Tecnai on-line help manual   --   TIA

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1 TIA Acquisition Basics

Note 1: This document may apply wholly, partly, or not at all to your microscope, dependent on hardware and software present.

Note 2: TIA does not have an undo function so make double sure before you delete anything so that you will not lose valuable data. In general, save your results on a regular basis.

1.1 Introduction to TIA

TIA (Tecnai Imaging & Analysis) contains software used for a wide variety of purposes associated with image and spectrum acquisition and analysis of these. Although it is a separate program, it is under control of the Tecnai microscope software which displays the TIA window inside the 'data' area (the area left open by the Tecnai User Interface in its various view formats). TIA contains two main modes, one being acquisition, the other analysis. On the whole, TIA itself is as complex and wide-ranging as the Tecnai microscope software itself (perhaps even more so) and full coverage of all its functionality is beyond the scope of this on-line help (for more details, see the TIA Help system itself, accessible by selecting Help while TIA is in analysis mode). This Tecnai on-line help covers mainly the aspects of the TIA acquisition and a few, often-used analysis functions (e.g. processing to obtain intensity line profiles or spectrum profiles and spectrum images).
See also the Emispec web site at www.emispec.com

1.1.1 TIA Acquisition mode

In the TIA Acquisition mode, TIA will be displayed at a fixed position with a thin frame   (no title bar, no menu, limited toolbar, default display of data only) inside the Tecnai data area. This mode is geared towards acquisition of data on the microscope. The major part of the functionality is controlled from various relevant Tecnai Control Panels (STEM imaging, EDX spectroscopy, EELS spectroscopy, Spectrum profiling and imaging, CCD/TV imaging). The TIA acquisition mode is automatically activated when the Tecnai User Interface view format has the control panels visible (Full screen open frame).

1.1.2 TIA Analysis mode

In the TIA Analysis mode, TIA will be displayed as a normal window (with title bar, menu, normal toolbars, etc). The Tecnai User Interface software will still adjust the TIA position, but in addition the user is free to move and size the window. The TIA Analysis mode is automatically activated when the Tecnai User Interface view format has the control panels not visible (Task bar only) or the Tecnai User Interface is not running at all.

1.1.3 Switching between TIA acquisition and TIA analysis

The switch between TIA acquisition mode and TIA analysis is controlled by the Tecnai User Interface view format, Full screen open frame for acquisition and Task bar only for analysis. The switch can be made as follows:

In Full screen mode, select Show (in the Tecnai menu) and Task bar only for analysis.
In Task bar only mode, click with the right-hand mouse button on a part of the user interface that has no normal popup menu (e.g. the message area when empty). A popup menu with the different view formats will be displayed. Select Full screen open frame for acquisition.

A rapid way of switching between Full size open frame en Task bar only is provided by a button next to the list of popup panels.

The button with the square blue block (far left) brings up the Application Selection Control Panel, while button with the L shape switches to Full size open frame mode.

The button with the square blue block (far left) brings up the Application Selection Control Panel, while button with the _ shape switches to Task bar only mode.

To close TIA while in acquisition mode, click inside the TIA window and press Alt + F4 (on the keyboard).

1.2   Elements of TIA

TIA contains different kinds of elements that can be visible or hidden in its window. Many of these elements have properties (which can be accessed by double-clicking on the element or its content - such as an image - with the left-hand mouse button) and popup menu with relevant functions (accessed by clicking with the right-hand mouse button on the element). Many of those elements can be selected by clicking on them with the left-hand mouse button, with the selected element displayed by handles, small white squares at the corners of the element.

1.2.1   Acquisition window

The acquisition window is the most important part of the TIA window as it will contain the data collected on the microscope. The acquisition window can be split into various fields, called panes, but it forms one integrated whole containing all the data. When the data are saved, the acquisition window is saved as a whole (it is also possible to save individual elements of an acquisition window separately such as an image or a spectrum). The acquisition window by default fills all the space remaining after all other elements that must be displayed are displayed (especially ones like control panels that have fixed size). The acquisition window forms the basis on which other elements are displayed. Close the acquisition window and all is removed. The acquisition window will contain at least one pane. The pane in turn can contain a display (real-space image, reciprocal-space image, real-space profile, reciprocal-space profile, EDX spectrum, EELS spectrum). On the display can be data and markers. The data do not contain the markers, so if you delete an image, the marker will remain. If you delete a display, however, the data and all markers are removed. If you delete a pane, the data, marker and display are removed.

Initially the acquisition window will be empty. When data are collected through the various functions of the Tecnai User Interface, the necessary displays are generated automatically.

1.2.2   Pane

The acquisition window is filled with one or more sizeable display areas called panes (unless the acquisition window is as yet empty). There is no software limit to the number of panes that can be defined (but in view of the limited room for data display, there is a practical limit). Panes can be filled by various displays (real-space and reciprocal-space image and profile displays, EELS and EDX spectrum displays). In acquisition mode, the panes and their displays are generated automatically as needed. If a pane is too small to display its data, a label will be displayed instead. The display will become visible only when the size of the pane is increased sufficiently.

Panes can be manipulated as follows:
• Change panes in size by moving the cursor to the horizontal or vertical gray bars separating individual panes (called splitters; the cursor changes to two parallel lines with arrows pointing away

from the lines), clicking on the splitter and dragging it sideways (vertical splitters) or up or down (horizontal splitters).

- Click with the right-hand button of the mouse on a pane away from any data like an image or spectrum. Various functions related to panes will appear in the popup menu, such as arrange panes (redistribute the existing panes to give them equal width or height), delete pane (removes the pane; WARNING: this operation cannot be undone in TIA and may lead to loss of acquired data) or split pane horizontally or vertically (divide the pane in two, with one pane of half width or half height containing the original pane's contents and a new empty one besides it).
- Drag the contents of a pane to another pane (click with the left-hand mouse button on a pane outside the area filled with data such as image or spectrum and drag the contents of the pane to another pane). The contents of the 'sending' and 'receiving' panes will be exchanged.
- Copy the contents of a pane to an empty pane. Click on a pane (outside any data area) and press Ctrl+C (or click with the right-hand mouse button and select Copy). Click in an empty pane (created e.g. by splitting a pane) and press Ctrl+V (or click with the right-hand mouse button and select Paste). Even shorter: click with the left-hand mouse button on the 'sender' pane and keep the Ctrl key pressed while dragging to an empty pane.

1.2.3   Shortcut bar

The shortcut bar is a bar, usually on the left-hand side of the acquisition window (but like all other display elements it can be dragged to another position), that contains shortcuts (rapid access) to various procedures (e.g. scripts). The shortcut bar can contain several different groups (for example, Processing and Lattice in the shortcuts bar shown to the left). To access the shortcuts of a group, click on the horizontal bar with the name of the group. The shortcut bar can be hidden by selecting the appropriate function in the toolbar in acquisition mode or by clicking on the Close button at top right of the shortcut bar.

1.2.4 Properties window

The TIA Properties window lists various properties of the item selected and a lists of measurements. The Properties window is shown or hidden through the toolbar function in acquisition mode.
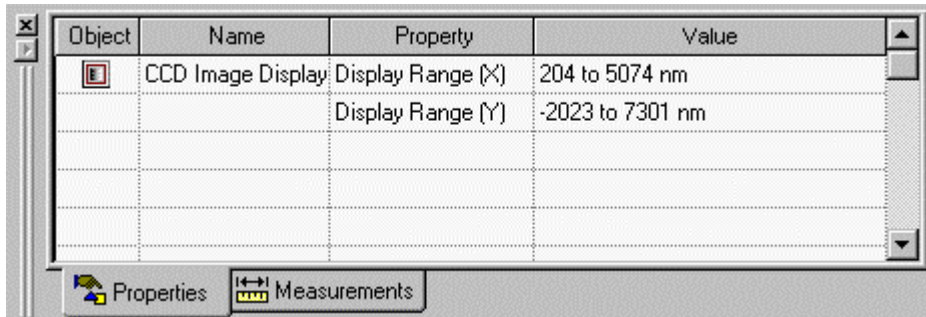

The TIA Properties window, displaying some properties of a CCD image display.
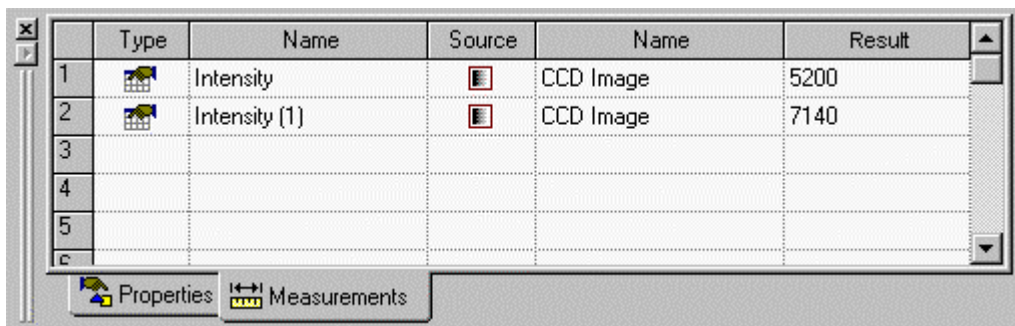
The measurements tab of the TIA properties window lists measurements (which can only be done in analysis mode). Here it shows two intensity measurements in a CCD image.

