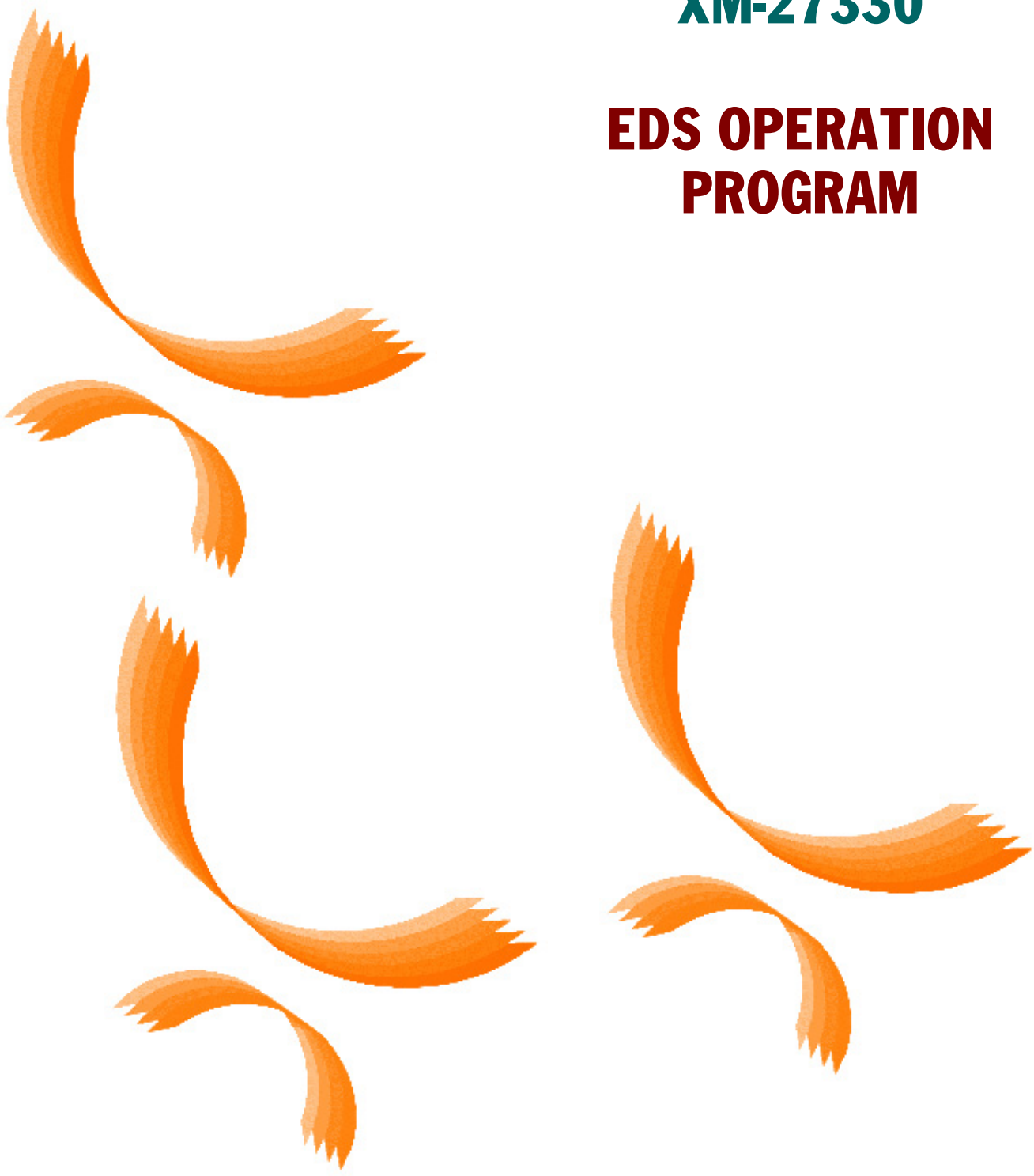
C

CONTENTS

XM-27330

EDS OPERATION PROGRAM



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NOTATIONAL CONVENTIONS AND GLOSSARY

General notations

⚠ **WARNING :**	A potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ **CAUTION :**	A potentially hazardous situation which, if not avoided, could result in minor injury or material damage. Material damage includes, but is not limited to, damage to related devices and facilities, and acquired data.
– CAUTION – :	Points where great care and attention is required when operating the device to avoid damage to the device itself.
✍ :	Additional points to be remembered regarding the operation.
☞ :	A reference to another section, chapter or manual.
1, **2**, **3** :	Numbers indicate a series of operations that achieve a task.
◆ :	A diamond indicates a single operation that achieves a task.
File:	The names of menus, or commands displayed on the screen, and those of buttons of the instrument, are denoted with **bold** letters.
File–Exit :	A command to be executed from a pulldown menu is denoted by linking the menu name and the command name with a dash (–). For example, **File–Exit** means to execute the **Exit** command by selecting it from the **File** menu.

Mouse operation

Mouse pointer:	An arrow-shaped mark displayed on the screen, which moves with the movement of the mouse. It is used to specify a menu item, command, parameter value, and other items. Its shape changes according to the situation.
Click:	To press and release the left mouse button.
Right-click:	To press and release the right mouse button.
Double-click:	To press and release the left mouse button twice quickly.
Drag:	To hold down the left mouse button while moving the mouse.

CONTENTS

1 GENERAL

This program is used to acquire EDS (energy dispersive spectrometer) spectra, to display data in realtime, to identify elements, and to perform semi-quantitative analysis.

The program can simultaneously display the contents of two of the four data memories that are used in storage of EDS-spectrum data.

EDS map analysis images are displayed using the ROI (region of interest) output which is set up with this program.

☞ For information on various kinds of settings and calibrations for EDS detectors and EDS analyzers, refer to the separate instruction manual, “EDS Calibration Program”.

2 SPECIFICATIONS

- EDS data acquisition

  Setting preset conditions for data acquisition

Full scale energy:	20 keV	
Number of spectrum data:	2 kch	
Measurement time:	Live time	1 to 65535 sec
	Real time	1 to 65535 sec
	ROI integral value	1 to 65535 kcnt
	"Unlimited" can be specified.	
Aperture number designation:	1 to 6 (1: open; 6: closed)	

  Starting and stopping of data acquisition

- Spectrum display: Spectrum enlargement/reduction (selectable)
  Spectrum display format (select vector, dot, or bar)
  Spectrum/background colors (select from 16 colors)
- Periodic table/KLM marker display: Element name, atomic number, and peak label can be displayed.
- ROI setting/display

Maximum number of ROIs that can be set:	127
Number of colors for ROI:	8
Number of outputs for map analysis:	8 or 16
ROI integral:	Displayed as net or gross value

- Data management

Spectrum data:	Read, store and delete data, and display directory
Acquisition condition data:	Read, store and delete data, and display directory
Standard profile data:	Read and delete data, and display directory

- Spectral calculations: Spectrum copying, four arithmetic operations with constants, addition/subtraction of two spectra, smoothing, second derivative, top-hat filtering, escape peak correction, detector efficiency correction, peak separation
- Spectrum peak identification: Possible
- Automatic qualitative analysis: Possible
- Semi-quantitative analysis: Possible
- Spectrum search: Possible

3 EDS HOME WINDOW

The EDS Home Window allows most EDS operations to be carried out.

3.1 Displaying and Closing the EDS Home Window

The procedures below display and close the EDS Home Window.

3.1.1 Displaying the EDS Home Window

1. Click on the **EDS** icon in the EPMA Main Menu window.
The EDS menu appears as shown in Fig. 1.

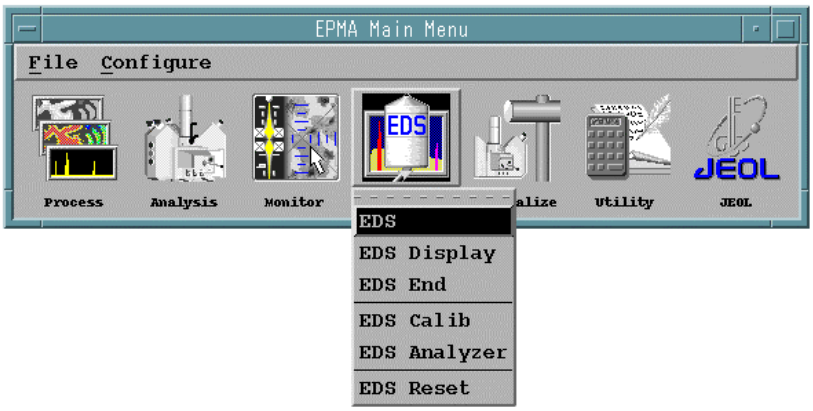

Fig. 1 EPMA Main Menu and EDS menu

2. Select **EDS** from the EDS menu.
The EDS Home Window appears as shown in Fig. 2.

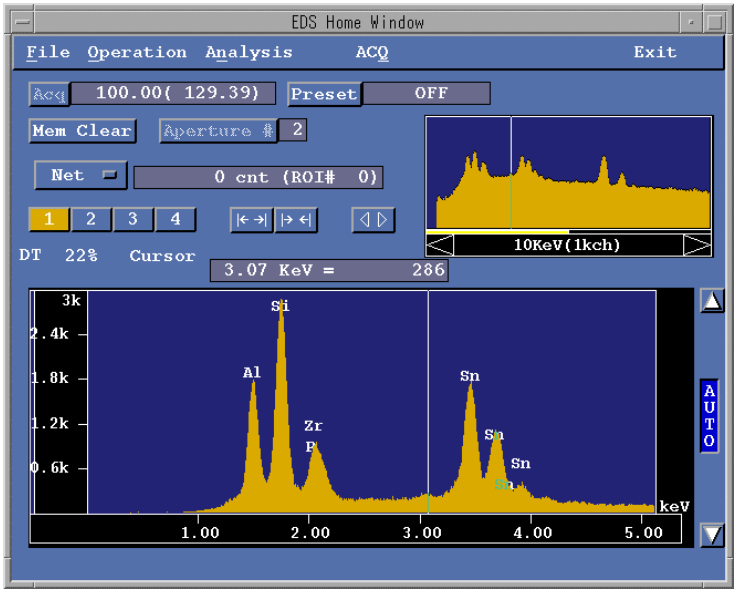

Fig. 2 EDS Home Window

3.1.2 Closing the EDS Home Window

◆ Click on the **Exit** button in the EDS Home Window.
The EDS Home Window closes.

✍ When you click on the **Exit** button during measurement, a confirmation dialog box appears, to ask you whether or not you really want to terminate the measurement.

3.1.3 Forcibly closing the EDS Home Window

■ If problems develop for some reason while the software is running

1. Click on the **EDS** icon in the EPMA Main Menu window.
The EDS menu appears as shown in Fig. 1.
2. Select **EDS End** from the EDS menu.
The EDS operation program will be forcibly closed.

3.1.4 Displaying the EDS Home Window for data processing

◆ Select **EDS Display** from the EDS menu.
The EDS Home Window appears, allowing you to process the EDS spectrum during data acquisition.

3.1.5 EDS Calibration

◆ Select **EDS Calibration** from the EDS menu.
The EDS Calibration window opens. Usually, users do not need to use it.

3.1.6 EDS Analyzer

◆ Select **EDS Analyzer** from the EDS menu.
The EDS Analyzer Main window opens, letting you monitor the status of EDS detectors.

☞ For details, refer to the separate instruction manual, “EDS Calibration Program”.

3.1.7 EDS Reset

◆ Select **EDS Reset** from the EDS menu.
The Confirmation window opens, allowing you to initialize the EDS Operation Program when the EDS function becomes abnormal for some reason.

☞ For instructions on how to use it, refer to Sect. 4.11, “Initialization of the EDS program”.

3.2 Functions of EDS Home Window

The EDS Home Window consists of an operation area having buttons and parameter-input boxes, and a spectrum-display area.
The functions of each area are as follows.

☞ Refer to the separate instruction manual, “EDS Calibration Program” for details.

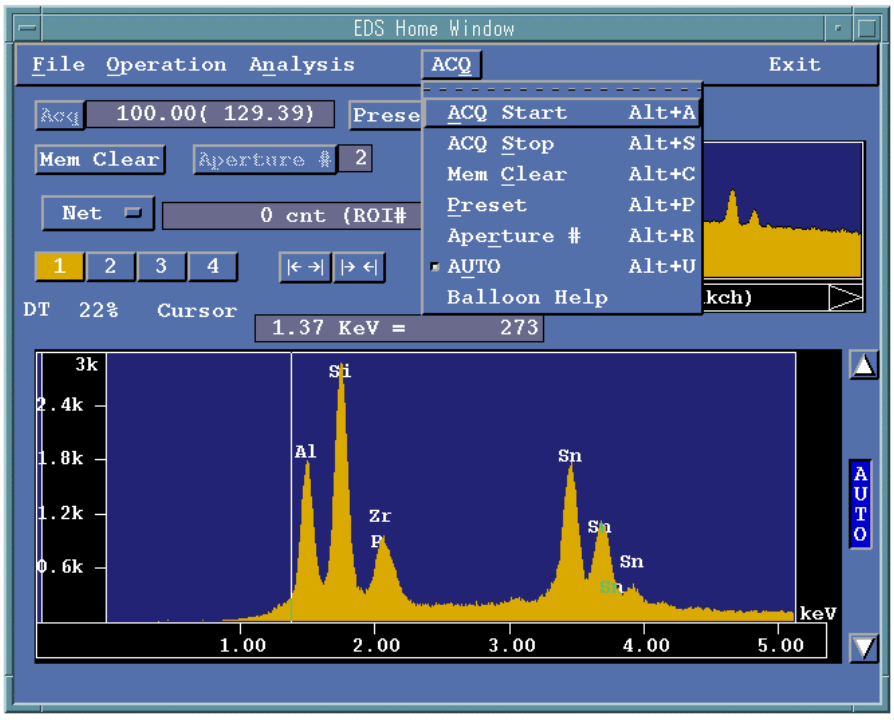

Fig. 3 Functions of EDS Home Window

3.2.1 Operation area having buttons and parameter-input boxes

The functions provided in the operation area of the EDS Home Window are as follows.

Object	Function
File	Selecting **File**–**Sample** displays the Sample window, in which you can specify the group name and sample name for the EDS spectrum data to be stored.
Operation	Clicking on **Operation** displays the Operation menu. Select one of the following menu items by positioning the pointer on the menu item and clicking the mouse button).
Display Mode	Selecting this item displays the Display Mode window, in which you can designate the display format.
Periodic Table	Selecting this item displays the Periodic Table KLM Marker window. When you designate an element name in this window, the marker lines and element name are displayed on the corresponding peak positions.

Object	Function
Peak ID	Selecting this item displays the Peak ID window. Element names and kinds (lines) of X-rays are automatically determined for each detected peak of the EDS spectrum.
Condition	Selecting this item displays a menu. By clicking on the desired item, you can delete, load, and save EDS measurement-condition files.
STD Profile	Selecting this item displays the STD Profile Directory window, in which you can read, delete and search profile data, load original sample data, and generate new profile data.
Spectra ROI	Selecting this item displays the ROI window for setting/canceling of ROIs.
Analysis	Selecting this item displays the Analysis menu (refer to ■Analysis menu). Several functions are provided in the menu.
Search	Selecting this item searches for a spectrum that best fits the displayed spectrum.
Parameter List	Selecting this item displays the Parameter List window, which displays the attribute information of the EDS spectrum stored in the front data memory.
Print	Selecting this item prints the information shown in the window.
Window Size	Selecting this item allows you to select the window size using the **L**/**M**/**S** buttons.
Analysis	Clicking on **Analysis** in the EDS Home Window displays the Analysis menu (refer to ■Analysis menu).
Exit	Clicking on this button terminates the EDS Home Window.
Acq	Clicking on this button performs EDS measurement with the EDS measurement preset conditions set in the Preset window.
Preset	Clicking on this button displays the Preset window, in which you can set the preset conditions (full-scale value of measurement, measurement mode, etc.). During measurement, you cannot click on this button.
Mem Clear	Clicking on this button clears the displayed spectrum.
Aperture #	Clicking on this button displays the Aperture window, in which you can specify the aperture to be used.
Cursor box	Clicking on any point on the spectrum displays in the box the energy value and counts at that point.
Gross/**Net**	When ROI is specified, you can switch between total counts and net counts.
Data memory **1**, **2**, **3**, **4** buttons	Select the spectrum to be displayed. Left clicking displays the front memory, and right clicking, the back memory.
Spectrum enlargement/ reduction buttons	Allows you to enlarge and reduce the spectrum.

Analysis menu

◆ Select **Analysis** from the **Operation** menu in the EDS Home Window.

