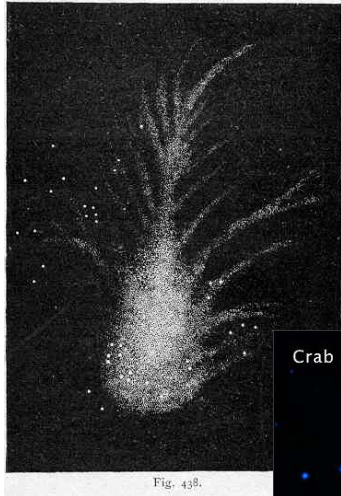
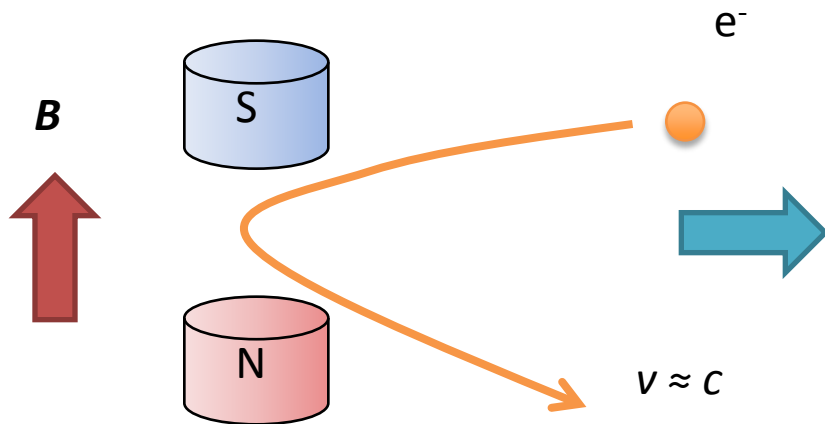


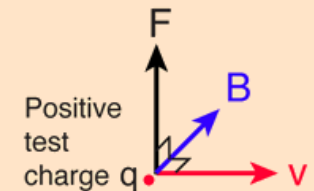
Fig. credit: https://en.wikipedia.org/wiki/Crab_Nebula

“Magnet”



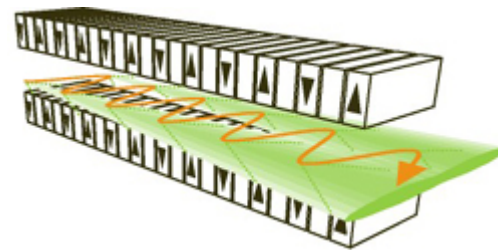
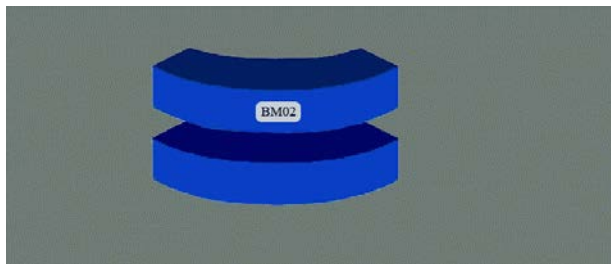
Lorentz Force Law

$$\vec{F} = q\vec{v} \times \vec{B}$$

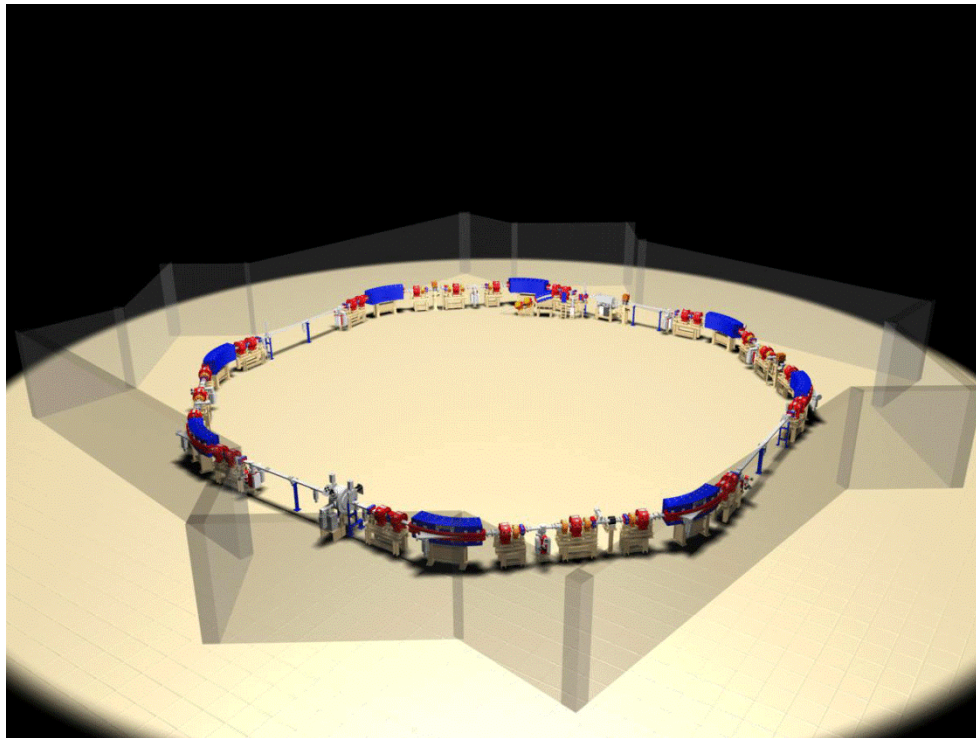


Insertion device:
Multi-pole wiggler/undulator

Bending magnet



Light from synchrotron



“Synchrotron produces high intensity light from an acceleration of electrons moving at the speed approaching the speed of light.”

