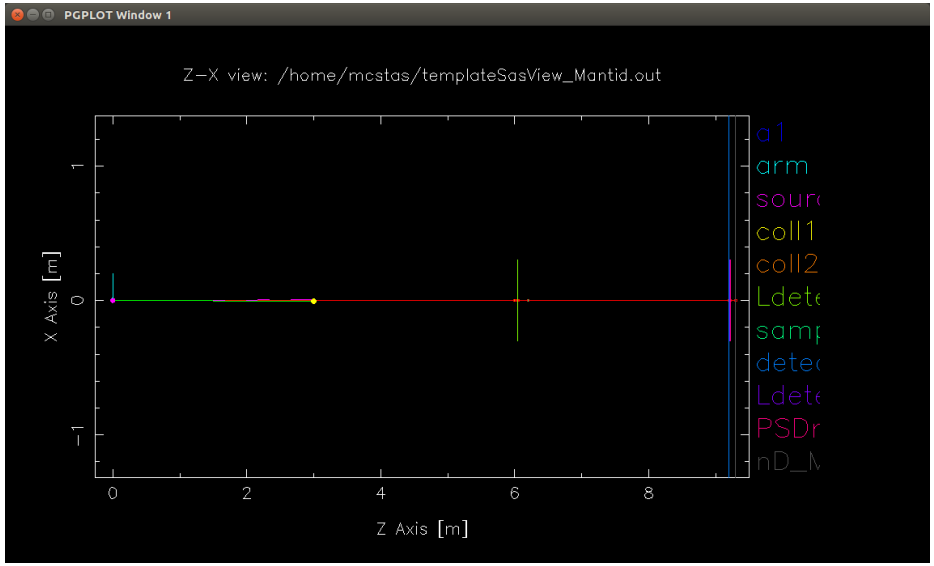
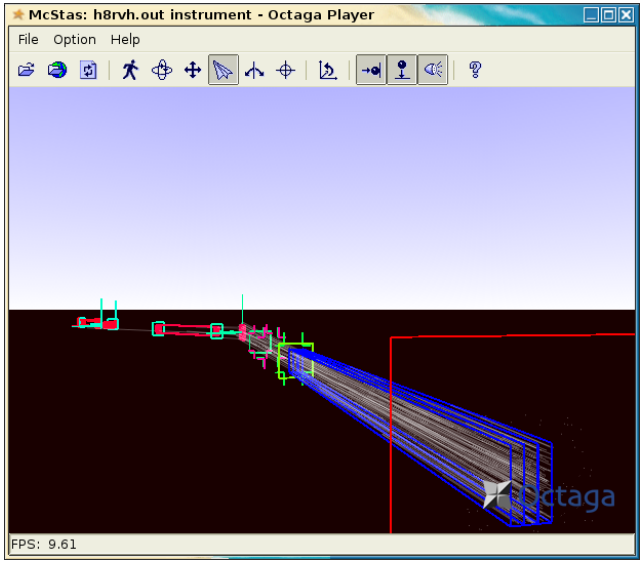
The McStas Raytracing Toolkit for Simulating Neutron Scattering Instruments and Experiments



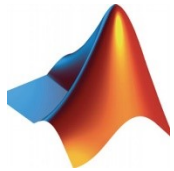


Monte Carlo Simulation of Triple Axis Spectrometers

- Developed at/supported by DTU Physics, ILL, PSI, Uni CPH, ESS DMSC.
- Freely available software. Licensed under GNU GPL v2.
- Flexible, general simulation utility for neutron scattering experiments.
- Allows virtual instruments to be built on a component by component basis.
- Used for instrumentation, planning, construction, virtual experiments, data analysis and teaching.
- Experimental data can be output to Nexus format (normally HDF5)

System Requirements and Supported Platforms

- A C Compiler (gcc/icc recommended)
- Perl and Perl-Tk
- Matlab OR (pgplot+pgperl+PDL) OR Gnuplot
- Linux, Windows and MacOS. (Instructions on website)



