The SNS Magnetism Reflectometer

Data Reduction Manual

April 18, 2011

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1. Starting SNS_IDL_TOOLS

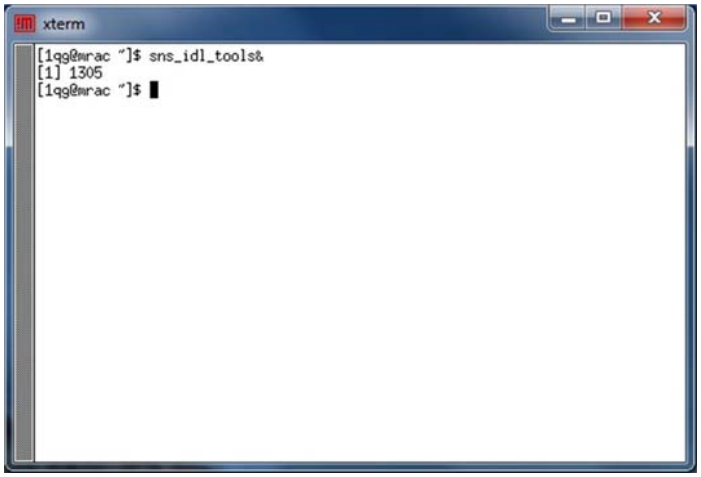
1.1. Running from MRAC (BL-4A LINUX Workstation)

1.1.1. Sit at the LINUX workstation console in the beam line 4A control cabin and use your XCAMS username and password to log on.

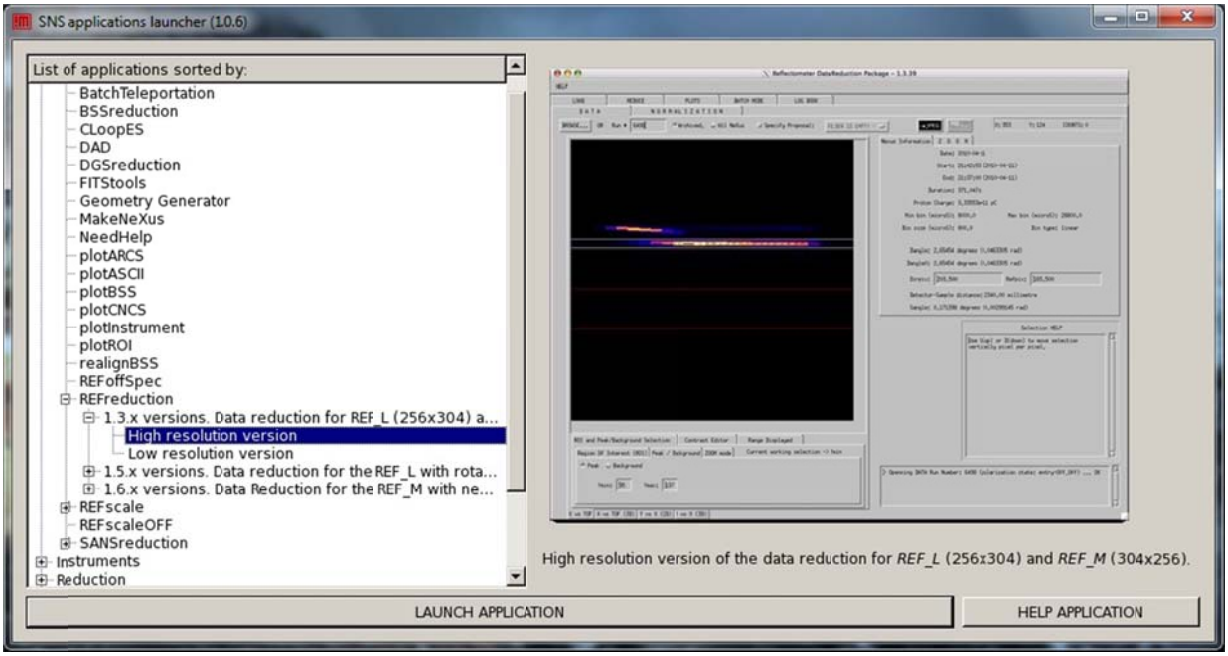
1.1.2. Use the Applications pull down menu to select SNS Applications from the Analysis list

As an alternate method you can select Terminal from the Accessories list to bring up a new terminal

and type sns_idl_tools& at the command prompt

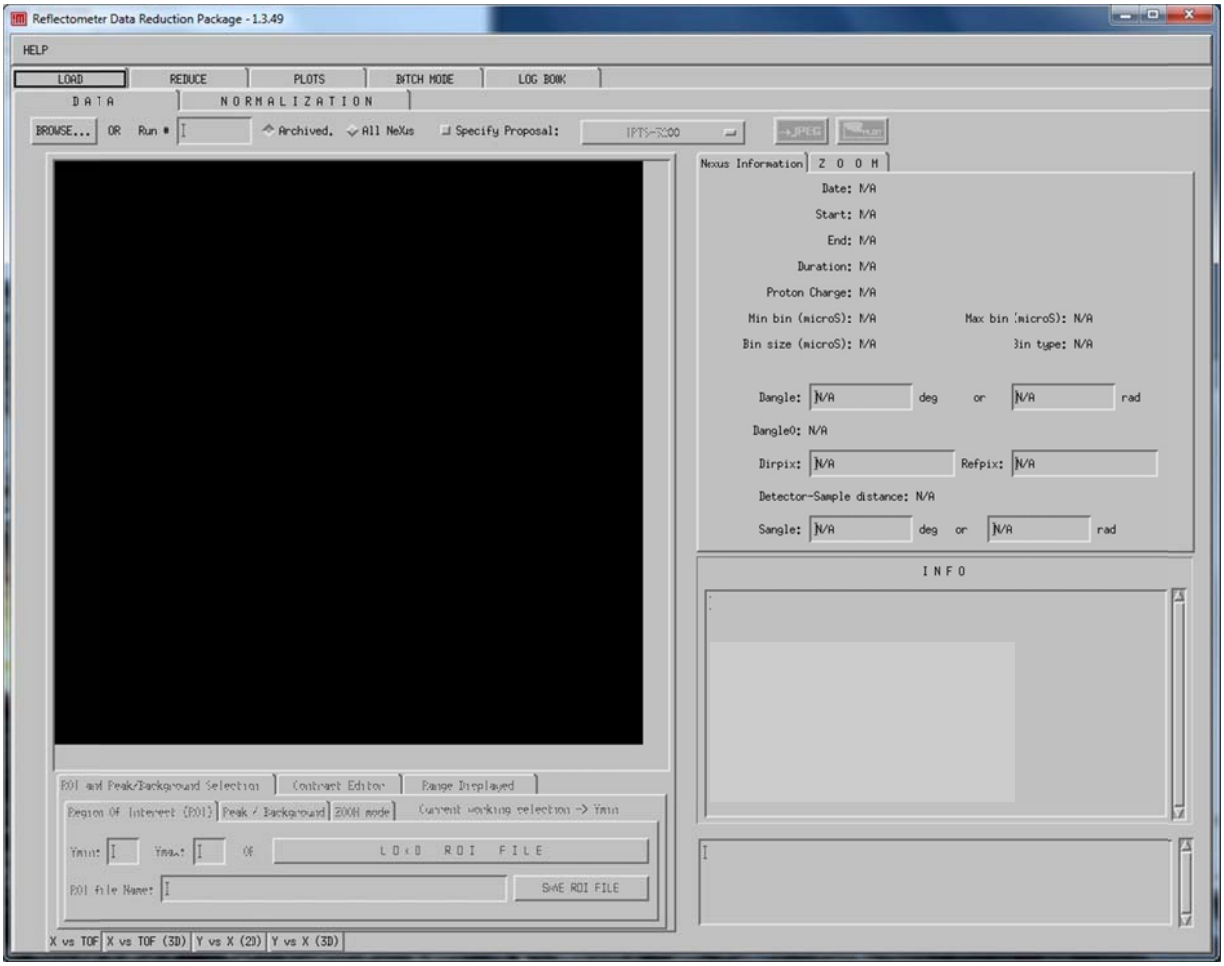


The SNS Application Launcher will appear.



1.1.3. Select REFreduction, 1.3x version, High Resolution version and click the button at the bottom labeled LAUNCH APPLICATION. The IDL splash window will appear.

1.1.4. Click anywhere on the splash window to continue. The REFreduction main window will appear.



1.2. Running from the BL-4A User Computer (WINDOWS Workstation)

1.2.1. Use the *Shortcut to MRAC* located in the *Start Menu* to start an NX session to the analysis computer MRAC

1.2.2. Enter your XCAMS username and password to log onto MRAC

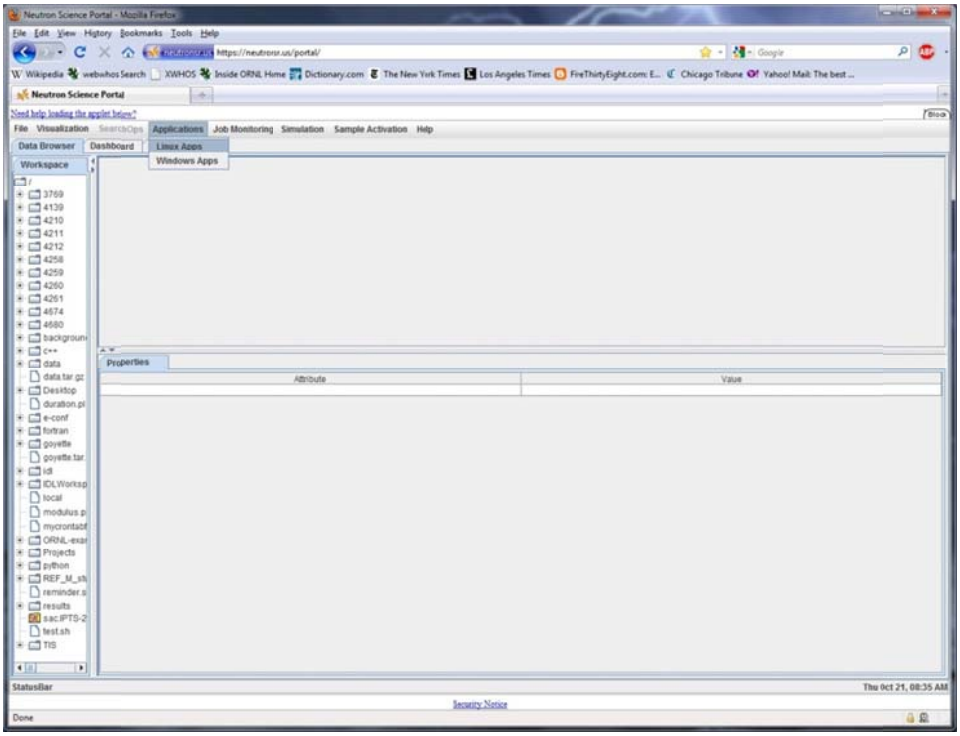
1.2.3. Follow the instructions from 1.1.2 – 1.1.4 listed above