Light from synchrotron

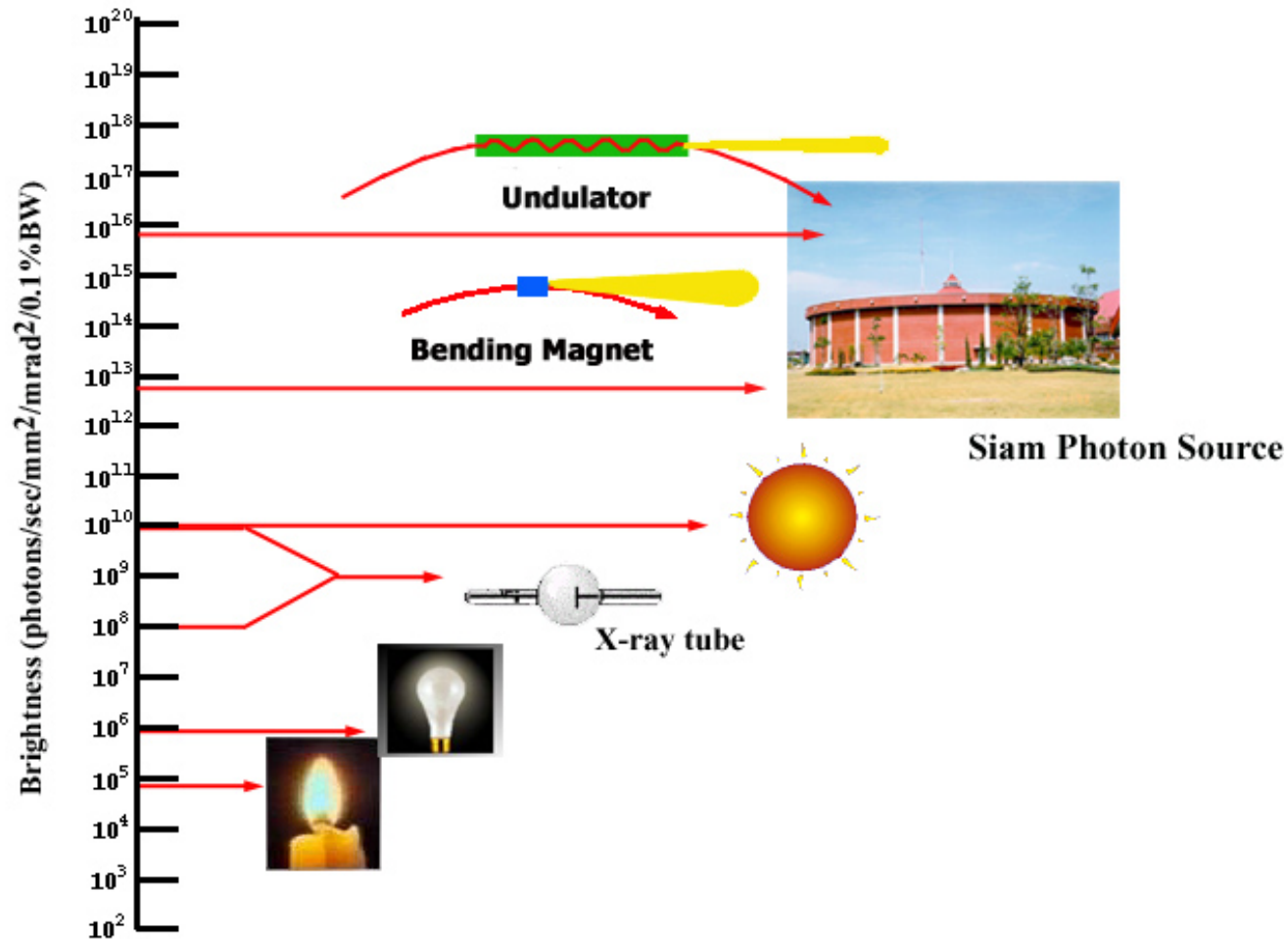
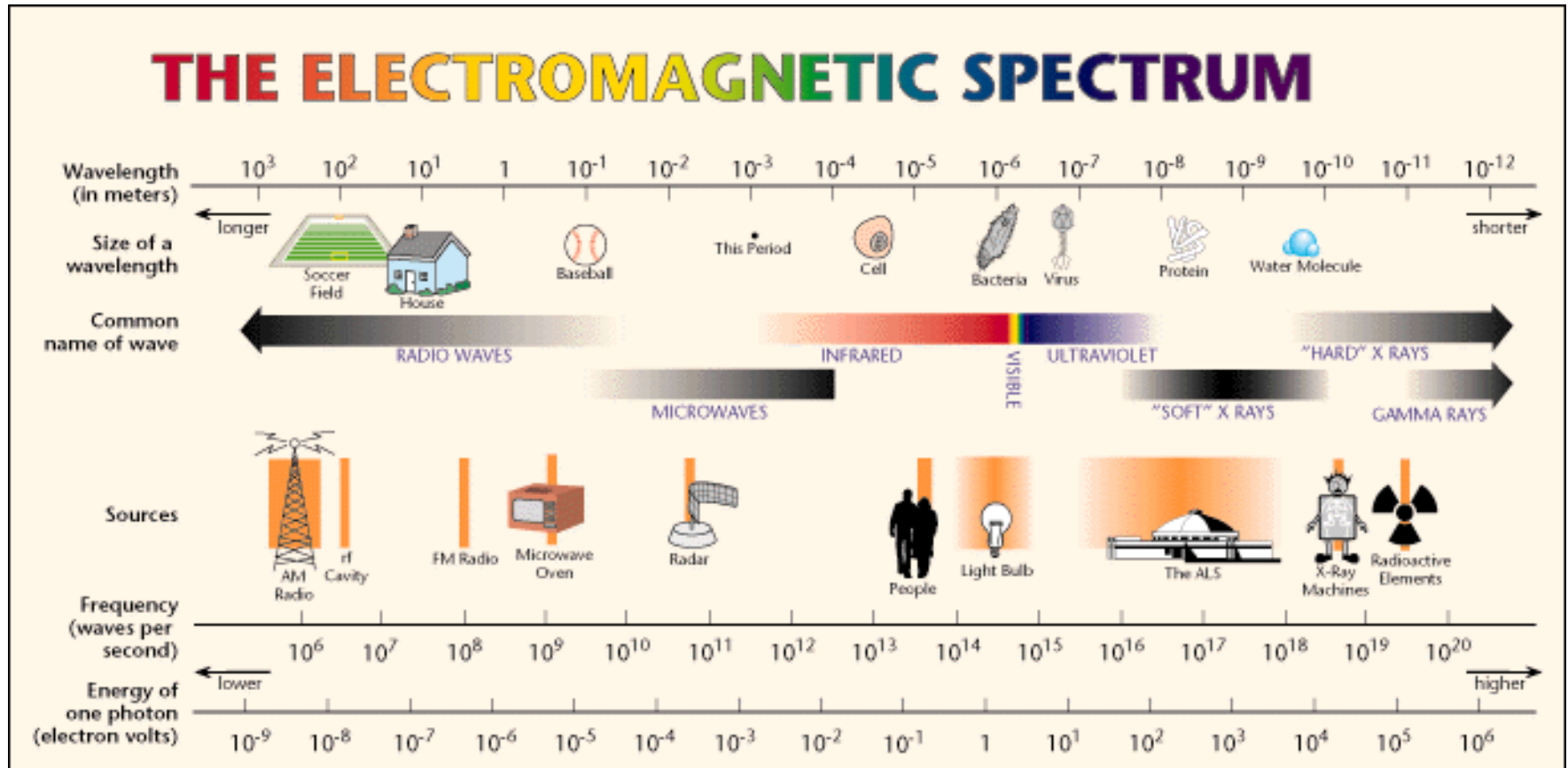
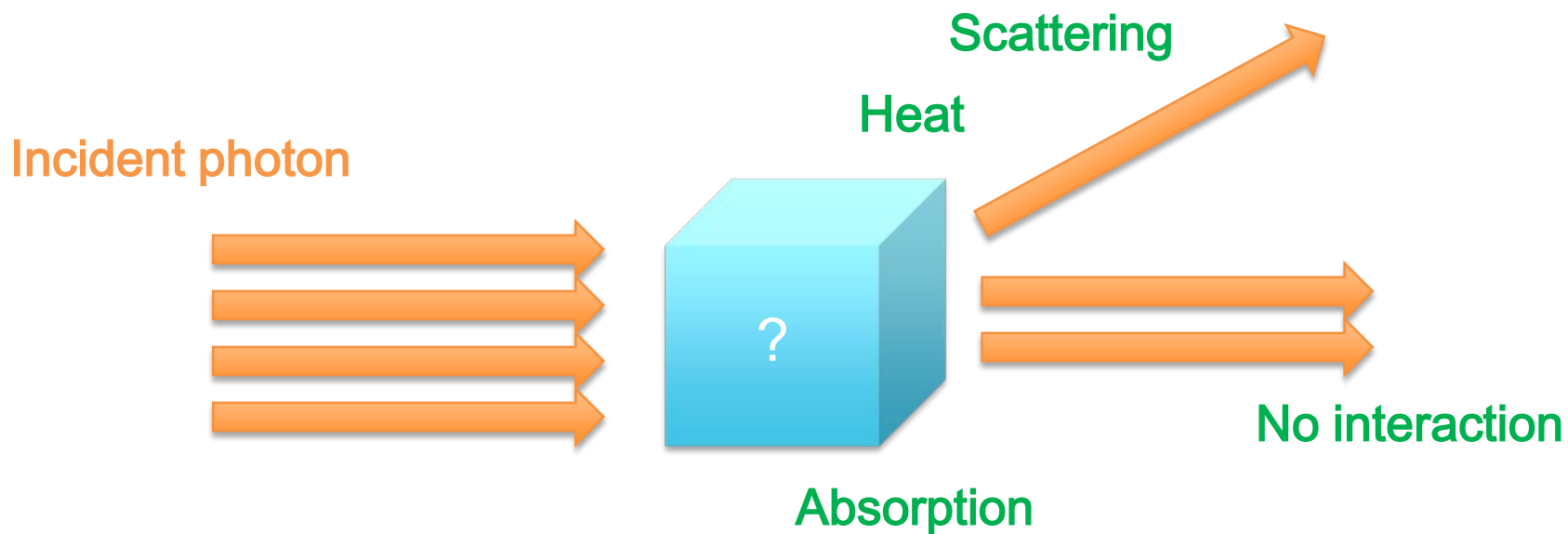
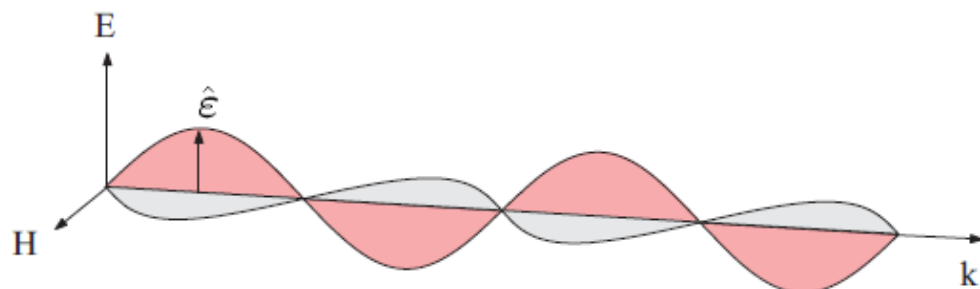