1.2.5 Output window

The Output window displays text information related to an operation performed. Examples are the results from data analysis such as peak fitting or elemental composition calculation from EDX spectra.
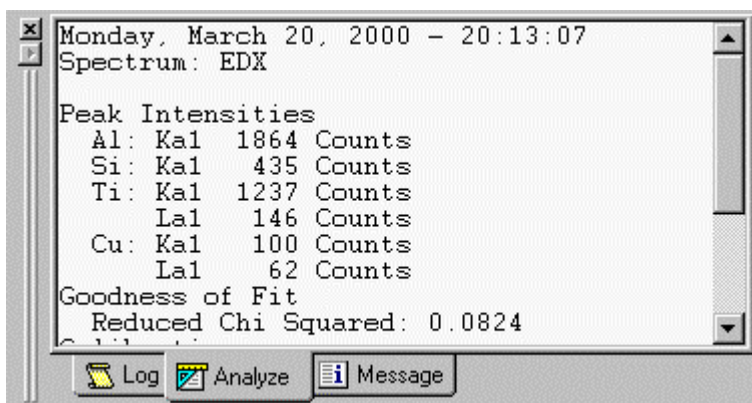
1.2.6   Control panels
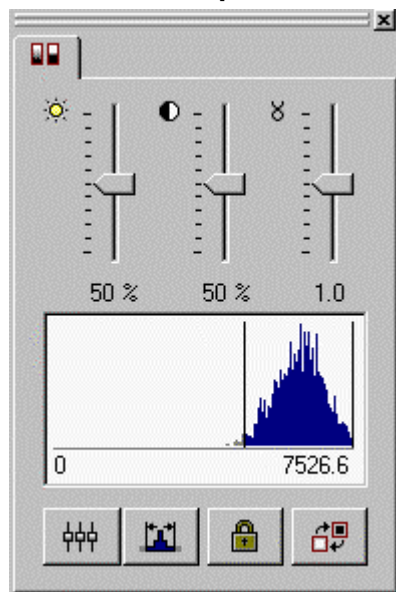
Control Panels are used to control processing and analysis and to manipulate the appearance of images. In TIA the only control panel present is the Image Display Control Panel. In addition the Series panel (see section 1.5) is always present as well. This panel contains tools for the adjustment of image appearance. Adjustments include **Brightness**, **Contrast**, **Gamma**, (from left to right at the top of the panel) and the minimum and maximum intensity values using a **Histogram** plot.

A Histogram plot of the intensities in the currently selected image is displayed within the panel. Two user-adjustable vertical lines in the histogram plot area define the minimum and maximum intensity values being used for display scaling. The minimum (left-most line) corresponds to black in the displayed image and the maximum (right-most line) corresponds to white.

The panel also controls whether or not TIA automatically scales the image data during acquisition. The **Lock Autoscaling** button is provided to prevent further autoscaling when the desired values for intensity scaling have been set. The image intensities may be rescaled at any time, even if autoscaling is locked, by pressing the **Reset Display Limits** button . Also, the brightness, contrast, and gamma settings may be reset to their default values by pressing the **Reset Display Controls** button . Finally, the panel provides an **Invert Contrast** button which causes the image to be displayed such that high intensities are black and low intensities are white.

1.2.7   Periodic table

There are two periodic tables for selecting elements in TIA. One is for quick access, the other one is the full periodic-table control panel with four tabs. The quick-access periodic table is accessible from the toolbar in acquisition and analysis mode, while the full periodic table is accessible only from the menu in analysis mode.

The quick-access periodic table gives the same information as the currently active tab of the full periodic table (but you cannot see what that tab is except by going to analysis mode and displaying the full periodic table). Elements are selected (or deselected) in the quick-access periodic table by moving the cursor to the required element and then pressing the space bar on the keyboard. Elements selected are shown with a dark gray background (O, Al, Si and Ti in the example above).

The full periodic table (accessible only in analysis mode) has four tabs with independent settings:
- Markers
- Fitting
- Standards
- Auto ID

The Markers and Fitting tabs are the most important in acquisition mode. Elements selected in the periodic table of the Markers tab get their peaks identified in the EDX or EELS spectrum. Elements selected in the Fitting tab are used in the spectrum fitting procedure (these are not necessarily the same as those marked; it is e.g. possible to mark peaks from the specimen grid, such as Cu, but not use them in the fitting). The Standards tab is important only for analysis, while the Auto ID tab shows the elements to be taken into account during automatic element identification (in general this can stay as it is).

In the full periodic table elements are selected or deselected by double-clicking on them with the left-hand mouse button. The elements from the Markers tab can be copied to the Fitting tab through the Copy KLM Setup toolbar button 🖳 function.

1.3 Tools in acquisition

This section gives a description of the available tools with some examples of how these tools can be used. Tools can be selected from the Mini tools toolbar. To change the default tool, click on the button of the tool required with the Shift key (on the keyboard) pressed. To change back to the default arrow tool, click on the arrow toolbar button with the Shift key pressed.

1.3.1 Image position marker tool

The image position marker tool ✛ defines a position in an image. Its properties (accessed by clicking with the right-hand mouse button on a marker and selecting Properties in the popup menu) include a name, a style (color for this type of marker; users can define different styles for the various display elements, see under the menu Edit., Styles ... in analysis mode), ordinal number and position X and Y.

To insert an image position marker in an image, click on the image position marker tool button ✛ and then click in the image. An image position marker will now be present in the image.

Examples:
- **Reading off image intensity**: Acquire an image. Switch to analysis mode. Insert an image position marker in the image. Click on the marker if it isn't currently selected (displayed by four handles - white squares - around it). Select in menu Process, Intensity. The Properties window will open with the Measurement tab selected, displaying the intensity data. If you move the marker around, the data in the Properties window will be updated automatically.
- **Displaying spectrum locations**: Once a spectrum has been acquired, the image position marker can be used to display the position of the spectrum in the image. Insert an image position marker in the image. Press the Alt key on the keyboard down, click on the image position marker and drag it (the cursor will change, part of it now displays a 'shortcut' type arrow) onto the spectrum (important, it must be on the spectrum, not just the spectrum pane). The image position marker will now be linked to the spectrum and be locked to the spectrum position.
- **Displaying locations of spectra from a profile or spectrum image**: Once a series of spectra has been acquired, the image position marker can be used to display the position of any spectrum of the series. Insert an image position marker in the image. Keep the Alt key on the keyboard pressed, click on the image position marker and drag it (the cursor will change, part of now displays a 'shortcut' type arrow) onto the spectrum (important, it must be on the spectrum, not just the spectrum pane). The image position marker will now be linked to the spectra. If the spectra define a profile, the marker can only move along the line. If it was a spectrum image, the marker must stay within the spectrum image area. If the marker is moved, the spectra will scroll through the series from one position to the other. Similarly if the spectra are scrolled through the series, the marker will move along with them. Even if the original line or image selection is moved, the image position marker will still display the proper position of the spectrum (for keeping the original line or image selection in place, lock it by selecting the line or image selection - click on it with the left-hand mouse button, then press the Lock toolbar button 🔒).

1.3.2　Beam position marker tool

The beam position marker tool ✛ is a combination of two features, a circle and a green crosshair. The circle is the real tool, the crosshair indicates the current beam position. Thus if two beam position marker tools are inserted into an image, only one will have the green cross (the one where the beam currently is). Clicking on the marker without the cross moves the beam position to that marker (and thus the green cross switches position). The beam position marker properties (accessed by clicking with the right-hand mouse button on a marker and selecting Properties in the popup menu) include a name, a style (color for this type of marker; users can define different styles for the various display elements, see under the menu Edit., Styles ... in analysis mode), ordinal number and position X and Y.

The beam position marker only functions in STEM images. It cannot be inserted in CCD or Video images (where it would have no meaning).

To insert a beam position marker in an image, click on the beam position marker tool button ✛ and then click in the image. A beam position marker will now be present in the image.

Examples:
- **Positioning the stationary beam**: With the beam position marker it is possible to define the position where the beam will be stationed while there is no acquisition active. Drag the marker to the position where you want the beam to stay while no image scan or other acquisition is taking place.
- **Defining beam positions for multiple spectrum acquisition**: Click on the beam position marker tool while keeping the Shift keyboard key pressed. Click with the left-hand mouse button in the image at all the positions where spectra must be recorded. Beam position markers will now be inserted in the image. Shift-click on the arrow tool to change the cursor back to the arrow. Click on each beam position marker and lock it by pressing the Lock toolbar button 🔒 . If no spectrum display exists as

yet in the acquisition window, click on the first beam position marker and acquire a spectrum from the EDX Control Panel (or PEELS). Go to the Experiments Control Panel and select Spectrum positions in the drop-down list. Define the required settings and press Acquire. A series of spectra will be acquired at the beam positions marked. Afterwards you can link an image position marker to the spectra (as described above under image position marker) which, while changing from one spectrum to another in the series, will move the image position marker where the spectrum currently displayed was collected.

1.3.3   Line marker tool

The line marker tool ╱ can be used to draw a line in an image. Its properties (accessed by clicking with the right-hand mouse button on a line and selecting Properties in the popup menu) include a name, a style (color for this type of marker; users can define different styles for the various display elements, see under the menu Edit., Styles ... in analysis mode), ordinal number and position (start and end X and Y).

To insert a line marker in an image, click on the line marker tool button. Click in the image at the starting point of the desired line and drag to the end point. The start and end positions can be modified by clicking on the line handles (white squares and dragging them elsewhere). The line can also be moved by clicking on it (away from handles) and dragging it to another position or by changing the values in the Properties dialog (click with the right-hand mouse button on the line and select Properties).