1.3. Running from the SNS Portal Web Page

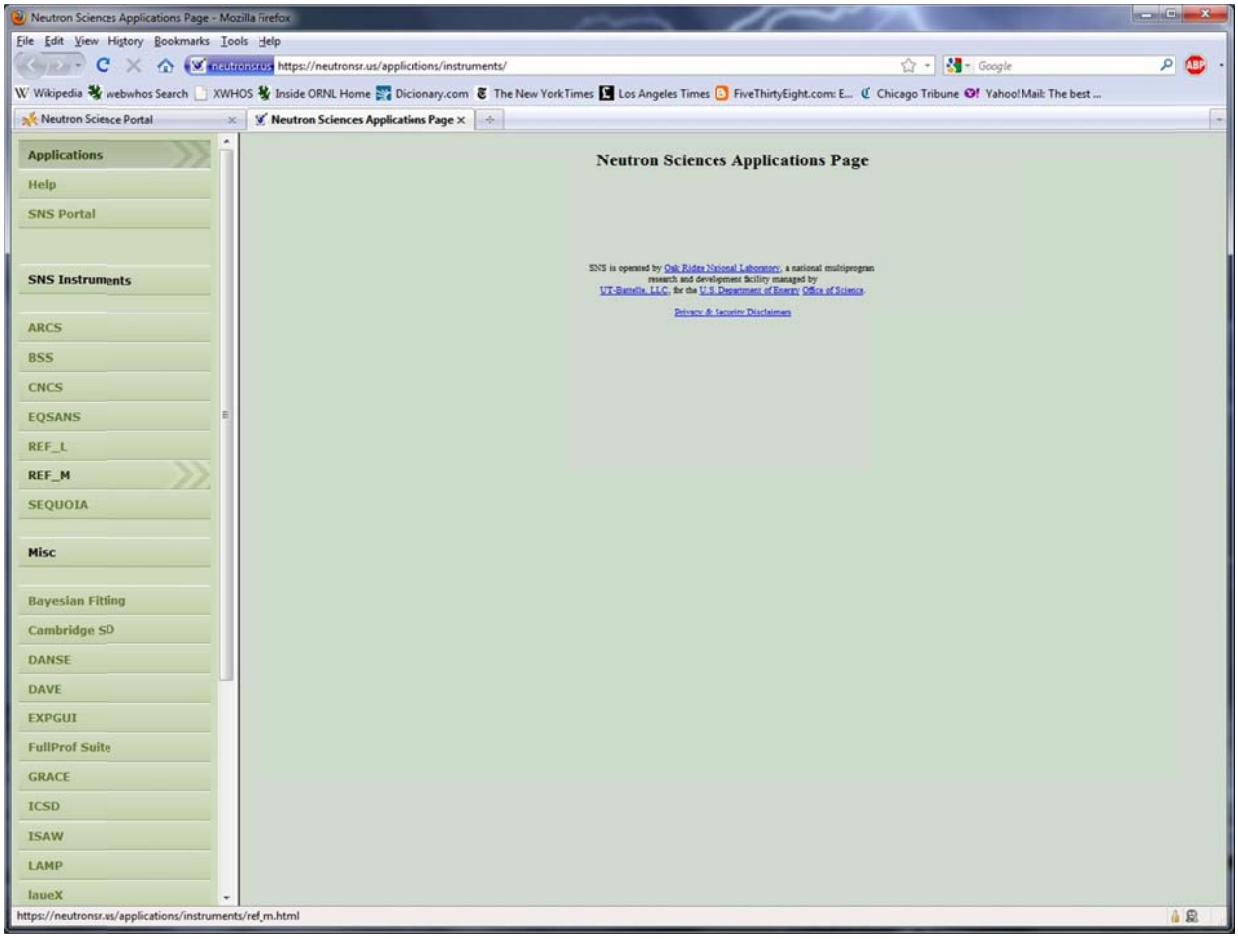
1.3.1. Load the Neutron Science Portal web page: https://neutronsr.us/portal/ You will be required to log in

1.3.2. Log in using your XCAMS account information.

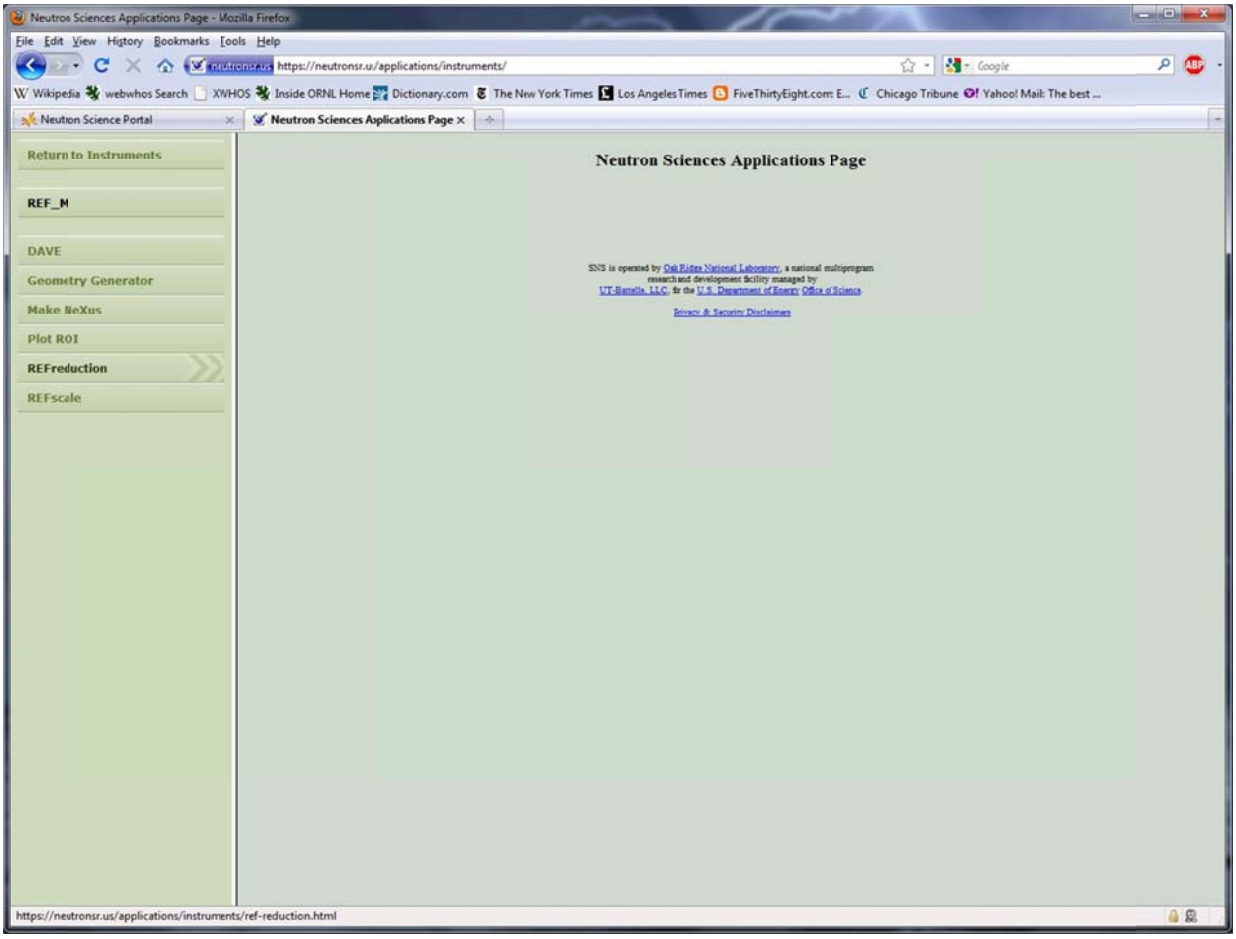
1.3.3. Select Linux Apps from the Applications menu.



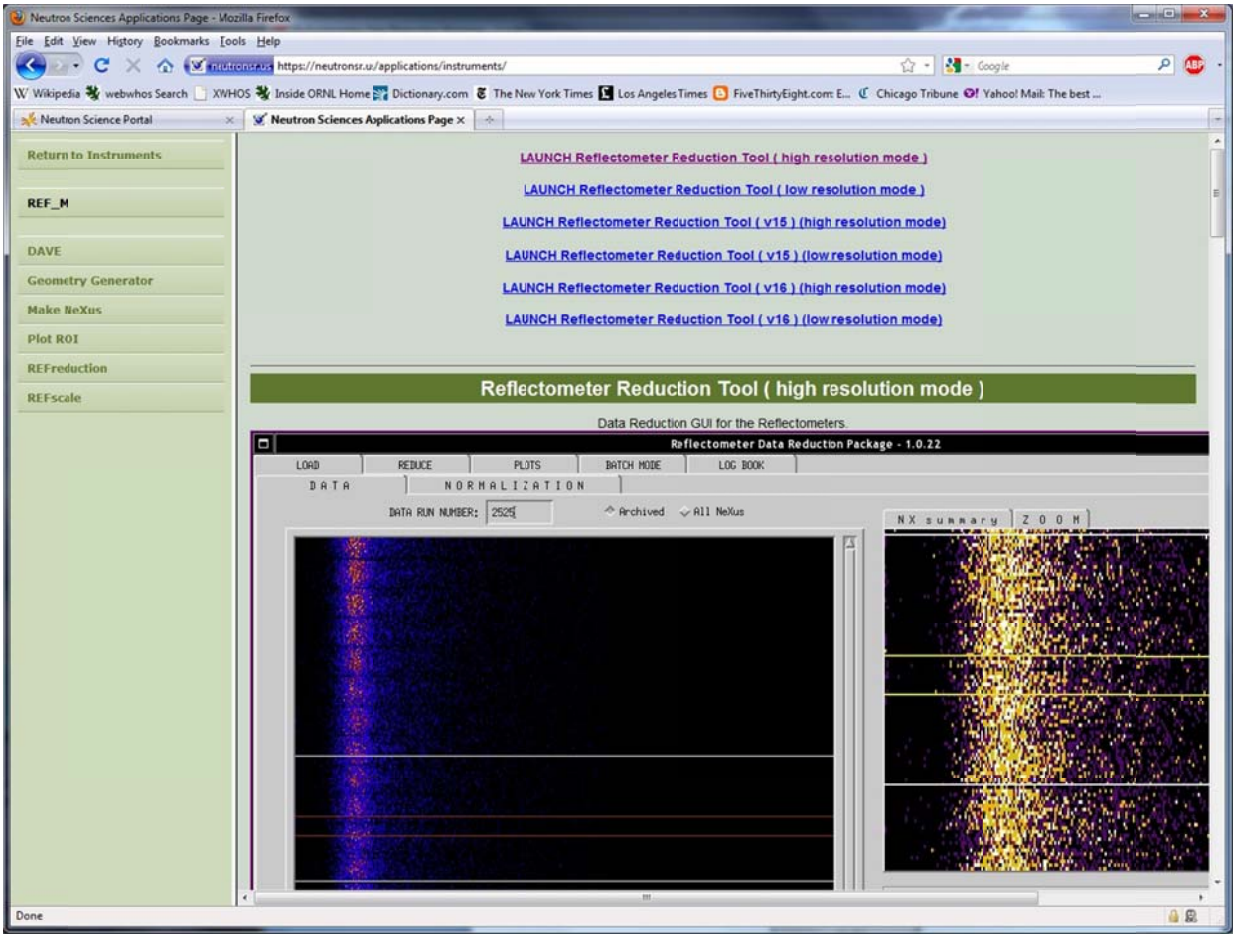
1.3.4.Select REF_M from the list of SNS instruments



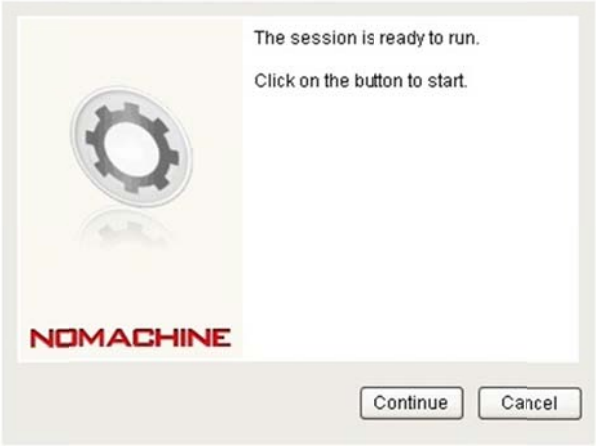
1.3.5.Select REFreduction from the list of applications.



