



## 4 - Moving Optics

- Velocity selector
- Disk Chopper
- Fermi Chopper



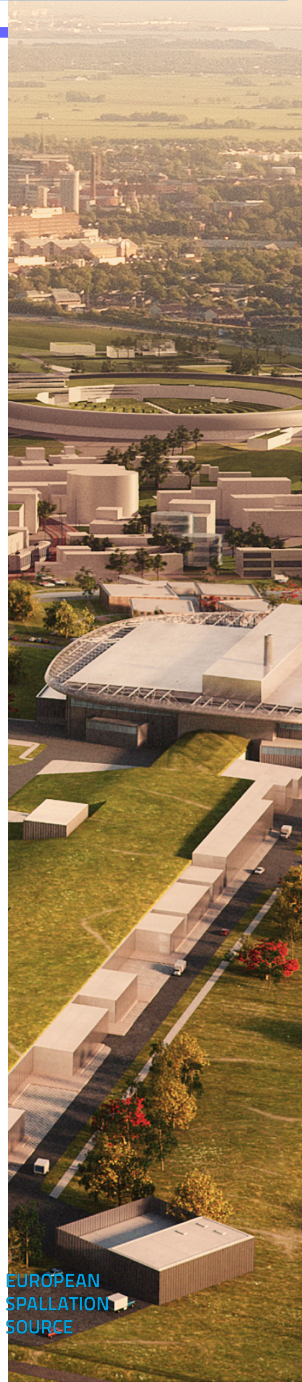
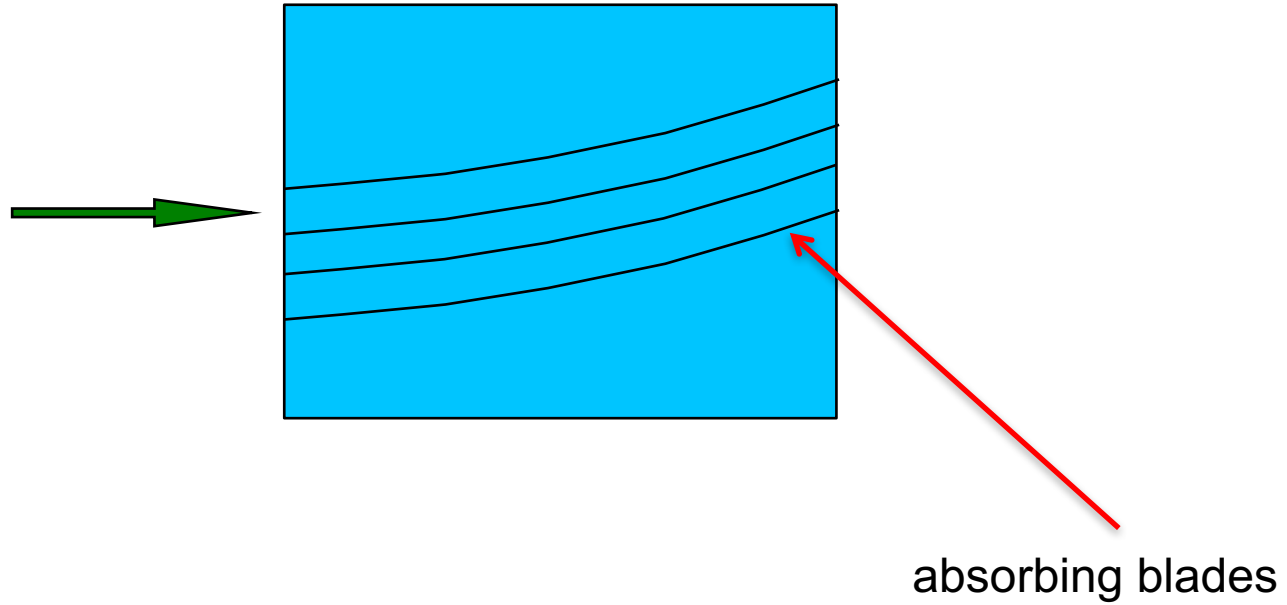
# Velocity Selectors