Examples:
* **Calibrating images**: Image dimensions are in real units (μm, nm, etc.). The accuracy of these units depends on two factors, the magnification on the microscope and the image calibration in TIA. The latter can only be set by TIA administrators (these settings then become system-wide and are used by all users). If several calibrations exist, recorded at different magnifications, TIA will automatically use the value for the calibration magnification that is closest to the magnification currently on the microscope. For STEM imaging three or four calibrations spanning the whole magnification range will generally be sufficient (the change between different scan magnifications is quite accurate). For CCD or Video imaging, it may be desirable to calibrate each TEM magnification separately (because there is no fixed pattern to any deviation between the true magnification and displayed magnification when going through the TEM magnifications). Images can also be calibrated by users after acquisition (provided the image contains features that allow calibration).
  To calibrate an image, insert a line marker in the image (see above). For calibration using two directions, insert another line at approximately 90° (in this case the lines should be approximately horizontal and vertical; calibration with one line at +45° and the other at -45° doesn't work properly). Click on the image with the right-hand mouse button and select Properties in the popup menu. Select the Calibration tab. Click on the Scale... button. In the dialog that is shown, select the line in the Line 1 drop-down list box and enter its length to the right of it. If there are two lines, select the other line in the Line 2 drop-down list box and enter its length. For one line, click on the Keep square checkbox. Click OK on all dialogs. The image is now calibrated.
  To make the calibration a system setting, see the relevant sections for STEM, CCD and Video.
* **Displaying an intensity profile**: Switch to analysis mode. Insert a line marker in the image (as described above) at the position where the intensity profile should be obtained. Click on a pane with the right-hand mouse mouse and select Split pane (horizontally or vertically; this creates space for the intensity profile). Click on the line marker to select it, and select from the menu Process, Line profile. The cursor now changes (when it cannot be inserted somewhere it becomes a kind of stop sign, a circle with a sloping line in it; when it can be inserted - over the empty pane, it becomes like this ▭⁺). Click with the left-hand mouse button in the empty pane and the intensity profile is inserted there automatically. If you move the line marker around, the intensity profile will be updated.
* **Defining scope profile positions**: If image acquisition is not active, a scope display can be obtained from a line in any orientation in the image. To obtain such a scope display, first insert a line marker in

the image (as described above) at the position where the scope profile should be obtained and then press the Scope button in the STEM Imaging Control Panel. The scope signal will be acquired continuously along the line. The line can be dragged to other positions to change the position of the scope signal.

Note: Scope displays are not persistent and disappear automatically when scope is switched off again. To create persistent intensity profiles, switch to analysis mode, split a pane to create room for the intensity profile display. The click on a line marker tool in the image and select from the menu Process, Line profile. Move the changed cursor to the empty pane and click there.
A scope display. The signal from the (BF) detector is displayed with high intensity (white) at the top and low intensity (black at the bottom). The vertical scale covers the full range of the possible detector signal (0-64000).
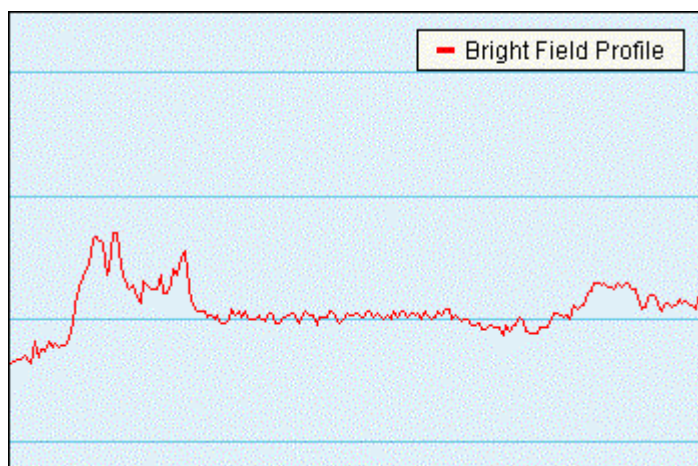
A scope display. The signal from the (BF) detector is displayed with high intensity (white) at the top and low intensity (black at the bottom). The vertical scale covers the full range of the possible detector signal (0-64000).

- **Acquiring a single spectrum while the beam is scanning along a line**: Insert a line marker in a STEM image and select the marker (handles are visible). Go to the EDX Control Panel (or PEELS), set the required conditions and press Acquire. The beam will be scanning continuously along the line while the spectrum is acquired, giving a spectrum that is an average of the line.
- **Defining spectrum profile positions**: For acquisition of spectrum profiles, the following pre-conditions must be met:
  - A STEM image must be present.
  - A spectrum display must be present of the required signal (EDX and or PEELS).
  - A line marker must be inserted in the STEM image and selected.

  Go to the Experiments Control Panel and select Spectrum line profile from the drop-down list. Set the required settings and press Acquire.
- **Measuring distances**: Draw a line in an image, then display the properties window. One of the parameters displayed is the length of the line.

1.3.4 Image selection tool

The image selection tool ☐ can be used to draw a frame in an image. Its properties (accessed by clicking with the right-hand mouse button on a marker and selecting Properties in the popup menu) include a name, a style (color for this type of marker; users can define different styles for the various display elements, see under the menu Edit., Styles ... in analysis mode), ordinal number and position (start and end X and Y).

To insert an image selection marker in an image, click on the image selection marker tool button ☐ . Click in the image at the top left corner of the desired frame and drag to the bottom right corner. The start and end positions can be modified by clicking on the handles (white squares and dragging them

elsewhere). The frame can also be moved by clicking on it (away from handles) and dragging it to another position or by changing the values in the Properties dialog (click with the right-hand mouse button on the line and select Properties).

Examples:

- **Calculating an FFT from an area inside an image**: FFTs (Fast Fourier Transforms) can be calculated from essentially any rectangular area (down to a horizontal or vertical line; the area does not have to have power of 2 dimensions). To obtain an FFT, draw an image selection marker around the area to be used for the FFT. If the shortcut bar is not visible, click on the Show/hide Shortcut Bar tool button   . Select the Processing group and in the Processing group click on FFT. An new pane will be created with the FFT in it. The FFT will be updated automatically when the image changes (new acquisition) or the image selection marker is changed (moved or changed in size).
- **Creating a copy of part of an image**: Insert an image selection marker in an image. Split a pane to create room for a new display. Go to analysis mode. Select the image selection marker. Select from the menu Process, Selection and click with the changed cursor   in the empty pane. A new image display is created in the pane with in it the part of the image covered by the image selection marker. The new image is linked to the image selection marker (it moves or resizes when the marker in the original image is moved or resized).
- **Acquiring a single spectrum while the beam is scanning an area**: Insert an image selection marker in a STEM image and select the marker (handles are visible). Go to the EDX Control Panel (or PEELS), set the required conditions and press Acquire. The beam will be scanning the area continuously while the spectrum is acquired, giving a spectrum that is an average of the area. Note that the image is not updated during the spectrum acquisition.
- **Defining spectrum image positions**: For acquisition of spectrum images, the following pre-conditions must be met:
  - A STEM image must be present.
  - A spectrum display must be present of the required signal (EDX and or PEELS).
  - An image selection marker must be inserted in the STEM image and selected.

  Go to the Experiments Control Panel and select Spectrum image (mapping) from the drop-down list. Set the required settings and press Acquire.

1.3.5   Marker tool

The marker tool   can be used to draw a vertical marker in a spectrum or profile display. Its properties (accessed by clicking with the right-hand mouse button on a marker and selecting Properties in the popup menu) include a name, a style (color for this type of marker; users can define different styles for the various display elements, see under the menu Edit., Styles ... in analysis mode), ordinal number and position.

To insert a marker in a profile or spectrum display, click on the marker tool button   . Click in the display and a marker will be inserted. The marker can be moved by clicking on it and dragging it sideways.

Examples:

- **Displaying the profile position in the image**: Create a line profile (e.g. an intensity profile, see under line marker tool above) from an image. Insert a marker in the profile. Keep the Alt key on the keyboard pressed, click on the marker in the profile and drag to the line in the image. The cursor will have changed to one with a 'shortcut' arrow in it. Release the mouse button. In the image the line now has a small square marker on it. When you move the marker in the profile to select another position there, the small square on the line will move to the corresponding position along the line in the image. Something similar can be done with spectrum positions of a spectrum line profile but in this case you must link an image position marker to the spectrum and the profile marker to the spectrum. The three (image position marker, profile marker and spectrum displayed) are now linked.

- **Extracting numerical data from an energy window**: Switch to analysis mode. Insert a marker in a spectrum and click on it to select it. Select from the menu Process, Intensity. The Properties window is now displayed with the Measurements tab selected and the value of the spectrum channel selected with the marker displayed.

1.3.6 Energy window tool

The energy window tool 🔳 can be used to draw an energy window in a spectrum display. Energy-window properties (accessed by clicking with the right-hand mouse button on a line and selecting Properties in the popup menu) include a name, a style (window-fill spectrum-fill and border color for this type of marker; users can define different styles for the various display elements, see under the menu Edit., Styles ... in analysis mode), ordinal number and start and end energy.

To insert an energy window, click on the energy window tool button 🔳 . Click in the spectrum on one side of the desired position of the window and drag to the other side. Energy windows can be changed in width (click on one of the borders of the window and drag it sideways) and moved sideways (click inside the window and drag it. Settings of the window can also be defined by double-clicking on the window and entering the required numerical values.

