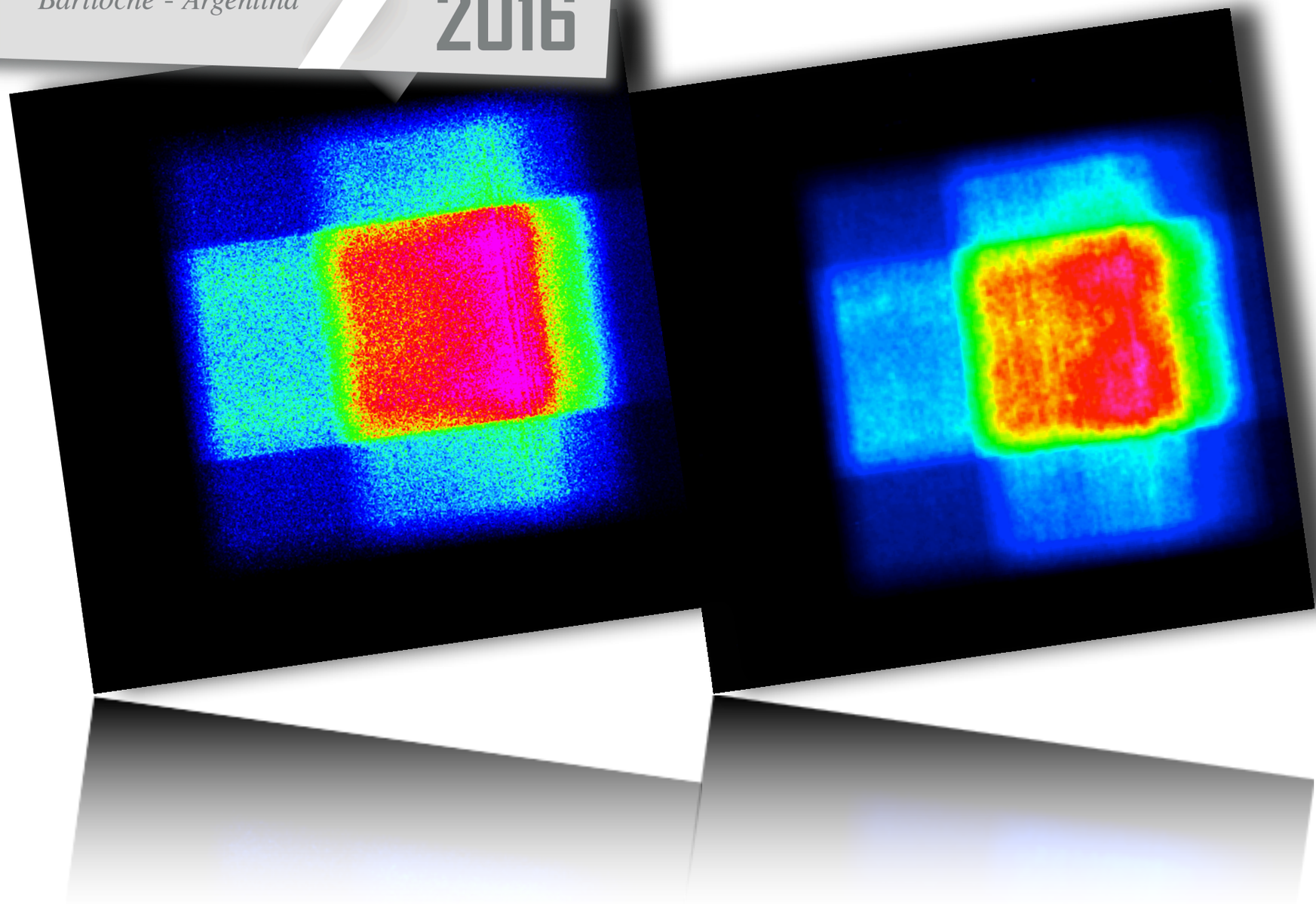
SOURCES AND MONITORS

McStas n

McStas School
Bariloche - Argentina

15th-19th FEBRUARY 2016



SOURCES AND MONITORS

<u>In this session:</u>

- Overview of existing Source and Monitor components
- Detailed description of the most commonly used ones
- How to 'call' them into a *.instr file
- Practical Exercise using sources and monitors

IMPORTANT:

All (and more) of this information can be found in the online pdf component documentation
http://www.mcstas.org/documentation/manual/mcstas-2.2a-components.pdf

also distributed with your McStas installation

The component documentation along with the "*mcdoc component_you_are_searching_for*" command, are your best friends when using McStas

SOURCES

Typing "*mcdoc source*" or "*mcdoc moderator*" in your command shell, will reveal a list of available sources and moderators.
Or you can search in the directories '*sources*', '*contrib*', and '*obsolete*'.

Mathematical:

- Source_simple.comp
- Source_div.comp

Pulsed sources:

- ESS_moderator.comp
- Moderator.comp
- SNS_source.comp (*)
- ISIS_moderator.comp (*)

Reactors :

- Source_Maxwell_3.comp
- Source_gen.comp
- Source_gen4.comp
- Source_multi_surfaces.comp (*)

(*) contributed (can be found in /mcstas/installation/folder/**contrib**)

SOURCES

Source_simple.comp A Simple continuous source with flat energy/wavelength spectrum

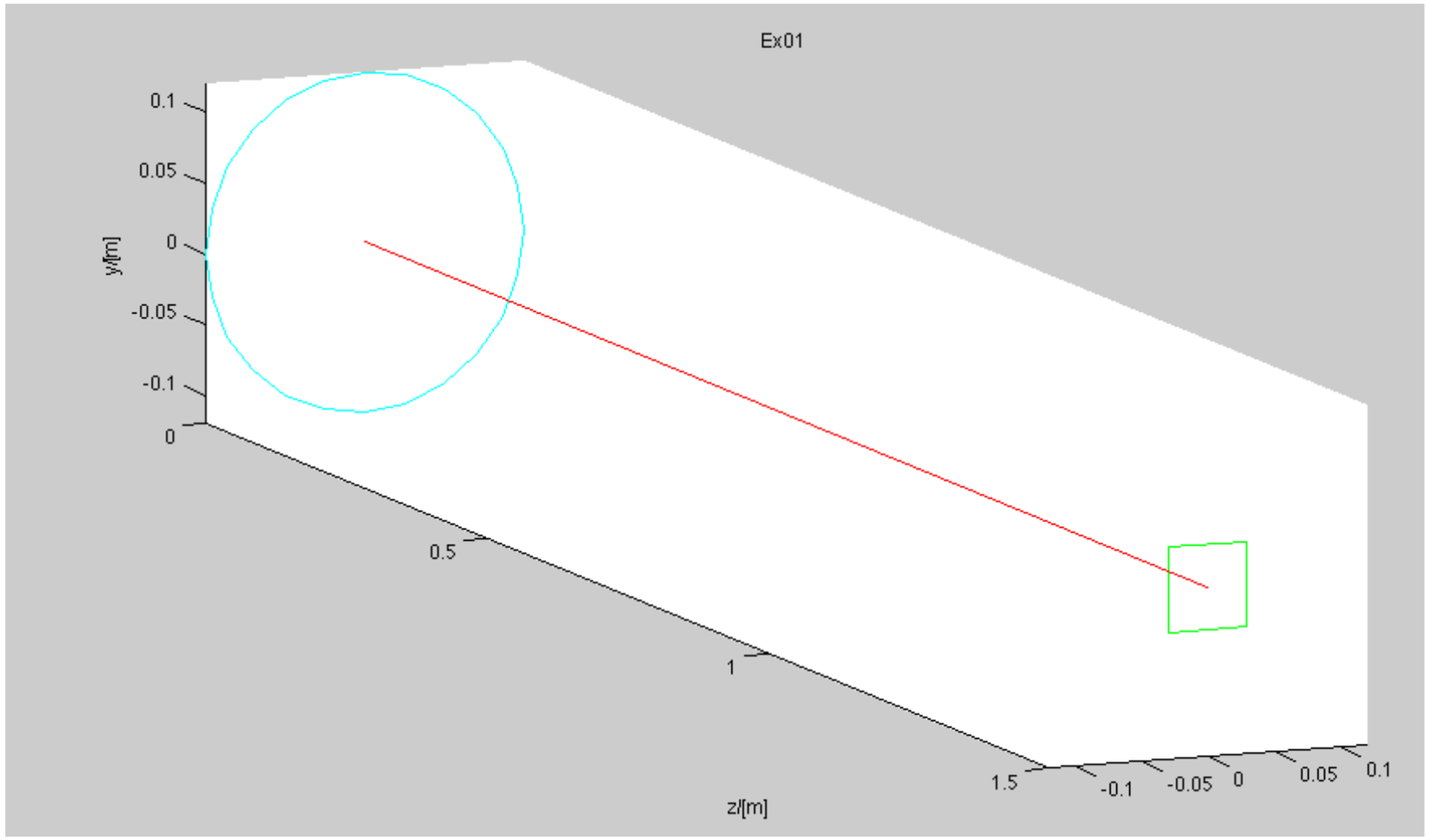
Parameters in **boldface** are required; the others are optional.