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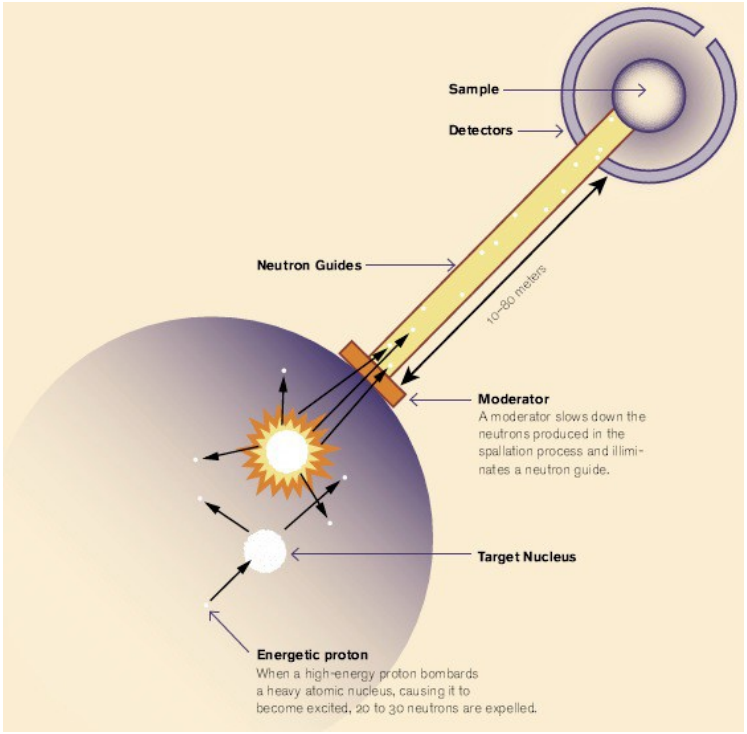
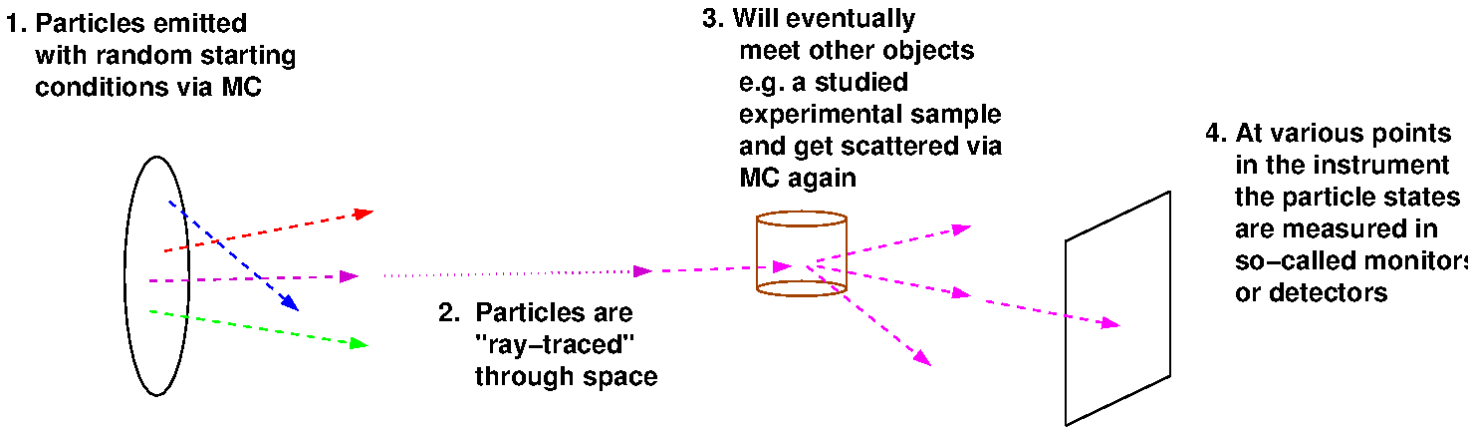
Supported Components

- Moderators
- Neutron Guides
- Collimators & Slits
- Choppers
- Samples
- Detectors (Monitors)
- And More



How it works (Simple)



