Polarized neutrons in McStas

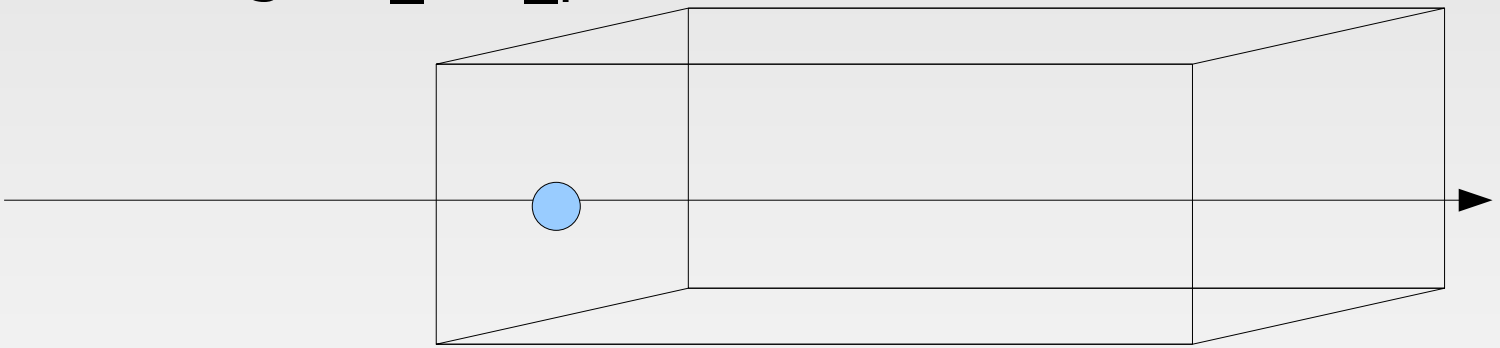
- Polarization in Kernel
  - Propagation through magnetic fields
- Polarization Components
  - Magnetic field components
  - Polarizers
  - Monitors
  - Optics

Kernel

- Magnetic field stack
  - How?
    - Components push a field description onto stack
    - Kernel takes care of propagation of neutron and polarization.
  - Why?
    - Separate pol-propagation physics from geometry
    - Nested fields – superposition vs. No superposition
    - Very different (user supplied) field descriptions, f.i from file.

Kernel

- Functions:
  - **mcmagnet_push(...)**
  - mcmagnet_pop(int n,...)
  - mcmagnet_init_par(...)



*field_function1	rotation1	position1	superpos_flag1	parameters1

Kernel

- Functions:
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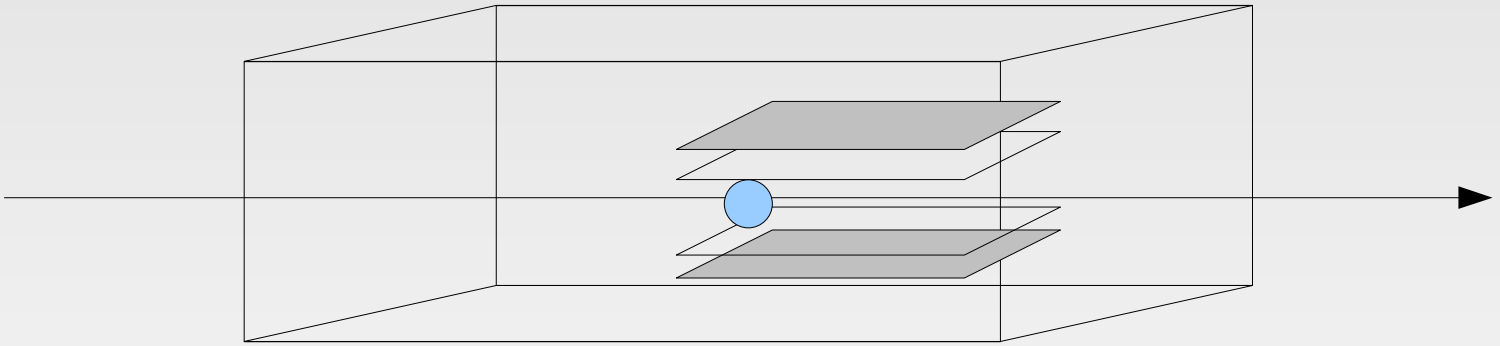

