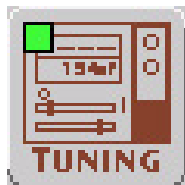


Chapter 2: Tuning Menu



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A. Trolley Panel

The screenshot shows the 'NANOSIMS50 - TUNING' software interface. It features a grid of control panels for five trolleys (Trolley 1-4, 5th Detector) and other detectors (FC, Secondary Electron, Total Ion Current, Large Detector). Each trolley panel includes fields for Counts, Radius (mm), Mass (amu), Deflect (V), and Slit (um), along with 'Adjust', 'Valid', and 'Cancel' buttons. A central panel displays 'Tuning mode' (Multi Collection, FCP, FCO, Total Ion Current), 'Detection Mode', 'Int time (s)', 'Magnetic Field (Gauss)', and 'EDW Offset (V)'. At the bottom, there is a mass spectrum plot and various system control buttons like 'Reset / Setup', 'Energy', 'PHD', 'HMR', 'Check', 'RTI', 'Exit', 'Detector Calib', 'Bar Graph', 'Beam Stab', 'Tools', and 'Sec. Ion Beam'.

Callouts from the left side of the image point to specific features:

- Tuning mode**: Points to the 'Tuning mode' dropdown menu.
- Detector use**: Points to the 'Detection Mode' dropdown menu.
- B. Ion optics**: Points to the 'Magnetic Field (Gauss)' and 'EDW Offset (V)' fields.
- Trolley positions**: Points to the 'Radius (mm)' and 'Mass (amu)' fields of Trolley 1.
- C. Submenus**: Points to the 'Reset / Setup' button.

Figure 2-1: View of Main Tuning Menu.

A. Trolley Panel

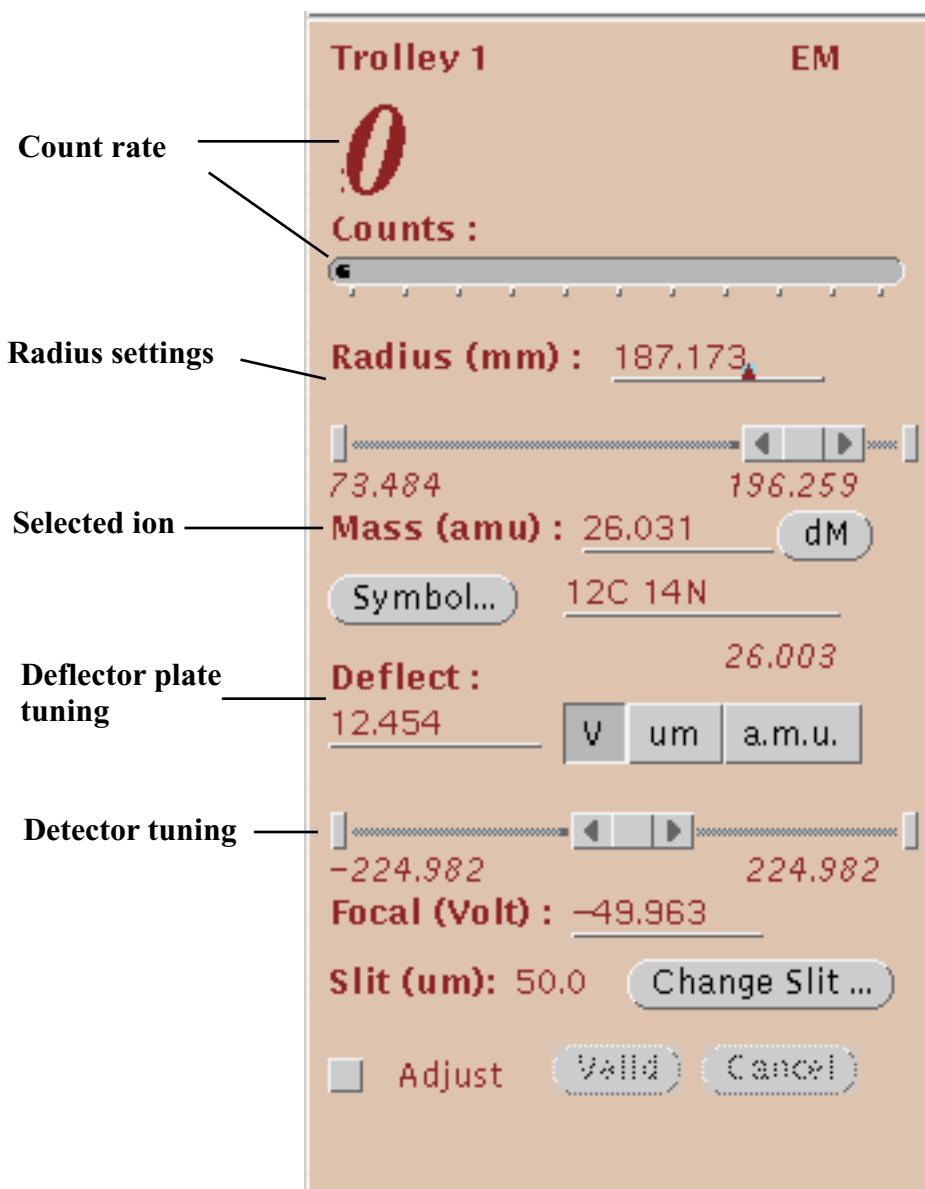



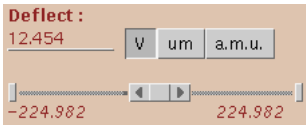
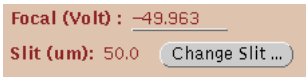



Figure 2-2: View of Trolley Panel

Menu Details: Trolley Panel



Count rate or counts per integration period. The counter will blank out if the ion current becomes too high. This does not protect the actual electron multiplier tube! To enlarge the count display to full screen (for tuning, etc.), click on “thermometer” bar. Cumulative count mode can be selected in Tuning mode window

| | |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Radius. Can be set numerically at the input line, or by clicking on the arrow buttons of the slider. The numbers below the slider indicate the range of the trolley in question.</p> |
|  | <p>Mass. The mass of the ions detected by this channel is given as a function of the B-field, the E-fields and the radius set above. This mass is precise, but not necessarily accurate. dM sets the amu range within which an ion is recognized.</p> <p>If you type a number, the trolley will move to that mass, i.e. if you type 12, it will move to where carbon is</p> |
|  | <p>Symbol. Identification of the detected ion, based on determined mass and acceptable deviation. The list of these ions can be edited with the Symbol sub menu</p> <p>If the mass value shows up in red, it needs to be adjusted. When the value is in agreement, it will show in blue.</p> |
|  | <p>Deflector. Fine tuning adjustments for the detected ion species at the detector level can be entered either as deflector voltage, effective change of the radius or difference of the mass. The deflector potential necessary to detect a specific ion is determined in the HMR (high mass resolution) tuning process.</p> |
|  | <p>Focal potential. Controls the focusing of the selected secondary ion beam into the electron multiplier. Change slit accesses the detector entry slit menu.</p> |
|  | <p>Adjust. Click on box to apply changes; re-confirm entry by clicking on Valid (French for Enter) or cancel.</p> |

B. Additional Controls

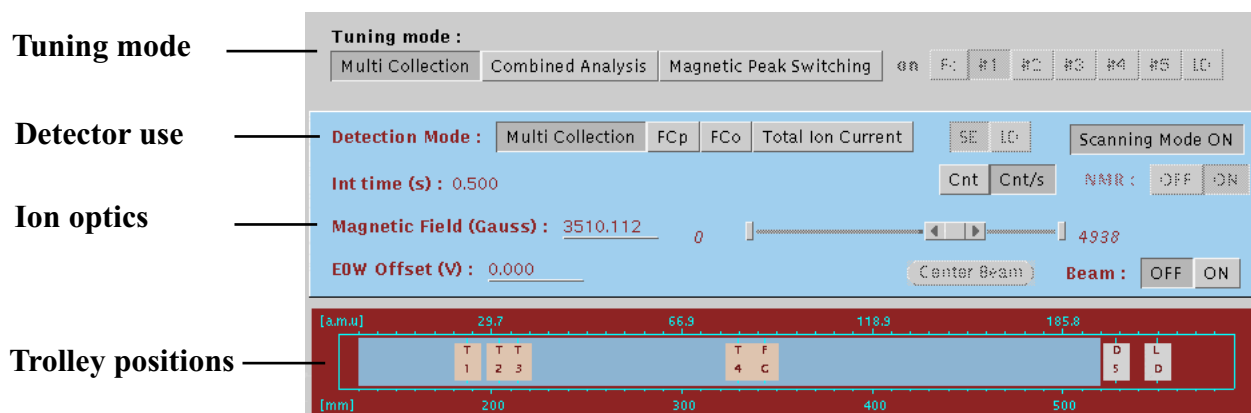
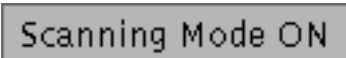
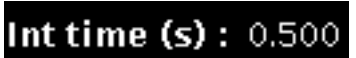
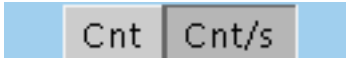


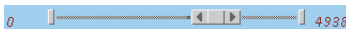
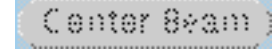
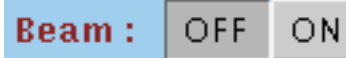


Figure 2-3: View of Additional Controls Within Tuning Menu.