Brief Note on McStas Design/Architecture

- McStas is based on a meta-language specifically designed for neutron scattering instruments.
- McStas compiles this metalanguage into ISO-C programs.
- There are three levels of source code:
  1. Instrument File (*.instr) - input
  2. Component Files (*.comp) - input
  3. ANSI c code (*.c) - output

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Defining an Instrument

```
DEFINE INSTRUMENT My_Instrument(DIST=10)

/* Here comes the TRACE section, where the actual              */
/* instrument is defined as a sequence of components           */
TRACE

/* The Arm() class component defines reference points and orientations  */
/* in 3D space.                                                         */
COMPONENT Origin = Arm(
  )
 AT (0, 0, 0) ABSOLUTE


COMPONENT Source = Source_simple(
  radius = 0.1, yheight = 0.1, xwidth = 0.1, dist = 10, E0 = 5,
  dE = 1)
 AT (0, 0, 0) RELATIVE Origin


COMPONENT Emon = E_monitor(
  filename = "Emon.dat", xmin = -0.1, xmax = 0.1, ymin = -0.1,
  ymax = 0.1, Emin = 0, Emax = 10)
 AT (0, 0, DIST) RELATIVE Origin


COMPONENT PSD = PSD_monitor(
  nx = 128, ny = 128, filename = "PSD.dat", xmin = -0.1,
  xmax = 0.1, ymin = -0.1, ymax = 0.1)
 AT (0, 0, 1e-10) RELATIVE Emon

/* The END token marks the instrument definition end*/
END
```

- Component Manual - http://www.mcstas.org/documentation/manual/mcstas-2.3-components.pdf
- Component Descriptions (and source) - http://www.mcstas.org/download/components/

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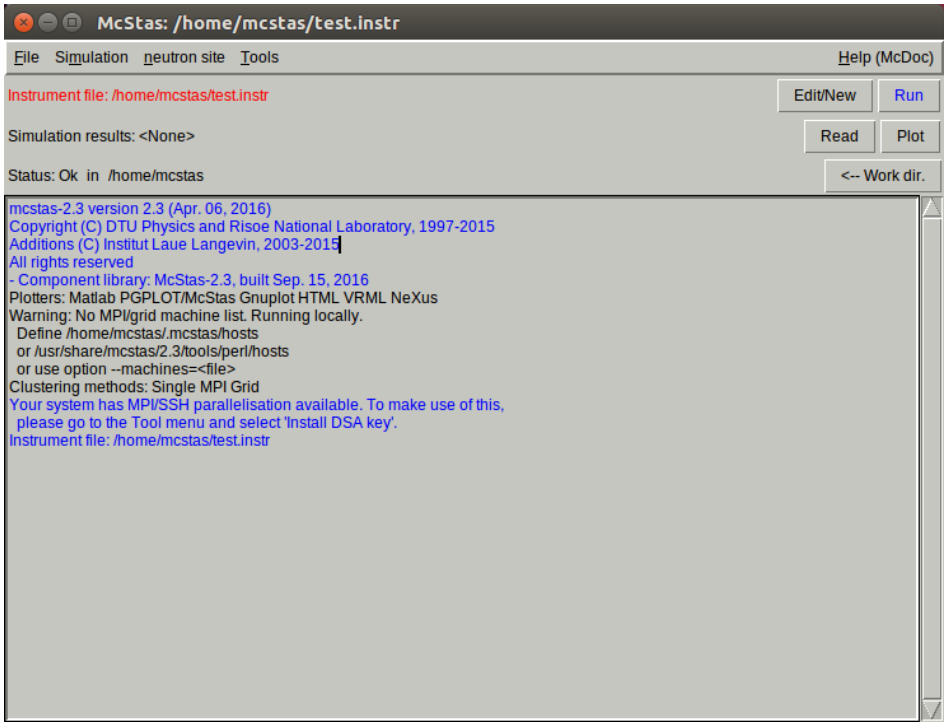
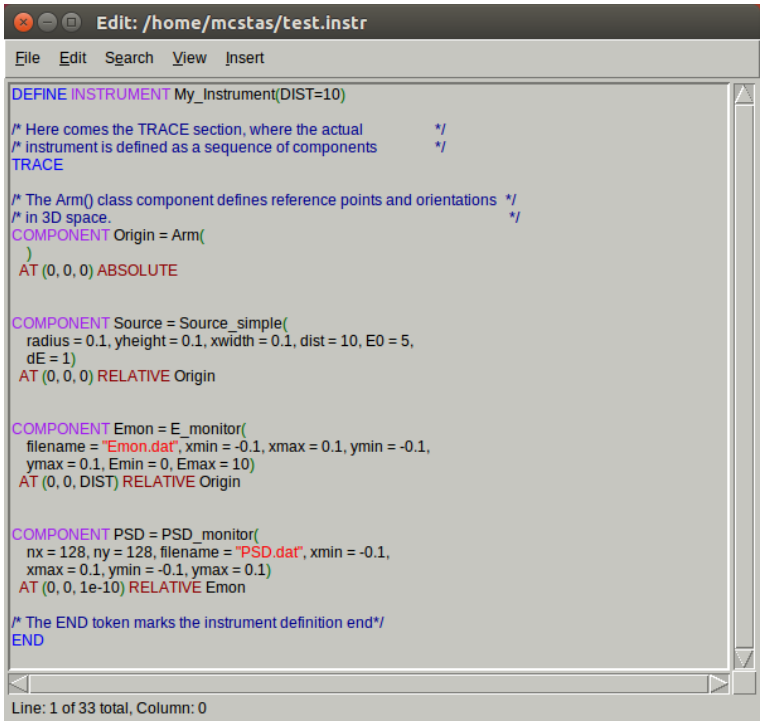
McGUI (Creating/Editing Instruments)