-

Select the neutron energy you want

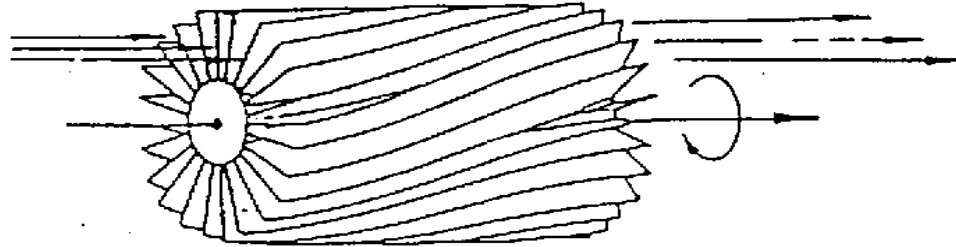


# VELOCITY SELECTORS



# VELOCITY SELECTORS

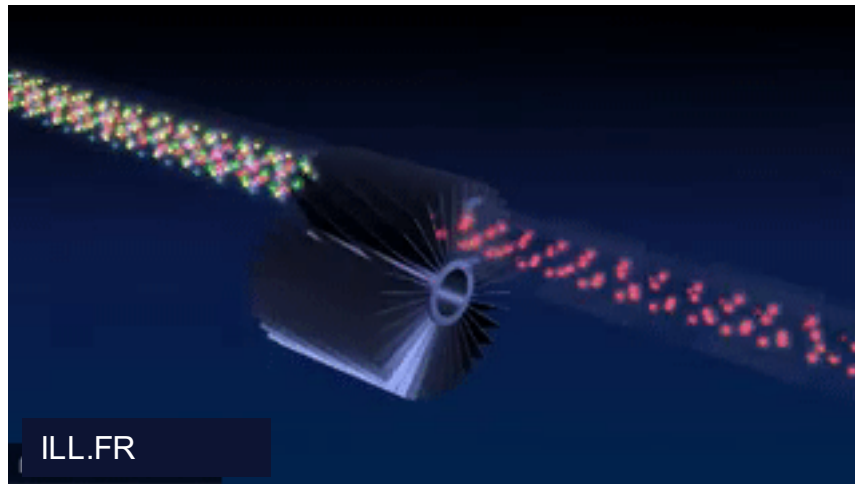
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EUROPEAN  
SPALLATION  
SOURCE

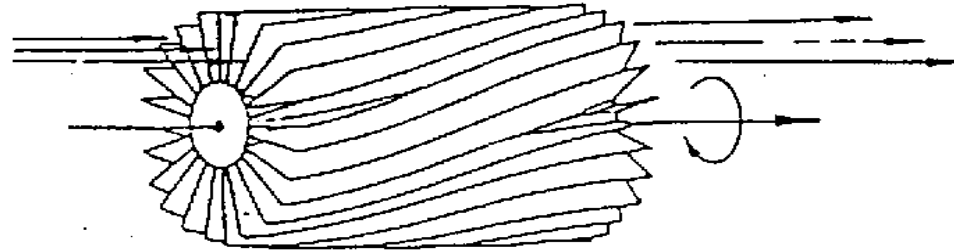
# VELOCITY SELECTORS

'broad' monochromatization  $\delta\lambda/\lambda \approx 10\%$



# VELOCITY SELECTORS

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## INPUT PARAMETER

xwidth	[m]	width entry aperture	} housing
yheight	[m]	height entry aperture	
zdepth	[m]	housing! length	
length	[m]	blade length	
d	[m]	blade thickness	
alpha	[deg]	twisting angle	
radius	[m]	distance rotation axis – aperture centre	
nu	[Hz]	rotation speed, counterclockwise	
nslit	[]	number of blades	