*field_function2	rotation2	position2	parameters2	superpos_flag2=0

*field_function1	rotation1	position1	parameters1	superpos_flag1=1

Kernel

- Functions:
  - **mcmagnet_push(...)**
  - mcmagnet_pop(int n,...)
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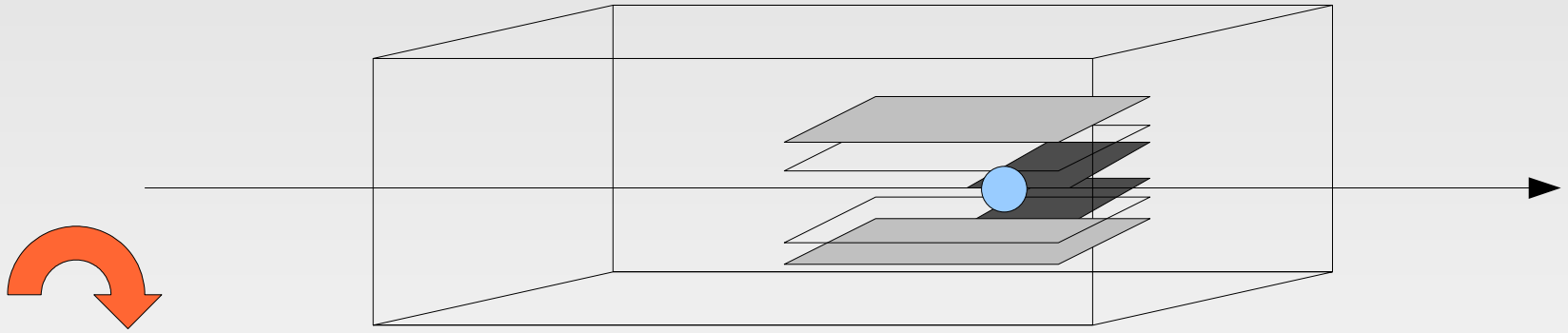

*field_function3	rotation3	position3	parameters3	superpos_flag3=1
*field_function2	rotation2	position2	parameters2	superpos_flag2=0

*field_function1	rotation1	position1	parameters1	superpos_flag1=1

Kernel

- Functions:
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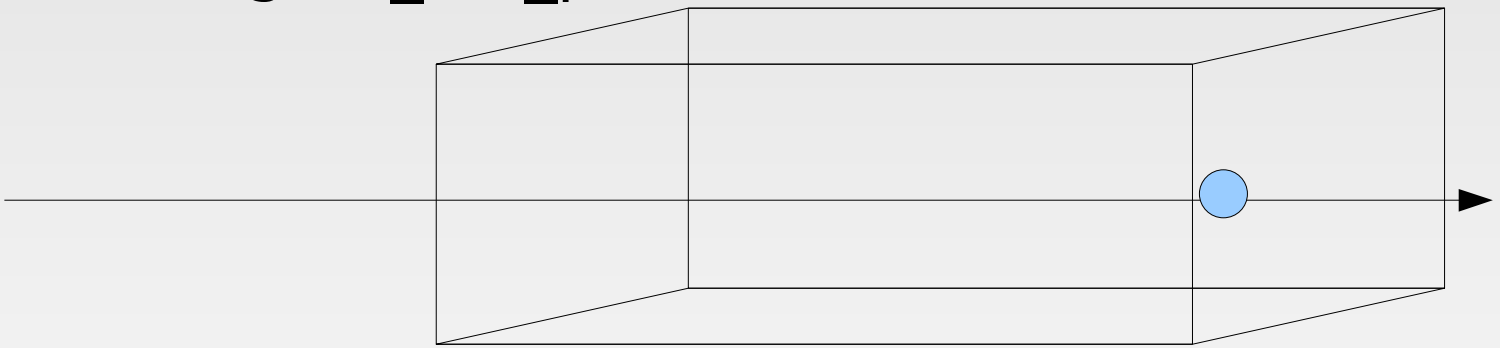
  - mcmagnet_init_par(...)