Examples:
- **Extracting numerical data from an energy window**: Switch to analysis mode. Insert the required energy window in a spectrum and click on it to select it. Select from the menu Process, Mean or Sum. The Properties window is now displayed with the Measurements tab selected and the value of the spectrum window selected with the marker displayed.
- **Processing spectrum profile or spectrum image data**: Acquire a spectrum profile (see above under line marker) or spectrum image (see above under image selection marker). Switch to analysis mode once acquisition is finished. Split a pane to make room for a new display. Insert an energy window around a peak of interest. Click on the energy window and select from the menu Process, Extract Map/Profile. Click with the new cursor 🔲 inside the empty pane and a new display (profile or image will be generated). Further energy windows can be inserted and selected for extraction of profiles or maps. For further energy windows there is one difference between profile and map: additional profiles can be dropped on the same display, but for each additional map a new pane must be created.

1.3.7 Calibration shift tool

The calibration shift tool 🔳 can be used for calibrating spectra. Since EDX spectra should remain close to properly calibrated at all times, this tool applies mainly to PEELS spectra where the spectrum offset can vary from microscope session to session or even within a session, dependent on PEELS hardware settings. For quickly calibrating the PEELS spectrum, select the Calibration shift tool. Click on the spectrum on a peak (edge) with known energy, and drag it to the correct energy in the spectrum display. The entire spectrum shifts while the energy axis remains fixed.

Use the Offset button in the PEELS Control Panel of the Tecnai User Interface to apply the new calibration to new acquisitions.

1.4   TIA acquisition toolbars

In acquisition mode, TIA will display two toolbars, the Mini toolbar and Mini tools toolbar. Both toolbars can be arranged around in various ways:

- Click with the left-hand mouse button on the striped part at the top (vertical toolbar) or left (horizontal toolbar) of the toolbar and drag it out of its position and the toolbar will form a separate small toolbar window that can be moved around and resized (e.g. to make two columns or two rows of buttons).
- Click with the left-hand mouse button on a part of a separate toolbar window (not on a button) and drag it to one side of the window (top, left, bottom, right) and the toolbar will be moved into a single bar at the edge of the window. Click and drag the striped part of the toolbar to move it to its proper position in the toolbar 'window' (the gray area available for toolbars).
- The two toolbars can be manipulated separately. Thus they can be together in a single bar, or one can be on the right side of the acquisition window and the other at the bottom, or one can be on the side of the acquisition window and the other floating above.

The **Mini toolbar** contains the following buttons:

Closes currently active acquisition window in TIA. Asks if data must be saved, possible to cancel operation.

Saves the currently active window in a sequential series.

Saves the currently active acquisition window under a user-defined filename.

Prints the currently active acquisition window.

Displays or hides the shortcut bar.

Displays or hides the properties window.

Displays or hides the output window.

Displays or hides the control panels.

Arranges the panes in the currently active acquisition window so that panes in columns and rows have equal widths and heights.

Deletes the currently selected pane. WARNING: this operation may lead to loss of data, no undo is possible.

Scales the elements (this includes data AND markers) in the selected pane according to their overall vertical dimension.

Scales the elements (this includes data AND markers) in the selected pane according to their overall horizontal and vertical dimensions (with the larger elements dimension and smaller pane dimension deciding the scaling).

Locks the currently selected object. Locked objects cannot be moved, deleted or overwritten.

Displays the periodic table for element identification.

Allows selection of a KLM setup (spectrum element identification) from a list of (previously defined) setups.

Clears all selected element markers in a spectrum.

Printing
You can print either the whole display window, a single display or an image. The selection is made in the Print dialog that comes up when you print something.
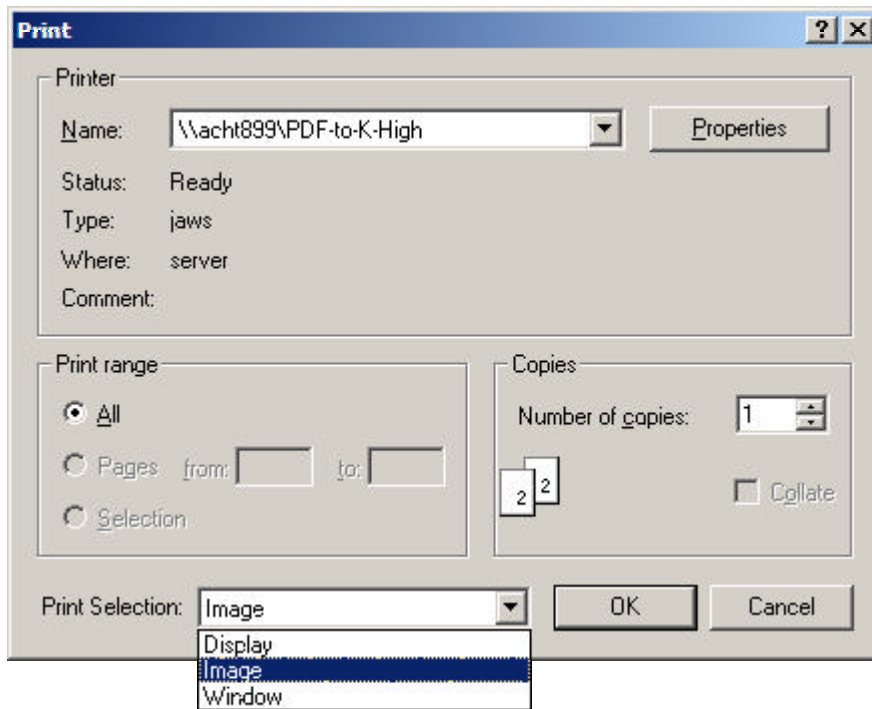
The Image option is only present when an image has been selected (clicked). To print an image of a display only, make sure the display or image is selected before printing (click on the display or image).

Note: The image is printed as is. This may result in part of the image being blocked by the display legend. To ensure proper printing of the image when the legend is visible over (part of) the image, either rescale the image so the legend does not overlap or hide the legend. To do the latter, right-click on the display (not the image) and select Properties or double-click on the display and switch Show Legend off.

The **Mini Tools toolbar** contains various tools. The normal default tool (displayed by a 'pressed down' button) is the arrow tool. Other tools can be selected by clicking once on the toolbar button. After the tool action, the selection will revert to the arrow tool. It is also possible to change the default tool by clicking with the left-hand mouse button on the toolbar button of the tool required while keeping the Shift key on the keyboard pressed. When the default tool is changed, the button of the new default tool becomes 'pressed down'. To change back to the default arrow tool, shift-click on the arrow tool button.

For an explanation of the function of the various tools, see the separate tools description.

The Mini Tools toolbar contains the following buttons:

The arrow tool is the default pointing and feature-selection tool.

The image position marker tool can be inserted in images to mark a position.

The beam position marker tool can be inserted in images to define the (STEM) beam position.

The line marker tool can be inserted in images to define a line.

The image selection tool can be inserted in images to define a rectangular image area.

The marker tool can be inserted in profiles and spectra to mark a position.

The energy window tool can be inserted in spectra to define a range in the spectrum.

The calibration shift tool can be used for calibration of spectra.

1.5   TIA Acquisition series

TIA can acquire data (images, spectra) in series. In some cases (e.g. spectrum profiling or imaging) this is automatic (that is, the series is made by TIA to allow all the individual spectra to fit). In other cases, the user must select a series size (larger than one) for data to be collected in a series. One example of series in data collection is recording a series of TV or CCD images of an area. These images will then record the dynamic behaviour of the specimen during the recording.

Note: For CCD Acquisition it is not possible to define a series. Instead you can use the sequential save feature to save each acquired image separately.

Sequential image save

CCD images are acquired in a separate pane called Acquire CCD Image (Search and Preview images are acquired in another pane to prevent overwriting of acquired CCD images). In order to allow easy saving of these images, you can save each image sequentially after it has been acquired. To use sequential save:

- Acquire a CCD image.
- Press the Save as 💾 button from the Toolbar. Give the file a name and check the Save Sequentially checkbox at the bottom of the dialog.
- After acquiring each new image, press the Save Sequential 💾 toolbar button.
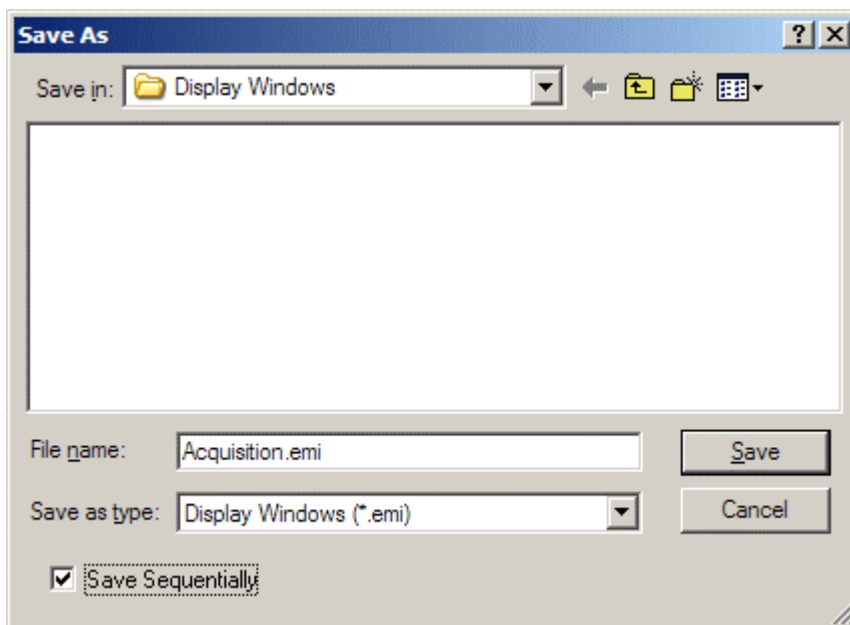
Data series

Data series are saved when their acquisition window is saved. When you copy an image or pane or export an image from a series, however, only the image currently displayed is copied or exported, not the whole series.