1.3.6. Select Launch Reflectometer Reduction Tool (high resolution mode) or (low resolution mode) depending on network speed.



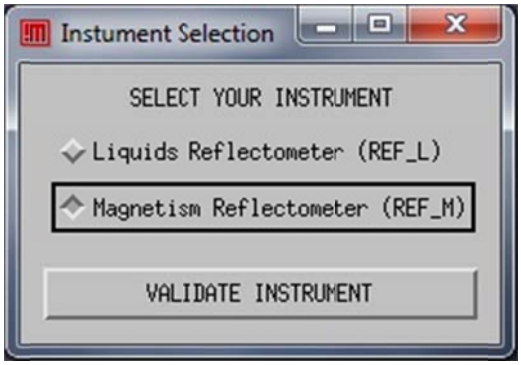
1.3.7. You may receive noticed that the NoMachine plug in must be installed. Follow the instructions to install the plug in. You will be notified when your session is ready to run.



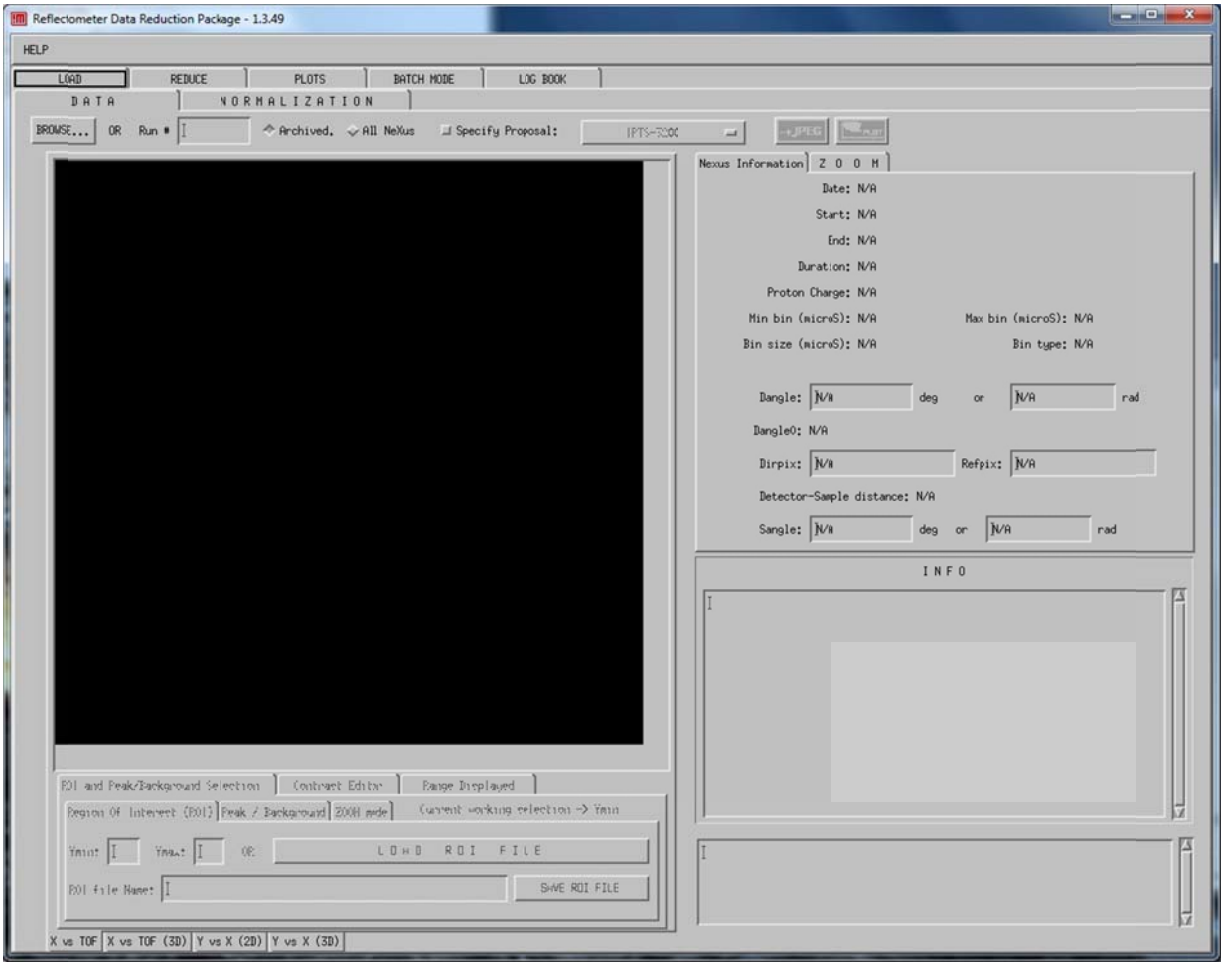
1.3.8. Click Continue. You will be asked for your log in information again.

The IDL splash window will appear.

1.3.9. Click anywhere on the splash window to continue. Select Magnetism Reflectometer (REF_M) in the Instrument Selection Window and click VALIDATE INSTRUMENT.



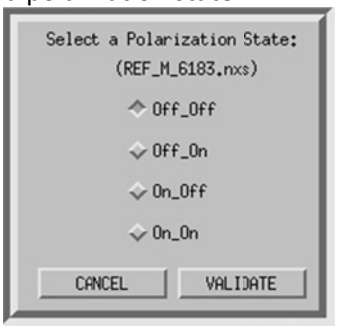
The REFreduction main window will appear.



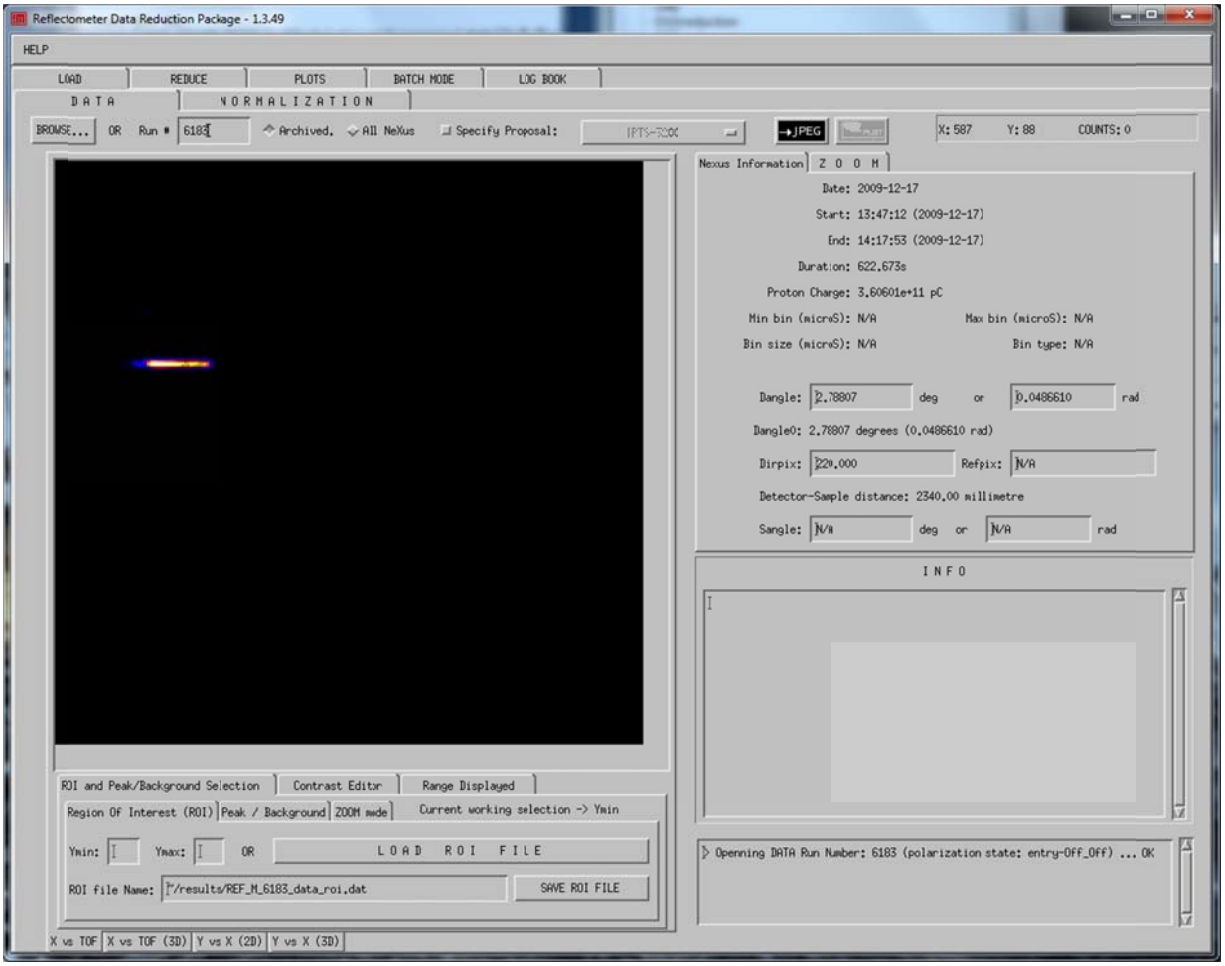
2. Loading Data

2.1. Verify that the tab labeled Load in the top tier and the tab labeled DATA in the second tier are selected. Verify that the button above the display area labeled Archived is selected.