| <i>Menu Details: Tuning Mode</i> | |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Multi Collection | Multi Collection. Uses the electron multipliers after the magnetic sector for detection. This setting is used to tune the imaging aspects of the NanoSIMS. |
| Combined Analysis | ??? |
| Magnetic Peak Switching | ??? |
| Detector Use | |
| Multi Collection | Multi Collection. Uses multiplier tubes after the mass spectrometer stage (Shown is the selected state for this button). |
| FCp FCo Total Ion Current | Faraday Cups. Use of Faraday cups to detect total ion current. The options are FCp to detect the primary ion current at the end of the primary column, FCo to detect the primary ion current at the sample stage and TIC to measure the total secondary ion current prior to analysis in the mass spectrometer stage. |
| SE LD | ??? |

| | |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Scanning Mode. Tuning can be done with a static primary ion beam, or with in scanning mode, where different parts of the sample are exposed to the primary ions. The latter is preferable to prevent the burning of holes in the sample. |
|  | Integration Time. Dwell time per data point - set in HMR tuning window etc. |
|  | Cnt / Cnt/s. Counting mode for ions - counts per integration time interval or counting rate as a measure for the ion current. |
|  | NMR. Indicates state of the NMR feed-back control that regulates the magnetic field strength |
| Ion Optics | |
|  | Magnetic Field. Sets magnetic field strength in the magnetic sector of the mass spectrometer stage and thus determine the radii of the secondary ion trajectories. Enter field strengths numerically in Gauss |
|  | Magnetic Field. Alternative input for magnetic field strength in Gauss. Minimum and maximum for the field strength are given. |
|  | Center Beam. Centers secondary ion beam maximum in detector if the tuning sub-modes are used. |
|  | Beam Off/On. Controls the primary ion beam. Make sure that the beam is off while setting up any tuning mode. A static beam can damage samples - defocus or turn on scanning mode before turning on the beam. |

C. Submenus

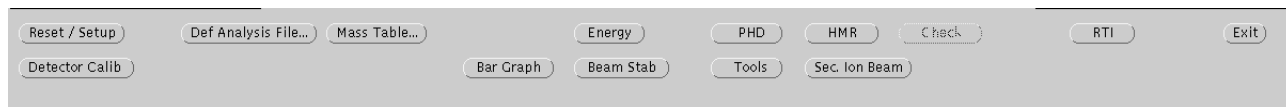

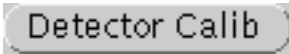
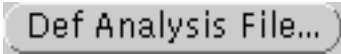
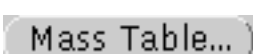


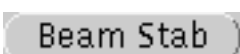

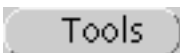


Figure 2-4: View of Bottom of Tuning Panel, Containing Buttons for Submenus.

| Menu Details: Submenus | |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Reset/Setup Menu. Controls the positioning of the electron multiplier trolleys in the magnetic sector |
|  | Detector Calibration Menu. Similar in function to the HMR Menu . Used to balance detector sensitivities. |
|  | Define Analysis File. Handles ion optics field parameters. Can be used to save or read the values as parameter sets. |
|  | Mass Table. Handles ion optics geometry parameters such as trolley position and masses detected. Can be used to save or read the values as parameter sets |
|  | Bar Graph. Allows the NanoSIMS to be used like a classical ES/MS system with fixed detector(s) and a scanning B-field for mass analysis |
|  | Energy. Controls filtering of the secondary ion beam according to kinetic energy in the electrostatic sector SS100 |
|  | Beam Stability. Records primary or secondary ion current over time |
|  | PHD. (Pulse Height Distribution) . Scans electron multiplier voltage of the secondary ion detectors. Corrects for aging and is used to optimize the S/N ratio of individual detectors |
|  | Tools. Tunes the various lenses and deflection plates in the optical path. |

| | |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HMR | HMR. (High Mass Resolution) Allows for the fine tuning of the selectivity of the detectors behind the mass spectrometer stage by adjusting the potential of their deflector plates.. |
| Sec. Ion Beam | Secondary Ion Beam. Controls the position of the secondary ion beam in the horizontal and vertical plane prior to entering the mass spectrometer stage. |
| RTI | Real Time Imaging. Allows to observe effect of changes in the ion optics on the actual scan in real time. used for focusing, etc. |
| Check | Check. ??? |

1. Reset Menu Reset / Setup

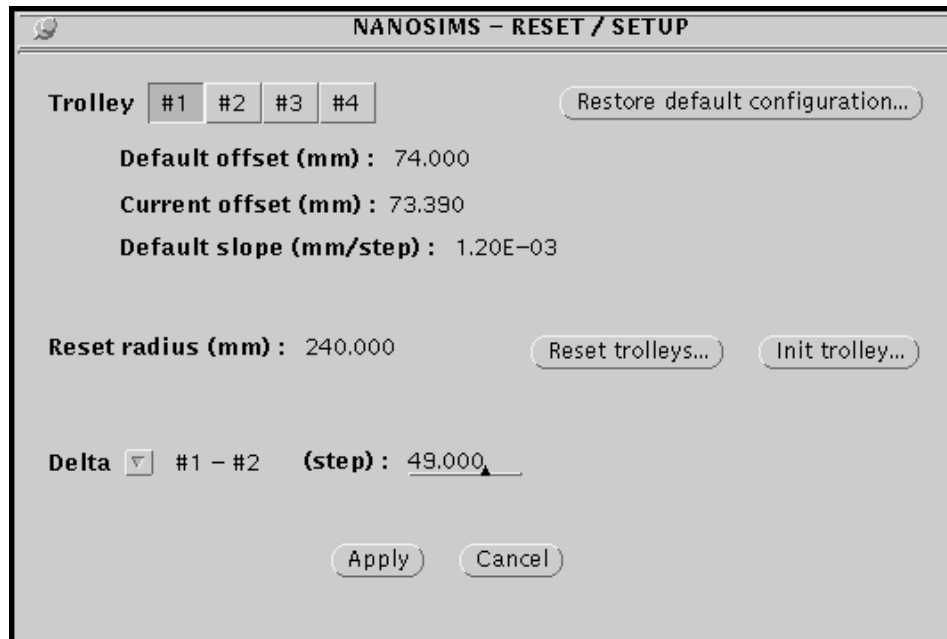


Figure 2-5: View of Reset Submenu.

| <i>Menu Details: Tuning/Reset Menu</i> | |
|-----------------------------------------------|-------------------------------------------|
| | Moves trolleys back to the reset position |
| | Readjusts the trolley position. |
| | |
| | |

