

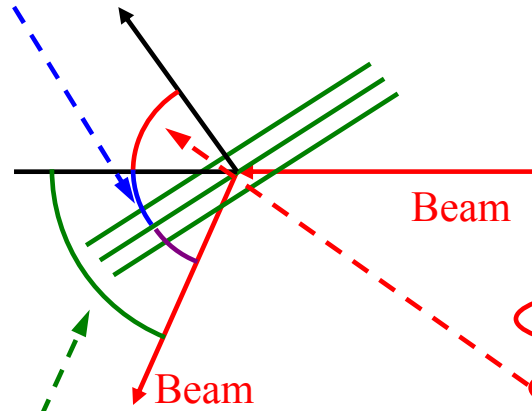
## Task 2.1.1: Flat Monochromator (*ma\_flat*)

1. Use the 'user wavelength distribution file' from Task 1.1 (linear Guide) to build a source of  $10 \times 10 \text{ cm}^2$
2. Send a beam in the range  $1.0 - 7.0 \text{ \AA}$  to a flat monochromator (*ma\_flat*) of  $10 \times 10 \text{ cm}^2$  size and  $0.5 \text{ cm}$  thickness in a distance of  $10 \text{ m}$
3. Choose
  - a mosaicity of  $40'$  (horizontal and vertical)
  - a d-spacing of  $3.3539 \text{ \AA}$
  - a take-off angle of  $74.28^\circ$  to get a wavelength of  $4.05 \text{ \AA}$
  - $\Delta d/d = 0$ , mosaic range factor 2.5
  - reflectivity normalization and repetition rate 1
  - standard frame generation
4. Add *mon1\_lambda*, *mon2\_pos* ( $20 \times 20 \text{ cm}^2$ ) and *mon2\_div* ( $-5^\circ$  to  $5^\circ$  in both directions) in  $0.828 \text{ m}$  distance
5. Check resulting wavelength, adapt generated wavelength range

# Task 2.1.1: Parameters of a Monochromator Element

Bragg angle

Take-off angle



ma\_flat module 2

### Monochromator Analyser

parameter file:

repetition rate:  mosaic spread horiz. [deg]:  mosaic spread vert. [deg]:

d spread:  reflectivity normalization [-]:

d-distribution:

Edit mono\_flat.par

### Monochromator-Analyser parameters

main position X [cm]:  main position Y [cm]:  main position Z [cm]:

surface offset horizontal [deg]:  surface offset vertical [deg]:

Bragg offset horizontal [deg]:  Bragg offset vertical [deg]:

thickness cryst. element [cm]:  width cryst. element [cm]:  height cryst. element [cm]:

d-spacing [A]:  order of reflection:

mosaic range factor:  d-range factor:

Output frame

output frame definition:

X' [cm]:  Y' [cm]:  Z' [cm]:

horizontal angle [deg]:  vertical angle [deg]:

## Task 2.1.2: Focusing Monochromator (*ma\_focus*)

1. Exchange the flat by a focusing monochromator that
  - consists of 5 pieces of 2 cm height, 10 cm width and 0.5 cm thickness
  - has a shape of a vertical cylinder, radius 1 m
  - has a minimal vertical angle of  $-2.292^\circ$
  - has the same mosaicity, d-spacing and take-off angle as the flat one
2. Compare wavelength and divergence distribution as well as spot size

## Task 2.1.2: Parameters of a Monochromator Ensemble

ma\_focus module 2

### Monochromator Analyser

parameter file:

repetition rate:  mosaic spread horiz. [deg]:  mosaic spread vert. [deg]:

d spread:  reflectivity normalization [-]:

focus file:

d-distribution:  focusing option:

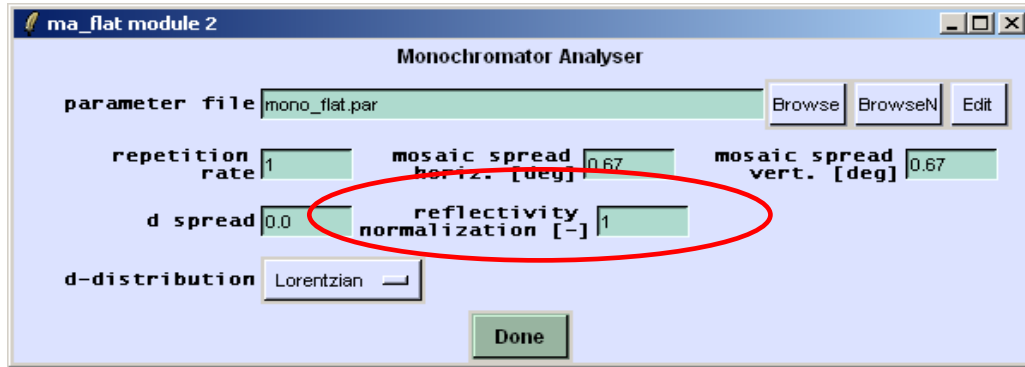
number of CE horizontal:  number of CE vertical:

radius horiz. [cm]:  radius vert. [cm]:  angle vert. [deg]:

gap between columns [cm]:  gap between rows [cm]:

orient. dev. hor. [deg]:  orient. dev. vert. [deg]:

## 2.1.3: Normalization



Basic idea: determine ratio of outgoing to incoming intensity for

- beam of divergence 0
- sufficiently large monochromator element

Necessary for each take-off angle

### E. Intensity normalization

The sophisticated computation procedures of this module (e.g. considering a 2-dim. distribution function for the mosaicity) leads to a very good description of the factors which influence the resolution behavior of the whole instrument.

For reliable intensity comparisons (to other types of instruments) it might be necessary to renormalize the calculation. The following procedure is recommended:

1. Use the module *source\_CWS* and adjust the ideal wavelength which is defined by fulfilling the Bragg condition with a mosaic of the crystal element under consideration which corresponds to the ideal direction  $\mathbf{n}_{CE}$ . Generate neutrons with nearly no or a very small divergence in each direction.
2. Simulate the reflection of this neutron beam at the crystal element described by this module (using the data known about the material, mosaicity a.s.o. and adjusting appropriate mosaic- and d-ranges).
3. Divide the output count-rate of this module by the input count-rate to obtain the rate of reflection  $R_{sim}$ .
4. Compare  $R_{sim}$  with the experimental peak reflectivity  $R_{exp}$ , known from mosaicity measurements (referring to the same ideal wavelength as used above) for the crystal under consideration, to obtain the rescaling parameter  $P = (R_{exp}/R_{sim})$ .
5. Now the intended VITESS simulation (e.g. an instrument which uses crystal elements of this type) can be performed. For this do not change the values and ranges (which have been used under 2.) for the mosaicity, d-spacing and neutron repetition rate, but renormalize the chosen reflectivity  $R$  by multiplication with  $P$ . Although the new value for  $R$  may now exceed 100% and differ from  $R_{exp}$ , the module will simulate correctly both, the intensity and resolution behavior of the crystal element system.