EUROPEAN  
SPALLATION  
SOURCE

# Velocity Selector

## Exercise 7.1

- Open the Ex\_7\_1\_Selector.instr instrument
- Notice use of wavelength monitors L\_mon
- Notice use of the V\_select component
- Input parameter f defines selector rotational velocity (Hz)

# VELOCITY SELECTOR



## Exercise 7.1

- Perform a TRACE at the default  $f=300$  Hz
- Perform a SIMULATE of  $1e7$  neutrons at default  $f$
- Estimate the relative bandwidth  $\delta\lambda/\lambda$  of the transmitted beam
- Perform a series of simulations in the range
  - $150 < f < 800$  (5 steps)
- Compare the transmitted beam in the different cases
- Question: What is the ideal rotational speed to select neutrons of  $10 \text{ \AA}$  with the selector from Ex 7.1?  
Hint:  $\lambda [\text{\AA}] \approx 3956/v [\text{m/s}]$

# DISK CHOPPER

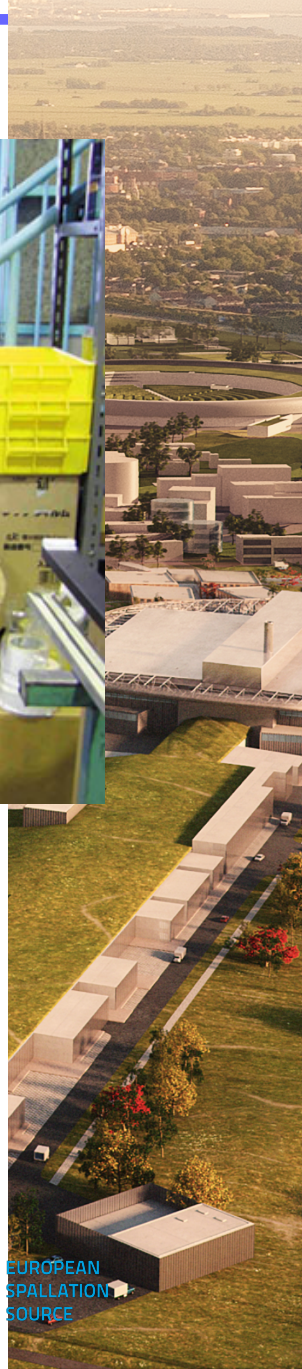
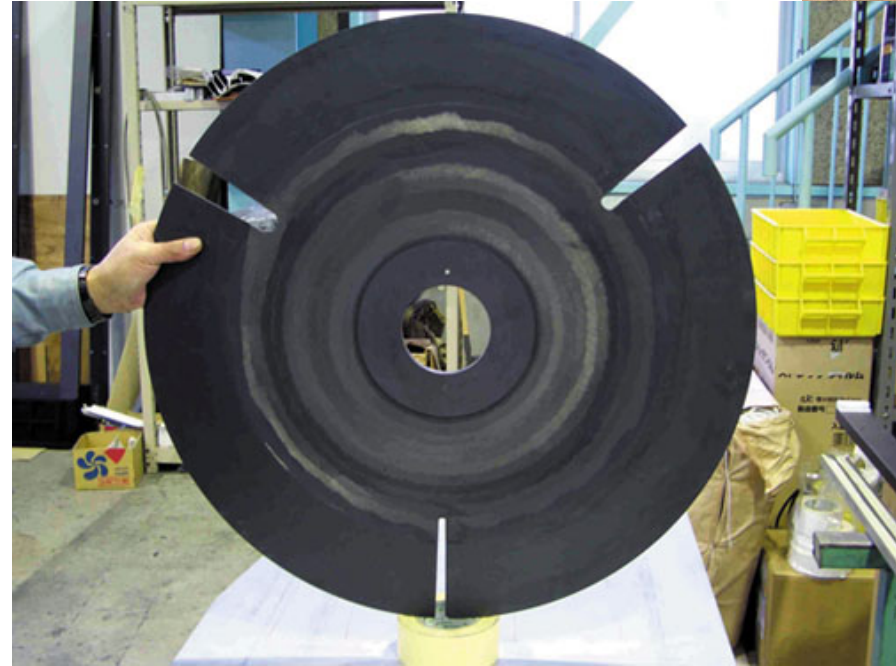
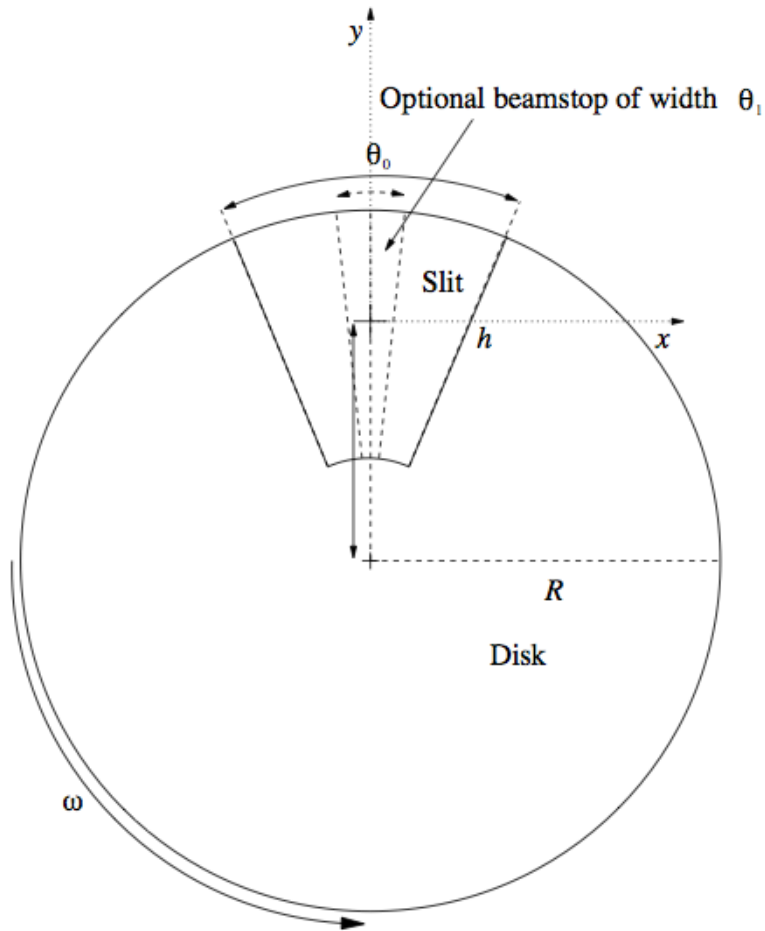


