Monochromators

Monochromators

Components

- Monochromator_flat
- Monochromator_curved
- Single_crystal

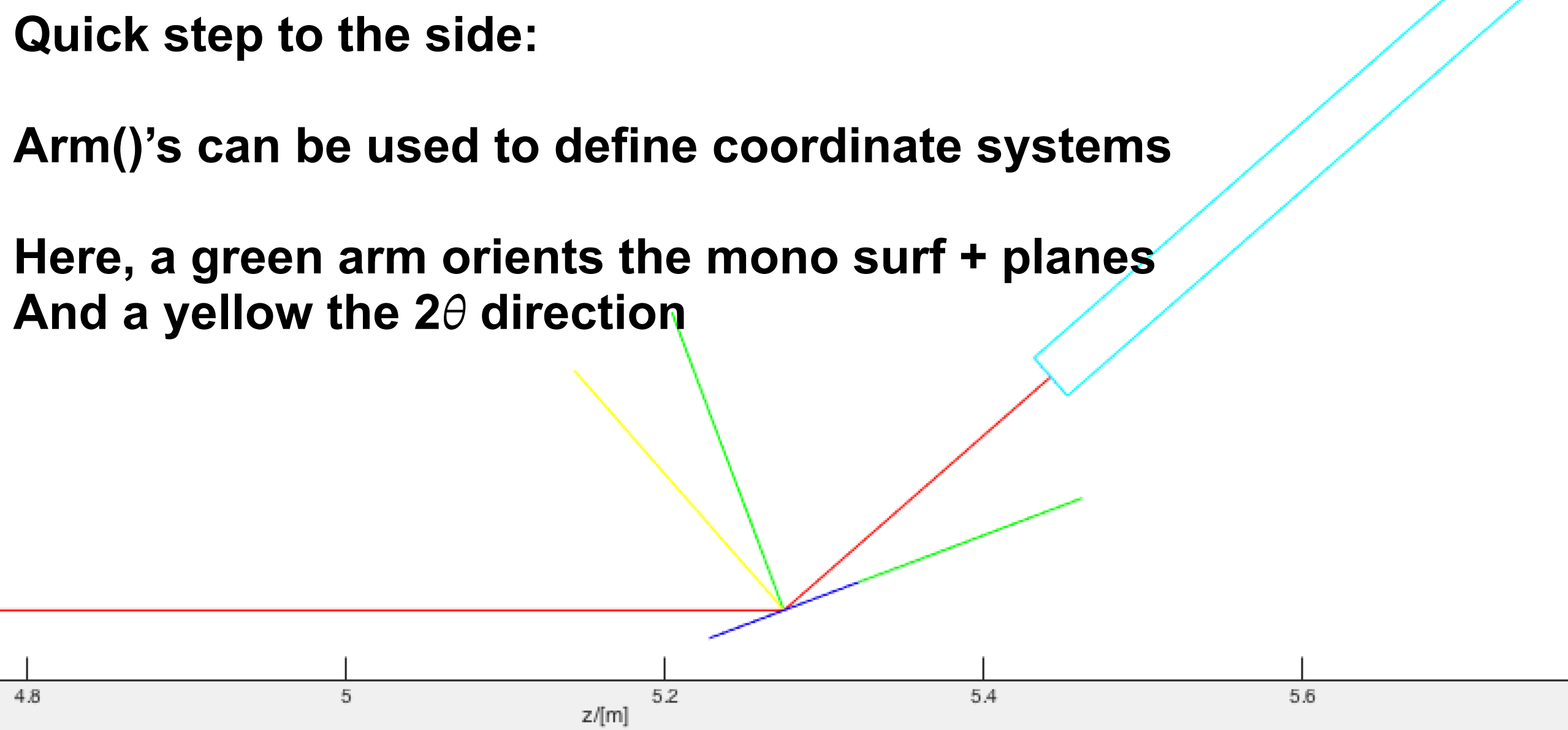
Use in instrument

- Monochromator
- Analyser
- Sample

Quick step to the side:

Arm()'s can be used to define coordinate systems

Here, a green arm orients the mono surf + planes
And a yellow the 2θ direction



Monochromator_flat

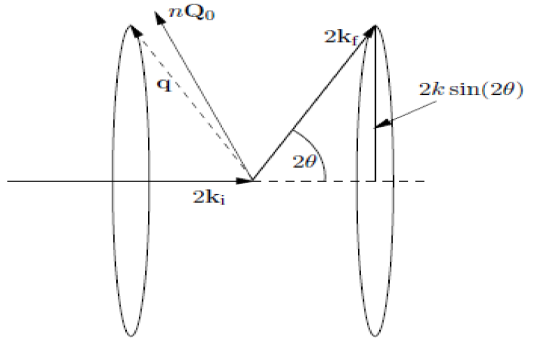
Properties:

- Infinitely thin, one scattering vector perpendicular to surface
  - no multiple scattering/secondary extinction
  - total reflectivity r0, not scattering cross sections
- Mosaic, vertical and horizontal η
- No variance of lattice parameter $\Delta d/d=0$

Algorithm:

- If intersect determine order n, $n\mathbf{Q}_0 = 2\mathrm{k}_i \sin\theta$
- From mosaicity η and angle α from Q_0 find prob $p_{\mathrm{reflect}} = R_0 e^{-\alpha^2/2\eta^2}$
- If reflected, determine direction on D-S cone
- Calculate weight for $\varphi \in [-\pi;\pi]$

$$f_{\mathrm{MC}}(\varphi) = \frac{1}{\sqrt{2\pi}(\alpha/\cos\theta)} e^{-\varphi^2/2(\alpha/\cos\theta)^2}$$



Input parameters

Parameters in **boldface** are required; the others are optional.

Name	Unit	Description	Default
zmin	m	Lower horizontal (z) bound of crystal	-0.05
zmax	m	Upper horizontal (z) bound of crystal	0.05
ymin	m	Lower vertical (y) bound of crystal	-0.05
ymax	m	Upper vertical (y) bound of crystal	0.05
zwidth	m	Width of crystal, instead of zmin and zmax	0
yheight	m	Height of crystal, instead of ymin and ymax	0
mosaich	arc minutes	Horizontal mosaic (in z direction) (FWHM)	30.0
mosaicv	arc minutes	Vertical mosaic (in y direction) (FWHM)	30.0
r0	1	Maximum reflectivity	0.7
Q	1/angstrom	Magnitude of scattering vector	1.8734
DM	angstrom	monochromator d-spacing, instead of Q = 2*pi/DM	0

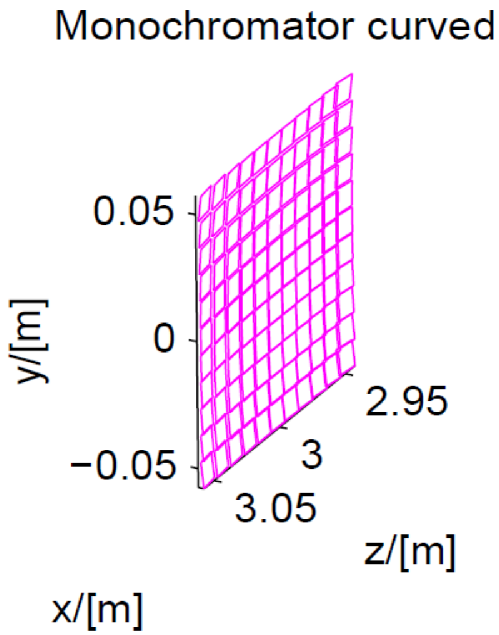
- `xwidth = 0.1, yheight = 0.1,`
- `mosaich = MOSH, mosaicv = MOSV,`
- `r0 = 0.8, Q = 1.8734` (PG 002)

Monochromator_curved

Properties

- Array of single mosaic crystals (blades) with one scattering vector
- Infinitely thin, one scattering vector perp. to each surface of blade - no multiple scattering/secondary extinction

  - total transmission *t(k)*
- Mosaic, vertical and horizontal η



Algorithm

For each individual blade the same as `Monochromator_flat`

Input parameters

Parameters in **boldface** are required; the others are optional.