A data series is always stored inside a single pane (image or spectrum display), where only one member of the series is visible at any time. The series can be accessed in various ways, e.g. by scrolling through or by playing the series as a video sequence. Access is only possible in analysis mode. In acquisition mode, switch to analysis mode first. If the control panels are hidden, display them (in the menu select View, Control Panels). If the panel shown below is not visible, the click with the right-hand mouse button on the window column with the control panels and select Panels... in the popup menu. Check the Series Panel check box.
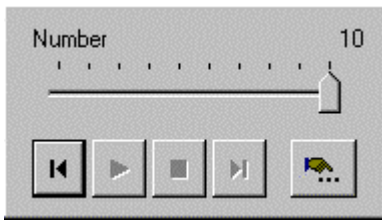
Number track bar
The Number track bar can be dragged to show the data at any point in the series.

Beginning
The Beginning button resets the display to the first series item.

Play
The Play button start the display of the series as a video sequence. The settings of the video sequence are defined under More.

Stop
The Stop button stops the display of the series as a video sequence.

End
The End button resets the display to the last series item.

More
The More button at the bottom-right of the panel provides control of other parameters associated with automated series playback.
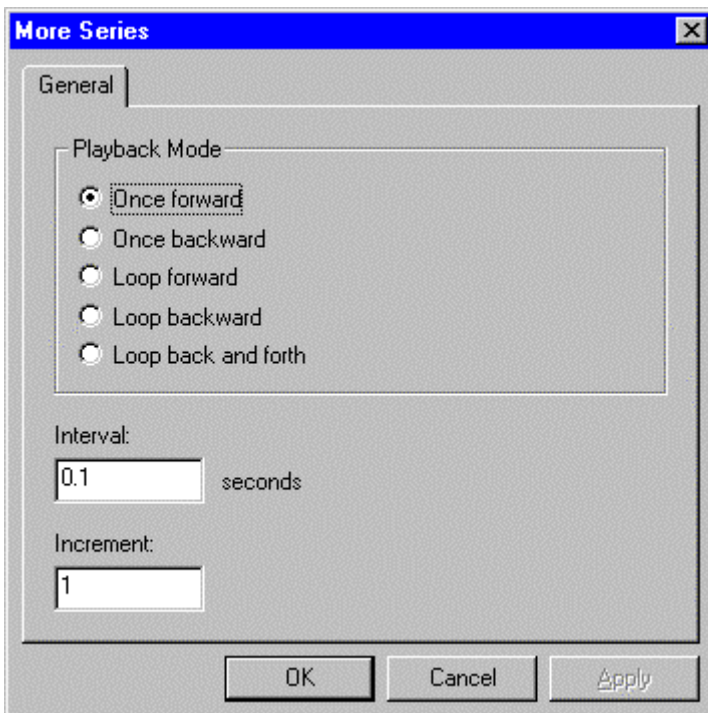
2 TIA CCD image acquisition

2.1 CCD Image

CCD acquisition in TIA is controlled through the CCD/TV Camera Control Panel of the Tecnai User Interface. In CCD acquisition TIA will display a single image display.

Note: The three acquisition modes (Search, Preview, Acquire) write their images into two displays, one for Search and Preview, the other for Acquire. Since each new acquisition overwrites the previous image, you must save that image if you want to keep. You can use the Sequential save feature to for easy saving of images.
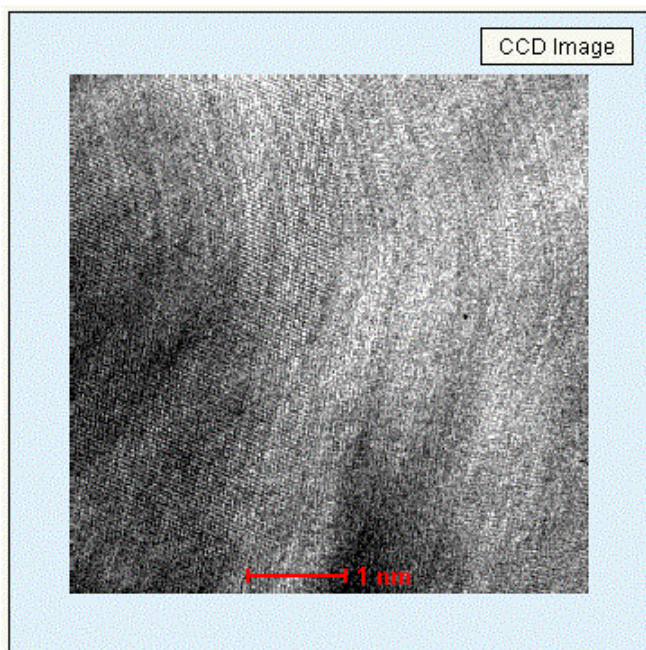
CCD image display. At bottom center a scale bar is shown (in red).

2.2 Calculating FFTs

FFTs (Fast Fourier Transforms) are often used together with CCD images, e.g. to adjust image astigmatism and judge the focus setting in high-resolution TEM imaging. FFTs can be created easily in TIA:

- If the shortcut bar is not visible, click on the Show/hide Shortcut Bar tool button ⊡ .
- Select the Processing group and in the Processing group click on FFT. An new pane will be created with the FFT in it.

The FFT will be updated automatically when the image changes (e.g. through a new acquisition). By inserting an image selection marker it is also possible to calculate FFTs of part of the image (the area can have any dimensions; it is not constrained to width and height of power of 2 values).

2.3 Calibration of TEM images

Image dimensions are in real units (μm, nm, etc.). The accuracy of these units depends on two factors, the magnification on the microscope and the image calibration in TIA. The latter can only be set by TIA administrators (these settings then become system-wide and are used by all users). If several calibrations exist, recorded at different magnifications, TIA will automatically use the value from the calibration magnification that is closest to the magnification currently on the microscope. For CCD or

Video imaging, it may be desirable to calibrate each TEM magnification separately (because there is no fixed pattern to any deviation between the true magnification and displayed magnification when going through the TEM magnifications). Images can also be calibrated by users after acquisition (provided the image contains features that allow calibration).

To calibrate an image, insert a line marker in the image, selected via the line marker tool button ✏ . For calibration using two directions, insert another line at approximately 90° (in this case the lines should be approximately horizontal and vertical; calibration with one line at +45° and the other at -45° doesn't work properly). Click on the image with the right-hand mouse button and select Properties in the popup menu. Select the Calibration tab. Click on the Scale... button.

The Scale dialog with calibration data using one line.

In the dialog that is shown, select the line in the Line 1 drop-down list box and enter its length to the right of it. If there are two lines, select the other line in the Line 2 drop-down list box and enter its length. For one line, click on the Keep square checkbox. Click OK on all dialogs. The image is now calibrated.

To make the calibration done a system calibration (functionality accessible to TIA administrators only), switch to analysis mode. From the menu select Acquire, Settings, CCD. In the More CCD dialog, select the Magnifications tab.
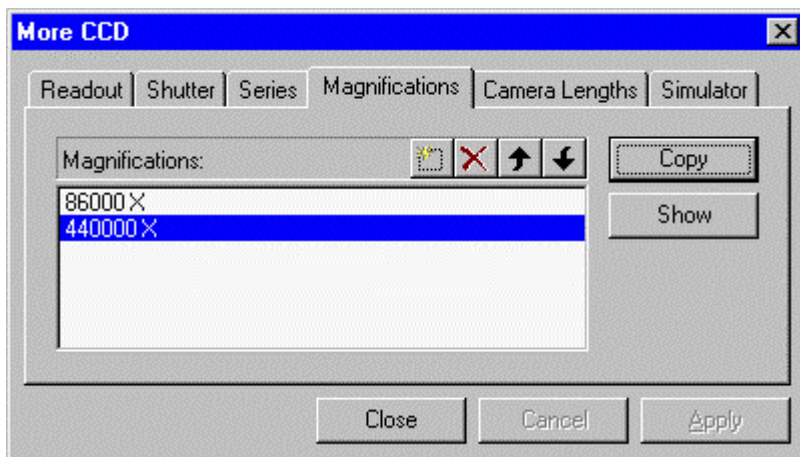
The Magnifications tab of the More CCD dialog.

If the TEM magnification used for recording the image is already listed, click on the magnification in the list (it becomes highlighted) and press the Copy button. If the TEM magnification is not yet in the list, click on the New (Insert) button 🗋 . TIA will create a new item in the list and put the cursor at the front of the line. Enter the numerical value of the TEM magnification (you do not have to enter the X) and press the Enter key on the keyboard. The value listed will be put into proper format (including the X). Click on the new value in the list (it becomes highlighted). Press the Copy button to insert the values in the calibration for the magnification. After the Copy button has been pressed the values used will be displayed.

3   TIA Video image acquisition

3.1   Video Image

Video acquisition in TIA is controlled through the CCD/TV Camera Control Panel of the Tecnai User Interface. In Video acquisition TIA will display a single image display.

