

DATA REDUCTION AT THE ILL:

A COMPARISON BETWEEN LAMP AND MANTID

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Introduction

The Past and the Present: LAMP

- The neutron scattering data treatment software used at the ILL for the past 20 years.
- Written in the IDL programming language.
- Multiplatform.
- Free to use, however for development IDL license is needed.

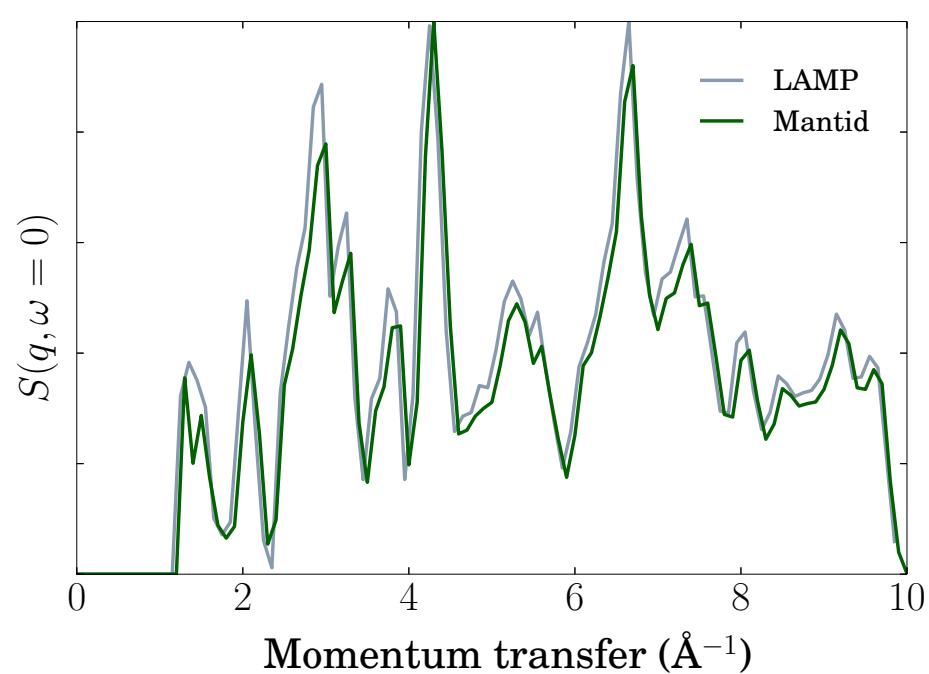
As part of a larger modernization program, the ILL is replacing the old in-house developed LAMP software with the Mantid framework as the default data treatment solution on most neutron scattering instruments. There are differences in how LAMP and Mantid deal with the data which have to be evaluated and understood to ensure a smooth transition.

The Future: Mantid

- Data treatment framework developed in collaboration between ESS, ISIS and SNS.
- Written in C++ and Python.
- Multiplatform.
- Completely open source under the GPL licence.