Fig. credit: S. Rugmai, SLRI

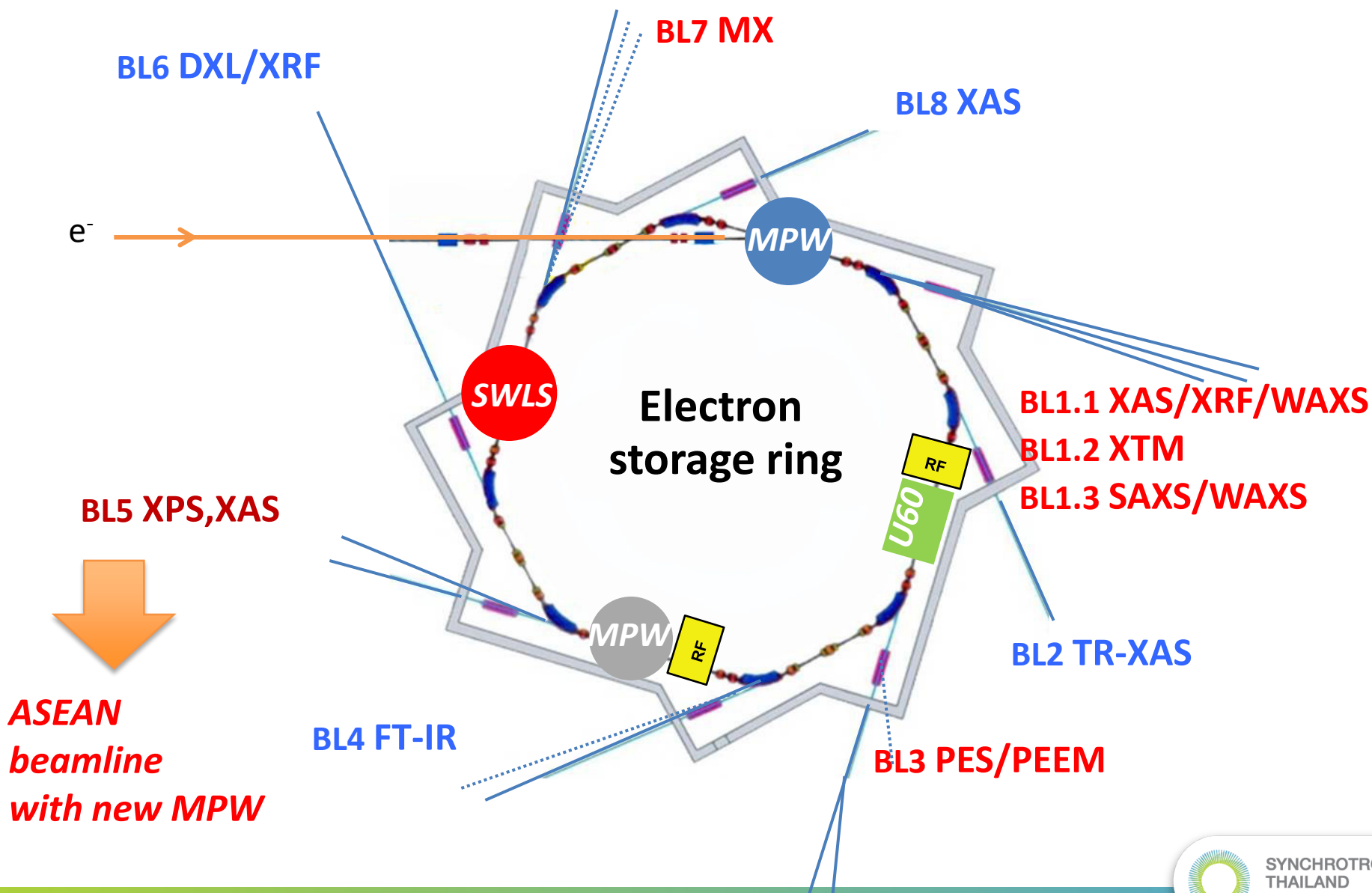
Light from synchrotron

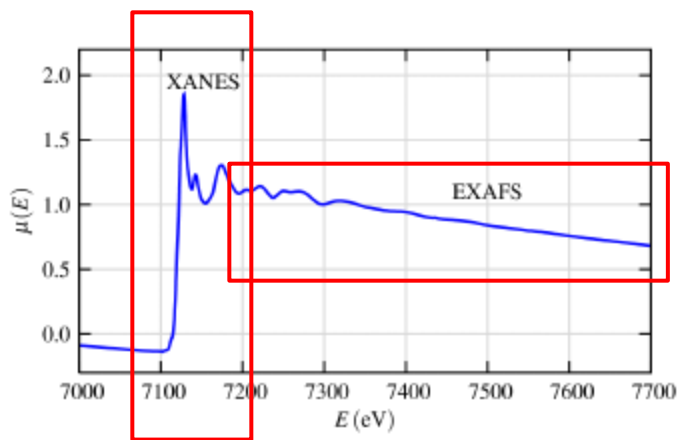
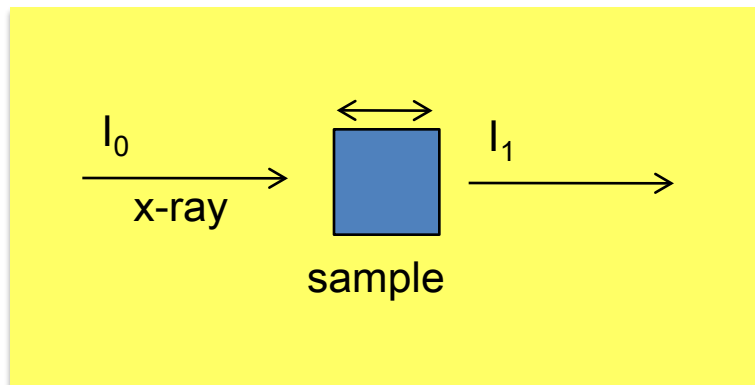


