Andy Ray Developments

PCSpectra
Reference Manual

Andy Ray Developments

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PCSpectra uses the Andy Ray Developments PCS Image File Conversion Suite for reading and writing data files in the bmp, fits and pgm formats.

The PCS Image File Conversion Suite can be downloaded from the Andy Ray Developments website, http://www.andyraydevelopments.co.uk.

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Introduction to the PCSpectra Reference Manual

PCSpectra was written by Andy Ray Developments for analysing spectra from the Elliott Instruments CCDSPEC spectrometer and can analyse images of up to 6144 pixels wide by 4096 pixels high.

It can:

load the image from a bmp, fits or pgm format file;

save the image in a bmp, fits or pgm format file;

save the displayed image in a bmp, fits or pgm format file;

print the displayed image;

set the initial display thresholds as % values;

close the image;

show the X and Y co-ordinates, the Wavelength (if a SpecCal.txt file exists) and the Intensity of the image. Additionally, show the Greyscale value of the displayed image.

display information about the image;

change the size of the displayed image;

invert the displayed image;

set the display thresholds as % or absolute values;

save and load the display settings;

invert the image (not the same as invert the displayed image - useful for identifying absorption lines);

define one or two regions of interest for analysis using the mouse;

set or adjust the size and position of the regions of interest;

display the Spectrum (X Axis Projection) of the region of interest of the image;
- save the displayed Spectrum in a bmp, fits or pgm format file
- or
- save the displayed Spectrum as data in a csv format file;
- print the displayed Spectrum;
- choose the X Scale (horizontal scale - Pixel or Wavelength);
- choose the Y Scale (vertical scale - Mean or Sum);
- choose the Limits (vertical scale - Manual or Auto).

display the Profile (Y Axis Projection) of the region of interest of the image;
- save the displayed Profile in a bmp, fits or pgm format file
- or
- save the displayed Profile as data in a csv format file;
- print the displayed Profile;

choose the Y Scale (vertical scale - Mean or Sum);
choose the Limits (vertical scale - Manual or Auto).

calculate and display the centroid and the number of pixels above the threshold value for the region of interest;

display the region of interest;
save the region of interest in a bmp, fits or pgm format file
or
save the displayed region of interest in a bmp, fits or pgm format file;
print the displayed region of interest;
change the size of the displayed region of interest;
invert the displayed region of interest image.

display the histogram (intensity distribution) for the region of interest;
save the displayed histogram in bmp, fits or pgm file format
or
save the displayed histogram as data in a csv format file; print the displayed histogram;
choose the Y Scale (vertical scale - Lin or Log);
choose the displayed Thresholds (Data or Display).

save and load the analysis settings;

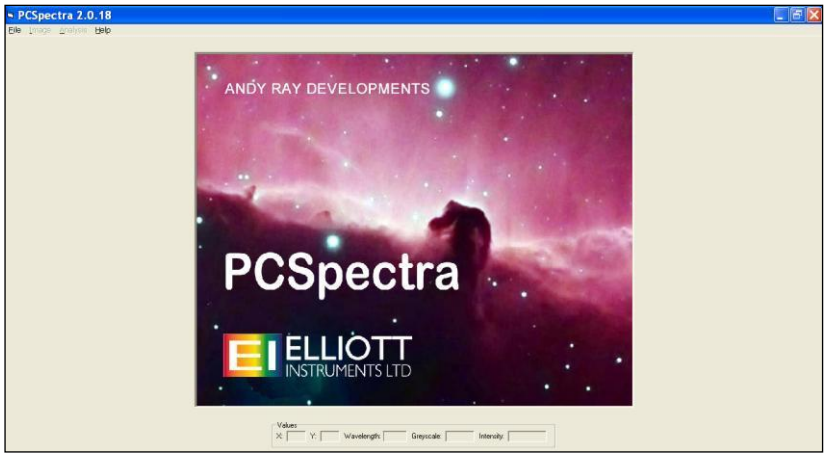
display information about the program.

Installation

PCSpectra is supplied on the CCDSPEC CD-ROM. Open the PCSpectra folder and double click on setup.exe. This installs the software in the C:\Program Files\Andy Ray Developments\PCSpectra folder.

Using PCSpectra

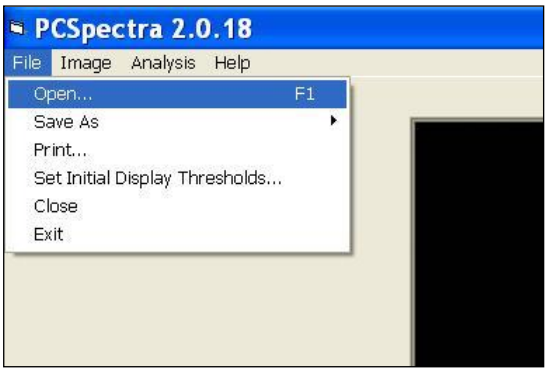
Select Start->Programs->PCSpectra->PCSpectra



The File Menu

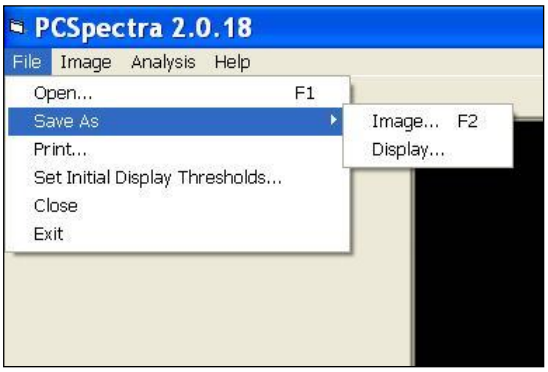
Loading the Image

Select File->Open to use the standard Open dialogue to load the image from a bmp, fits or pgm format file.