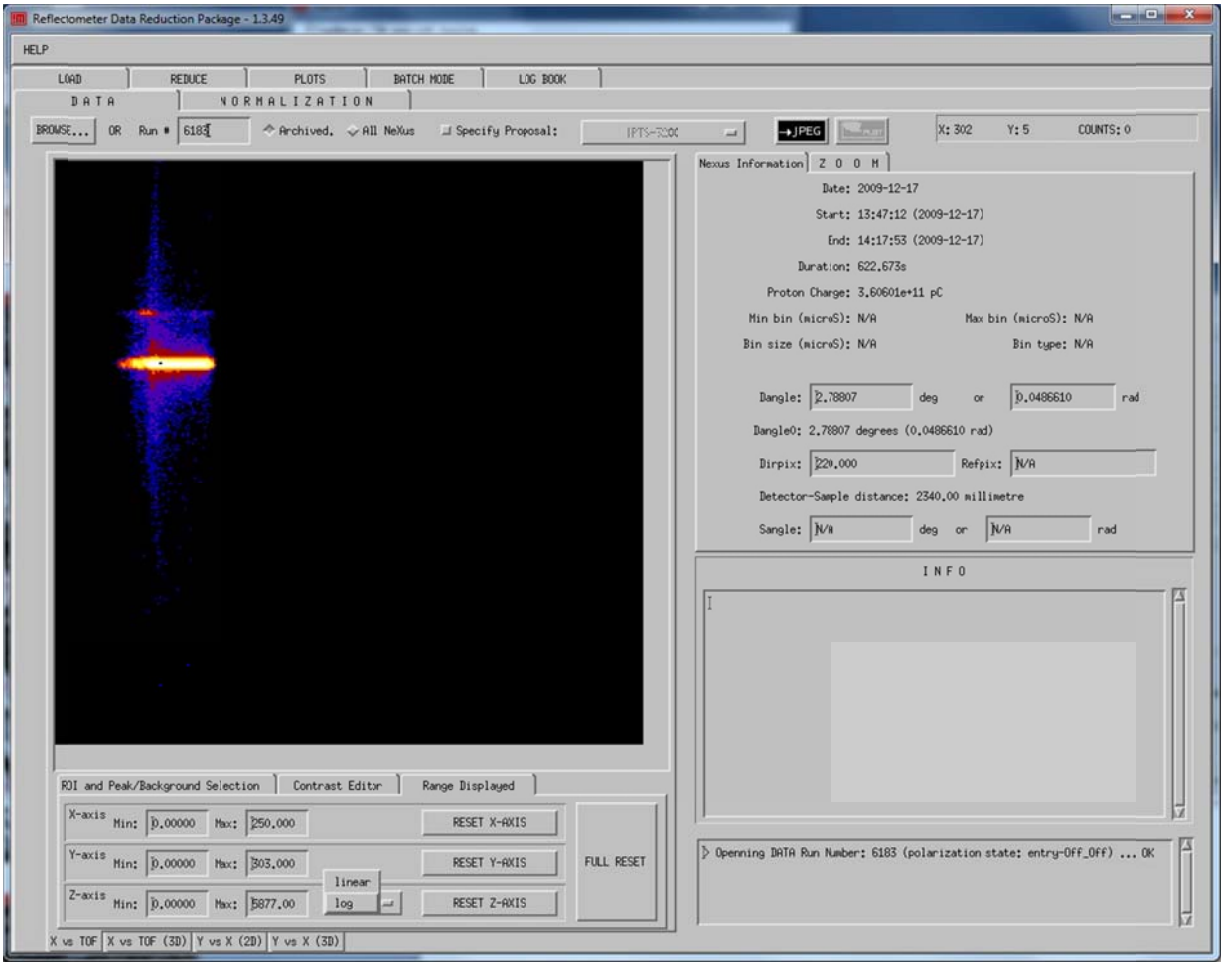
2.2. Enter the number of the run to be reduced in the box labeled Run # and press enter. A window will appear asking you to select a polarization state:



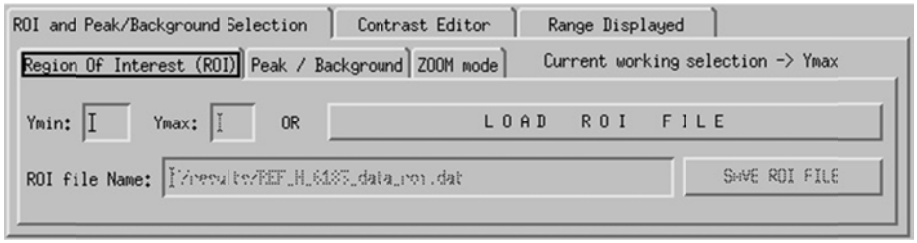
2.3. Select the desired spin state and click VALIDATE. The selected spin state will be displayed.



2.4. Click the tab at the bottom of the window labeled Range Displayed and click on the button at the bottom labeled Linear to activate the pull down menu.
2.5. Select Log to change the display to logarithmic scale.



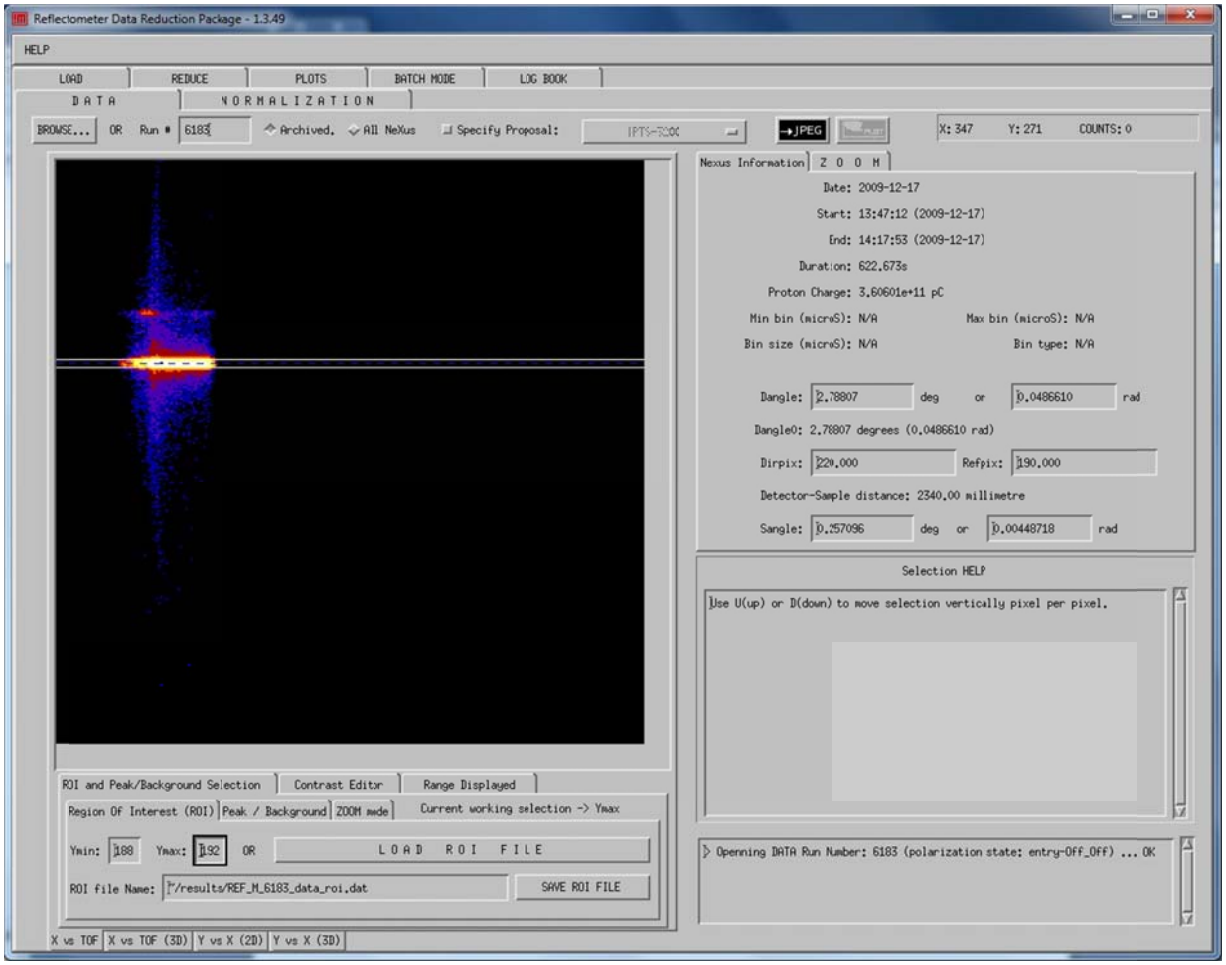
2.6. Select the tab at the bottom labeled ROI and Peak/Background Selection.
2.7. Select the tab labeled Region Of Interest (ROI)



2.8. Using your mouse place the cursor at the minimum position of the signal region. Note in the upper right corner of the REFreduction window the cursor position is displayed.

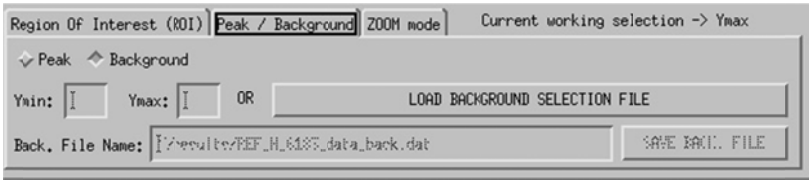
2.9. The Y value is the minimum pixel of the signal region. This value may be typed directly into the Ymin box or may be entered automatically by clicking the left mouse button. A white line will appear in the display to show the current value of Ymin. This value may be modified by editing the number in the Ymin box.

