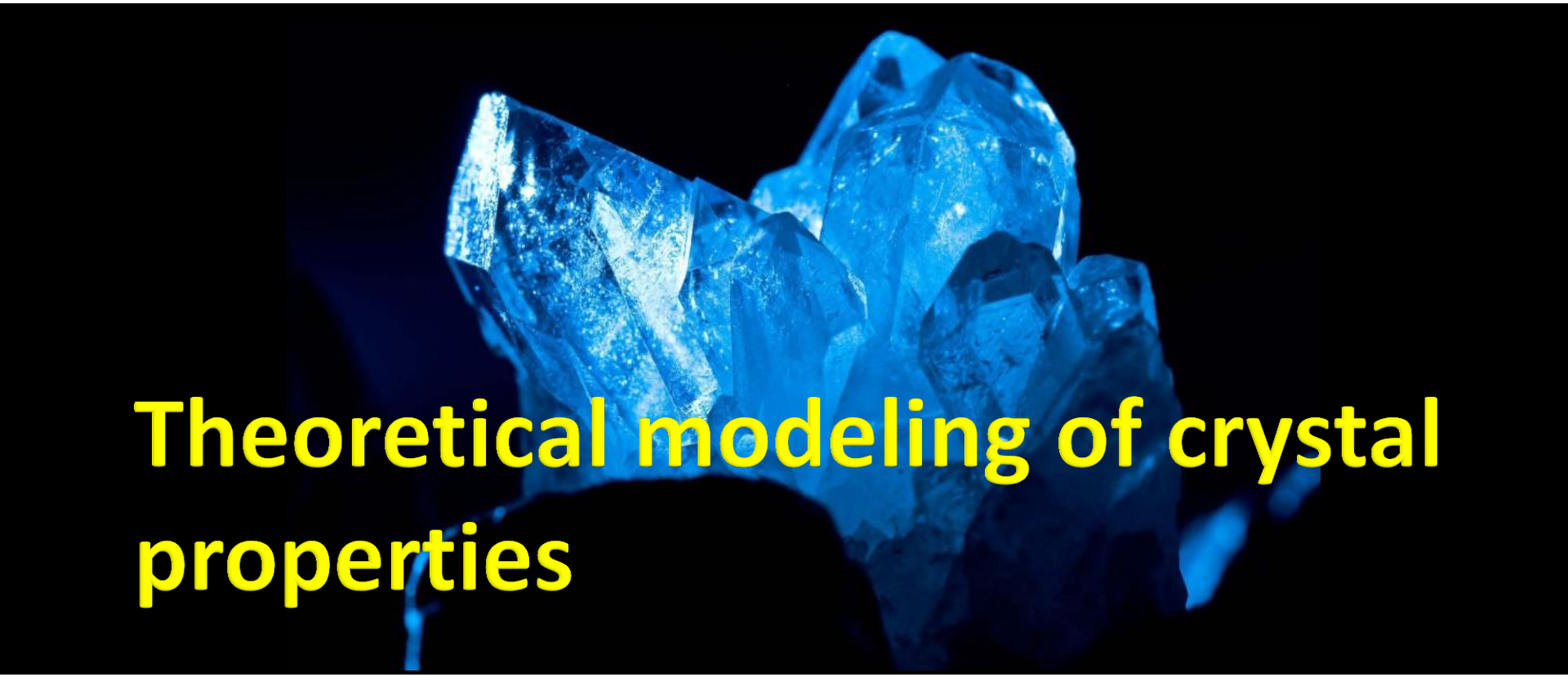
Uniwersytet Wrocławski

Progress on EUV & X-ray spectroscopy and imaging II

CBK PAN



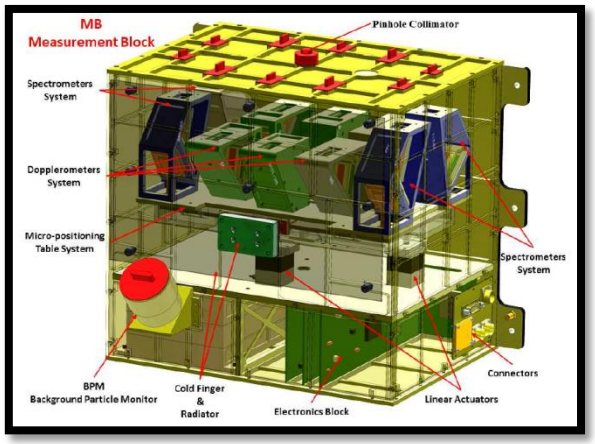
Theoretical modeling of crystal properties