Point Detectors vs. Realistic Instrument Model

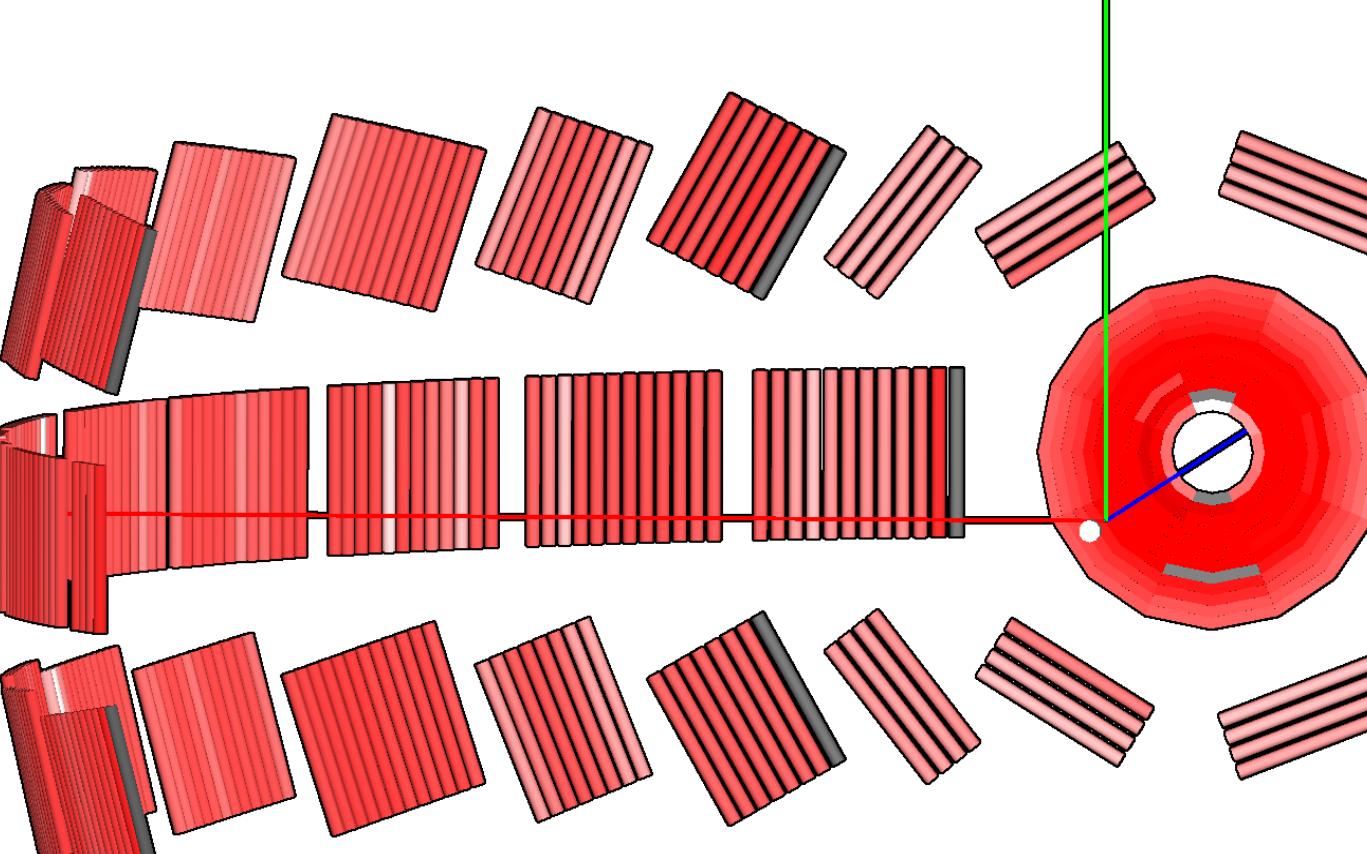
Point-like Detectors



In certain data reduction operations, LAMP-like behavior can be simulated in Mantid by reducing the size of neutron detectors to point-like.

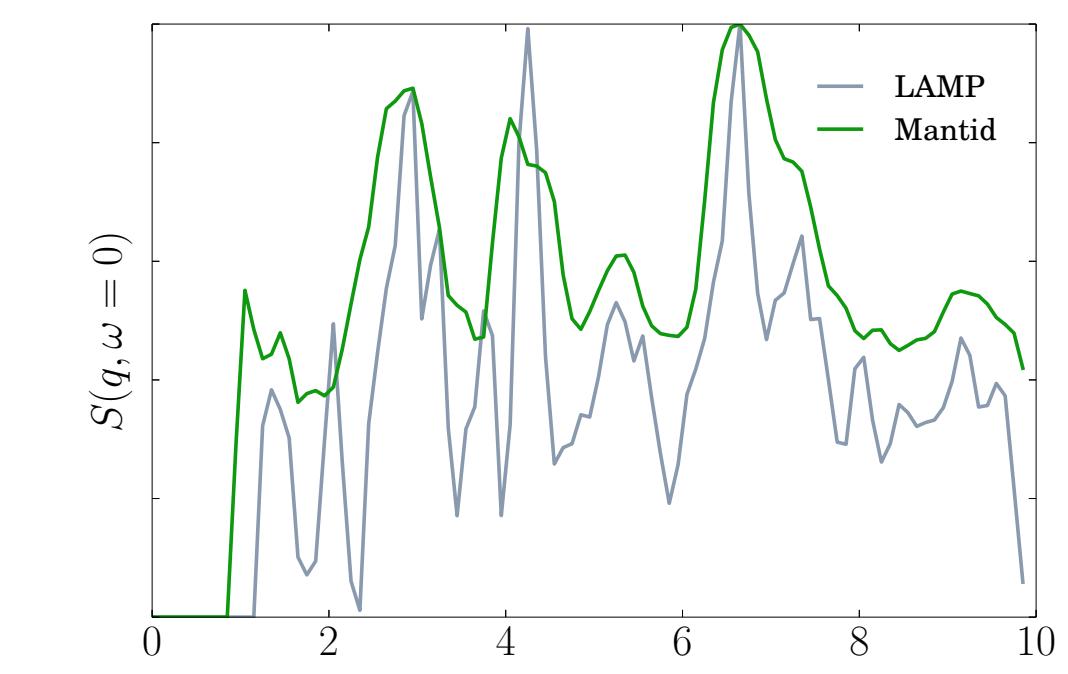
- In Mantid, the instrument definition describes the positions, orientations and shapes of components, such as choppers, monitors and detectors in 3D space.
- Enables the usage of full instrument geometry in computations.
- LAMP stores only the detector scattering angles.
- For some older instruments at the ILL, it is challenging to gather all geometry the data needed for an accurate definition.

