Ex. 2.2: Rotating, moving parts

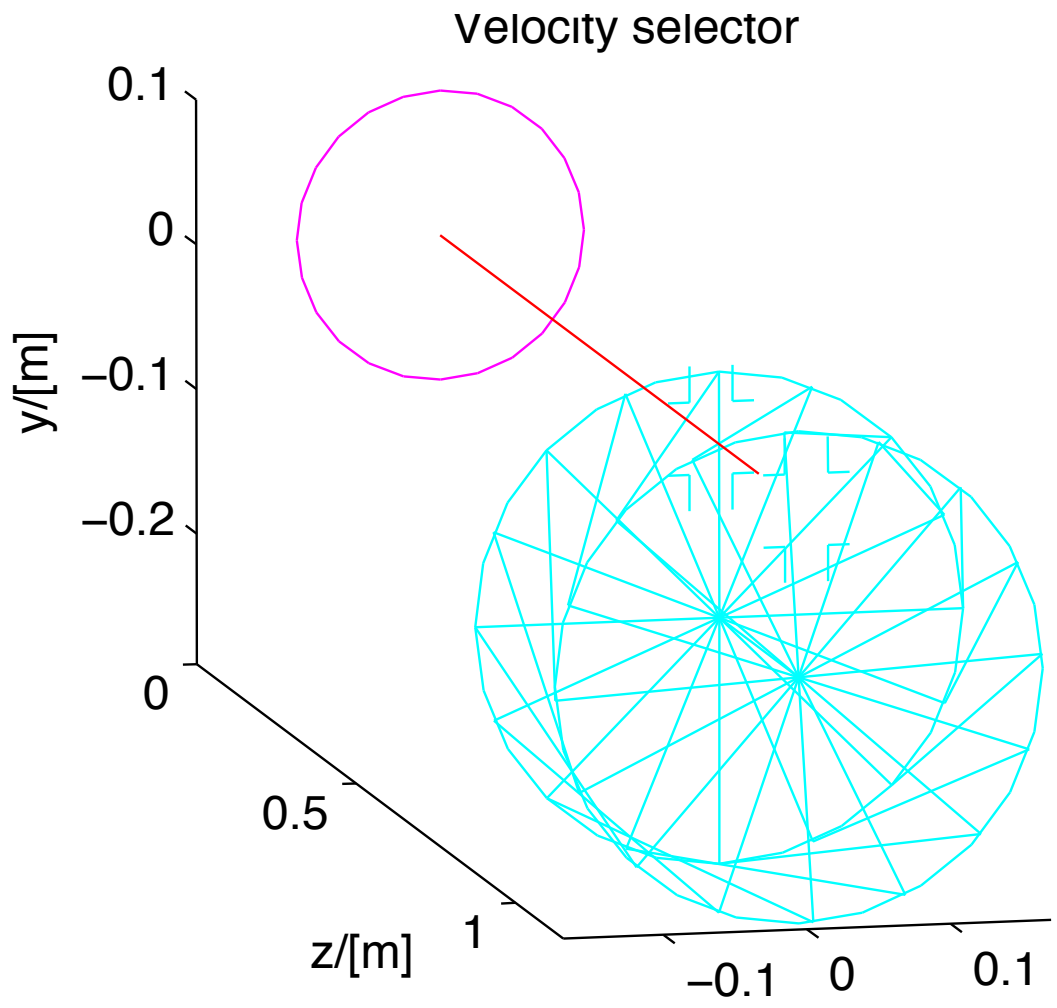
2.2.1 Velocity selector

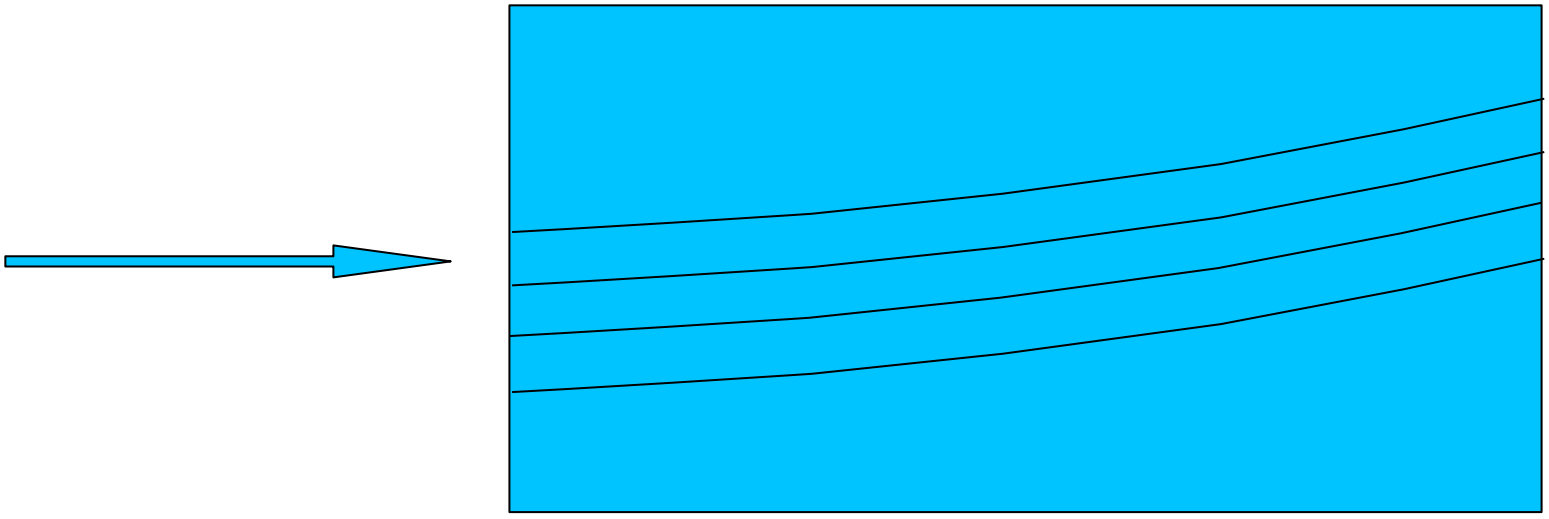
2.2.2 Disk Chopper

2.2.3 Fermi Chopper

2.2.1: Velocity selector:

As you saw, monochromators define a very monochromatic beam. A greater bandwidth monochromatization device is a velocity selector





Input parameters

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

Name	Unit	Description	Default
width	m	Width of entry aperture	0.03
height	m	Height of entry aperture	0.05
l0	m	Distance between apertures	0.30
r0	m	Height from aperture centre to rotation axis	0.12
phi	deg	Twist angle along the cylinder	48.298
l1	m	Length of cylinder (less than l0)	0.25
tb	m	Thickness of blades	0.0004
rot	rpm	Cylinder rotation speed, counter-clockwise	20000
nb	1	Number of Soller blades	72

Exercise 2.2.1

Open the Ex_2_2_1.instr instrument

Notice use of wavelength monitors L_mon

Notice use of the V_select component

Input parameter ROT defines selector rotational velocity (RPM)

