Introducción a McStas
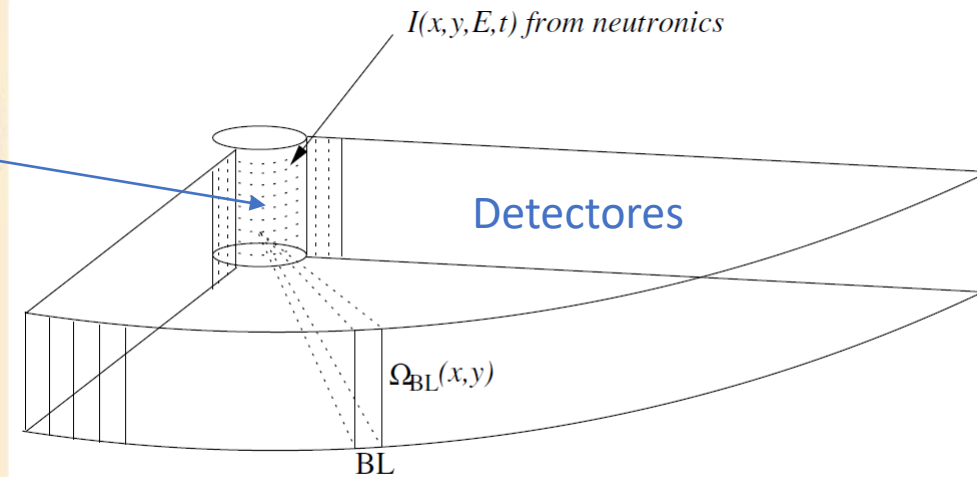
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Cuestiones generales en un experimento

Muestra y entorno de muestra

$I(x,y,E,t)$ from neutronics

Detectores

Guías de haces

Neutron Guides

10-80 meters

Moderator
A moderator slows down the neutrons produced in the spallation process and illuminates a neutron guide.

Sample

Detectors

$\Omega_{BL}(x,y)$

BL

Per beamline: $I_{BL}(x,y,E,t) = \dfrac{\Omega_{BL}(x,y)}{4\pi} \, I(x,y,E,t)$

Fuente:
- Reactor
- Espalación
- LINAC

Target Nucleus

Energetic proton
When a high-energy proton bombards a heavy atomic nucleus, causing it to become excited, 20 to 30 neutrons are expelled.

Interacción a estudiar:
- Difracción (varios tipos)
- Dispersión a bajo ángulo
- Dispersión inelástica
- Activación neutrónica
- Etc, etc…

Experimentos de SANS: V4

Figure 1: View of V4 model.