Note: All three acquisition modes (Search, Preview, Acquire) write their images into the same display, so after an image has been acquired, the data must be saved before restarting acquisition, otherwise the image acquired will be overwritten. To save the current image, you can also split the pane (see section 1.2.2) and copy the current image to the new, empty pane. You can also change the name of the display (not the image itself) and TIA will create a new display for continued acquisition.
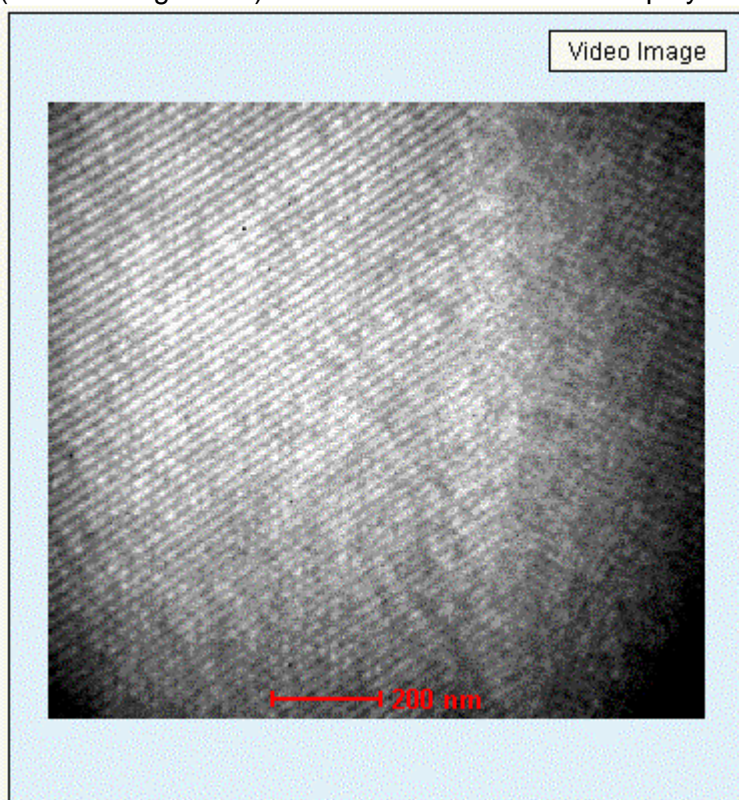
Video image display. At bottom center a scale bar is shown (in red).

3.2   Calculating FFTs

FFTs (Fast Fourier Transforms) are often used together with Video images, e.g. to adjust image astigmatism and judge the focus setting in high-resolution TEM imaging. FFTs can be created easily in TIA:

- If the shortcut bar is not visible, click on the Show/hide Shortcut Bar tool button 🖿 .
- Select the Processing group and in the Processing group click on FFT. An new pane will be created with the FFT in it.

The FFT will be updated automatically when the image changes (e.g. through a new acquisition). By inserting an image selection marker it is also possible to calculate FFTs of part of the image (the area can have any dimensions; it is not constrained to width and height of power of 2 values).

3.3 Calibration of TEM images

Image dimensions are in real units (µm, nm, etc.). The accuracy of these units depends on two factors, the magnification on the microscope and the image calibration in TIA. The latter can only be set by TIA administrators (these settings then become system-wide and are used by all users). If several calibrations exist, recorded at different magnifications, TIA will automatically use the value from the calibration magnification that is closest to the magnification currently on the microscope. For CCD or Video imaging, it may be desirable to calibrate each TEM magnification separately (because there is no fixed pattern to any deviation between the true magnification and displayed magnification when going through the TEM magnifications). Images can also be calibrated by users after acquisition (provided the image contains features that allow calibration).

To calibrate an image, insert a line marker in the image, selected via the line marker tool button . For calibration using two directions, insert another line at approximately 90° (in this case the lines should be approximately horizontal and vertical; calibration with one line at +45° and the other at -45° doesn't work properly). Because the scan directions of the TV tube can be adjusted separately, it is advised to calibrate video images always with two lines. Click on the image with the right-hand mouse button and select Properties in the popup menu. Select the Calibration tab. Click on the Scale... button.
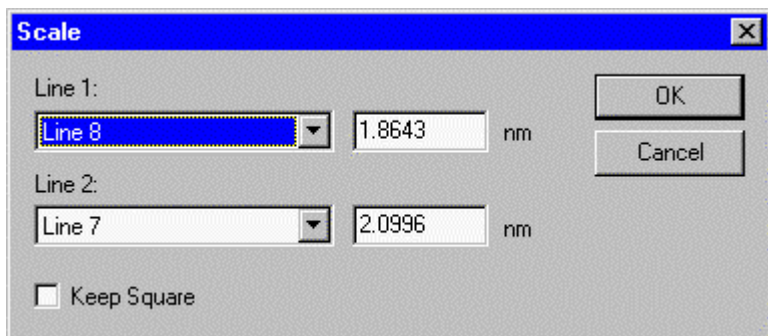
The Scale dialog with calibration data using two lines.

In the dialog that is shown, select the line in the Line 1 drop-down list box and enter its length to the right of it. If there are two lines, select the other line in the Line 2 drop-down list box and enter its length. For one line, click on the Keep square checkbox. Click OK on all dialogs. The image is now calibrated.

To make the calibration done a system calibration (functionality accessible to TIA administrators only), switch to analysis mode. From the menu select Acquire, Settings, Video. In the More Video dialog, select the Magnifications tab.
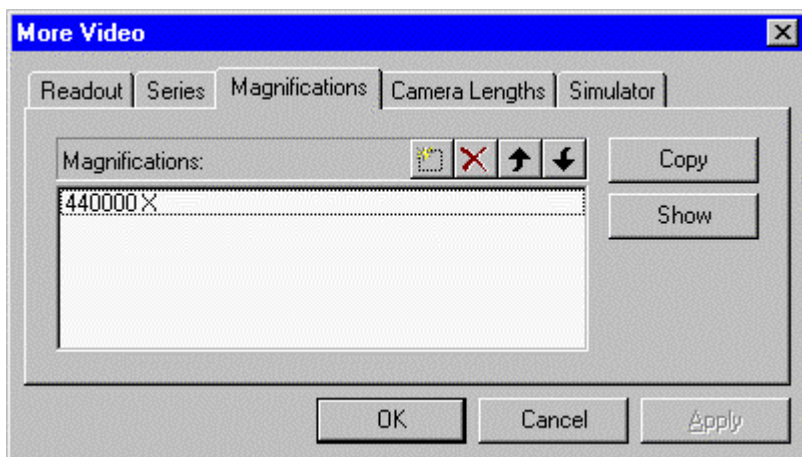
*The Magnifications tab of the More Video dialog.*

If the TEM magnification used for recording the image is already listed, click on the magnification in the list (it becomes highlighted) and press the Copy button. If the TEM magnification is not yet in the list, click on the New (Insert) button . TIA will create a new item in the list and put the cursor at the front of the line. Enter the numerical value of the TEM magnification (you do not have to enter the X) and press the Enter key on the keyboard. The value listed will be put into proper format (including the X). Click on the new value in the list (it becomes highlighted). Press the Copy button to insert the values in the calibration for the magnification. After the Copy button has been pressed the values used will be displayed.

4   TIA STEM image acquisition

4.1   STEM Image

STEM acquisition in TIA is controlled through the STEM Imaging and STEM Detector Control Panels of the Tecnai User Interface. In STEM acquisition TIA will display one or more image displays, dependent on the detector choice.

Note: All three acquisition modes (Search, Preview, Acquire) write their images into the same display, so after an image has been acquired, the data must be saved before restarting acquisition, otherwise the image acquired will be overwritten. To save the current image, you can also split the pane (see section 1.2.2) and copy the current image to the new, empty pane. You can also change the name of the display (not the image itself) and TIA will create a new display for continued acquisition.

STEM image display. At top right is displayed the detector with which the image was collected. At bottom center a scale bar is shown (in red).

Each image is properly labeled with the name of the detector. Examples:
- One detector (BF) is chosen, no displays are present yet. Acquisition of an image creates a new display, labeled Bright Field, with the STEM image in it.
- Two detectors (BF and DF) are chosen, no displays are present yet. Acquisition of the images creates two new displays, labeled Bright Field and Dark Field, with the STEM images in them.
- One detector (DF) is chosen, a BF image is already present. Acquisition of an image creates a second, new display, labeled Dark Field, with the STEM image in it.

The maximum number of image displays created automatically is thus limited by the number of detectors on the microscope (but if you rename one of the existing displays, a new one will be created when image acquisition is repeated).

4.2   Scope signal

In addition to image displays, the videoscope signal can be displayed. There are three possibilities for obtaining a scope profile (to obtain the scope display, press the Scope button in the STEM Imaging Control Panel):

- If image acquisition is active, the scope profile (a videoscope signal - a display of image intensity along a line) follows the current scan line in the image. To obtain the scope display, press the Scope button in the STEM Imaging Control Panel.
- If image acquisition is not active and no line marker has been selected, the scope profile is along a horizontal line in the center of the image.
- If image acquisition is not active and a line marker has been selected, the scope profile is along the line selected (which can be anywhere and in any orientation in the image).
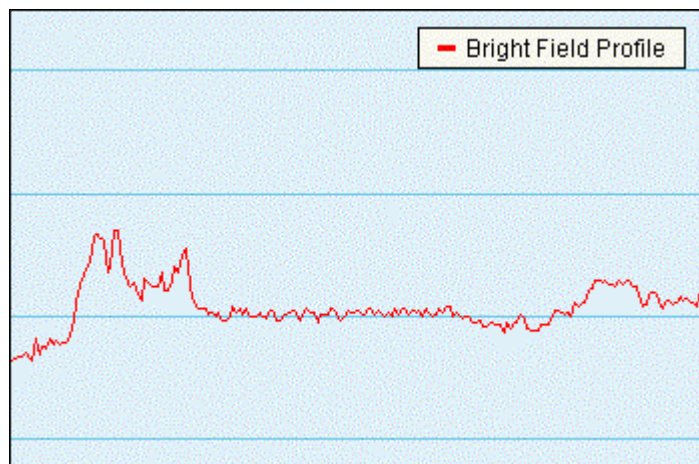
A scope display. The signal from the (BF) detector is displayed with high intensity (white) at the top and low intensity (black at the bottom). The vertical scale covers the full range of the possible detector signal (0-64000).