A menu appears as shown in Fig. 4.

✍ Selecting **Analysis** in the EDS Home Window also displays the same menu.

The function of each menu item is as follows.

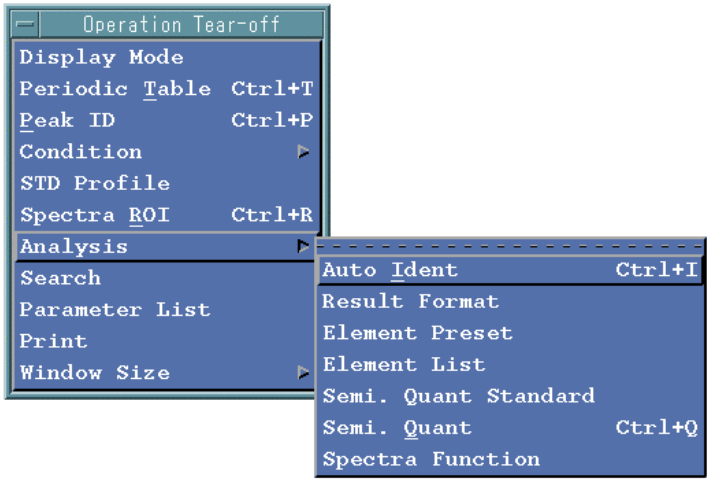

Fig. 4 Analysis menu

Menu item	Function
Auto Ident	Selecting this item applies the automatic qualitative analysis function to the spectrum displayed in the EDS Home Window and displays the Qualitative Result window. This function can also be executed using Ctrl + I when the cursor is on the spectrum.
Result Format	Selecting this item displays the Result Format window. In this window, you can specify the format for outputting results of the automatic qualitative analysis or semi-quantitative analysis.
Element Preset	Selecting this item allows you to specify elements to be included in and elements to be excluded from the semi-quantitative analysis.
Element List	Selecting this item displays the Element List window. You can specify an element list for the semi-quantitative analysis in this window.
Semi. Quant Standard	Selecting this item allows you to specify elements to be used as standard samples in the semi-quantitative analysis.
Semi. Quant	Selecting this item displays the Semi Quantitative Result window. The semi-quantitative analysis can be executed. This function can also be executed using Ctrl + Q when the cursor is on the spectrum.
Spectra Function	Selecting this item displays the Spectra Calc window, in which mathematical operations are applied to EDS spectra.

Context menu

When the cursor is on the spectrum, right clicking displays a menu, allowing rapid operation.

Keyboard short-cuts

Some menu items can be directly displayed by keystrokes.

☞ Refer to Sect. 4.2.4 “EDS acquisition and operations on a spectrum using the keyboard” for details.

3.2.2 Spectrum-display area

An EDS spectrum, spectrum information, and spectrum cursor information are displayed on the EDS Home Window (Fig. 3).

Spectrum

Two spectrum-display modes, Full spectrum (displayed at the upper right of the EDS Home Window) and Partial spectrum (in which enlargement and reduction are possible) are provided in the EDS Home Window.

- Full spectrum
  The entire spectrum is displayed on a log/linear graph. The part of the spectrum being enlarged is indicated with a horizontal bar.
- Partial spectrum
  Clicking on the H-Scale buttons allows you to specify the part of the spectrum to be enlarged. The full-scale value of the vertical axis can be changed in 19 steps from 20 counts to 20 million counts (cnt).

Spectrum information

The window shows the following information about the presently displayed spectrum.

- Full scale value (for all channels)
- Preset mode (“**Off**” if preset is off)
- Preset value (Units for display are seconds for Live Time and Real Time in the Preset mode and kcnt (kilo counts) for ROI count.)
- Live Time
- Real Time
- Dead Time (number)
- Dead Time (bar)

Spectrum cursor information

The spectrum cursor is a vertical line drawn on the Partial spectrum. You can drag the spectrum cursor to any energy on the graph by using the mouse. The following information about the spectrum cursor is displayed.

- Energy at the cursor position
- Number of counts at the cursor position
- ROI accumulation mode (**Gross** or **Net**)
- ROI number (only when ROIs are set)
- ROI integrated value (only when ROIs are set)

4 MEASUREMENT OPERATION

4.1 Measurement

4.1.1 Setting EDS measurement preset conditions

◆ Click on the **Preset** button in the EDS Home Window.

The Preset window opens as shown in Fig. 5. The Preset window allows you to preset measurement conditions such as full scale, and measurement mode. The full-scale energy is 20 keV and number of channels 2 kch (kilo channels).

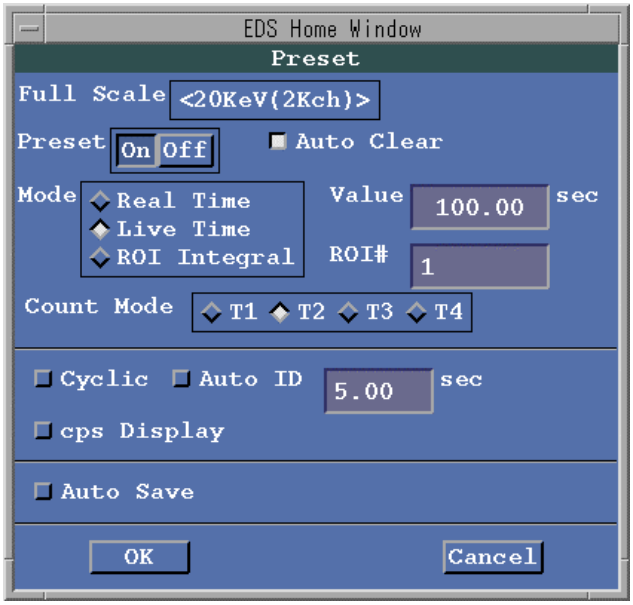

Fig. 5 Preset window

Follow the procedure below to preset measurement conditions.

1. Click on the **Preset**–**On** or **Off** button to enable or disable the specification of measurement mode and measurement time.

✍ Clicking on the **Preset**–**Off** button cancels preset conditions. Data acquisition, once it is started in this condition, will continue until it is forced to terminate. When **Auto Clear** is clicked on, the spectrum is automatically cleared before acquisition.

2. Click on the **Real Time**, **Live Time**, or **ROI Integral** button to specify the desired measurement mode.

✍ The measurement mode is in effect when **Preset** is **On**. Usually, click on **Live Time**.

3. In the **Value** input box, enter the measurement time for each measurement mode (1 to 65535 seconds for **Real Time** and **Live Time**; ROI number and 1 to 65535 kilo counts for **ROI Integral**). For the ROI Integral value, the ROI must have been set in advance, according to Sect. 4.4 “Setting/Clearing ROI (Region of Interest)”.

✍ Usually, specify several tens to several hundreds of seconds of measurement time for **Live Time**. The longer the measurement time, the higher the precision of element identification or semi-quantitative analysis.

4. Select the count mode.

When accuracy is important as in quantitative analysis, click on **T3** or **T4**. When you want to get more counts as in area analysis, click on **T1** or **T2**.

5. Use the following buttons if you find it necessary to use them.

- **Cyclic**

  The **Cyclic** mode is used for sample hunting. In this mode, the spectrum is cleared and measurement is repeated whenever the time in the right column elapsed, thus letting you ascertain the features of the spectrum.

- **Auto ID**

  When the **Auto ID** button is clicked on, peak identification and element labeling on the spectrum are executed every specified time.

- **cps Display**

  The **cps Display** mode displays the spectrum with average number of counts per second regardless of accumulation time.

  In this mode, the spectrum height does not grow with acquisition time but the spectrum shape becomes smoother with time. This mode is used when the spectrum is to be compared with other spectra, which might have different measurement times.

- **Auto Save**

  The **Auto Save** mode stores the present spectrum automatically when you are acquiring spectra continuously.

  Clicking on the **Auto Save** button opens a window where the group name in which the spectrum is to be stored, sample name, number and comments are to be entered. Spectra are saved according to the settings in this window before another new spectrum is acquired. The number is automatically incremented by one.

6. Click on the **OK** button.

The system is set to the preset conditions.

7. Click instead on the **Cancel** button if you want to cancel the preset conditions.

The preset conditions are abandoned.

4.1.2 Starting measurement

◆ Click on the **Acq** button in the EDS Home Window.

EDS measurement begins under the conditions preset in Sect. 4.1.1.

When the measurement has started, the **Acq** button turns red, indicating that the measurement is underway. During measurement, the EDS Home Window displays the EDS spectrum in real time, together with **DT** (dead time), and real time/live time.

Before EDS measurement starts, you can use the dead time bar to set the probe current and the EDS aperture. The usual setting of the dead time for EDS measurement is between 20% and 30%.

Clicking on the **Mem Clear** button during measurement clears the spectrum and cancels the acquisition results.

When the measurement is completed, the **Acq** button returns to its original color. If you want to interrupt the measurement, click on the **Acq** button.

4.1.3 Saving EDS spectrum

◆ In order to store an obtained EDS spectrum in a file, select **Sample** from the **File** menu in the EDS Home Window.

The Sample window opens as shown in Fig. 6. In this window, specify the group name and sample name for the data.

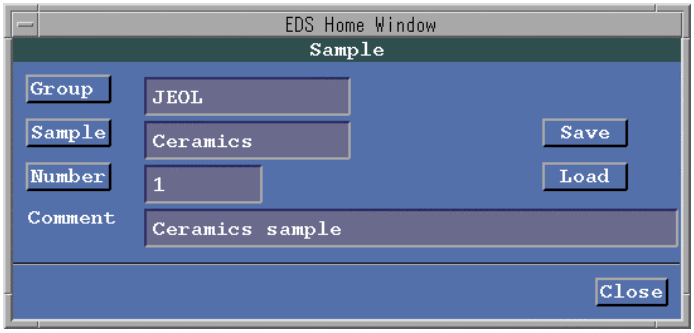

Fig. 6 Sample window

● **Setting group name**

1. Click on the **Group** button in the Sample window.

The Spectrum Group Directory window opens as shown in Fig. 7. In this window, the existing group names are listed.

Fig. 7 Spectrum Group Directory window

2. Select the desired group name from the list.

If you want to enter a new group name, type it in the **Group** input box in the Sample window.

(Up to 14 alphanumeric characters and underscores "_" are acceptable in a sample name.)

- **Setting sample name**

  1. Click on the **Sample** button in the Sample window.

     The Spectrum Sample Directory window opens. In this window, the existing sample names will be listed.

  2. Select the desired sample name from the list.

     If you want to enter a new sample name, type it in the **Sample** input box in the Sample window.

     (Up to 14 alphanumeric characters including underscores "_" are acceptable in a sample name.)

- **Setting number**

  1. Click on the **Number** button in the Sample window.
  2. Type the sample number in the **Number** input box, being careful not to duplicate the number.

     Numbers can be from 1 to 10000.

- **Entering comment**

  - You can type a comment of up to 40 characters in the **Comment** input box.

- **Saving the EDS spectrum**

  - Click on the **Save** button in the Sample window.

    The EDS spectrum is saved in a file with the specified group name and sample name. If a spectrum data file having this number already exists, a confirmation window appears before the present EDS spectrum is saved.

4.1.4 Displaying EDS spectrum

1. As when saving the EDS spectrum, select the group name and sample name first, and then click on the **Number** button.

   The Spectrum Directory window opens as shown in Fig. 8.

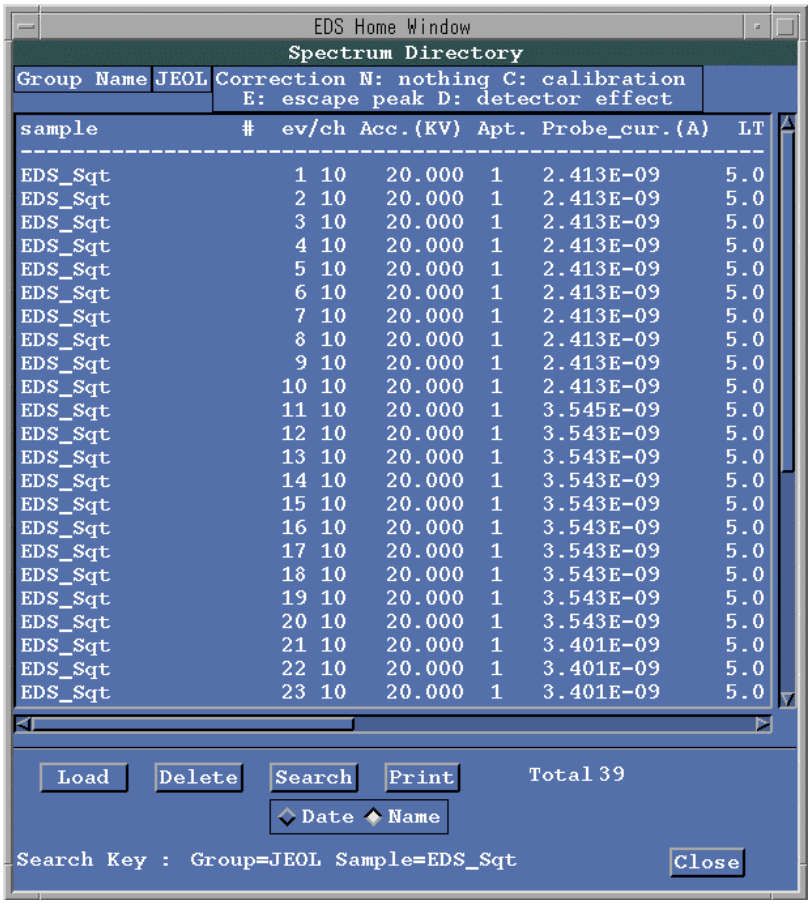

Fig. 8 Spectrum Directory window

2. Select the spectrum you want to display.

3. Click on the **Load** button.
The Sample Load window opens as shown in Fig. 9.

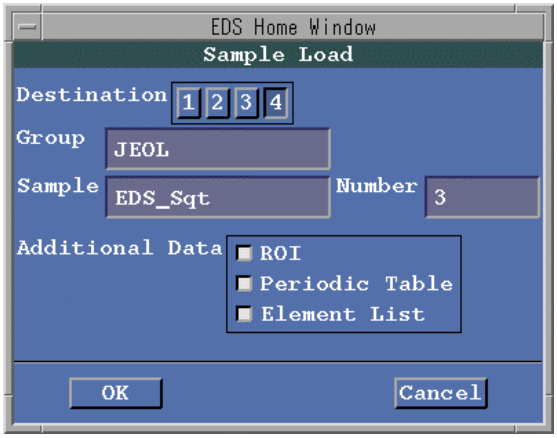

Fig. 9 Sample Load window

4. Select a display memory from **1** to **4** in **Destination**.

5. Select any desired buttons from the **ROI**, **Periodic Table**, and **Element List** buttons, if necessary.
The ROI information, periodic table and element list can be loaded at the same time.

6. Click on the **OK** button.
The spectrum is displayed in the specified memory.

4.2 Displaying Spectra

4.2.1 EDS spectrum data memory

There are four data memories for storage of EDS spectra. The contents of up to two data memories can be displayed at the same time.

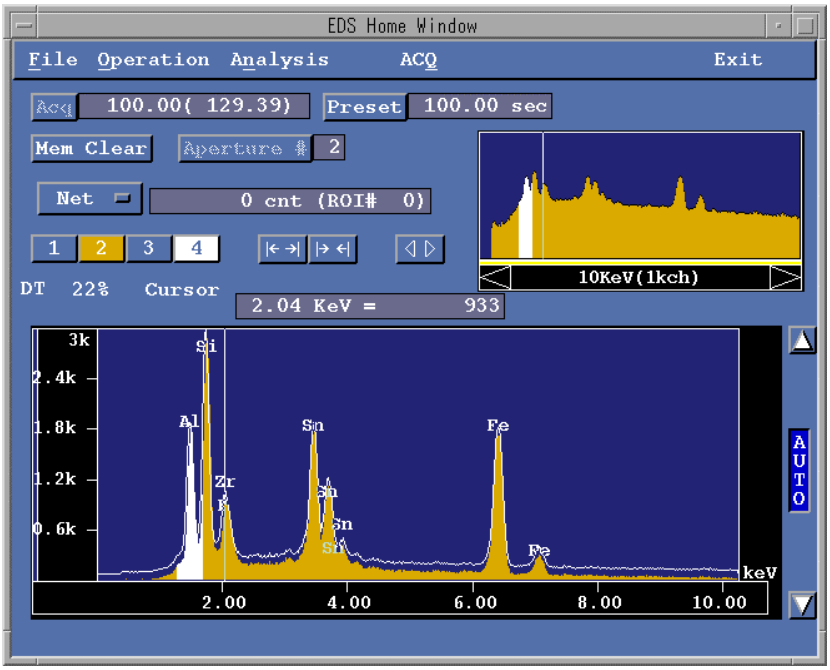

Fig. 10 Correlation between spectra and data memory

Fig. 10 shows two spectra. The spectrum shown painted has its data stored in the front data memory. The spectrum displayed as a line graph has its data stored in the back data memory.