IN4 Spectrometer in Mantid



Full description of instrument component positions and shapes.

Full Instrument Definition

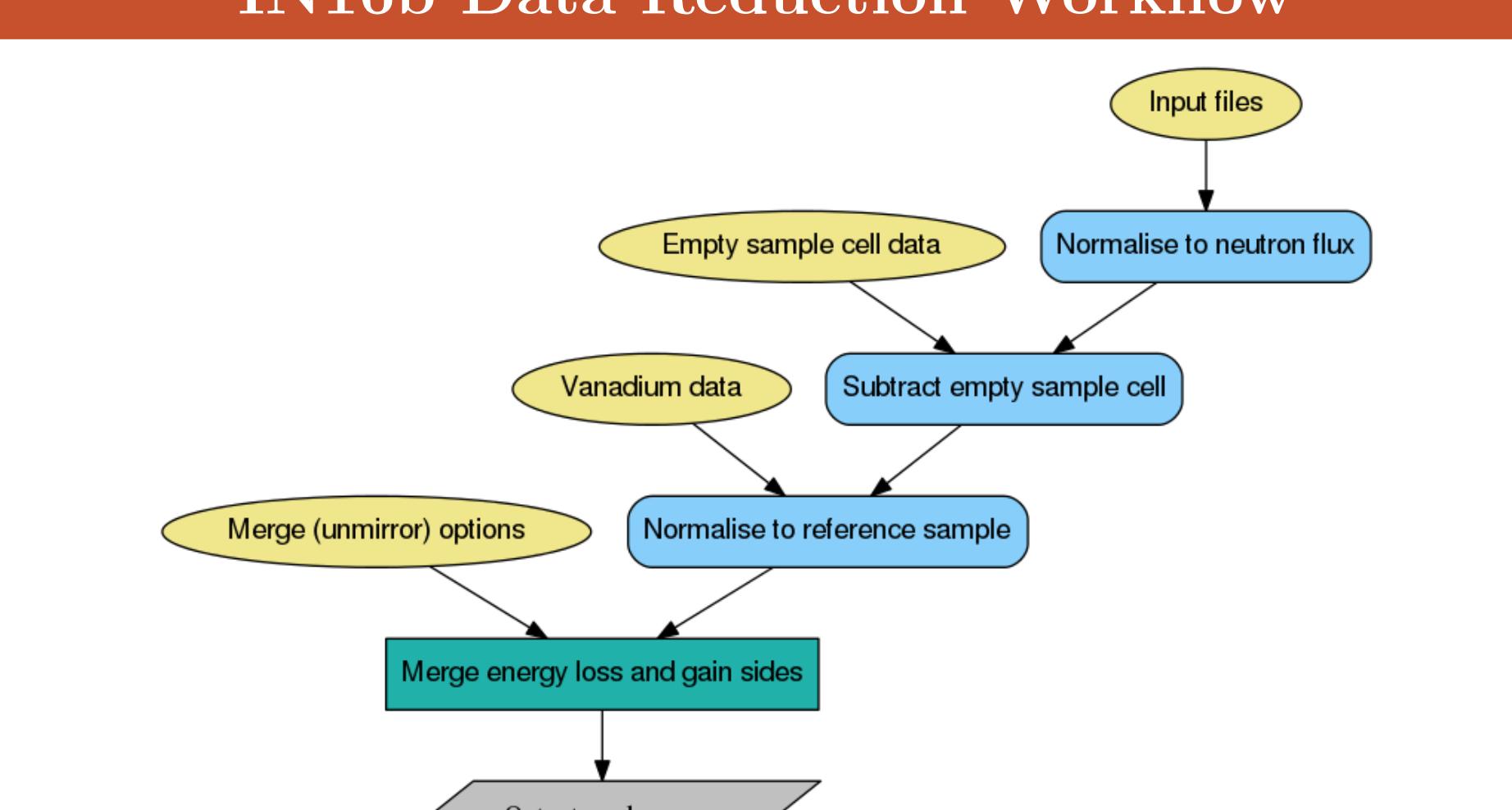


When the realistic instrument geometry is taken into account in the data treatment, Mantid may produce quite different results than LAMP.