2.10. Repeat this process for Ymax. The display will now show two white lines indicating the region of interest.

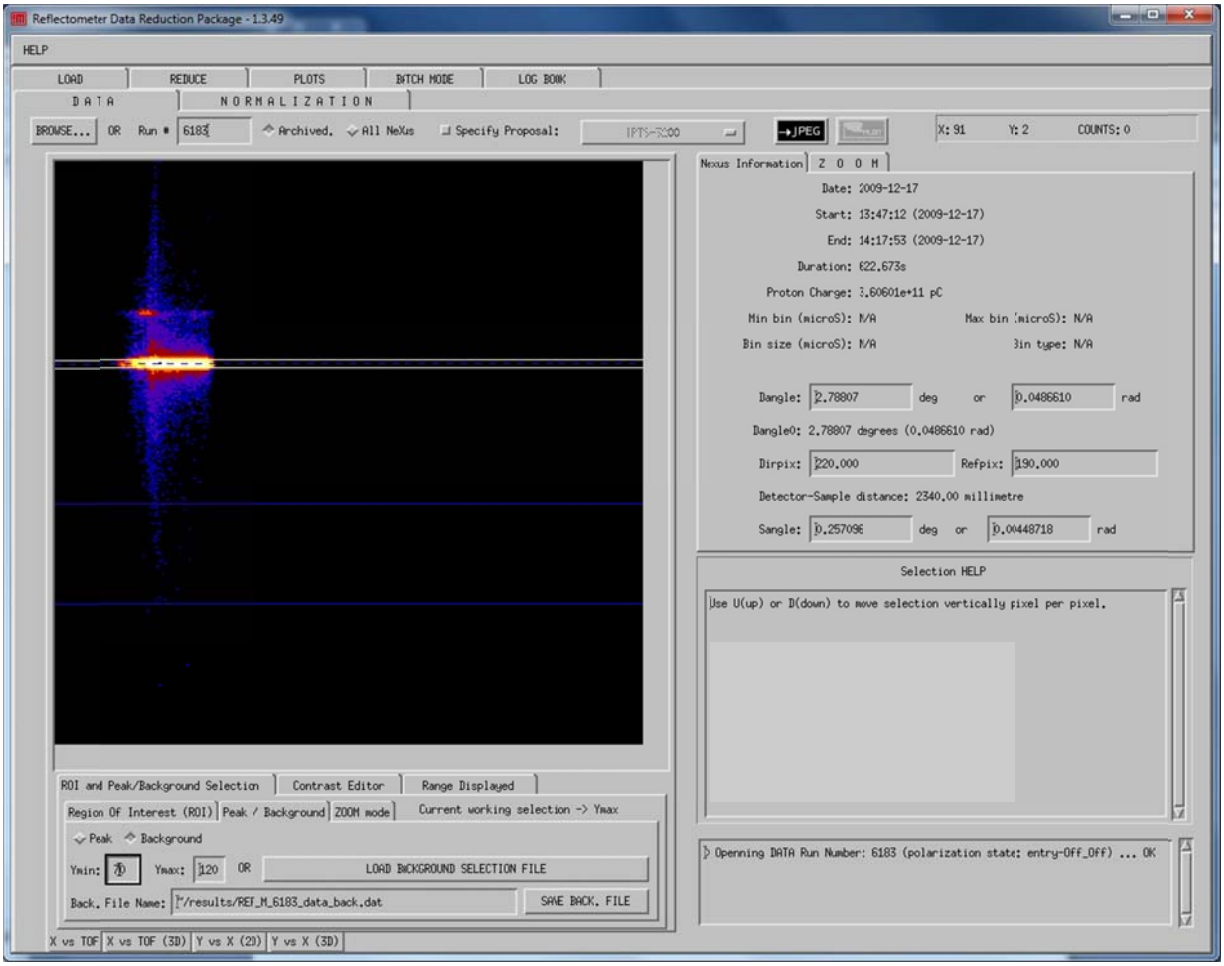


2.11. Make adjustments to the Ymin and Ymax values and when satisfied click the button labeled SAVE ROI FILE.

2.12. Go back to the Peak/Background tab and click the button labeled Background.



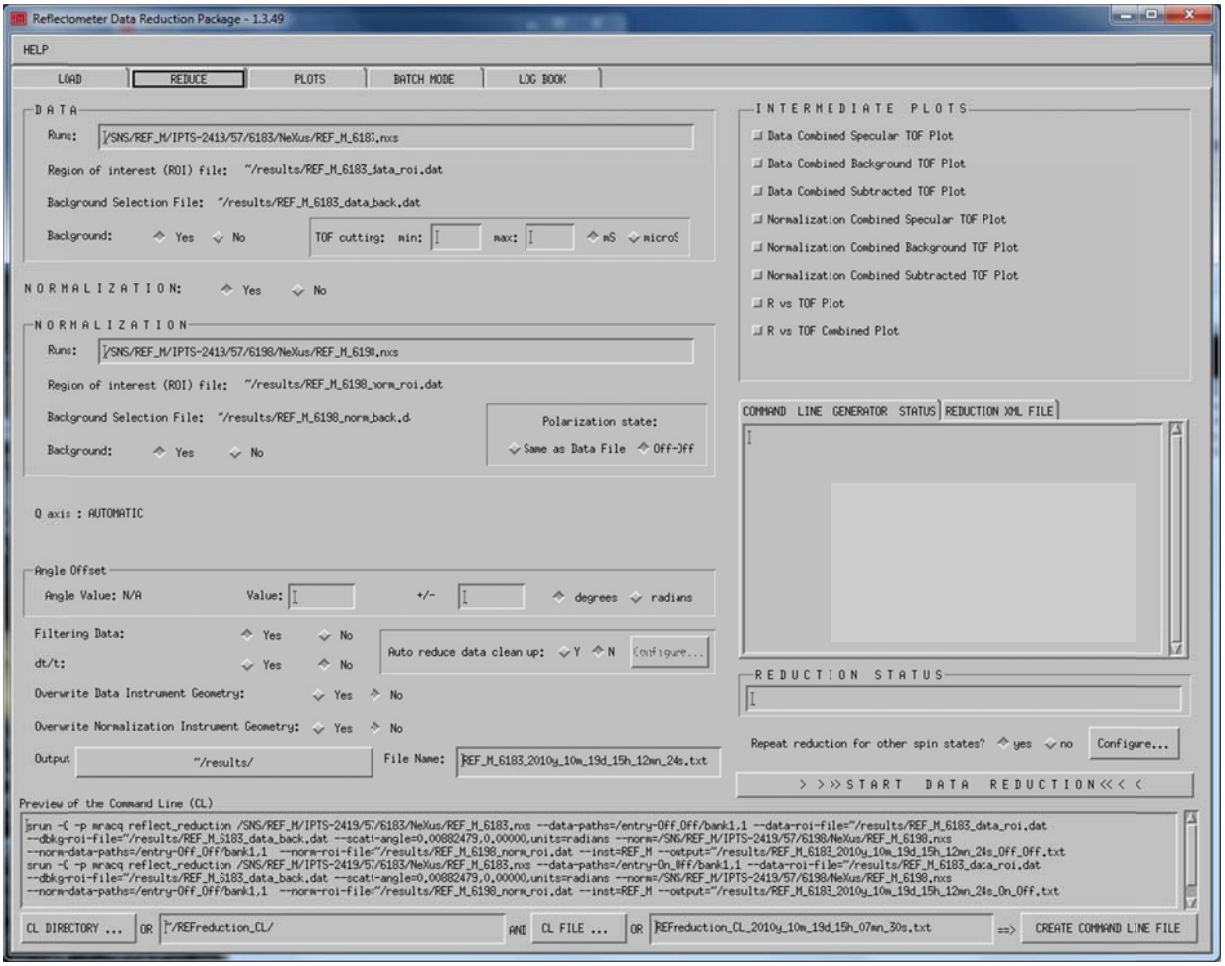
2.13. Repeat the processed you just used for the signal and select Ymin and Ymax values for the background region.



2.14. Click the button labeled SAVE BACK. FILE when satisfied with the settings.
2.15. Switch to the tab labeled NORMALIZATION.
2.16. Enter the run number of the direct beam measurement.
2.17. Repeat the process used previously for Data runs.

3. Reducing Data

3.1. Switch to the tab labeled REDUCE in the top tier.



3.2. If all necessary information is present the button labeled START DATA REDUCTION will be active. If this button is not active, the command line generator status window will display messages regarding what additional steps are required.

3.3. Verify the NORMALIZATION: Yes button is selected.

3.4. Verify the Background: Yes button for both DATA and NORMALIZATION is selected.

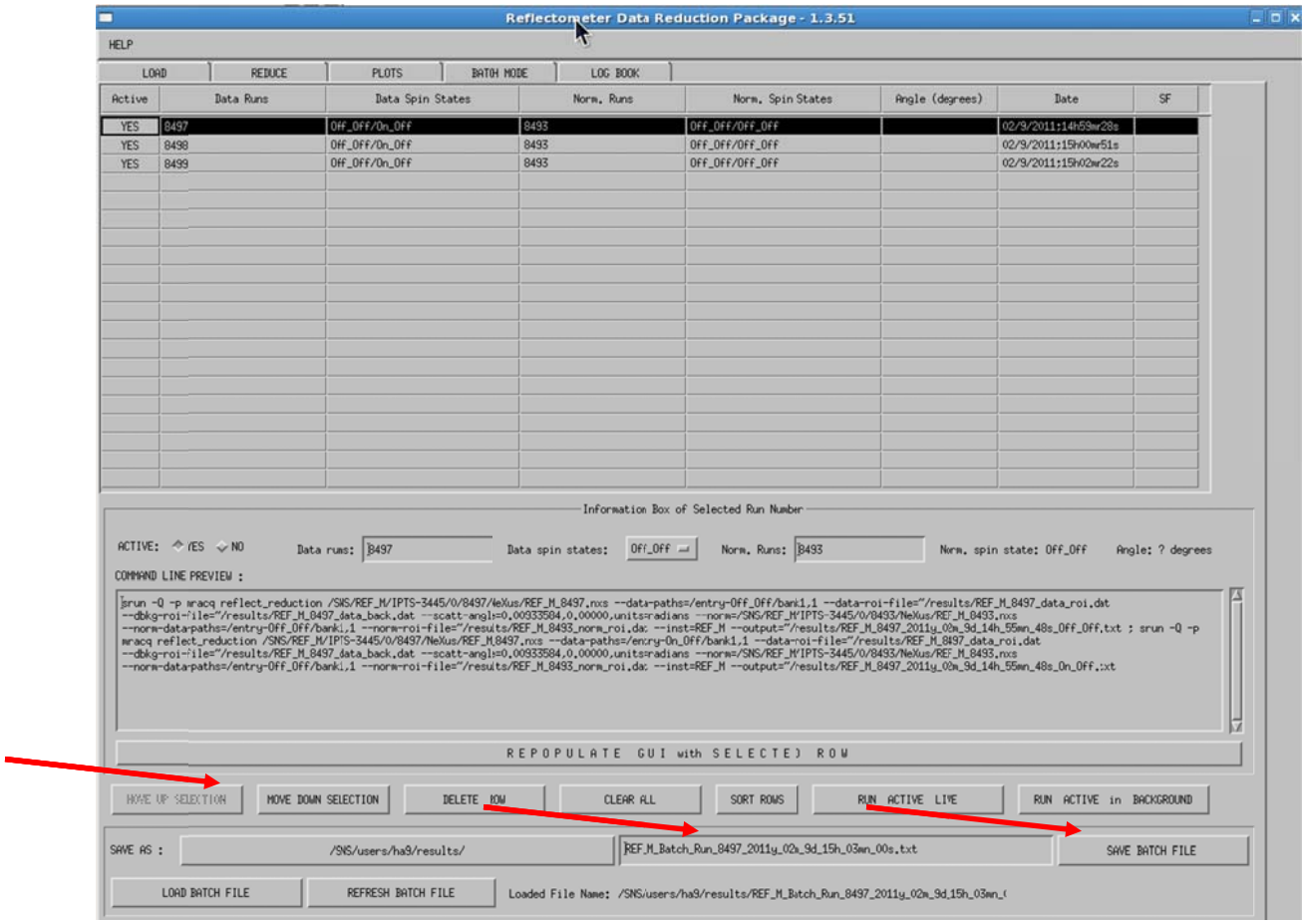
3.5. Verify the Repeat reduction for other spin states: Yes button is selected and click the Configure button:

3.6. Select all the spin states measured for this data (the default is Off-Off and On-Off). Click CLOSE when done.

3.7. Edit the file name if desired.

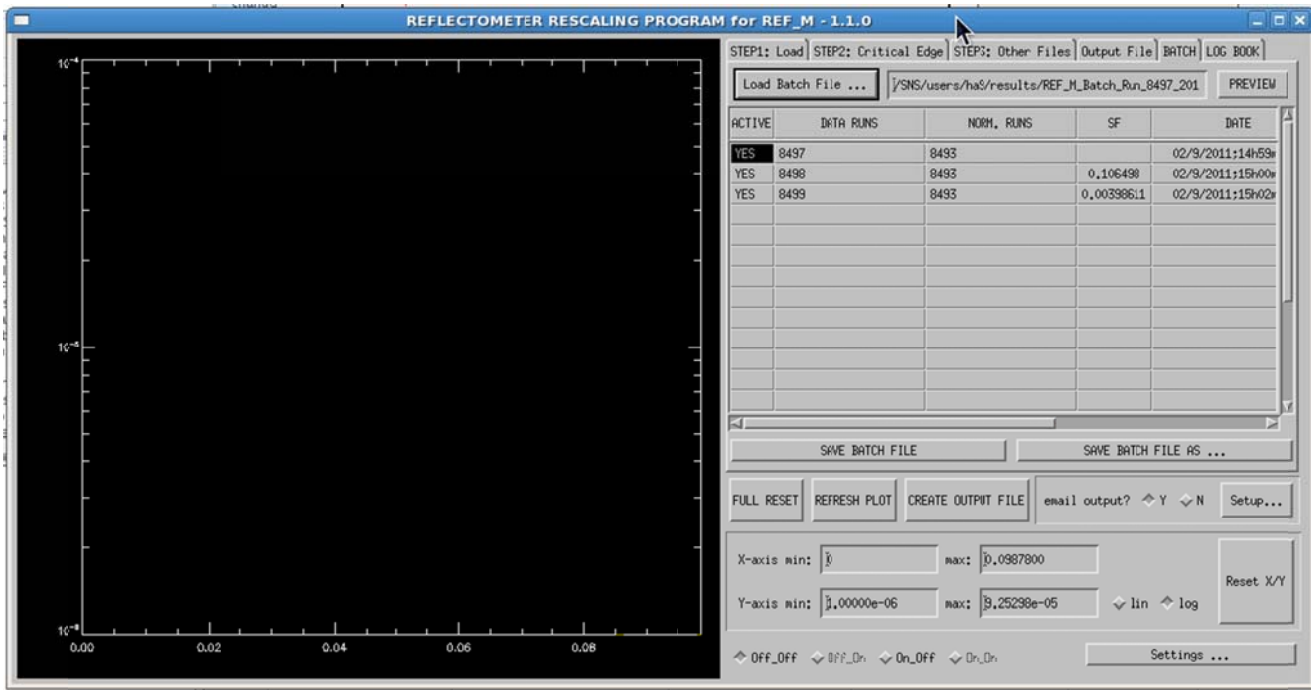
3.8. Click the START DATA REDUCTION button.