4.3 Calibration of STEM images

Image dimensions are in real units (µm, nm, etc.). The accuracy of these units depends on two factors, the magnification on the microscope and the image calibration in TIA. The latter can only be set by TIA administrators (these settings then become system-wide and are used by all users). If several calibrations exist, recorded at different magnifications, TIA will automatically use the value from the calibration magnification that is closest to the magnification currently on the microscope. For STEM imaging three or four calibrations spanning the whole magnification range will generally be sufficient (the change between different scan magnifications is quite accurate). Images can also be calibrated by users after acquisition (provided the image contains features that allow calibration).

To calibrate an image, insert a line marker in the image, selected via the line marker tool button ✐ . For calibration using two directions, insert another line at approximately 90° (in this case the lines should be approximately horizontal and vertical; calibration with one line at +45° and the other at -45° doesn't work properly). Click on the image with the right-hand mouse button and select Properties in the popup menu. Select the Calibration tab. Click on the Scale... button.

The Scale dialog with calibration data using one line.

In the dialog that is shown, select the line in the Line 1 drop-down list box and enter its length to the right of it. If there are two lines, select the other line in the Line 2 drop-down list box and enter its length. For one line, click on the Keep square checkbox. Click OK on all dialogs. The image is now calibrated.

To make the calibration done a system calibration (functionality accessible to TIA administrators only), switch to analysis mode. From the menu select Acquire, Settings, Scanning. In the More Scanning dialog, select the Magnifications tab.
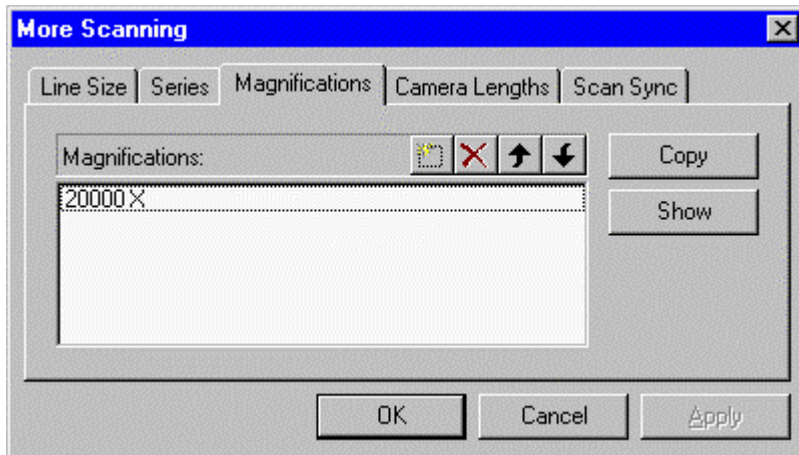
The Magnifications tab of the More Scanning dialog.

If the STEM magnification used for recording the image is already listed, click on the magnification in the list (it becomes highlighted) and press the Copy button. If the STEM magnification is not yet in the list, click on the New (Insert) button   . TIA will create a new item in the list and put the cursor at the front of the line. Enter the numerical value of the STEM magnification (you do not have to enter the X) and press the Enter key on the keyboard. The value listed will be put into proper format (including the X). Click on the new value in the list (it becomes highlighted). Press the Copy button to insert the values in the calibration for the magnification. After the Copy button has been pressed the values used will be displayed.

5 TIA EDX spectrum acquisition

5.1 EDX Spectrum

EDX spectrum acquisition in TIA is controlled through the EDX Control Panel of the Tecnai User Interface. In EDX spectrum acquisition TIA will display an EDX spectrum display.

Note: Both acquisition modes (View, Acquire) write their spectra into the same display, so after an spectrum has been acquired, the data must be saved before restarting acquisition, otherwise the spectrum acquired will be overwritten. To save the current spectrum, you can also split the pane (see section 1.2.2) and copy the current spectrum to the new, empty pane. You can also change the name of the display (not the spectrum itself) and TIA will create a new display for continued acquisition.
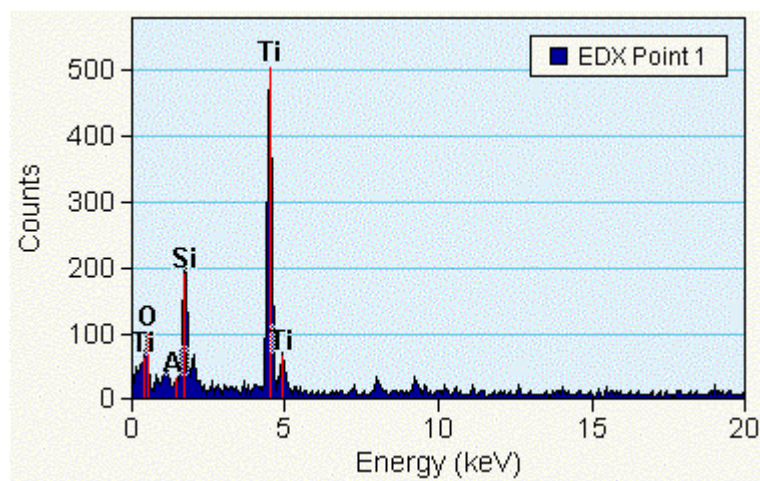
EDX spectrum display.

5.2 Manipulation of spectrum displays

The spectrum display has a vertical scale (Counts) and a horizontal scale (Energy). The scale can be manipulated as follows:

- Move the cursor over one of the scales. The cursor will change to a splitter cursor (two parallel lines with arrows on either side pointing away from the lines). Clicking with the left-hand mouse button on the scale and:
  - On the horizontal scale dragging to the right - the scale expands around the point where the scale was clicked.
  - On the horizontal scale dragging to the left - the scale contracts around the point where the scale was clicked.
  - On the vertical scale dragging up - the scale expands around the 0 count level.
  - On the vertical scale dragging down - the scale contracts around the 0 count level.
- Move the cursor over one of the scales while keeping the **Shift key** on the keyboard pressed. The cursor will change to a modified splitter cursor (one line with arrows on either side pointing away from the line). Clicking with the left-hand mouse button on the scale and:
  - On the horizontal scale dragging to the right or left - the scale shifts to the right or left.
  - On the vertical scale dragging up or down - the scale shifts up or down. The 0 count level is now displaced, but any expansion or contraction (see above) still takes place around the 0.
- Double-click anywhere on the display except on the spectrum itself and the scales (where the cursor is modified) or click with the right-hand mouse button and selecting Properties gives the Properties dialog. Select the X-Axis or Y-Axis tab and modify the Min and/or Max values of the Range. Press

Apply button to see the effect of the change immediately or press OK (then the changes are made when the dialog is closed).

The style of the display can be modified (in analysis mode, select from the menu Edit, Styles, then select Display, Normal Spectrum Display) with regard to colors (plot area, background, grid), the style of the grid lines and the visibility of the X and Y axes.

5.3   Calibration of EDX spectra

There are different systems for calibrating EDX spectra.

5.3.1   Individual spectrum calibration

Whenever a spectrum fit is done with energy calibration as a variable (accessible in analysis mode from the menu by selecting Analyze, Edit Setup, Vary energy calibration on the Fitting tab), the spectrum is automatically recalibrated during the fitting procedure.


5.3.2   System calibration

Insert a specimen into the microscope that will give clearly defined peaks suitable for calibration (a combination of Al and Cu is generally used, either as two grids together or an Al foil on a Cu grid). Set up the analysis conditions on the microscope (make sure to have no more than ~1000 counts per second for normal pulse processing times and at maximum 2000-3000 for the very short pulse processing times).

There is some dependence on the hardware present:
- For an EDAX detector with the EDAMIII (Phoenix) system, it is best to calibrate the detector in the EDAX service software for the various spectrum processing times and keep the calibration settings in TIA to an offset of 0.000 and a scale of 0.0100 kV. To set the TIA settings with a properly calibrated EDAMIII system, simply double-click on a spectrum, select the Calibration tab and enter the two numbers. For making this calibration system-wide, see below.
- For a Link (Oxford) detector with XP3 pulse processor, the six different pulse processing times (selected through a switch on the pulse-processor box) should be calibrated separately. Start with pulse processing time 4 as the default. If the hardware must be adjusted as well, first set the calibration settings in TIA to an offset of 0.000 and a scale of 0.0100 kV (double-click on a spectrum, select the Calibration tab and enter the two numbers; make this calibration system-wide for the Default dispersion as described below). Then change the hardware settings so that the spectrum peaks are present as near as possible to their true positions. After that acquire a spectrum for about 60 seconds, identify the peaks (use only the Ka peaks in the fitting) and do a fit. Make this calibration the Default system calibration (see below). Repeat the software calibration (do not change the pulse processor hardware anymore - except for the switch to the other pulse processing times) for the other pulse processing times. Save these also as system calibrations (see below) under dispersion names that make it clear which is which.

