

X-ray Spectrometry at INPP

Andreas Karydas

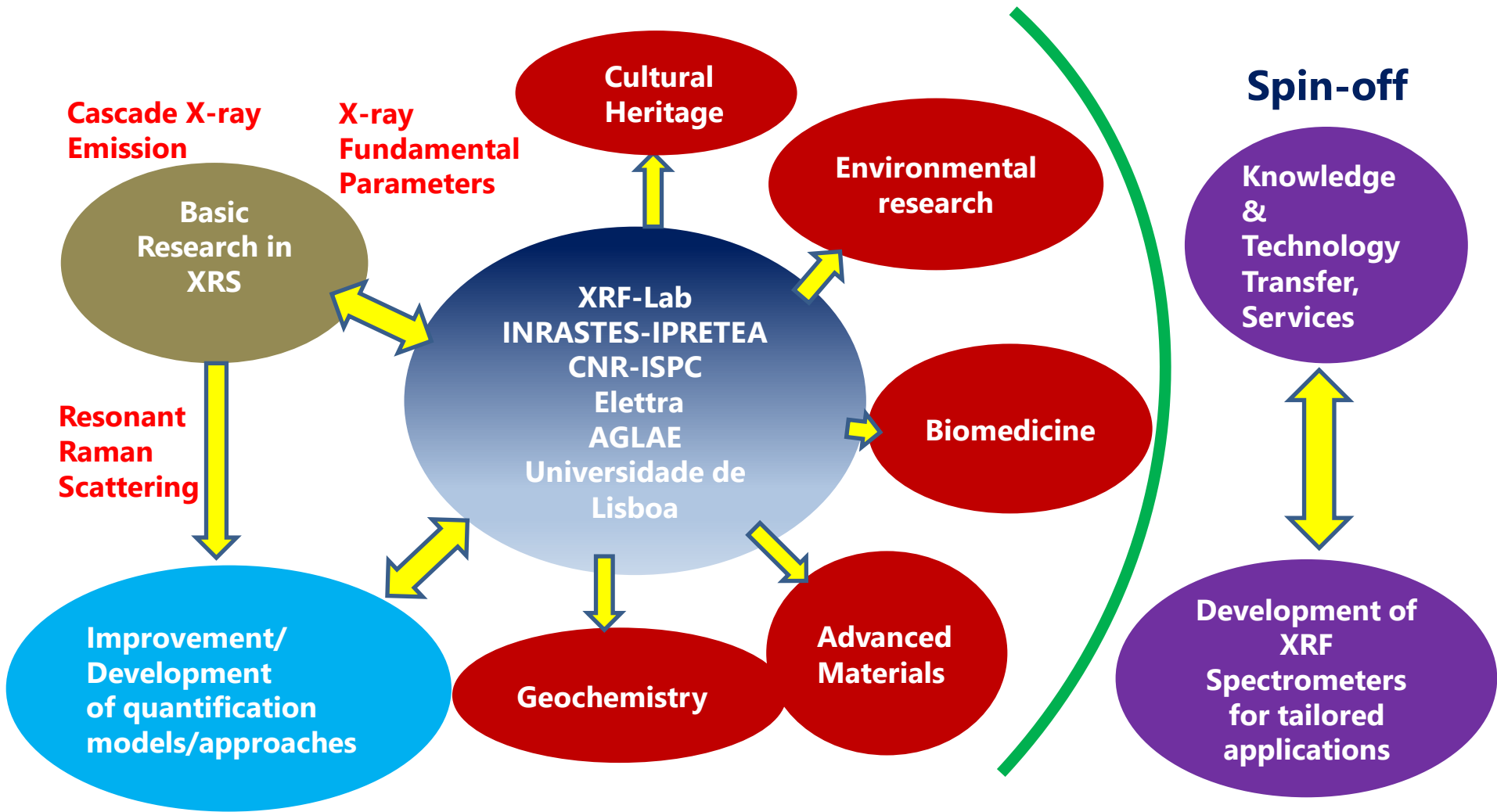
Director of Research

Head of the XRF laboratory

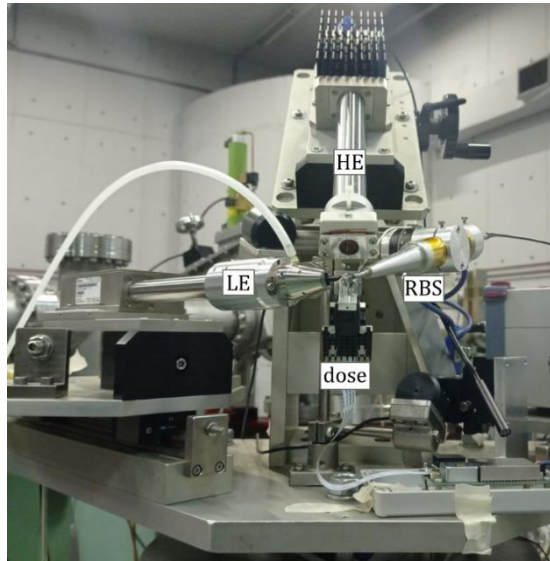
<http://www.inp.demokritos.gr/xrf/>