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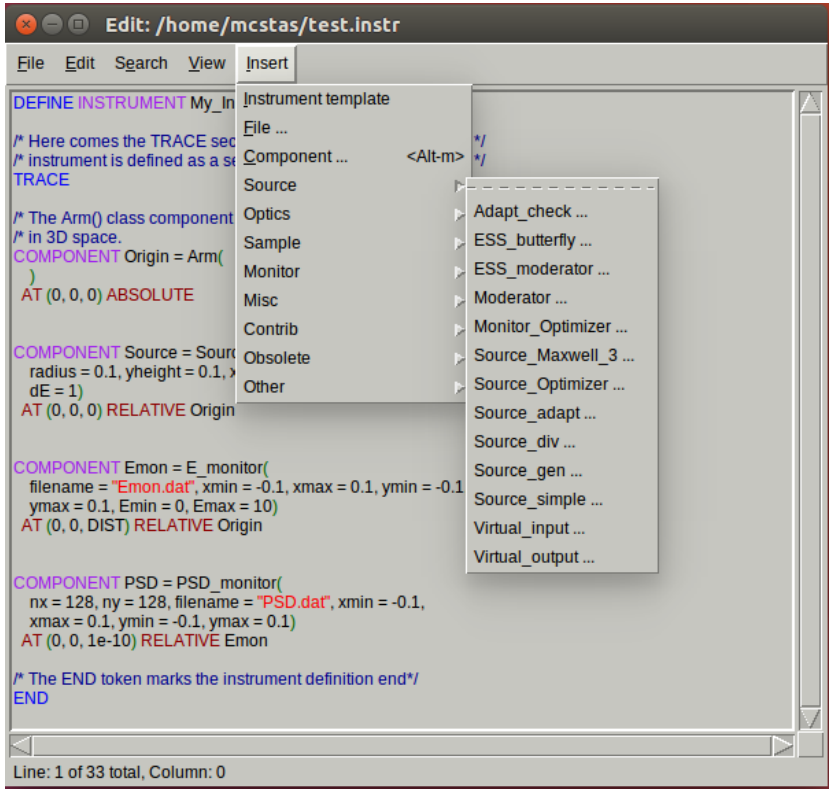
McGUI (Selecting Components)