To make a calibration done a system calibration (functionality accessible to TIA administrators only), switch to analysis mode. From the menu select Acquire, Settings, EDX. In the More EDX dialog, select the Magnifications tab.
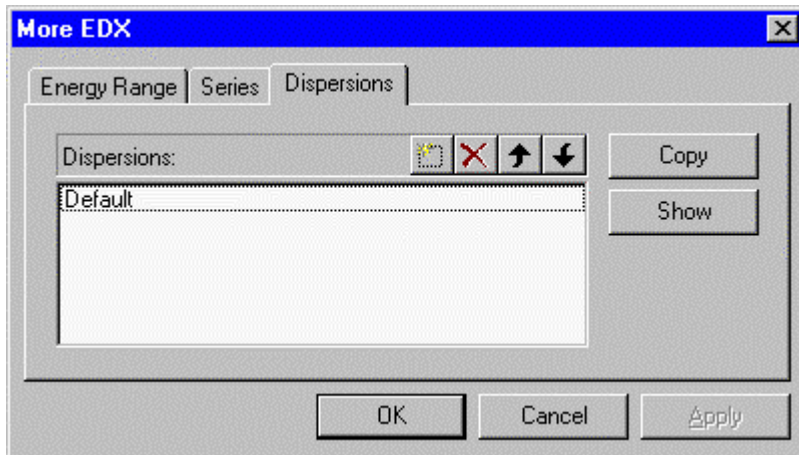
The Dispersions tab of the More EDX dialog.

If only one calibration is used (e.g. EDAX detector) , click on the Default in the list (it becomes highlighted) and press the Copy button.

If several calibrations are used for different settings, select the proper dispersion setting by clicking on it or add one. Press the Copy button to insert the values in the calibration. After the Copy button has been pressed the values used will be displayed.

To add a dispersion to the list, click on the New (Insert) button [icon] . TIA will create a new item in the list and put the cursor at the front of the line. Enter the name of the new dispersion and press the Enter key on the keyboard. Click on the new item in the list (it becomes highlighted).

6 TIA PEELS spectrum acquisition

6.1 PEELS Spectrum

PEELS spectrum acquisition in TIA is controlled through the PEELS Control Panel of the Tecnai User Interface. In PEELS spectrum acquisition TIA will display a PEELS spectrum display.

Note: Both acquisition modes (View, Acquire) write their spectra into the same display, so after an spectrum has been acquired, the data must be saved before restarting acquisition, otherwise the spectrum acquired will be overwritten. To save the current spectrum, you can also split the pane (see section 1.2.2) and copy the current spectrum to the new, empty pane. You can also change the name of the display (not the spectrum itself) and TIA will create a new display for continued acquisition.
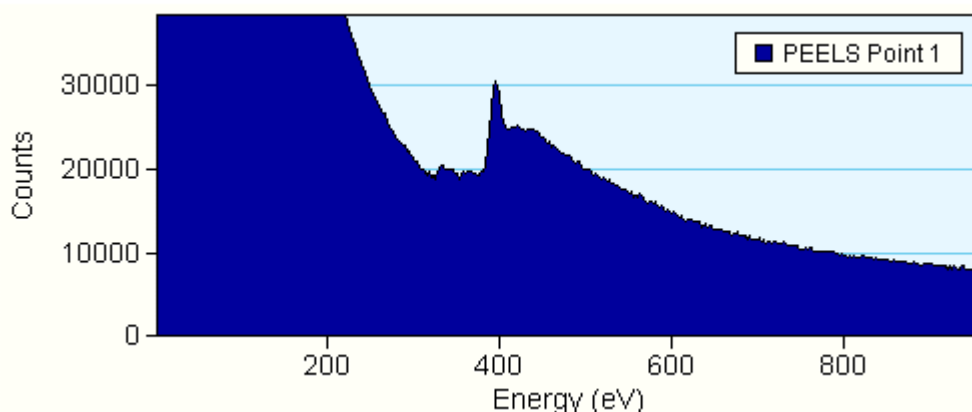
PEELS spectrum display.

6.2 Manipulation of spectrum displays

The spectrum display has a vertical scale (Counts) and a horizontal scale (Energy). The scale can be manipulated as follows :
- Move the cursor over one of the scales. The cursor will change to a splitter cursor (two parallel lines with arrows on either side pointing away from the lines). Clicking with the left-hand mouse button on the scale and:
  - On the horizontal scale dragging to the right - the scale expands around the point where the scale was clicked.
  - On the horizontal scale dragging to the left - the scale contracts around the point where the scale was clicked.
  - On the vertical scale dragging up - the scale expands around the 0 count level.
  - On the vertical scale dragging down - the scale contracts around the 0 count level.
- Move the cursor over one of the scales while keeping the **Shift key** on the keyboard pressed. The cursor will change to a modified splitter cursor (one line with arrows on either side pointing away from the line). Clicking with the left-hand mouse button on the scale and:
  - On the horizontal scale dragging to the right or left - the scale shifts to the right or left.
  - On the vertical scale dragging up or down - the scale shifts up or down. The 0 count level is now displaced, but any expansion or contraction (see above) still takes place around the 0.
- Double-click anywhere on the display except on the spectrum itself and the scales (where the cursor is modified) or click with the right-hand mouse button and selecting Properties gives the Properties dialog. Select the X-Axis or Y-Axis tab and modify the Min and/or Max values of the Range. Press Apply button to see the effect of the change immediately or press OK (then the changes are made when the dialog is closed).

The style of the display can be modified (in analysis mode, select from the menu Edit, Styles, then select Display, Normal Spectrum Display) with regard to colors (plot area, background, grid), the style of the grid lines and the visibility of the X and Y axes.

6.3   Calibration of PEELS spectra

6.3.1   Individual spectrum calibration

If the **spectrum is single** (not one of a series) and the **dispersion is correct** (the eV/channel) :
- Select the Calibration shift tool 🔧 .
- Click on the spectrum.
- Shift the spectrum to where it should be on the energy scale.

If the **spectrum is one of a series** and the **dispersion is correct** (the eV/channel) :
- Click with the right-hand mouse button on the PEELS spectrum display (not on the spectrum itself).
- Select Unhide Objects from the popup menu.
- Select the Acquire PEELS Point 1 object.
- Select the Calibration shift tool 🔧.
- Click on the spectrum (this now is the Acquire PEELS Point 1 spectrum)
- Shift the spectrum to where it should be on the energy scale.
- Click with the right-hand mouse button on the spectrum and select Hide Object.
- Now the whole series of spectra has been recalibrated.

If the **spectrum is single** (not one of a series) and the **dispersion is not correct** (the eV/channel) :
- Switch to analysis mode.
- Select the Calibration shift tool 🔧 .
- Click on the spectrum at a known edge (the position is important because it defines the point around which the stretch of the spectrum in the next steps is done).
- Shift the spectrum to where it should be on the energy scale.
- Select the Calibration scale tool.
- Click on the spectrum at another know edge.
- Shift this edge to where it should be on the energy scale (the spectrum will be stretched or compressed around the position used for the calibration shift).

If the **spectrum is one of a series** and the **dispersion is not correct** (the eV/channel) :
- Click with the right-hand mouse button on the PEELS spectrum display (not on the spectrum itself).
- Select Unhide Objects from the popup menu.
- Select the Acquire PEELS Point 1 object.
- Select the Calibration shift tool 🔧 .
- Click on the spectrum (this now is the Acquire PEELS Point 1 spectrum) at a known edge (the position is important because it defines the point around which the stretch of the spectrum in the next steps is done).
- Shift the spectrum to where it should be on the energy scale.
- Select the Calibration scale tool and click on the spectrum at another know edge.
- Shift this edge to where it should be on the energy scale (the spectrum will be stretched or compressed around the position used for the calibration shift).
- Shift the spectrum to where it should be on the energy scale.
- Click with the right-hand mouse button on the spectrum and select Hide Object.
- Now the whole series of spectra has been recalibrated.

6.3.2   System calibration

Insert a specimen into the microscope that will give a clearly defined edge suitable for calibration (nickel-oxide is generally used). Set up the analysis conditions on the microscope and collect a spectrum. Calibrate as described above.

To make a calibration done a system calibration (functionality accessible to TIA administrators only), switch to analysis mode. From the menu select Acquire, Settings, PEELS. In the More PEELS dialog, select the Dispersions tab.
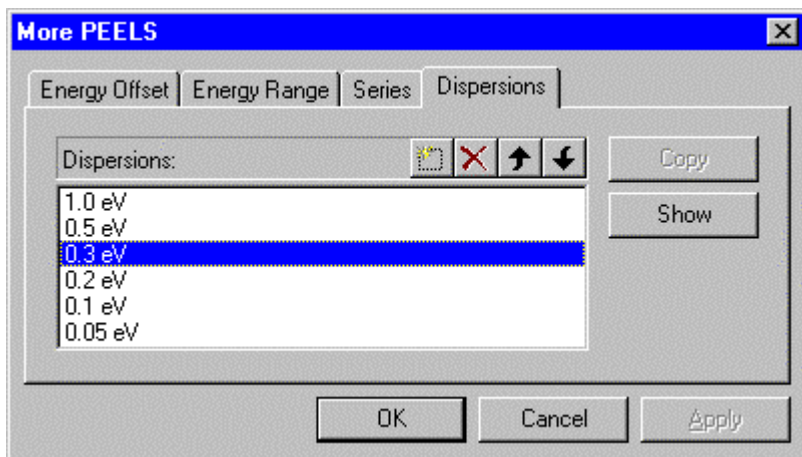
The Dispersions tab of the More PEELS dialog.

Select the proper dispersion setting by clicking on it or add one. Press the Copy button to insert the values in the calibration. After the Copy button has been pressed the values used will be displayed.

To add a dispersion to the list, click on the New (Insert) button [ ] . TIA will create a new item in the list and put the cursor at the front of the line. Enter the name of the new dispersion and press the Enter key on the keyboard. Click on the new item in the list (it becomes highlighted).