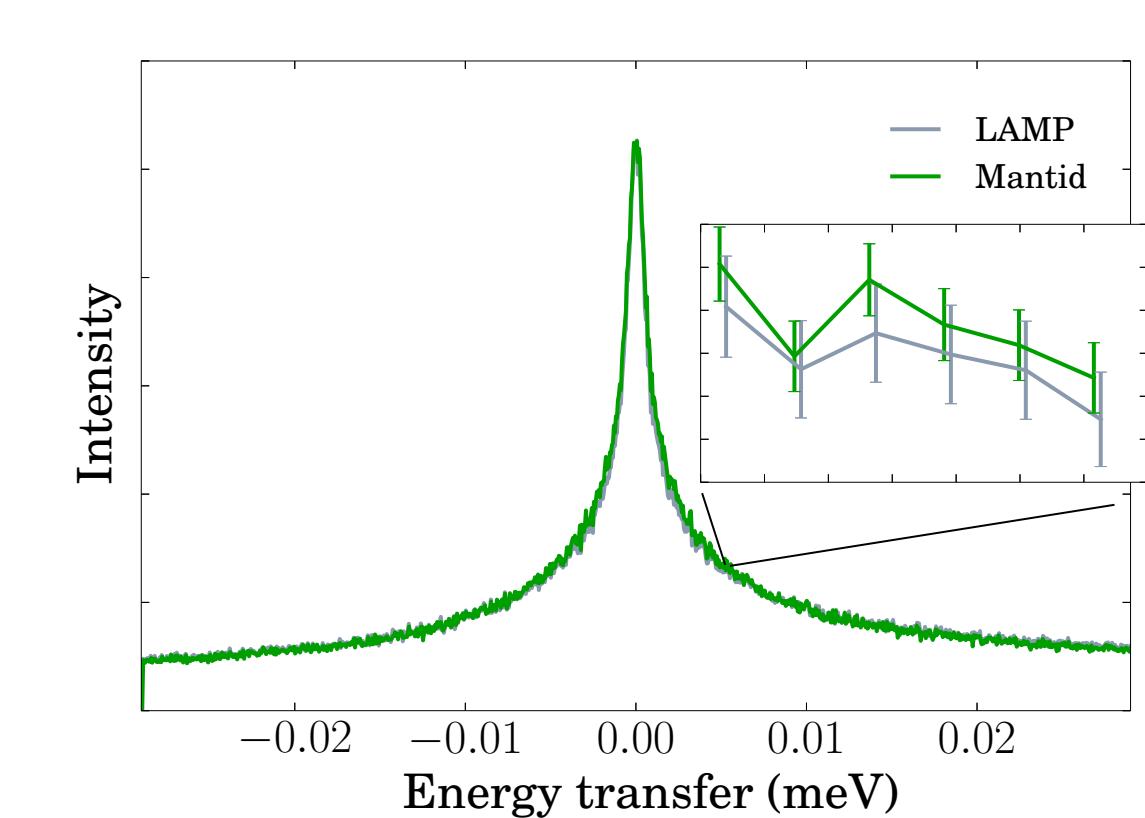
Benchmarking of Complex Data Treatments

- One of the first instruments to start using Mantid is IN16b, a neutron backscattering spectrometer.
- The data reduction workflow shown on the right transfers the raw counts-per-detector data to physical observables.
- The workflows between LAMP and Mantid are compatible and the results within experimental error from each other.
- The small differences between the resulting data come from several sources, some difficult to identify. Examples:
 - Fitting algorithms.
 - LAMP's data presentation vs. Mantid's histograms.
 - Differences in normalization algorithms.