If a SpecCal.txt calibration text file is present in the same folder as the image file a pixel to wavelength calibration is carried out. The text file must contain the zero point and scale factor constants on one line separated by a comma. For example: 50.0, 0.6

Saving the Image



Select File->Save As->Image to use the standard Save As dialogue to save an image to a bmp, fits or pgm format file.

An image in one file format can be loaded with File->Open and saved in another file format with File->Save As->Image.
Select File->Save As->Display to use the standard Save As dialogue to save the displayed image in a bmp, fits or pgm format file

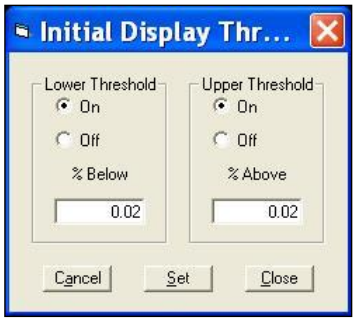
Note that the displayed image saved using File->Save As->Display is not the same as the image saved using File->Save As->Image. The displayed image includes the effects of setting the lower and upper thresholds and inverting the display.

Printing the Displayed Image

Select File->Print

Setting the Initial Display Thresholds

Select File->Set Initial Display Thresholds



The lower threshold is set such that the specified % of pixels is below it.

The upper threshold is set such that the specified % of pixels is above it.

When an image is loaded, all pixels with intensity less than the lower threshold are displayed as black and all pixels with intensity greater than the upper threshold are displayed as white. This is useful when loading an image with a low contrast.

Closing the Image

Select File->Close to close the image and clear the display.

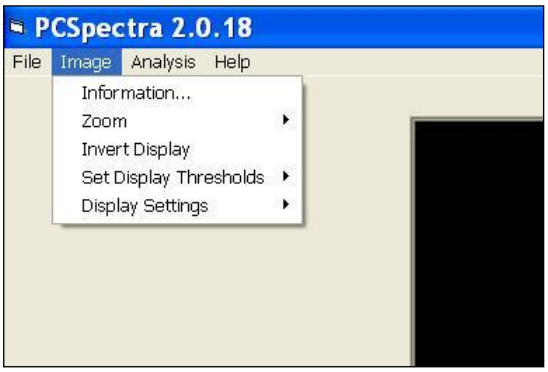
Exiting PCSpectra

Select File->Exit

Displaying Values

When the pointer moves over the display the X and Y co-ordinates, the Wavelength (if the SpecCal.txt file exists) and the Intensity of the image are shown. Additionally, the Greyscale value of the displayed image is shown.

The Image Menu

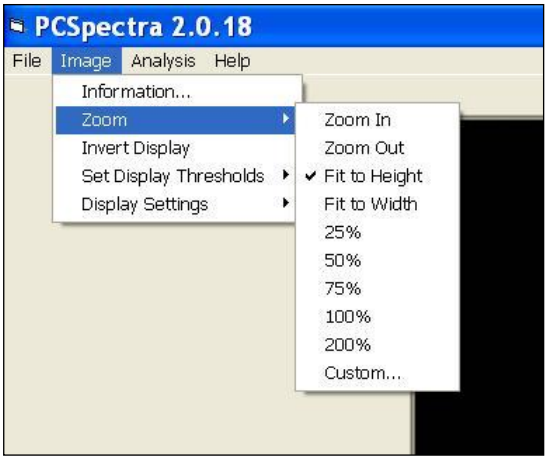


Displaying Information about the Image

Select Image->Information

Changing the Size of the Displayed Image

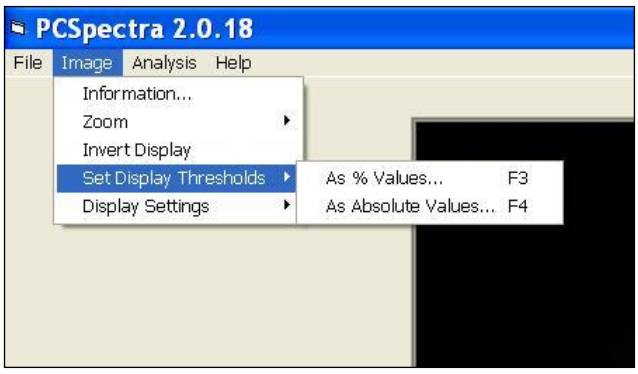
Select Image->Zoom->Zoom In, Zoom Out ... or Custom to change the size of the displayed image. The Fit to Width option is particularly useful for spectra.



Inverting the Displayed Image

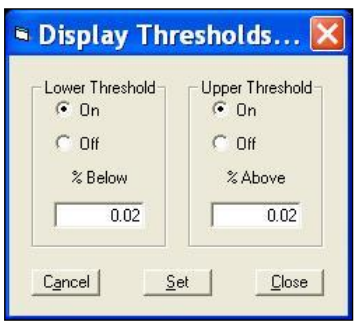
Select Image->Invert Display

Setting the Display Thresholds



Setting the Display Thresholds As % Values

Select Image->Set Display Thresholds->As % Values

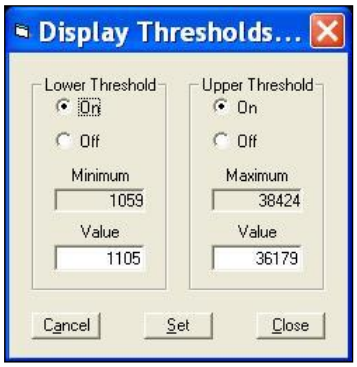


The lower threshold is set such that the specified % of pixels is below it. The upper threshold is set such that the specified % of pixels is above it.