Define time structure of the beam

Time Of Flight (TOF) measurements



# DISK CHOPPER



# DISK CHOPPER

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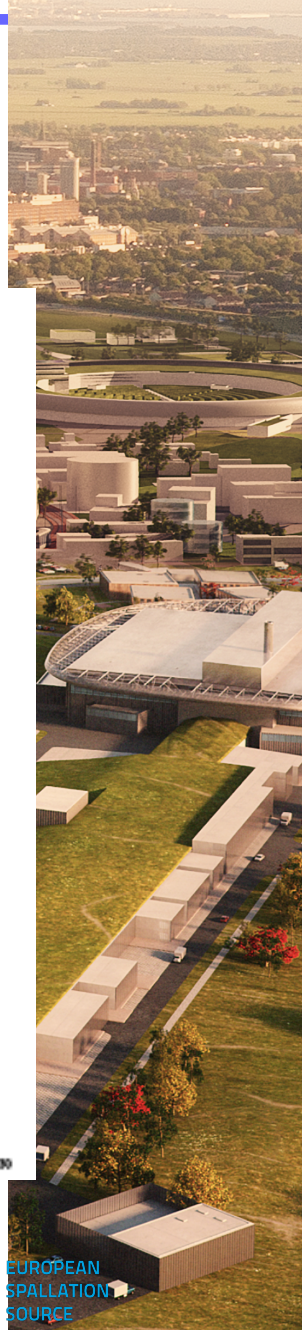
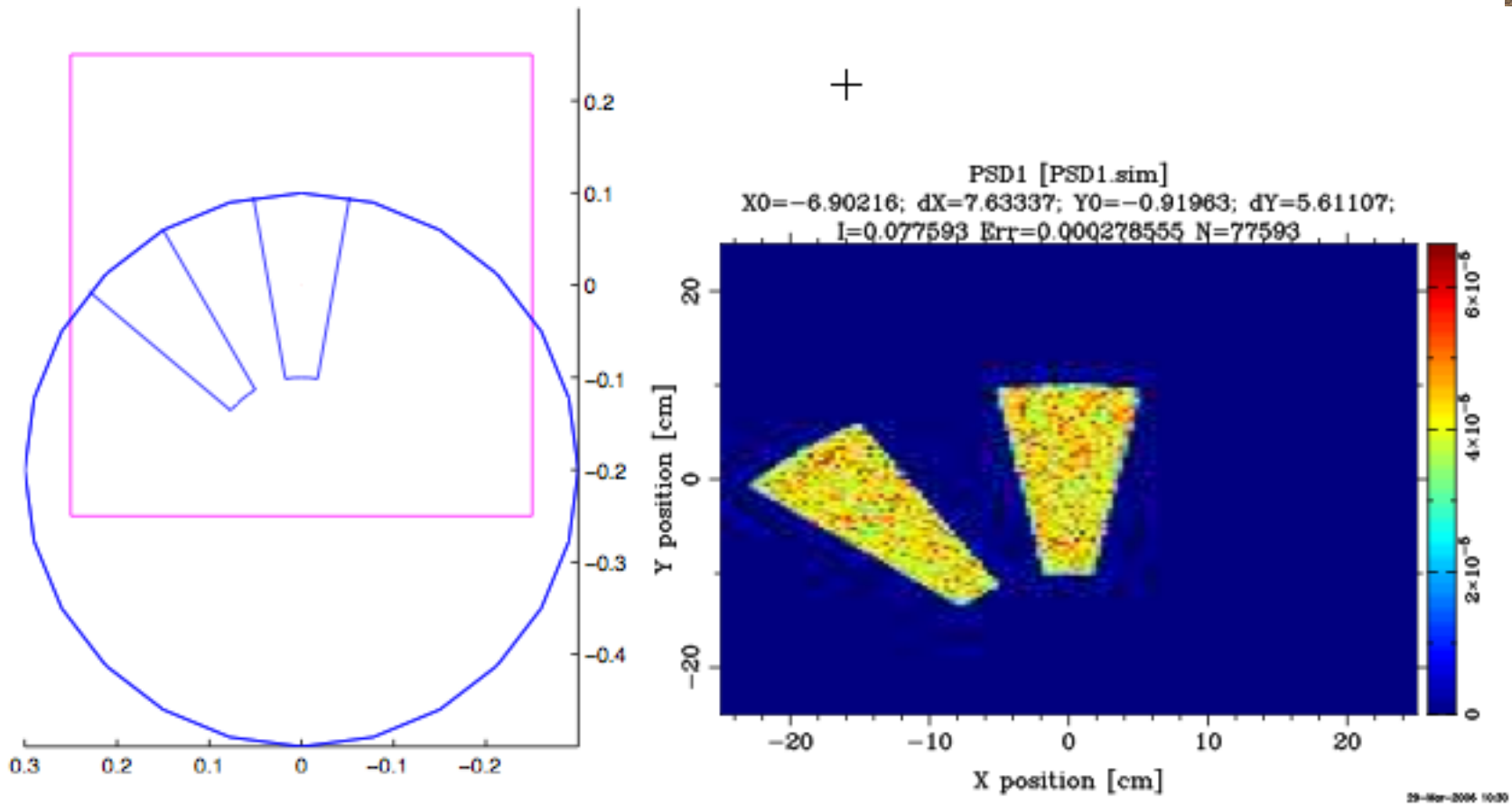