Żaneta Szaforz

1. Astronomical Institute, University of Wrocław; 2. Space Research Centre, PAS, Wrocław

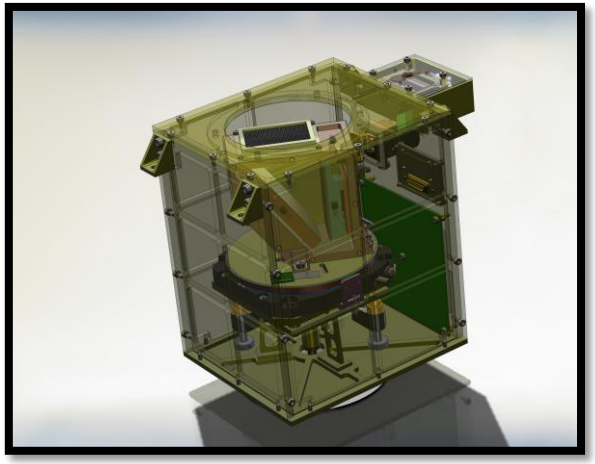
Polish crystal spectrometers

DIOGENESS



CHEMIX

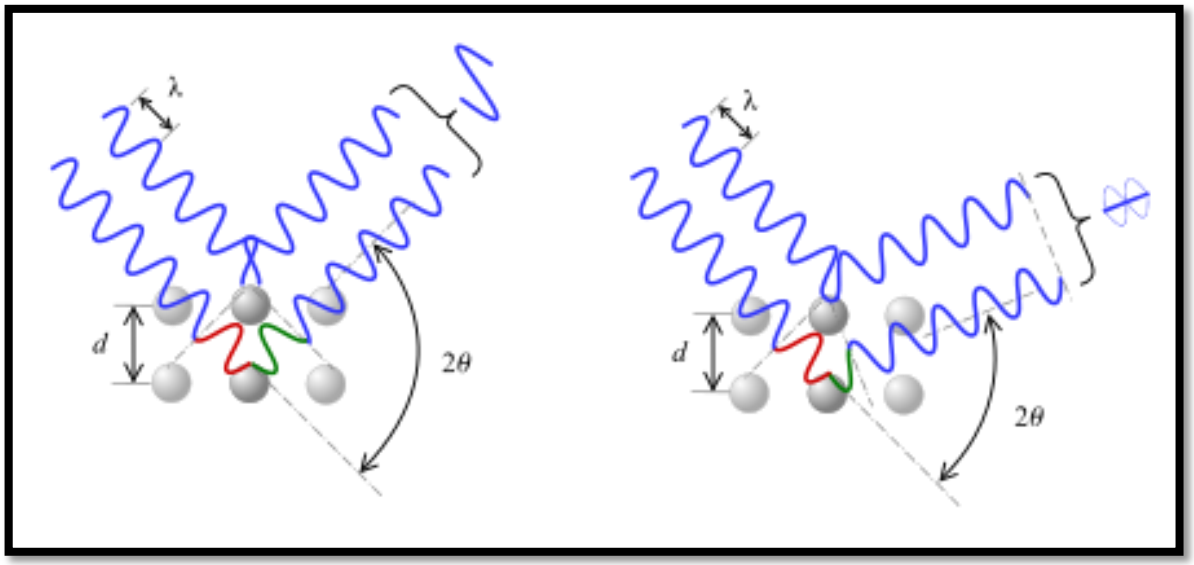
RESIK

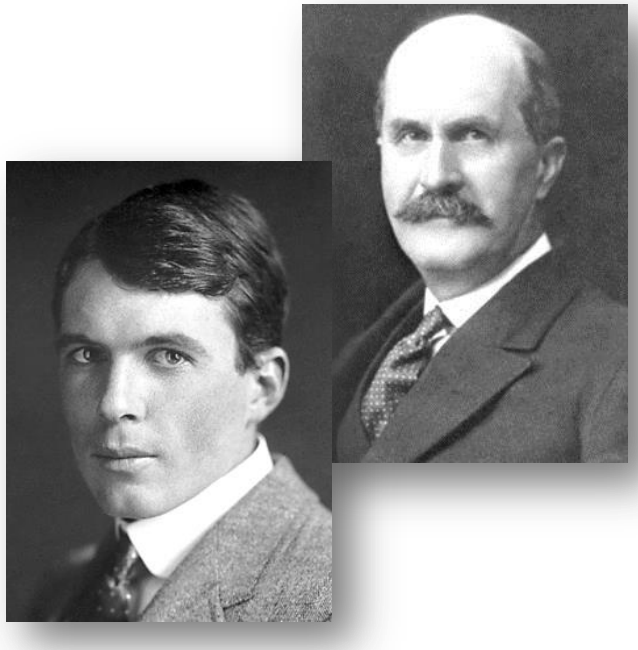


SOLPEX

Bragg's law

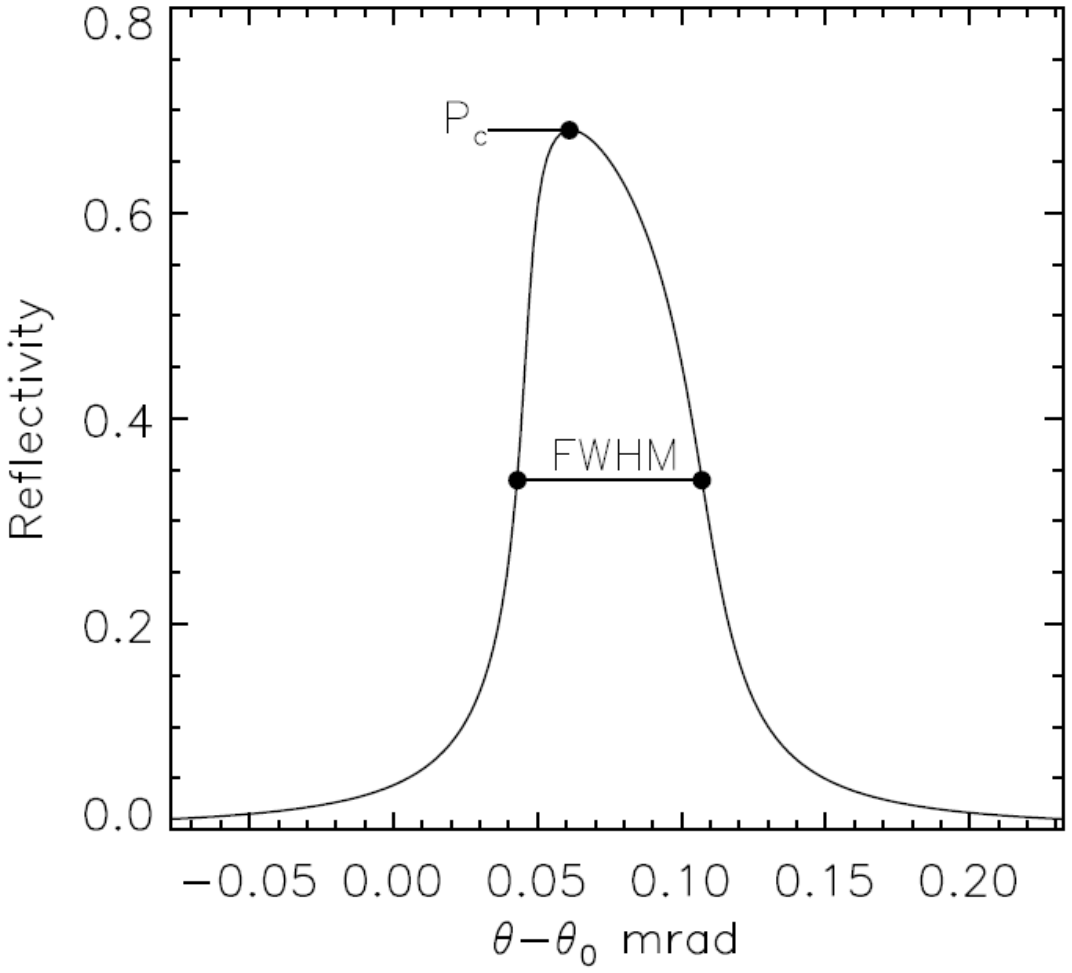
$$2\,d \sin\theta_B = n\,\lambda$$





Sir William Henry Bragg
Sir William Lawrence Bragg

Rocking curve



$$R = \frac{I_0}{I}$$

$$R_c(\theta) = \int R(\theta)\, d\theta$$

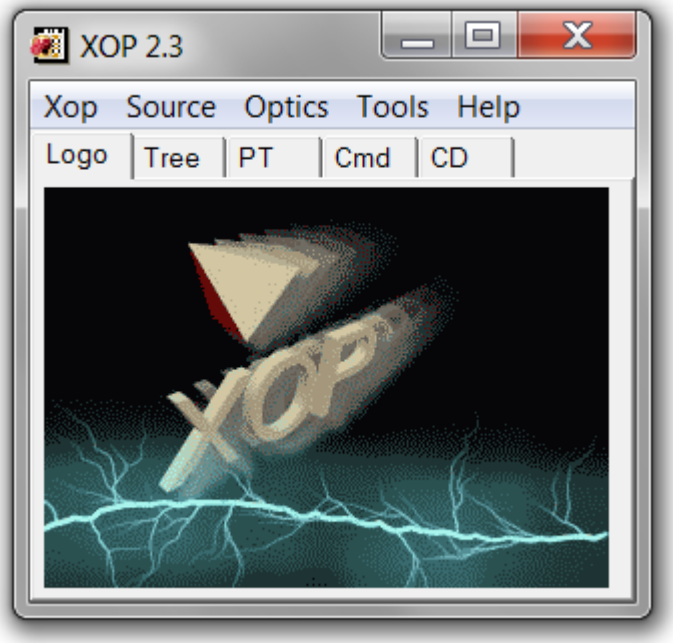
Dynamic Theory of Diffraction

- Dynamical diffraction theory for perfect crystal (Darwin,1914; Ewald, 1917; von Lane, 1931; Zachariasen, 1967)
