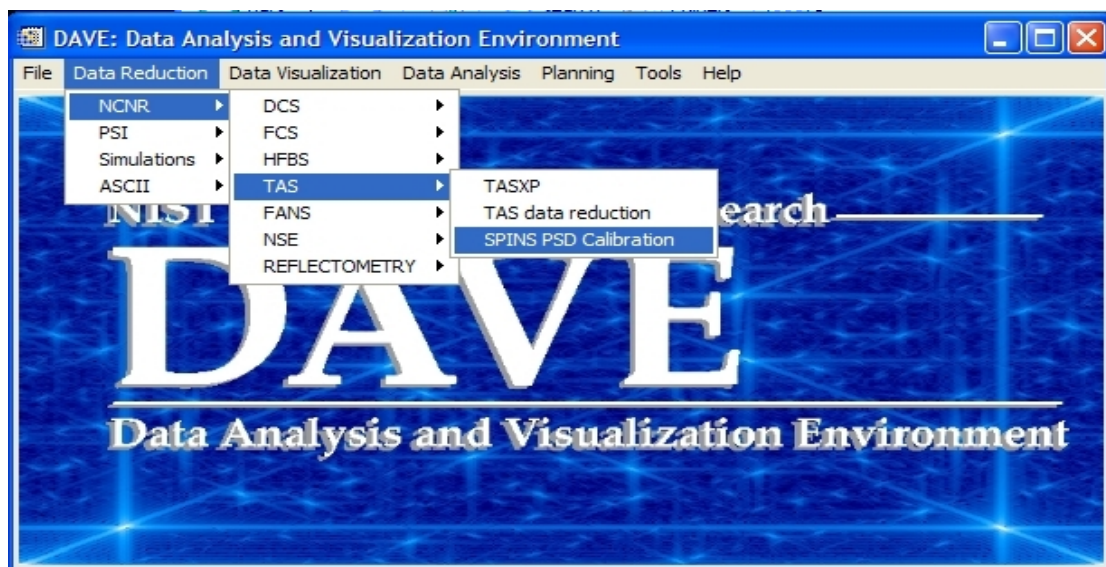# SPINS PSD Calibration

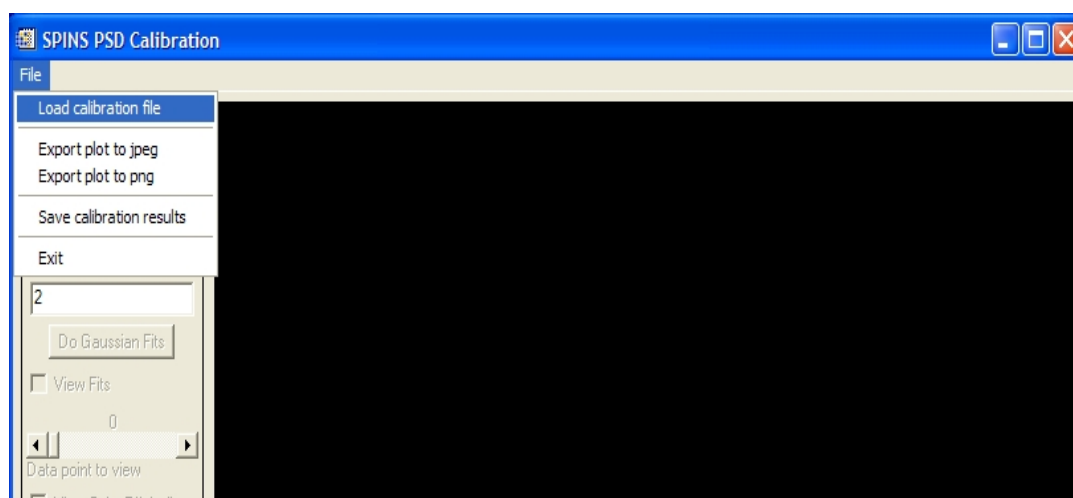## Mini Manual

Launching application module.

This program module is distributed as part of DAVE and is used for generating calibration information for the PSD detector on the SPINS (NG5) triple axis instrument.