The front data memory is used for measuring EDS spectra and storing spectrum data.

To switch between blocks of the front data memory, bring the cursor to the **1**, **2**, **3**, or **4** button in the EDS Home Window, then click the left mouse button. Clicking the right mouse button designates the back data memory.

When the spectrum data stored in the front data memory and the one stored in the back data memory are displayed simultaneously, you may click the right mouse button on the memory number whose front data is being displayed or the left mouse button on the memory number whose back data is being displayed. Then, the front and back data memory numbers exchange and the displayed spectra exchanges accordingly.

4.2.2 Enlarging/reducing a spectrum

A spectrum can be enlarged or reduced by the following methods.

- **Horizontal scale**

  Using the enlarge/reduce buttons, change the energy range on the horizontal scale to enlarge or reduce the spectrum.
  - Clicking on the enlarge button  enlarges the spectrum, using the present cursor position as the center.
  - Clicking on the reduce button  reduces the spectrum, using the present cursor as the center.

- **Vertical scale**

  Set the vertical scale for the displayed spectrum.
  - Clicking on the ▼ button increases the numerical range of the vertical scale, thereby reducing the spectrum.
  - Clicking on the ▲ button decreases the numerical range of the vertical scale, thereby enlarging the spectrum.

    The full scale is variable from 20 counts to 20 M (million) counts.

- **Setting the vertical scale automatically**

  Clicking on the **AUTO** button automatically sets the vertical scale so that the maximum value of the displayed spectrum is displayed within the area. Another clicking on the **AUTO** button cancels the automatic setting.

  When you change the vertical scale by clicking on the vertical scale's enlarge/reduce icon after the vertical scale is set automatically, the automatic setting of the vertical scale is canceled.

4.2.3 Operating the spectrum cursor

You can read the energy value and X-ray count at any position of the spectrum by positioning the spectrum cursor there.

To position the spectrum cursor, click at the desired position on either the full spectrum display (the spectrum displayed in the upper right of Fig. 10) or the partial spectrum display (the spectrum displayed at the bottom of Fig. 10).

When ROIs are set for the spectrum, you can read the number and count value of the desired ROI by positioning the spectrum cursor in that ROI. Clicking on the **Net** button in the EDS Home Window displays the net intensity of the ROI integral, and clicking on the **Gross** button displays the gross value of the ROI integral (the integrated value over the entire ROI).

The cursor is moved toward the left or right by left clicking or right clicking the cursor button  respectively. Use this feature for fine adjustment of the cursor position.

4.2.4 EDS acquisition and operations on a spectrum using the keyboard

Sect. 4.2.3 explained operation using the mouse.
When the mouse cursor is positioned on an EDS spectrum, the spectrum can be directly operated on by using the keyboard. The following keyboard operations are possible.

"Alt+" means pressing and releasing the specified key while holding down the Alt key. Holding down the Shift key while moving the spectrum or cursor increases the amount of movement.

Keyboard	Function
Alt+A	Start acquisition
Alt+S	Stop acquisition
Alt+C	Clear the memory
Alt+P	Open the Element Preset window
Alt+R	Open the Aperture window
Alt+U	Change the vertical axis Automatic/Manual
Ctrl+T	Open the Periodic Table KLM Marker window
Ctrl+P	Open the Peak ID window
Ctrl+R	Open the ROI window
Ctrl+I	Execute automatic qualitative analysis
Ctrl+Q	Execute semi-quantitative analysis
Right/left keys	Move the cursor right/left
Up/down keys	Increase/decrease full scale value when the vertical scale is set to manual

Keypad keys allow the following operations.

Keypad	Functions
+	Expand the horizontal axis with the cursor as the center
–	Reduce the horizontal axis with the cursor as the center
1	Shift spectrum right in the partial spectrum display
3	Shift spectrum left in the partial spectrum display
4	Reduce KLM marker atomic number
6	Increment KLM marker atomic number

4.2.5 Parameters

◆ Select **Parameter List** from the **Operation** menu in the EDS Home Window.

The Parameter List window opens as shown in Fig. 11.
This window shows the supplementary information on the EDS spectrum stored in the front data memory.

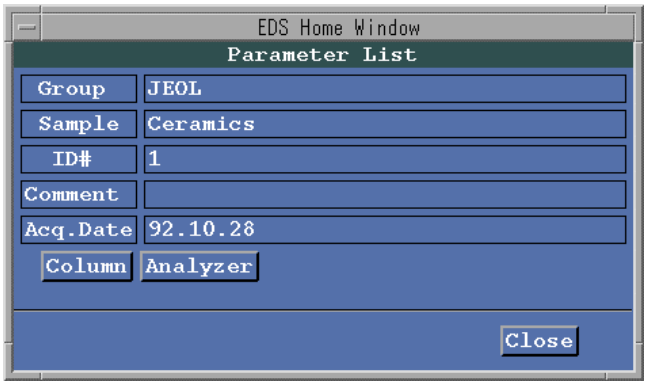

Fig. 11 Parameter List window

The Parameter List window shows the group name, sample name, ID number, comment, and date of data acquisition. For more detailed information, click on the **Column** button or the **Analyzer** button.

● **Column button**

◆ Click on the **Column** button.

The Column Parameter window opens. The information on the EPMA basic unit, such as the accelerating voltage and probe current, as well as the information on the stage, is displayed, as shown in Fig. 12.

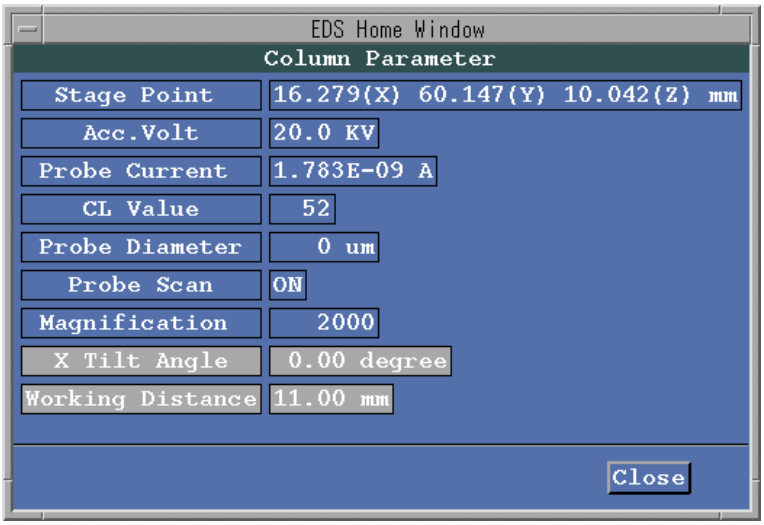

Fig. 12 Column Parameter window

Analyzer button

- Click on the **Analyzer** button.

  The Analyzer window opens. The information on the EDS subsystems, such as the linear amplifier and the ADC, as well as the information on the detector, is displayed, as shown in Fig. 13.

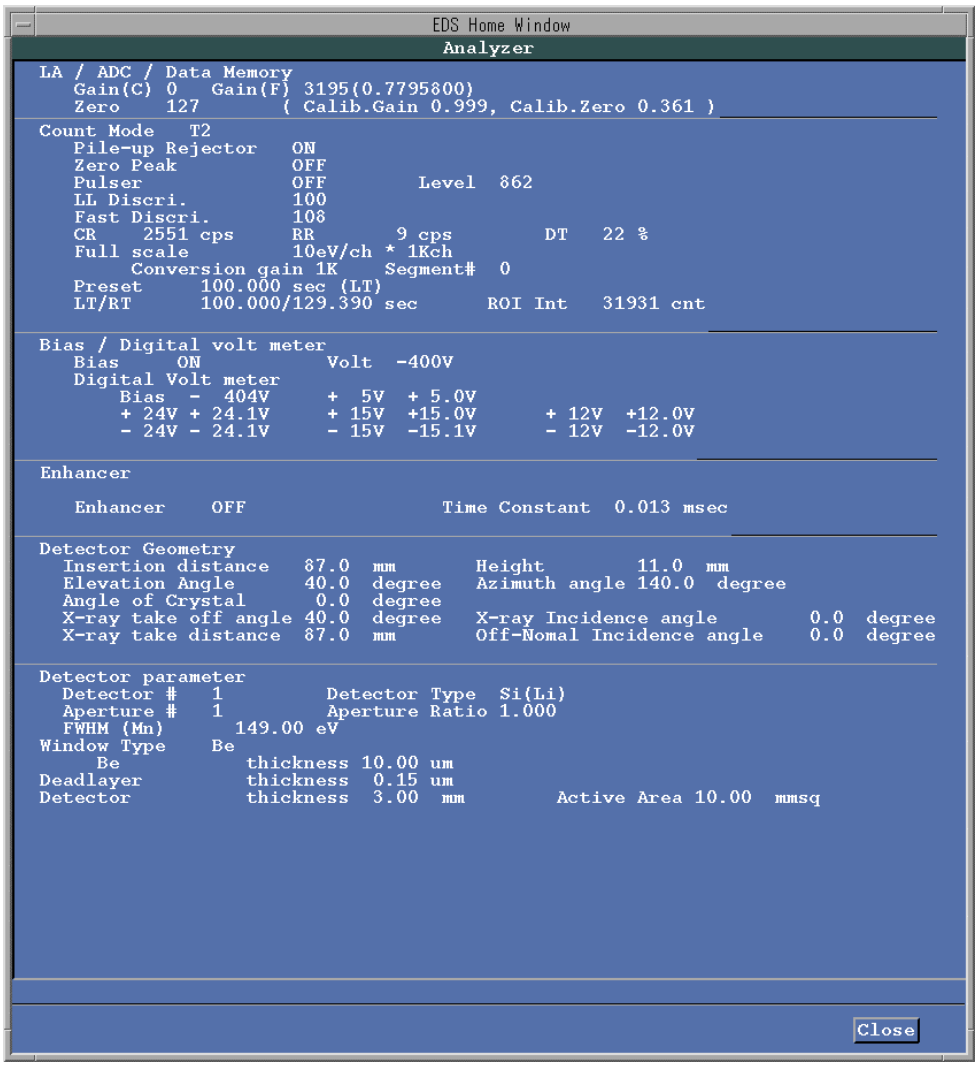

Fig. 13 Analyzer window

4.2.6 Erasing the EDS spectrum data

1. Click on the **Mem Clear** button in the EDS Home Window.
   The confirmation window opens as shown in Fig. 14.

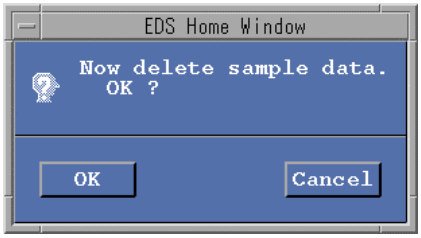

Fig. 14 Confirmation window

2. Click on the **OK** button.
   The EDS spectrum data in the front data memory is erased.
   If you delete data during measurement, the spectrum data is erased, and the Live Time becomes 0, but the measurement continues.

4.2.7 Selecting the EDS aperture

1. Click on the **Aperture** button in the EDS Home Window.
   The Aperture window opens as shown in Fig. 15.

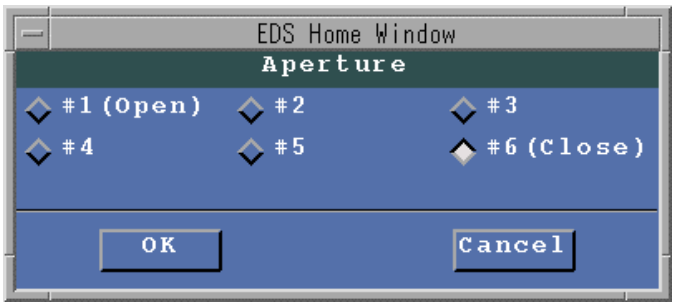

Fig. 15 Aperture window

2. Click on the EDS aperture number button that you want to use.
3. Click on the **OK** button.
   The aperture is switched over.

The aperture **#1** is the open aperture. The bigger the aperture number, the smaller the aperture diameter and so the shorter the dead time. However, the **#6** is not used for data acquisition because it is closed.
When the EDS Home Window is going to close, the aperture is automatically closed to protect the detector. The number of the latest used aperture is memorized. Thus, when you next acquire data, that aperture will return.

4.2.8 Offline processing during measurement

The following are the operations for offline processing when you desire it during measurement.

◆ Select **EDS–EDS Display** from the EPMA Main Menu.

The EDS Home Window for offline processing opens as shown in Fig. 16.

You can use all the functions except the **Acq** button and **Aperture** button in this EDS Home Window.

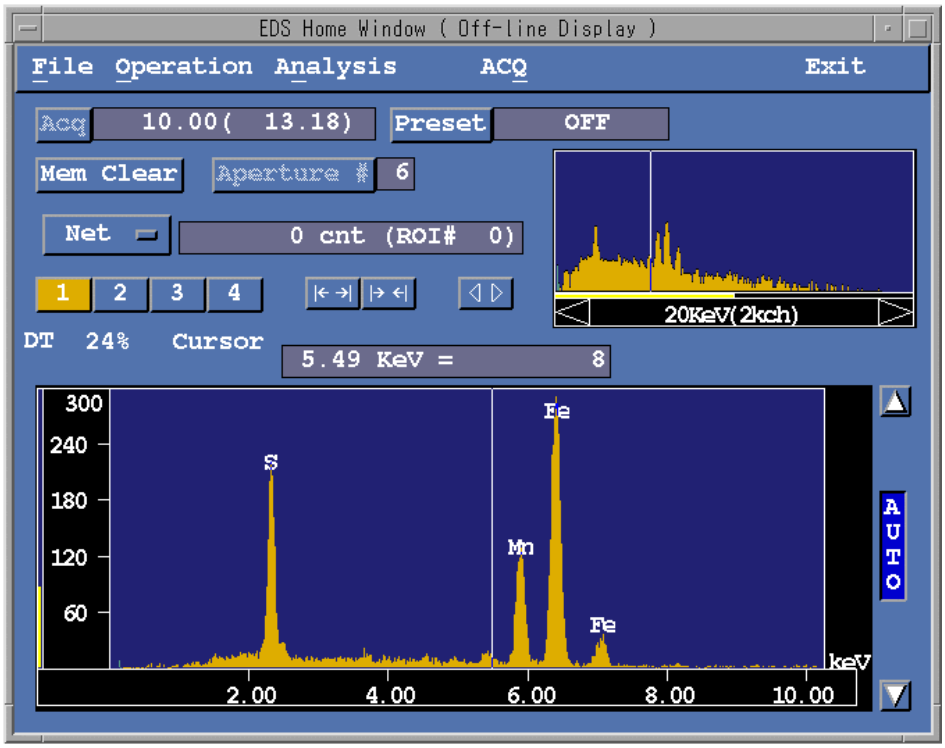

Fig. 16 EDS Home Window for offline processing

4.3 KLM Marker

For the specified element, you can display vertical markers and the element names at the positions of the characteristic X-rays of elements. Follow the procedure below.

1. Select **Operation–Periodic Table** from the EDS Home Window.

The Periodic Table KLM Marker window opens as shown in Fig. 17.

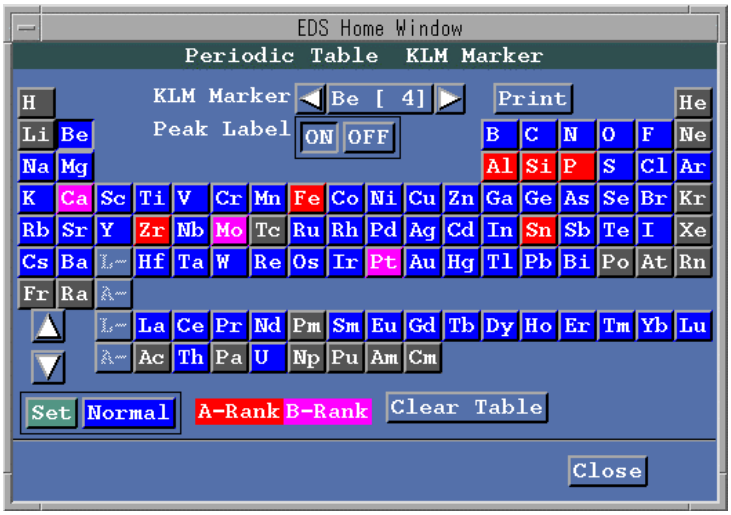

Fig. 17 Periodic Table KLM Marker window

2. In the Periodic Table KLM Marker window, specify the name of the element for which the KLM markers are to be displayed.