- Local application of the dynamical diffraction theory for perfect crystal to distored crystals (Multilamellar method, Bonse, 1958; Authier, 1966)
- Geometrical oplic (Penning-Polder theory, Penning & Polder, 1961a)
- Wave optic (Takagi-Taupin theory, Takagi, 1969; Taupin, 1964a)

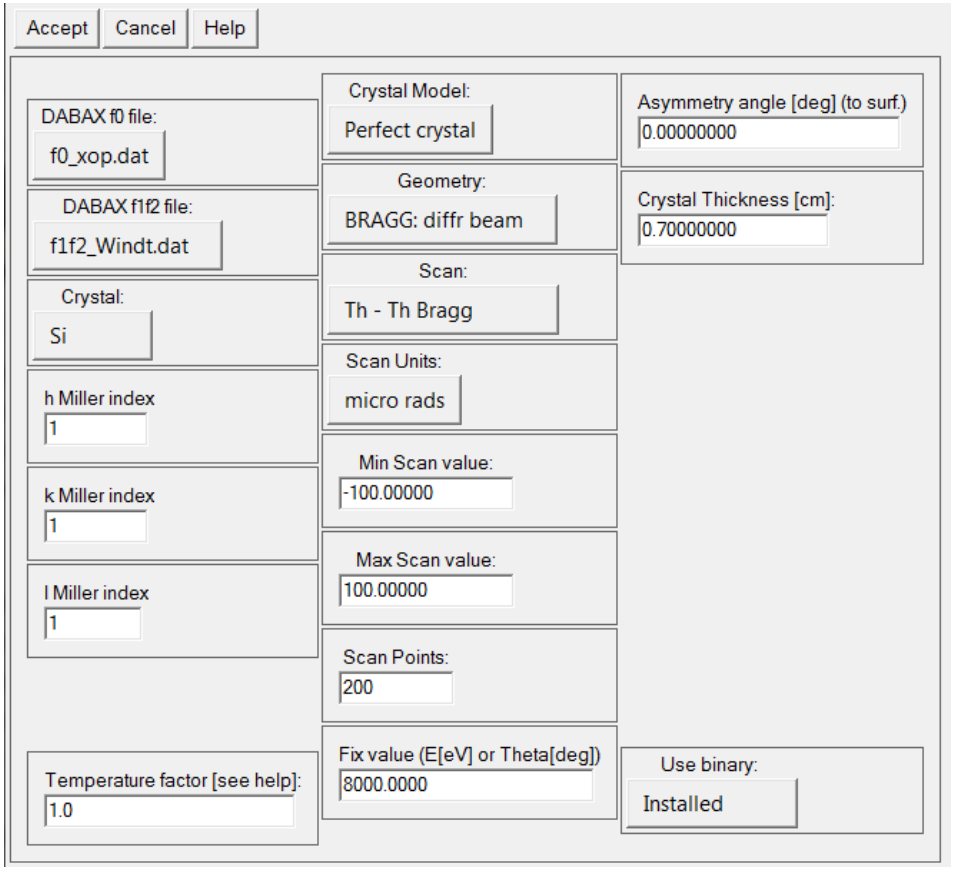
Software

- REFLECT (Eteläniemi et al., 1989)
- REFLEX (Caciuffo et al., 1990)
- PEPO (Cchulze & Chapman, 1995)
- DIXI (Holzer et al., 1998)
- X-ray server/GID_SL (Stepanov, 2004)
- XOP: X-ray Oriented Programs (Sanchez del Rio & Dejus, 2011)

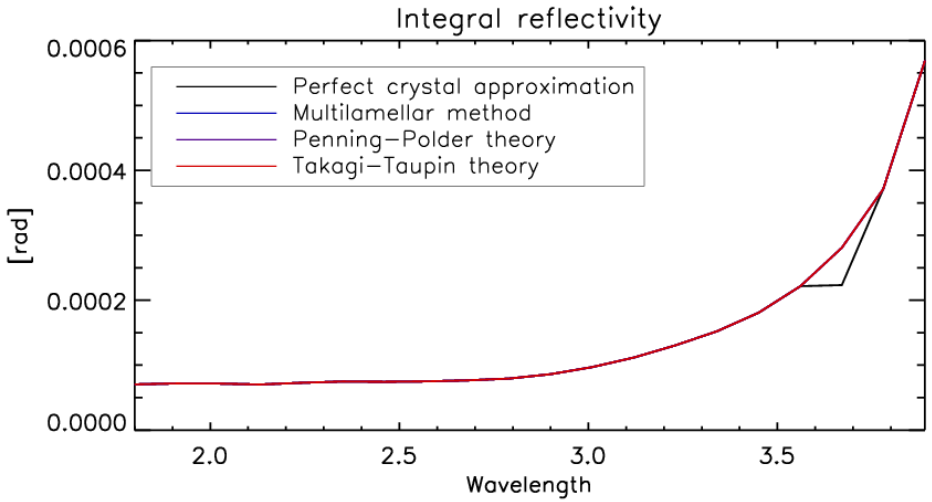
XOP (X-ray Oriented Programs)