*field_function2	rotation2	position2	pa

*field_function1	rotation1	position1	parameters1	superpos_flag1=1

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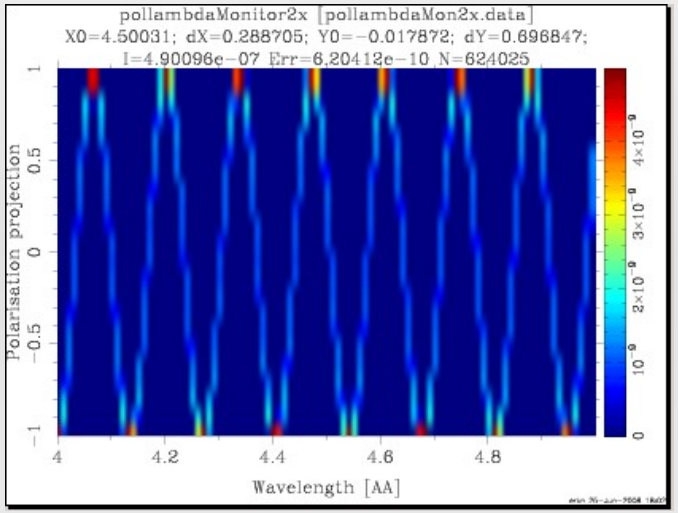
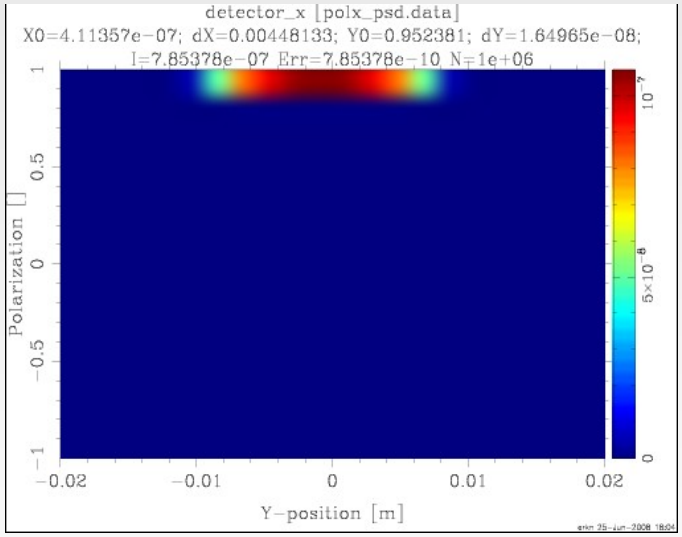
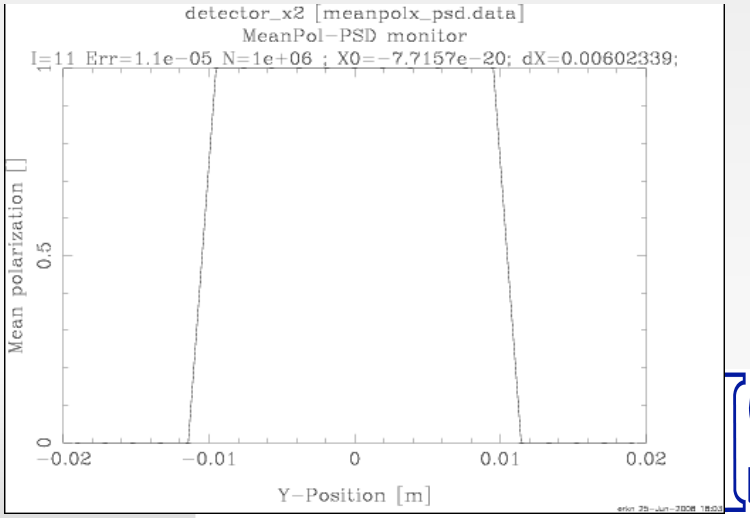
Components

- Monitors
  - **P** vs. wavelength
  - **P** – PSD
  - $\bar{\mathbf{P}}$ vs. Wavelength
  - $\bar{\mathbf{P}}$ – PSD