INPP, NCSR “Demokritos”

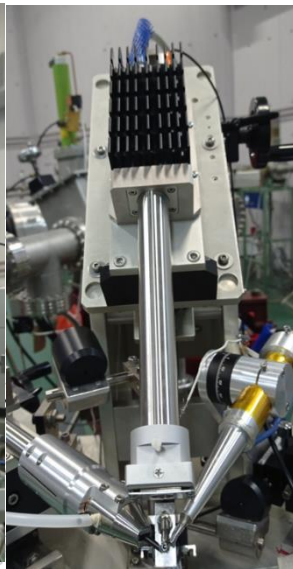
karydas@inp.demokritos.gr



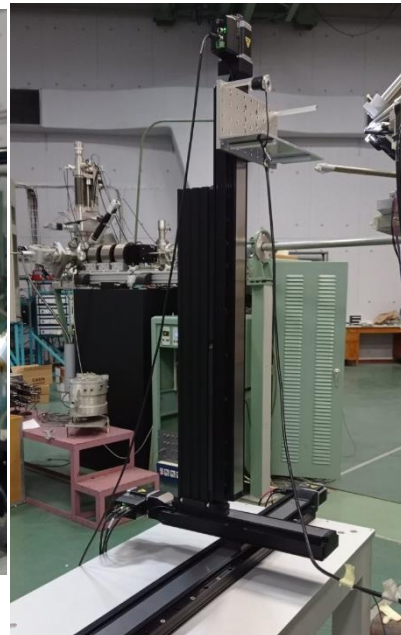
NPA The new external IBA set-up at NCSR Demokritos, Greece