X-rays interaction with matter



SLRI beamlines





XANES – x-ray absorption near-edge spectroscopy

EXAFS – Extended x-ray absorption fine-structure

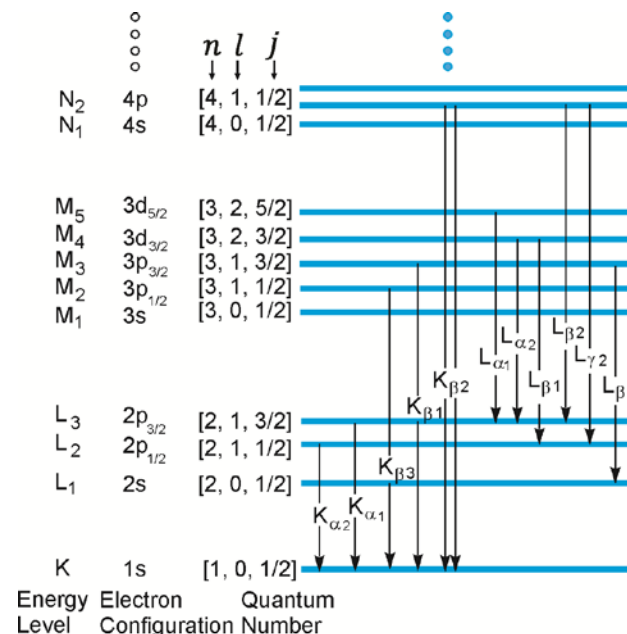
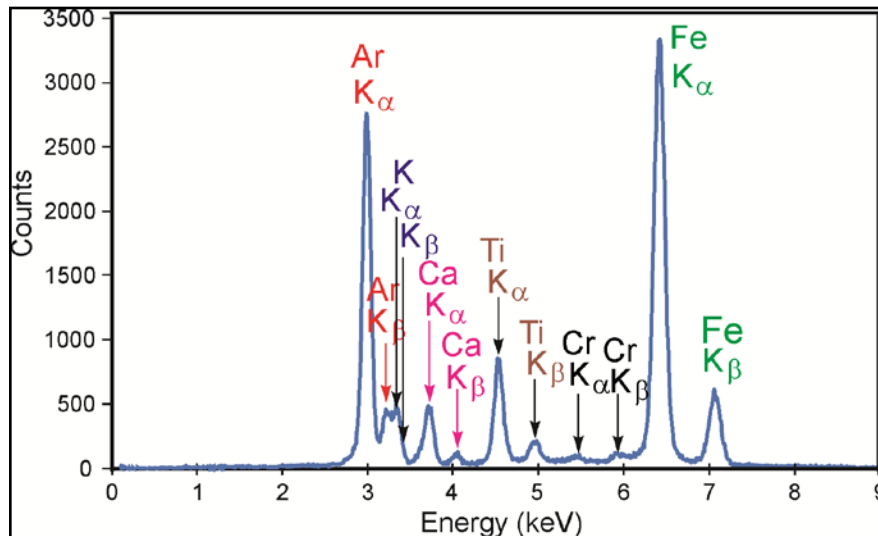
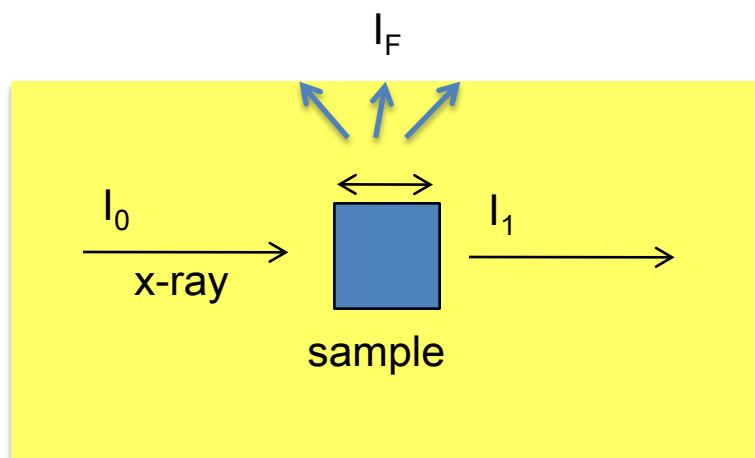
Local coordination environment

Application

- local structure refinement
- Speciation

Oxidation state, symmetry

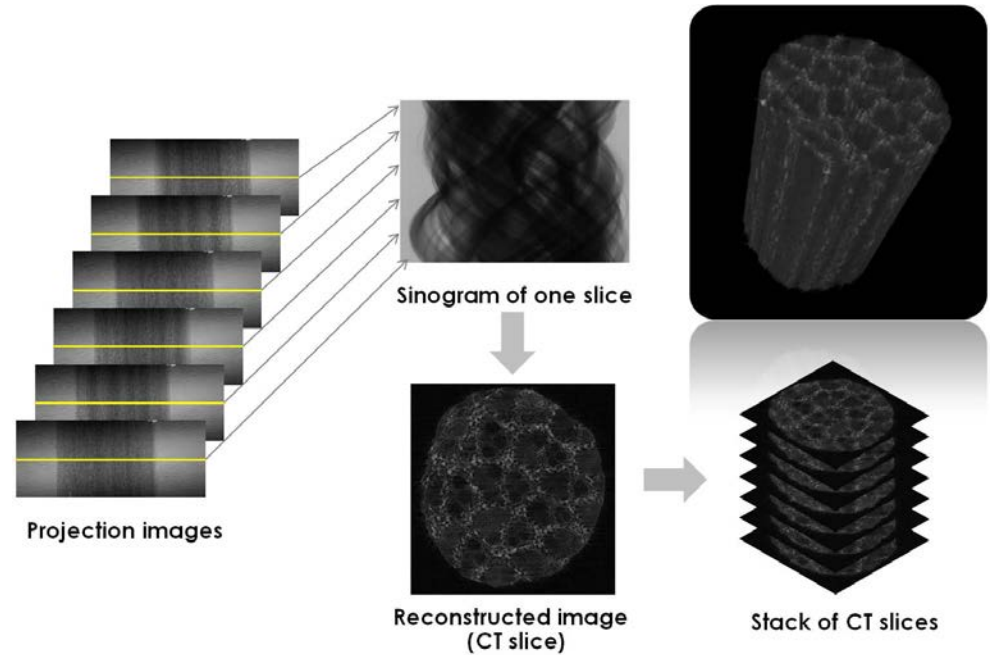
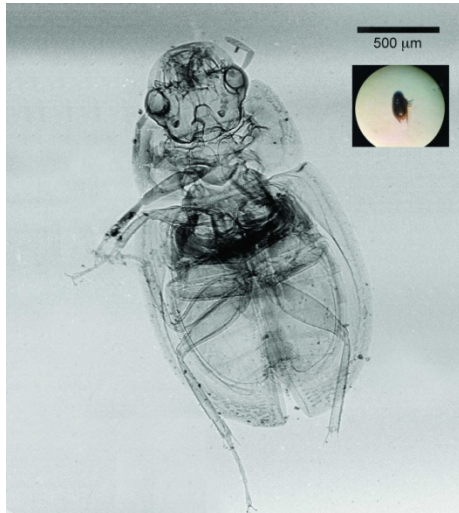
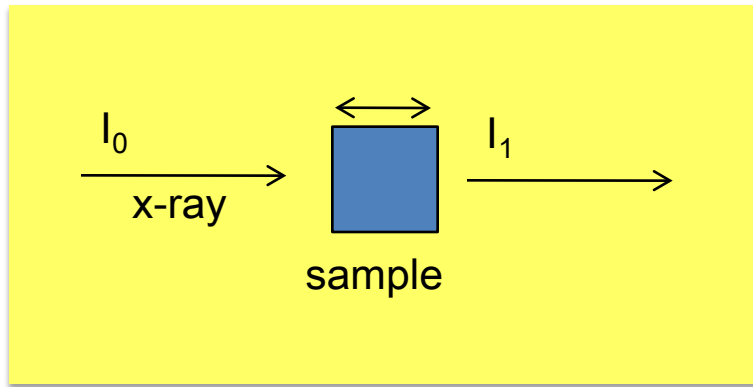
X-ray Fluorescence, XRF (BL1.1W, BL2.2, BL5.2, BL8, BL6b)