2. Detector Calibration Detector Calib

a) Setup window

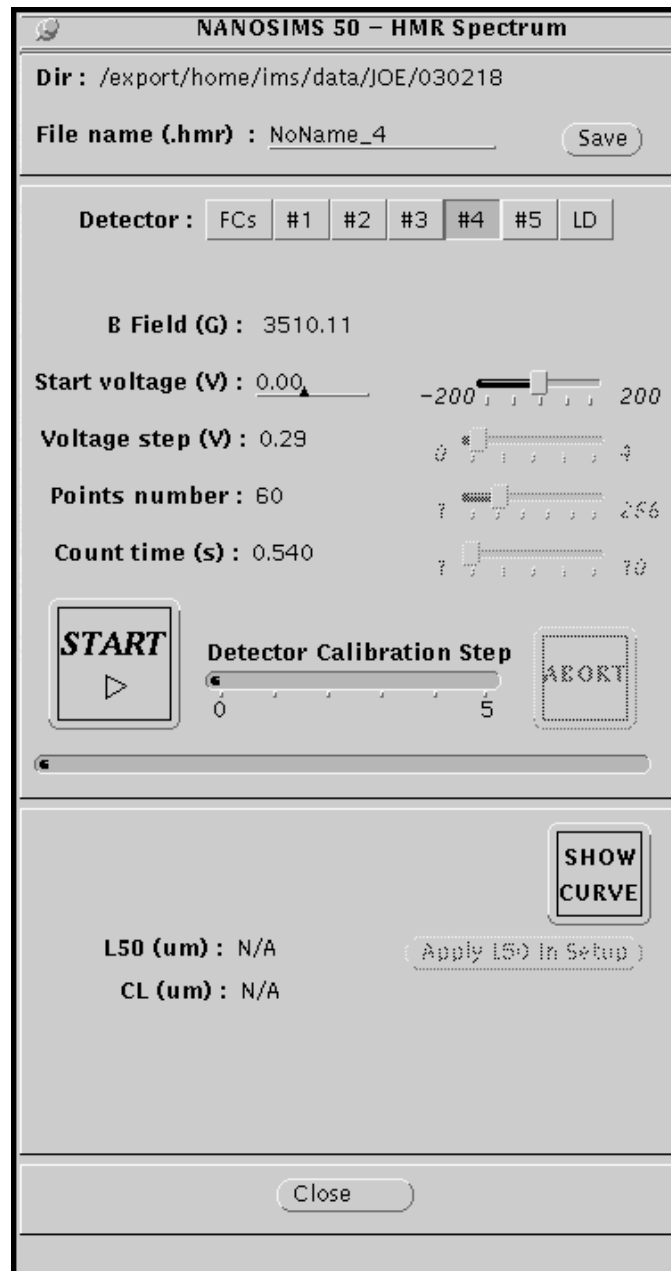


Figure 2-6: View of Setup Window

Menu Details: Setup Window

| | |
|--|--|
| | |
| | |

b) Display Window

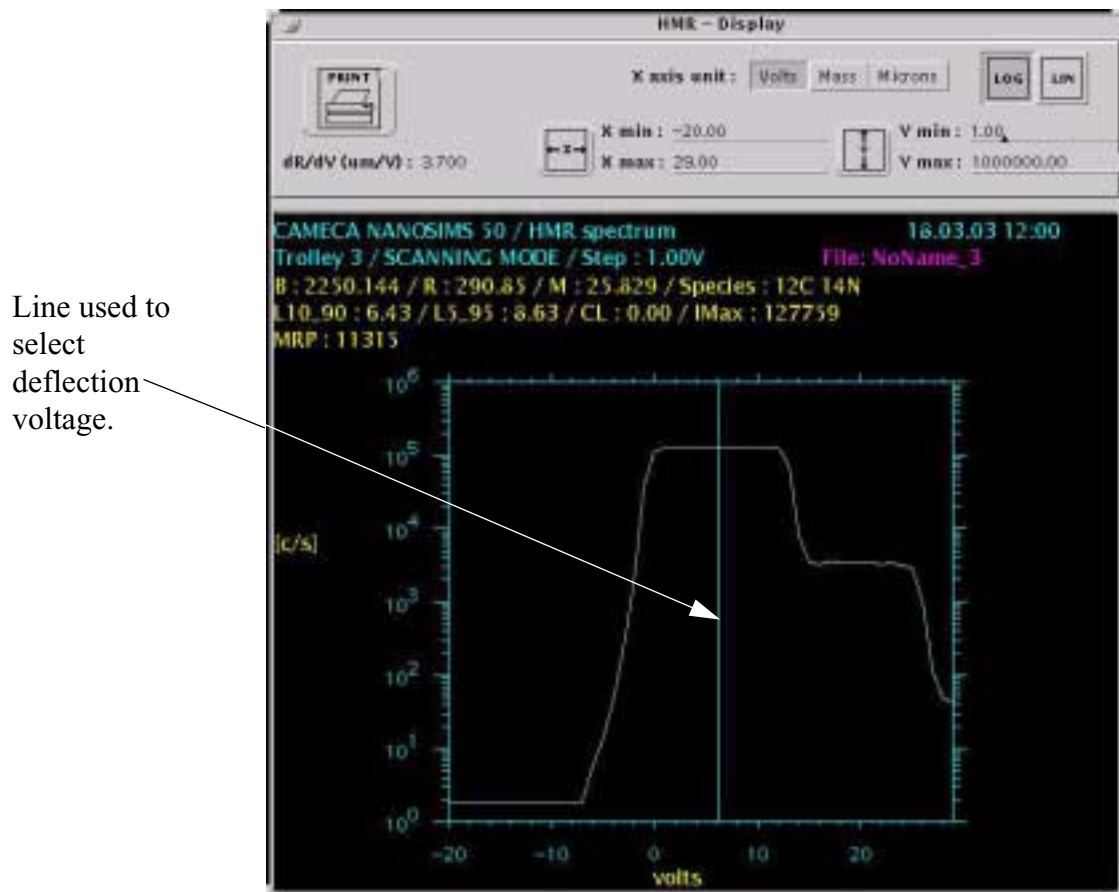


Figure 2-7: View of Setup Display Window

Menu Details: Display Window

The line in Figure 2-7 indicates the deflection voltage. You move the line to change the deflection voltage. When you put your mouse over the window, a new line appears, which you can move back and forth and place in any location. Currently the line is set to select for just ^{14}N . If you moved it to the right in the middle of the other plateau, you'd be choosing just ^{12}C .

3. Define Analysis Menu Def Analysis File...

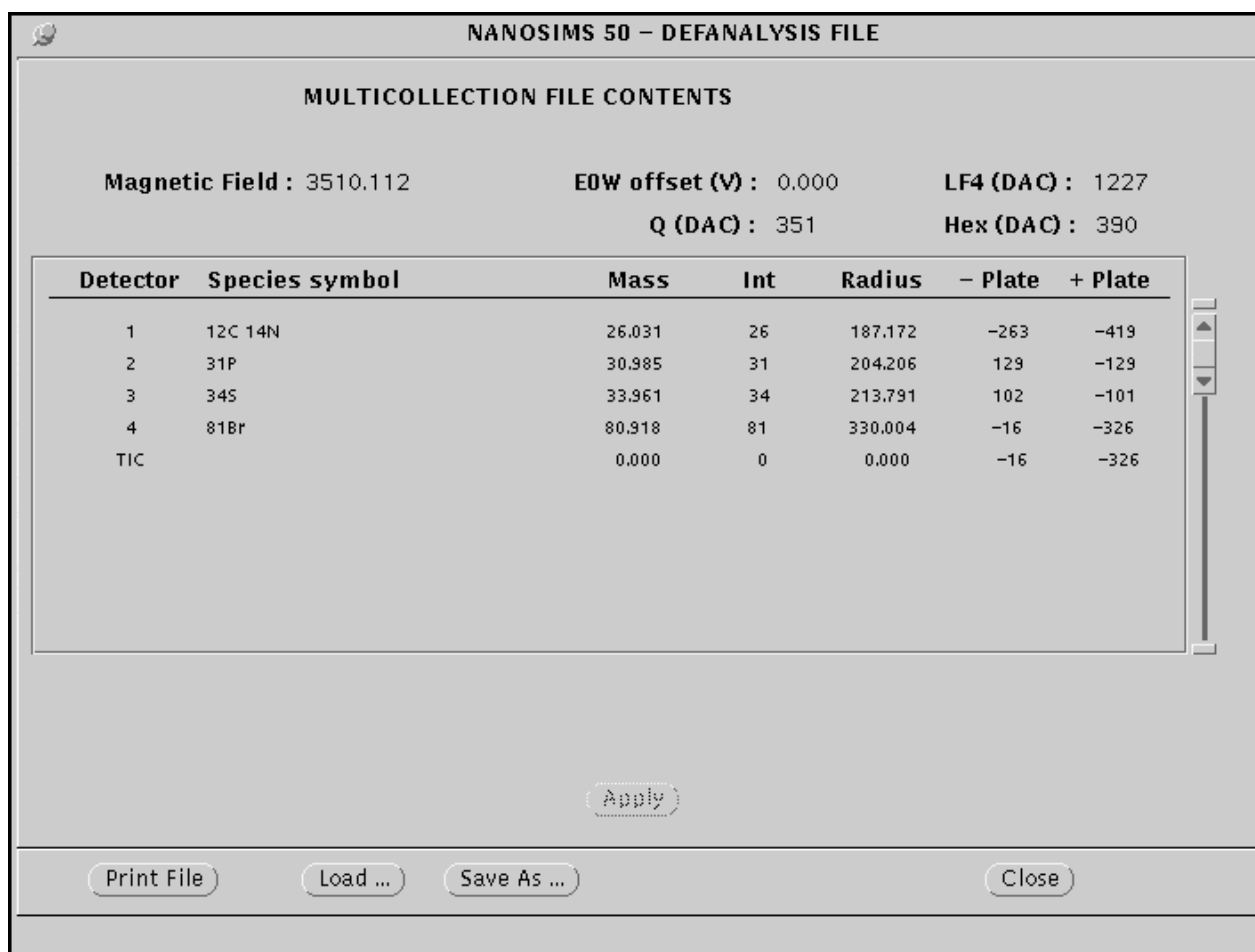


Figure 2-8: View of Define Analysis Menu.

| Menu Details: Define Analysis | |
|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Print File | Print File. Prints out listing of the contents of the parameter file |
| Load ... | Load. Retrieves saved parameter sets |
| Save As ... | Save as.. Writes current parameters to named file |

4. Mass Table Menu Mass Table...

In Fig. 2-9, choosing the button ‘Trolley Install’ brings up the menu shown in (b). You select trolley 1,2,3, or 4, and window (b) will give you a list of allowable positions.

Using the ‘Adjust radius’ button (which brings up panel ‘c’), does not result in mechanical movement. The software just reorients itself to make sure it’s in agreement with the physics.

a) Mass Table - Edit Mass

Please select a mass table :

| B | Date |
|----------|-----------------------|
| 2104.782 | Sun Jan 26,2003 10:03 |
| 2104.806 | Sat Jan 25,2003 15:01 |
| 2250.144 | Fri Jan 24,2003 12:15 |
| 2250.144 | Tue Nov 26,2002 14:47 |
| 3510.112 | Sun Feb 02,2003 14:12 |
| 3510.112 | Sat Feb 01,2003 19:31 |
| 3820.000 | Sat Feb 01,2003 16:08 |

Table Description :
MultiCollection table

Magnetic Field (Gauss) : 3510.112 Mass Table Real

Fix Radius : 127.083 Field Install

Symbol : 12C Delete mass

| Id | Species symbol | Mass | Int | Radius |
|----|----------------|--------|------|---------|
| 1 | 12C | 12.000 | (12) | 127.083 |
| 2 | 16O | 15.995 | (16) | 146.719 |
| 3 | 12C 14N | 26.003 | (26) | 187.072 |
| 4 | 12C 15N | 27.000 | (27) | 190.625 |
| 5 | 28Si | 27.977 | (28) | 194.042 |
| 6 | 30Si | 29.974 | (30) | 200.848 |
| 7 | 31P | 30.974 | (31) | 204.170 |
| 8 | 32S | 31.972 | (32) | 207.435 |
| 9 | 34S | 33.968 | (34) | 213.811 |
| 10 | 35Cl | 34.969 | (35) | 216.939 |

Buttons: Edit mass | Trolley install | Adjust radius

Axis: [a.m.u] 29.7, 66.9, 118.9, 185.8; [mm] 200, 300, 400, 500

b) Mass Table - Assign Trolleys

Magnetic Field (Gauss) : 3510.112 Mass Table Real

Fix Radius : 127.083 Field Install

Symbol : 12C Delete mass

| Id | Species symbol | Mass | Int | Radius |
|----|----------------|--------|------|---------|
| 1 | 12C | 12.000 | (12) | 127.083 |
| 2 | 16O | 15.995 | (16) | 146.719 |
| 3 | 12C 14N | 26.003 | (26) | 187.072 |
| 4 | 12C 15N | 27.000 | (27) | 190.625 |
| 5 | 28Si | 27.977 | (28) | 194.042 |
| 6 | 30Si | 29.974 | (30) | 200.848 |
| 7 | 31P | 30.974 | (31) | 204.170 |
| 8 | 32S | 31.972 | (32) | 207.435 |
| 9 | 34S | 33.968 | (34) | 213.811 |
| 10 | 35Cl | 34.969 | (35) | 216.939 |

Buttons: Edit mass | Trolley install | Adjust radius

Select a trolley : FCs | 1 | 2 | 3 | 4 **Mode :** Moveable | Static **Start**

c) Mass Table - Place Trolleys

Magnetic Field (Gauss) : 3510.112 Mass Table Real

Fix Radius : 127.083 Field Install

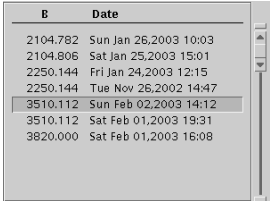






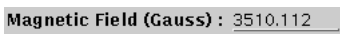
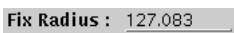
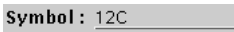
Symbol : 12C Delete mass