All pixels with intensity less than the lower threshold are displayed as black and all pixels with intensity greater than the upper threshold are displayed as white.

Setting the Display Thresholds As Absolute Values

Select Image->Set Display Thresholds->As Absolute Values

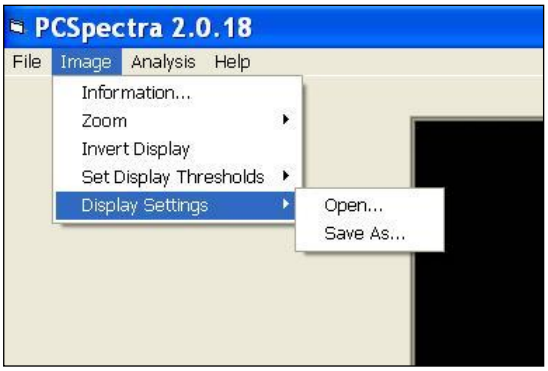


The lower threshold must be set to a value between the minimum and the upper threshold.

The upper threshold must be set to a value between the maximum and the lower threshold.

All pixels with intensity less than the lower threshold are displayed as black and all pixels with intensity greater than the upper threshold are displayed as white.

Saving and Loading the Display Settings

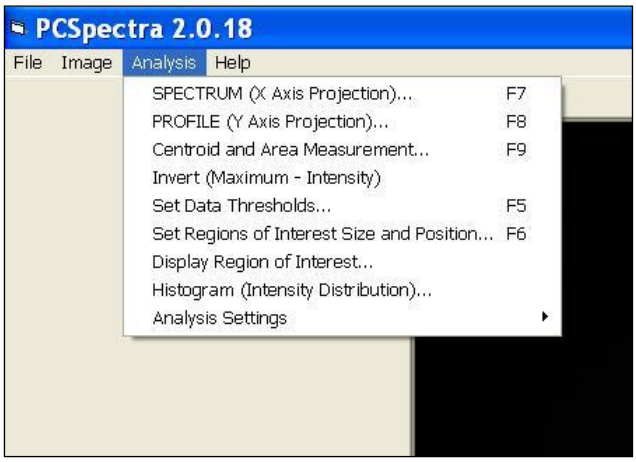


The display settings are the size, thresholds and whether the display is inverted.

Select Image->Display Settings->Save As to save

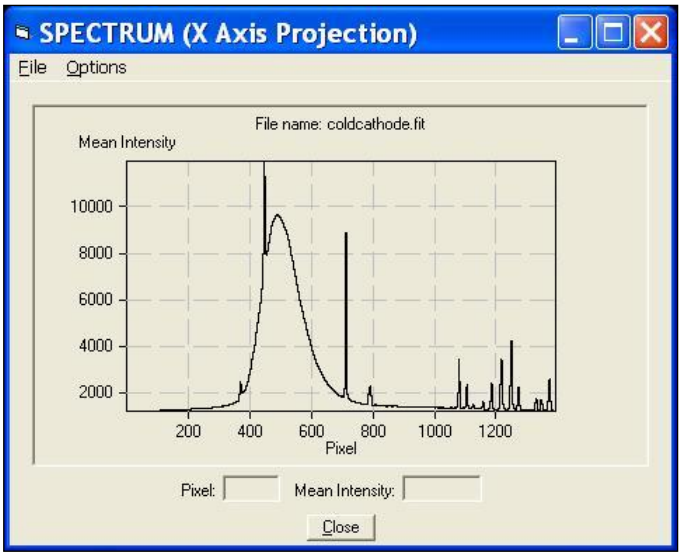
Select Image->Display Settings->Open to load

The Analysis Menu



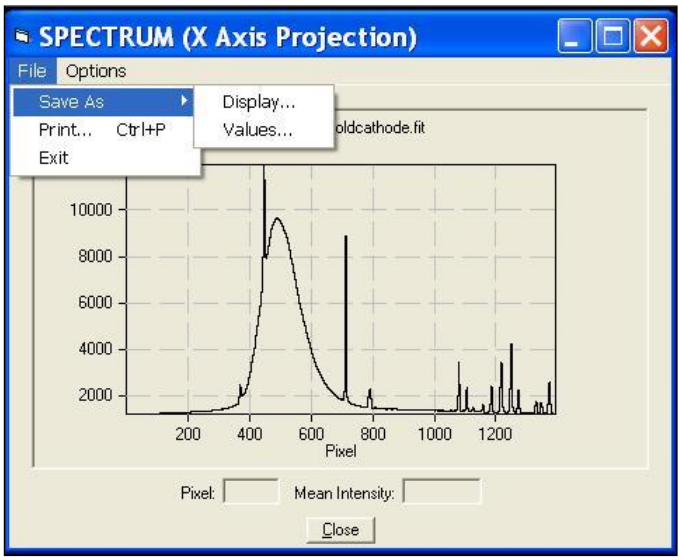
Displaying the SPECTRUM (X Axis Projection)

Select Analysis->SPECTRUM (X Axis Projection) to display the mean or sum of the intensity values over the height (Y) for each width (X) of the region of interest of the image.



The X co-ordinate (Wavelength or Pixel) and mean or sum of the intensity value are shown as the cursor is moved over the display.