## INPUT PARAMETER

nu	[Hz]	frequency
yheight	[m]	slit height (if 0, yheight = radius)
radius	[m]	disk radius
theta_0	[deg]	angular width of slits
xwidth	[m]	horizontal slit width opening, beam center
jitter	[s]	jitter in time phase
delay	[s]	time delay
phase	[deg]	angular delay, overrides time
lsfirst	[0/1]	several choppers, defines first chopper
npulse	[1]	number of pulses if lsfirst=true
verbose	[1]	display disk chopper config

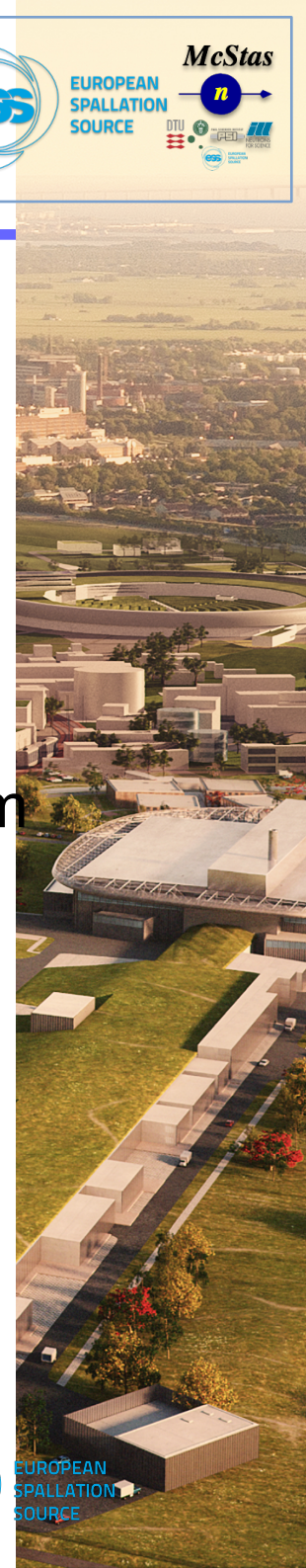


# DISK CHOPPER\_S

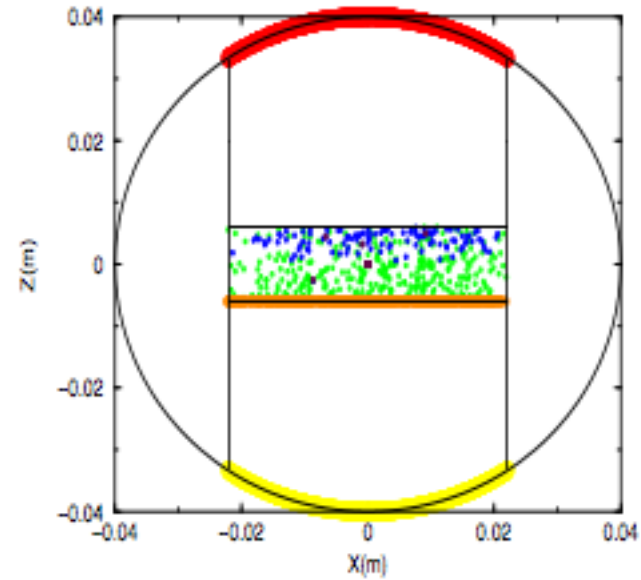
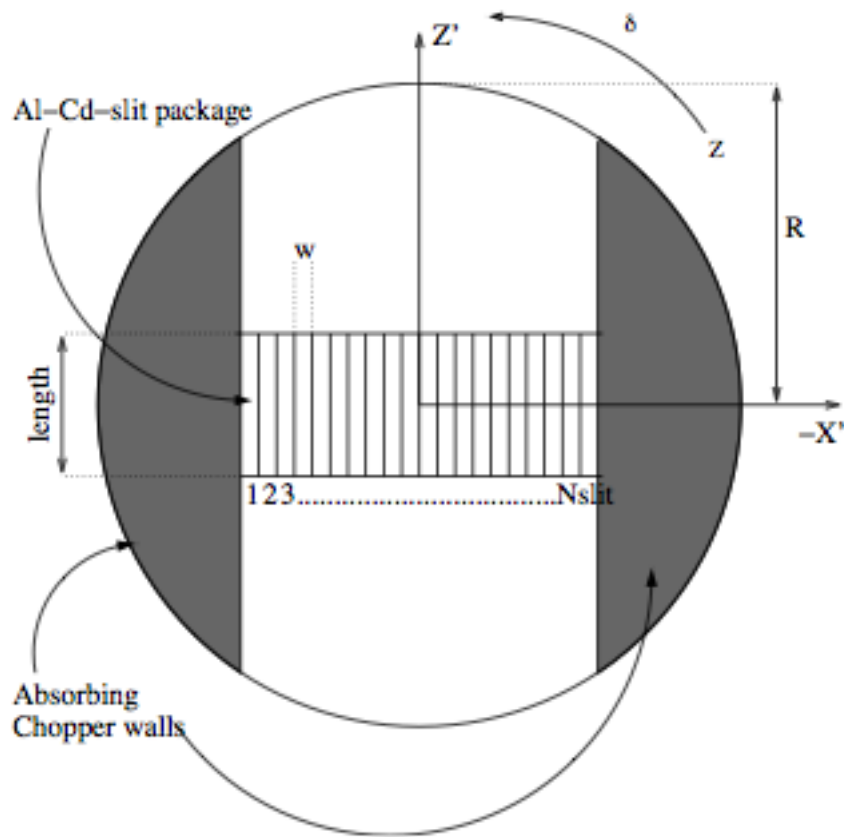


## Exercise 4.1

- Notice the  $V\_select$  component and the input parameter  $f$   
Perform a TRACE at the default  $f=300$  Hz
- Perform a SIMULATE of  $1e7$  neutrons at default  $f$
- Estimate the relative bandwidth  $\delta\lambda/\lambda$  of the transmitted beam
- Perform a series of simulations in the range
- $150 < f < 800$  (5 steps)
- Compare the transmitted beam in the different cases
- Question: What is the ideal rotational speed to select neutrons of  $10 \text{ \AA}$  with the selector from Ex 4.1?  
Hint:  $\lambda [\text{\AA}] \approx 3956/v [\text{m/s}]$



# FERMI CHOPPER



# DISK CHOPPER

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## Exercise

- Open the Ex\_4\_2\_DiskChopper.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"



# DISK CHOPPER

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## Exercise :

- **Insert** a disk chopper 0.5 mm after guide exit
- Chopper Component Parameters:
  - radius of disk-chopper (we use 0.5 m)
  - n, number of openings (we use 2)
  - Phase (angular phase at t=0, in degrees, we use 90 deg)
- Instrument input parameters:
  - f (Hz) - chopper frequency
  - Theta0 (degrees) - opening width of slits



# DISK CHOPPER

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## Exercise

- Make a TRACE to get an overview of the instrument
- SIMULATE  $1e7$  neutrons at the default of  $f=5\text{Hz}$  and  $\text{Theta}0=10$  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  $\text{Theta}0$  chopper opening to higher and lower value. Comment on the results.