Perform a TRACE at the default ROT=20000 RPM

Perform a SIMULATE of 1e7 neutrons at default ROT

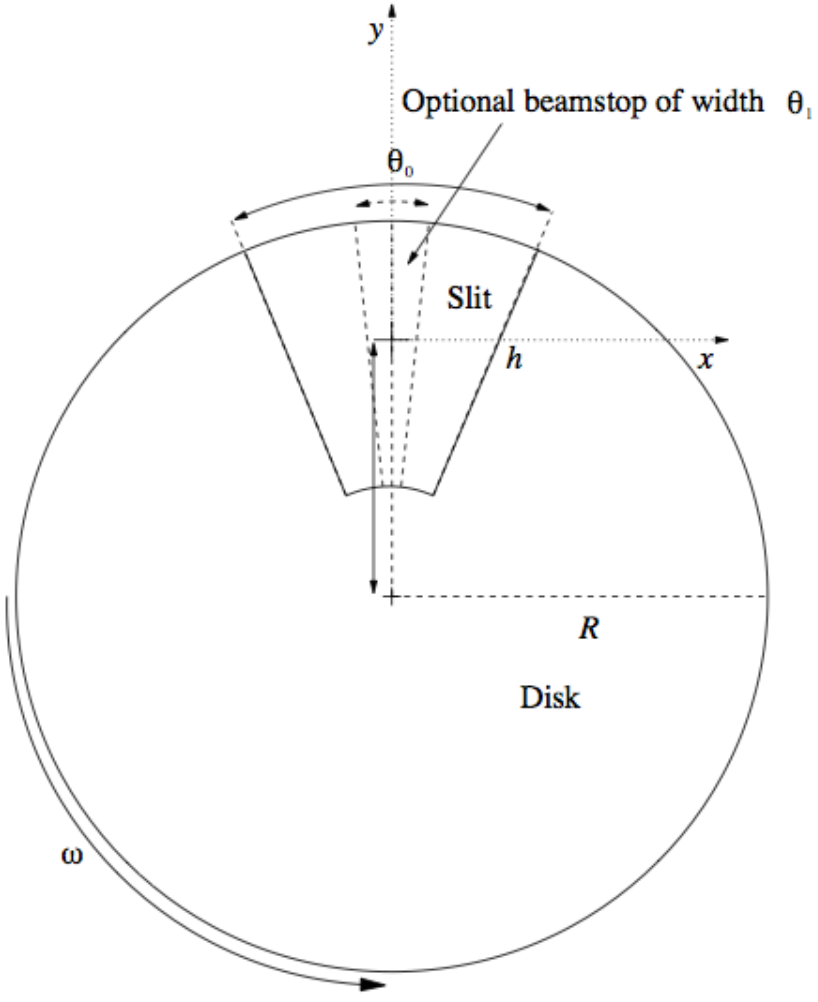
Estimate the relative bandwidth $\delta\lambda/\lambda$ of the transmitted beam

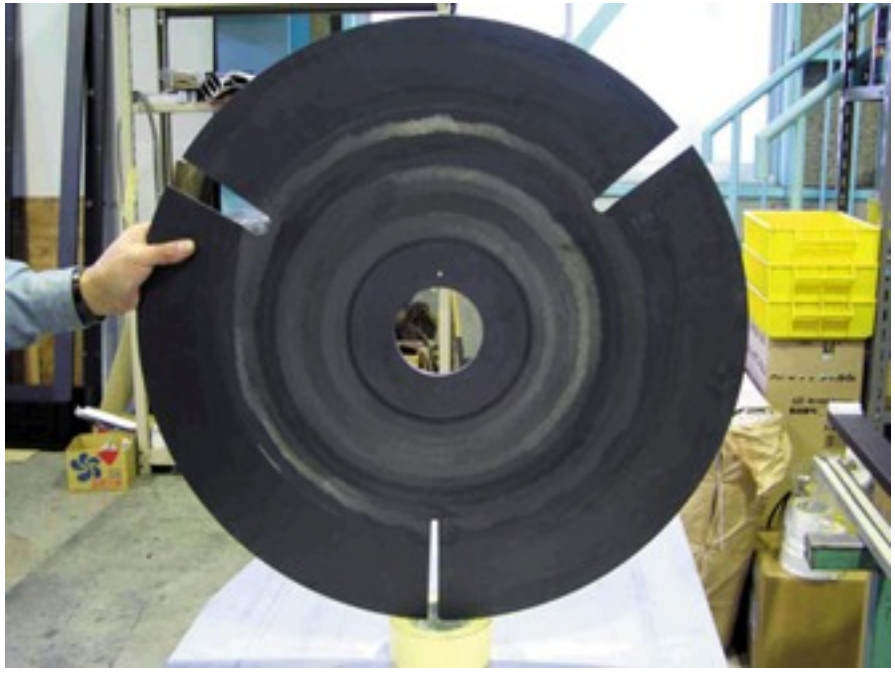
Perform a series of simulations in the range
$10000 < ROT < 50000$ (5 steps)