Saving the SPECTRUM (X Axis Projection)



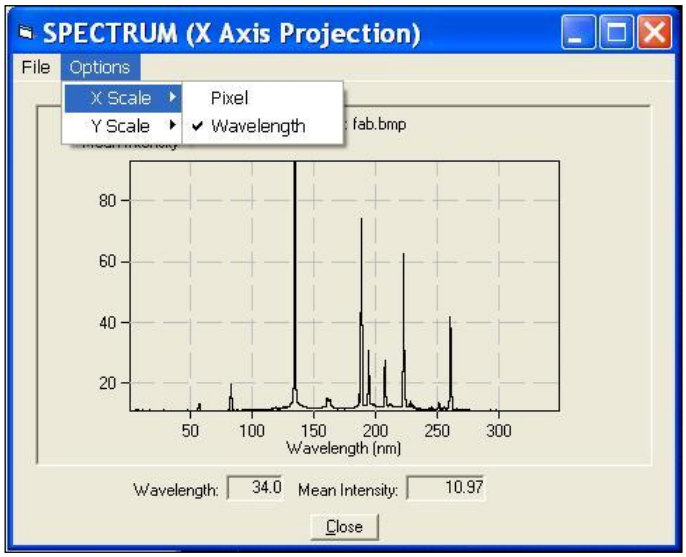
Select File->Save As->Display to use the standard Save As dialogue to save the displayed Spectrum in a bmp, fits or pgm format file. The saved display can be used in reports.

Select File->Save As->Values to use the standard Save As dialogue to save the displayed Spectrum as data in a csv format file. The saved data can be read into a spreadsheet.

Printing the SPECTRUM (X Axis Projection)

Select File->Print

Changing the X Scale of the SPECTRUM (X Axis Projection) Display to Pixel or Wavelength

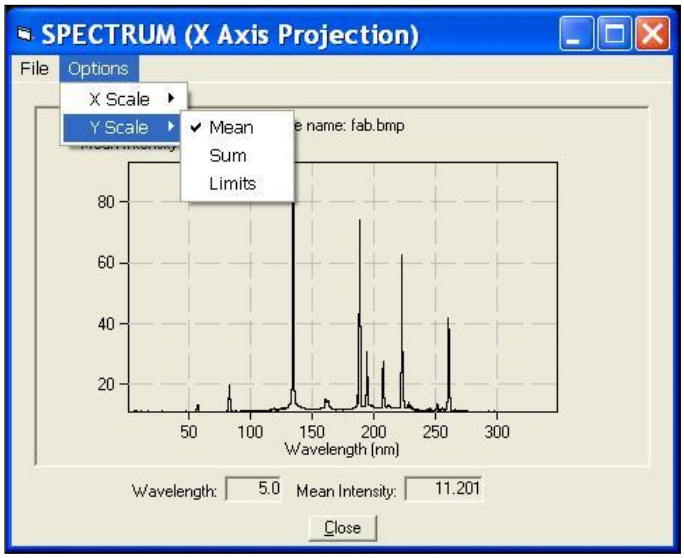


Select Options->X Scale->Pixel

or

Select Options->X Scale->Wavelength

Changing the Y Scale of the SPECTRUM (X Axis Projection) Display to Mean or Sum

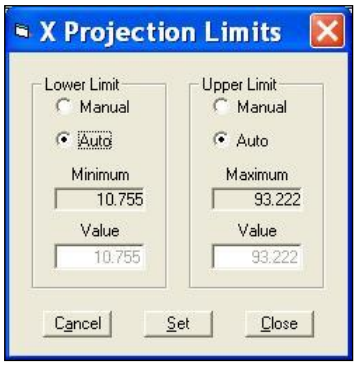


Select Options->Y Scale->Mean

or

Select Options->Y Scale->Sum

Changing the Y Scale Limits of the SPECTRUM (X Axis Projection) Display to Manual or Auto



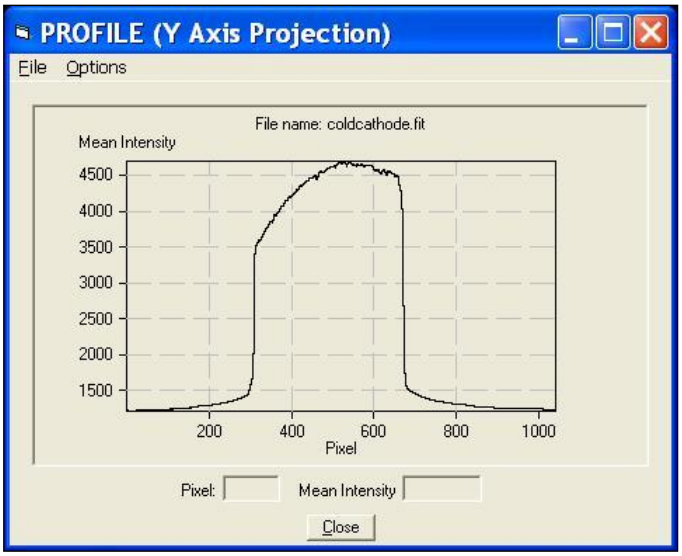
Select Options->Y Scale->Limits->Manual to change the lower and upper limits to Manual and enter the lower and upper limits

or

Select Options->Y Scale->Limits->Auto to change the lower and upper limits to Auto (ie between the minimum and maximum intensities of the image)

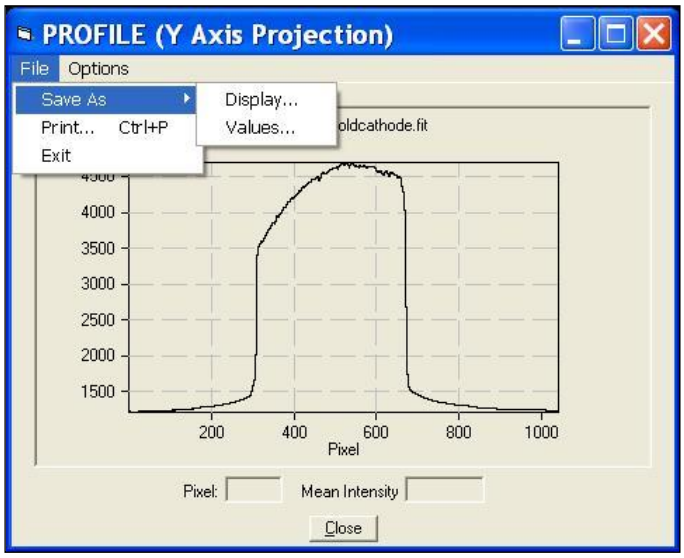
Displaying the PROFILE (Y Axis Projection)

Select Analysis->PROFILE (Y Axis Projection) displays the mean or sum of the intensity values over the width (X) for each height (Y) of the region of interest of the image.