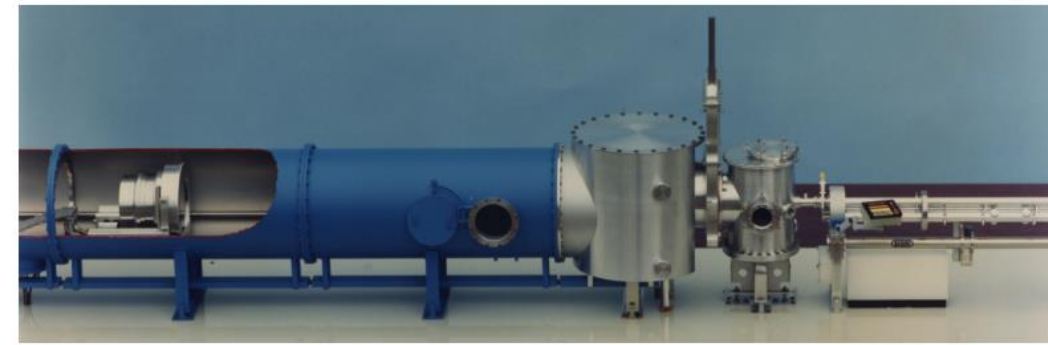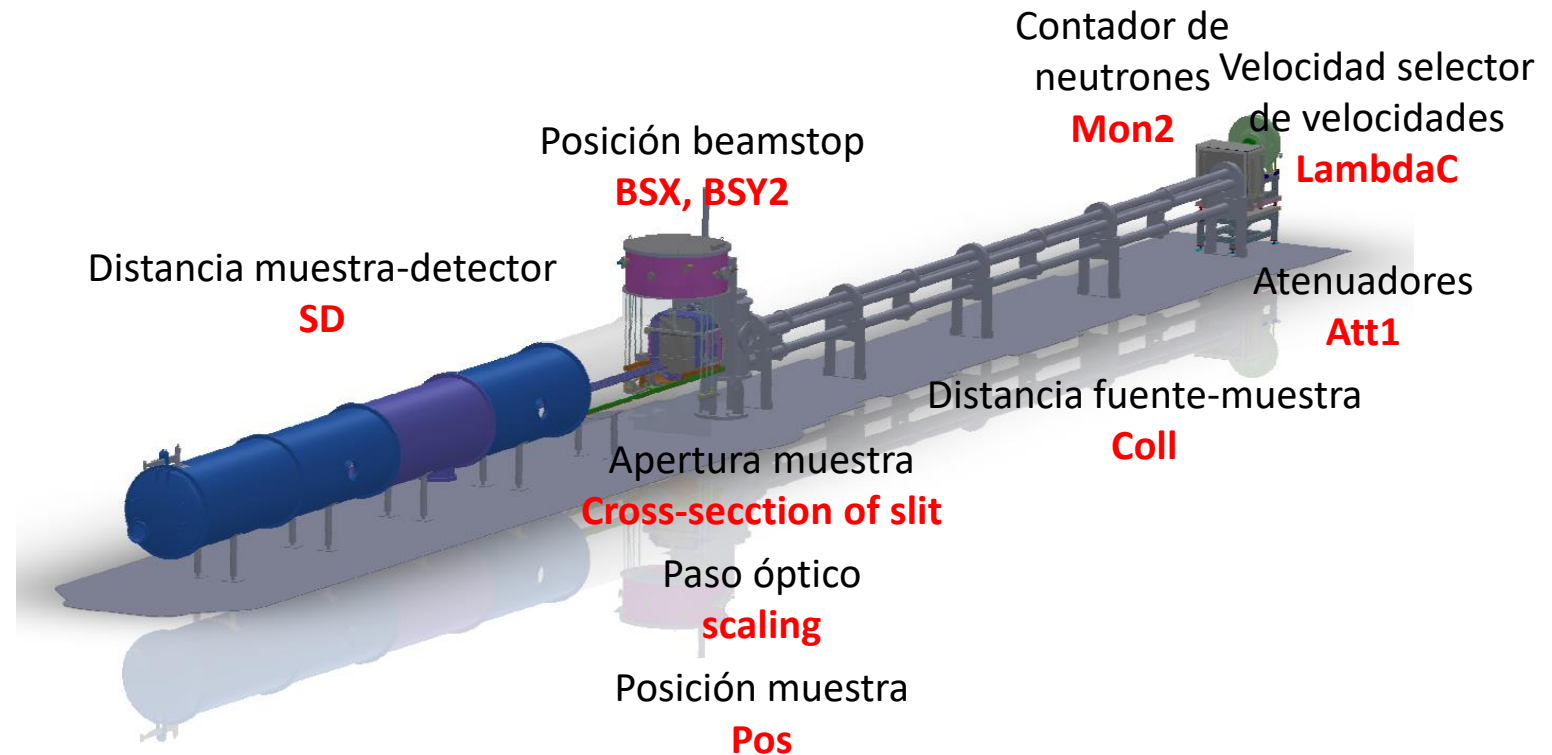| Neutron guide	NL 3A
Collimation	Entrance window: 50x30 mm^2 Collimator length: 2 m, 4 m, 8 m, 12 m (all also for SANSPOL), and 16 m
Monochromator	Mechanical velocity selector
Wavelength	$0.45 < \lambda < 2$ nm
Wavelength resolution	$8\% < \Delta\lambda/\lambda < 18\%$ FWHM
Flux	$1.0 \cdot 10^7$ n/cm^2 at $\lambda = 0.5$ nm, $\Delta\lambda/\lambda = 10\%$ and collimation 2 m
Q range	0.01 nm$^{-1} < Q < 8.5$ nm^{-1}
Detector	ca. 1 m diameter, 112 Reuter-Stokes tubes, 1000 mm / 850 mm / 600 mm
Sample-to-detector distance	Horizontal: 1 to 16 m continuously Vertical offset: 0.17 m at short distance
Polarized neutrons	Yes
Instrument options	• SANSPOL • Stroboscopic SANS • TISANE
Sample environment	• T-controlled automatic sample changer (5°C-70°C) • Automatic sample changer with magnetic field 1.5T
Software	BerSANS