The menu item to launch the program module from DAVE is shown in the following screenshot:
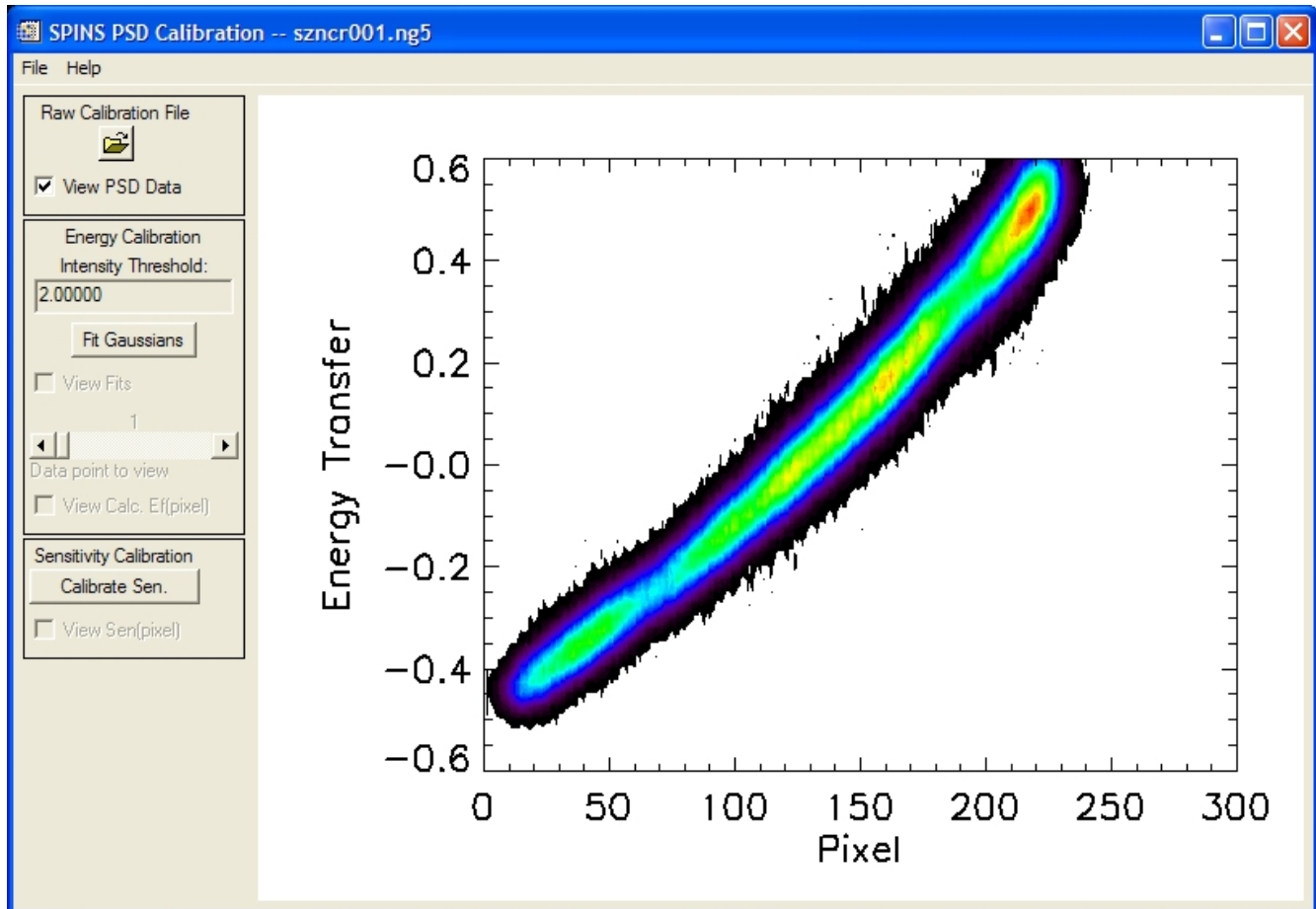

Load calibration data

The main application window that is displayed consists of a dialog area on the left and a graphics window to the right. The first task to be performed is the loading of a raw calibration dataset taken on SPINS. Use the **File->Load calibration file** menu item as shown to select the calibration file to load.