Application

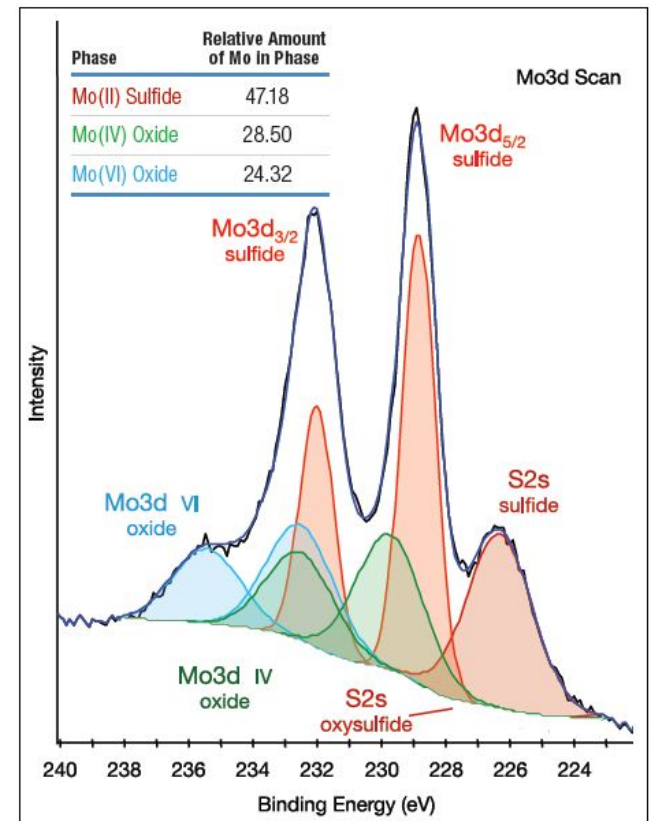
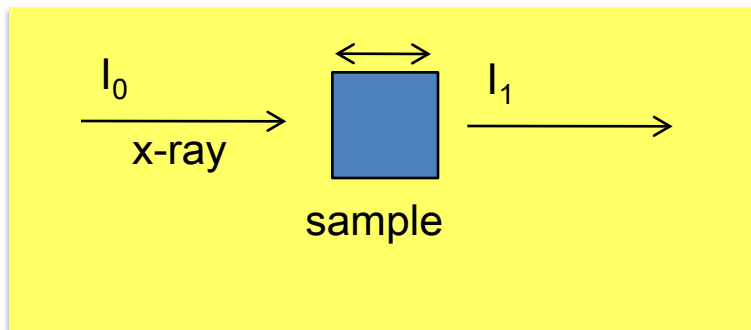
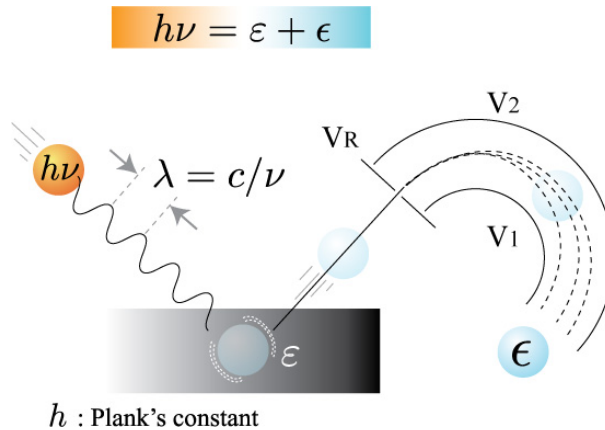
- Elemental identification
- Elemental mapping

Imaging and Tomography (BL1.2W)



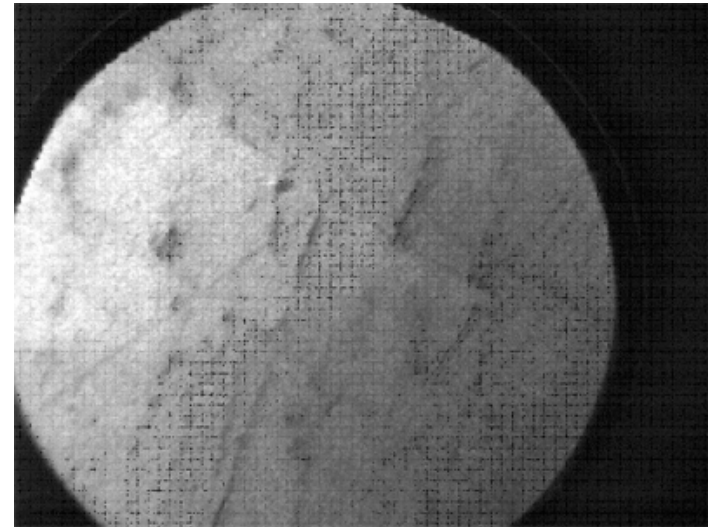
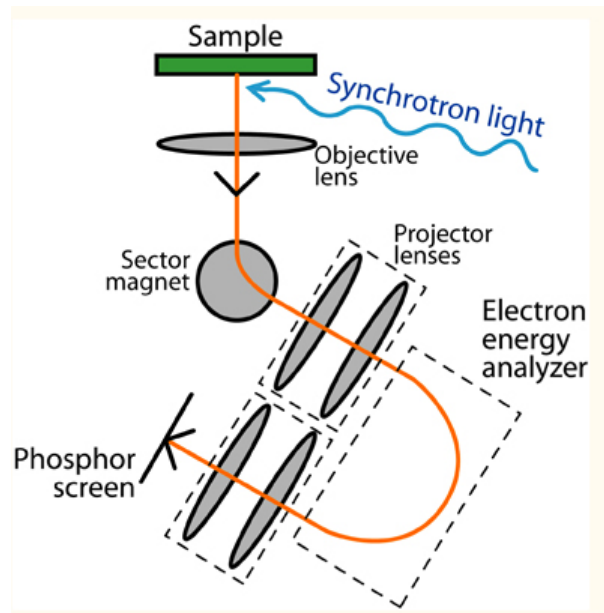
Application
- Microstructure