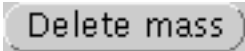


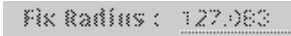

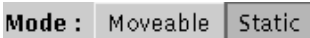
| Id | Species symbol | Mass | Int | Radius |
|----|----------------|--------|------|---------|
| 1 | 12C | 12.000 | (12) | 127.083 |
| 2 | 16O | 15.995 | (16) | 146.719 |
| 3 | 12C 14N | 26.003 | (26) | 187.072 |
| 4 | 12C 15N | 27.000 | (27) | 190.625 |
| 5 | 28Si | 27.977 | (28) | 194.042 |
| 6 | 30Si | 29.974 | (30) | 200.848 |
| 7 | 31P | 30.974 | (31) | 204.170 |
| 8 | 32S | 31.972 | (32) | 207.435 |
| 9 | 34S | 33.968 | (34) | 213.811 |
| 10 | 35Cl | 34.969 | (35) | 216.939 |

Buttons: Edit mass | Trolley install | Adjust radius

Select a detector : FCs | 1 | 2 | 3 | 4 | 5 | LD **Adjust**

Figure 2-9: View of Main Mass Table Menu with Three Panels Shown for Edit Mass (a), Assign Trolleys (b), and Place Trolleys (c).

| Menu Details: Mass Table Menu | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| a) Mass Table - Edit Masses | |
|  | File list. List of existing files for combinations of magnetic field strengths, radii and isotope masses. Can be selected by clicking on entries |
|  | New. Starts new blank file, using the current magnetic field strength. |
|  | Delete. Deletes selected parameter set. |
|  | Discard edits. Returns parameters to initial, saved state from any edits that have been made. |
|  | Save. Opens menu to write new parameter list to a file. |
|  | Print. Sends current parameters to print file |
|  | Close. Closes Mass Table menu. |
|  | Magnetic Field. Enter magnetic field strength for current data set. |
|  | Fix Radius. Enter radius for selected isotope |
|  | Symbol. Symbol for detected ion - Applies to all the windows during this analysis |
| A note about Magnetic Field, Fix Radius, and Symbol: these three parameters are inter-related. You determine one parameter by setting the other two. For example, if you input the magnetic field and the symbol, the appropriate radius will be automatically calculated. | |

| | |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Mass Table/Real. |
|  | Field Install. Apply entered field strength to the magnet. Large changes can lead to a loss of the NMR lock. Plus, hysteresis and induction can also make transitions a bit rocky. |
|  | Remove Mass. Delete high-lighted entry from mass table |
|  | Periodic Table. Accesses sub-menu with a periodic table of the isotopes and an editable list of polyatomic ions. |
| B) Mass Table - Assign Trolleys | |
|  | Magnetic Field Strength. Has been set in panel A) |
|  | Radius. Can be assigned. In this case the fixed Faraday cup FCs had been selected, so the option is grayed out. |
|  | Select a trolley. Assigns a specific detector to a given isotope under the chosen physical conditions (Field, etc.) |
|  | Mode. Fixes the position of a trolley or lets it float to accommodate other restrains (Not really a choice in the case of FCs). |
| C) Mass Table - Place Trolleys | |
| | |

5. Bar Graph Menu Bar Graph

a) Bar Graph Conditions

NANOSIMS 50 - BarGraph Spectrum

Dir : /export/home/ims/data/JOE/030218

File name (.br) : NoName Save

Detector : 1 2 3 4

Start B Field (G) : 1500.000 End B Field (G) : 1820.000

Bfield step (G) : 1.600

Number of step : 200

MassResolution : 519

Count time (s) : 1.000

Waiting time (s) : 0.200 Computed

Beam Blanking : OFF ON


Start mass : _____ End mass : _____

START
▶ STOP ABORT

Selected Value (G) : Apply SHOW
CURVE

Close

Figure 2-10: View of Bar Graph Conditions Menu

| Menu Details: Bar Graph Conditions | |
|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Detector : <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 | Detector. Select detector used for the acquisition of the spectrum |
| Start B Field (G) : <input type="text" value="1500.000"/> | Start B Field. Sets starting point for B-field scan. |
| End B Field (G) : <input type="text" value="1820.000"/> | End B Field. Sets end point for B-field scan. |
| Bfield step (G) : <input type="text" value="1.600"/> | Bfield step. B field increment for scan - linked to number of steps . |
| Number of step : <input type="text" value="200"/> | Number of steps. Number of steps - linked to increment size. |
| MassResolution : <input type="text" value="519"/> | Mass resolution. ????? |
| Count time (s) : <input type="text" value="1.000"/> | Count time. Acquisition time per time point. |
| Waiting time (s) : <input type="text" value="0.200"/> | Waiting time. Equilibration time after move to next field strength. Depends on step size. This interval can be computed by the program. |
| Beam Blanking : <input type="radio"/> OFF <input type="radio"/> ON | Beam Blanking. Turns beam off during move from one field strength to the other. Blurs spectrum if OFF. |
|  | Show Curve. Opens Display window for the effect of the B-field on the count rates at the selected detector. |

b) Bar Graph Display Window

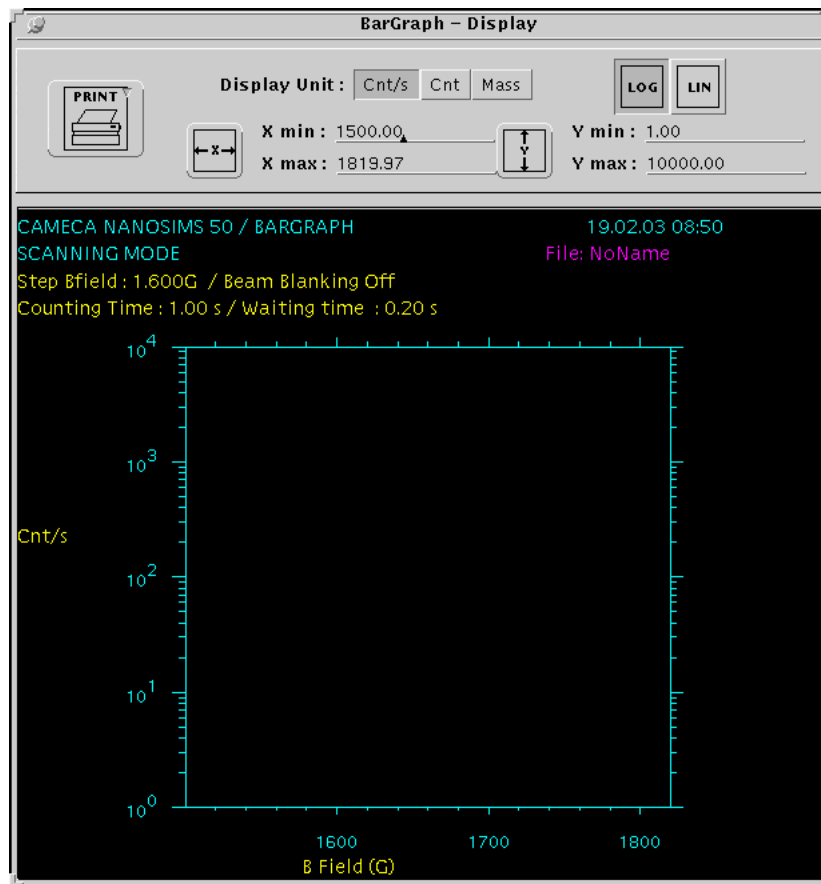


Figure 2-11: View of Bar Graph Display Window.

| Menu Details: Bar Graph Display | |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Display Units. Displays scanning results as secondary ion current or as counts per acquisition period. Also changes X-axis to mass units ???? |
| | Y-axis scale. Sets y-axis to either log or linear. |
| | X-axis range. Lower and upper limit for x-axis |
| | Y-axis range. Lower and upper limit for y-axis |

6. Energy Menu Energy

a) Energy Tuning

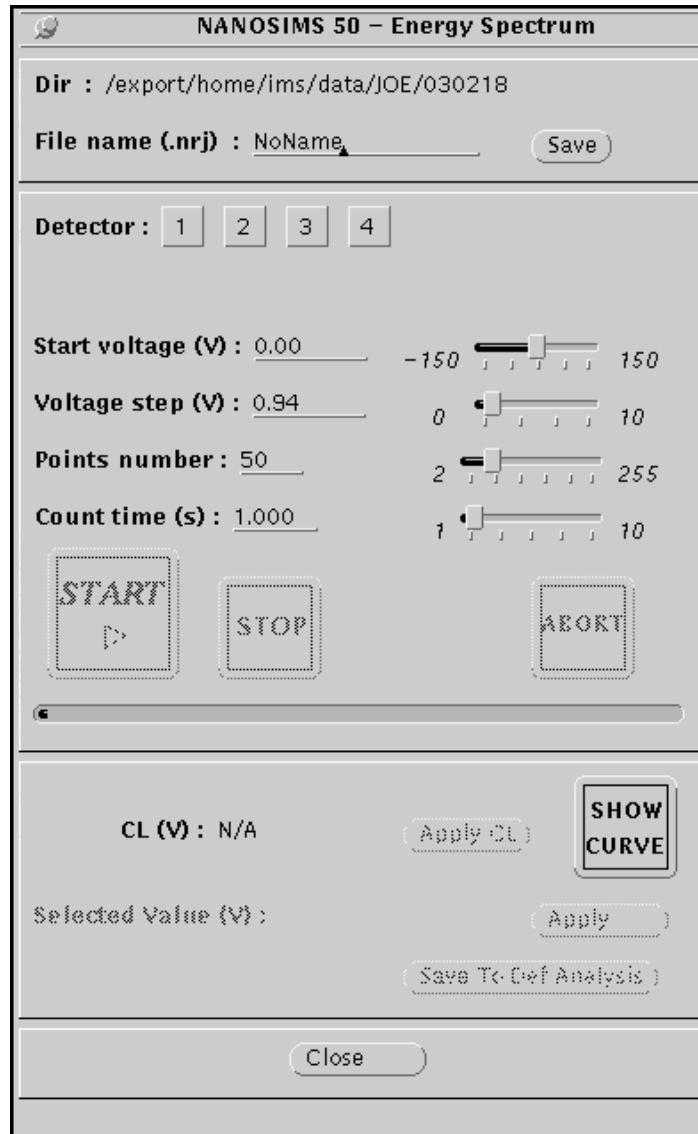



Figure 2-12: View of Energy Tuning Window.