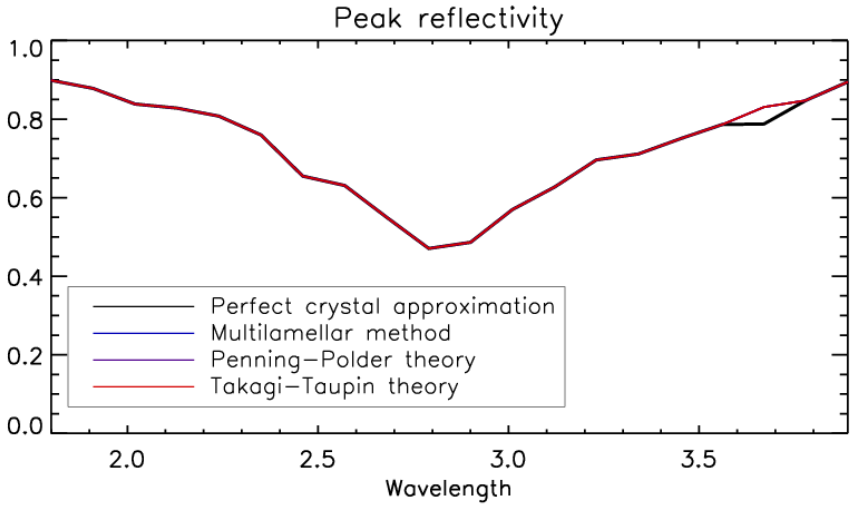


- XCRYSTAL
- XCRYSTAL_Bent

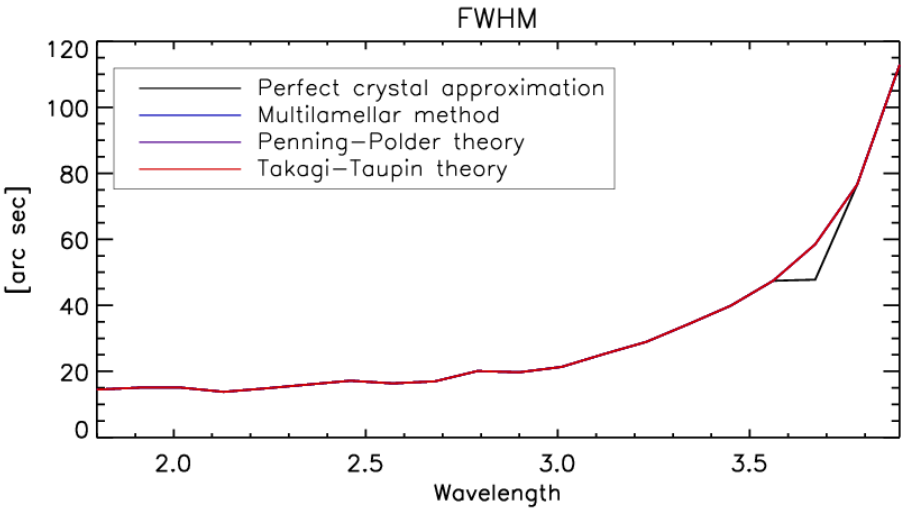


Crystal parameters- XOP/XCRYSTAL

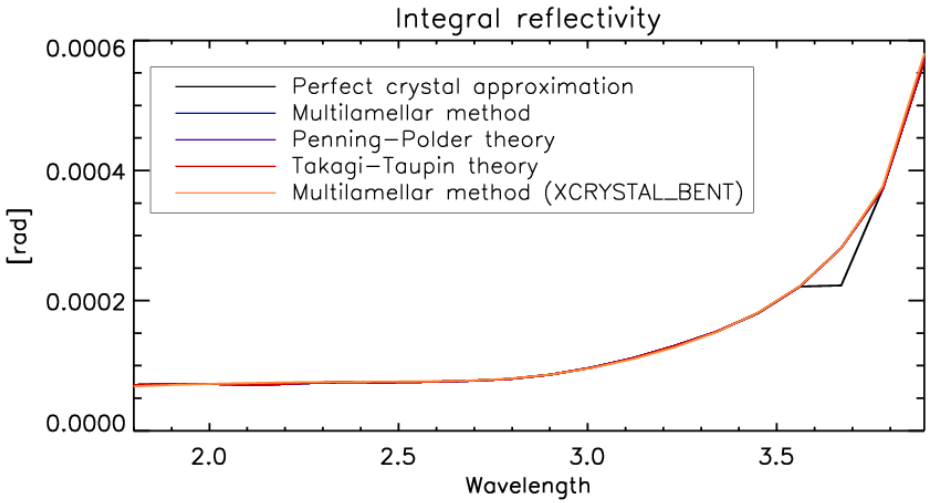


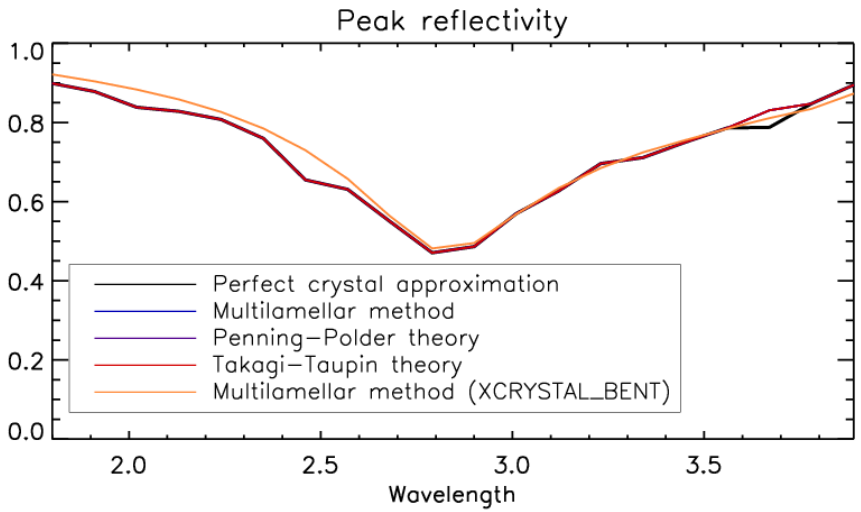


Ge 220 crystal

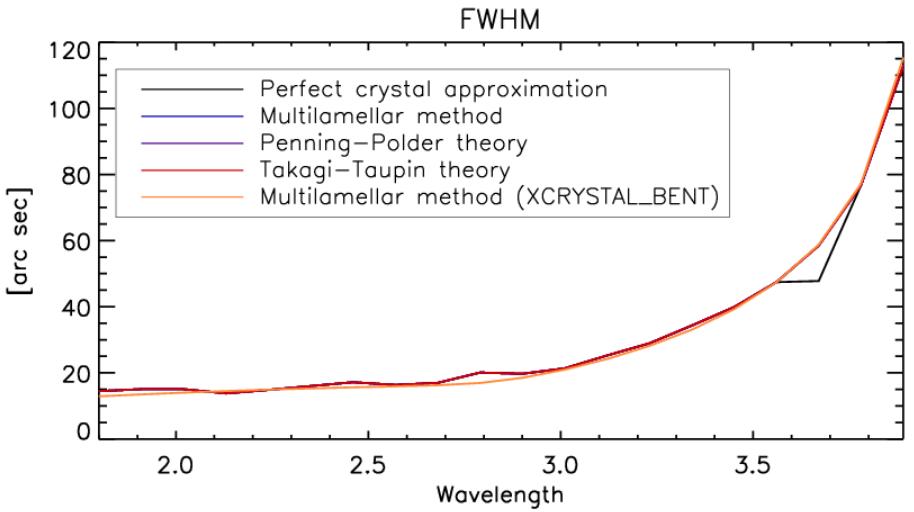


Crystal parameters- XOP/XCRYSTAL_BENT





Ge 220 crystal



X-ray server/GID_SL

GID_SL on the Web

Dynamical x-ray diffraction from strained crystals, multilayers and superlattices at usual and grazing incidence angles