X-ray photoelectron emission spectroscopy, PES, XPS (BL3.2Ua, BL5.3)

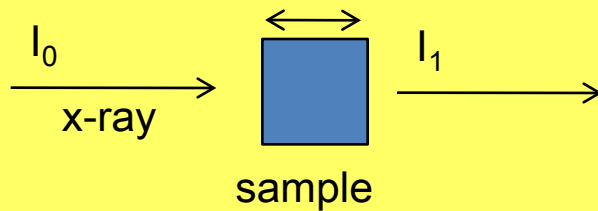


Application

- Work function
- Chemical state



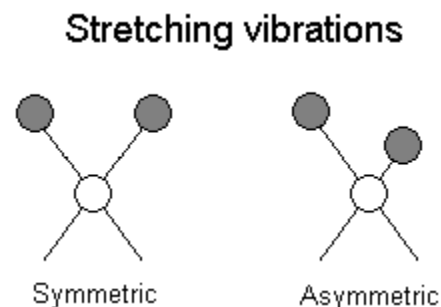
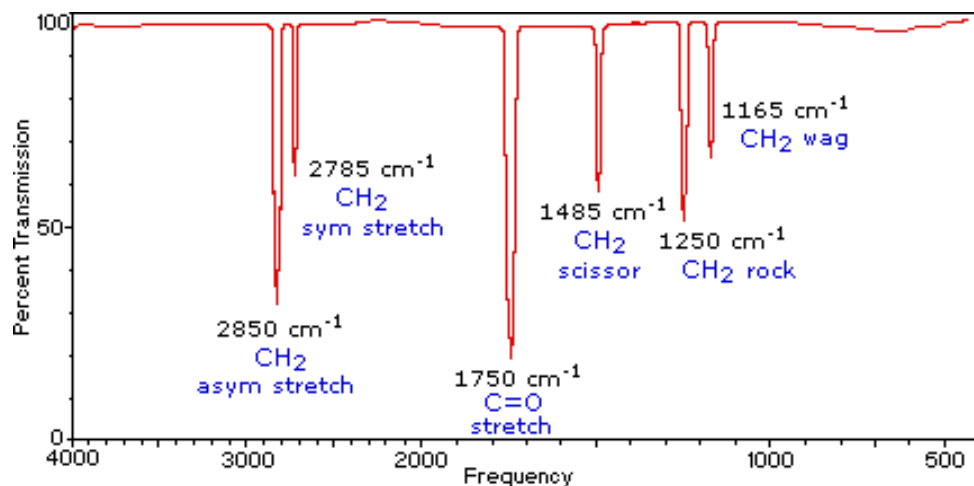
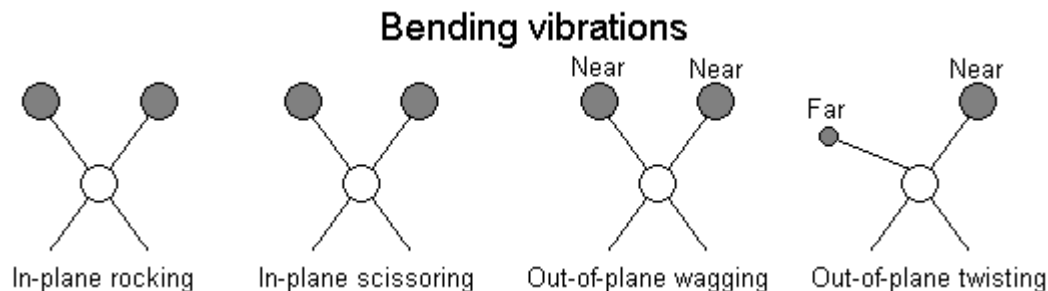
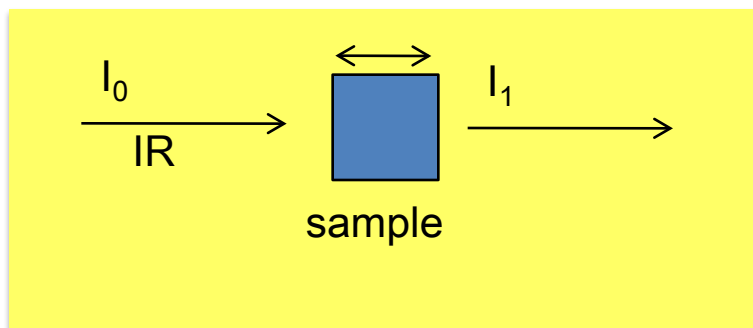
PEEM image of tungsten. Field of view is 75 microns.



Application

- Image of chemical information

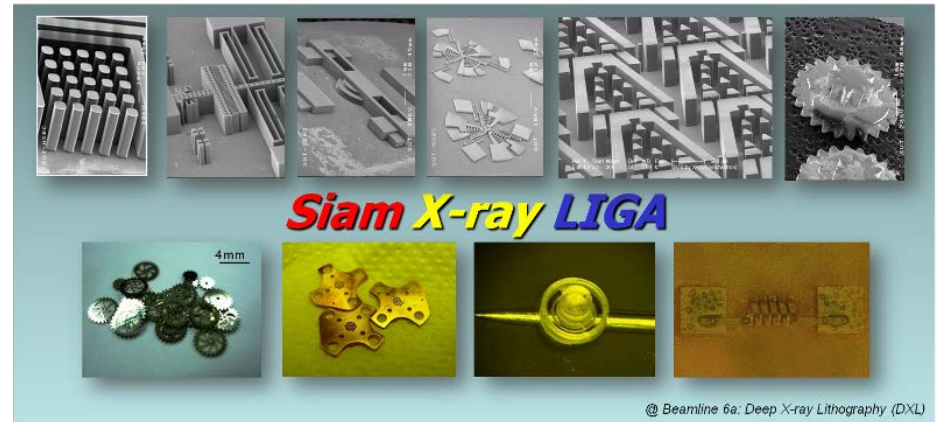
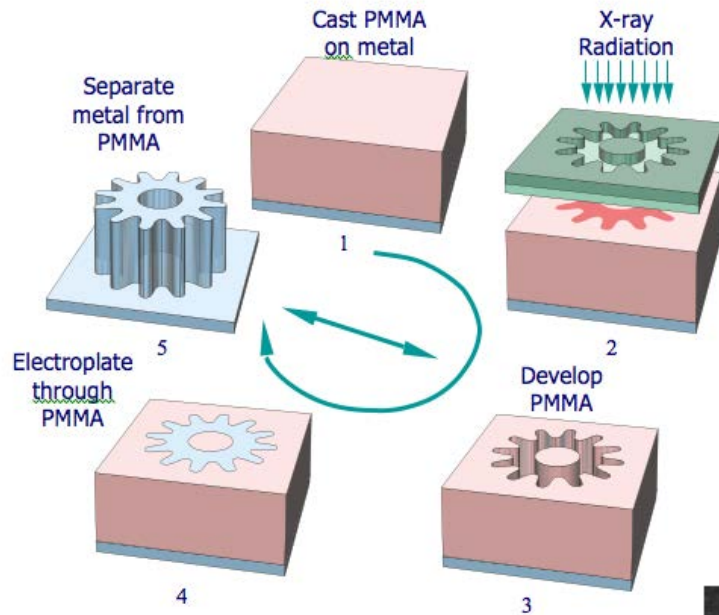
Infrared spectroscopy and imaging (BL4.1)