Name	Unit	Description	Default
radius	m	Radius of circle in (x,y,0) plane where neutrons are generated.	0.1
yheight	m	Height of rectangle in (x,y,0) plane where neutrons are generated.	0
xwidth	m	Width of rectangle in (x,y,0) plane where neutrons are generated.	0
dist	m	Distance to target along z axis.	0
focus_xw	m	Width of target	.045
focus_yh	m	Height of target	.12
E0	meV	Mean energy of neutrons.	0
dE	meV	Energy half spread of neutrons (flat or gaussian sigma).	0
lambda0	AA	Mean wavelength of neutrons.	0
dlambda	AA	Wavelength half spread of neutrons.	0
flux	1/(s*cm**2*st*energy unit)	flux per energy unit, Angs or meV if flux=0, the source emits 1 in 4*PI whole space.	1
gauss	1	Gaussian (1) or Flat (0) energy/wavelength distribution	0
target_index	1	relative index of component to focus at, e.g. next is +1 this is used to compute 'dist' automatically.	+1

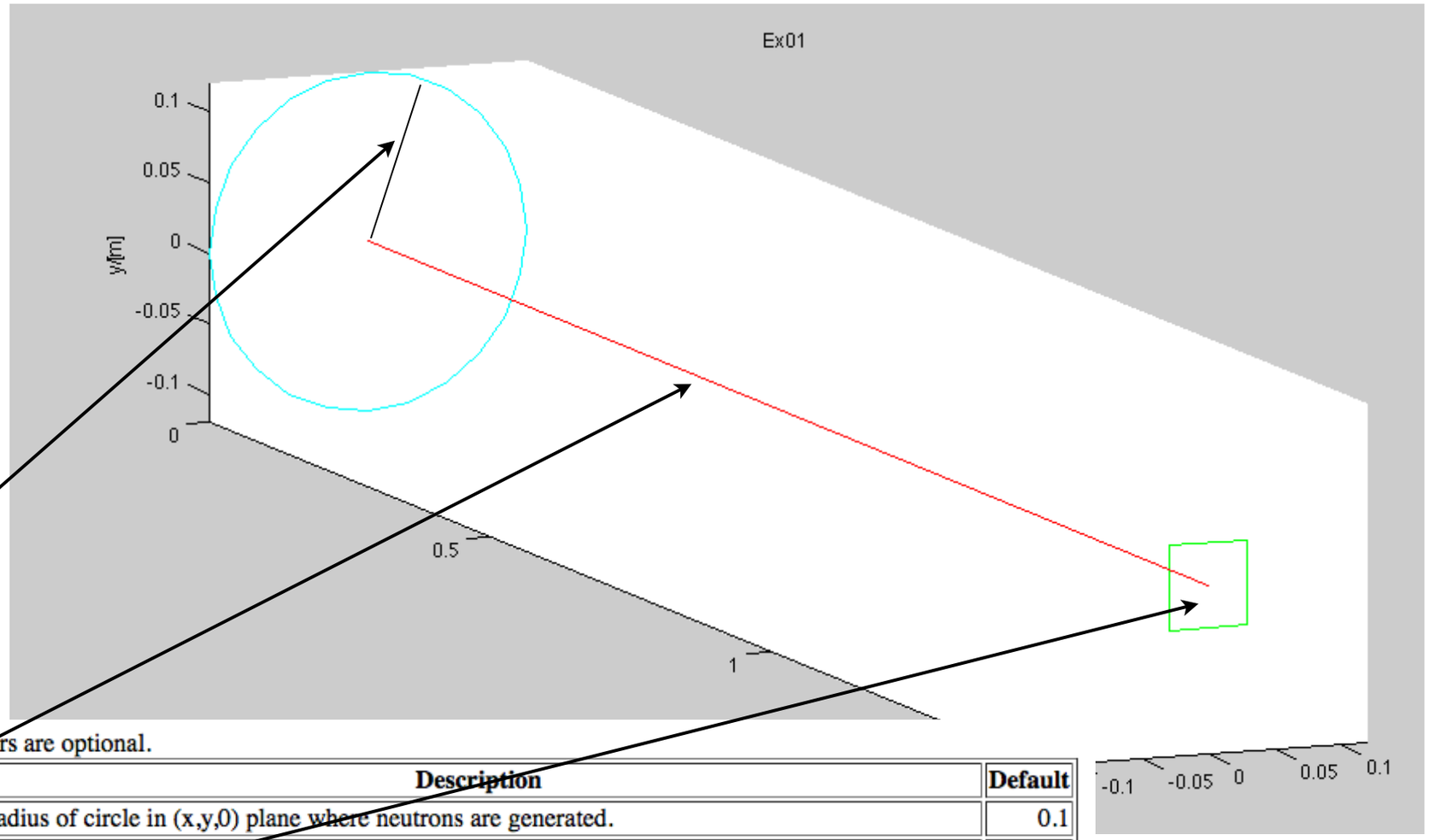
What do we need the distance and target size for?

(let us take a small break and investigate this)

SOURCES



SOURCES



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

Name	Unit	Description	Default
radius	m	Radius of circle in (x,y,0) plane where neutrons are generated.	0.1
yheight	m	Height of rectangle in (x,y,0) plane where neutrons are generated.	0
xwidth	m	Width of rectangle in (x,y,0) plane where neutrons are generated.	0
dist	m	Distance to target along z axis.	0
focus_xw	m	Width of target	.045
focus_yh	m	Height of target	.12
E0	meV	Mean energy of neutrons.	0
dE	meV	Energy half spread of neutrons (flat or gaussian sigma).	0
lambda0	AA	Mean wavelength of neutrons.	0
dlambda	AA	Wavelength half spread of neutrons.	0
flux	1/(s*cm**2*st*energy unit)	flux per energy unit, Angs or meV if flux=0, the source emits 1 in 4*PI whole space.	1
gauss	1	Gaussian (1) or Flat (0) energy/wavelength distribution	0
target_index	1	relative index of component to focus at, e.g. next is +1 this is used to compute 'dist' automatically.	+1

SOURCES

Source_simple.comp

A simple continuous source with flat energy/wavelength spectrum

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

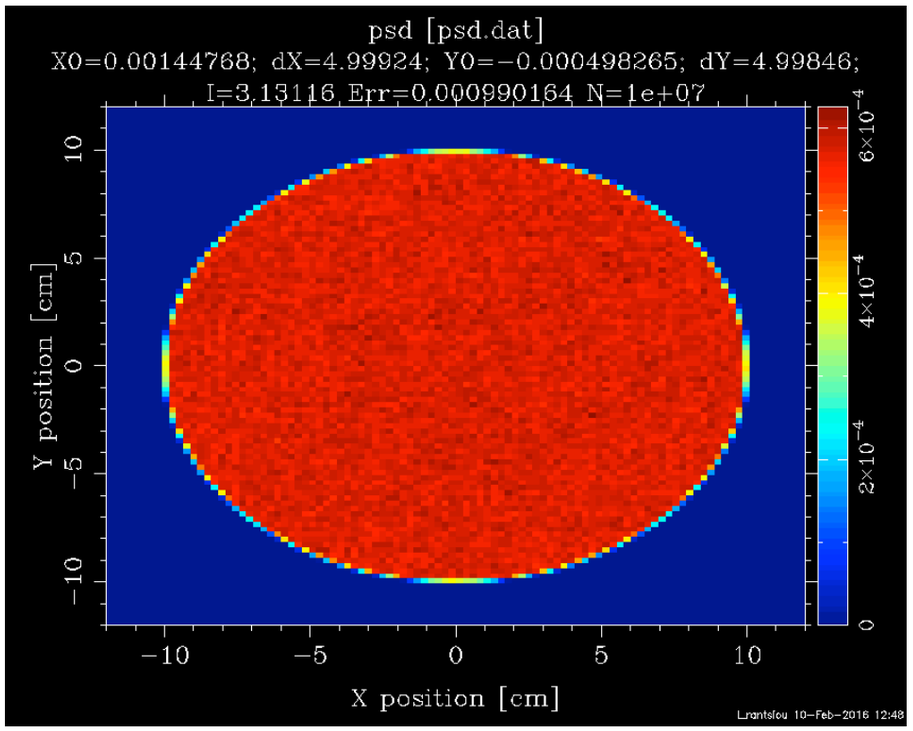
Name	Unit	Description	Default
radius	m	Radius of circle in (x,y,0) plane where neutrons are generated.	0.1
yheight	m	Height of rectangle in (x,y,0) plane where neutrons are generated.	0
xwidth	m	Width of rectangle in (x,y,0) plane where neutrons are generated.	0
dist	m	Distance to target along z axis.	0
focus_xw	m	Width of target	.045
focus_yh	m	Height of target	.12
E0	meV	Mean energy of neutrons.	0
dE	meV	Energy half spread of neutrons (flat or gaussian sigma).	0
lambda0	AA	Mean wavelength of neutrons.	0
dlambda	AA	Wavelength half spread of neutrons.	0
flux	1/(s*cm**2*st*energy unit)	flux per energy unit, Angs or meV if flux=0, the source emits 1 in 4*PI whole space.	1
gauss	1	Gaussian (1) or Flat (0) energy/wavelength distribution	0
target_index	1	relative index of component to focus at, e.g. next is +1 this is used to compute 'dist' automatically.	+1