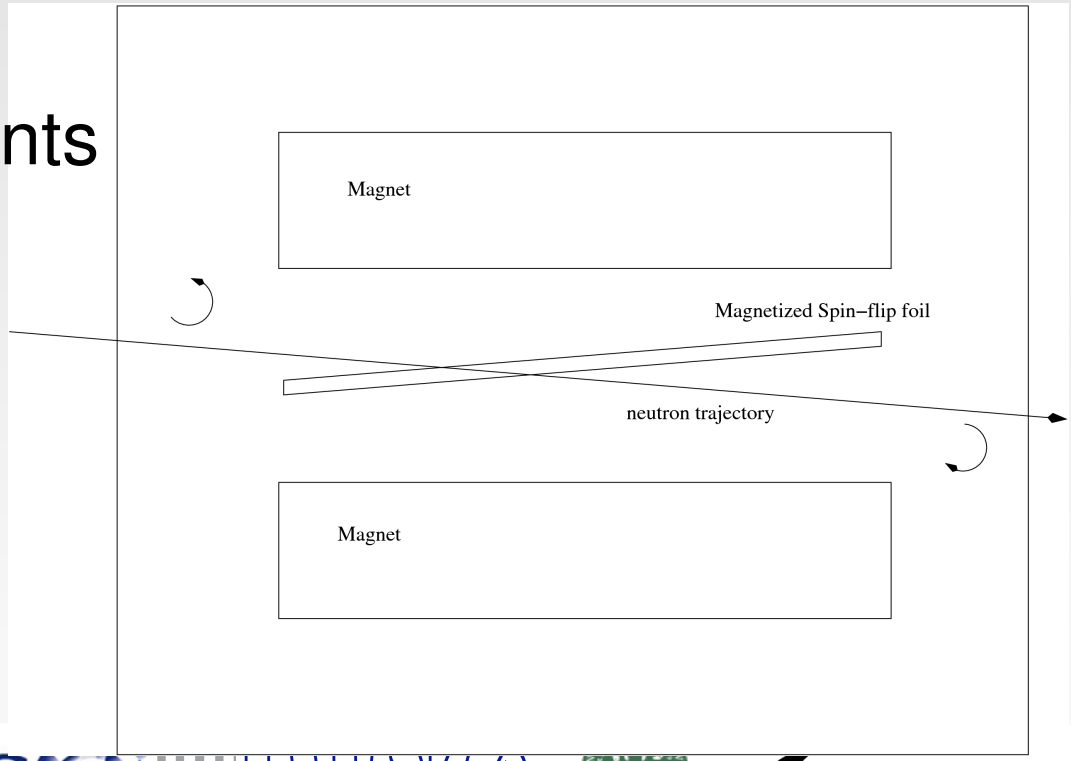






Components

- Magnetic Field components
  - Box
  - Start/Stop Pair
  - Specialized components
    - Foil Flipper Magnets
- Optics
  - Flippers
  - Rotators



Components

- Polarizers
  - Set polarization
  - Depolarizer
  - Polarizing mirror
    - Single bounce
  - Multilayer
  - Bender Polarizer

Target Instrument