3.9. Once you are finished reducing the data switch to the label BATCH MODE. You will see all the files you have processed listed. Order them in ascending order by using the buttons MOVE UP SELECTION and MOVE DOWN SELECTION at the bottom. Click SAVE BATCH FILE. You can change the file name and folder if you want.



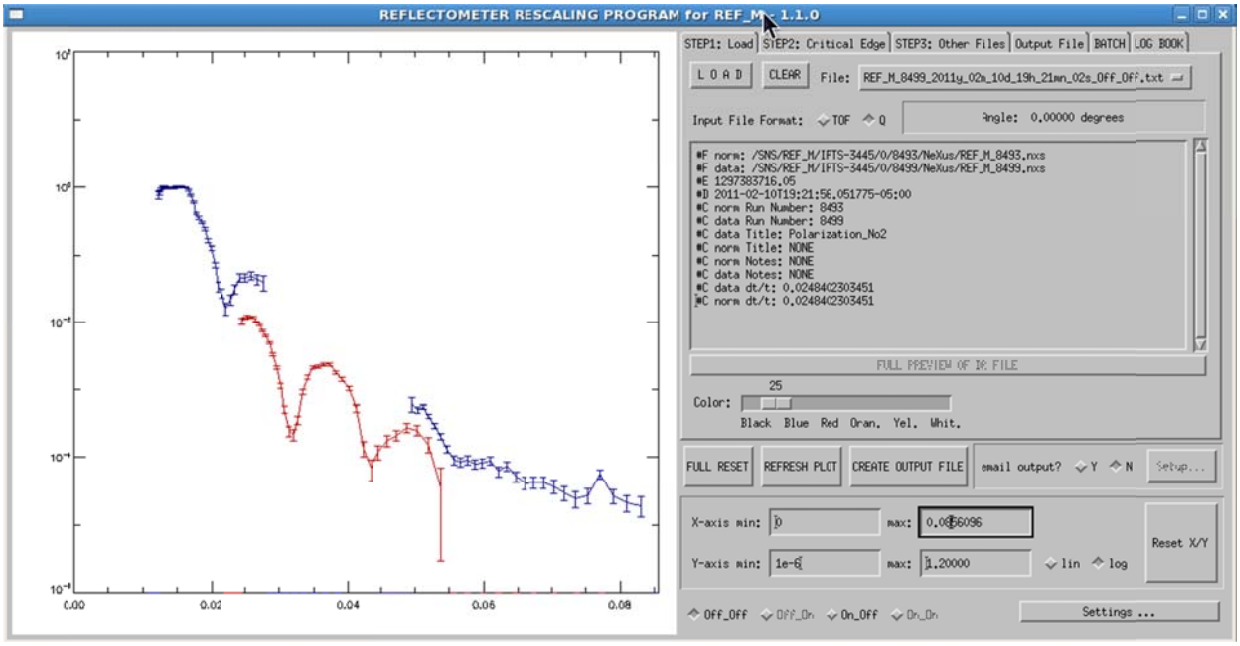
4. Scaling Data

4.1. Select Refscale from the list of applications (the list where you have selected Refreduction).
4.2. Click batch and then Load Batch File. Here you load the file that you have created at the end of the refreduction (previous page)



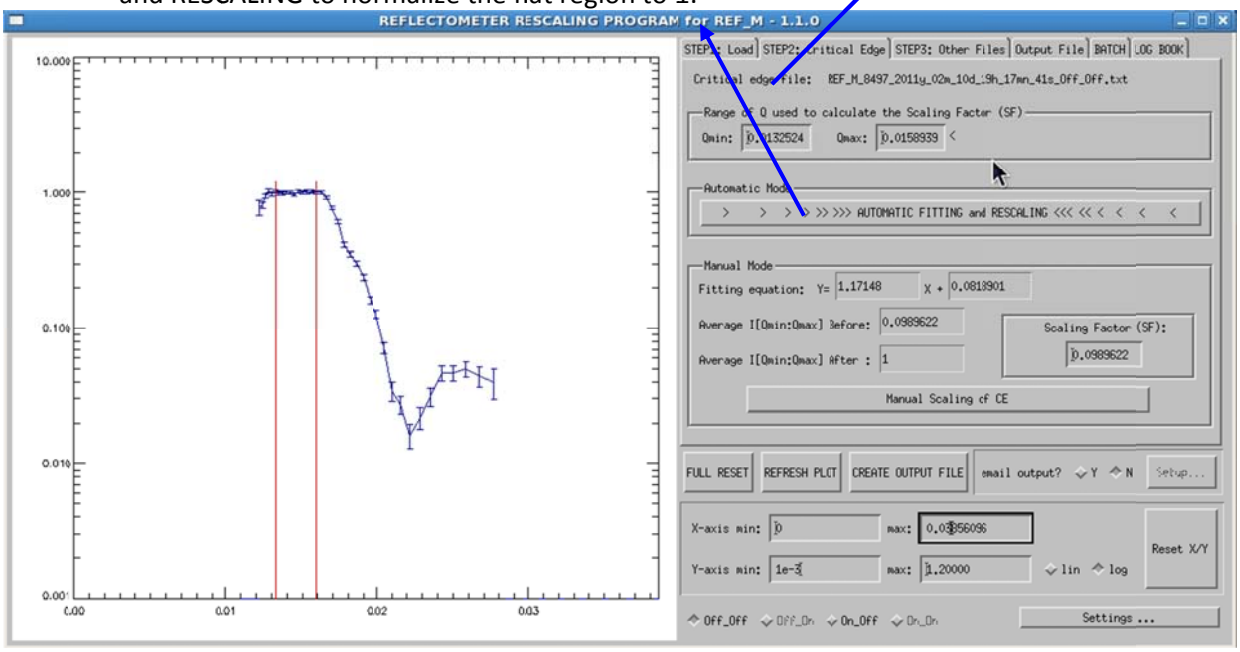
4.3. Changing Scale

4.3.1. You will see plots like this that includes all the angles you have measured



4.4. Critical edge-Autofitting and Rescaling

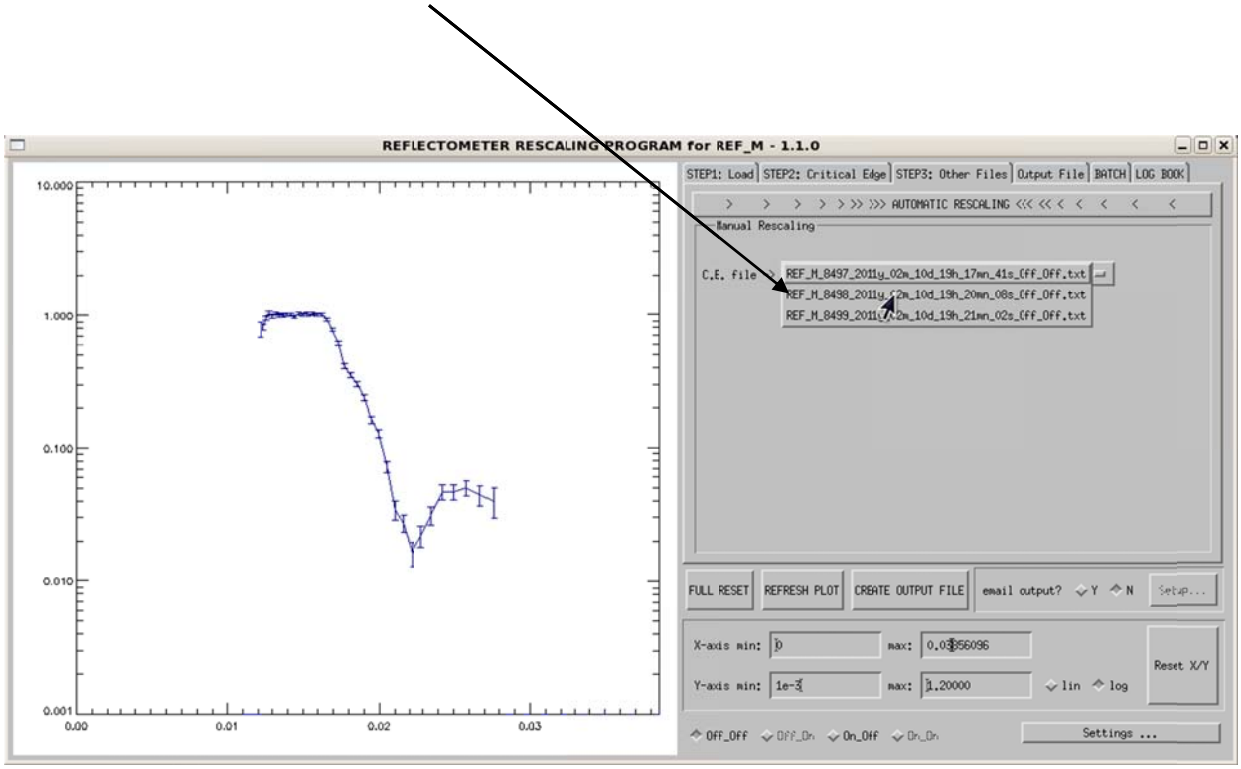
4.4.1. Click STEP 2: CRTICAL EDGE and select the flat region as shown. You can enter Qmin and Qmax to select the flat region. Once satisfied with the selection click AUTOMATIC FITTING and RESCALING to normalize the flat region to 1.



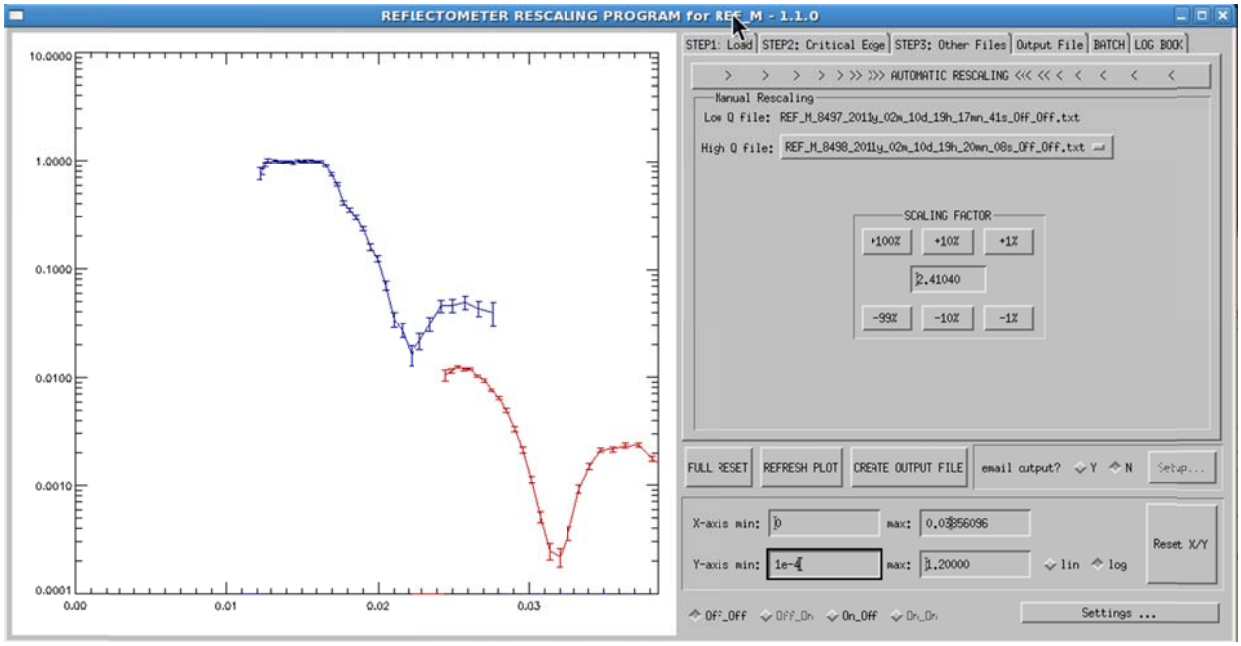
4.4.2. Background of the plot can be changed by clicking Settings… you can go between black and white for background color, turn error bars on or off, and configure auto cleaning.