Contador de neutrones **Mon2**
Velocidad selector de velocidades **LambdaC**
Posición beamstop **BSX, BSY2**
Distancia muestra-detector **SD**
Atenuadores **Att1**
Distancia fuente-muestra **Coll**
Apertura muestra **Cross-secction of slit**
Paso óptico **scaling**
Posición muestra **Pos**

Referencia: 10.17815/jlsrf-2-101

Experimentos de SANS: SANS-II

2D position-sensitive detector (active diameter 59 cm, pixel size 0.5 cm) movable in the range 1-6 m from the sample position

Slit in sample position

Silt (full open, 24, 16, 8 or 1.7mm)

1m-long neutron-guide / collimation sections equipped with fixed slits (standardly 16mm)

Selector 4.5-20 Å

Sample, sample environment

Neutron-flux monitor

Exchangeable attenuators (factor appx.1, 5, 25, 125 or 625)
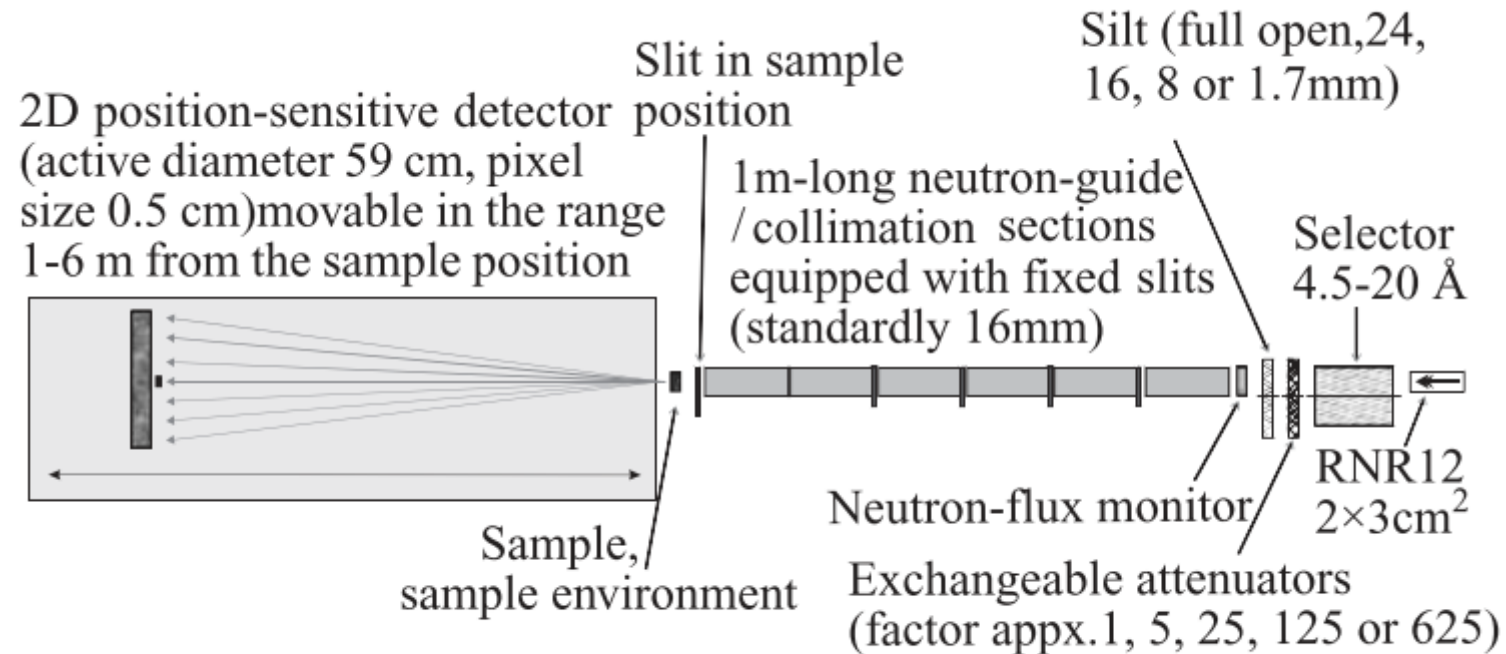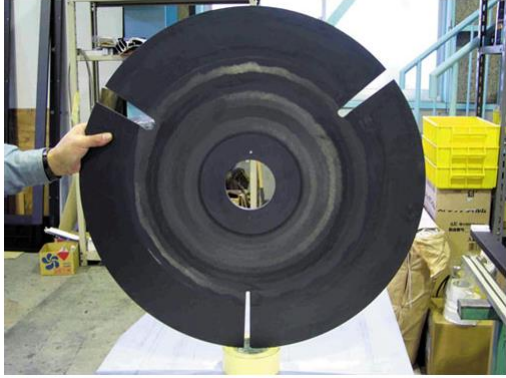
RNR12 $2\times3cm^2$