Menu Details: Energy Tuning - Conditions

The electrostatic sector of a double focusing mass spectrometer selects the ions by kinetic energy, regardless of mass. Energy tuning optimizes the voltage applied to the electrostatic sector SS100 to send the center of the secondary ion beam kinetic energy distribution into the magnetic sector.

| | |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Detector : 1 2 3 4 | Detector. Selects one or more of the electron multipliers behind the magnetic sector to measure the specific secondary ion currents. |
| Voltage step (V) : 0.94 | Voltage step. Increment for the voltage scan of SS100. |
| Points number : 50 | Points number. Number of increment steps during the scan. |
| Count time (s) : 1.000 | Count time. Acquisition time per scan point. |
| CL (V) : N/A Apply CL | CL (V). Center line voltage. Automatically detected maximum for the voltage scan. Can be written to the parameter file by clicking on Apply CL . |
| Selected Value (V) : | Selected Value. User selected value for the potential of SS100. This is done by clicking with the mouse in the display window. Clicking on Apply writes the value to the parameter file. |
| Save To Def Analysis | |
|  | Show Curve. Opens display window for the energy scan. |

b) Energy Display

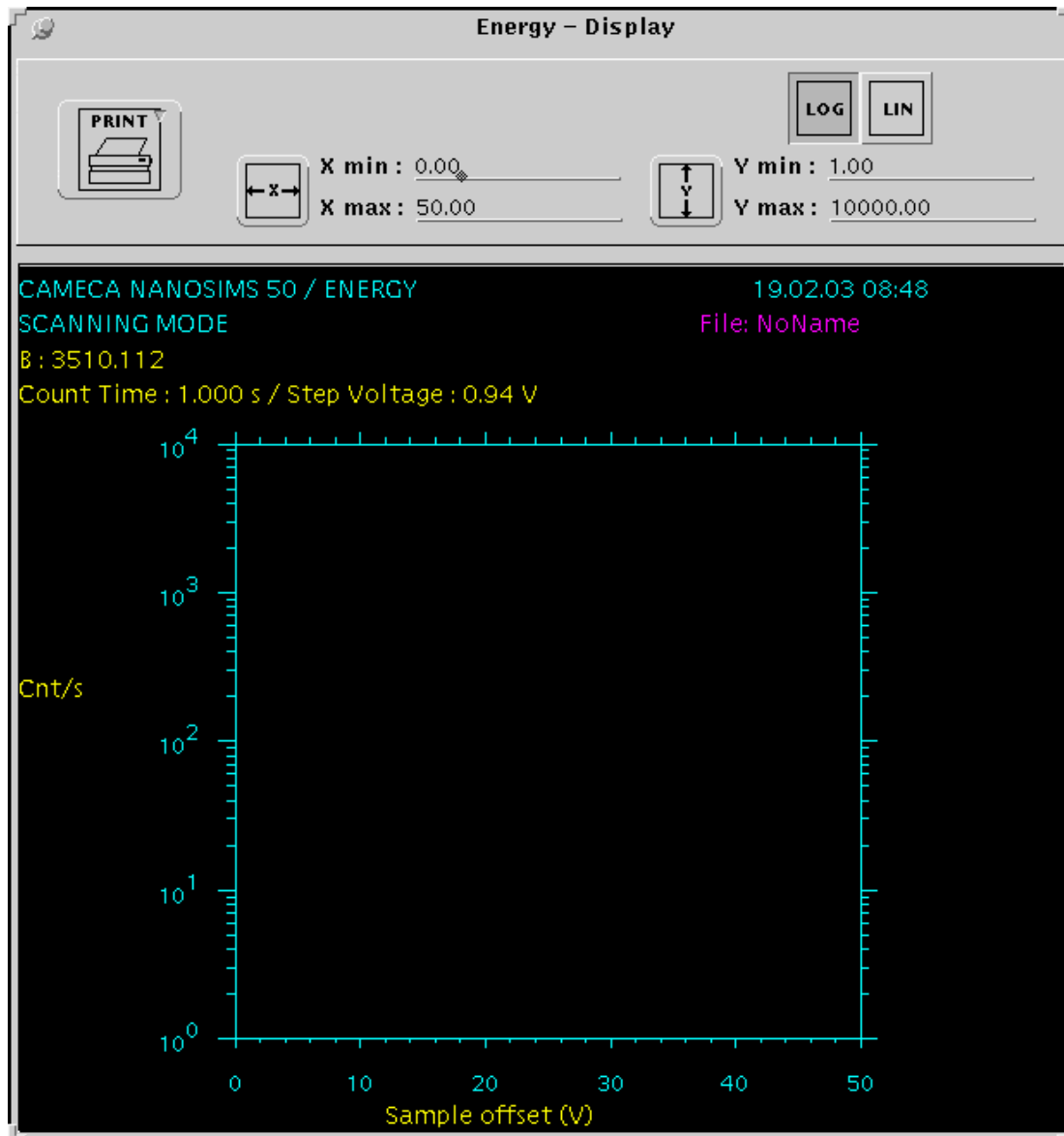
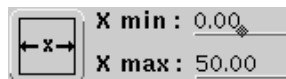




Figure 2-13: View of Energy Display Window.

Menu Details: Energy Tuning - Display

After the scan the program selects automatically the peak maximum and passes the sample offset value to the main panel as CL. Alternatively, the user can mark a different peak with the mouse and apply this value as a correction to the potential of the electrostatic sector.



X-axis range. Lower and upper limit for x-axis

| | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
|  A control panel for the y-axis range. It features a vertical double-headed arrow icon with the letter 'Y' in the center. To the right of the icon are two input fields: the top one is labeled 'Y min : 1.00' and the bottom one is labeled 'Y max : 10000.00'. <p>Y min : 1.00 Y max : 10000.00</p> | Y-axis range. Lower and upper limit for y-axis |
|  A control panel for the y-axis scale. It contains two square buttons side-by-side. The left button is labeled 'LOG' and the right button is labeled 'LIN'. <p>LOG LIN</p> | Y-axis scale. Sets y-axis to either log or linear |

7. Beam Stability Menu Beam Stab

a) Beam Stability Conditions

Primary beam is scanning over a preset area, rather than burning a hole in one spot. Static vs. Scan is set in the main tuning window

Detection mode selects either Faraday cups for the primary ions or EM detectors for secondary ions

Electron multiplier tubes after mass spectrometer stage

Faraday cups in the primary column and behind the sample stage

Start/Stop buttons greyed out since no detector has been selected yet

Starts statistical analysis of the beam stability after the acquisition is completed

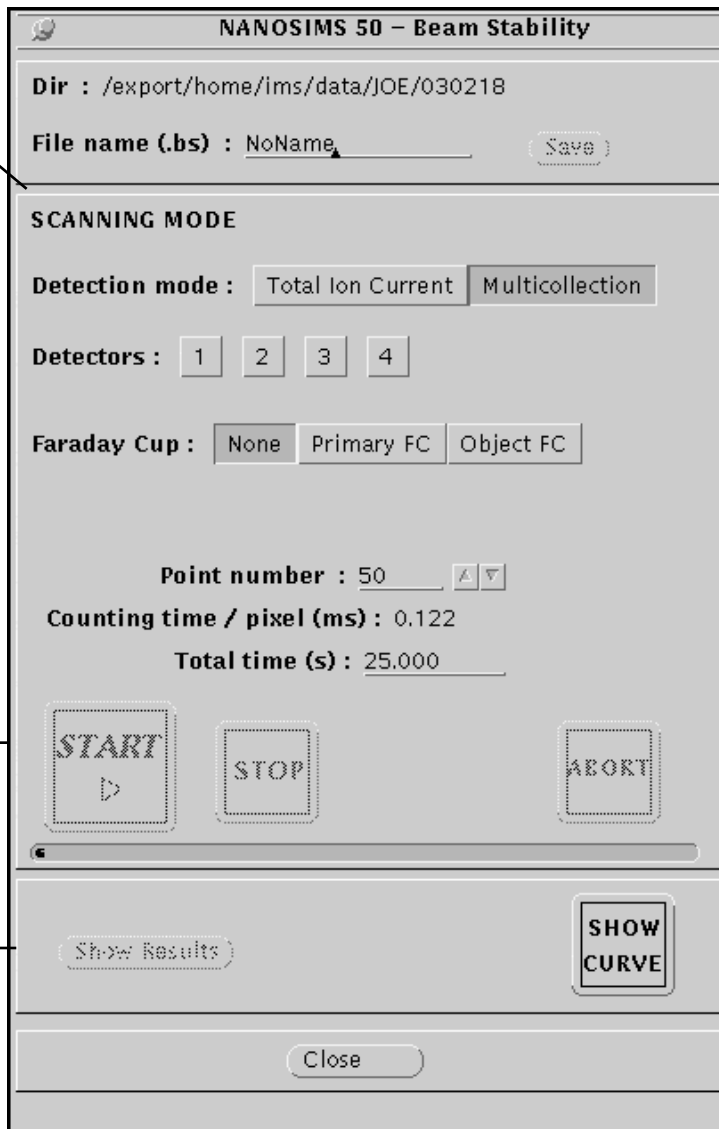
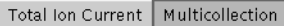


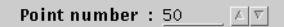
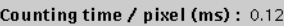
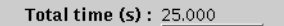

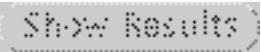



Figure 2-14: View of Beam Stability Conditions Menu.

| Menu Details: a) Beam Stability Conditions | |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| SCANNING MODE | Scanning Mode. Indicates that the primary beam will be scanned across the sample. Set in the main Tuning panel. |

| | |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>TIC/MC. Selects detectors used - either Faraday cups for total ion current or electron multiplier dynodes for secondary ion counts after the mass spectrometer stage.</p> |
|  | <p>Detectors. Selects the EM detector used for the beam stability measurements (as stability of secondary ion generation)</p> |
|  | <p>Faraday Cup. Selects position in w</p> |
|  | <p>Point number. Number of time points at which the beam intensity is determined</p> |
|  | <p>Counting time.For scanning mode: Time per pixel during the acquisition of one scan at a given time point.</p> |
|  | <p>Total time. Duration over which the beam intensity is recorded</p> |
|  | <p>Start/Stop/Abort. Start: Starts beam stability recording. Stop: Ends acquisition early, saves data. Abort: Stops acquisition, discards data.</p> |
|  | <p>Show results. opens window with statistical analysis of the beam stability</p> |
|  | <p>Show Curve. Opens Beam Stability Display</p> |

b) Beam Stability Display

Scanning mode with raster set to 0 is the equivalent of a static beam!