X-rays specified by: Wavelength (A) Value= 1.540562 Line= Cu-Ka1 Polarization= Sigma

Crystal: Germanium Auto DB for f',f" Sigma= 0. A W0= 1. Wh= 1.

Bragg Reflection: 1 1 1 Substrate da/a= 0.

Geometry specified by: angle of Bragg planes to surface ('+' for g0>gh) , Value: 0. degr.

Scan: from -60. to +60. sec. Scan points: 401 Invert axis: Plot argument: scan angle

Approximations: alpha_max= 1.E+8 *|xh|

watch progress Submit Query (single click, please!)

Top layer profile *(optional)*:

```
period=
t=  sigma=  da/a=  code=  x=  code2=  x2=  code3=  x3=  code4=  x0=  xh=  xhdf=  w0=  wh=
end period
```

Submit Query (same "Submit" action as above; single click, please!)

The profiles are restricted to 5000 layers after applying periods.
Do not use links or unusual words in surface layer profile!

Available codes:

[?] Crystals:

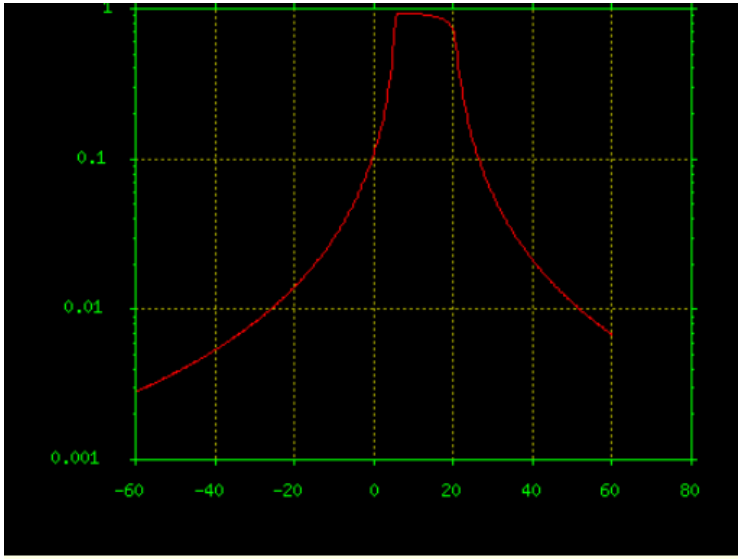
ADP
AlAs
AlFe3
AlN
AlP
alpha-Fe
AlSb

[?] Non-crystals:

Al2O3
B4C
BeO
BN
C18H37Cl3
Si

[?] Elements:

Ac
Ag
Al
Am
Ar
As
At
Au



Data plot

Download ZIPped results: gd667714.zip

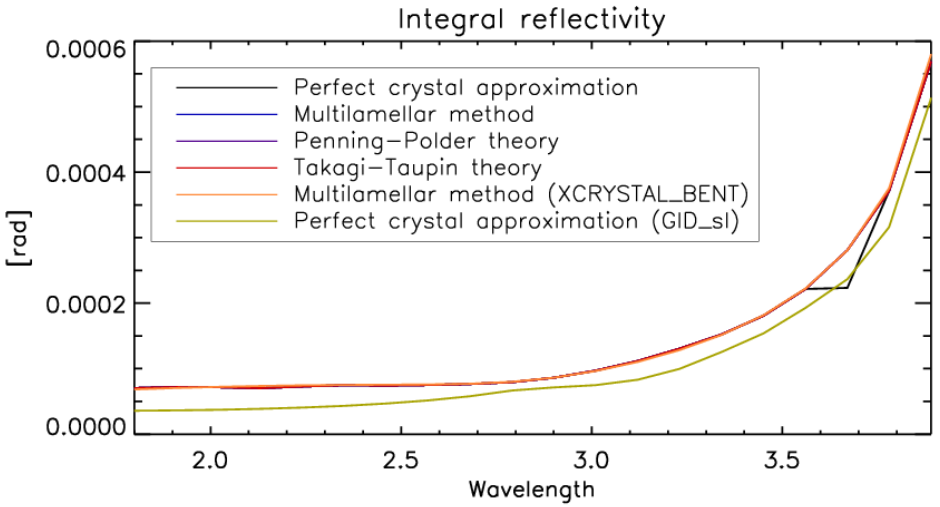
(Get a freeware UNZIP software for the most of platforms at Info-Zip Web site)