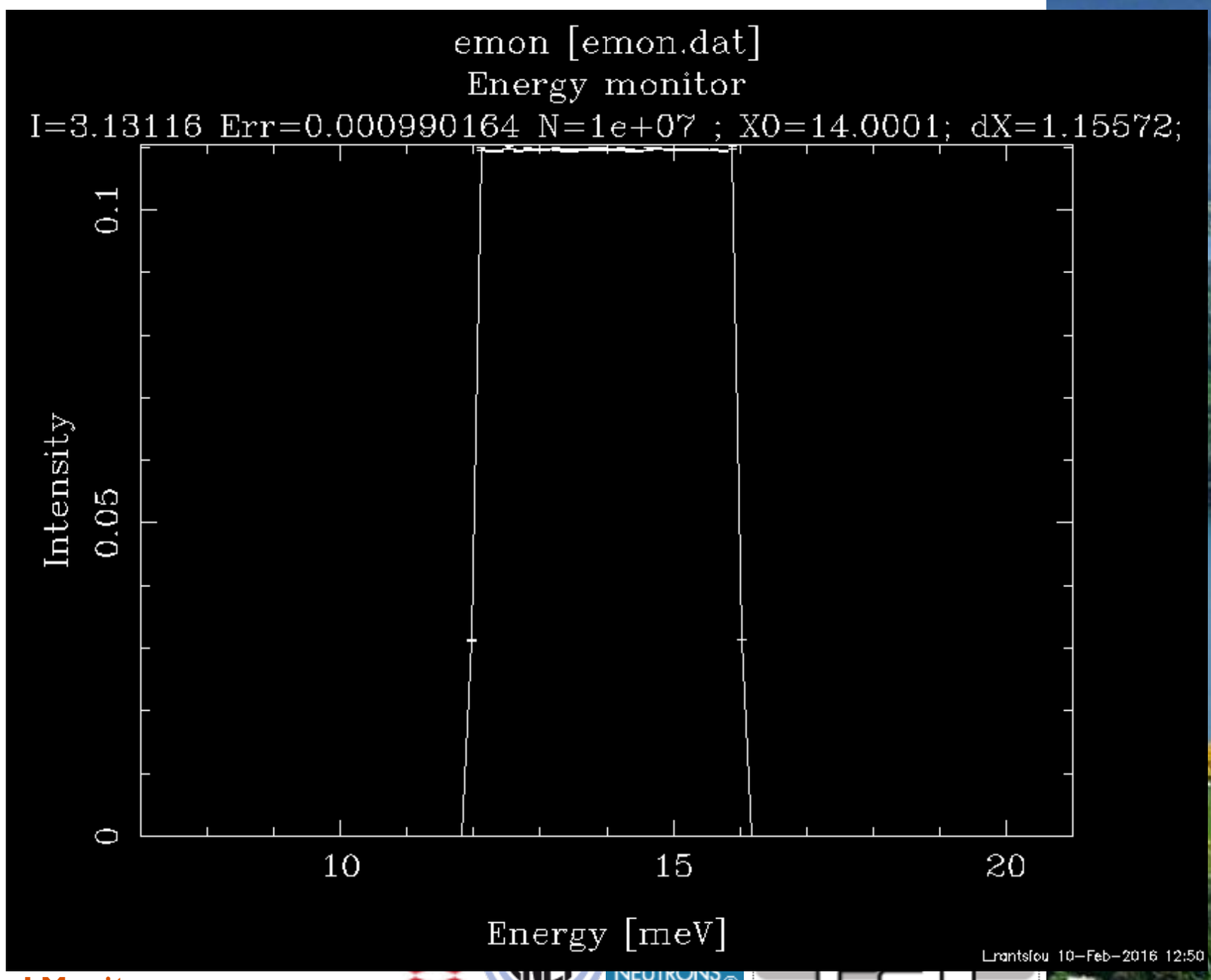
Example:

```
COMPONENT my_simple_source = Source_simple(radius=0.1, dist=2.0,
                             focus_xw=0.1, focus_yh=0.1, E0=14.0,
                             dE=2.0)
```

SOURCES

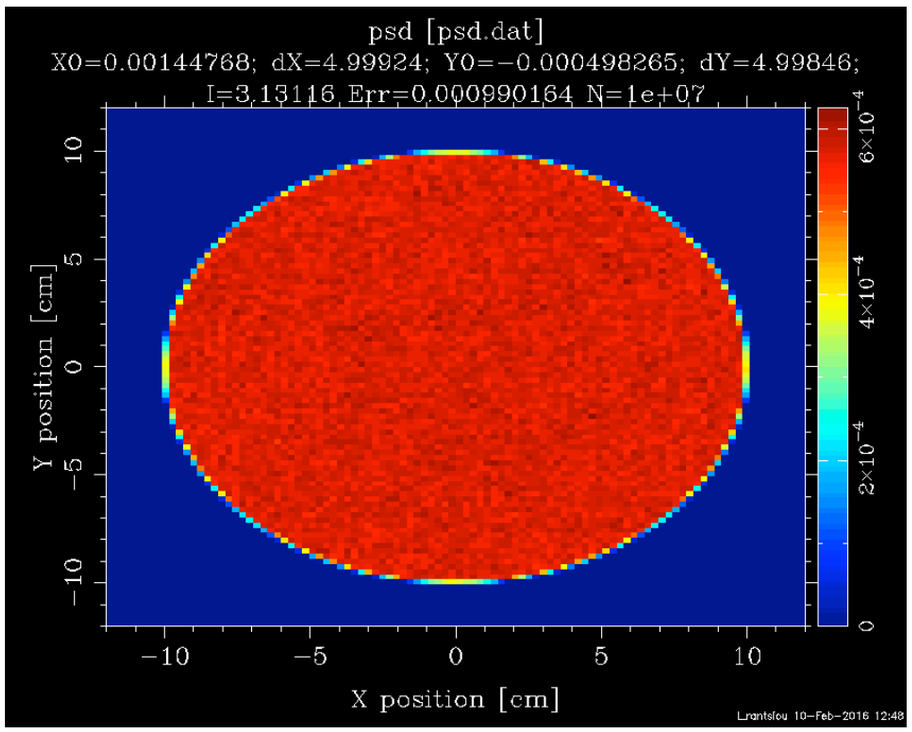
Source_simple.comp A simple continuous source with flat energy/wavelength spectrum



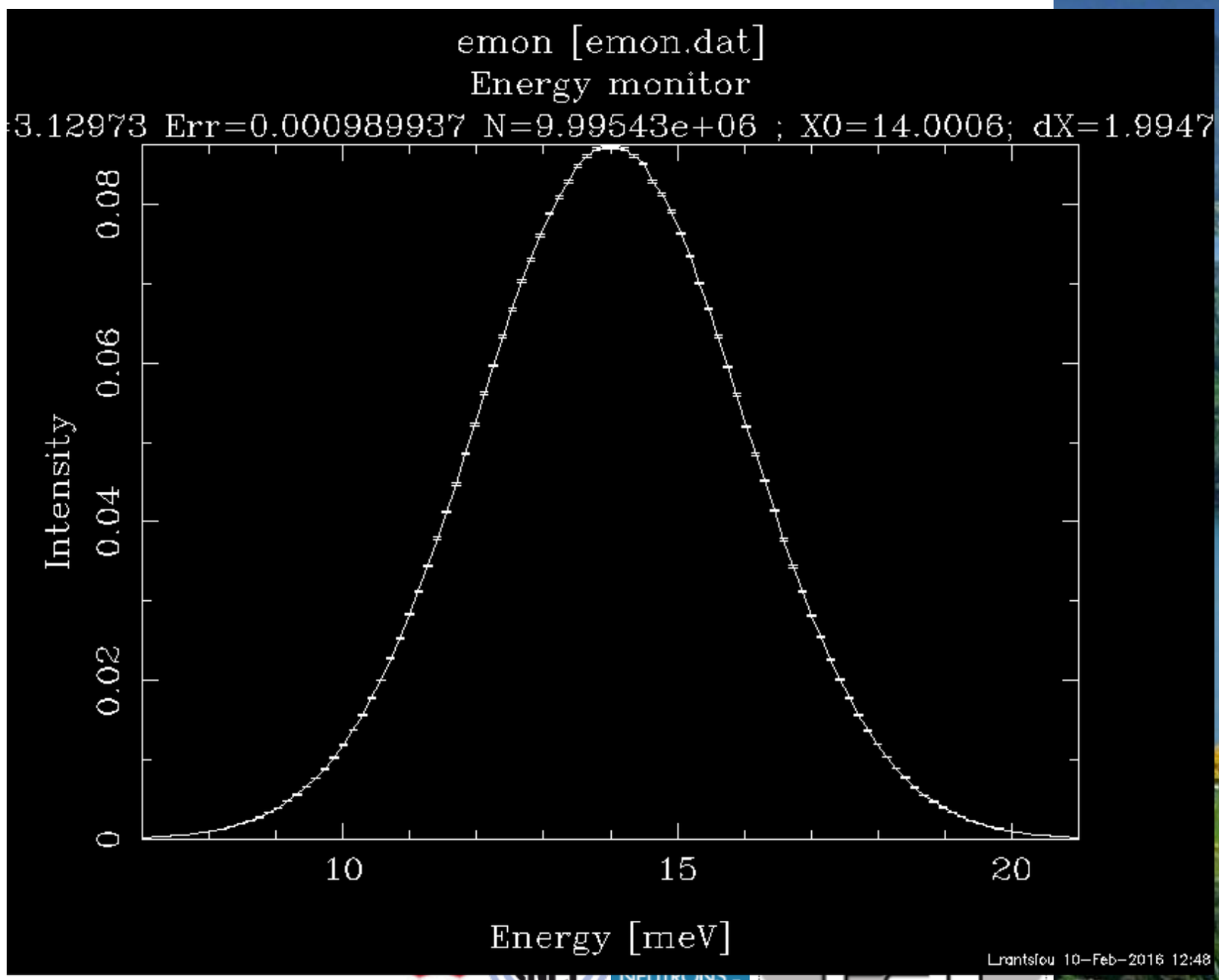


SOURCES

Source_simple.comp A simple continuous source with flat energy/wavelength spectrum



gauss = 1



SOURCES

Source_div.comp

A continuous source with specified divergence

Input parameters

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

Name	Unit	Description	Default
xwidth	m	Width of source	
yheight	m	Height of source	
focus_aw	deg	FWHM (Gaussian) or maximal (uniform) horz. width divergence	
focus_ah	deg	FWHM (Gaussian) or maximal (uniform) vert. height divergence	
E0	meV	Mean energy of neutrons.	0.0
dE	meV	Energy half spread of neutrons.	0.0
lambda0	Ang	Mean wavelength of neutrons (only relevant for E0=0)	0.0
dlambda	Ang	Wavelength half spread of neutrons.	0.0
gauss	0|1	Criterion: 0: uniform, 1: Gaussian distributions	0
flux	1/(s*cm**2*st*energy unit)	flux per energy unit, Angs or meV	1