The name may be specified by one of the following methods:

- Click on the desired element label in the periodic table.
- Bring the mouse cursor onto the element-name button displayed in the top center of the periodic table. Then click the left mouse button (to specify the element whose atomic number is one less than the present atomic number), or click the right mouse button (to specify the element whose atomic number is one more than the present atomic number).
- Click on the right or left arrow button in the top center of the periodic table to shift to the neighboring element.

When the element name is specified by one of the above methods, lines and element names are displayed at the positions of the characteristic X-rays of that element.

3. Click on the **Peak Label ON** or **OFF** button, as needed, to turn on or off the element-name display.

If you click on the **Peak Label OFF** button, no element labels will be displayed.

4. If you want the element name to remain displayed in the spectrum, click on the **Set** button and then specify the element name.

Usually, attach element labels to the specified peaks using the Peak ID window.

5. If you want to cancel the designated element name, click on the **Normal** button and then specify the element name.

6. To remove an element from the list of A-rank or B-rank elements after element identification is done with the **Auto Ident** function (see Sect. 4.5.1), click on the **Clear Table** button.

Element names excluded from analysis are indicated with gray boxes.

4.4 Setting/Clearing ROI (Region of Interest)

◆ Select **Spectra ROI** from the **Operation** menu in the EDS Home Window.

The ROI setting window opens as shown in Fig. 18, allowing you to set or clear a ROI.

A ROI is used for preset count, creating standard profile and mapping output.
When the ROI setting window is opened, two red lines appear on the EDS spectrum, indicating the range of the ROI. The ROI energy range is numerically displayed to the right of the ROI# (ROI number) area in the ROI setting window.

✍ The ROI numbers can be set in the range from 1 to 127, and each ROI is sequentially given one of eight colors. If a different ROI number is specified for the same energy range, a new ROI for the last specified number will be set.

✍ You can set the ROI number from 1 to 8 by clicking on the button from **#1** to **#8** and entering the energy range of the ROI. You can set any ROI numbers from 1 to 127 by entering a ROI number in the input box at the right of the **ROI #**, then entering the desired energy range.

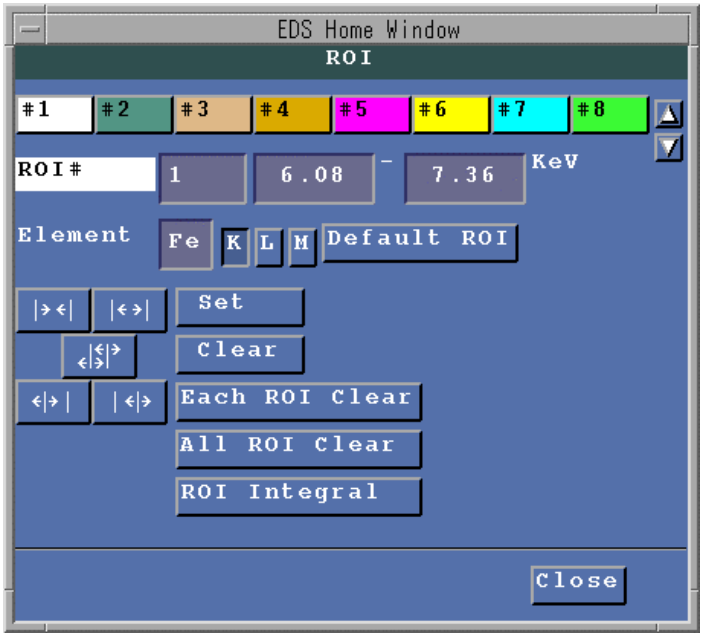

Fig. 18 ROI setting window

4.4.1 Setting a ROI

1. Type a ROI number in the **ROI#** input box of the ROI setting window.
2. Select the spectrum, and move the cursor near the center of the ROI you are setting.
3. Move the two red lines showing the ROI by dragging the mouse to set the ROI.

   The present ROI is indicated, for example 6.08 - 7.36 ke V, to the right of the ROI number.

You can also set the ROI using the arrow buttons at the left of the window. Also, specifying the **Element** name and clicking on the **KLM** button sets the ROI of elements automatically.

4. Click on the **Set** button.

4.4.2 Clearing a ROI

◆ Specify the ROI number to be cleared in the **ROI#** input box of the ROI setting window.

- If multiple ROIs are presently set with the same ROI number and you want to clear any one of them, specify the corresponding range (a range enclosed with two red lines on the spectrum) by moving the cursor, then click on the **Clear** button.
- To clear all ROIs for the specified ROI number, click on the **Each ROI Clear** button. This clears all of the separately set ROIs having the same ROI number.
- To clear all ROIs for the ROI numbers from 1 to 127, click on the **All ROI Clear** button.

4.4.3 ROI integrated value (Net / Gross)

◆ Click on the **ROI Integral** button in the ROI setting window.

The ROI Net/Gross window opens. This window displays ROI integrated values for each ROI number. These values are the gross integrated values (integrated values over the entire ROI), or the net integrated values (where both ends of a ROI are taken as background, and the background approximated with a straight line is subtracted).

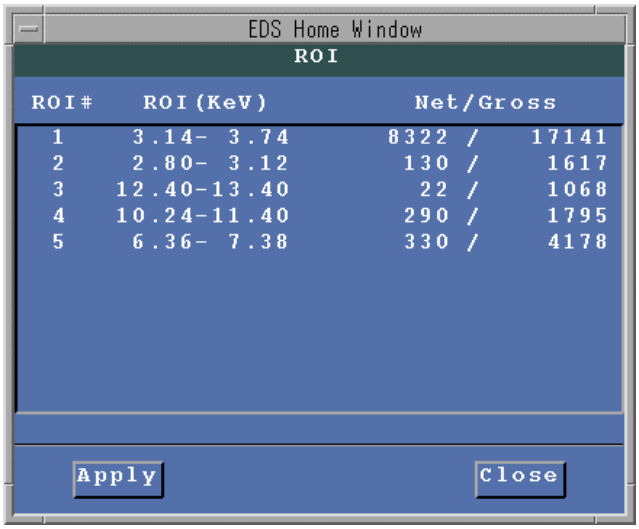

Fig. 19 ROI Net/Gross window

4.5 Spectrum Analysis

The Spectrum Analysis function allows you to perform spectrum analysis.

◆ Select **Analysis** from the **Operation** menu in the EDS Home Window.
The **Analysis** menu opens as shown in Fig. 20.

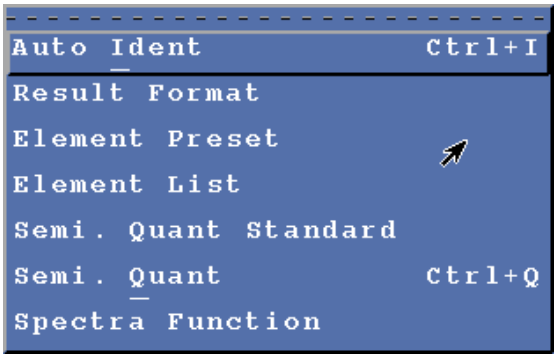

Fig. 20 Analysis menu

4.5.1 Auto Ident (automatic qualitative analysis)

The **Auto Ident** function performs automatic qualitative analysis on the spectrum displayed in the EDS Home Window.

◆ Select **Auto Indent** from the **Analysis** menu.
The following series of operations is automatically executed, and he Qualitative Result window opens as shown in Fig. 21.
- The spectrum is smoothed.
- The spectrum is differentiated twice.
- Peak positions are detected from the second derivative.
- Elements are identified from these peak positions.
  When a beryllium detector window is in use, the identification range extends from Na to U; when a UTW detector window is in use, the identification range extends from B to U. Elements which are excluded from the Periodic Table KLM Marker window are not identified.
- Elements are identified using ID Doctor.
- The results of identification are displayed on the monitor.
  The A-rank elements are the elements whose existence is ascertained and the B-rank elements are minor constituents or those whose existence is uncertain.
  If you have selected **Printer–On** in the Result Format window (refer to Sect. 4.5.2), the results are also printed.

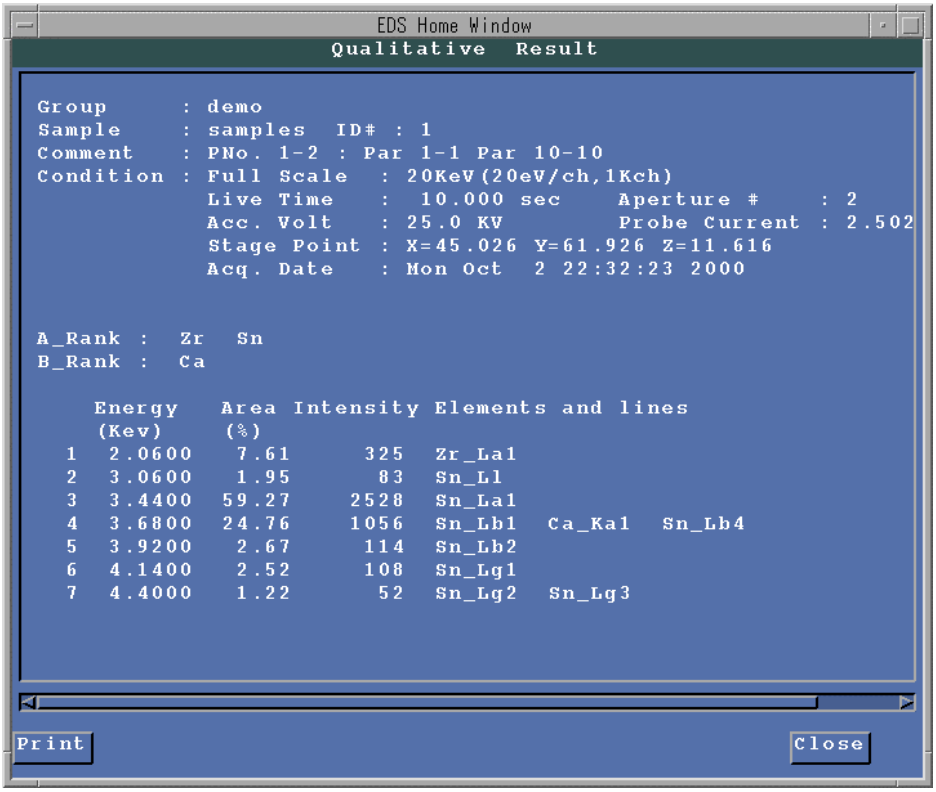

Fig. 21 Qualitative Result window

4.5.2 Specifying result output

◆ Select **Result Format** from the **Analysis** menu.

This opens the Result Format window as shown in Fig. 22. Using this window, you can specify how to output the results of automatic qualitative analysis and semi-quantitative analysis.

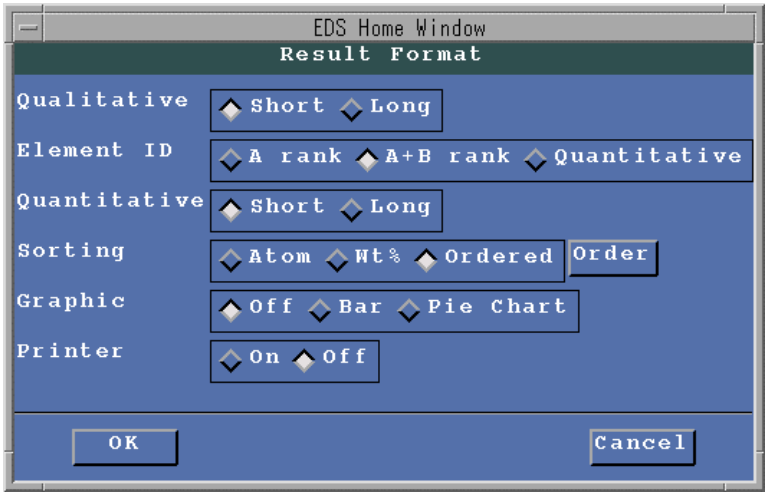

Fig. 22 Result Format window

Specifying a result output format

By clicking on the buttons in the Result Format window, you can specify the following.

Object	Function
Qualitative	Specifies the abbreviated format or detailed format for the output of the results of automatic qualitative analysis. Click on the **Short** button for the abbreviated format, or the **Long** button for the full format.
Element ID	Allows you to select the format for displaying identified elements. Select **A rank** to display only the element labels of the A rank. If you select **A + B rank**, the element labels of both ranks are displayed. When **Quantitative** is selected, the X-ray peak labels are displayed only on the X-rays used in semi-quantitative analysis. In other words, even if multiple X-rays have been detected, the peak labels are attached only to the peaks which have been used for spectrum fitting.
Quantitative	Specifies the abbreviated format or detailed format for the output of the results of semi-quantitative analysis. Click on the **Short** button for the abbreviated format, or the **Long** button for the full format.
Sorting	Specifies the order in which to print the elements resulting from semi-quantitative analysis. Select Atom if you want to print elements from small atomic number to large atomic number. If you select **Mass %**, elements are printed in order from high mass concentration to low mass concentration. If you select **Ordered**, click on the **Order** button, then specify the order in which to print elements as you desire.
Graphic	Specifies whether to output the results of semi-quantitative analysis as a bar graph or a pie chart. Click on the **Off** button to disable graphic output of semi-quantitative analysis results.

Specifying a result output destination

Specify the output destination for the results of automatic qualitative analysis and semi-quantitative analysis. The destination may be only the Computer Display or both the Computer Display and printer.

◆ Click on the **ON** button for **Printer** in the Result Format window.

The results of automatic qualitative analysis and semi-quantitative analysis are both displayed on the Computer Display and printed on the printer at the same time.

4.5.3 Element Preset

The Element Preset function allows you to specify the elements for semi-quantitative analysis.

◆ Select **Element Preset** from the **Analysis** menu.

The Element Preset window opens as shown in Fig. 23.

Here, specify the "**Always**" elements which are always to be included in semi-quantitative analysis, the "**Never**" elements, the "**If A rank**" elements which are to be considered if they are included in the A rank, and the "**If A or B**" elements which are to be considered if they are included in the A or B rank. If you select either "**If A rank**" or "**If A or B**", you can then click on the **Set All** button to assign all elements to that category.

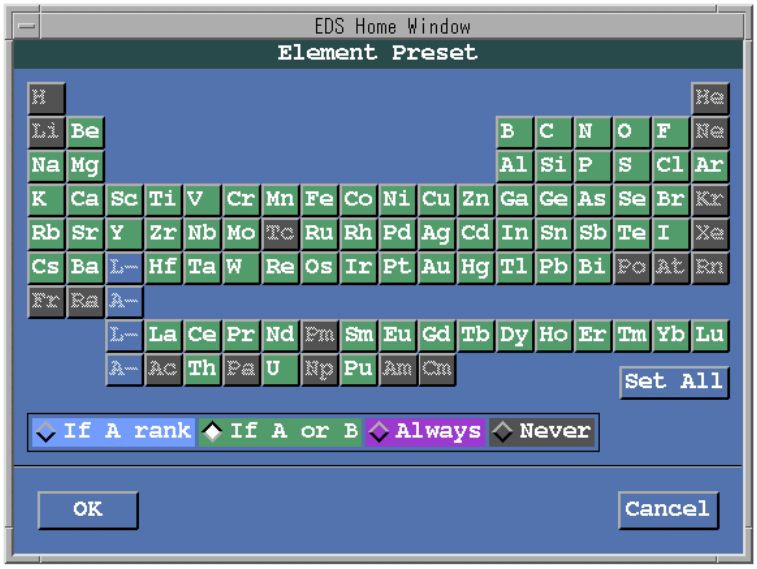

Fig. 23 Element Preset window

4.5.4 Creating element list

◆ Select **Element List** from the **Analysis** menu.

The Element List window opens as shown in Fig. 24, where you can create an element list for elements to be used for semi-quantitative analysis.