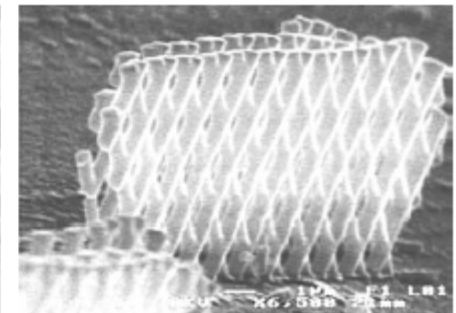
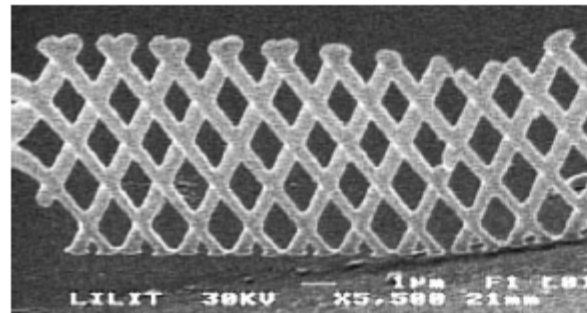
Application

- Functional group identification
- mapping

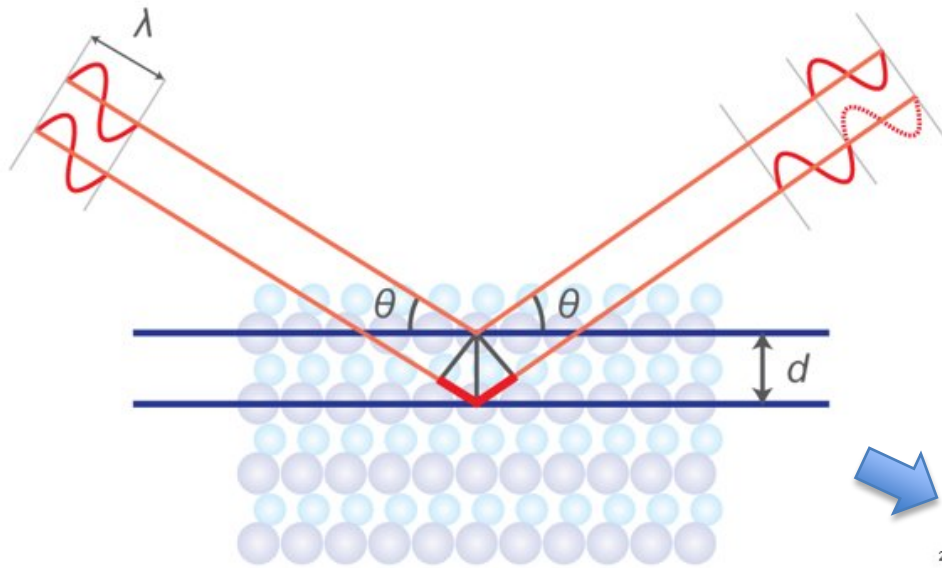
Absorption: Deep X-ray Lithography, DXL (BL6a)



Application
- micro fabrication

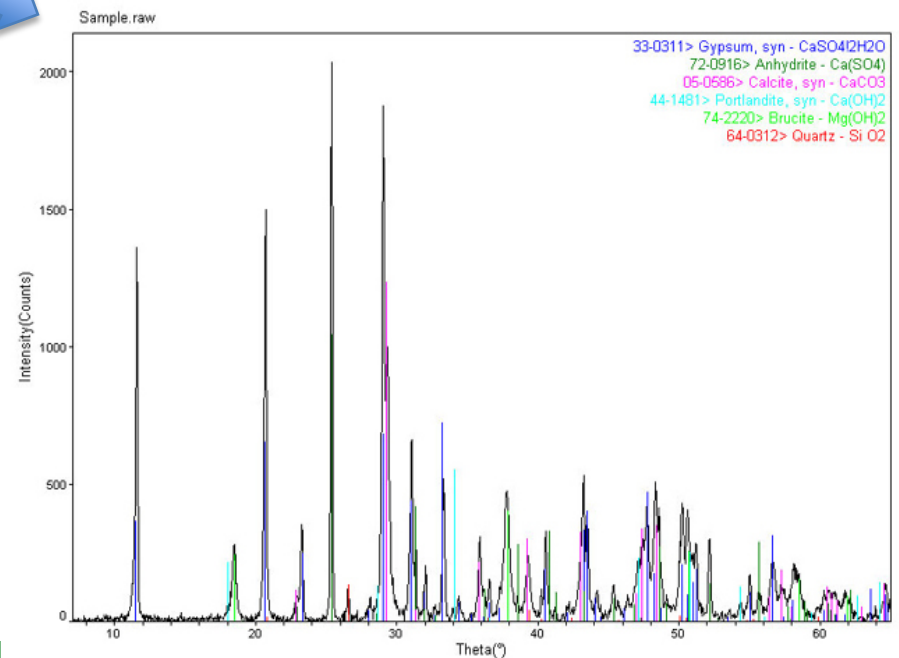


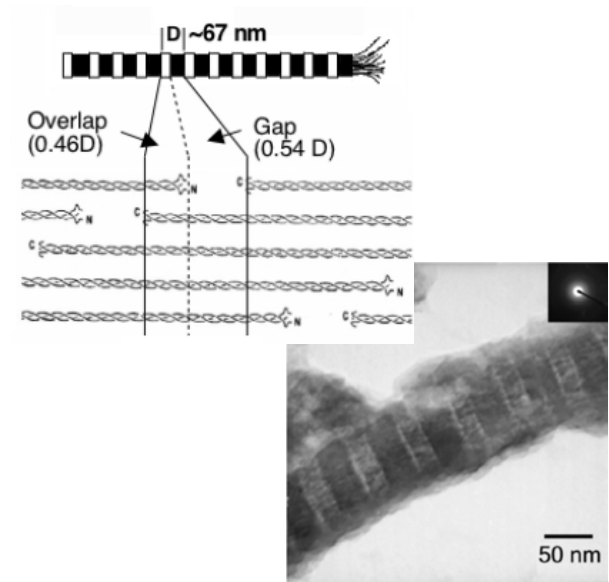
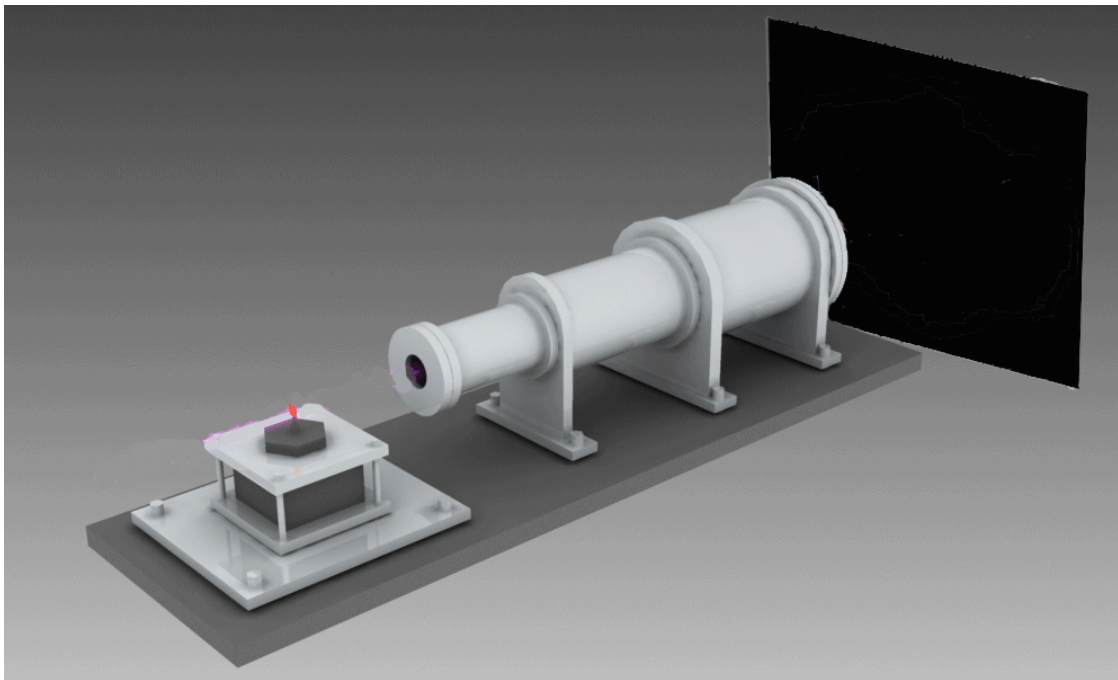
X-ray Diffraction, XRD (BL1.1W)