The Y co-ordinate (Pixel) and mean or sum of the intensity values are shown as the cursor is moved over the display.

Saving the PROFILE (Y Axis Projection)



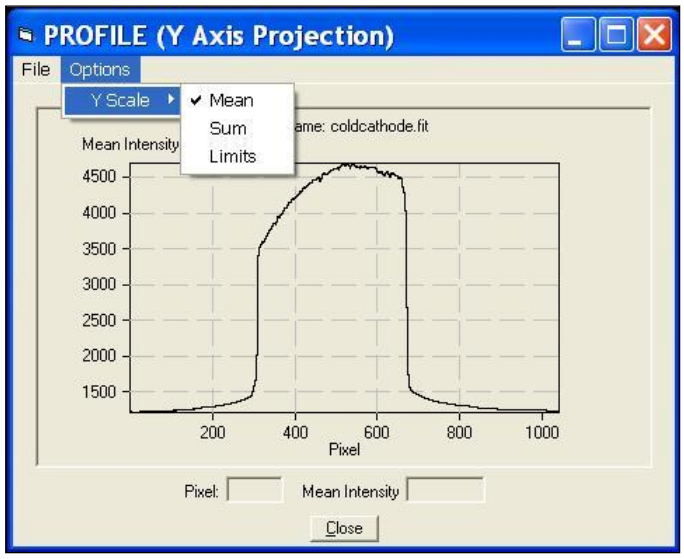
Select File->Save As->Display to use the standard Save As dialogue to save the displayed Profile in a bmp, fits or pgm format file. The saved display can be used in reports.

Select File->Save As->Values to use the standard Save As dialogue to save the displayed Profile as data in a csv format file. The saved data can be read into a spreadsheet.

Printing the PROFILE (Y Axis Projection)

Select File->Print

Changing the Y Scale (Vertical Scale) of the PROFILE (Y Axis Projection) Display to Mean or Sum

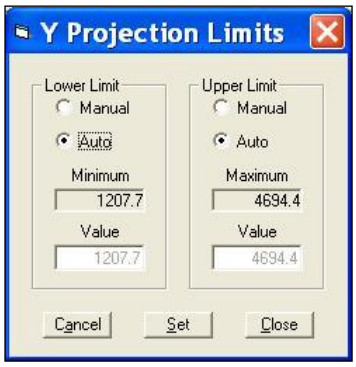


Select Options->Y Scale->Mean

or

Select Options->Y Scale->Sum

Changing the Y Scale (Vertical Scale) Limits of the PROFILE (Y Axis Projection) Display to Manual or Auto



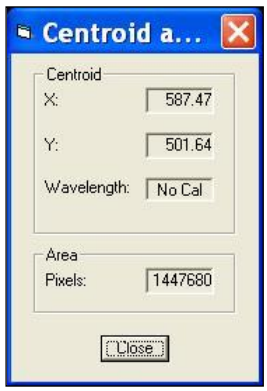
Select Options->Y Scale->Limits->Manual to change the lower and upper limits to Manual and enter the lower and upper limits

or

Select Options->Y Scale->Limits->Auto to change the lower and upper limits to Auto (ie between the minimum and maximum intensities of the image)

Displaying the Centroid and Area Measurement

Select Analysis->Centroid and Area Measurement to calculate and display the centroid and the number of pixels with intensities above the threshold value in the region of interest.



Inverting the Image

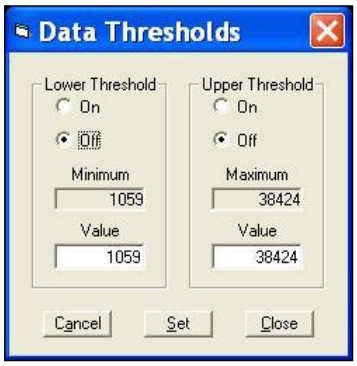
Select Analysis->Invert (Maximum - Intensity)

Inverting the image enables the centroid of an absorption line to be determined.

Note that inverting the image using Analysis->Invert (Maximum - Intensity) is not the same as inverting the display using Image->Invert Display. Inverting the image inverts each intensity value by subtracting it from the maximum intensity value and the modified value is used in subsequent analysis. Inverting the display only changes the visual appearance of the display and has no effect on the intensity value.

Setting the Data Thresholds

Select Analysis->Set Data Thresholds to set the data thresholds.



The lower threshold must be set to a value between the minimum and the upper threshold.

The upper threshold must be set to a value between the maximum and the lower threshold.

All pixels with intensity less than the lower threshold and all pixels with intensity greater than the upper threshold are excluded in subsequent analysis.