4.5. Load other files

4.5.1.You can load the next file in the list

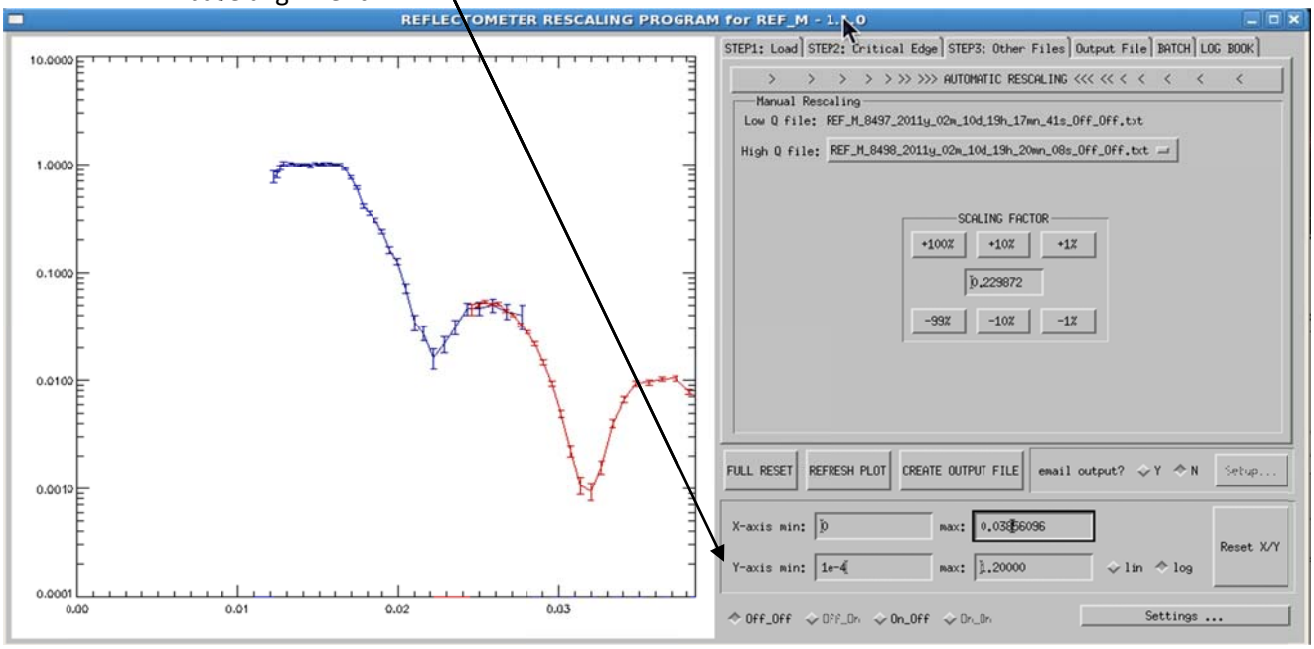


4.5.2.Load the second run

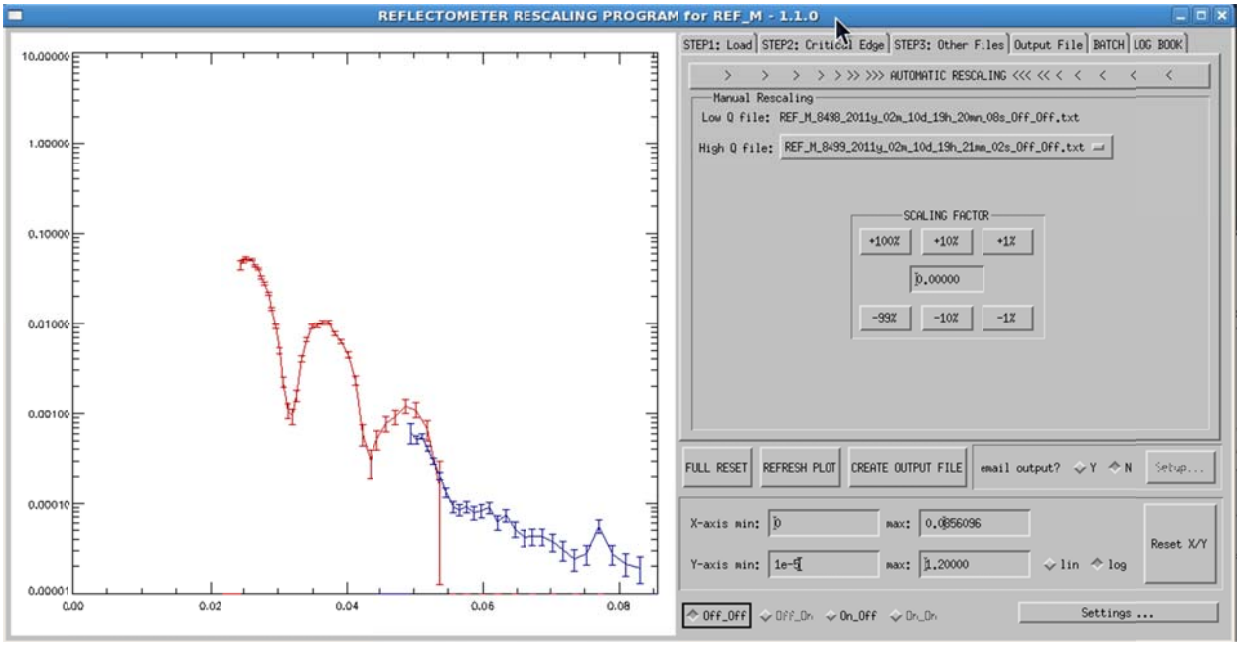


4.5.3.Scale the second run

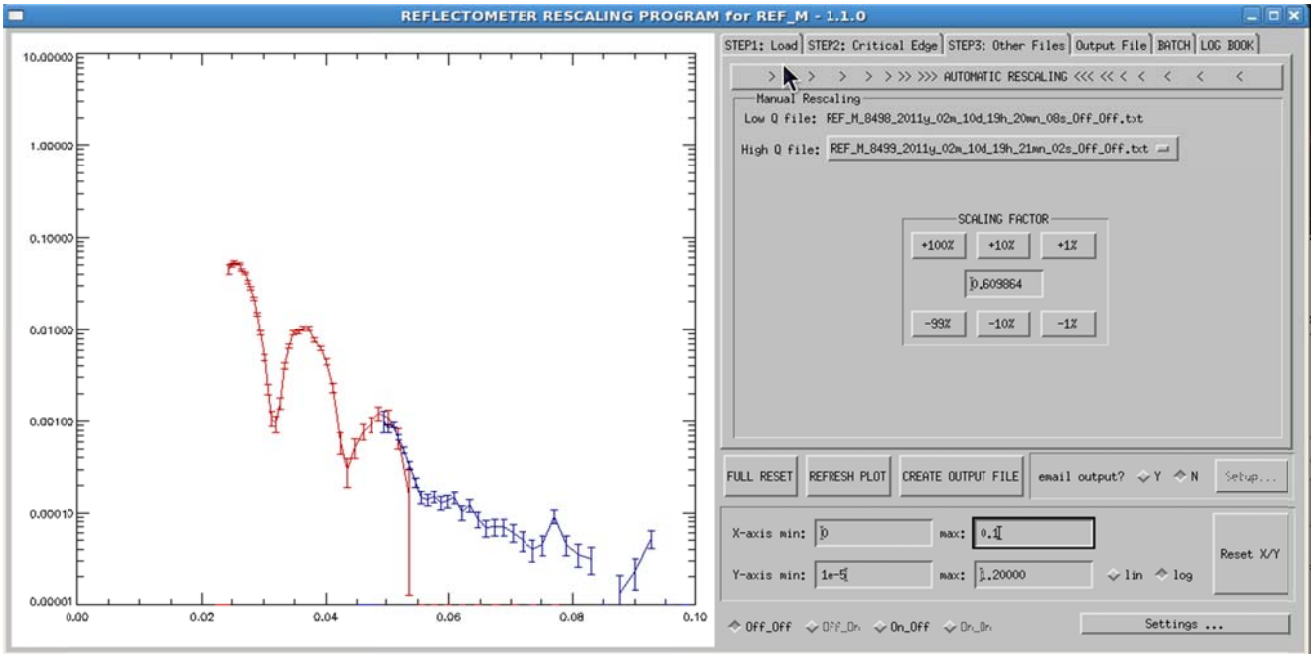
4.5.3.1. By clicking on the scaling factor arrows you can align or scale the second run to the first. There are three scaling factors indicating how big the jump or scaling is. 1 big the smallest step. You can go between the different spin states to choose the base alignment.