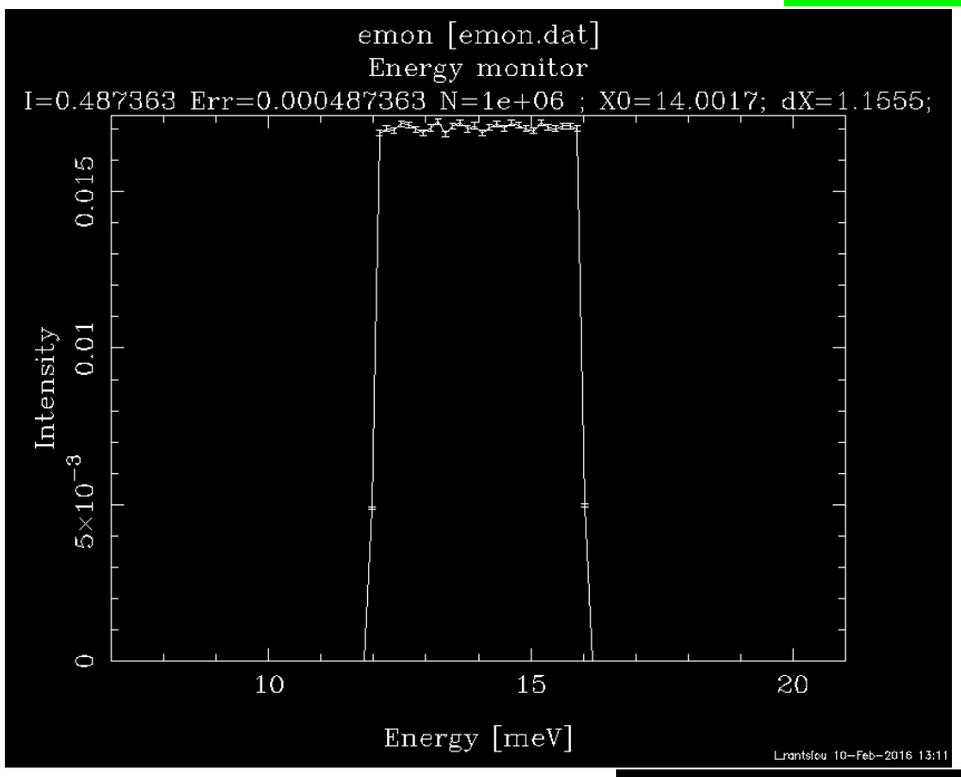
Example:

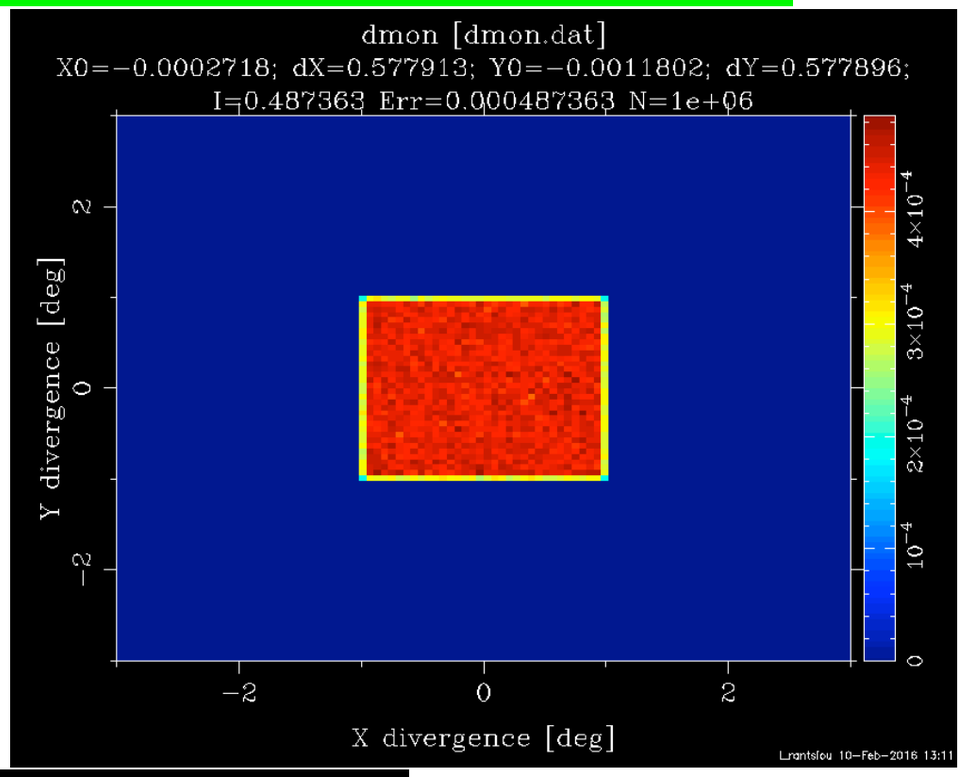
```
COMPONENT my_source_div = Source_div(xwidth=0.1, yheight=0.1,
                         focus_aw=2,focus_ah=2, E0=14, dE=2, gauss=0)
```