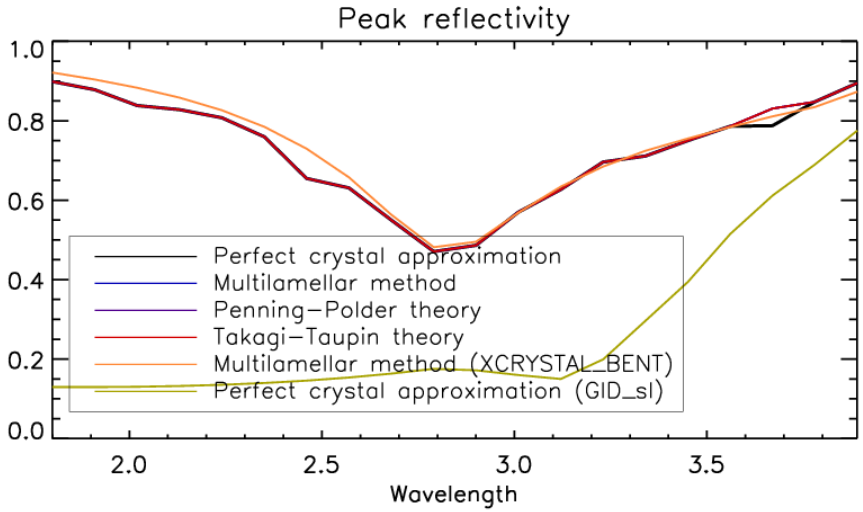
Display inp file: gd667714.inp

Display tbl file: gd667714.tbl

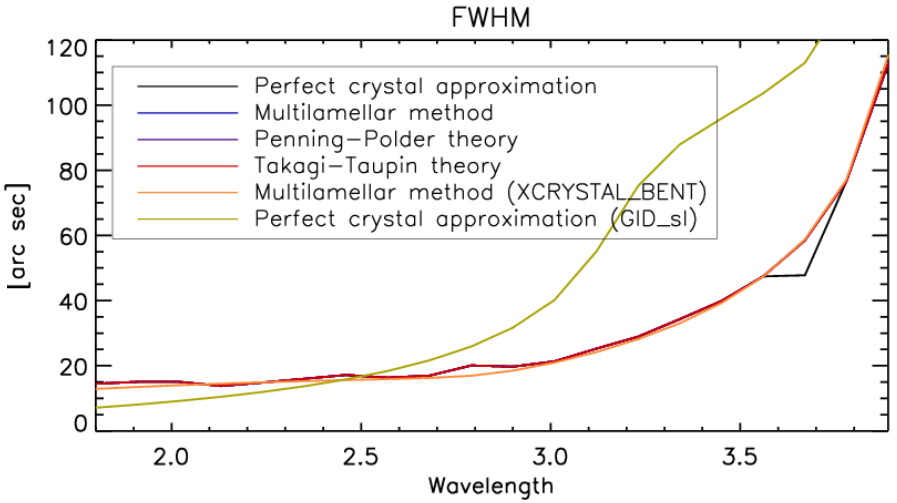
Display dat file: gd667714.dat

Crystal parameters- GID_SL

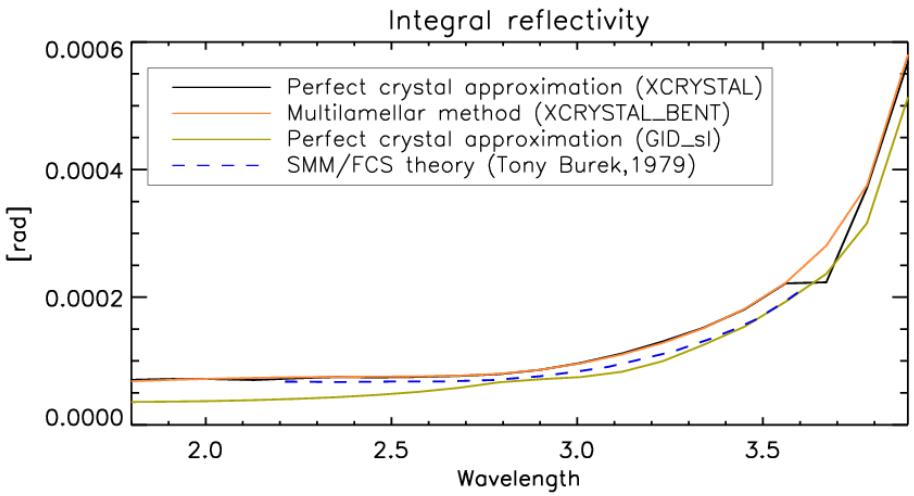


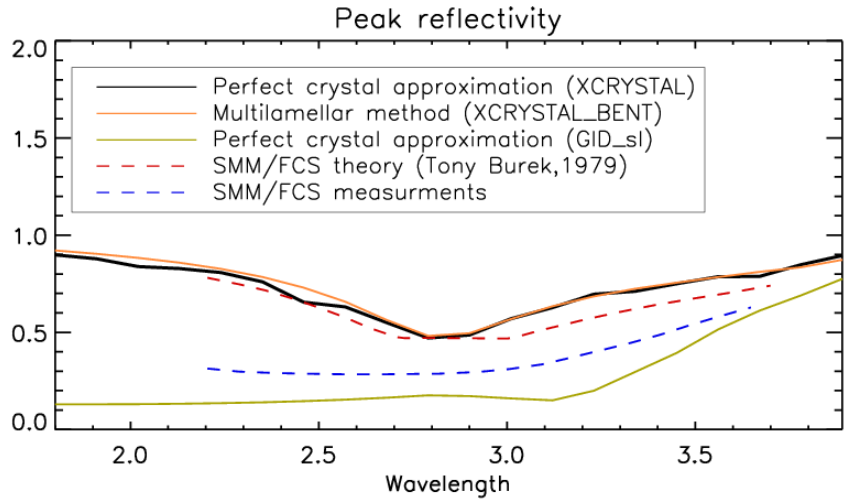


Ge 220 crystal

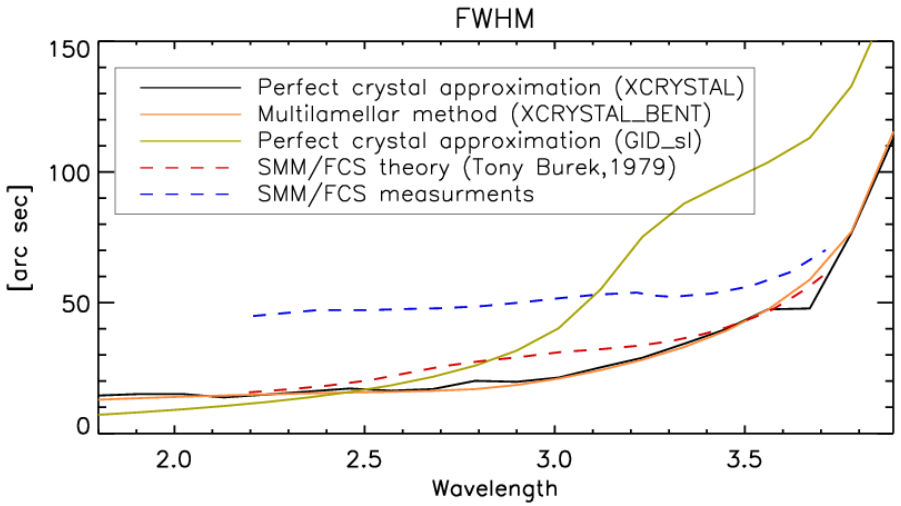


Theory vs measurments



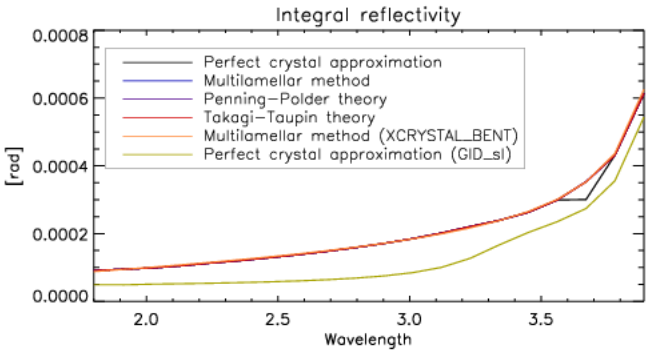