IN16b Data Reduction Workflow



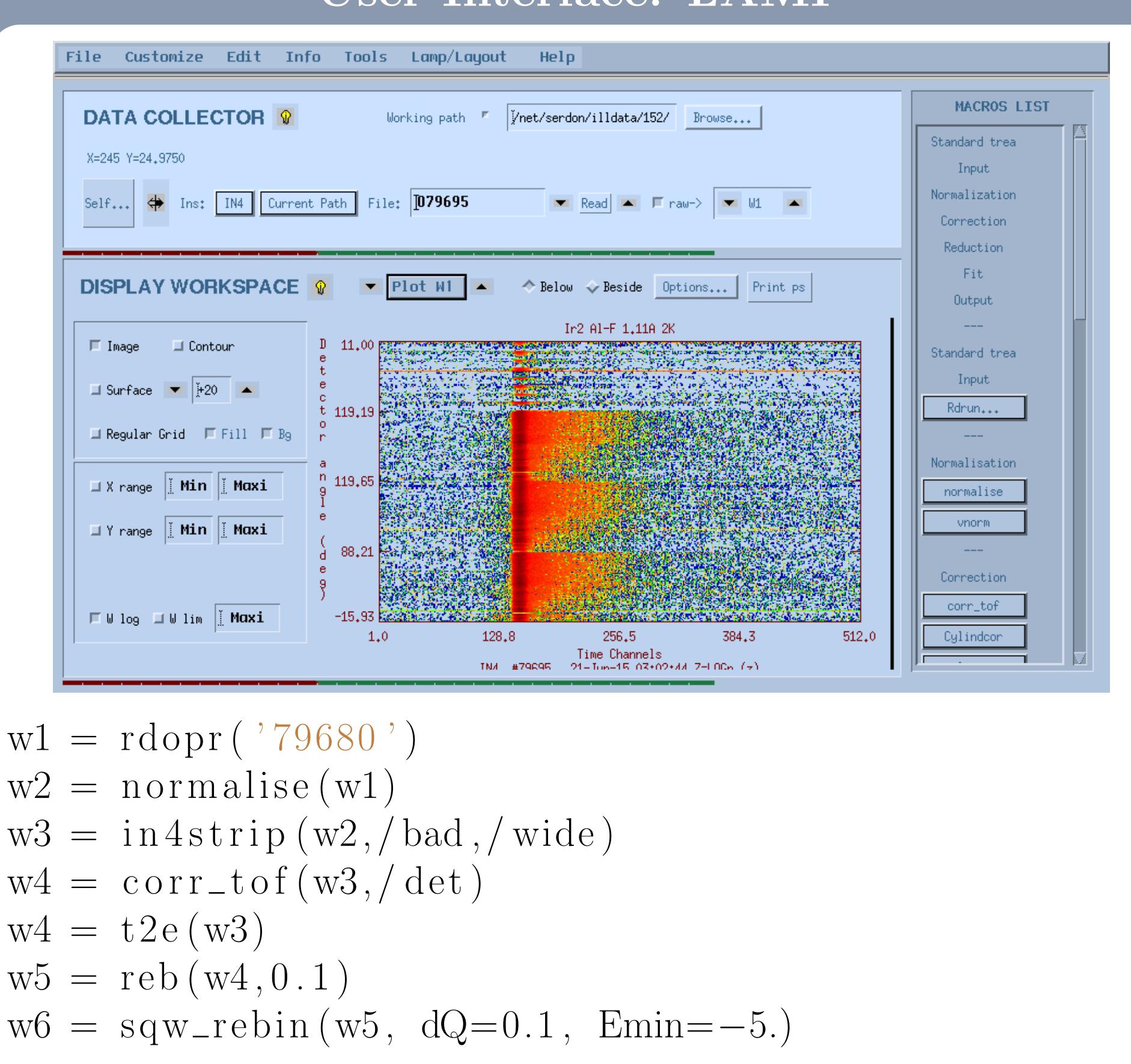
Comparison of IN16b Data Reduction Results



The correspondence in the reduced neutron spectra between LAMP and Mantid is rather good even with the slight differences in e.g. fitting algorithms.

User Interfaces and Data Manipulation

User Interface: LAMP



- Both pieces of software offer a scripting environment integrated in a GUI.
- LAMP uses IDL as the scripting language while Mantid has Python algorithms and bindings to C++.
- Mantid can be also used as a general framework without the GUI.
- With Mantid, support for the old ILL ASCII data file format will be dropped. It has been superseded by the new HDF5 based binary format, Nexus.
 - More efficient, better floating point accuracy, and more flexibility in terms of structure and metadata.
- Both programs organize the data into workspaces and have algorithms to operate on them.
- Mantid supports both histogram and distribution type data, LAMP only distributions.
 - Makes comparing data from both programs sometimes difficult.

User Interface: Mantid