The raw calibration file must be an ICP file with a .ng5 extension prepared using a 'Q-buffer'. It is also

expected that the data was collected in fixed final energy and that the PSD 'a+' mode was used where the vertical pixels are integrated. When a suitable calibration dataset is identified and successfully loaded, the title bar of the application will reflected the loaded file name and the graphics window will be updated to display a contour image of the raw dataset. The plot, as seen in the next screenshot, shows the horizontal pixels in the x-axis and energy transfer in the y-axis. The calibration data is essentially incoherent scattering from a standard sample taken at a series of data points as the incident energy is scanned. The resulting Gaussian peaks vary across the PSD with energy transfer and this is used to perform the energy calibration of the pixels by this program.
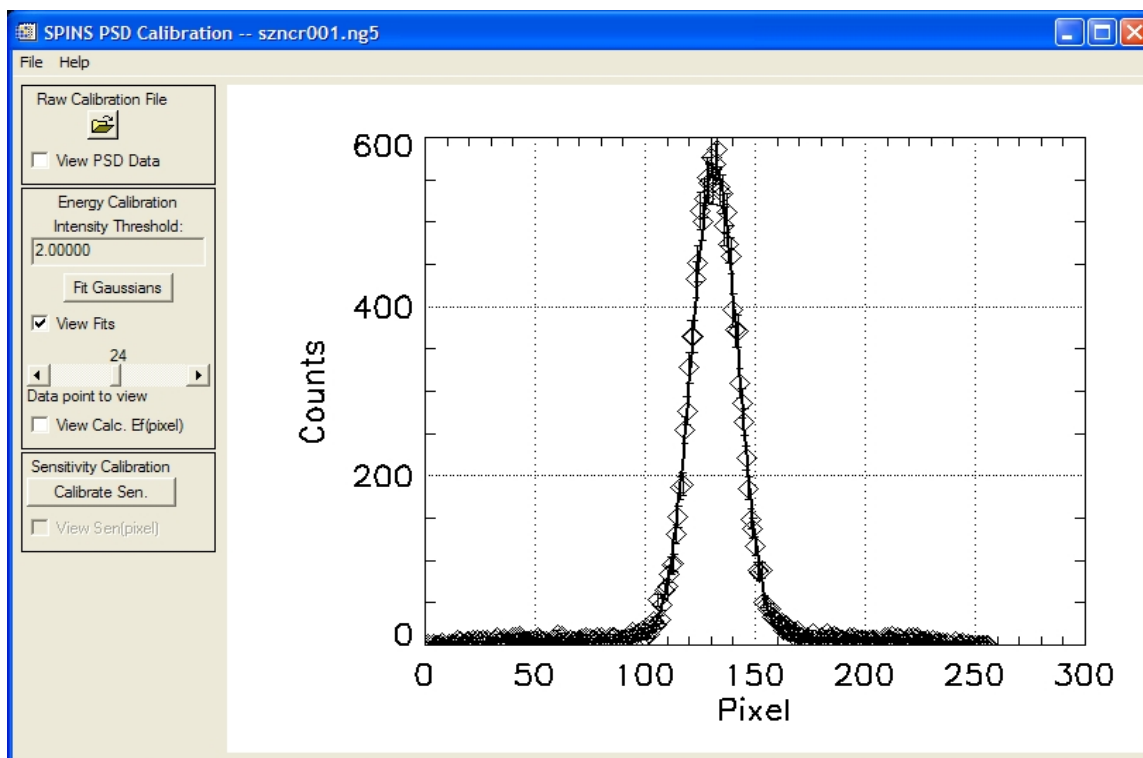