Fig. 1. **SANS-II** layout at PSI (at cold neutron guide RNR-12).
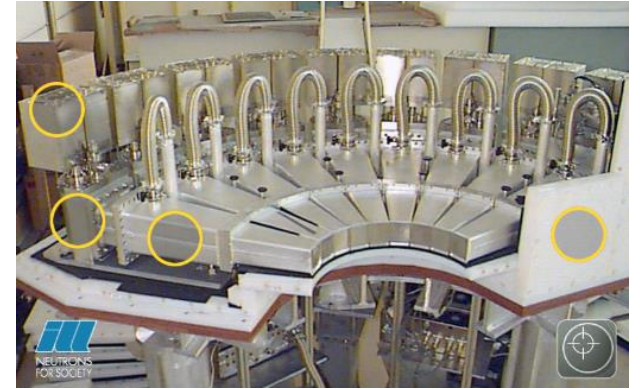
Componentes

Chopper

Selector de velocidades
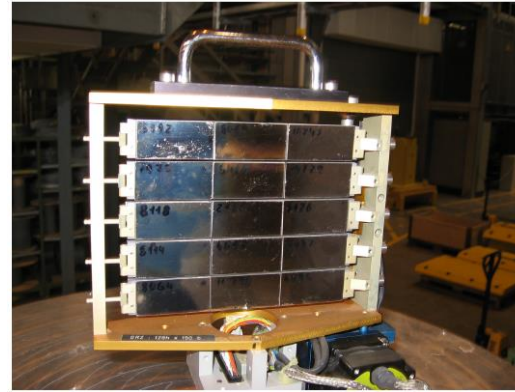
Monocromador

Detectores

Y mucho más…

http://www.mcstas.org/download/components/2.7/

Conceptos claves en la simulación

Neutron ray/package:

Weight (p): # neutrons (left) in the package
Coordinates (x,y,z)
Velocity (v_x, v_y, v_z)
Spin (s_x, s_y, s_z)
Time (t)

Monochroma...

Detector

La partícula se propaga en Z en mcstas!

Crystal in Bragg scattering condition

A grandes rasgos:

2.) Los neutrones son "trazados" o transportados en el espacio (x, y, z)

4.) Las propiedades de los neutrones podrán ser detectadas en distintos lugares del experimento a través de monitores

Muestra

1) Fuente:

Inicio de posiciones y velocidades del neutrón aleatorias por MC:
(x, y, z, v_x, v_y, v_z)

3.) Algunos eventualmente llegarán a la siguiente componente y podrán interactuar vía MC nuevamente

Detector (Monitor)