- SE-SANS machine at TU-Delft
  - Pretty picture
  - Good example instrument: why?
    - Fairly simple geomtrical setup
    - Nested fields
    - Upgradable complexity

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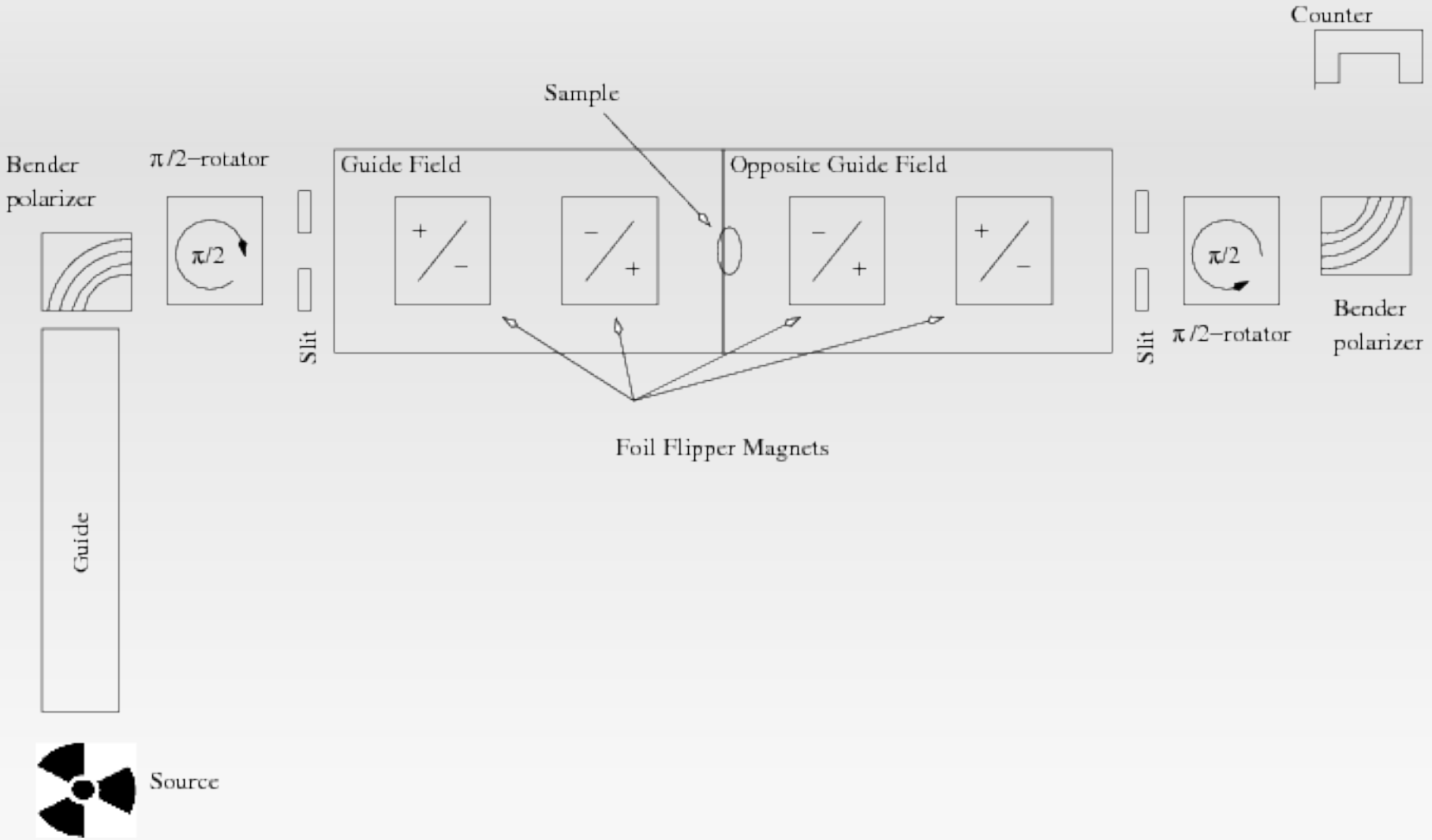
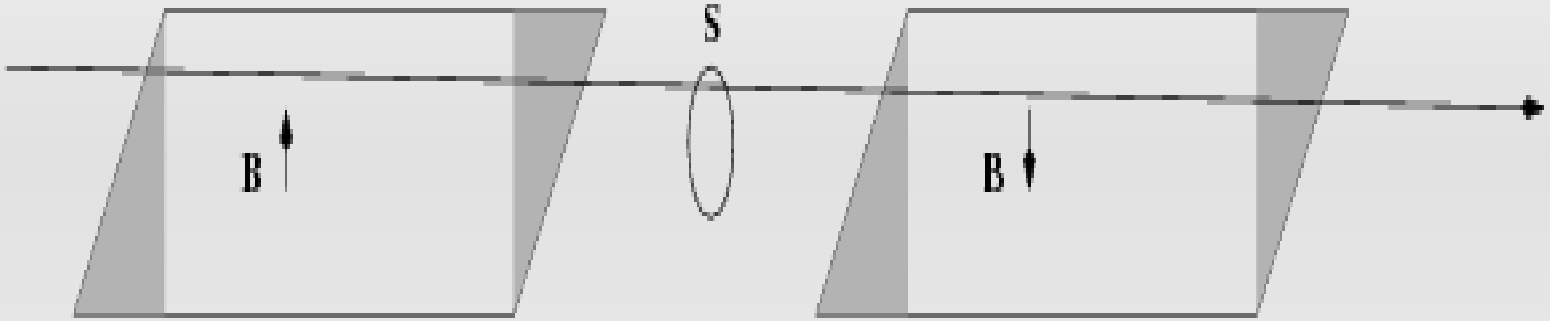
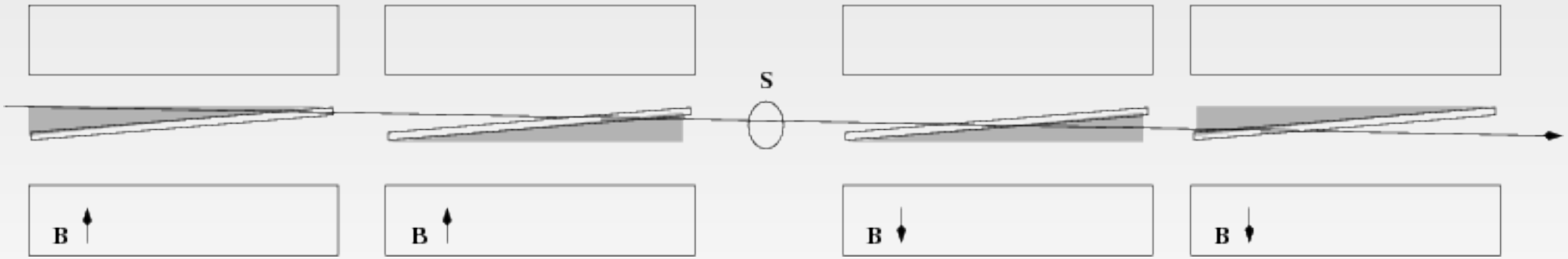
SE-SANS