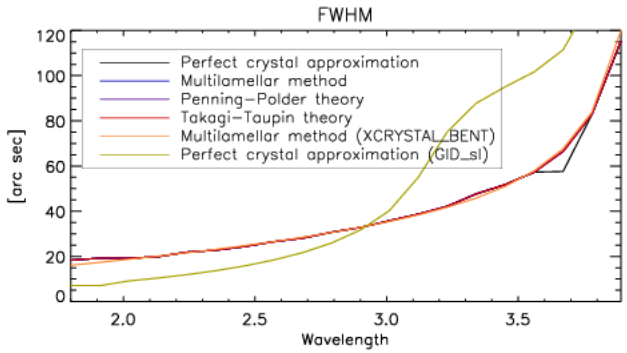
Ge 220 crystal

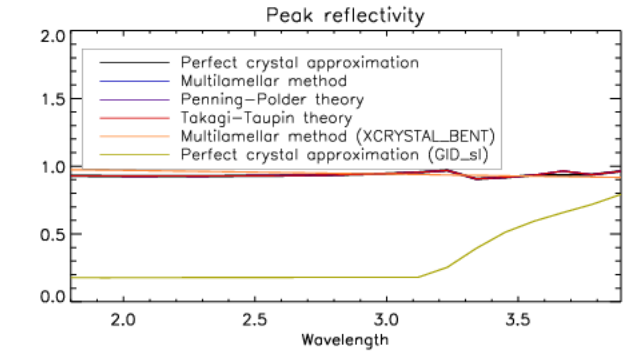


Polarization

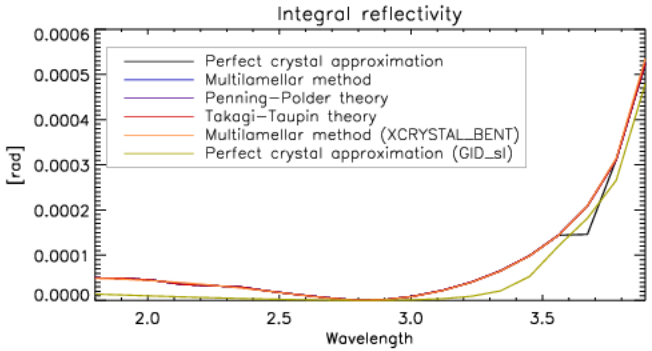
S-polarized light

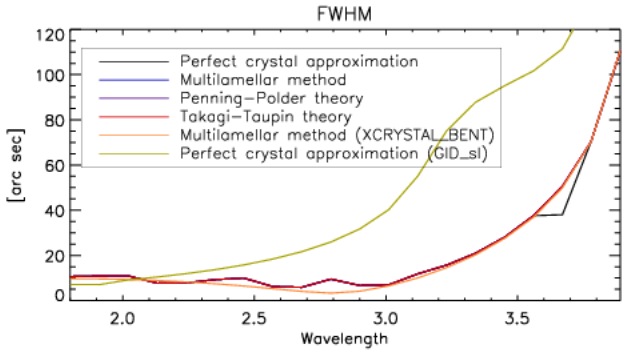


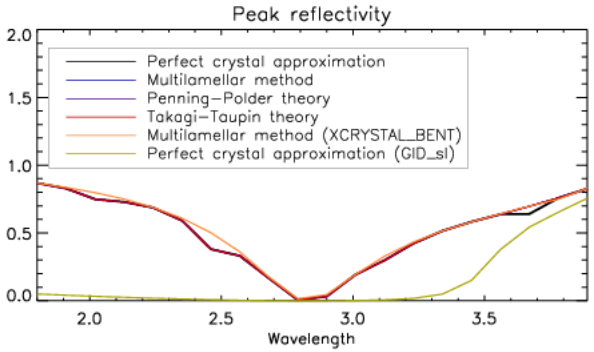




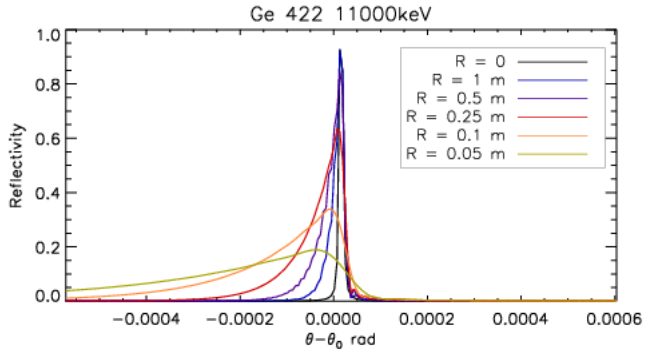
P-polarized light

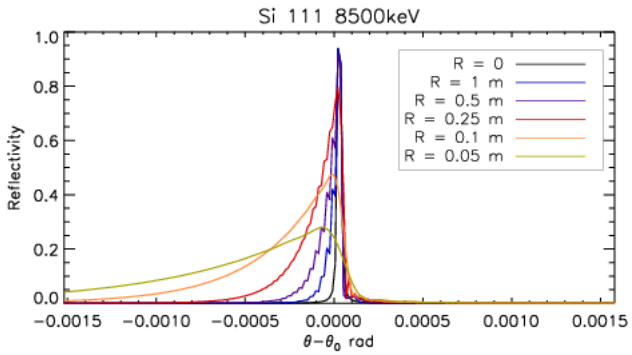