Energy Calibration

This involves determining the horizontal pixel location of the Gaussian peak at each data point. The effective final energy (energy transfer + fixed analyzer final energy) at each data point is then associated with the pixel at which the Gaussian is centered. The pixel location for the peaks are determined by fitting a Gaussian function to the data. Before the fits can be performed, it is necessary to specify which data points are to be included in the analysis, since it is possible for the counts in some pixels to be too low.
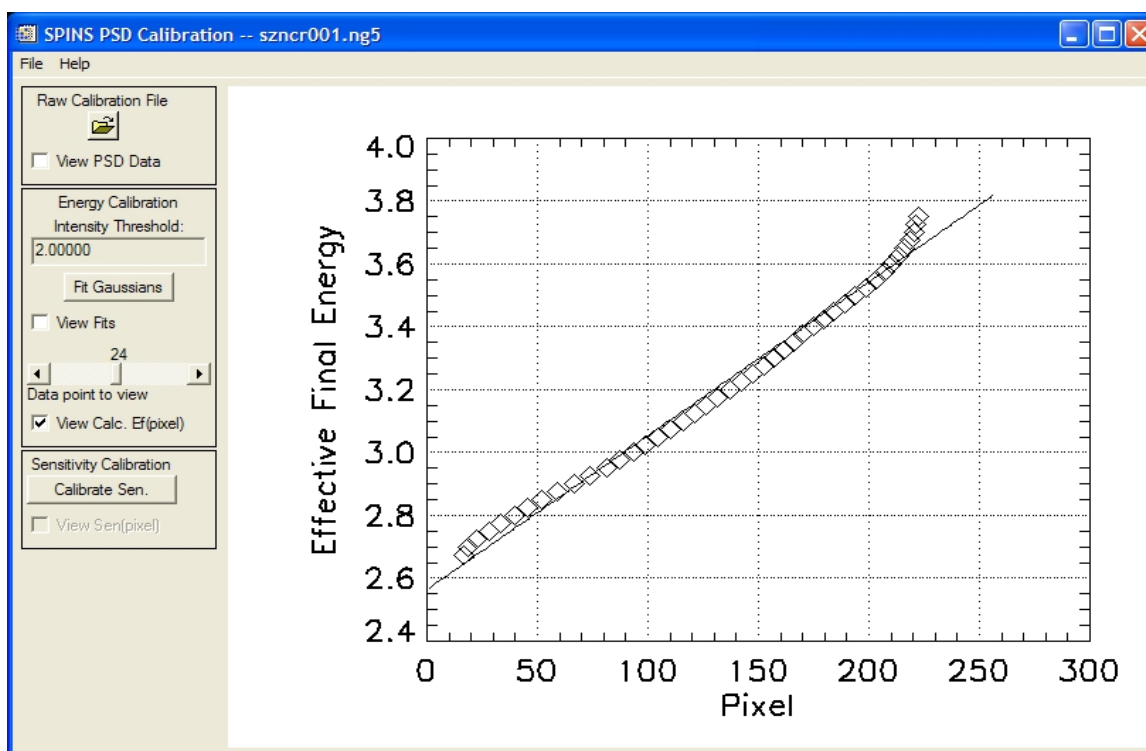
The '**Intensity. Threshold**' field is used to specify a range of intensities that are allowed during fitting. When the raw data is read in, the average peak intensity at each data point is determined and the overall mean (I_{ave}) and standard deviation (σ) of the peak intensities are calculated. The **Intensity. Threshold** specifies an intensity window defined as : $I_{ave} \pm$ Intensity Threshold x σ

Any data point whose peak intensity falls within this window will be fitted – the default value for the Intensity Threshold is 2.0 but depending on the quality of the data you may want to alter this. Click on the **Fit**

