µView, *XYfit* & *LSHfit* : µSR Data Visualization and Analysis Tools

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CIAR, UBC, SFU & TRIUMF

The Need for Better Tools

- We "see" *µSR* data with software "eyes" and were getting nearsighted.
- Superconducting lineshape analysis is especially challenging.
  LSHfit makes this more accessible to all µSR users.
- *µView* replaces the old *db* utility and adds access to µSR data(MUD) files.
- *XYfit* reads XML files generated by *µView* and is easily customized.

µView

System Requirements and Launching:

- Linux/Unix/Mac/Windows platforms compatible.
- Works with Safari, Netscape, Firefox, Mozilla but not M$IE.
- Online (`http://musr.org/muview/`) or Locally (`muviewpackage.zip`)
- A `.java.policy` file is required to access local files.
- *µView* Manual and Documentation available online.
- The full *µView* state can be saved.
- Import DataTables from: *db*, MUD and XML.
- Export into *db* or XML format.
- See poster on *µView*

XYfit

Written by UBC undergrads Aaron Froese, Anthony Uy and Angus Lau with kibbitzing from Jess Brewer and beta-testing by many users, *XYfit* is a C++ program using CERN's new C++ MINUIT library, Trolltech's *Qt3.1.1* for the graphical user interface (GUI) and *gnuplot* for graphics.

Features:

- Fits $Y(X)$ data to optimize theory parameters P_i by χ^2 minimization.
- Reads in DataTables as *db* or XML files from *µView*.
- Custom theory functions can be loaded as "plugins".

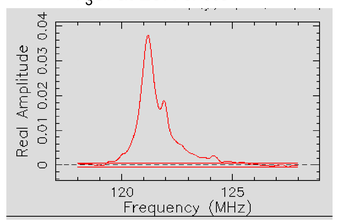
LSHfit

Adapted by UBC undergrad Aaron Froese from Jess Brewer's general purpose µSR fitting program *msrfit* and superconducting lineshape analysisprograms written by Jeff Sonier at SFU, *LSHfit* is aFORTRAN program using CERN's standard MINUIT library for χ^2 minimization and *pgplot* for graphics.

Features:

- Fits µSR time spectra in the rotating reference frame (RRF) to optimize lineshape parameters such as $, \xi$ *etc*. by χ^2 minimization. (Fitting in the time domain is essential to the extraction of all available information from the data, because statistical precision is a function of time in the spectra.)
- Reads in raw Histograms, converts them to complex asymmetry spectra and transforms into the RRF in one step, hence relatively convenient to use.
- Must recalculate frequency spectrum numerically every few steps, so is glacially slow! Massive number crunching power is essential.
- Recently ported to Mac OS/X for more speed.
- Because most effects are very subtle, use with extreme care!

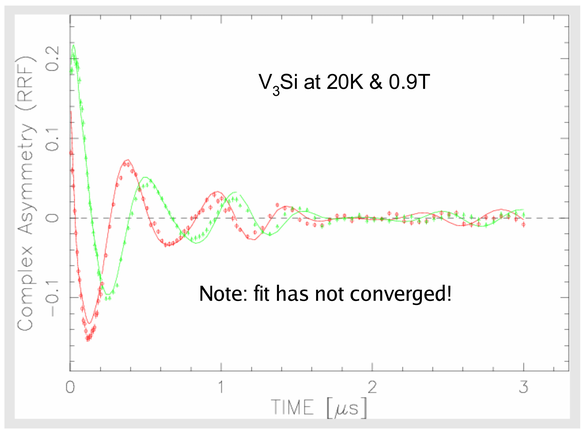
V_3Si at 20K & 0.9T



FFT over 4 µs with strong apodization gives less noise from late time bins (where counting statistics are lower) but features are broadened artificially.

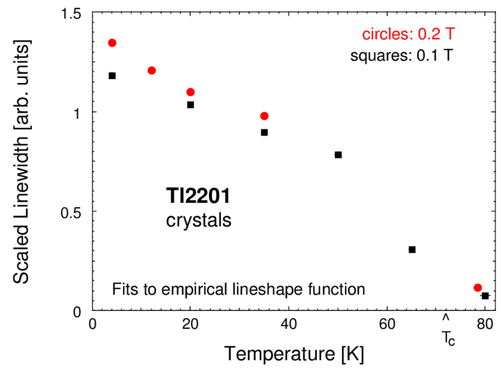
FFT over 6 µs with strong apodization shows sharper features but is very "noisy".

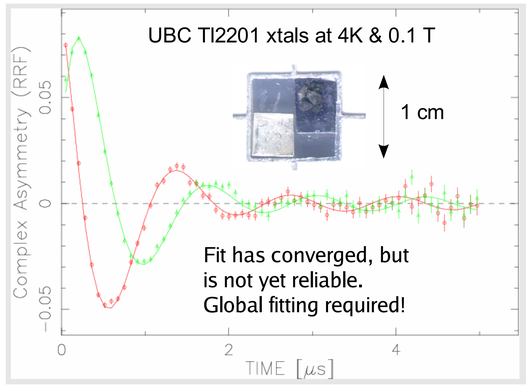
Solution: analyze data in time domain where time-dependent statistical uncertainty can be exactly accounted for.



FFT over 6 µs with strong apodization is still too short a time range to resolve tiny background signal in May 2005 Tl2201 data (peak is just to the right of the cusp).

Empirical lineshape fits (modeling the true lineshape as the sum of a Gaussian and a shifted Lorentzian)gives quick qualitative results [overdoped cuprates look *d*-wave, as expected!] but does not reveal the absolute value of $, \xi$ *etc*.





Tl2201 (UBC xtals) at 0.1 T