LOW



DOSE SDD



Cluster of Accelerator Laboratories for Ion-Beam Research and Applications

ΕΠΑΝΕΚ 2014-2020
ΕΠΙΧΕΙΡΗΣΙΑΚΟ ΠΡΟΓΡΑΜΜΑ
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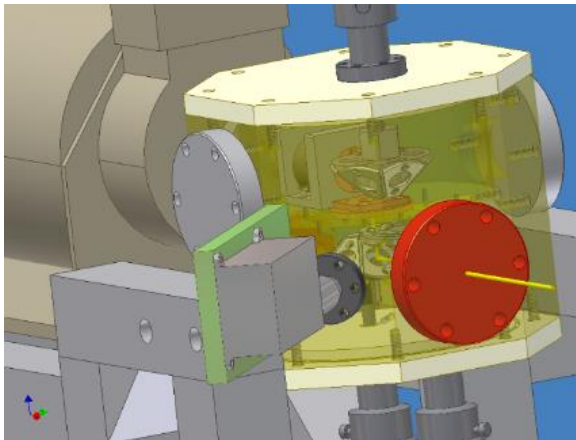
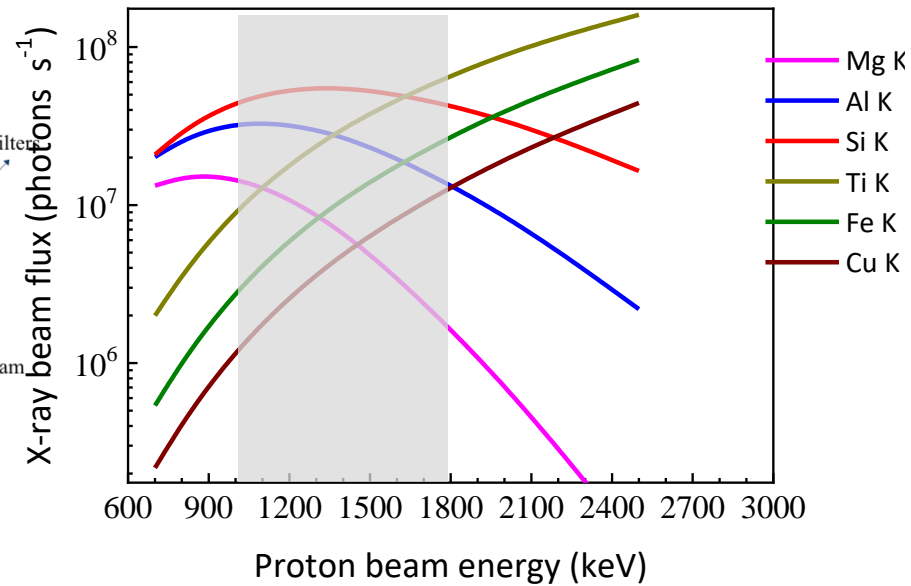
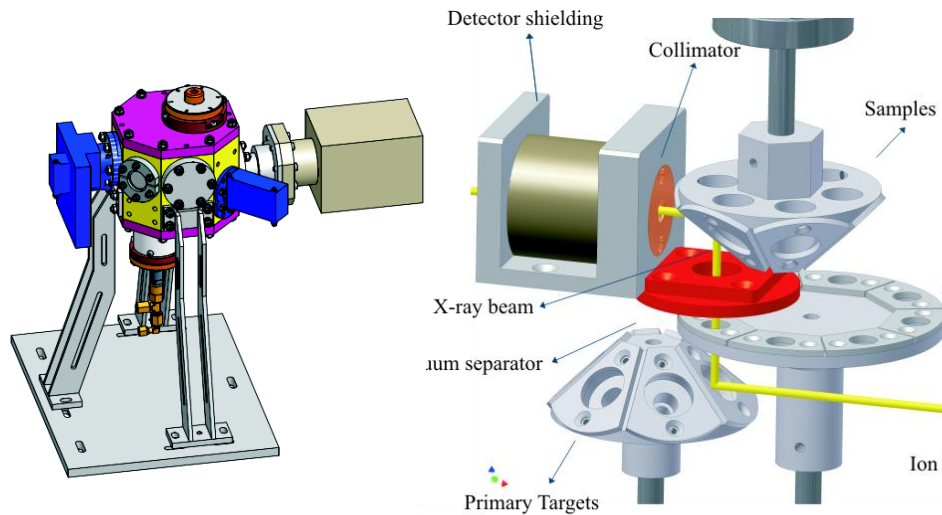
ΕΣΠΑ
2014-2020
ανάπτυξη - εργασία - αλληλεγγύη

www.antonistikotita.gr
Με τη συγχρηματοδότηση της
Ελλάδας και της Ευρωπαϊκής Ένωσης

MSc

- Applications to Cultural Heritage

NPA PIXE-XRF setup – Production of monochromatic x-rays



X-ray intensities **1.2 keV - 8.04 keV**
@ sample position
~ **10⁷-10⁸ ph/s, 1 µA beam current**

D. Sokaras, et al.

Review of Scientific Instruments 83, 123102 (2012);