Counter
Sample
Bender
polarizer
π/2–rotator
Guide Field
Opposite Guide Field
Slit
Slit
π/2–rotator
Bender
polarizer
Guide
Foil Flipper Magnets
Source

SE-SANS variants

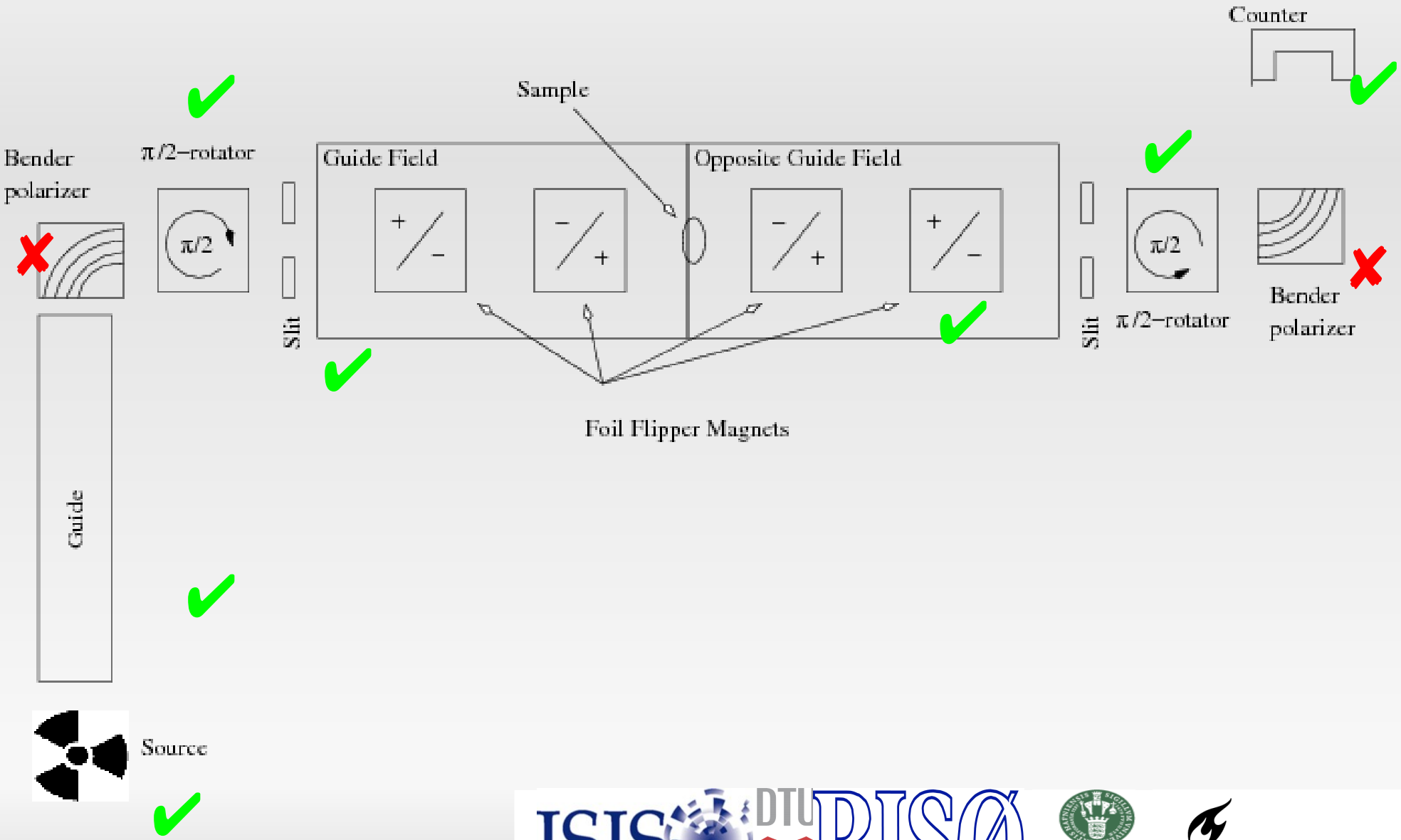


"Regular" Spin-Echo SANS

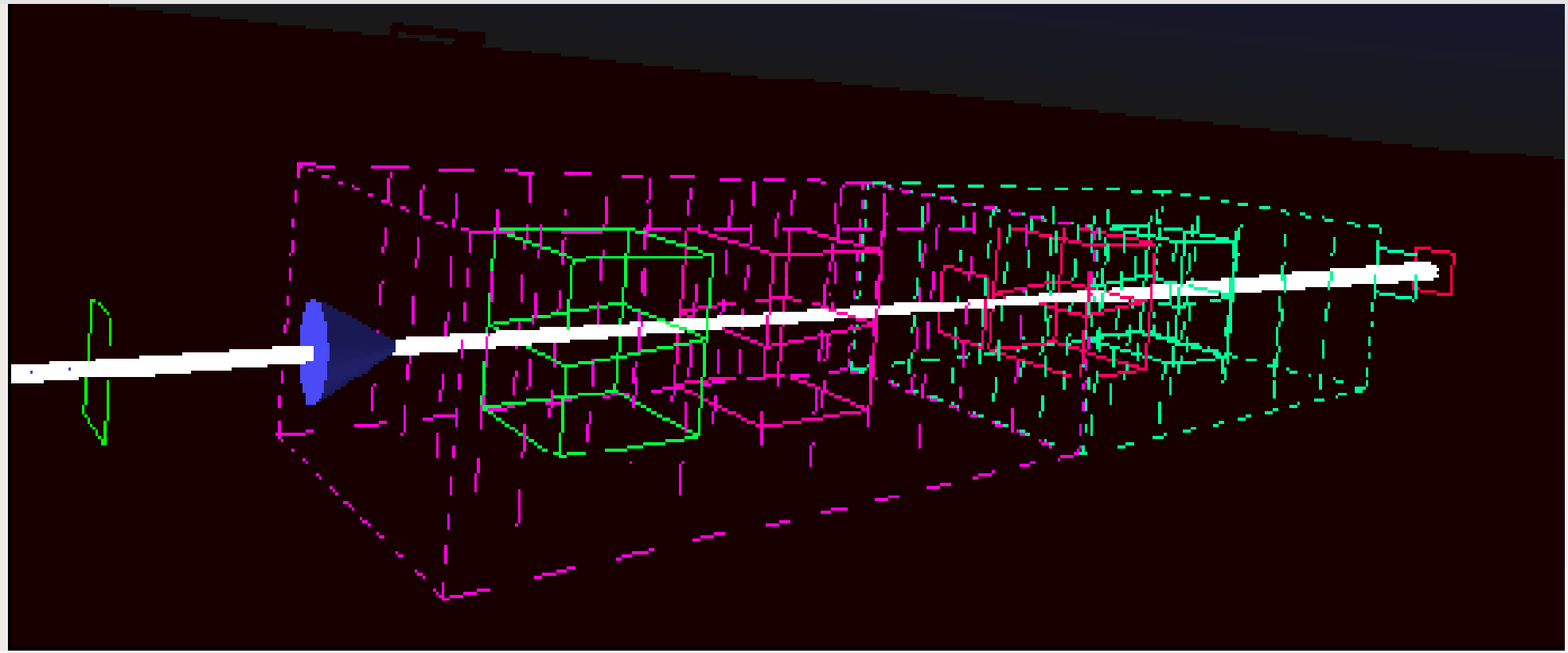


"Foil-Flip" Spin-Echo SANS

SE-SANS


Counter
Sample
Bender polarizer
π/2−rotator
Guide Field
Opposite Guide Field
π/2
Slit
Slit
π/2