Gaussians button to perform a least-squares fit of a Gaussian to all data points that lie with the specified intensity window. You can view the fitted function by clicking on the **View Fits** button. The graphics window will be updated to show the data for the current data point shown as symbols and the fitted lineshape, if available, shown as a solid line. You can display the data plus fits for the other data points by cycling through the **Data point to view** slider control.
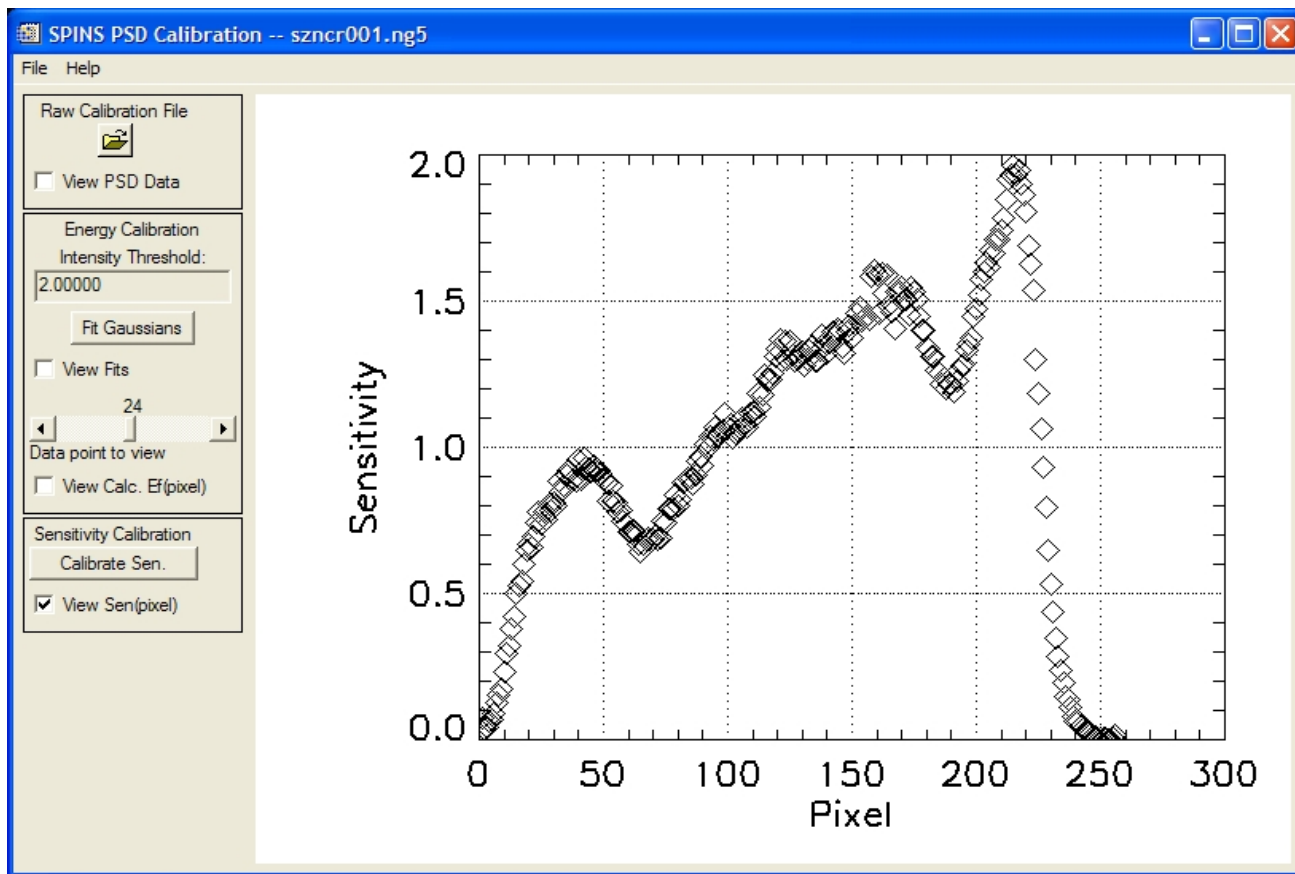

Select the **View Calc. Ef(pixel)** to display the evaluated final energy as shown in the next shot.

The symbols specify the final energies determined at the fitted data points and the solid line represents a linear fit to symbols. The solid represents the final result for the evaluated final energy at each pixel.

Sensitivity Calibration

In addition to the energy calibration, it is also necessary to determine the relative sensitivity of each pixel in the PSD. This is accomplished by evaluating the integrated intensity in each horizontal pixel. The integration is performed over all data points and the results are scaled by the gradient of the final energy with respect to pixel number and normalized. Use the **Calibrate Sen.** button in the Sensitivity Calibration sub frame to make the above calculations. You can view the results in the graphics window by selecting the **View Sen.(pixel)** button. The shot shows the relative sensitivity of the PSD at each pixel.

Save plots in image formats

It is possible to save the contents of the graphics window at any point by using the **File -> Export plot to jpeg** or **File -> Export plot to png** menu to create a jpeg or png image file respectively.

Save Calibration results

Finally, the calibration information which consists of the number of pixels in the detector, the final energy and relative sensitivity at each pixel can be saved in an output file for later use. **Use the File -> Save calibration results** menu to accomplish this.