Compare the transmitted beam in the different cases

2.2.2: Disk chopper:

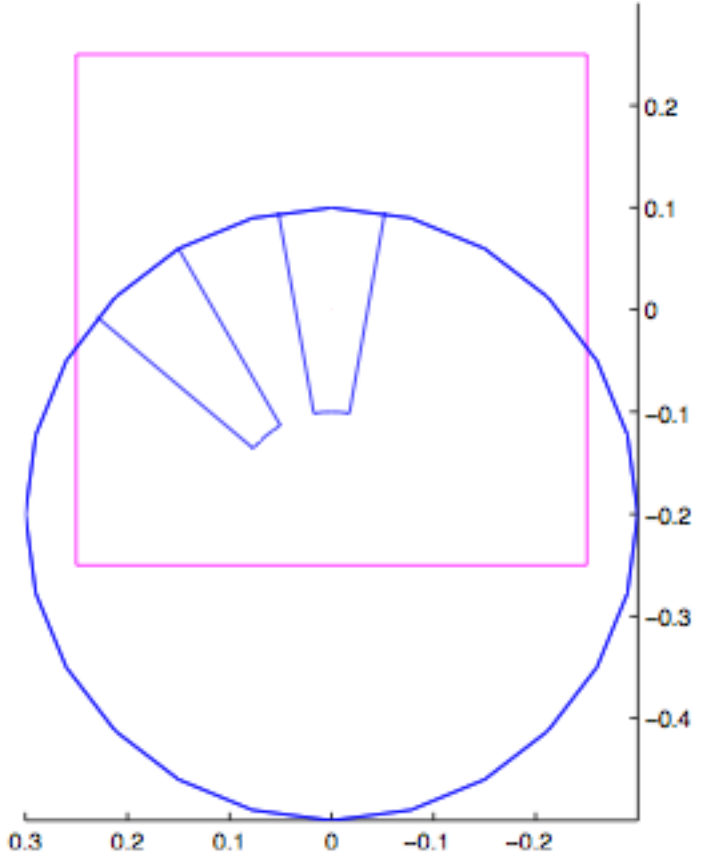
A Disk Chopper is also a rotating device, selecting neutrons. The travelled distance in the device is much smaller (disk), for defining time structure in the neutron beam.