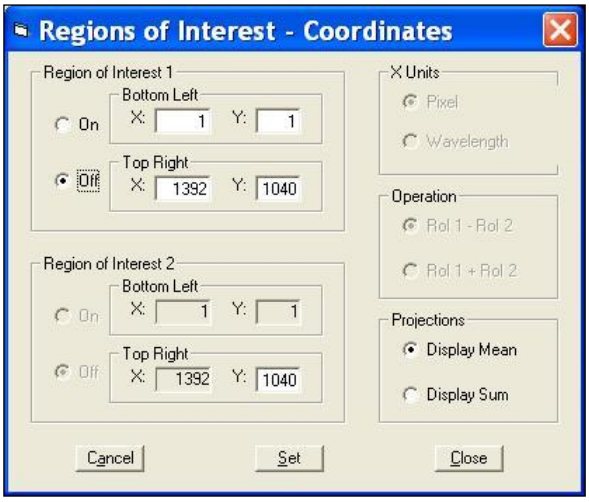
Note that setting the data thresholds is not the same as setting the display thresholds. Setting the data thresholds excludes pixels in subsequent analysis. Setting the display thresholds only changes the visual appearance of the display and has no effect on the subsequent analysis.

Using the Mouse to Define Regions of Interest for Analysis

To define the first region of interest depress the left hand mouse button in one corner of the region, move the pointer to the diagonally opposite corner and release the button. The first region is marked by a blue rectangle. To define a second region of interest depress the shift key and depress and release the left hand mouse button in the top left hand corner of the region. The second region is also marked by a blue rectangle.

Setting or Adjusting the Size and Position of the Regions of Interest

Select Analysis->Setting the Regions of Interest Size and Position

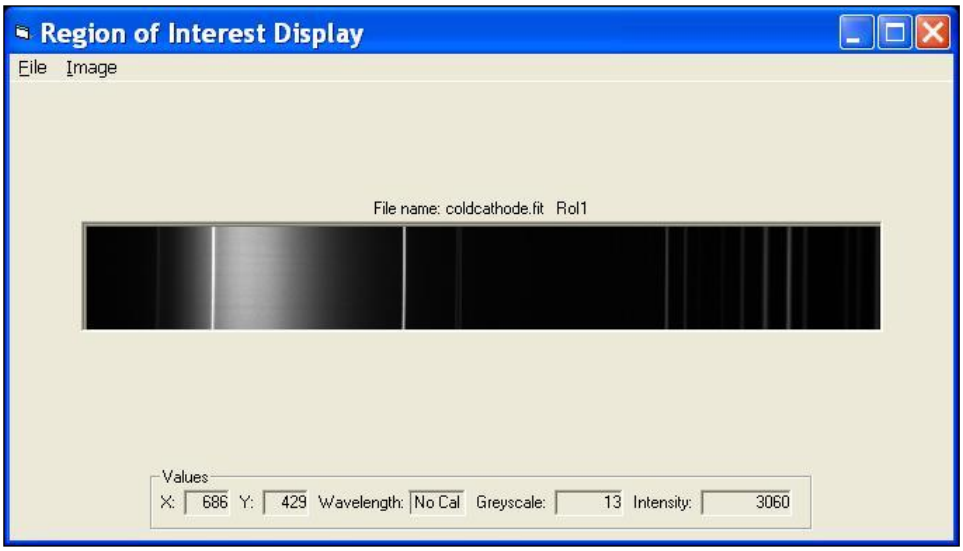


In addition to setting or adjusting the size and position of the regions of interest the display of the mean or sum for projections can be selected and, when regions of interest have been set, the operation, subtraction or addition, can be selected. If the SpecCal.txt file exists the X units, pixel or wavelength, can be selected

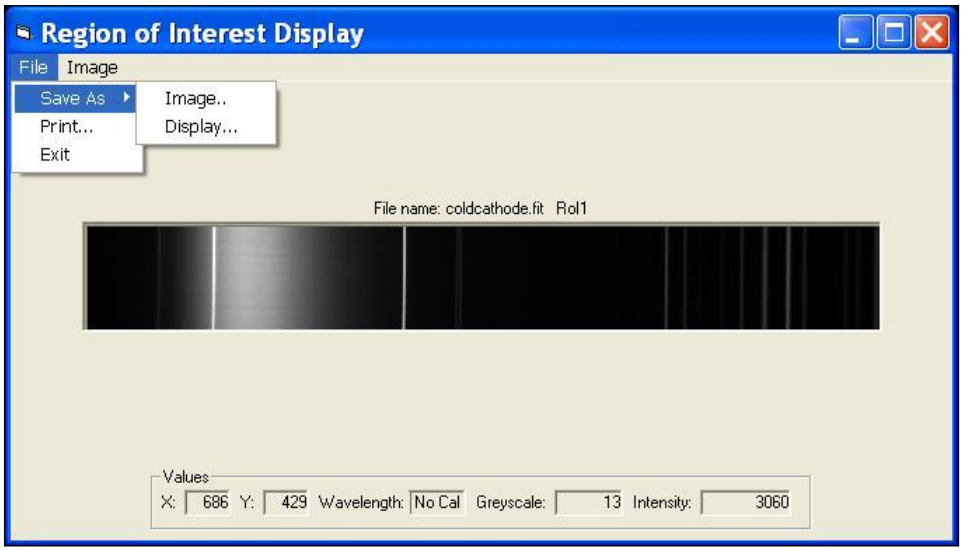
If the first region of interest contains the spectrum and the second region of interest contains the background, selection of RoI 1 – RoI 2 removes the background from the spectrum.

Displaying the Region of Interest

Select Analysis->Display Region of Interest



Saving the Region of Interest



Select File->Save As->Image to use the standard Save As dialogue to save the region of interest in a bmp, fits or pgm format file. The saved image can be used in further analysis.

Select File->Save As->Display to use the standard Save As dialogue to save the displayed region of interest in a bmp, fits or pgm format file. The saved display can be included in reports.