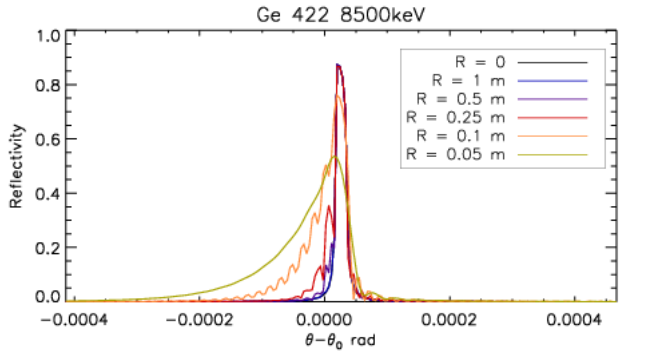


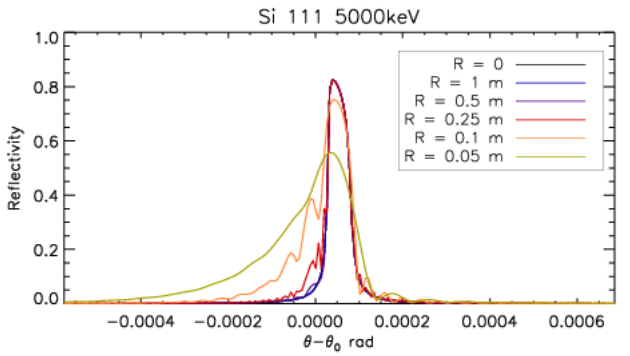


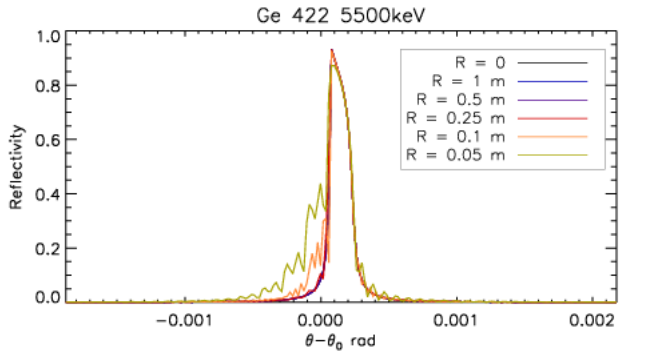
Crystal bending

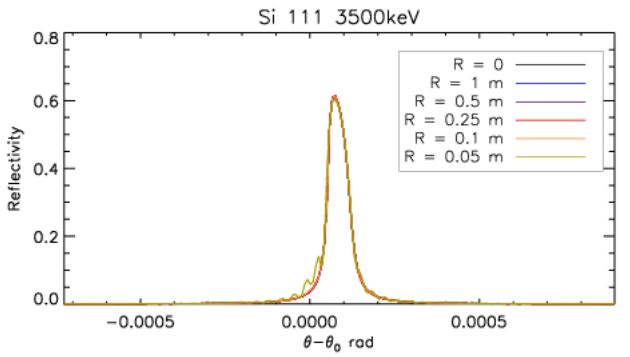




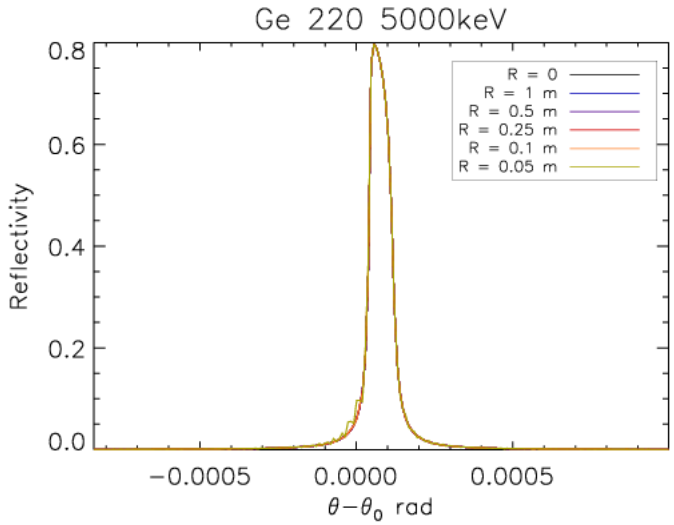


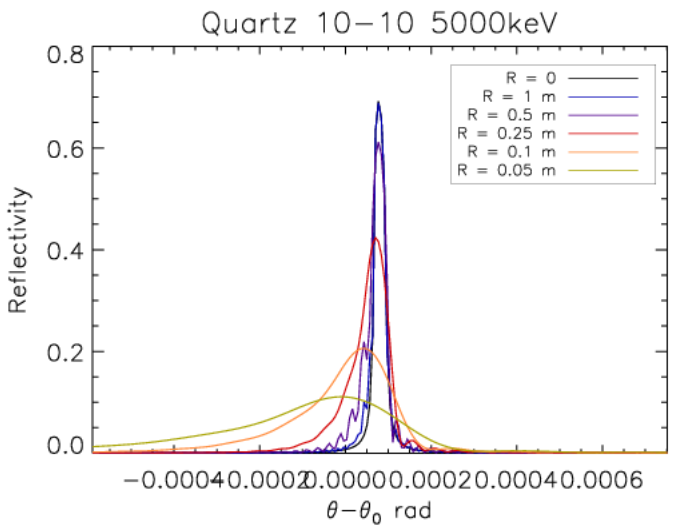


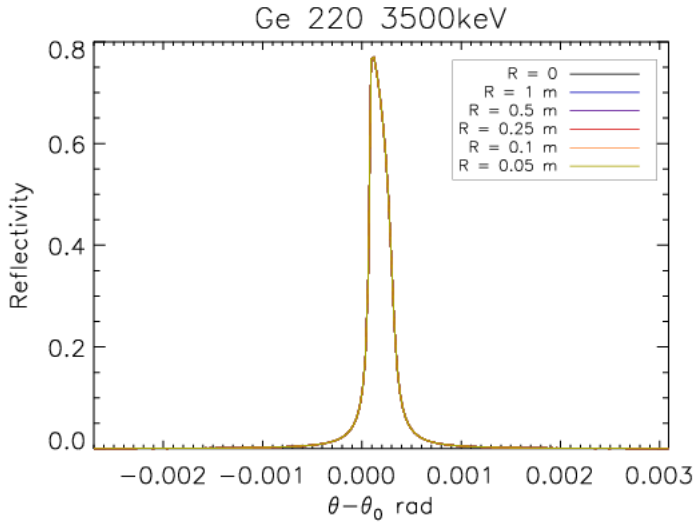


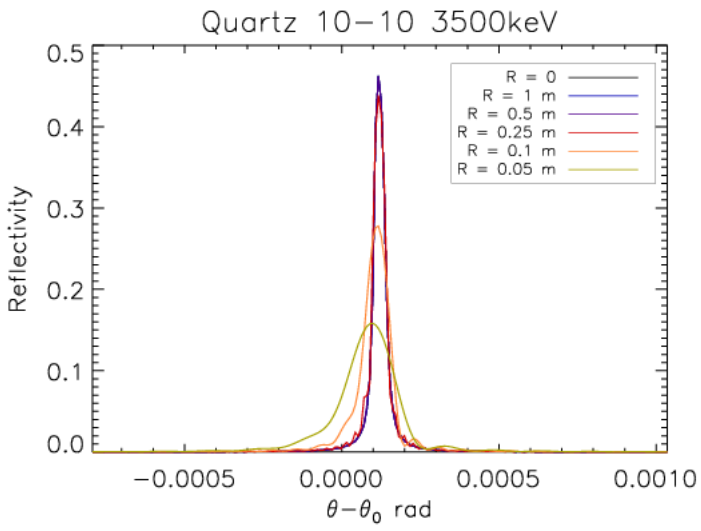


Crystal bending










Thank you for your attention