Physical Review A 83 (2011) 052511

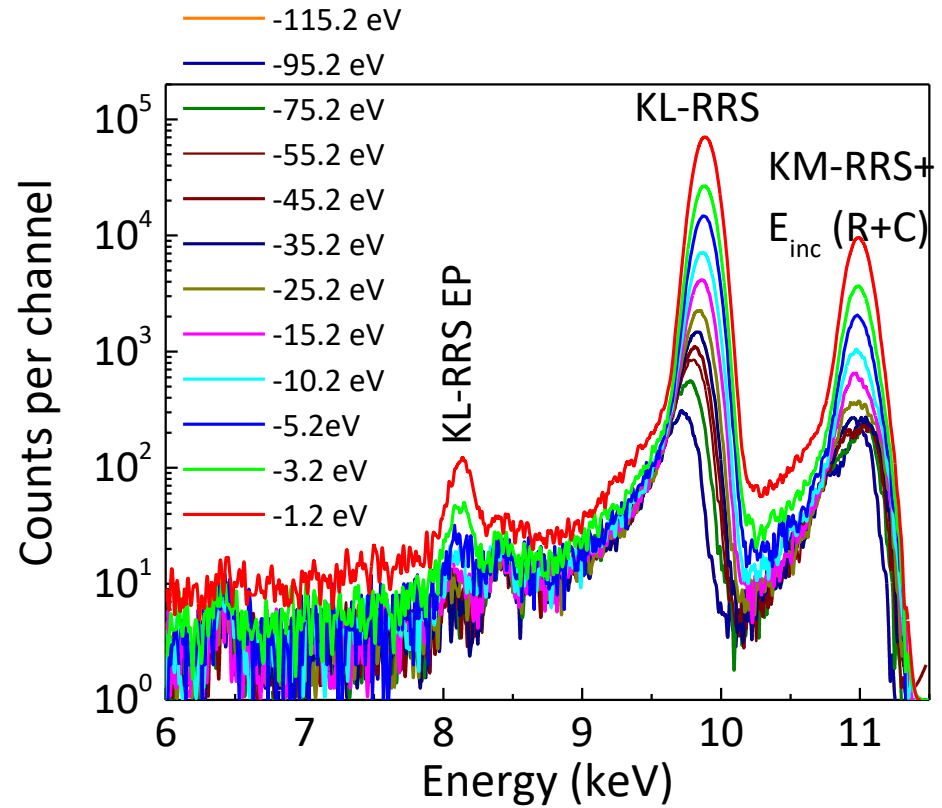
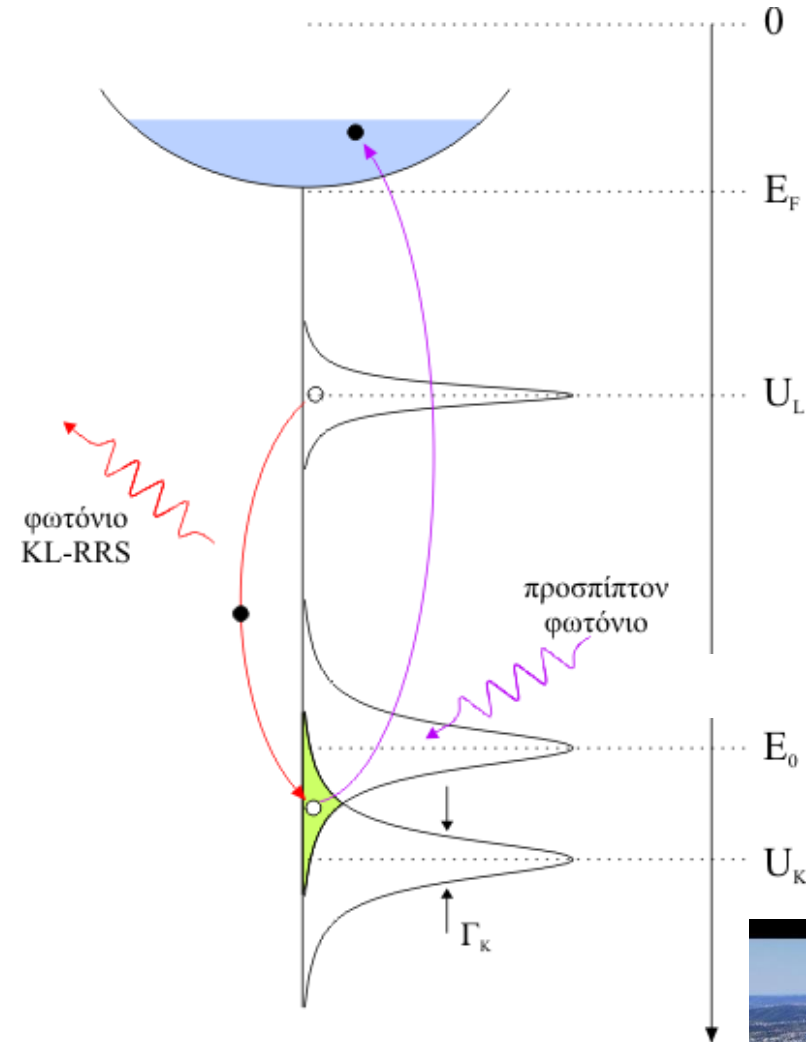
Physical Review A 81 (2010) 012703

PhD thesis (2010)