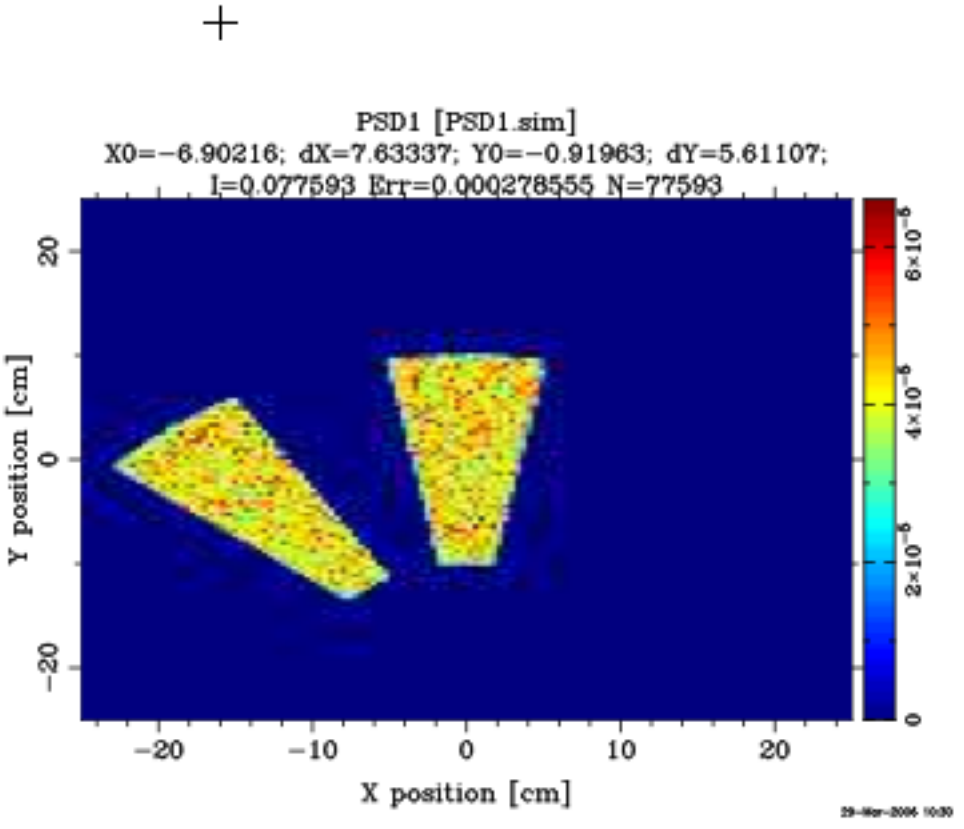




2.2.2: Disk chopper:

A Disk Chopper is also a rotating device, selecting neutrons. The travelled distance in the device is much smaller (disk), for defining time structure in the neutron beam.





Ex. 1 / Peter Willendrup

2.2.2: Disk chopper:

Parameter significance

Input parameters

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

Name	Unit	Description	Default
theta_0	deg	Angular width of the slits.	
R	m	Radius of the disc	
h	m	Slit height (if = 0, equal to R). Auto centering of beam at h/2.	0
omega	rad/s	Angular frequency of the Chopper (algebraic sign defines the direction of rotation)	
n	1	Number of slits	3
j	s	Jitter in the phase	0
theta_1	deg	Angular width of optional beamstop in chopper windows	0
t_0	s	Time 'delay'.	0
IsFirst	0/1	Set it to 1 for the first chopper position in a cw source (it then spreads the neutron time distribution)	0
n_pulse	1	Number of pulses (Only if IsFirst)	1
abs_out	0/1	Absorb neutrons hitting outside of chopper radius?	1
phi_0	deg	Angular 'delay' (suppresses t_0)	0
w	m	'width' of slits for compatibility with Chopper.comp	0
wc	m	'width' of beamstops for compatibility with Chopper.comp	0
compat	1	Chopper placement compatible with original Chopper.comp	0

2.2.2: Disk chopper:

Used parameters

- R, radius of disk-chopper (we use 0.5 m)
- n, number of openings (we use 2)
- phi_0 (angular phase at t=0, in degrees, we use 90 deg)
- omega (angular frequency of chopper)
- theta_0 (angular width of each chopper opening)

Exercise 2.2.2

Open the Ex_2_2_2.instr instrument

Notice use of the EXTEND %{ %} section, defining a time structure (1 second, flat distribution)

Notice use of Monitor_nD, our “Swiss army knife” monitor

options=”t auto bins=200”
options="t auto bins=200 x auto bins=200"
- Automatic binning if wished
- Monitors any state (or user) variable vs. any other
- Assumes various shapes/geometries
- ...