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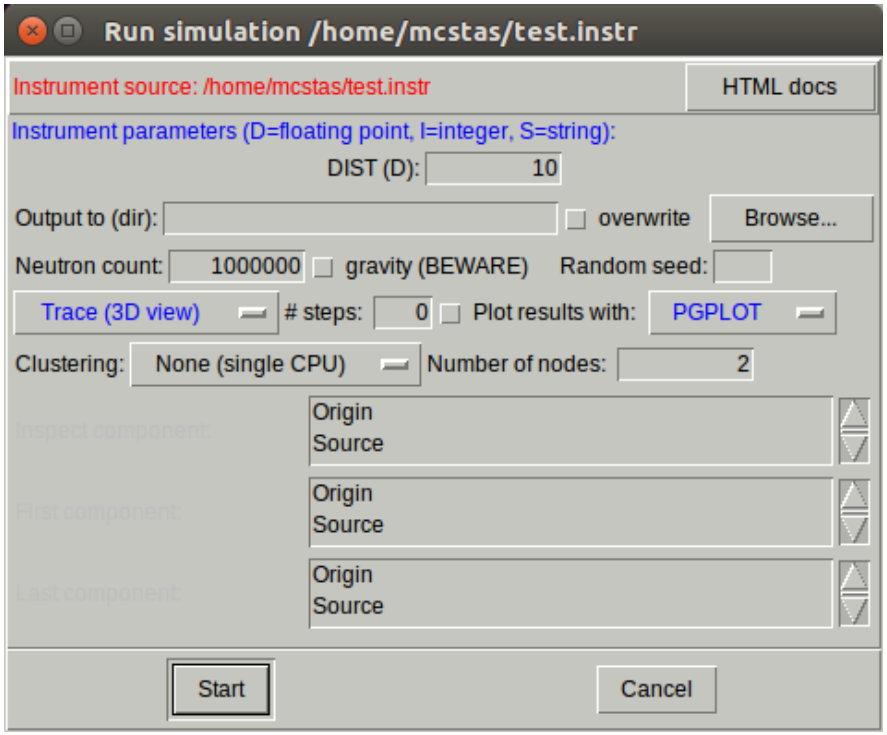
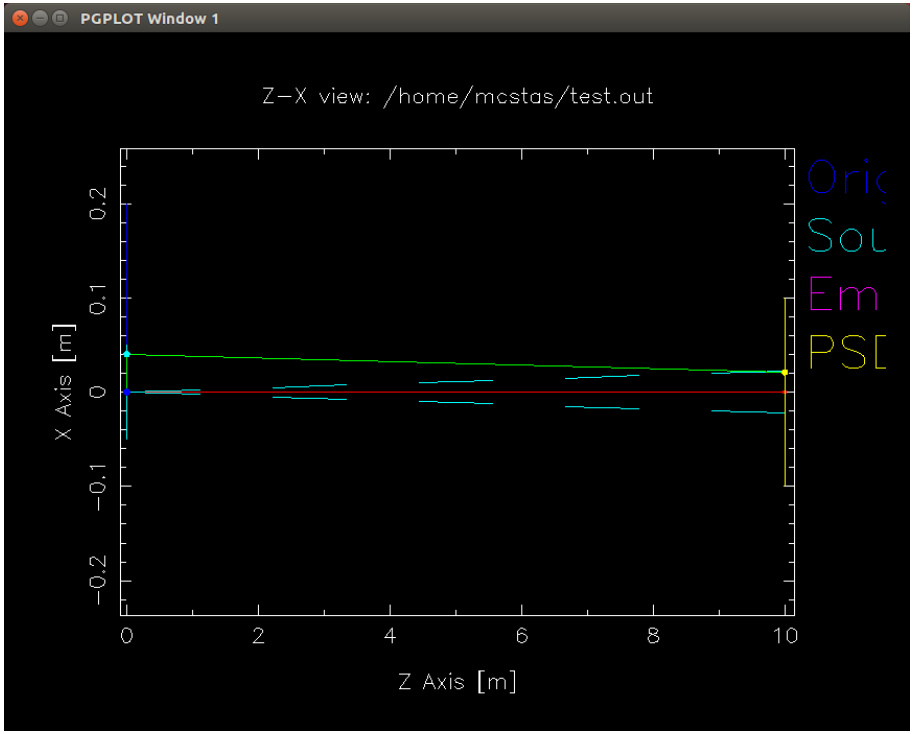
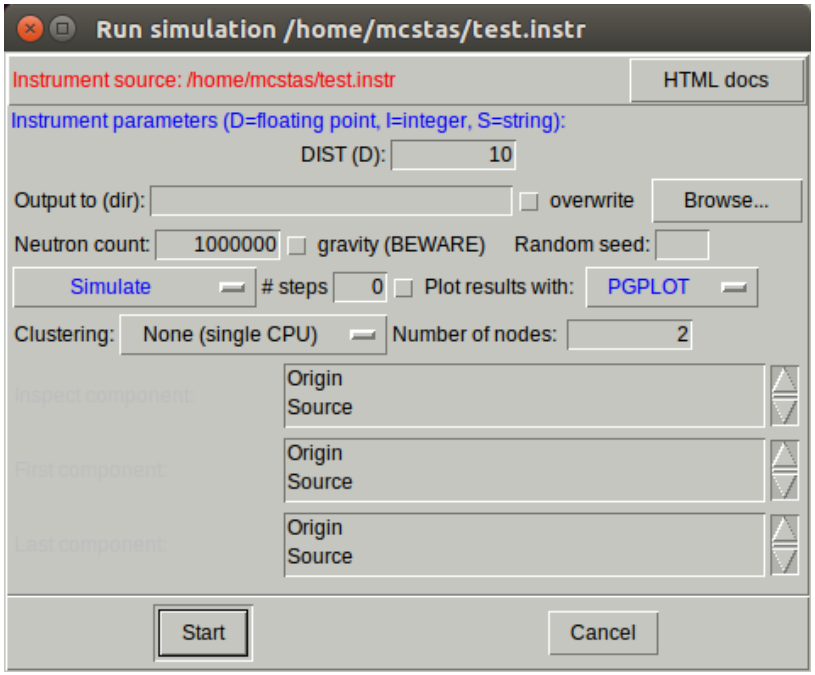
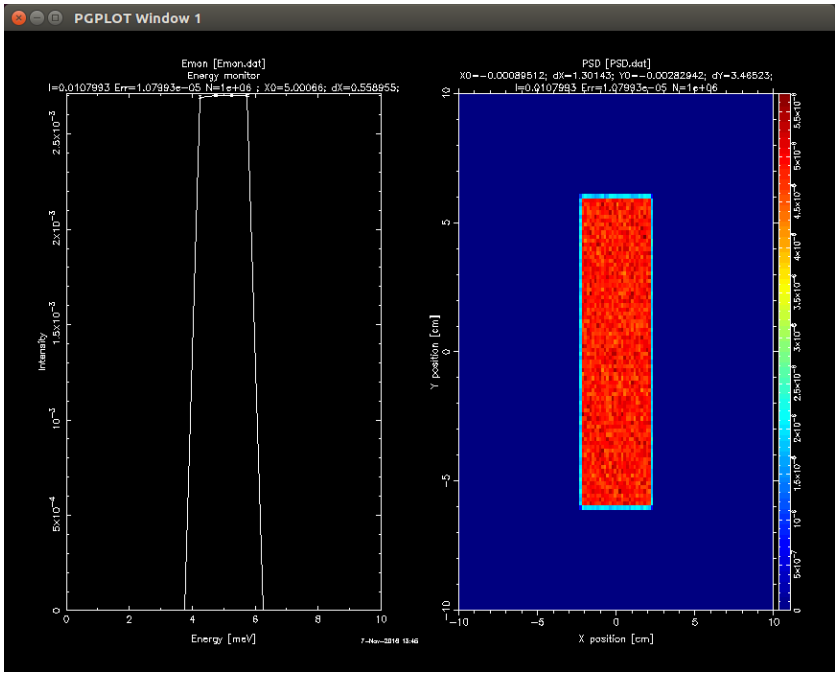
McGUI (Tracing by Hand)





McGUI (Running the simulation)





Extras

- Interoperability with Mantid. Components are written as Mantid components into an IDF.
- IDF embedded in Nexus output and written as a xml file using mcdisplay.
- Requires special naming conventions.
  - sourceMantid
  - sampleMantid
  - nd_Monitor_n
- Uses OFF file types for more complex geometries.

Questions?

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