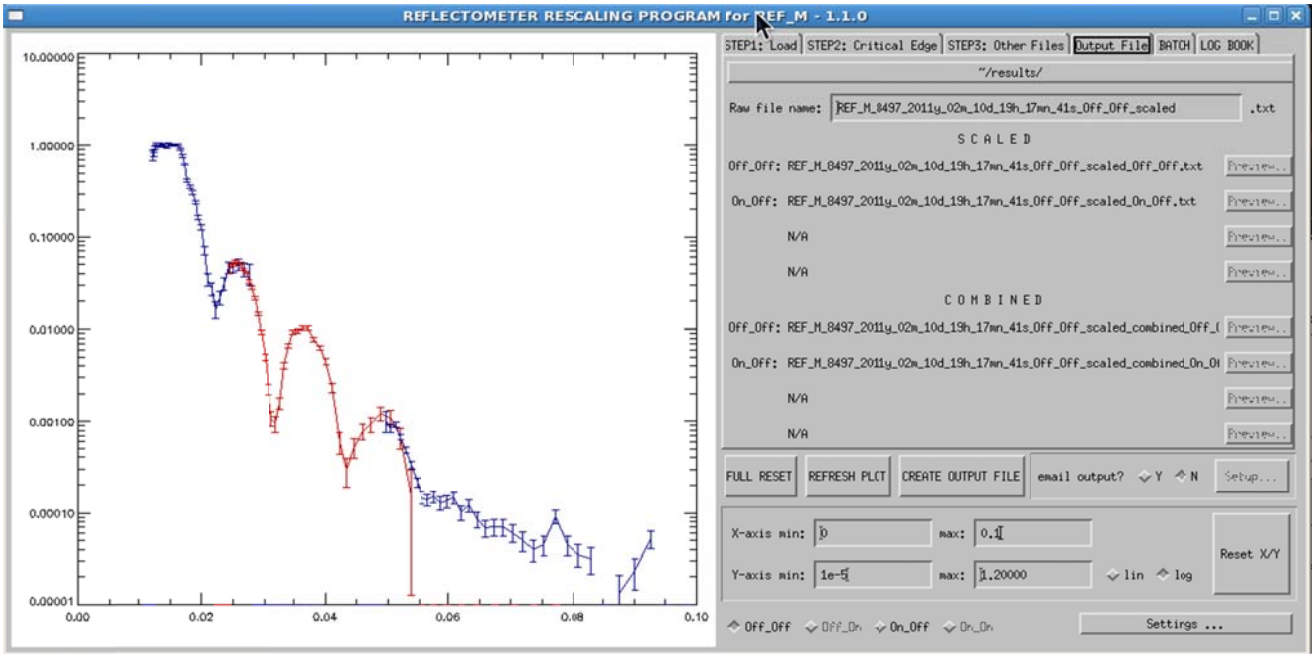
4.5.4.Loading the next run



4.5.4.1. Scaled-you repeat the same thing you have done in the previous scaling.



4.5.5.If satisfied with the scaling click OUTPUT FILE from the menu



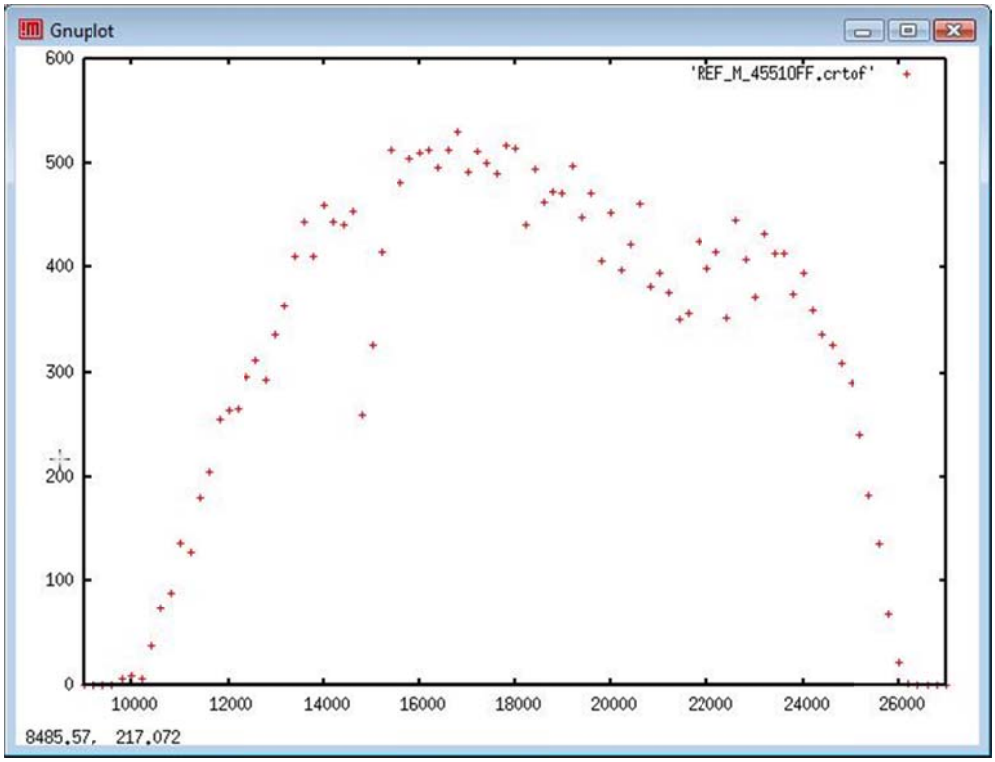
4.6. Click CREATE OUTPUT FILE

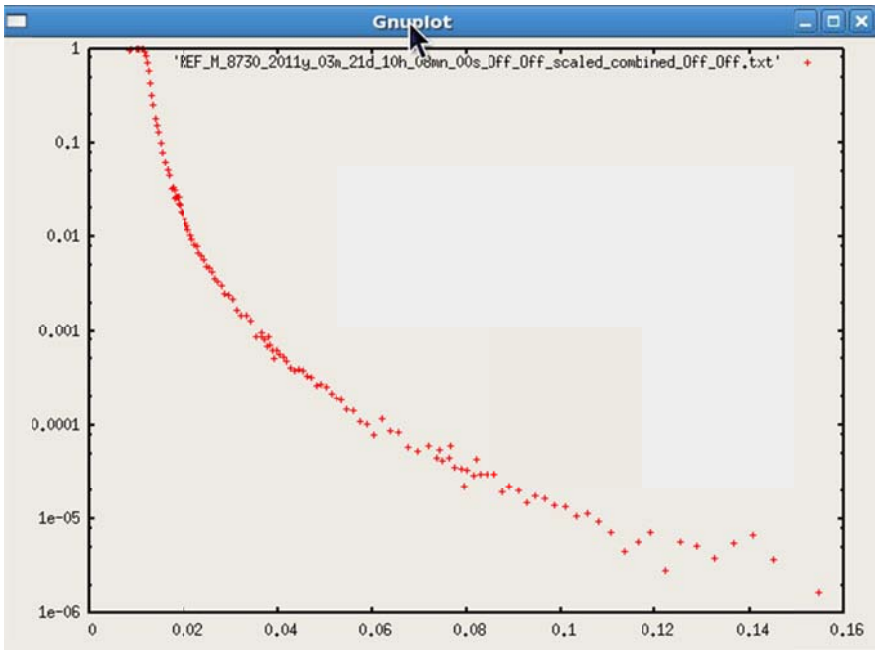
4.7. You can also have the output file emailed to you. Click "email output" (Y)es and the "SETUP" button will be active. Click on SETUP and enter your email address when prompted. When you are done "save and close" the window. Click CREATE OUTPUT FILE to have the out files sent to your email address.

5. Plotting Data

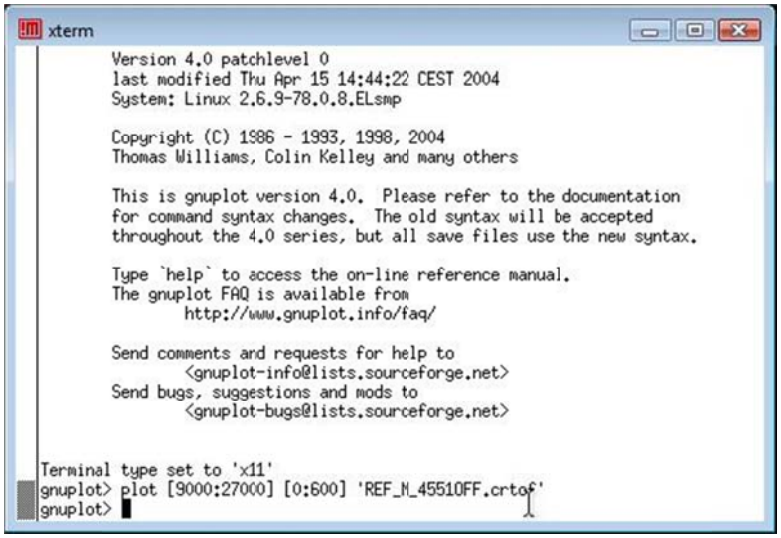
5.1. Plotting data with GNUPLOT

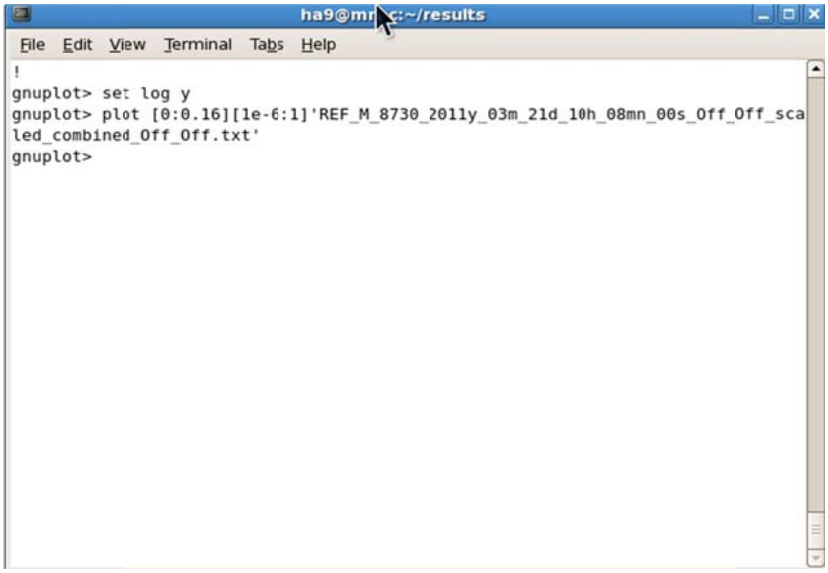
5.1.1. Once the *IDL* software has finished, you may use *gnuplot* to view the data; type "**gnuplot**" to start the program and get to the *gnuplot* command line. *Gnuplot* is a versatile plotting package. Obtaining a simple plot requires only the command "**plot *'filename'***". Note that since your data files will be in the "**~results**" subdirectory (in my case **/SNS/users/1qg/results**) you should change your working directory to your version of that with the command "**cd ~/results**" prior to starting *gnuplot*. You can include the x and y-ranges in square brackets as shown in the example. Some minor tweaking after the initial look (***plot [0:0.16] [0:1] 'filename.txt'***) yields:





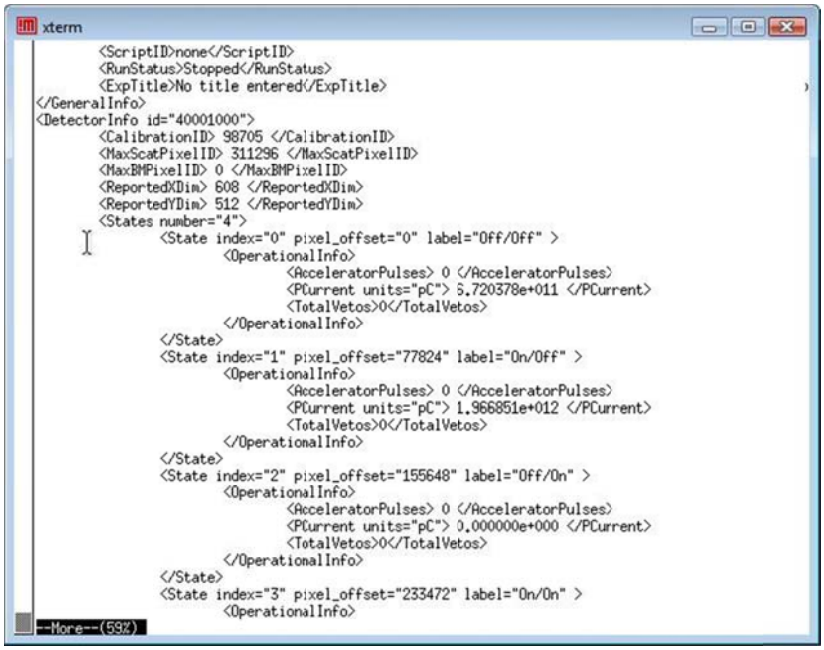
The log scale of a selected axis can be set by writing "set log y/x" on the command line.





6. Additional Run File Information

6.1. The proton charge for each spin state can be obtained from the preNexus data. For example, run 4551 stores it's preNexus data in directory */SNS/REF_M/IPTS-1307/21/4551/preNeXus/*, and the file containing the proton charge information is *REF_M_4551_runinfo.xml*. . You can also obtain all the parameters for your measurement including the proton charge through the portal by going to your proposal/directory. Once you are in the portal (https://neutronsr.us/portal/) for example, you go to /data/SNS/REF_M/IPTS-xxxx/0/#number/NeXus/. Double click on REF_M_#number.nxs. A list of the 4-crossections will be displayed. Select anyone of the spin states you have measured. In DASlogs you will find the list of all the motors. Select a motor and click on value to get the number. Proton charge, duration, end time, and so on are also listed. Select them to get the values.



6.2. Scroll down in the file until you find the lines that say *State index="0"* and *State index="1"*. These correspond to the *p0* and *p1* NEXUS files we analyzed. The values stored as *PCurrent* are the proton charge for each of the spin states.