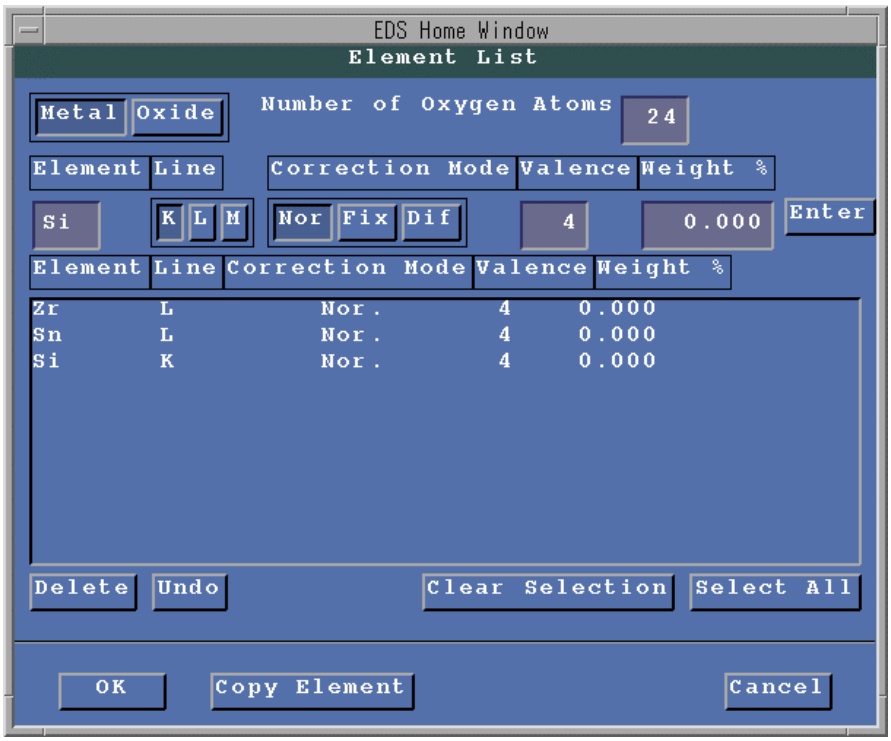

Fig. 24 Element List window

Follow the procedure below.

1. Specify the type of sample.

Select **Metal** or **Oxide** in the Element List window to specify whether the sample is a metal or an oxide.

2. If the sample is an oxide, bring the cursor to the **Number of Oxygen Atoms** input box, and type the total number of oxygen atoms.

After you carry out **Auto Ident** (automatic qualitative analysis), the identified A-rank and B-rank element names and element names set in **Element Preset** are automatically listed in the Element List.

Clicking on the **Copy Element** button copies into the Element List the information on the elements previously set in the Peak ID window or the Periodic Table KLM Marker window.

3. Enter the name of an element to be measured and the conditions for measuring it, by using the **Element** input box, **Line K/L/M** buttons, **Correction Mode**–**Nor/Fix/Dif** buttons, **Valence** input box, and **Mass%** input box. Then click on the **Enter** button.

Item	Function
Element input box	Bring the cursor to the **Element** input box, and enter the name of the element to be measured.
Line **K**/**L**/**M** buttons	Click on the **K**, **L** or **M** button to specify the type of characteristic X-rays of the element to be measured.
Correction Mode **Nor**/**Fix**/**Dif** buttons	Click on the **Nor**, **Fix** or **Dif** button to specify the desired calculation mode. ☞ In semi-quantitative analysis, the **Dif** mode is the same as the **Nor** mode.
Valence input box	For an oxide, enter its valence in the **Valence** input box.
Mass% input box	When the calculation mode is set to **Fix**, enter its mass percentage (Mass%). For an oxide, this value must include oxygen as well (for example, if the element name is Fe and valence is 2, enter the weight percentage of FeO).

4. Repeat the previous step to specify any other elements to be analyzed. (Up to 90 elements can be specified).
5. If you need to remove an element from the Element List, click on it in the Element List, then click on the **Delete** button.
6. Finally, click on the **OK** button to store the Element List in the file.

4.5.5 Selecting a standard sample for semi-quantitative analysis

- Select **Semi. Quant Standard** from the **Analysis** menu.

  The Semi. Quant Standard window opens as shown in Fig. 25.

  The list of standard samples of the elements set in the Element List is displayed in the Semi. Quant Standard window. The entry **Cal-STD** shows that the default standard sample is used (that is, no standard sample is specified). If you have a standard sample you want to use, click on the standard sample button to display the list of standard samples of the measured element and select the desired standard sample. To do this, it is necessary to have made a standard sample profile using the Standard Sample Program beforehand.

  A standard sample, once specified, is memorized. If you want to clear it, select **Cal-STD**.

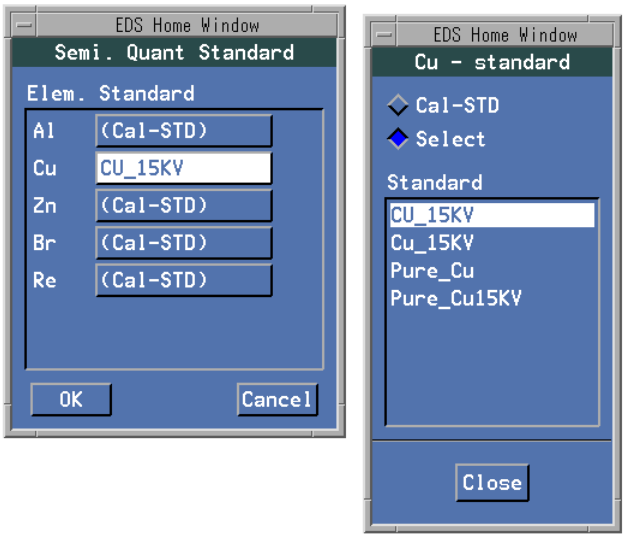

Fig. 25 Semi. Quant Standard window

4.5.6 Semi-quantitative analysis

◆ Select **Semi. Quant** from the **Analysis** menu.

The Semi Quantitative Result window opens as shown in Fig. 26, and then semi-quantitative analysis will be executed.

Note the following points for semi-quantitative analysis:

- The standard profile is already provided.
  The standard profiles for semi-quantitative analysis, 7, 10, 15, 20, 25, 30 kV standard profiles, are stored in the /opt/epma/phys directory as Be EDS and UTWEDS. If Semi Quant Standard is specified, it is given priority.

  ✍ The profile contains the data for Na through U, excluding the inert gases and Rb, Tc, Cs, Hg, Po, At, Fr, Ra, Pm, Ac and Pa.

- Semi-quantitative analysis is conducted on the EDS spectrum data stored in the front data memory.
- Up to 90 elements can be specified for analysis.
- Quantitative analysis is performed using the digital-filter method.
- Quantitative analysis is corrected by the ZAF method.
- The results of analysis are displayed on the Computer Display.
  The results of analysis are displayed after normalization to 100%. They are printed when **Printer–On** is selected in the Result Format window (refer to Fig. 22). Also, a bar graph or pie chart is added to the results when **Graphic–Bar** or **–Pie Chart** is selected in the Result Format window.

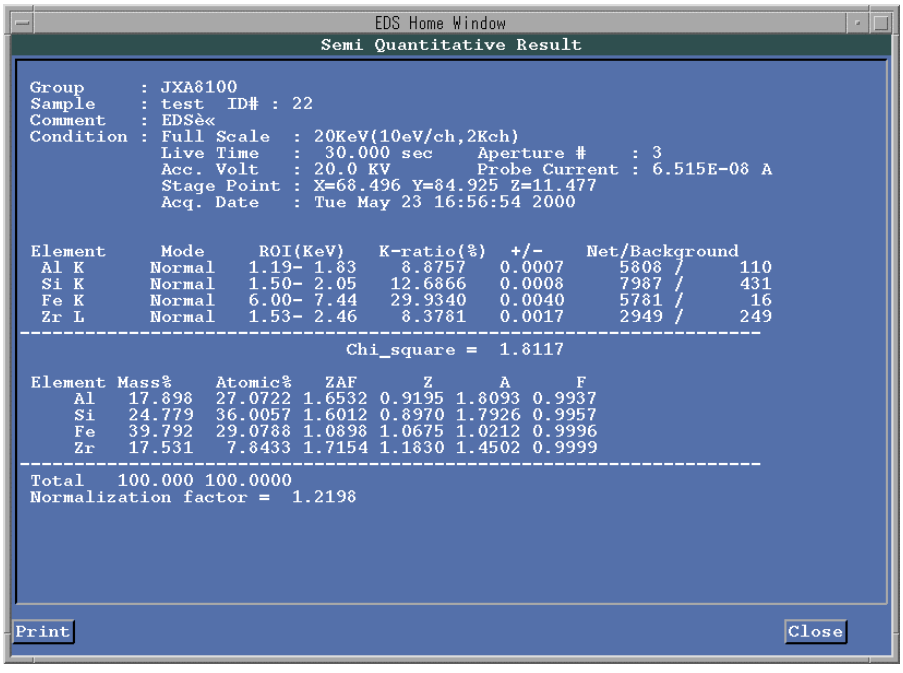

Fig. 26 Semi Quantitative Result window

4.5.7 Spectrum arithmetic operations

◆ Select **Spectra Function** from the **Analysis** menu.

The Spectra Calc window opens as shown in Fig. 27. This window is used for arithmetic and other operations on EDS spectra.

✍ **Energy Calib**, **Escape Peak**, and **Detector Efficiency** can be performed only once on any spectrum.

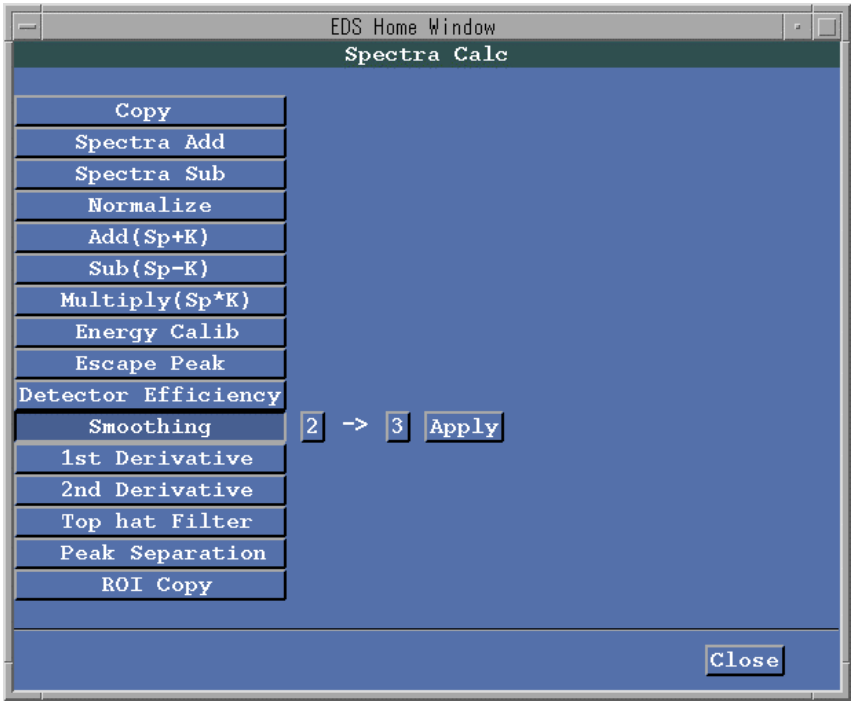

Fig. 27 Spectra Calc window

- **Copy**

  Copies spectrum data from one specified data memory to another.

- **Spectra Add**

  Adds spectrum data in one specified data memory to that in another.

- **Spectra Sub**

  Subtracts spectrum data of one specified data memory from that in another.

- **Normalize**

  Scales a given spectrum so that the ROI selected with the cursor becomes the same area as that of another specified data memory.

- **Add (Sp + K)**

  Adds a constant to the spectrum in the specified data memory.

- **Sub (Sp – K)**

  Subtracts a constant from the spectrum in the specified data memory.

- **Multiply (Sp * K)**

  Multiplies the spectrum in a specified data memory by a constant.

- **Energy Calib**

  Usually, measured EDS spectra are displaced a few electron volts from their theoretical values.
  Energy Calibration matches the EDS spectra to the theoretical values.

- **Escape Peak**

  Removes the escape peak of Si from measured spectra.

- **Detector Efficiency**

  Corrects measured spectra for the absorption by the detector.

- **Smoothing**

  Smoothes the spectrum stored in the specified data memory.
  A smoother spectrum with less noise can be obtained.

- **1st Derivative**

  Differentiates the spectrum stored in the specified data memory.

- **2nd Derivative**

  Differentiates the spectrum stored in the specified data memory twice.

- **Top hat Filter**

  Filters the spectrum stored in the specified data memory using a top hat filter.

- **Peak Separation**

  Performs peak separation for up to three elements within the ROI specified with the cursor on the data in the front data memory.

  1. Specify the ROI on the spectrum and position the cursor within the ROI.
  2. Click on the **Peak Separation** button in the Spectra Calc window.

     The Peak Separation Set window opens as shown in Fig. 28. Here, carry out the following operations.

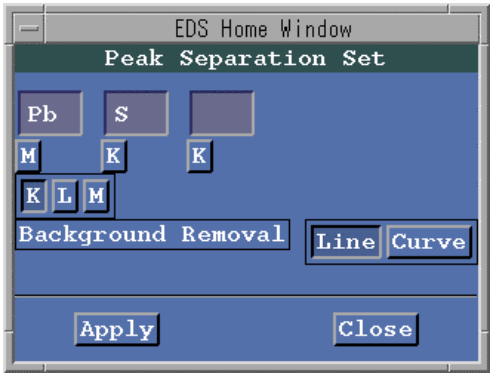

Fig. 28 Peak Separation Set window

a. Specify an element name and an X-ray line name for peak separation.

Type the name of an element for peak separation in the element input box in the Peak Separation Set window. Then, click on the **K**, **L**, or **M** button to specify an X-ray line. Repeat for up to two more elements or lines.

b. Click on the **Line** or **Curve** button in the Peak Separation Set window to specify the method of removal, as described below.

- **Line**

  Both ends of the range for peak separation (that is, the ROI) are regarded as the background, which is approximated with a straight line and subtracted.

- **Curve**

  The background is approximated by the background-modeling method and subtracted. Since information about the composition of the sample is required to use **Curve**, Semi-Quantitative Analysis must be executed in advance by selecting **Semi. Quant** from the **Analysis** menu.

Fig. 29 shows the results of peak separation.

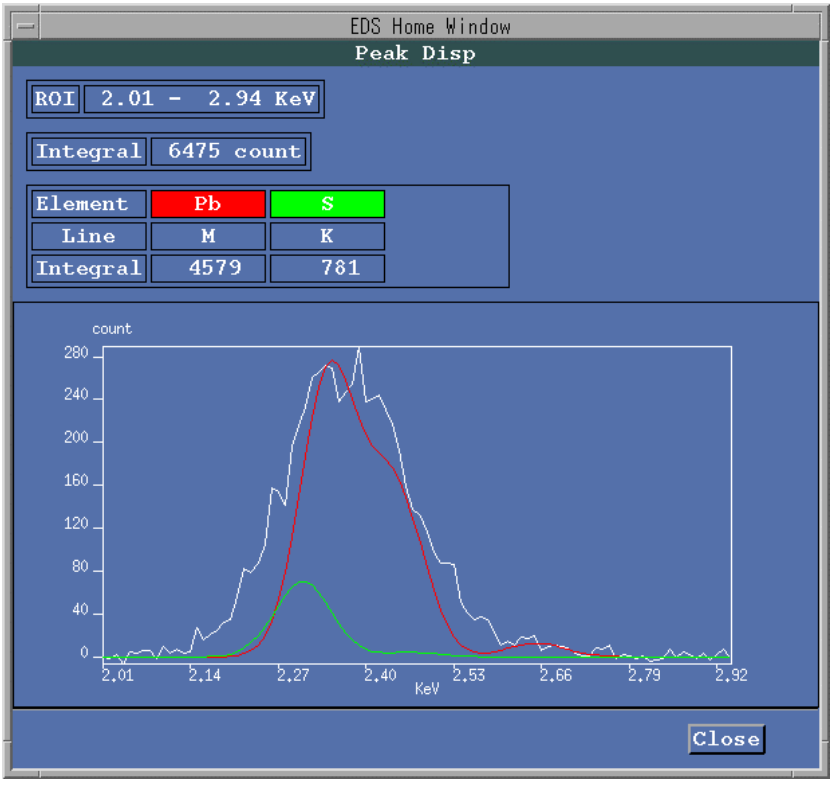

Fig. 29 Peak Disp window

- **ROI Copy**

  Copies the ROI data from the front data memory to the monitor-screen data memory.

4.6 Peak ID (Peak Identification)

This Peak ID function allows you to check which characteristic X-rays a peak on the EDS spectrum corresponds to.

◆ Bring the spectrum cursor to the position of a peak, and select **Peak ID** from the **Operation** menu.

The names of the characteristic X-rays near the cursor are displayed, and the Peak ID window opens as shown in Fig. 30.

You may click on the buttons in the Peak ID window to execute the following functions.