Instrument input parameters:

f (Hz) - chopper frequency ω=2π*f in component parm list)
Theta0 (degrees) - opening width of slit(s)

Exercise 2.2.2

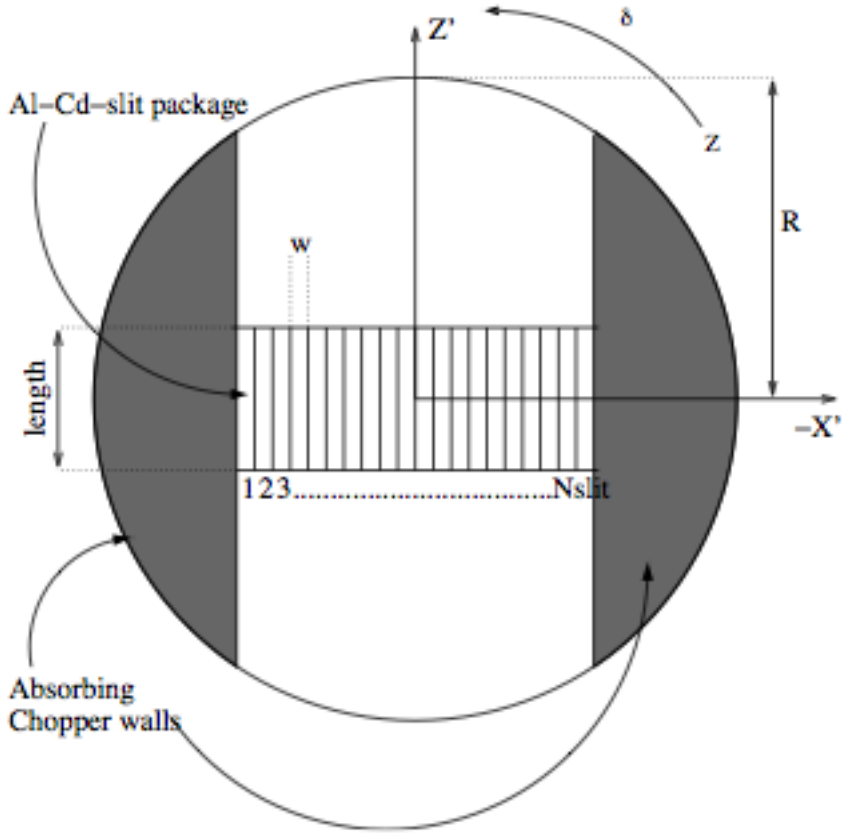
Make a TRACE to get an overview of the instrument

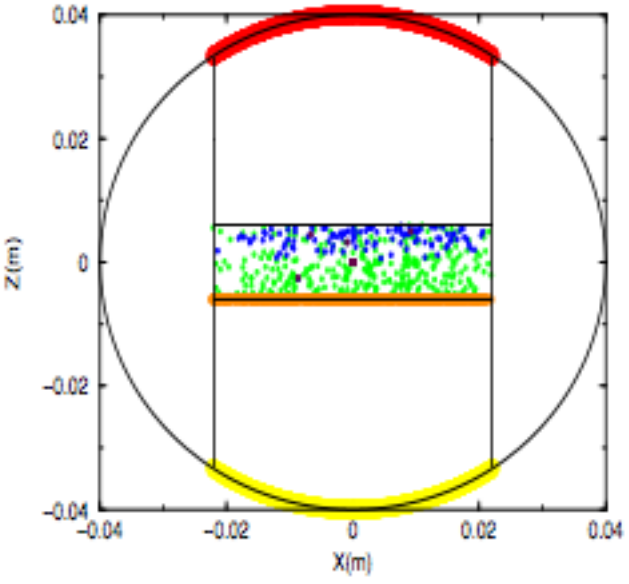
SIMULATE 1e7 neutrons at the default of f=5Hz and Theta0=10 degrees. While simulation is ongoing, estimate the number of pulses per second?

Try another 1e7 at f=1 hz. Notice space-time correlation in the third TOF panel

At a given frequency, try changing the Theta0 chopper opening to higher and lower value. Comment on the results.