Application

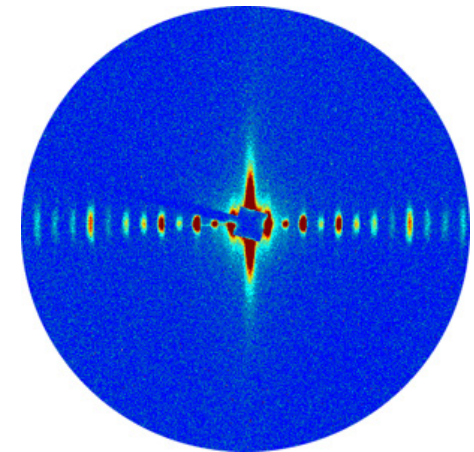
- Phase identification
- Stress/strain analysis
- Crystal structure refinement



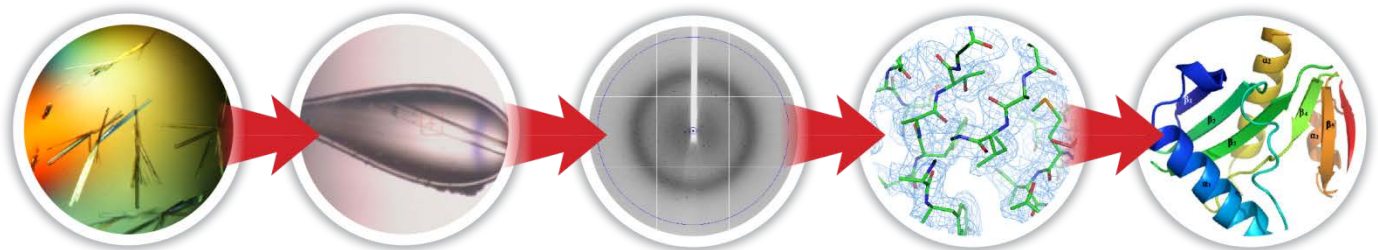
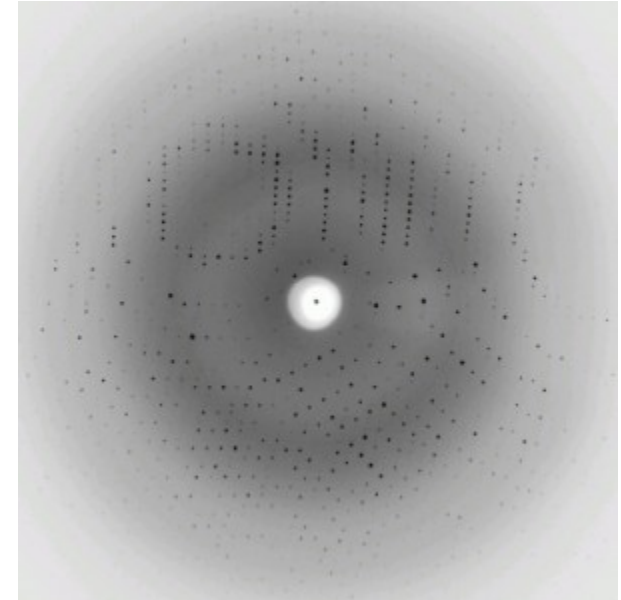
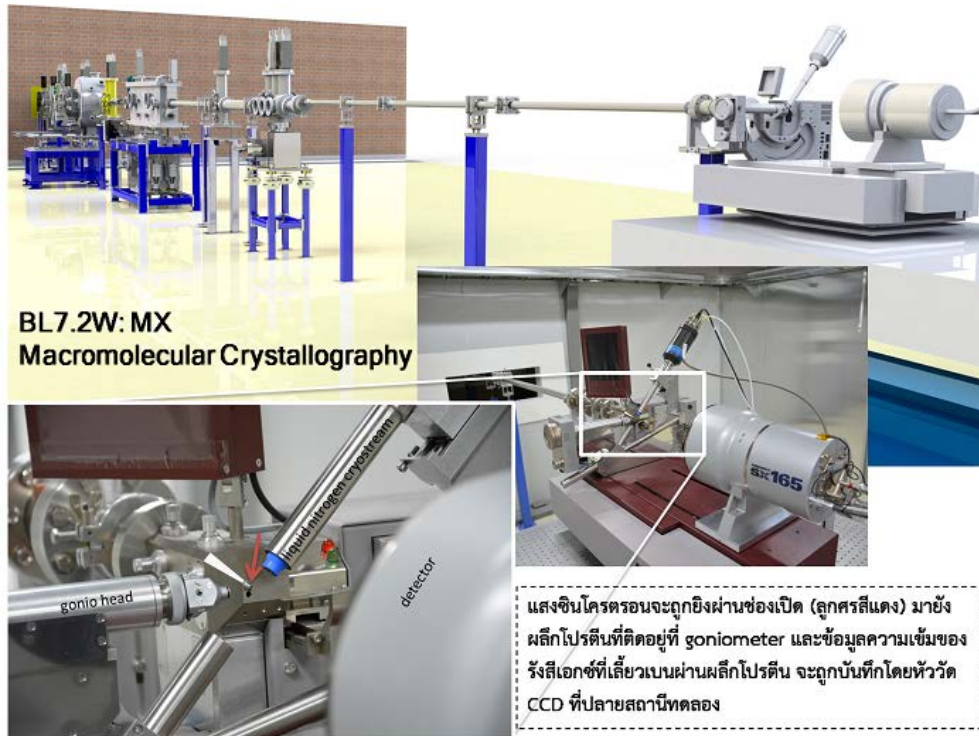


Application

- nano structure
- particle size and size distribution
- crystal structure
- crystal orientation
- crystallinity



Macromolecular crystallography, MX (BL7.2W)



Application

- crystal structure of protein

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