Button	Function
Peak–Previous	Clicking on this button identifies the neighboring peak toward lower energy automatically.
Peak–Next	Clicking on this button identifies the neighboring peak toward higher energy automatically.
Peak Label–Set	If you select the line name of characteristic X-rays displayed in the **Element Line** of the Peak ID window (Fig. 30), the line name will be highlighted. Then, when you click on the **Set** button, you can add the desired label to the spectrum.
Peak Label–Delete	If you select the line name of characteristic X-rays displayed in the **Element Line** of the Peak ID window (Fig. 30), the line name will be highlighted. Then, when you click on the **Delete** button, you can delete the label added using the **Set** button from the spectrum. ☞ To delete all the labels for the designated element, click on the **Normal** button in the Periodic Table KLM Marker window, then select the element whose labels you want to delete. To delete all labels from the spectrum, click on the **Clear Table** button in the Periodic Table KLM Marker window.
Shift	Clicking on this button and then dragging an element label on the spectrum using the mouse can change the position of the label. After you have finished dragging the label, click on **Shift** again to cancel.
Reset	Return the label that was shifted to its original position.

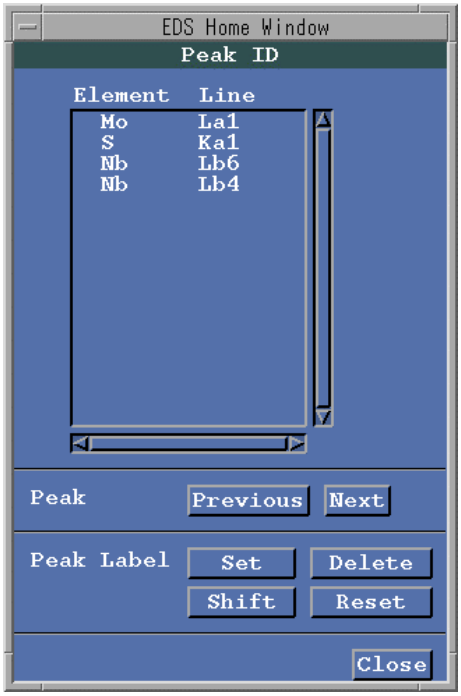

Fig. 30 Peak ID window

4.7 Creating and Controlling a Standard Profile

◆ Select **STD Profile** from the **Operation** menu in the EDS Home Window.

The Std Profile Directory window opens as shown in Fig. 31.

Using this window, you can load, delete and search the profile data that was created using the Standard Sample Program, or load and create new profile data.
A standard profile stores data such as the composition of a standard sample's characteristic X-ray peaks (specified by ROI) for elements of interest. The file is used for quantitative analysis to obtain the K-ratio (the intensity of an unknown sample relative to a standard sample).

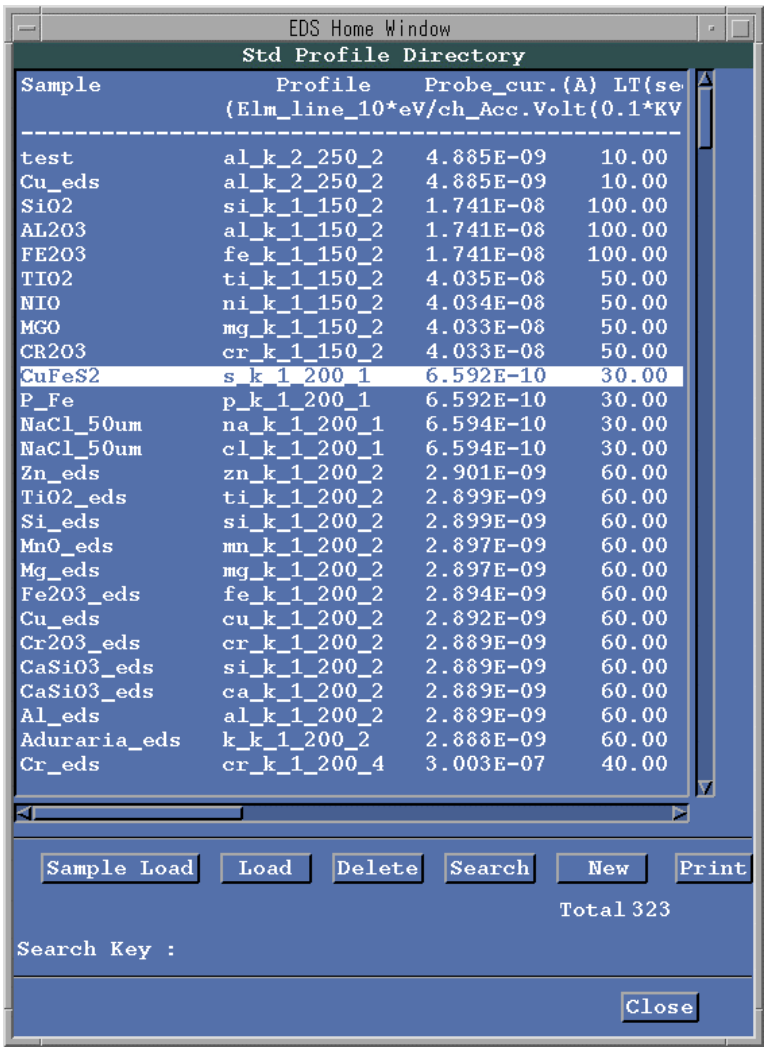

Fig. 31 Std Profile Directory window

4.7.1 Loading profile data

Here, read in the profile data for the desired sample name using the procedure below.

1. Select the data of the profile that you want to display from the list in the Std Profile Directory window.
2. Click on the **Load** button.
   The STD Profile Load window opens as shown in Fig. 32.

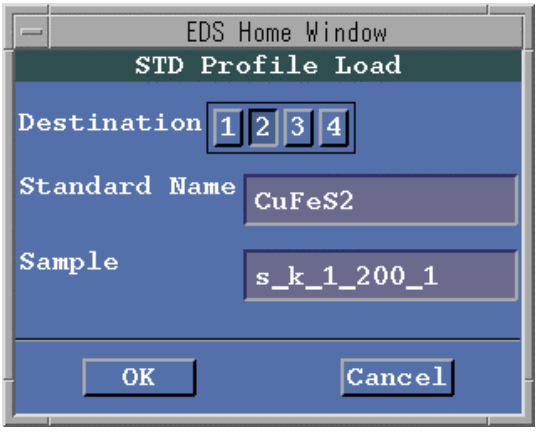

Fig. 32 STD Profile Load window

3. Select a **Destination** button from **1** to **4**, to specify the data memory into which to read the EDS spectrum.
   By default, the data is read into the present front data memory.
4. Confirm that the presently selected standard sample name of the profile and profile name are displayed in the **Standard Name** and **Sample** display boxes, respectively.
5. Read in the profile data by clicking on the **OK** button.
   The information on the standard composition is displayed as well.

4.7.2 Deleting profile data

Follow the procedure below to delete stored spectrum data.

1. Select the profile data that you want to delete from the list in the Std Profile Directory window.
2. Click on the **Delete** button.
   The STD Profile Delete window opens as shown in Fig. 33.

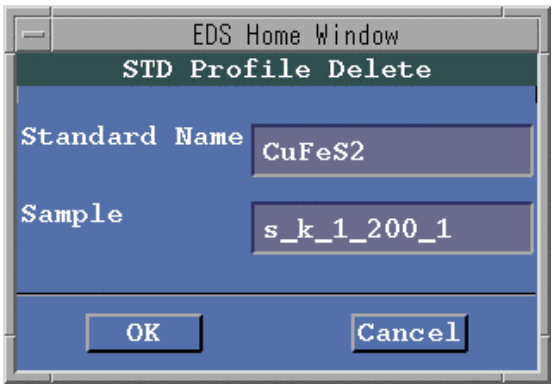

Fig. 33 STD Profile Delete window

3. Confirm that the presently selected standard sample name of the profile and the profile name are displayed in the **Standard Name** and **Sample** display boxes, respectively.
4. Delete the profile data by clicking on the **OK** button.

4.7.3 Searching for profile data

1. Click on the **Search** button in the Std Profile Directory window.
   The STD Profile Search window opens as shown in Fig. 34.

Fig. 34 STD Profile Search window

2. Specify the profile data display conditions as described below.

Object	Function
Full Scale– <20 keV (2 Kch)>	The profile data having the **20 kev (2 Kch)** full-scale energy is to be searched for and displayed in the Std Profile Directory window. (This cannot be altered.)
Aperture #– 1 to **5**	Click on one of these buttons. The profile data having the specified aperture number will be searched for and displayed in the Std Profile Directory window.
Acc. volt	Bring the cursor to the **Acc. volt** input box and type the desired accelerating voltage range. The profile data having the accelerating voltage in the specified range will be searched for and displayed in the Std Profile Directory window.
Acq. Date	Bring the cursor to the **Acq. Date** input box and type the desired range of data acquisition dates. The profile data having the date in the specified range will be searched for and displayed in the Std Profile Directory window. The input format for dates is yy,mm,dd.
Data Region	Bring the cursor to the Data Region input box and type the desired range of profile data to be searched for. The profile data in the range specified here will be searched for and displayed in the Std Profile Directory window.
OK	Finalizes all the selected and typed items and closes the window.
Clear Table	Clears all the selected and typed items.
Cancel	Cancels all the selected and typed items and closes the window.

- Specifying sample name, element name, and line name

  In the **Sample** and **Element** input boxes, type the sample name and element name, respectively, of the profile data that you want to display in the Std Profile Directory window. Then, click on the **Line**–**K**, **L** or **M** button to specify the line name of the characteristic X-rays of the profile data.

  ✍ If multiple standard profiles exist for the same element name, the sample name is used to tell them apart.

  ✍ You can use the wild card "*" in the **Sample** input box.

- Specifying key search

  In **Key Search**, specify the desired range by clicking on the desired item in **Aperture #** and typing values in other input boxes so that the profile data that you want to obtain will be displayed in the Std Profile Directory window.

3. Click on the **OK** button.

The Std Profile Directory window opens as shown in Fig. 35.

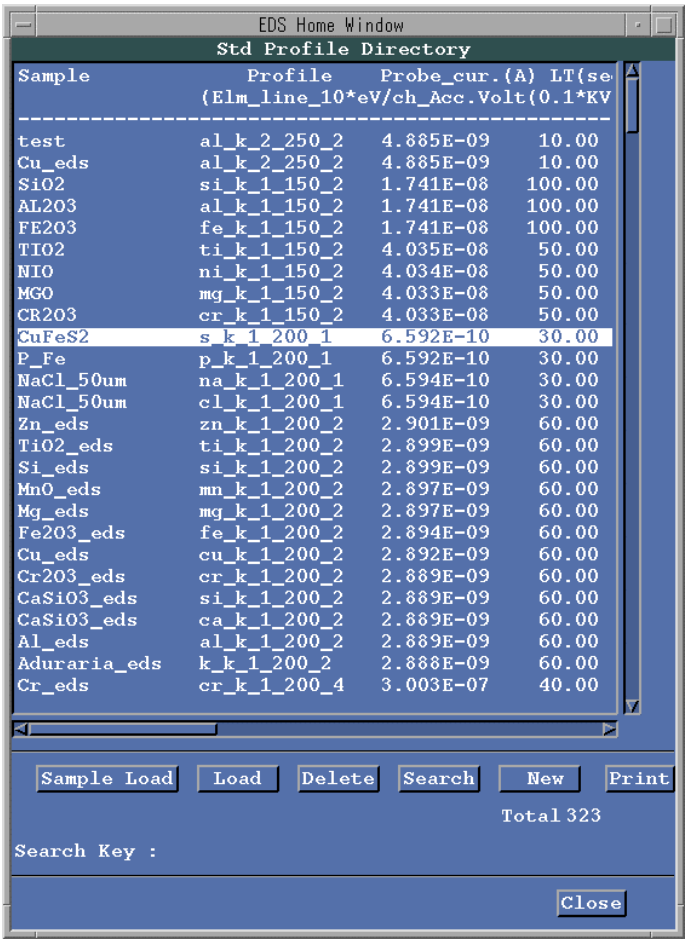

Fig. 35 Std Profile Directory window

4.7.4 Creating profile data

Follow the procedure below to create profile data.

1. Click on the **New** button in the Std Profile Directory window.
The Std Profile Save window opens as shown in Fig. 36.

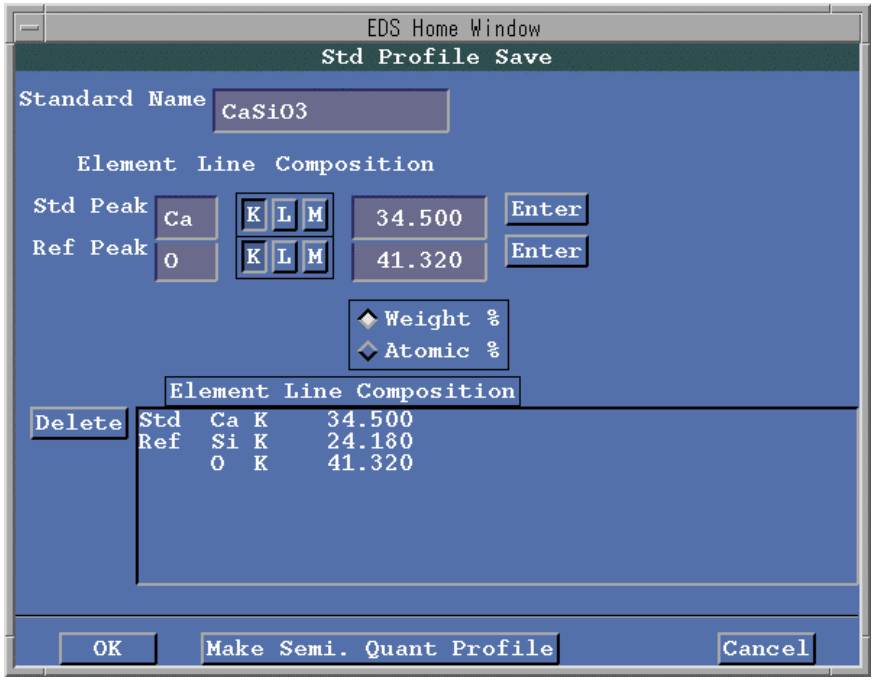

Fig. 36 Std Profile Save window

2. Type the desired sample name in the **Standard Name** input box of the Std Profile Save window.
To distinguish standard profiles for the same element, a sample name needs to be entered in the **Standard Name** input box.

3. Specify the composition percentage.
If you want to enter the composition of the standard profile as mass percentage (mass %), click on the **Mass %** button.
If you want to enter the composition as atomic percentage (at %), click on the **Atomic %** button.

4. Type the element name for the standard peak, click on a line name, and type a composition percentage in **Std Peak**, as described below.

- Entering the element name for the standard peak
  Bring the cursor to the **Std Peak** input box and type the element name for the standard peak.
- Selecting a line name
  Select **Line**–**K**, **L**, or **M** to specify the line name.
- Entering a composition percentage
  Bring the cursor to the **Composition** input box and type the composition percentage.

Such information will be automatically copied and displayed in the Element Line Composition table of the Standard Profile Save window if you used the Standard Sample Program.

5. Click on the **Enter** button.
   The data entered and specified in Step 4 is displayed in the Element Line Composition table of the Standard Profile Save window. At the same time, the ROI is automatically set on the EDS spectrum in the front data memory.
6. If you want to change the ROI, use the ROI setting window.
   If the ROI for the standard peak involves a peak of another element, the quantitative analysis will be less accurate.
7. Type an element name for a non-standard peak coexisting in the standard sample, click on its line name and type its composition percentage in **Ref Peak**, as described below.
   - Entering an element name for the coexisting peak
     Bring the cursor to the **Ref Peak** input box and type the element name for the coexisting peak.
   - Selecting a line name
     Select **Line**–**K**, **L**, or **M** to specify the line name.
   - Entering a composition percentage
     Bring the cursor to the **Composition** input box and type the composition percentage.
8. Click on the **Enter** button.
   The data entered and specified in Step 7 is displayed in the Element Line Composition table of the Standard Profile Save window.
9. If you want to delete an element from the Element Line Composition table of the Standard Profile Save window, select the element of interest, then click on the **Delete** button.
   Deleting the standard-element peak also clears the ROI on the EDS spectrum.
10. Click on the **OK** button to finalize all the items entered and specified above.

Through the above procedure, you can enter coexisting peaks for up to 19 elements. That is, you can specify up to 20 elements, including the element for the standard peak, as the composition of the standard sample.