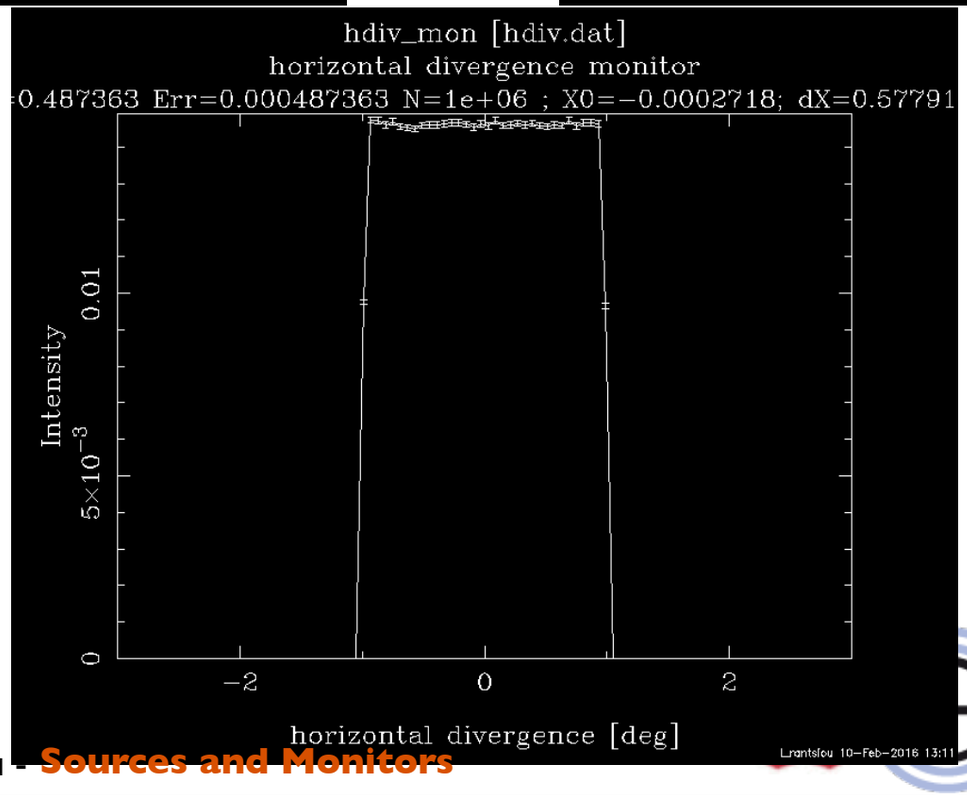
SOURCES

Source_div.comp

A continuous source with specified divergence



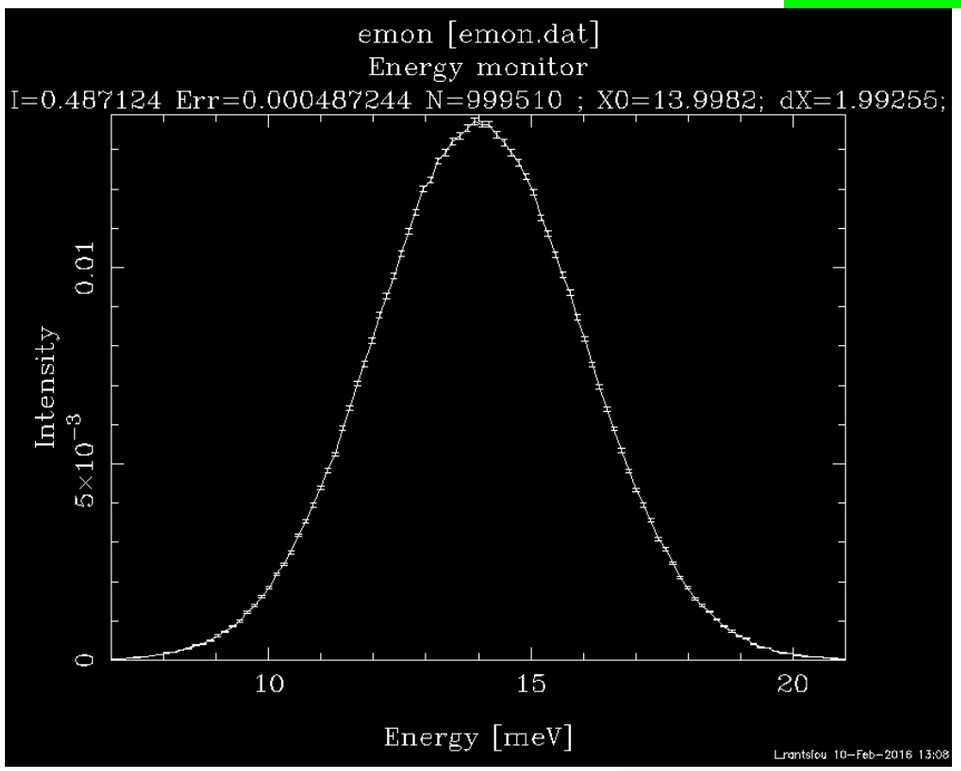


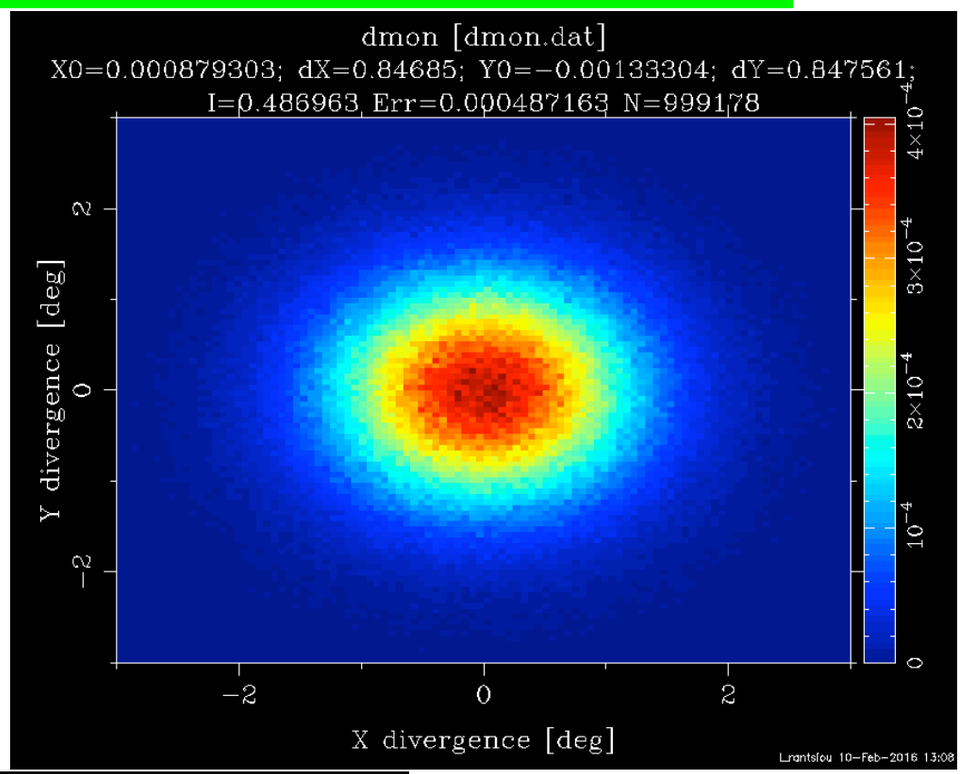


SOURCES

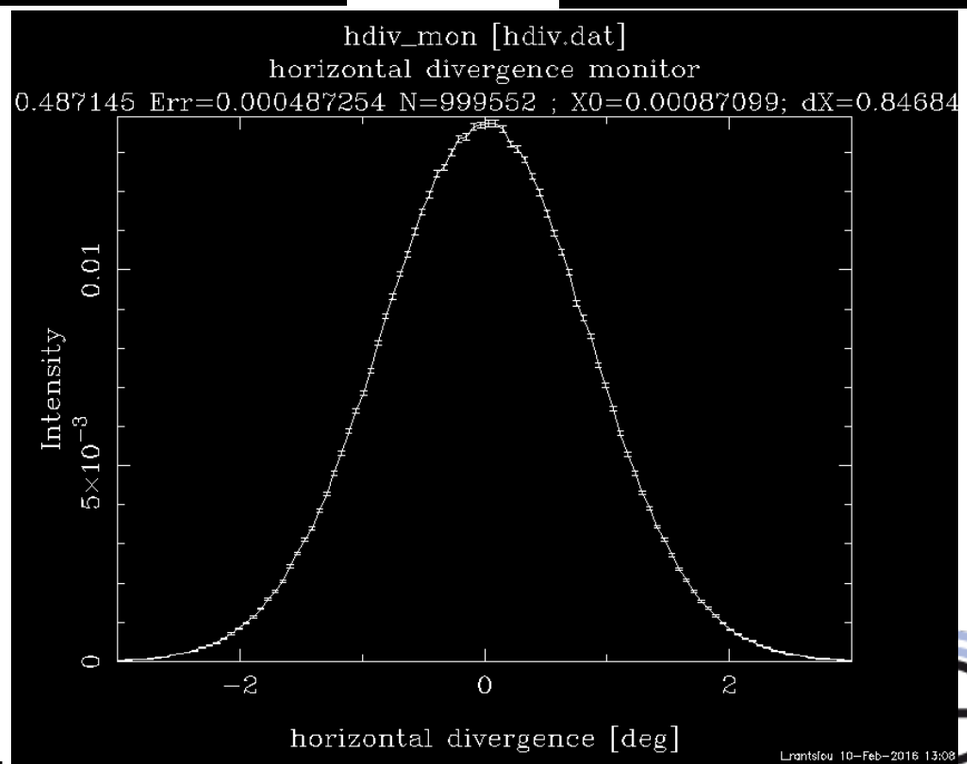
Source_div.comp

A continuous source with specified divergence





gauss = 1



SOURCES

Source_gen.comp

A general continuous source

Input parameters

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

Name	Unit	Description	Default
flux_file	str	Name of a two columns [lambda flux] text file that contains the wavelength distribution of the flux in **either** [1/(s*cm**2*st)] **or** [1/(s*cm**2*st*AA)] (see flux_file_perAA flag) Comments (#) and further columns are ignored. Format is compatible with McStas/PGPLOT wavelength monitor files. When specified, temperature and intensity values are ignored.	"NULL"
xdiv_file	str	Name of the x-horiz. divergence distribution file, given as a free format text matrix, preceeded with a line '# xylimits: xmin xmax xdiv_min xdiv_max'	"NULL"
ydiv_file	str	Name of the y-vert. divergence distribution file, given as a free format text matrix, preceeded with a line '# xylimits: ymin ymax ydiv_min ydiv_max'	"NULL"
radius	m	Radius of circle in (x,y,0) plane where neutrons are generated. You may also use 'yheight' and 'xwidth' for a square source	0.0
dist	m	Distance to target along z axis.	0
focus_xw	m	Width of target.	0.045
focus_yh	m	Height of target.	0.12
focus_aw	deg	maximal (uniform) horz. width divergence	0
focus_ah	deg	maximal (uniform) vert. height divergence	0
E0	meV	Mean energy of neutrons.	0
dE	meV	Energy spread of neutrons, half width.	0
lambda0	AA	Mean wavelength of neutrons.	0
dlambda	AA	Wavelength spread of neutrons,half width	0
I1	1/(cm**2*sr*AA)	Source flux per solid angle, area and Angstrom if I1=0, the source emits 1 in 4*PI whole space.	1
yheight	m	Source y-height, then does not use radius parameter	0.1
xwidth	m	Source x-width, then does not use radius parameter	0.1
verbose	0/1	display info about the source. -1 unactivate source.	0
T1	K	Temperature of the Maxwellian source, 0=none	0
flux_file_perAA	1	When true (1), indicates that flux file data is already per Angstroem. If false, file data is per wavelength bin.	0
flux_file_log	1	When true, will transform the flux table in log scale to improve the sampling.	0
Lmin	AA	Minimum wavelength of neutrons	0
Lmax	AA	Maximum wavelength of neutrons	0
Emin	meV	Minimum energy of neutrons	0
Emax	meV	Maximum energy of neutrons	0
T2	K	Second Maxwellian source Temperature, 0=none	0
I2	1/(cm**2*sr*AA)	Second Maxwellian Source flux	0
T3	K	Third Maxwellian source Temperature, 0=none	0
I3	1/(cm**2*sr*AA)	Third Maxwellian Source flux	0
zdepth	m	Source z-zdepth, not anymore flat	0
target_index	1	relative index of component to focus at, e.g. next is +1 this is used to compute 'dist' automatically.	+1

Example:

```
COMPONENT my_source_gen = Source_gen(yheight=0.1, xwidth=0.1, Emin=1,
                          Emax=3, I1=1e13, verbose=1, focus_xw=0.01,
                          focus_yh=0.01)
```