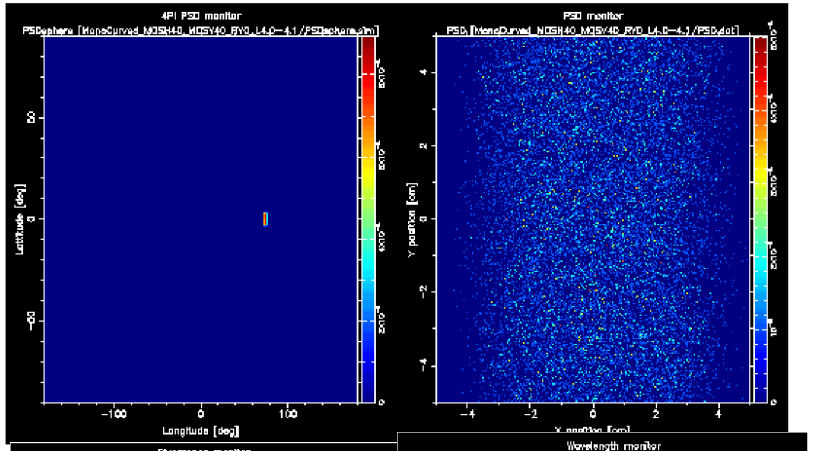
Name	Unit	Description	Default
reflect	str	reflectivity file name of text file as 2 columns [k, R]	"NULL"
transmit	str	transmission file name of text file as 2 columns [k, T]	"NULL"
zwidth	m	horizontal width of an individual slab	0.01
yheight	m	vertical height of an individual slab	0.01
gap	m	typical gap between adjacent slabs	0.0005
NH	columns	number of slabs horizontal	11
NV	rows	number of slabs vertical	11
mosaich	arc minutes	Horisontal mosaic FWHM	30.0
mosaicv	arc minutes	Vertical mosaic FWHM	30.0
r0	1	Maximum reflectivity. O unactivates component	0.7
t0	1	transmission efficiency	1.0
Q	AA-1	Scattering vector	1.8734
RV	m	radius of vertical focussing. flat for 0	0
RH	m	radius of horizontal focussing. flat for 0	0
DM	Angstrom	monochromator d-spacing instead of Q=2*pi/DM	0
mosaic	arc minutes	sets mosaich=mosaicv	0
width	m	total width of monochromator, along Z	0
height	m	total height of monochromator, along Y	0
verbose	0/1	verbosity level	0
order	1	specify the diffraction order, 1 is usually prefered. Use 0 for all	0

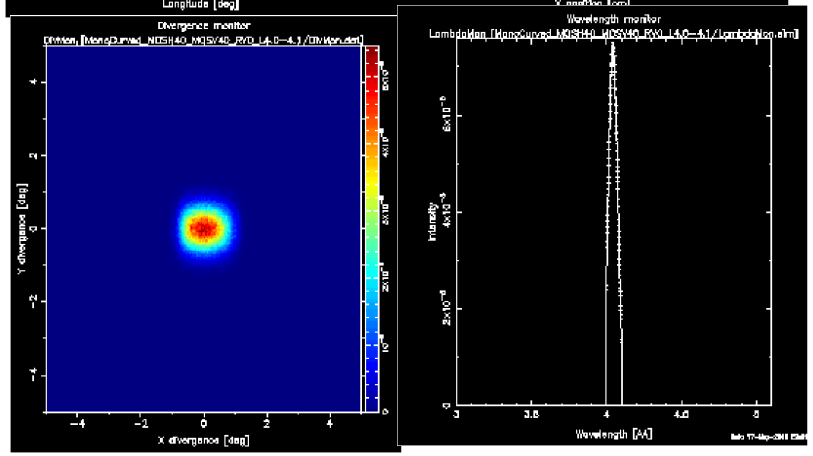
nk)

- 5 vertical slabs :`NV=5, yheight=0.02, zwidth=0.1, RV=1`
- Use reflecivity list '`HOPG.rfl`' provided in McStas datafiles
- `r0 = 1,Q = 1.8734` (PG 002)

Monochromator_curved

No focus





With focus