4.7.5 Recording profile data into the standard specimen for semi-quantitative analysis

1. According to the previous section, create the information for the standard sample profile in the Standard Profile Save window.
2. Click on the **Make Semi. Quant Profile** button in the Standard Profile Save window.
   The Confirmation window opens as shown in Fig. 37.

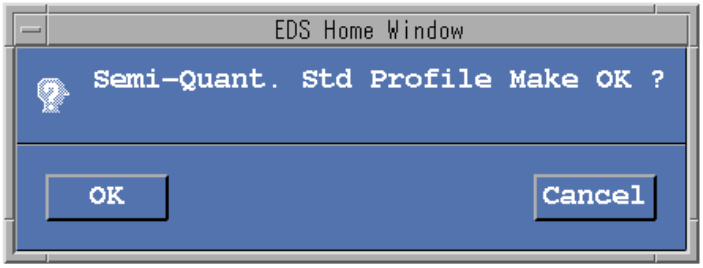

Fig. 37 Confirmation window

3. Click on the **OK** button.
   The profile data is copied into the directory for semi-quantitative analysis.

4.7.6 Reading original sample data

Follow the procedure below to read original sample data.

1. Click on the **Sample Load** button in the Std Profile Directory window.
   The Sample Load window opens as shown in Fig. 38.

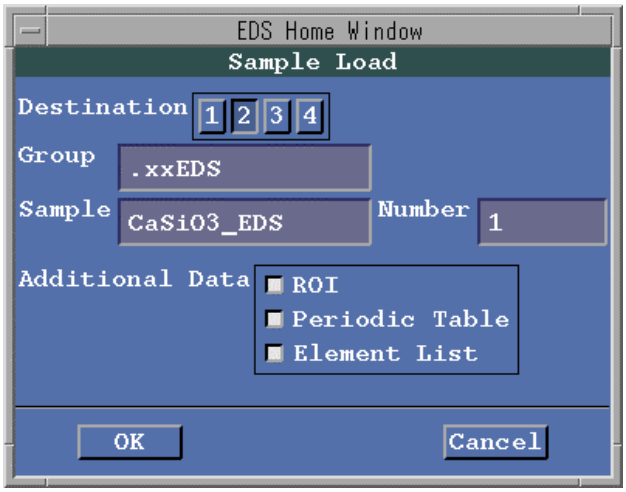

Fig. 38 Sample Load window

2. Select a **Destination** button from **1** to **4**, to specify the data memory into which to read the EDS spectrum.
3. Select the desired sample name from the directory list displayed on the Std Profile Directory window, and click on the **OK** button.
   The specified sample data will be read.

4.8 Display Mode

◆ Select **Display Mode** from the **Operation** menu of the EDS Home Window.
The Display Mode window opens as shown in Fig. 39.

This window is used to specify how to display EDS spectra.

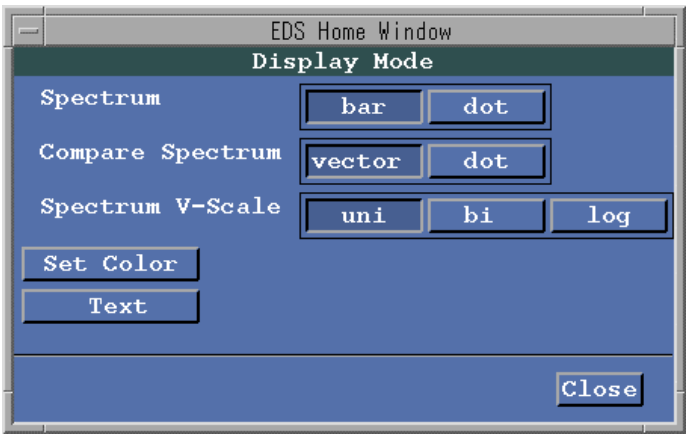

Fig. 39 Display Mode window

4.8.1 Selecting display mode

Button	Function
Spectrum **–bar** **–dot**	Clicking on the **bar** button displays the front spectrum in bar form. Clicking on the **dot** button displays the front spectrum in dot form.
Compare Spectrum **–Vector** **–dot**	Clicking on the **vector** button displays the back spectrum in vector form. Clicking on the **dot** button displays the back spectrum in dot form.
Spectrum V-Scale **–uni** **–bi** **–log**	Selecting the **uni** (unipolar), **bi** (bipolar), or **log** (logarithmic scale) button specifies the corresponding form of spectrum display.

Fig. 40 shows how a second derivative spectrum is displayed when using the **Spectrum V-Scale–bi** button.

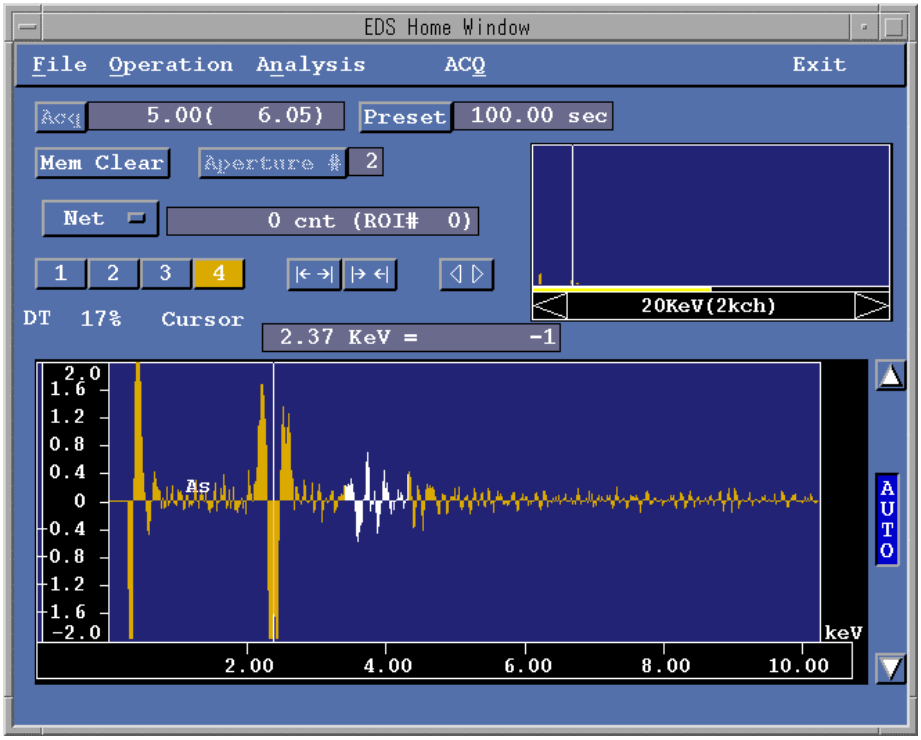

Fig. 40 Spectrum with Spectrum V-Scale–bi selected

4.8.2 Selecting color

- Click on the **Set Color** button in the Display Mode window.

  The Set Color window opens as shown in Fig. 41, allowing you to select colors for the front spectrum, background and other items from the 16 colors on **Color Palette**.

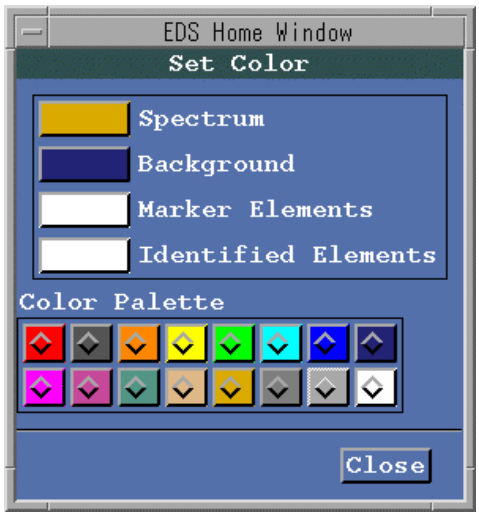

Fig. 41 Set Color window

4.8.3 Writing text

1. Click on the **Text** button in the Display Mode window.
   The Text Write window opens as shown in Fig. 42, allowing you to write any text on the EDS spectrum.
2. Bring the cursor to the text input box in the window, and type any desired text using up to 20 characters.
3. Specify a character color and a character size by using the **Color** and **Size** buttons.
4. Click on the **Write** button, bring the cursor to the desired position on the EDS spectrum screen, and click the mouse button; then the text is written at the specified position.

To delete written text, click on the **Delete** button to display a list of written texts, move the cursor to the text to be deleted (the text becomes highlighted), then click the mouse button.

Fig. 42 Text Write window

4.9 Managing Spectrum Data

◆ Select **Sample** from the **File** menu in the EDS Home Window.
The Sample window opens (refer to Fig. 6).

Spectrum data management is performed on the windows opened by clicking on the buttons displayed on the Sample window.

4.9.1 Searching for, loading and deleting spectrum data

◆ Click on the **Number** button in the Sample window.
The Spectrum Directory window opens as shown in Fig. 43. Using this window, you can search for, load and delete spectrum data.

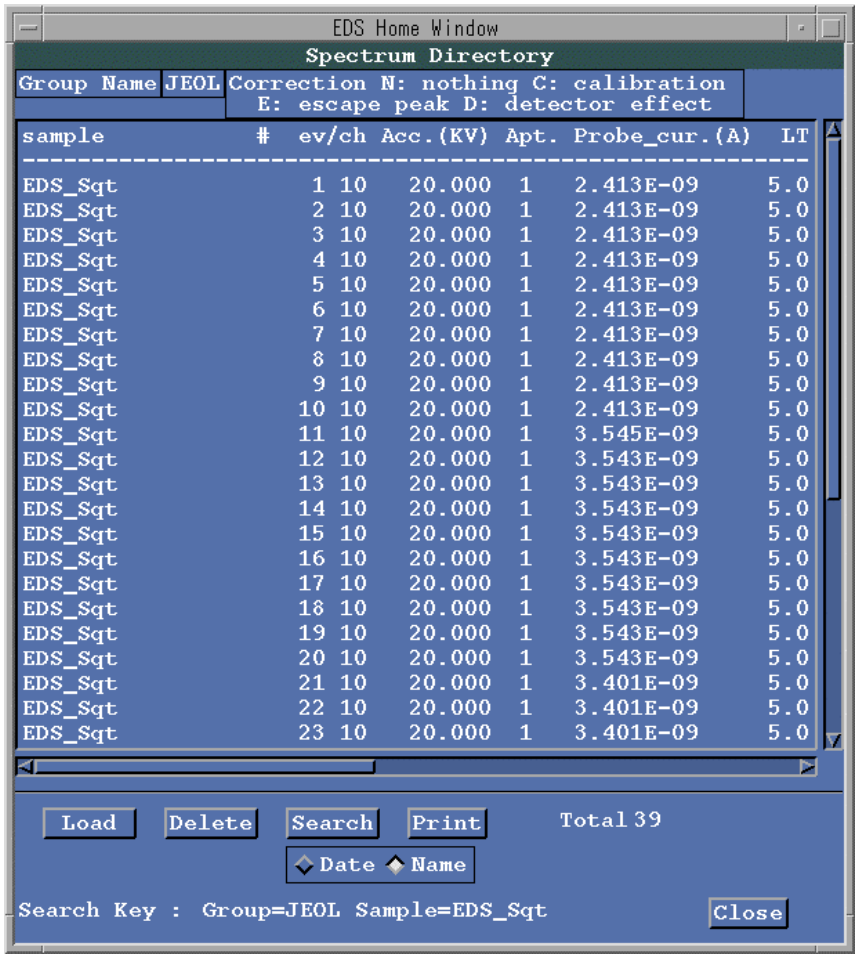

Fig. 43 Spectrum Directory window

Searching directory

1. Click on the **Search** button in the Spectrum Directory window.

The Sample Search window opens as shown in Fig. 44.

2. Specify the sample spectrum data display conditions described below, and click on the **OK** button in the Sample Search window.

Then, the results of the search are displayed on the Spectrum Directory window as shown in Fig. 43.

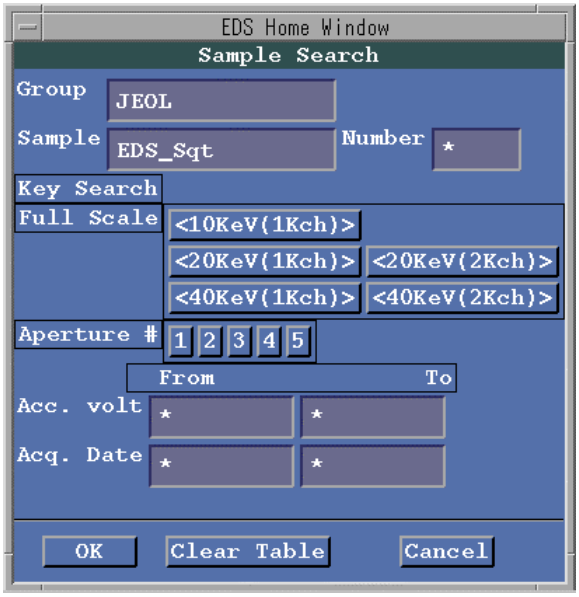

Fig. 44 Sample Search window

- Specifying group name, sample name, and number

  Bring the cursor to the **Group**, **Sample** and **Number** input boxes, and type the group name, sample name, and number, respectively, which you want to display in the Spectrum Directory window.

  ✍ You can use wild cards "*".

- Specifying key search

  Specify **Key Search** so that a specific range is searched to display the sample spectrum data.

  Clicking on the **Clear Table** button cancels all the sample spectrum data display conditions that you typed and selected.

Object	Function
Full Scale– **<20 keV (2 Kch)>**	The sample spectrum data having the **20 kev (2 Kch)** full-scale energy is to be searched for and displayed in the Spectrum Directory window. (This cannot be altered.)
Aperture #– **1** to **5**	Click on one of these buttons. The sample spectrum data having the specified aperture number will be searched for and displayed in the Spectrum Directory window.

Object	Function
Acc. volt	Bring the cursor to the **Acc. volt** input box, and type the desired acceleration voltage range. The sample spectrum data having the accelerating voltage in the specified range will be searched for and displayed in the Spectrum Directory window.
Acq. Date	Bring the cursor to the Acq. Date input box, and type the desired range of data acquisition dates. The sample spectrum data having the date in the specified range will be searched for and displayed in the Spectrum Directory window. The input format of date is yy,mm,dd.
OK	Finalizes all the selected and typed items and closes the window.
Clear Table	Clears all the selected and typed items.
Cancel	Cancels all the selected and typed items and closes the window.

■ Loading spectrum data

◆ Click on the **Load** button in the Spectrum Directory window.

The Sample Load window opens as shown in Fig. 45.

Load the spectrum data for the desired sample name by following the procedure as described below.

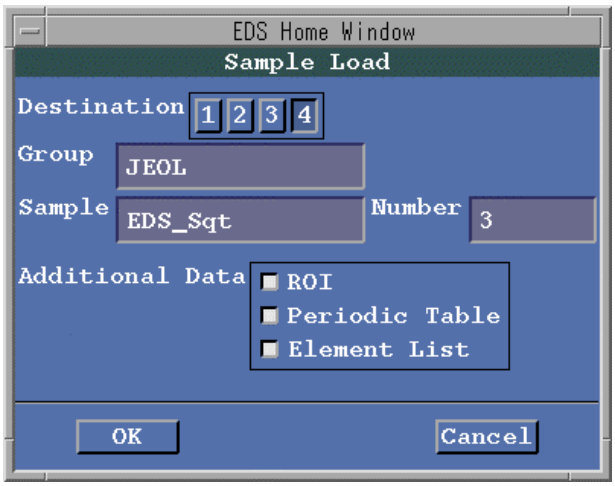

Fig. 45 Sample Load window (for spectrum data)

- Select a **Destination** button from **1** to **4**, to specify the data memory number to which the EDS spectrum data is to be read.
  By default, the data will be read into the present front data memory.
- Bring the cursor to the **Group**, **Sample**, and **Number** input boxes, and type the desired group name, sample name, and number, respectively, of the spectrum to be loaded.
  You can also enter them by selecting the desired sample spectrum data from those displayed in the Spectrum Directory window.
- Select the **Additional Data** buttons: **ROI**, **Periodic Table**, and **Element List**.
  The spectrum can be read together with the ROI information, periodic table, and analysis element list.
- Click on the **OK** button to load the spectrum data.

■ Deleting spectrum data

◆ Click on the **Delete** button in the Spectrum Directory window.
The Sample Delete window opens as shown in Fig. 46.