MSc thesis

- Different applied directions are open

$$H_{int} = -\frac{e}{mc} \mathbf{p} \cdot \mathbf{A} + \frac{e^2}{2mc^2} \mathbf{A} \cdot \mathbf{A}$$



MSc/PhD Thesis

- Analysis of synchrotron data
- Development of spectrum analysis code

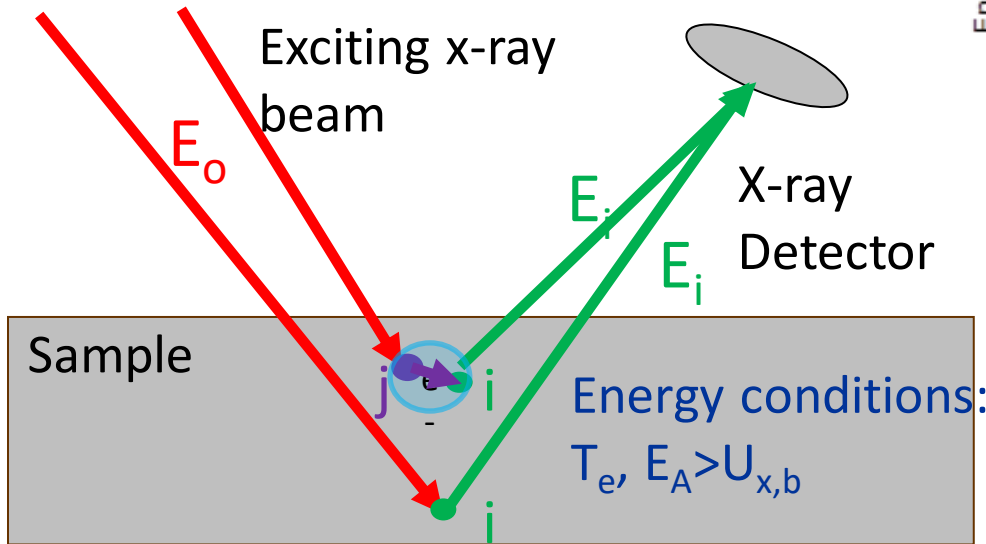


XRF Beamline
end-station at
Elettra
Sincrotrone
Trieste,
Trieste, Italy

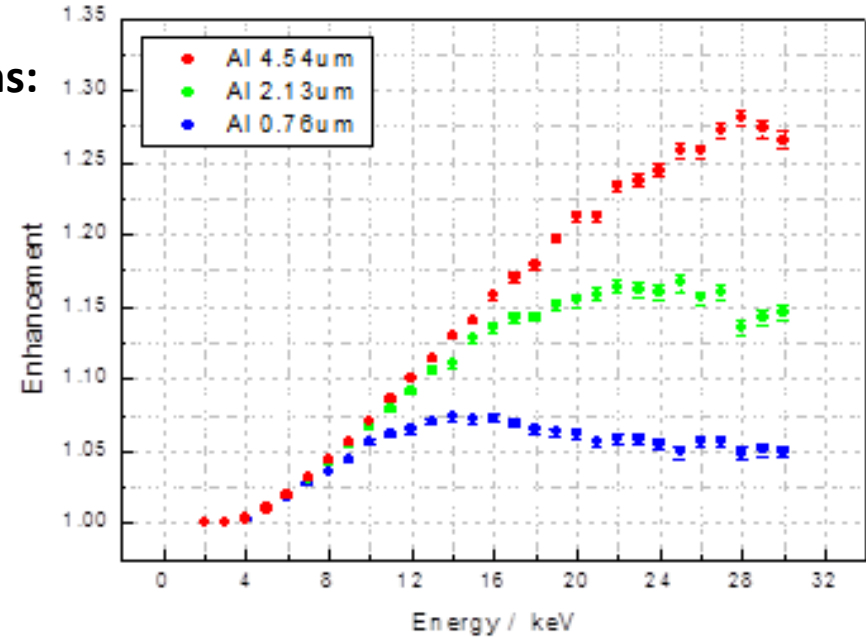
Secondary electron induced inner-shell ionizations:

Discrete energy electrons: Photo-e, Auger

Continuous energy electrons: Compton



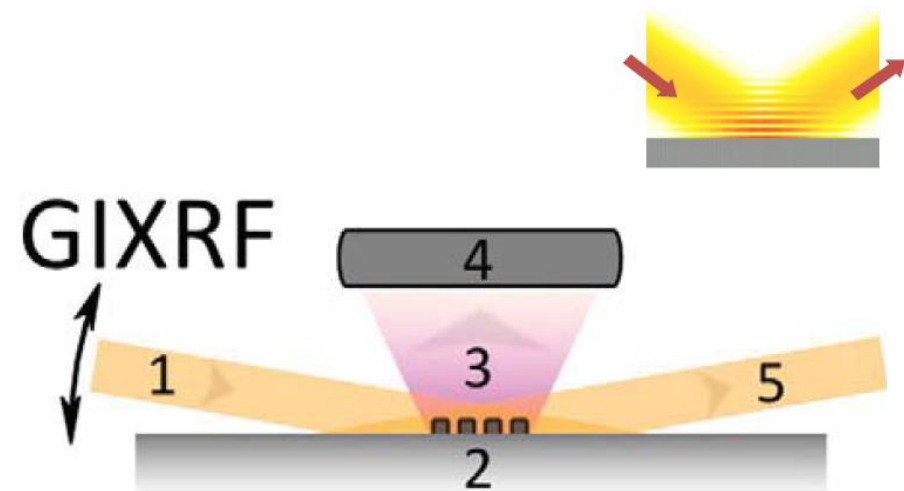
Ejected electrons from the atoms of element j can ionize an inner shell of element i



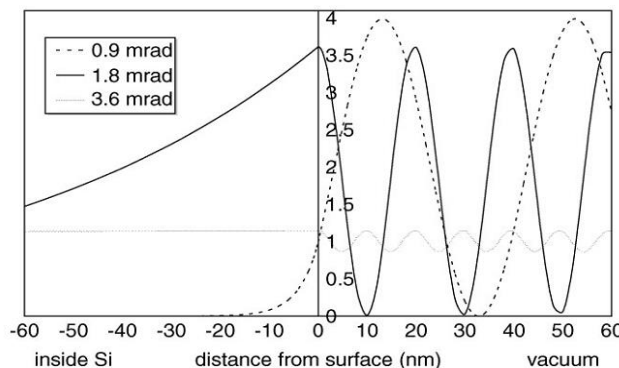
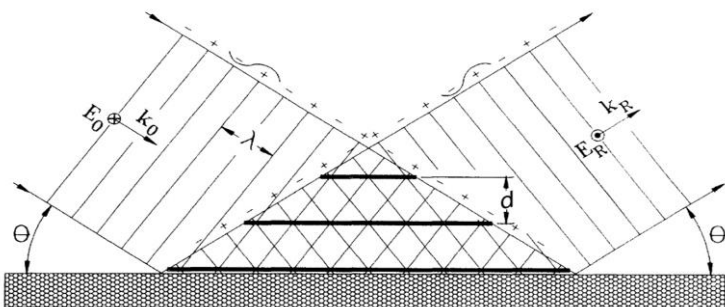
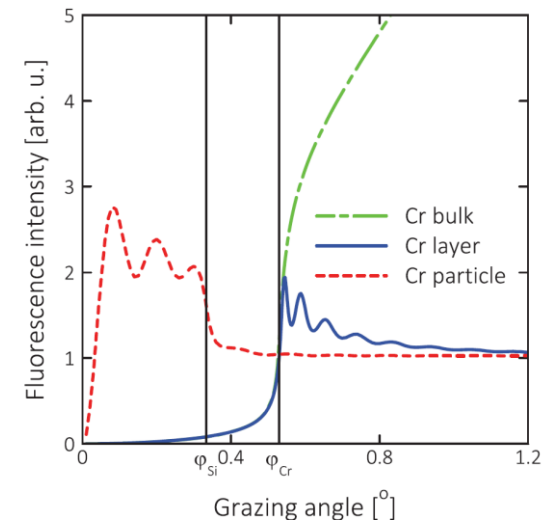
New measurements available for silicon nitride (Si_3N_4) membranes 100 - 2000 nm 4-14 keV range

MSc Thesis

- Analysis of synchrotron data
- GEANT/PENELOPE MC simulations



Formation of X-ray Standing Wave (XSW) at grazing incident/exit angle



Electric Field Modulations above the surface

GIXRF/XRR as Characterization Tools for Patterned Hierarchical Nanoarchitectures

MSc Thesis

- Analysis of synchrotron data/Development of methodology
- Joint project with INN (E. Makarona)