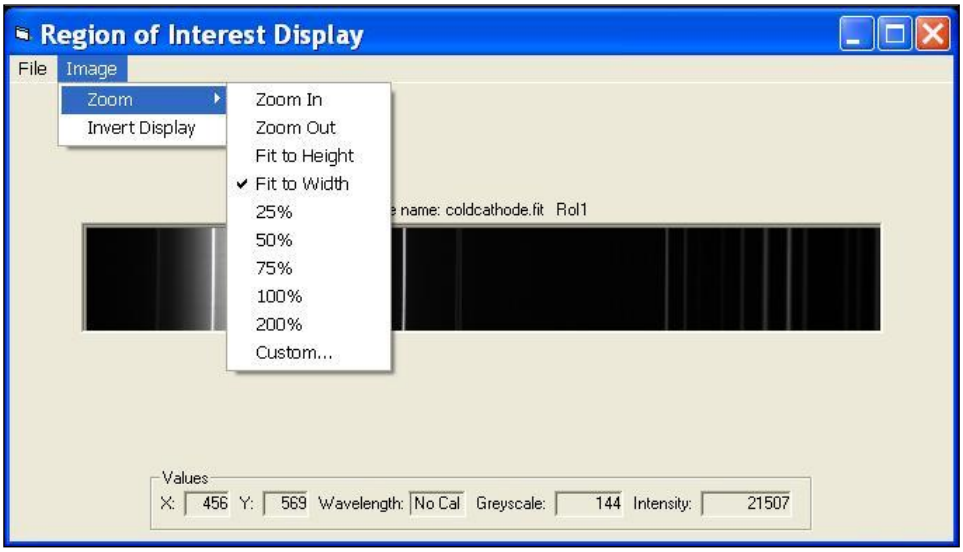
Note that the display saved using File->Save As->Display is not the same as the image saved using File->Save As->Image. The display includes the effects of setting the lower and upper thresholds and inverting the display.

Printing the Displayed Region of Interest Image

Select File->Print

Changing the Size of the Region of Interest Display

Select Image->Zoom->Zoom In, Zoom Out ... or Custom to change the size of the display. The Fit to Width option is particularly useful.

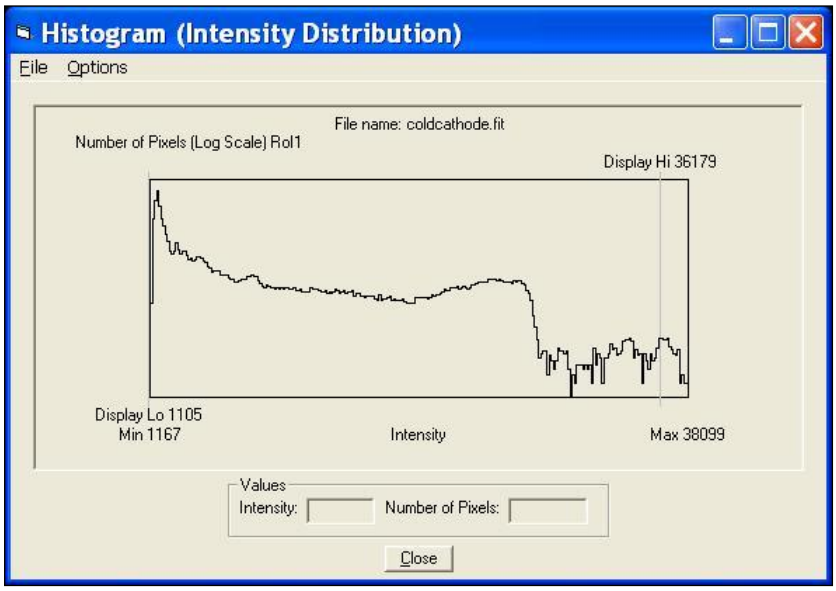


Inverting the Region of Interest Display

Select Image->Invert Display

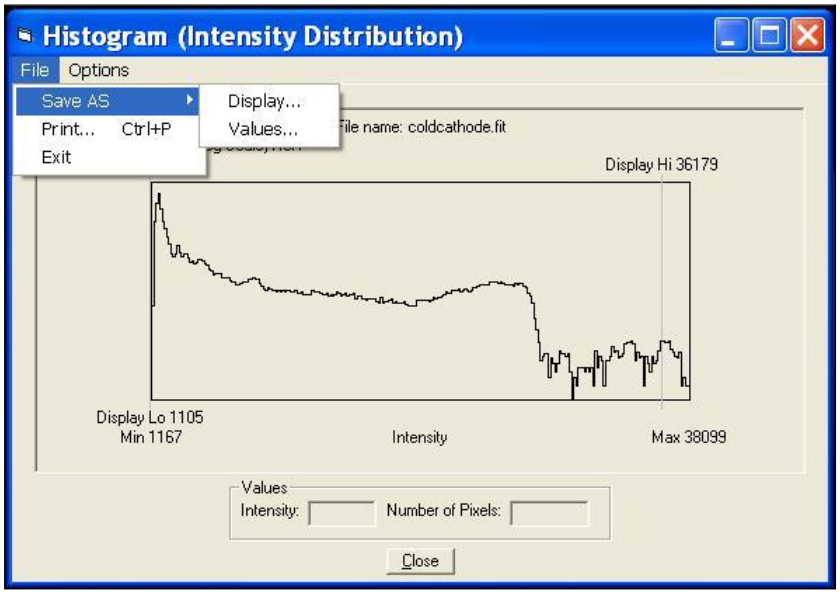
Displaying the Histogram (Intensity Distribution) for the Region of Interest

Select Analysis->Histogram (Intensity Distribution)



The Histogram (Intensity Distribution) shows the distribution of intensity (brightness) in the image to assist in setting display and data thresholds.