π/2−rotator
Bender polarizer
Guide
Foil Flipper Magnets
Source

McStas - Simulation



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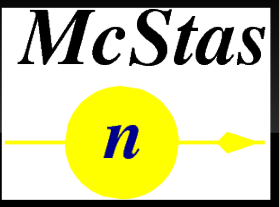
First neutrons through



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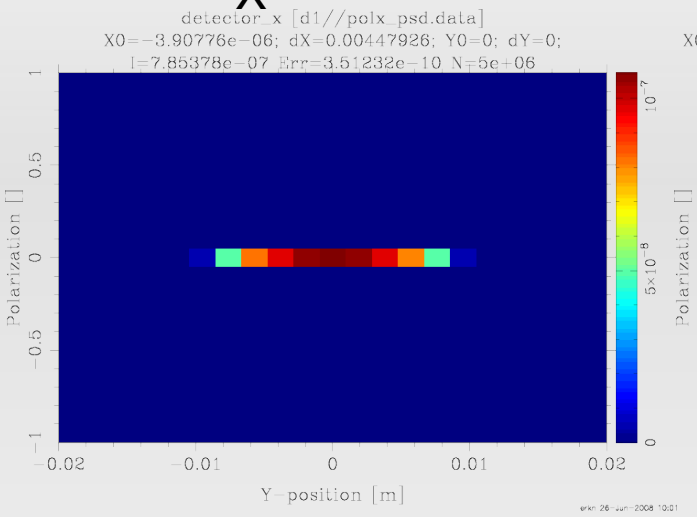
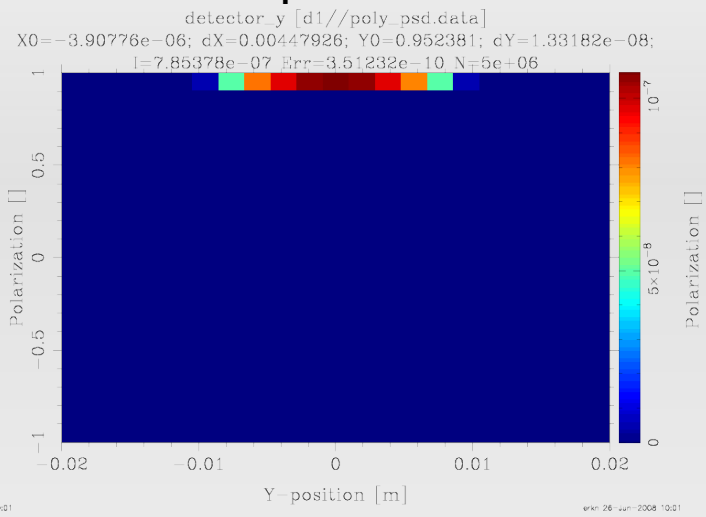
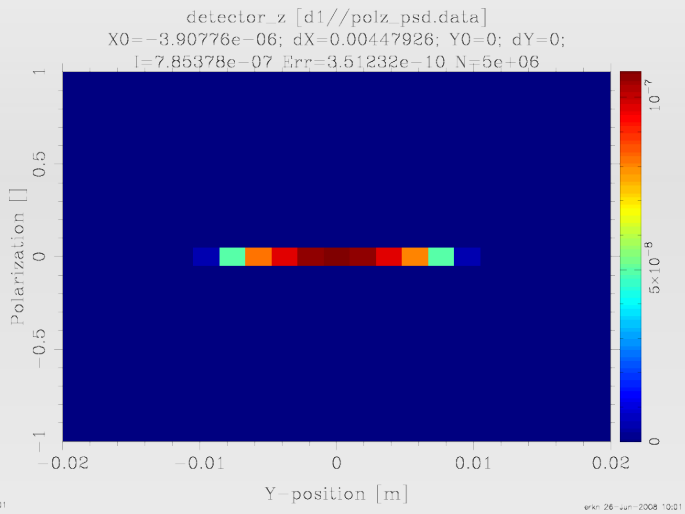
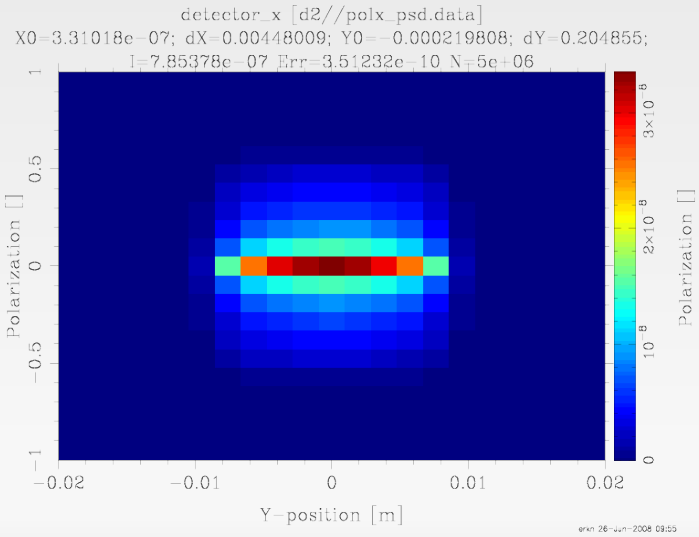