Acquisition time per scanned frame.

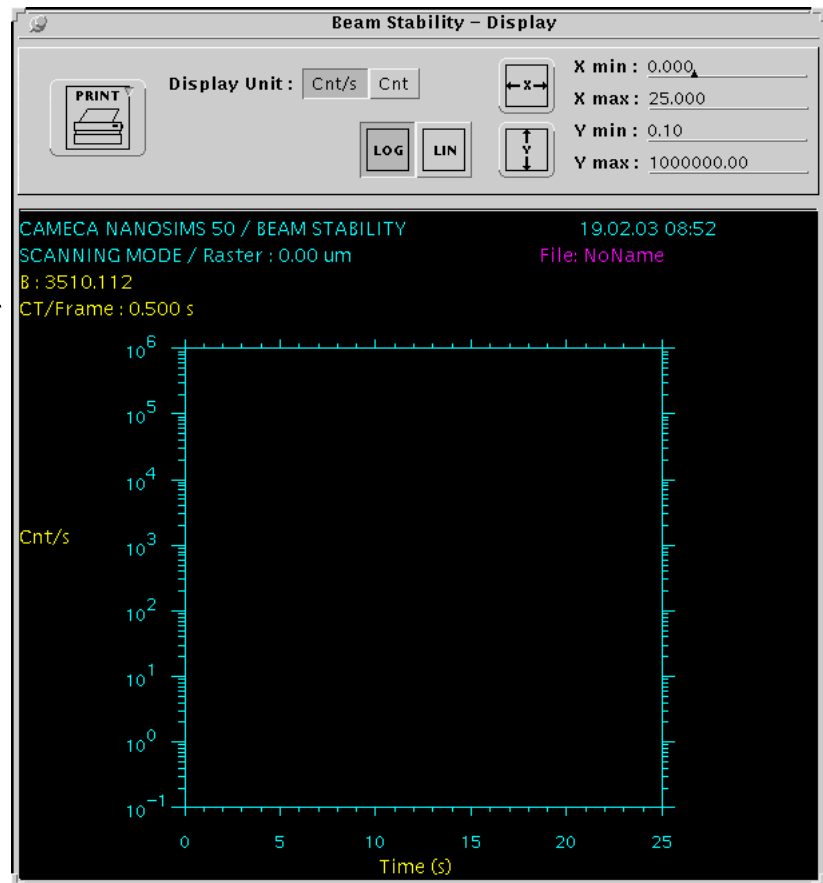


Figure 2-15: The Beam Stability Display Window.

Menu Details: b) Beam Stability Display

| | |
|----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <p>Display Unit : <input type="button" value="Cnt/s"/> <input type="button" value="Cnt"/></p> | <p>Display Units. Either as counts per second (Cnt/s) or as counts per scanned field (Cnt)</p> |
| <p><input type="button" value="←x→"/> X min : <input type="text" value="0.000"/> X max : <input type="text" value="25.000"/></p> | <p>x-Axis. x-axis range</p> |
| <p><input type="button" value="↑y↓"/> Y min : <input type="text" value="0.10"/> Y max : <input type="text" value="1000000.0"/></p> | <p>y-Axis. y-axis range</p> |
| <p><input type="button" value="LOG"/> <input type="button" value="LIN"/></p> | <p>Log/Lin. Format of the y-axis (logarithmic or linear)</p> |

8. PHD Menu PHD

a) PHD Conditions

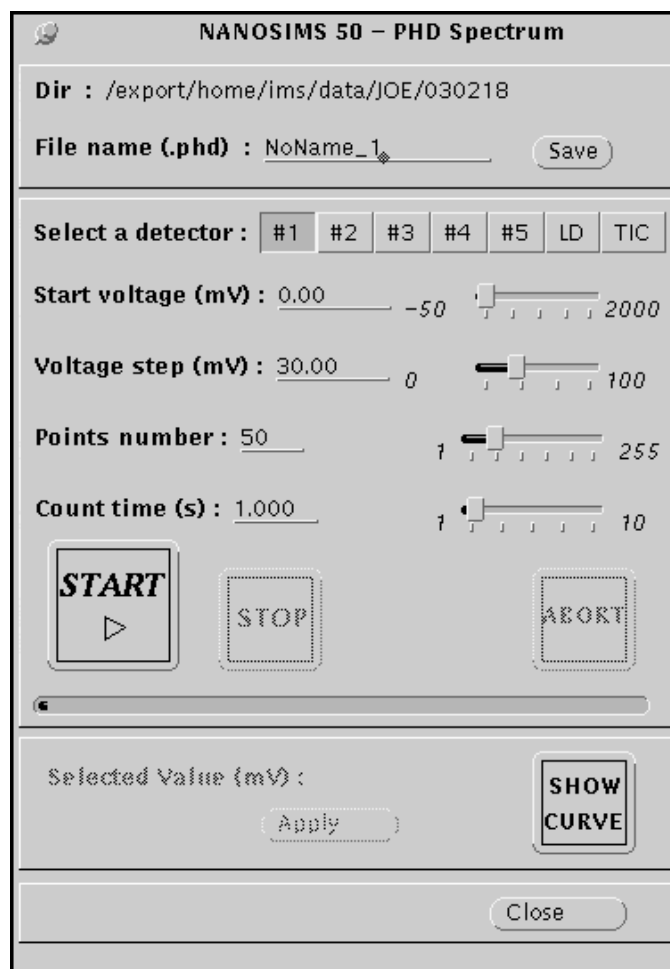
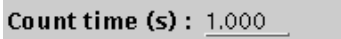






Figure 2-16: View of the PHD Conditions Window.

| Menu Details: a) PHD Conditions | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| <div style="border: 1px solid black; padding: 2px; display: inline-block;"> #1 #2 #3 #4 #5 LD TIC </div> | Detector Selection. Selects detector for threshold adjustment |
| <div style="border: 1px solid black; padding: 2px; display: inline-block;"> Start voltage (mV): 0.00 </div> | Start Voltage. Starting point for threshold voltage scan. |
| <div style="border: 1px solid black; padding: 2px; display: inline-block;"> Voltage step (mV): 30.00 </div> | Voltage Step. Voltage increment for threshold scan. |
| <div style="border: 1px solid black; padding: 2px; display: inline-block;"> Points number: 50 </div> | Points number. Number of data points for the scan. |

| | |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Count Time. Acquisition time for each scanned point.</p> |
|  | <p>Start/Stop/Abort. Start: Starts beam stability recording. Stop: Ends acquisition early, saves data. Abort: Stops acquisition, discards data.</p> |
|  | <p>Show Curve. Opens PHD Display</p> |
|  | <p>Selected Value. Grayed out until completion of scan. After using the mouse in the PHD display to select the optimal voltage, the value is transferred to this line.</p> |
|  | <p>Apply. Applies selected voltage to the detector.</p> |

b) PHD Display

In Figure 2-17, move the line to select the threshold voltage. You change the voltage of the actual detector to shut out noise. The line should always be at the vertex of the curve, as shown in this example.

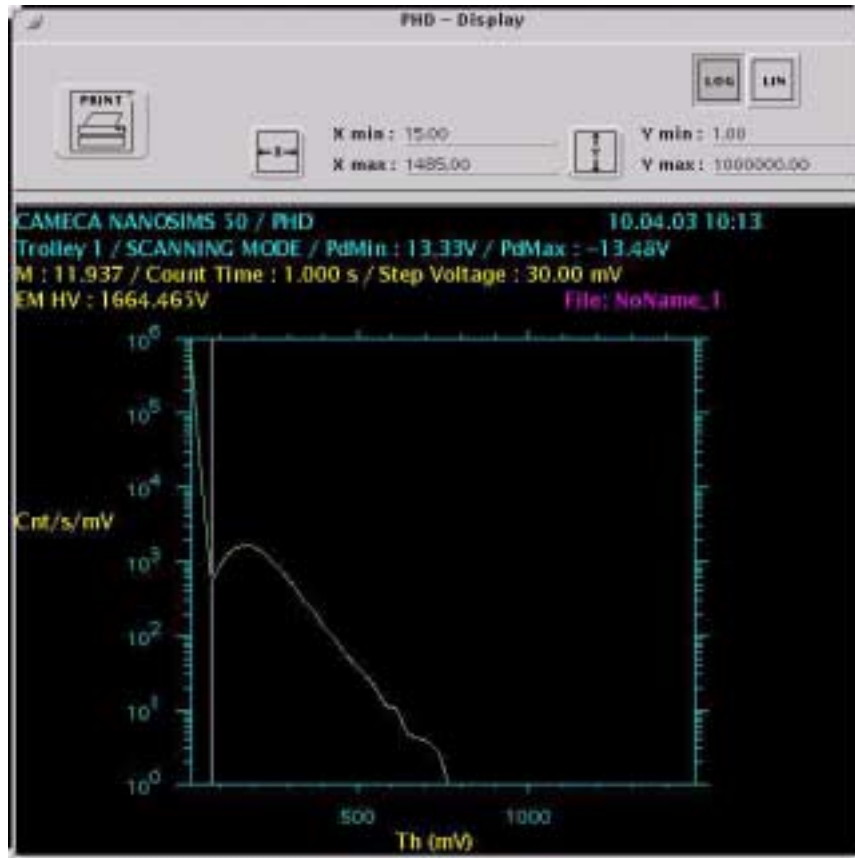


Figure 2-17: View of PHD Display Window.