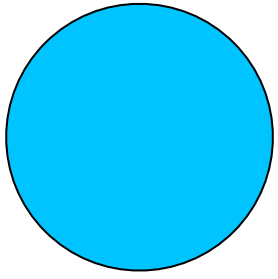
2.2.3 Fermi chopper - summary





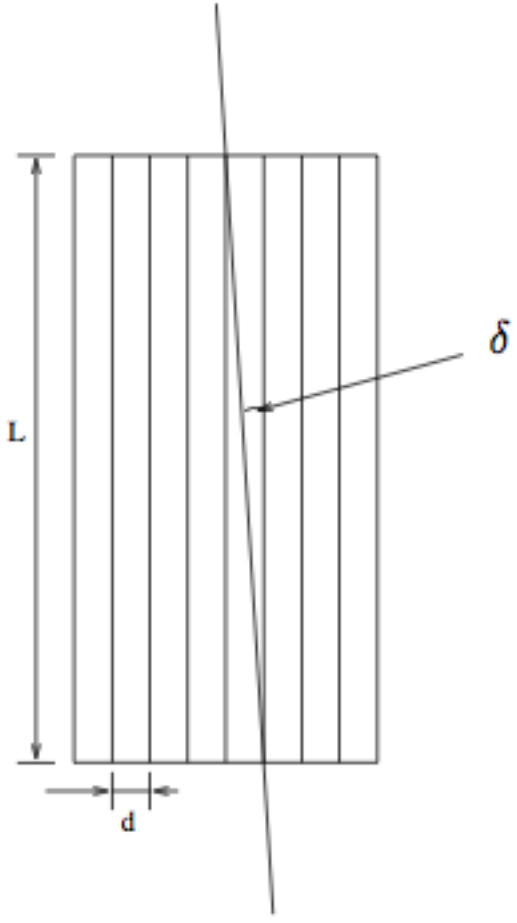
2.3 Slits - short summary

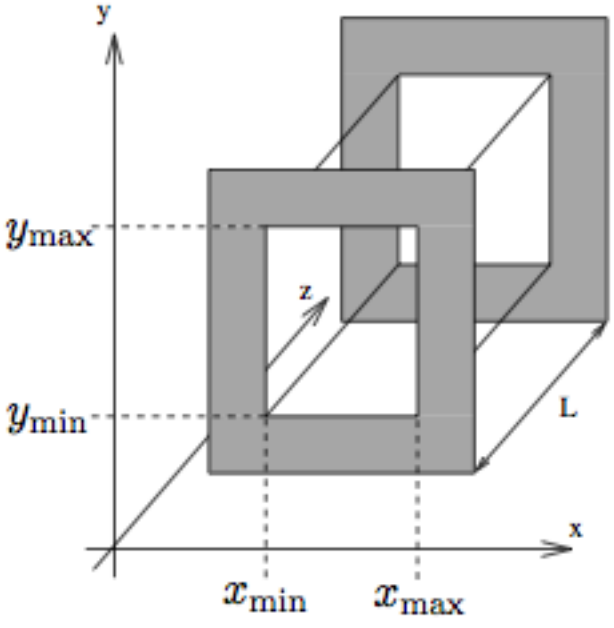
Name:	Slit
Author:	System
Input parameters	$x_{\min}$, $x_{\max}$, $y_{\min}$, $y_{\max}$
Optional parameters	r, p_{cut}
Notes	



2.4 Collimators - linear collimator - short summary

Name:	Collimator_linear
Author:	System
Input parameters	x_{min}, x_{max}, y_{min}, y_{max}, L, δ
Optional parameters	
Notes	





2.4 Collimators - radial collimator - short summary

Name:	Collimator_radial
Author:	(System) E.Farhi, ILL
Input parameters	w_1, h_1, w_2, h_2, *len*, θ_{min}, θ_{max}, *nchan*, *radius*
Optional parameters	*divergence*, *nblades*, *roc* and others
Notes	Validated