SOURCES

Source_gen.comp

A general continuous source

Input parameters

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

Name	Unit	Description	Default
flux_file	str	Name of a two columns [lambda flux] text file that contains the wavelength distribution of the flux in **either** [1/(s*cm**2*st)] **or** [1/(s*cm**2*st*AA)] (see flux_file_perAA flag) Comments (#) and further columns are ignored. Format is compatible with McStas/PGPLOT wavelength monitor files. When specified, temperature and intensity values are ignored.	"NULL"
xdiv_file	str	Name of the x-horiz. divergence distribution file, given as a free format text matrix, preceeded with a line '# xylimits: xmin xmax xdiv_min xdiv_max'	"NULL"
ydiv_file	str	Name of the y-vert. divergence distribution file, given as a free format text matrix, preceeded with a line '# xylimits: ymin ymax ydiv_min ydiv_max'	"NULL"
radius	m	Radius of circle in (x,y,0) plane where neutrons are generated. You may also use 'yheight' and 'xwidth' for a square source	0.0
dist	m	Distance to target along z axis.	0
focus_xw	m	Width of target.	0.045
focus_yh	m	Height of target.	0.12
focus_aw	deg	maximal (uniform) horz. width divergence	0
focus_ah	deg	maximal (uniform) vert. height divergence	0
E0	meV	Mean energy of neutrons.	0
dE	meV	Energy spread of neutrons, half width.	0
lambda0	AA	Mean wavelength of neutrons.	0
dlambda	AA	Wavelength spread of neutrons,half width	0
I1	1/(cm**2*sr*AA)	Source flux per solid angle, area and Angstrom if I1=0, the source emits 1 in 4*PI whole space.	1
yheight	m	Source y-height, then does not use radius parameter	0.1
xwidth	m	Source x-width, then does not use radius parameter	0.1
verbose	0/1	display info about the source. -1 unactivate source.	0
T1	K	Temperature of the Maxwellian source, 0=none	0
flux_file_perAA	1	When true (1), indicates that flux file data is already per Angstroem. If false, file data is per wavelength bin.	0
flux_file_log	1	When true, will transform the flux table in log scale to improve the sampling.	0
Lmin	AA	Minimum wavelength of neutrons	0
Lmax	AA	Maximum wavelength of neutrons	0
Emin	meV	Minimum energy of neutrons	0
Emax	meV	Maximum energy of neutrons	0
T2	K	Second Maxwellian source Temperature, 0=none	0
I2	1/(cm**2*sr*AA)	Second Maxwellian Source flux	0
T3	K	Third Maxwellian source Temperature, 0=none	0
I3	1/(cm**2*sr*AA)	Third Maxwellian Source flux	0
zdepth	m	Source z-zdepth, not anymore flat	0
target_index	1	relative index of component to focus at, e.g. next is +1 this is used to compute 'dist' automatically.	+1

Source input can be an ASCII file!!

Example:

```
COMPONENT my_source_gen = Source_gen(yheight=0.1, xwidth=0.1,
                          dist=1.5, focus_xw=0.01, focus_yh=0.01,
                          lambda0=1, dlambda=8,
                          flux_file='source.dat')
```

SOURCES

Source_Maxwell_3.comp A continuous source with a maxwellian spectrum

Input parameters

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

Name	Unit	Description	Default
size	m	Edge of cube shaped source (for backward compatibility)	0
yheight	m	Height of rectangular source	0
xwidth	m	Width of rectangular source	0
Lmin	AA	Lower edge of lambda distribution	
Lmax	AA	Upper edge of lambda distribution	
dist	m	Distance from source to focusing rectangle; at (0,0,dist)	
focus_xw	m	Width of focusing rectangle	
focus_yh	m	Height of focusing rectangle	
T1	K	1st temperature of thermal distribution	
T2	K	2nd temperature of thermal distribution	300
T3	K	3nd temperature of - - -	300
I1	in flux units, see above	[1/(cm**2*st*AA)] flux, 1	
I2	in flux units, see above	[1/(cm**2*st*AA)] flux, 2	0
I3	1/(cm**2*st*AA)	flux, 3 - - -	0
target_index	1	relative index of component to focus at, e.g. next is +1 this is used to compute 'dist' automatically.	+1
lambda0	AA	Mean wavelength of neutrons.	0
dlambda	AA	Wavelength spread of neutrons.	0

SOURCES

Source_Maxwell_3.comp

A continuous source with a maxwellian spectrum

Input parameters

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

Name	Unit	Description	Default
size	m	Edge of cube shaped source (for backward compatibility)	0
yheight	m	Height of rectangular source	0
xwidth	m	Width of rectangular source	0
Lmin	AA	Lower edge of lambda distribution	
Lmax	AA	Upper edge of lambda distribution	
dist	m	Distance from source to focusing rectangle; at (0,0,dist)	
focus_xw	m	Width of focusing rectangle	
focus_yh	m	Height of focusing rectangle	
T1	K	1st temperature of thermal distribution	
T2	K	2nd temperature of thermal distribution	300
T3	K	3nd temperature of - - -	300
I1	in flux units, see above	[1/(cm**2*st*AA)] flux, 1	
I2	in flux units, see above	[1/(cm**2*st*AA)] flux, 2	0
I3	1/(cm**2*st*AA)	flux, 3 - - -	0
target_index	1	relative index of component to focus at, e.g. next is +1 this is used to compute 'dist' automatically.	+1
lambda0	AA	Mean wavelength of neutrons.	0
dlambda	AA	Wavelength spread of neutrons.	0

```
COMPONENT source = Source_Maxwell_3(yheight=0.156, xwidth=0.126,
                   Lmin=0.1, Lmax=9.0, dist=1.5, focus_xw = 0.025,
                   focus_yh = 0.12, T1=296.16, I1=8.5E11,
                   T2=40.68, I2=5.2E11)
```

SOURCES

Special Sources

<u>"Feedback" components:</u>

- Adapt_check.comp
- Source_adapt.comp
- Source_Optimizer.comp
- Monitor_Optimizer.comp

<u>I/O mechanisms:</u>

- Virtual_input.comp
- Virtual_output.comp
- **Virtual_mcnp_ss_input.comp** (useful for MCNP/McStas coupling (*))
- Virtual_tripoli4_input.comp
- **Virtual_mcnp_ss_output.comp** (useful for MCNP/McStas coupling (*))
- Virtual_tripoli4_output.comp
- Vitess_input.comp
- Vitess_output.comp

(*) Klinkby, et. al (2013) DOI 10.1016/j.nima.2012.10.052

SOURCES

Special Sources

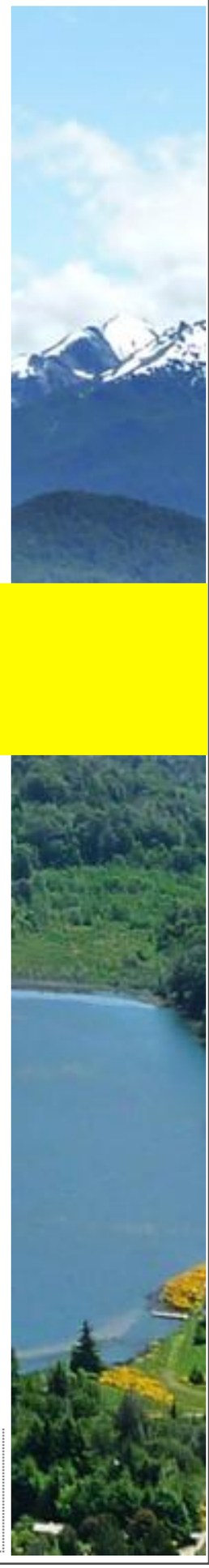
"Feedback" components:

- Adapt_check.comp
- Source_adapt.comp
- Source_Optimizer.comp
- Monitor_Optimizer.comp

Need more practical info on that?
Ask the instructors

- Virtual_input.comp
- Virtual_output.comp
- **Virtual_mcnp_ss_input.comp** (useful for MCNP/McStas coupling (*))
- Virtual_tripoli4_input.comp
- **Virtual_mcnp_ss_output.comp** (useful for MCNP/McStas coupling (*))
- Virtual_tripoli4_output.comp
- Vitess_input.comp
- Vitess_output.comp

(*) Klinkby, et. al (2013) DOI 10.1016/j.nima.2012.10.052



MONITORS

Detectors and monitors

Name	*Origin*	*Author(s)*	*Source code*	*Description*
DivLambda_monitor	Risoe	Kristian Nielsen	comp	Divergence/wavelength monitor.
DivPos_monitor	Risoe	Kristian Nielsen	comp	Divergence/position monitor (acceptance diagram).
Divergence_monitor	Risoe	Kim Lefmann	comp	Horizontal+vertical divergence monitor.
EPSD_monitor	Risoe	Kim Lefmann	comp	A monitor measuring neutron intensity vs. position, x, and neutron energy, E
E_monitor	Risoe	Kristian Nielsen and Kim Lefmann	comp	Energy-sensitive monitor.
Hdiv_monitor	Risoe	KL,	comp	A divergence sensitive monitor.
L_monitor	Risoe	Kristian Nielsen and Kim Lefmann	comp	Wavelength-sensitive monitor.
MeanPolLambda_monitor	Risoe	Peter Christiansen	comp	Polarisation and wavelength sensitive monitor.
Monitor	Risoe	Kim Lefmann	comp	Simple single detector/monitor.
Monitor_4PI	Risoe	Kim Lefmann and Kristian Nielsen	comp	Monitor that detects ALL non-absorbed neutrons. Example: Monitor_4PI()
Monitor_nD	ILL	Emmanuel Farhi	comp	This component is a general Monitor that can output 0/1/2D signals (Intensity or signal vs. [something] and vs. [something] ...)
PSD_monitor	Risoe	Kim Lefmann	comp	Position-sensitive monitor.
PSD_monitor_4PI	Risoe	Kim Lefmann and Kristian Nielsen	comp	Spherical position-sensitive detector.
PSDcyl_monitor	Risoe	Kim Lefmann	comp	A 2D Position-sensitive monitor. The shape is cylindrical with the axis vertical. The monitor covers the whole cylinder (360 degrees).
PSDlin_monitor	Risoe	Kim Lefmann	comp	Rectangular 1D PSD, measuring intensity vs. vertical position, x
PolLambda_monitor	Risoe	Peter Christiansen	comp	Polarisation and wavelength sensitive monitor.
Pol_monitor	Risoe	Peter Christiansen	comp	Polarisation sensitive monitor.
PreMonitor_nD	ILL (France)	Emmanuel Farhi	comp	Neutron parameters cross-correlation monitor.
Res_monitor	Risoe	Kristian Nielsen	comp	Monitor for resolution calculations
TOF2E_monitor	Risoe	Kim Lefmann and Helmuth Schoeber	comp	TOF-sensitive monitor, converting to energy
TOFLambda_monitor	Risoe	KL	comp	Time-of-flight/wavelength monitor.
TOF_cylPSD_monitor	Risoe	Kim Lefmann	comp	Cylindrical (2pi) PSD Time-of-flight monitor.
TOF_monitor	Risoe	KN, M. Hagen	comp	Rectangular Time-of-flight monitor.
TOFlog_mon	Risoe	Kim Lefmann	comp	Rectangular Time-of-flight monitor with logarithmic time binning.