9. Tools Menu Tools

a) Tuning Tools Conditions

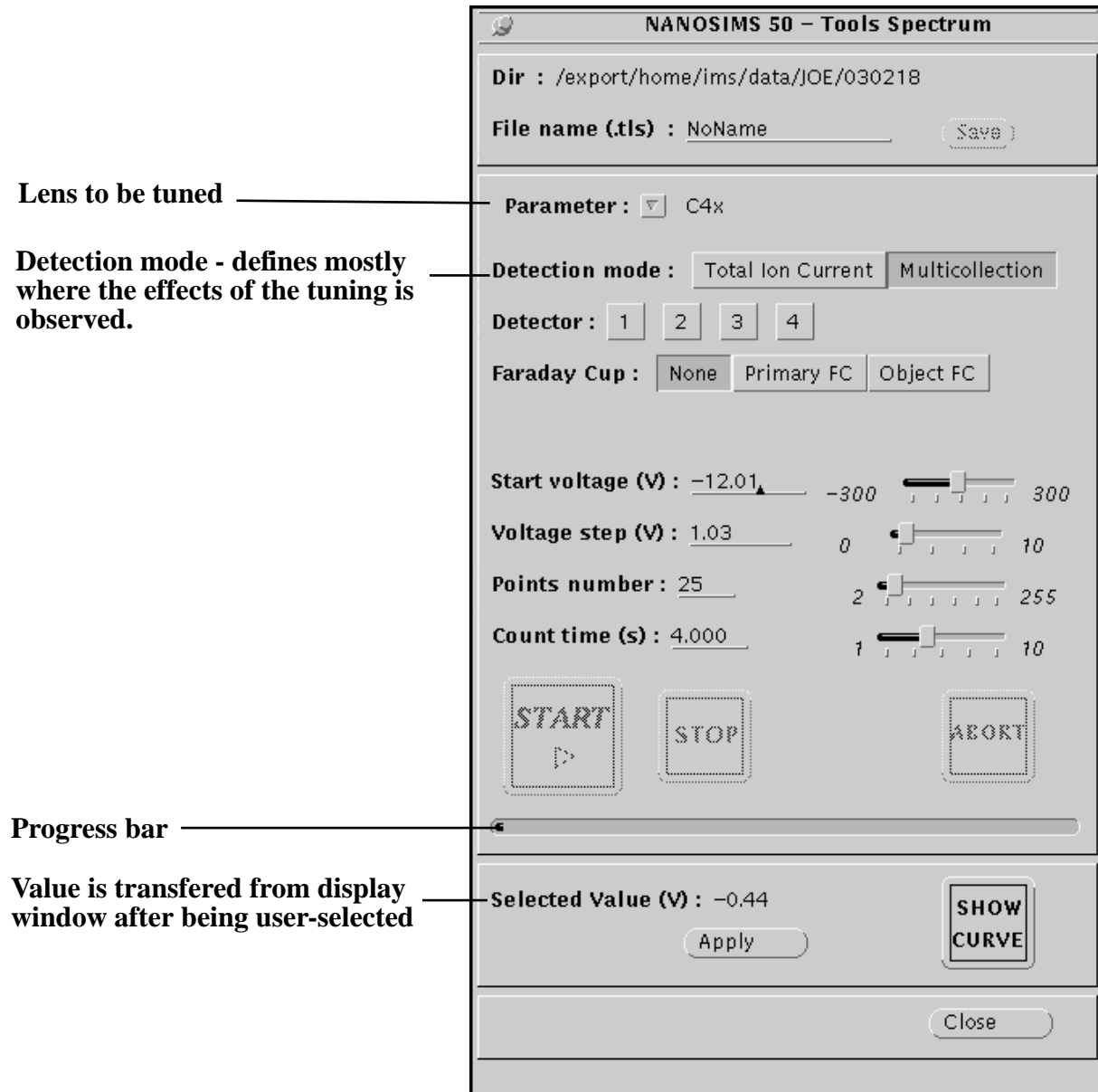


Figure 2-18:View of Tuning Tools Menu.

Menu Details: a) Tuning Tools Conditions

| | |
|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Parameter : ▾ C4x | Parameter. Selects lens, etc. that will be tuned |
|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------|

| | |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="text" value="Total Ion Current"/> <input type="text" value="Multicollection"/> | Detection mode. Selects detector for the observation of the effects of tuning. |
| <input type="text" value="1"/> <input type="text" value="2"/> <input type="text" value="3"/> <input type="text" value="4"/> | Detector. EM detectors used for detection via multi collection after the mass spectrometer stage. Multiple detectors can be used. |
| <input type="text" value="None"/> <input type="text" value="Primary FC"/> <input type="text" value="Object FC"/> | Faraday Cup. Faraday cups used for measurement of the primary ion current. |
| Start voltage (V) : <input type="text" value="-12.01"/> | Start Voltage. Starting point for tuning scan. |
| Voltage step (V) : <input type="text" value="1.03"/> | Voltage Step. Voltage increment for tuning scan. |
| Points number : <input type="text" value="25"/> | Points number. Number of steps in the scan |
| Count time (s) : <input type="text" value="4.000"/> | Count time. Acquisition time per increment. |
| <input type="button" value="START"/> <input type="button" value="STOP"/> <input type="button" value="ABORT"/> | Start/Stop/Abort. Start: Starts beam stability recording. Stop: Ends acquisition early, saves data. Abort: Stops acquisition, discards data. |
| <input type="button" value="SHOW CURVE"/> | Show Curve. Opens Tools Display |
| Selected Value (V) : <input type="text" value="-0.44"/> | Selected Value. Grayed out until completion of scan. After using the mouse in the PHD display to select the optimal voltage, the value is transferred to this line. |
| <input type="button" value="Apply"/> | Apply. Applies selected voltage to the selected element. |

b) Tools Display

Multiple EM detectors were selected to observe the effect of tuning on the multi-collection stage. Optimize tuning for all 4 collectors.

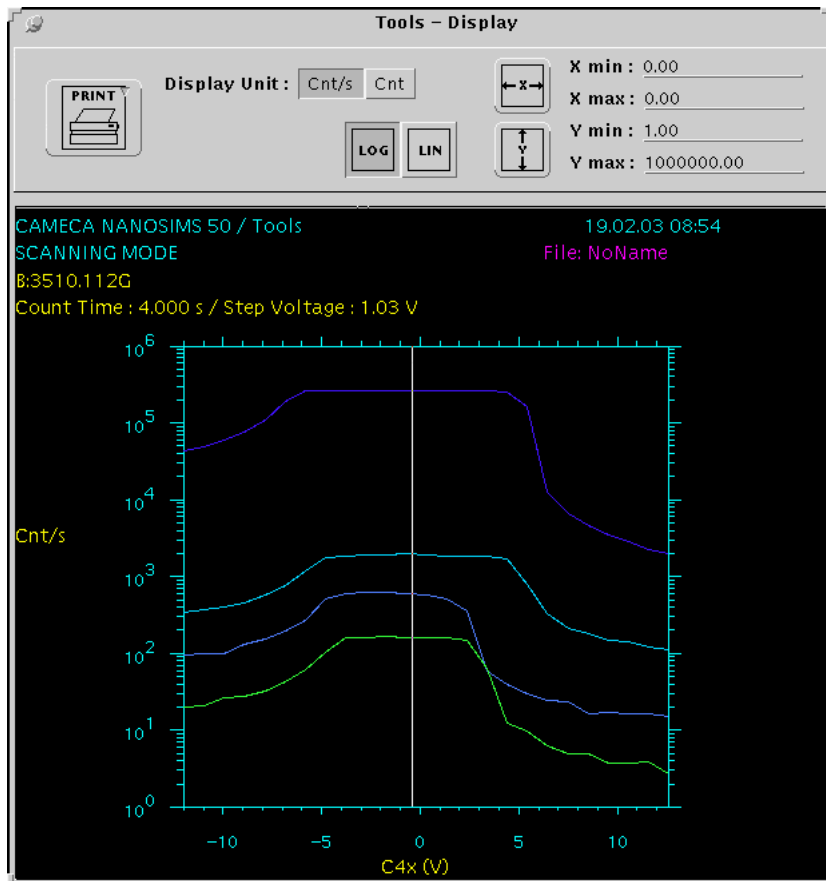


Figure 2-19: Tools Display Window.

Menu Details: b) Tools Display

| | |
|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Display Unit: <input type="button" value="Cnt/s"/> <input type="button" value="Cnt"/> | Display Units. Either as counts per second (Cnt/s) or as counts per scanned field (Cnt) |
| <input type="button" value="X min"/> X min : 0.000 <input type="button" value="X max"/> X max : 25.000 | x-Axis. x-axis range |
| <input type="button" value="Y min"/> Y min : 0.10 <input type="button" value="Y max"/> Y max : 1000000.0 | y-Axis. y-axis range |
| <input type="button" value="LOG"/> <input type="button" value="LIN"/> | Log/Lin. Format of the y-axis (logarithmic or linear) |

10. HMR Menu HMR

a) High Mass Resolution Scan - Conditions

High Mass Resolution scans are done after the mass spectrometer stage; therefore only these detectors are options.