Saving the Histogram (Intensity Distribution) for the Region of Interest



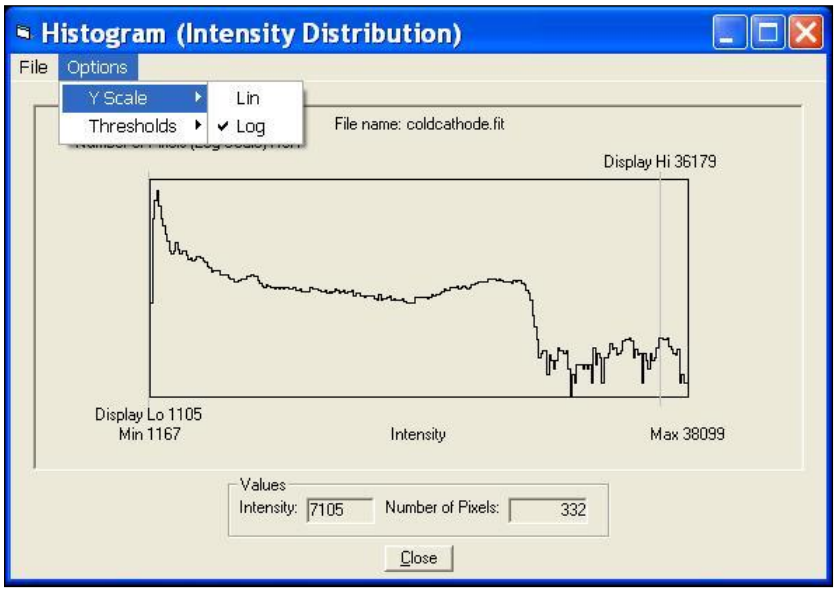
Select File->Save As->Display to use the standard Save As dialogue to save the displayed histogram in bmp, fits or pgm file format. The saved display can be used in reports.

Select File->Save As->Values to use the standard Save As dialogue to save the displayed histogram as data in a csv format file. The saved data can be read into a spreadsheet.

Printing the Histogram (Intensity Distribution)

Select File->Print

Changing the Type of Y Scale (vertical scale - Lin or Log) Displayed

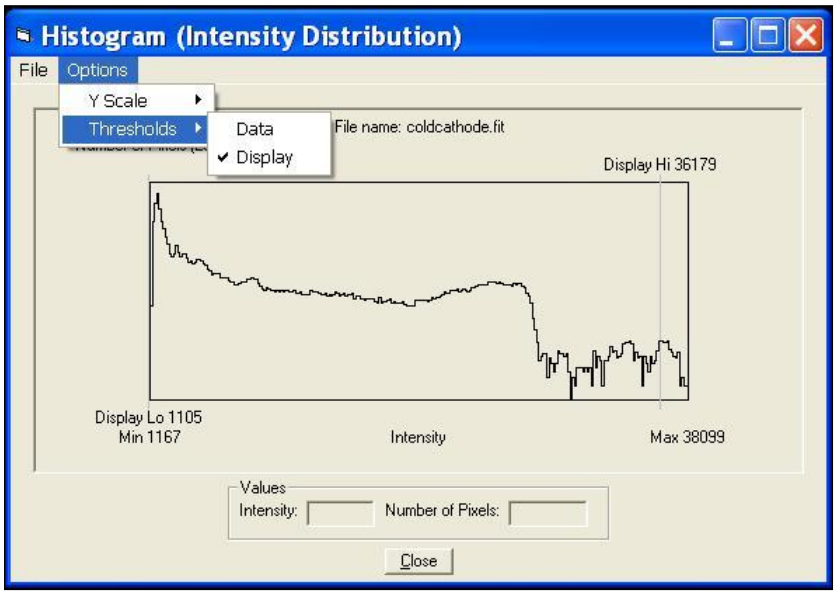


Select Options->Y Scale->Lin

or

Select Options->Y Scale->Lin

Changing the Type of Threshold (Data or Display) Displayed

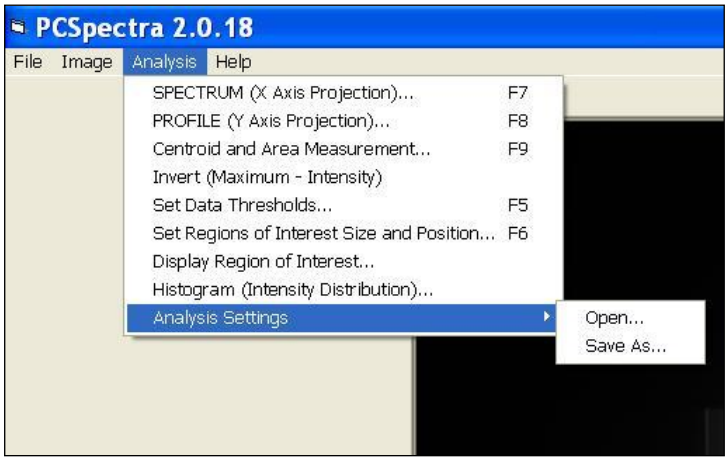


Select Options->Thresholds->Data

or

Select Options->Thresholds->Display

Saving and Loading the Analysis Settings



The analysis settings are the size and position of the regions of interest and the choices of the mean or sum, subtraction or addition, pixel or wavelength and data thresholds.

Select Analysis->Analysis Settings->Save As

or

Select Analysis->Analysis Settings ->Open

The ability to save and load the analysis settings enables the same regions of interest and choices of the mean or sum, subtraction or addition, pixel or wavelength and data thresholds to be used for every image in a set of spectra taken with the same setup making comparison easy.

The Help Menu

Select Help->About to display information about PCSpectra