MONITORS

Semantics

- In reality:
  - Monitor: intensity probe of the beam; transparent to neutrons; has efficiency <1%
  - Detector: should detect each and every neutron; as high efficiency as possible.

- In McStas:
  - In simulations we can program monitors and detectors to behave any way we like. We refer to both of those indistinguishably as 'monitors'.

MONITORS

[L_monitor.comp](#)

1-D wavelength sensitive monitor

Input parameters

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

Name	Unit	Description	Default
nL	1	Number of wavelength channels	20
filename	text	Name of file in which to store the detector image	0
xmin	m	Lower x bound of detector opening	-0.05
xmax	m	Upper x bound of detector opening	0.05
ymin	m	Lower y bound of detector opening	-0.05
ymax	m	Upper y bound of detector opening	0.05
xwidth	m	Width of detector. Overrides xmin,xmax.	0
yheight	m	Height of detector. Overrides ymin,ymax.	0
Lmin	AA	Minimum wavelength to detect	
Lmax	AA	Maximum wavelength to detect	
restore_neutron	1	If set, the monitor does not influence the neutron state	0

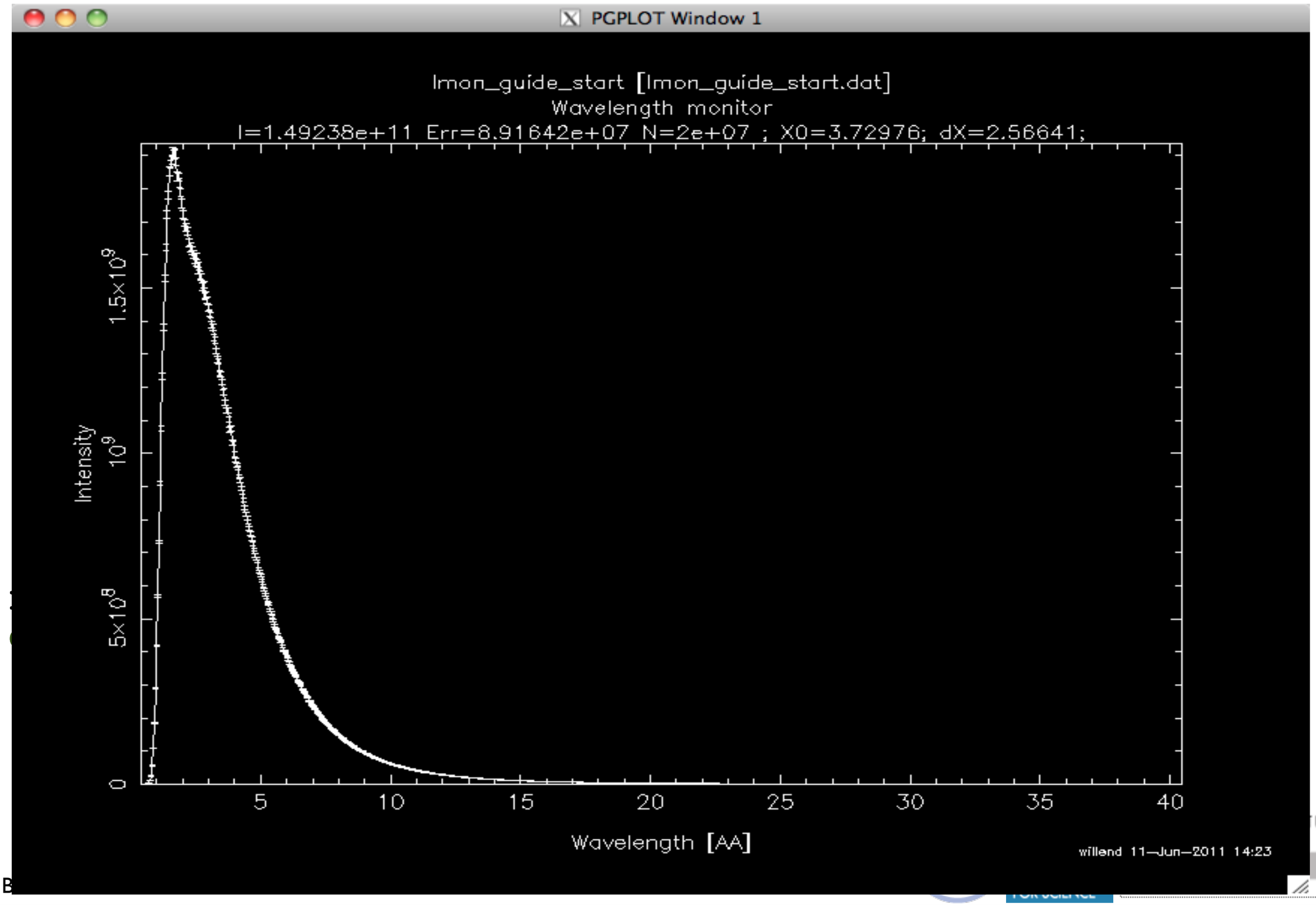
Example:

```
COMPONENT my_L_monitor = L_monitor(xmin=-0.1, xmax=0.1, ymin=-0.1,
                         ymax=0.1, nL=20, filename="Output.L",
                         Lmin=2, Lmax=10)
```

MONITORS

L_monitor.comp

I-D wavelength sensitive monitor



MONITORS

PSD_monitor.comp

2-D position sensitive monitor

Input parameters

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

Name	Unit	Description	Default
nx	1	Number of pixel columns	90
ny	1	Number of pixel rows	90
restore_neutron	1	If set, the monitor does not influence the neutron state	0
filename	text	Name of file in which to store the detector image	0
xmin	m	Lower x bound of detector opening	-0.05
xmax	m	Upper x bound of detector opening	0.05
ymin	m	Lower y bound of detector opening	-0.05
ymax	m	Upper y bound of detector opening	0.05
xwidth	m	Width of detector. Overrides xmin,xmax.	0
yheight	m	Height of detector. Overrides ymin,ymax.	0

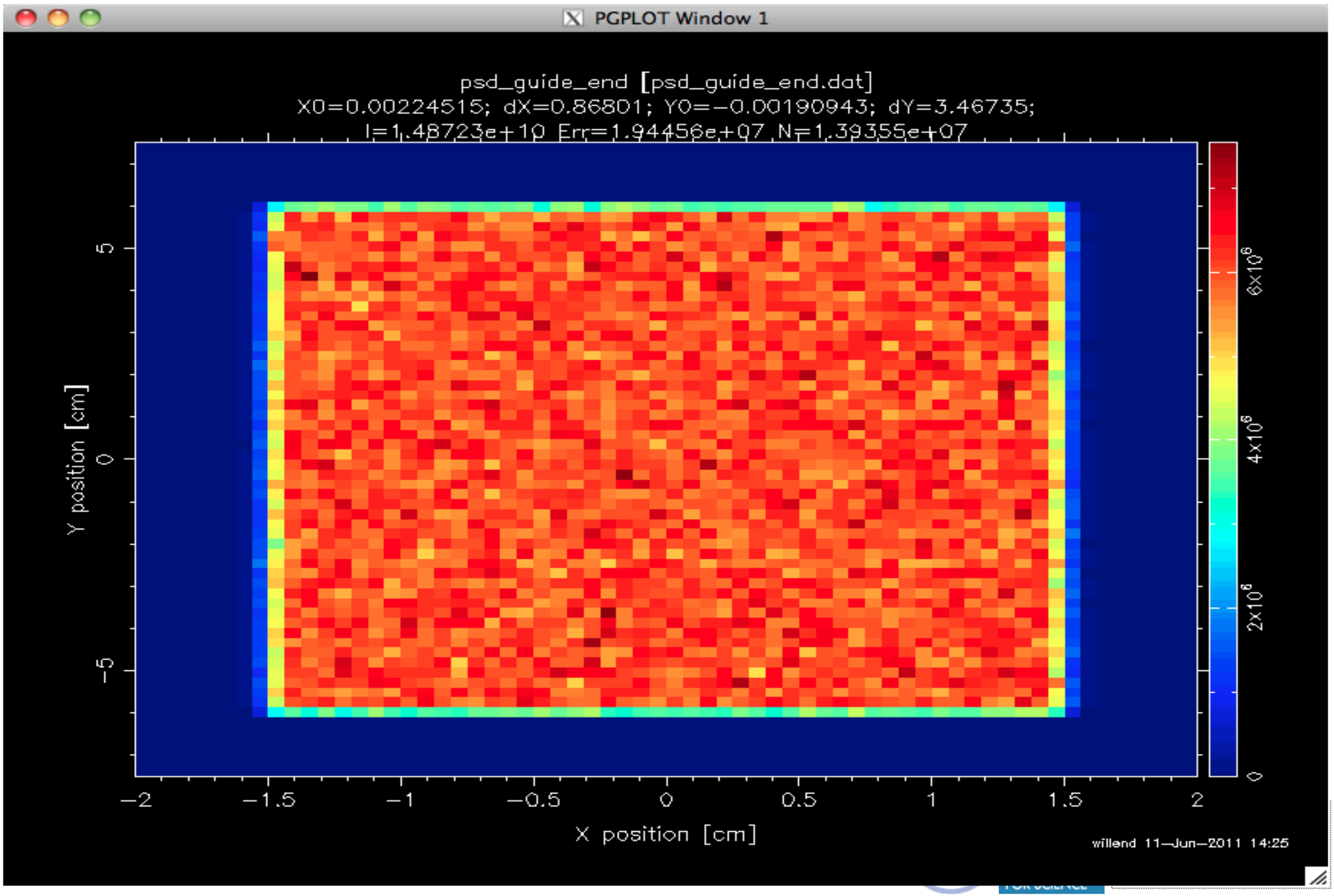
Example:

```
COMPONENT my_PSD_monitor = PSD_monitor(xmin=-0.1, xmax=0.1, ymin=-0.1
                           ymax=0.1, nx=90, ny=90,
                           filename="Output.psd")
```