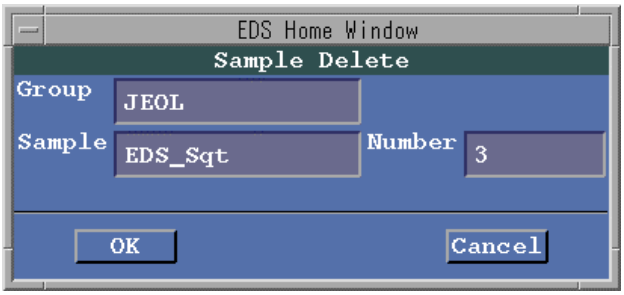

Fig. 46 Sample Delete window (for spectrum data)

Follow the procedure as described below to delete the desired spectrum data.

- Bring the cursor to the **Group**, **Sample**, and **Number** input boxes in the Delete window, and type the group name, sample name, and number, respectively, of the spectrum to be deleted.
  You can also enter them by selecting the desired sample spectrum data from those displayed in the Spectrum Directory window.
- Click on the **OK** button to delete the spectrum data.

4.9.2 Saving spectrum data

To save the spectrum data that are in the front data memory into the desired data file, follow the procedure below using the Sample window.

1. Check the group name in **Group** of the Sample window. (Only when you need to change the group name, bring the cursor to the **Group** input box and type a new group name.)
2. Bring the cursor to the **Sample** input box and type the desired sample name.
3. Bring the cursor to the **Number** input box and type the number to be saved.
   The input range is from 1 to 10,000. If the spectrum data having this number already exists, a confirmation window appears before the present spectrum data is saved.
4. Click on the **Save** button in the Sample window.

4.10 Managing EDS Measurement Condition Files

◆ Select **Condition** from the **Operation** menu of the EDS Home Window.

The **Condition** menu opens.

You can manage EDS measurement condition files by selecting any item from the **Condition** menu.

Item	Function
List	Selecting this item displays the Condition Search window, where you can search for measurement condition files to be loaded or deleted. Clicking on the **OK** button in the window displays the Acq. Condition List window. From it, select the files to be loaded or deleted.
Load	Selecting this item displays the Condition Load window, where you can load the measurement condition file. Open the Condition Load window, and select the desired measurement condition file from the Acq. Condition List window. Then, the file name is displayed in the **File name** input box in the Condition Load window. Clicking on the **OK** button loads the file whose name is displayed.
Save	Selecting this item displays the Condition Save window, where you can save the present measurement conditions in a file under the specified file name. Type the name of the file you want to save in the **File name** input box in the Condition Save window (if necessary, you can type a comment in the **Comment** input box), and click on the **OK** button. Then, the measurement condition file is saved.
Delete	Selecting this item displays the Condition Delete window, where you can delete the desired measurement condition file. Open the Condition Delete window, and select the measurement condition file you want to delete from the Acq. Condition List window. Then, the file name is displayed in the **File name** input box in the Condition Delete window. Clicking on the **OK** button deletes the file whose name is displayed.

4.10.1 Displaying directory

1. Select **List** from the **Condition** submenu.

   Then, the Condition Search window opens as shown in Fig. 47.

2. Click on the **OK** button in the window.

   The Acq. Condition List window opens as shown in Fig. 48, where the list of EDS Measurement Condition files is displayed.

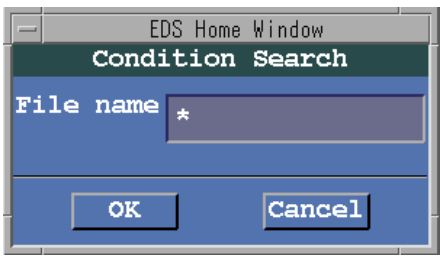

Fig. 47 Condition Search window

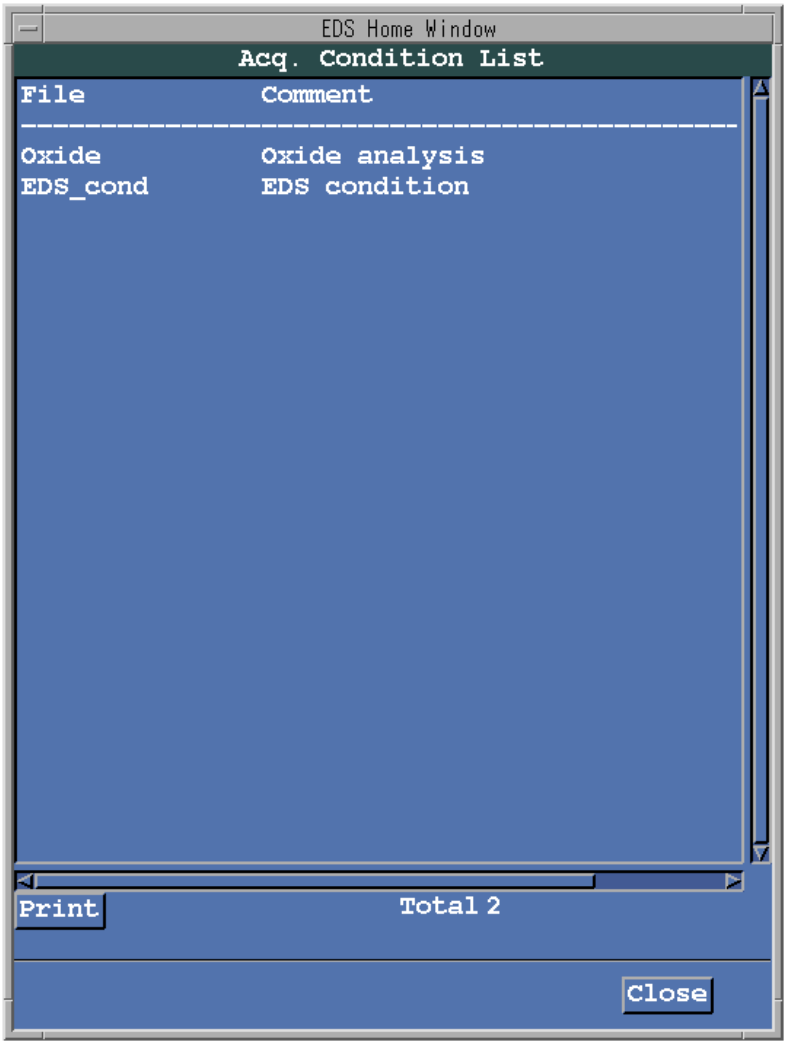

Fig. 48 Acq. Condition List window

4.10.2 Loading EDS measurement conditions

◆ Select **Load** from the **Condition** submenu.

The Condition Load window opens as shown in Fig. 49.

Here, bring the cursor to the **File name** input box and type the desired file name. The EDS measurement conditions under the file name will be loaded.

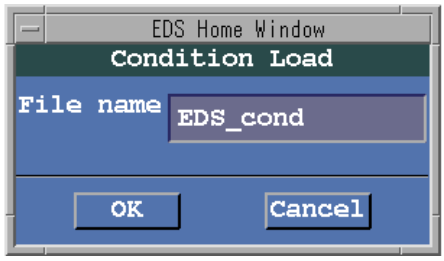

Fig. 49 Condition Load window (EDS measurement conditions)

4.10.3 Saving EDS measurement conditions

◆ Select **Save** from the **Condition** submenu.

The Condition save window opens as shown in Fig. 50, where the present EDS measurement conditions are saved under the specified file name.

✍ If a file having the same file name already exists, the file's contents will be replaced with the new EDS measurement conditions.

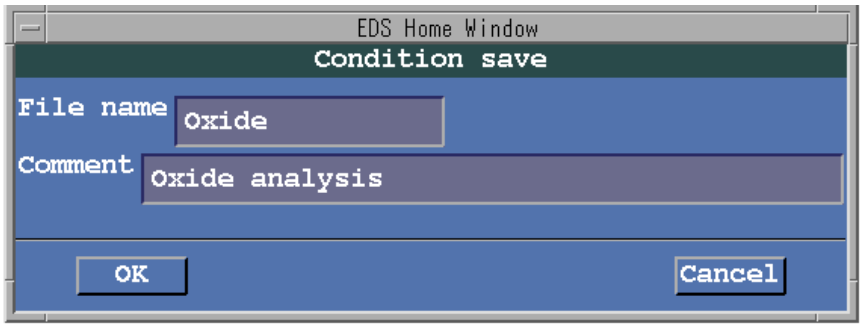

Fig. 50 Condition save window

4.10.4 Deleting EDS measurement conditions

1. Select **Delete** from the **Condition** submenu.

The Condition Delete window opens as shown in Fig. 51. Follow the procedure below to delete EDS measurement conditions.

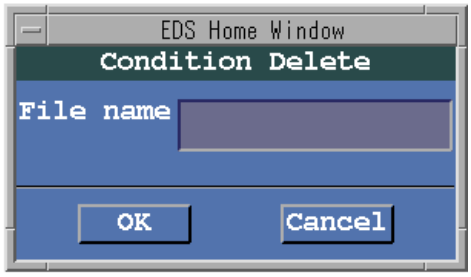

Fig. 51 Condition Delete window (EDS measurement conditions)

2. Bring the cursor to the **File name** input box in the Condition Delete window, and type the name of the file containing the measurement conditions to be deleted.

✍ You can also enter the file name by selecting the corresponding file name from the Acq. Condition List window for measurement conditions.

3. Click on the **OK** button to delete the specified measurement condition file.

4.10.5 Searching for spectrum

This window is used when you want to search for the standard sample that is most similar to the unknown sample under measurement after measuring its characteristic profile. Also, you can use it when you want to search for the measured sample that is most similar to the unknown sample under measurement.

1. Select Search from the **Operation** menu of the EDS Home Window.
   The Search window opens as shown in Fig. 52.

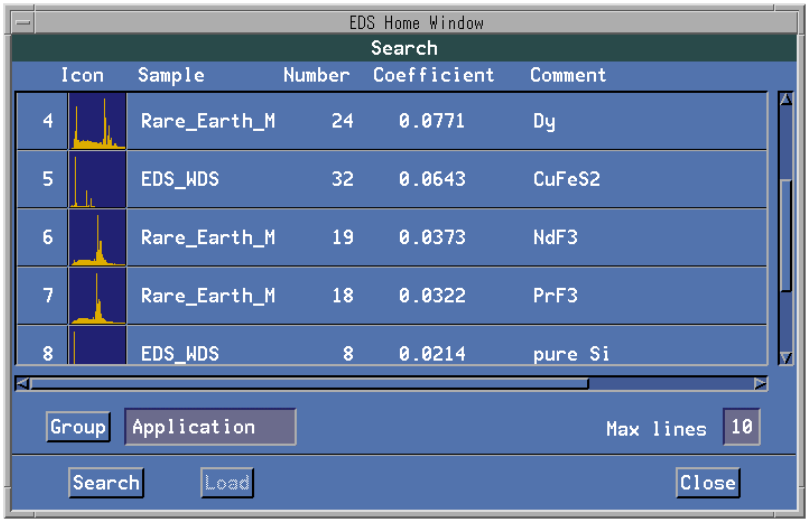

Fig. 52 Search window

2. Click on the **Group** button and then select the desired group name from the group name list.
3. Specify the maximum number of spectra to display by entering a number in the **Max lines** input box.
4. Click on the **Search** button to start searching.
   The sample name, number, coefficient and comment are displayed in order. The coefficient is a number less than or equal to 1; 1 means the strongest possible correlation. Samples are sorted according to the coefficient from bigger to smaller.
5. After searching, you can display the spectrum by clicking on the **Load** button.

4.10.6 EMSA format

The EMSA format is a standard format for interfacing external data. Using this function can convert the EDS spectrum data into the EMSA format and read in the EMSA format data to display its spectrum.

1. Click on the **Utility** icon in the EPMA Main Menu window.
   The Utility menu opens.
2. Select **File Utility**, and then select **Data Arrange–EDS Data**.
   The File Utility–Data Arrange menu opens as shown in Fig. 53.

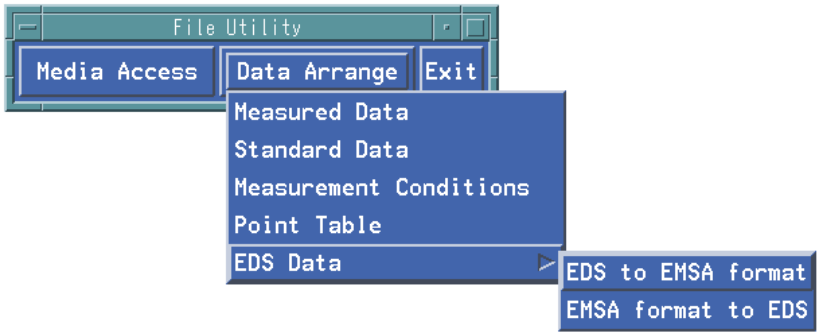

Fig. 53 File Utility–Data Arrange menu

4.10.7 Conversion into EMSA format

1. Select EDS to EMSA format from the submenu (refer to Fig. 53).
   The EDS to EMSA window opens as shown in Fig. 54.

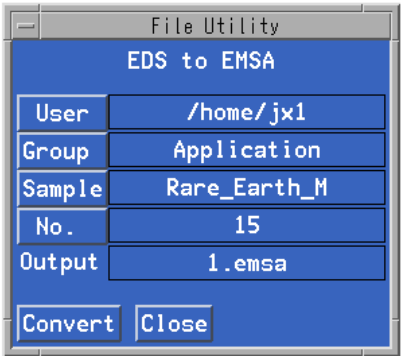

Fig. 54 EDS to EMSA window

2. Select the desired spectrum by using the **Group** button, **Sample** button and **No.** (number) button.
3. Click on the **Convert** button.
   The converted ASCII file is created with a file name of 1.emsa.
   You can view the file using the File Manager or other utility.
   The path to the file is ./<Group>/<Sample>/.eds/<Number>/1.emsa. You can open the file using a text editor or other software. Also, you can transport it to external computers using network transfer software like ftp.

4.10.8 Conversion from EMSA format

1. Select **EMSA format to EDS** from the submenu (refer to Fig. 53).
   The EMSA to EDS window opens as shown in Fig. 55.

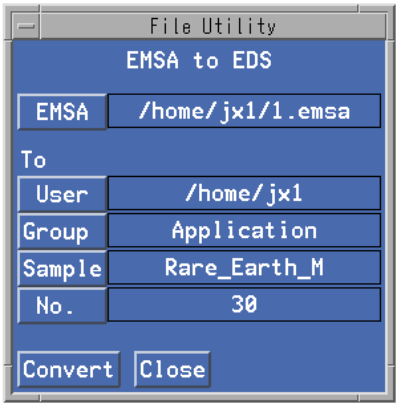

Fig. 55 EMSA to EDS window

2. Select the file that you want to copy from the **EMSA** file selection box.
3. Specify the group name, sample name and number after conversion.
4. Click on the **Convert** button.
   The EMSA format file is converted into the internal format file.
   0.cnd is the condition file, and 1.dat is a binary file in which the spectrum is to be stored.
   Then, you can load the file from the EDS Home Window as usual. Copy the desired file having the EMSA format to the workstation using network transfer software like ftp.

4.11 Initialization of the EDS Program

In the EDS Operation Program, clicking on the **Exit** button in the EDS Home Window terminates the EDS Home Window. At that time, the contents of the EDS Home Window are retained in the previous condition file (.eds/tmp/edsdef.data).
The next time you select **EDS** from the **EDS** menu, the EDS Home Window will open with the retained conditions and values.

If the EDS program has stopped abnormally, the contents of the EDS Home Window may not be correctly retained in the file. In such a case, delete the previous condition file by the following procedure, and then initialize the EDS program.

- **How to delete the previous EDS condition file for initialization**

Perform the following procedure.

1. Click on the **EDS** icon in the EPMA Main Menu to display the EDS menu.
2. Select **EDS Reset** from the EDS menu.
   The Confirmation window opens as shown in Fig. 56.

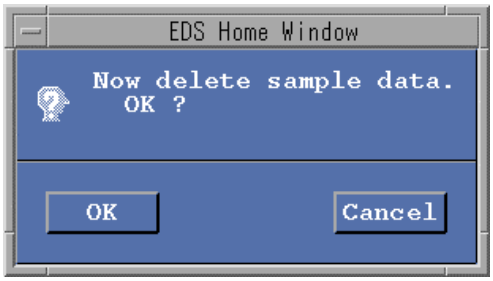

Fig. 56 Confirmation window

3. Click on the **OK** button.
   The system erases the latest values and initializes the EDS Operation Program.
4. Select **EDS Analyzer** from the EDS pull-down menu.
   The Main window opens.
5. Click on the **Detector Parameter** button.
   The Detector Parameter window opens.
6. Verify whether the settings of the detector window match the types of detector window for the instrument (**Be** type or **UTW (STL)** type). If not, select **Be** or **UTW (STL)**.