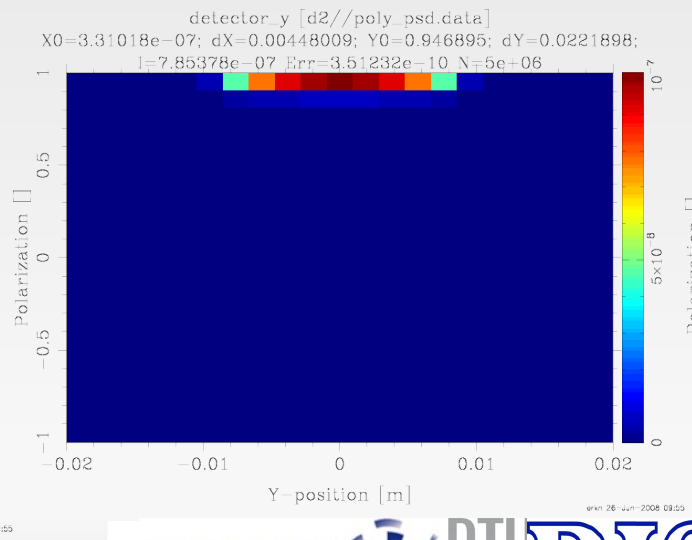
Y

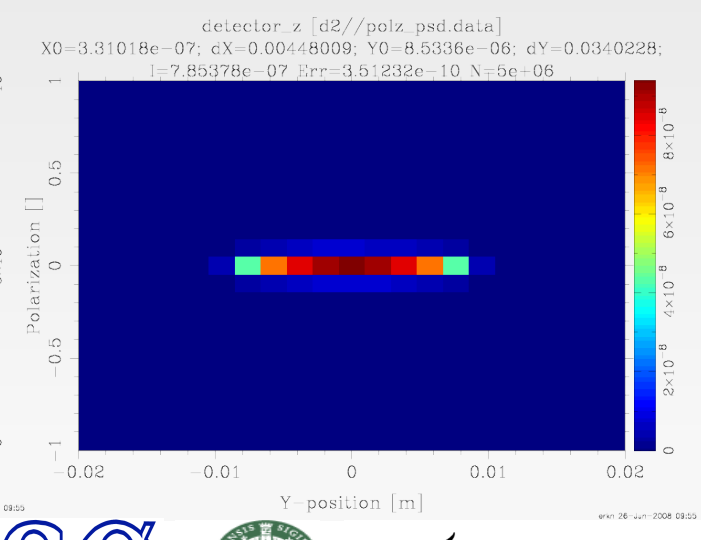


Z









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Polarized neutrons in McStas

- Future
  - **Optimizations to precession code**
  - **RF-fields**
  - Basic component library
  - More example instruments