MONITORS

PSD_monitor.comp

2-D position sensitive monitor



MONITORS

More Monitors

- TOF_monitor.comp
- E_monitor.comp (1-D energy sensitive monitor)
- Res_monitor.comp
- TOF2E_monitor.comp
- Divergence_monitor.comp (2-D divergence monitor)
- EPSD_monitor.comp
- DivPos_monitor.comp (2-D divergence and position monitor)
- Brilliance_monitor.comp
- DivLambda_monitor.comp
- Monitor.comp
- Hdiv_monitor.comp
- PSDlin_monitor.comp
- PSD_monitor_4PI.comp
- Monitor_Sqw.comp
- Pol_monitor.comp
- Monitor_4PI.comp
- .....
- Monitor_nD

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- Monitor_nD

MONITORS

Monitor_nD.comp

A general monitor for 0D/1D/2D records

The all-in-one , swiss-army-knife of monitors

Monitor_nD can have almost any shape, and record any requested standard quantities

MONITORS

Monitor_nD.comp

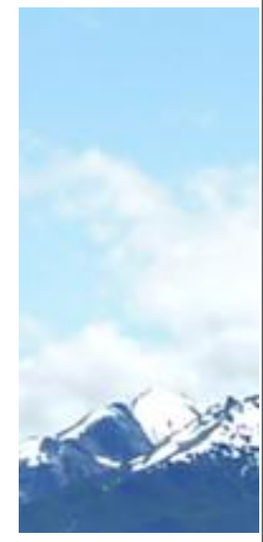
A general monitor for 0D/1D/2D records

Input parameters

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

Name	Unit	Description	Default
user1	variable	Variable assigned to User1	FLT_MAX
user2	variable	Variable assigned to User2	FLT_MAX
user3	variable	Variable assigned to User3	FLT_MAX
xwidth	m	Width of detector.	0
yheight	m	Height of detector.	0
zdepth	m	Thickness of detector (z).	0
xmin	m	Lower x bound of opening	0
xmax	m	Upper x bound of opening	0
ymin	m	Lower y bound of opening	0
ymax	m	Upper y bound of opening	0
zmin	m	Lower z bound of opening	0
zmax	m	Upper z bound of opening	0
bins	1	Number of bins to force for all variables. Use 'bins' keyword in 'options' for heterogeneous bins	0
min	u	Minimum range value to force for all variables Use 'min' or 'limits' keyword in 'options' for other limits	-1e40
max	u	Maximum range value to force for all variables Use 'max' or 'limits' keyword in 'options' for other limits	1e40
restore_neutron	0|1	If set, the monitor does not influence the neutron state. Equivalent to setting the 'parallel' option.	0
radius	m	Radius of sphere/banana shape monitor	0
options	str	String that specifies the configuration of the monitor The general syntax is "[x] options..." (see **Descr.**).	"NULL"
filename	str	Output file name (overrides file=XX option).	"NULL"
geometry	str	Name of an OFF file to specify a complex geometry detector	"NULL"
username1	str	Name assigned to User1	"NULL"
username2	str	Name assigned to User2	"NULL"
username3	str	Name assigned to User3	"NULL"

MONITORS



Monitor_nD.comp

A general monitor for 0D/1D/2D records

```
1  kx ky kz k wavevector  [Angs-1] (     usually axis are
2  vx vy vz v             [m/s]          x=horz., y=vert., z=on axis)
3  x y z                  [m]       Distance, Position
4  kxy vxy xy radius      [m]       Radial wavevector, velocity and position
5  t time                 [s]       Time of Flight
6  energy omega           [meV]
7  lambda wavelength      [Angs]
8  p intensity flux       [n/s] or [n/cm^2/s]
9  ncounts                [1]
10 sx sy sz               [1]       Spin
11 vdiv ydiv dy           [deg]     vertical divergence (y)
12 hdiv divergence xdiv   [deg]     horizontal divergence (x)
13 angle                  [deg]     divergence from  direction
14 theta longitude        [deg]     longitude (x/z) [for sphere and cylinder]
15 phi   lattitude        [deg]     lattitude (y/z) [for sphere and cylinder]
```

MONITORS

Monitor_nD.comp

A general monitor for 0D/1D/2D records

EXAMPLES:

```
COMPONENT MyMon = Monitor_nD( xwidth = 0.1, yheight = 0.1, zdepth = 0,
                  options = "intensity per cm2 angle,limits=[-5 5],
                  bins=10,with borders, file = mon1")

              options = "banana, theta limits=[10,130], bins=120, y"

options = "multiple kx ky kz, auto abs log t, and list all neutrons"
```

```
COMPONENT MyMo = Monitor_nD(xwidth = 0.1, yheight = 0.1,
                  user1=age, username1="Age of the Captain [years]",
                  options="user1, auto")
```

SOURCES

Typing "*mcdoc source*" or "*mcdoc moderator*" in your command shell, will reveal a list of available sources and moderators.
Or you can search in the directories '*sources*', '*contrib*', and '*obsolete*'.

Mathematical:

- Source_simple.comp
- Source_div.comp

Pulsed sources:

- ESS_moderator.comp
- Moderator.comp
- SNS_source.comp (*)
- ISIS_moderator.comp (*)

Reactors :

- Source_Maxwell_3.comp
- Source_gen.comp
- Source_gen4.comp
- Source_multi_surfaces.comp (*)

(*) contributed (can be found in /mcstas/installation/folder/**contrib**)

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TOF*monitor.comp

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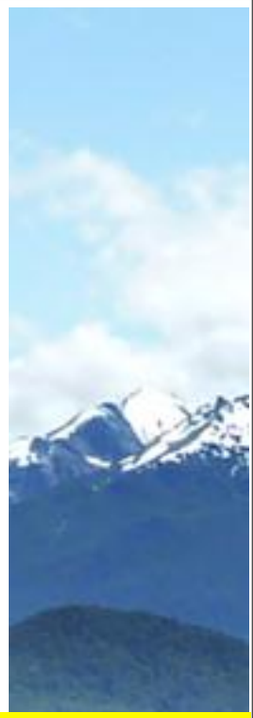

Need more practical info on that?
Ask the instructors

Source_div.comp

Source_gen.comp

Source_gen4.comp

Source_multi_surfaces.comp (*)

Pulsed sources:

- ESS_moderator.comp
- Moderator.comp
- SNS_source.comp (*)
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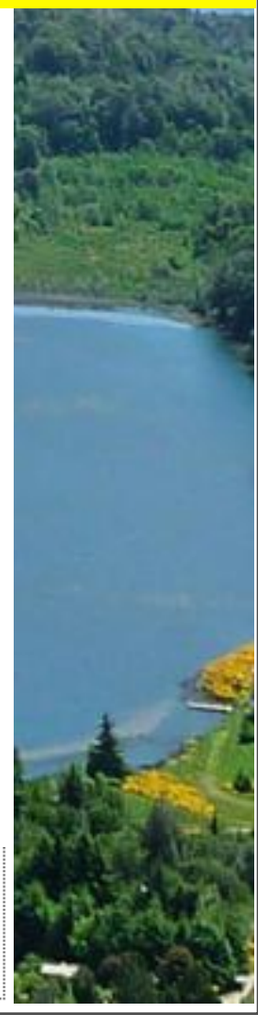
TOF*monitor.comp



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SOURCES AND MONITORS

EXERCISE

- Create a new instrument file, named 'sources_monitors_ex.instr'.
  HINT: you can use the '*template.instr*' file that exists in today's class folder and you can open it with the editor of your liking, **or** open it from the McStas gui by clicking: *neutron site* --> *Templates* --> *template (test)* and then press the 'Edit/New' button to open and edit it.

- Add a source using the *Source_gen.comp* component, with:
  - source dimensions: (w)0.132m X (h)0.164m
  - distance to target : 1.5 m
  - focus area: (w)0.03m X (h)0.12m
  - wavelength range: 0.1Å to 9.9Å
  - T1=27.63[K], I1=2.4E12 [n/s/cm^2/st/AA], T2=130.76[K], I2=4.03E12[n/s/cm^2/st/AA] ,T3=309.33[K], I3=1.24E13[n/s/cm^2/st/AA]
- Add the following monitors at two different distances from the source, at 1.5m and 4.5m:
  - PSD monitor (*PSD_monitor*)
  - A linear PSD monitor for the y-direction (*PSDlin_monitor*)
  - Wavelength monitor (*L_monitor*)
  - 2D Divergence monitor *(Divergence_monitor*)
  - Divergence-position monitor for the x-direction (*DivPos_monitor*)

SOURCES AND MONITORS

EXERCISE

- Run your instrument with 1e6 number of neutrons

- Compare the output of the two sets of monitors at the different distances (i.e. how does the divergence distribution along the x-direction look at 1.5m and 4.5m from the source, etc)

- Change the resolution of (some of) your monitors, rerun the instrument and notice the effects on the quality (resolution) of the generate plots
- Re-run your instrument with 1e7 neutrons (save the results in a new folder) and compare to the previous run.

HINTS:
Make sure to give your monitors appropriate dimensions (physical size, divergence and wavelength limits, etc.) as to ensure you can 'see' all the available neutrons.