NANOSIMS 50 – HMR Spectrum

Dir : /export/home/ims/data/JOE/030218

File name (.hmr) : NoName_4 Save

Detector : FCs #1 #2 #3 #4 #5 LD

Start voltage (V) : 0.00 -200 200

Voltage step (V) : 1.00 0 4

Points number : 50 1 256

Count time (s) : 0.540 1 10

START STOP ABORT

L10-90 (um) : 44.73 SHOW CURVE

L5-95 (um) : 50.29

L50 (um) : 27.00 Apply L50 In Setup

CL (um) : 0.00

Selected Voltage (V) : 20.95 Apply

Center Line Voltage (V) : 22.71 Apply CL

Close

X-Deflection, deflection voltage and mass are used interchangeably in this sub menu.

Figure 2-20: The High Mass Resolution (HMR) Scan Menu.

| Menu Details: a) High Mass Resolution Scan - Conditions | |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Detectors. Select the detector used for tuning. Only one detector can be tuned at a time. |
| Start voltage (V) : 0.00 | Start voltage. Initial potential of the deflector plates in front of the EM. |
| Voltage step (V) : 1.00 | Voltage step. Increment size for the scan |
| Points number : 50 | Points number. Number of steps for the scan. |
| Count time (s) : 0.540 | Count time. Acquisition time per point of measurement. |
| | Start/Stop/Abort. Start: Starts beam stability recording. Stop: Ends acquisition early, saves data. Abort: Stops acquisition, discards data. |
| L10-90 (um) : 44.73 | L10-90. Distance over which the signal rises from 10% of the maximum to 90%, expressed in um. Serves as a measure of the quality of the left shoulder of the spectrum. |
| L5-95 (um) : 50.29 | L9-95. Distance over which the signal goes from 5% to 95% of the maximum. |
| L50 (um) : 27.00 | L50. ???? |
| CL (um) : 0.00 | CL. Center line - Automatically determined maximum of the HMR spectrum |
| Apply L50 In Setup | Apply L50 in setup.??? |
| Selected Voltage (V) : 20.95 | Selected Voltage. Deflection voltage selected in display window with mouse (yellow line). Important for the distinction between isobars such as $^{12}\text{C}^{15}\text{N}$ and $^{13}\text{C}^{14}\text{N}$. |
| Center Line Voltage (V) : 22.7 | Center Line Voltage. Deflection voltage to center maximum on detector |
| Apply | Apply. Transfers selected voltage to deflector potential settings. |

| | |
|----------|----------------------------------------------------------------------------------------------------------------|
| Apply CL | Apply CL. Transfers voltage settings to center maximum on the detector to deflector potential settings. |
|----------|----------------------------------------------------------------------------------------------------------------|

b) HMR Display

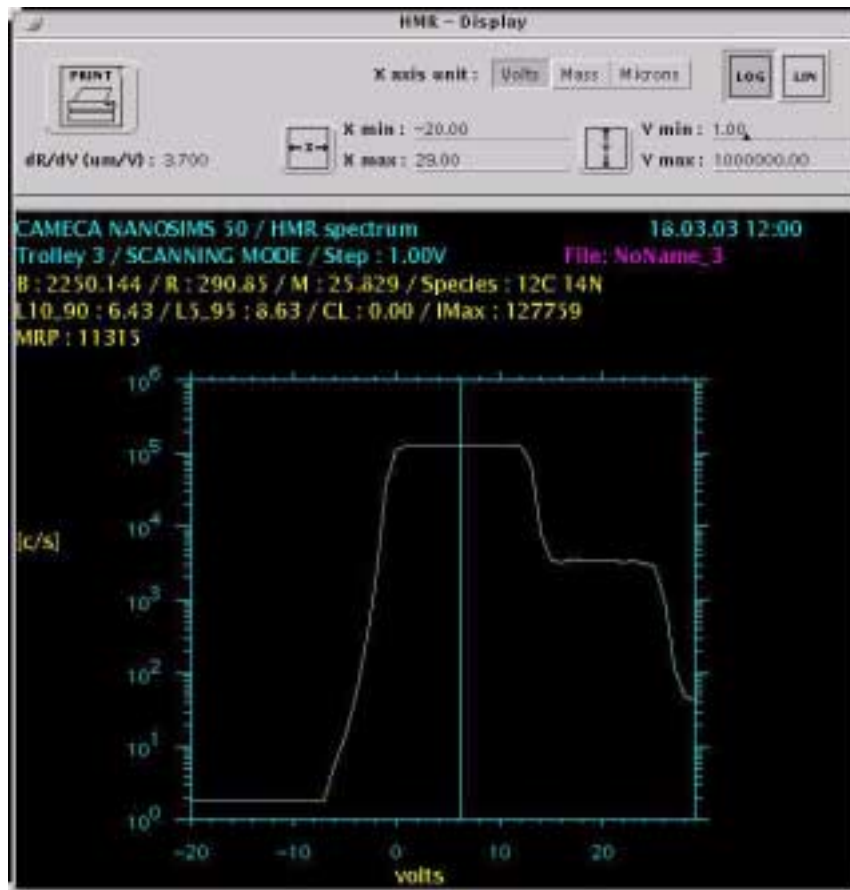


Figure 2-21:View of HMR Display Window. Moving the bar sets the voltage of the deflector or lens that you re checking.

11. Sec. Ion Beam Menu Sec. Ion Beam

a) Secondary Ion Beam - Conditions

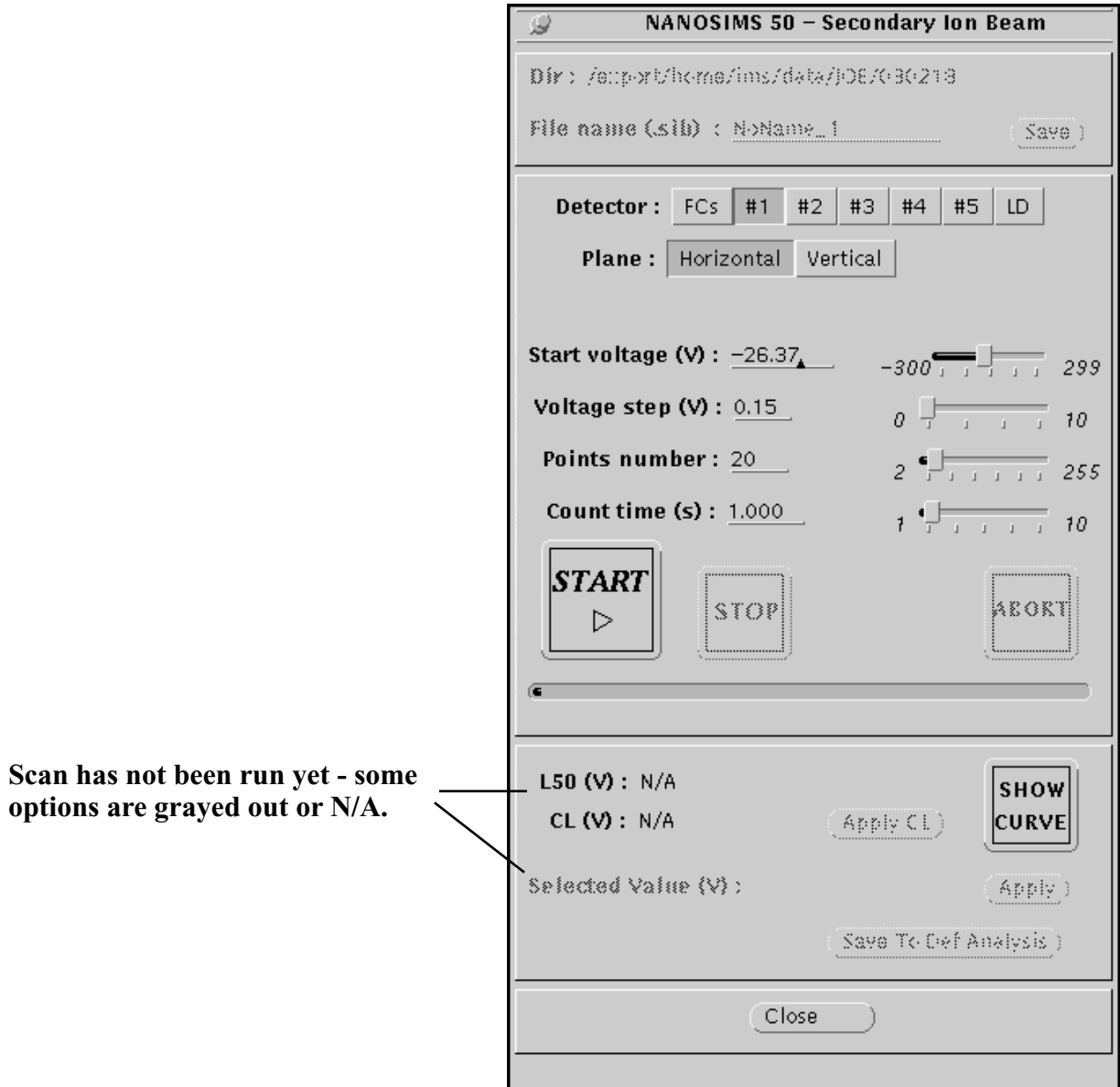




Figure 2-22: View of Secondary Ion Beam Conditions

Menu Details: a) Secondary Ion Beam - Conditions

| | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| FCs #1 #2 #3 #4 #5 LD | <p>Detector. Selects detector used to monitor the quality of the secondary ion beam after the mass spectrometer stage.</p> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|

| | |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Plane : <input type="radio"/> Horizontal <input type="radio"/> Vertical | Plane. Toggles between horizontal (C_y) and vertical (C_z) alignment of the secondary ion beam. |
| Start voltage (V) : <input type="text" value="-26.37"/> | Start voltage. Initial potential of the deflector plates in front of the EM. |
| Voltage step (V) : <input type="text" value="0.15"/> | Voltage step. Increment size for the scan |
| Points number : <input type="text" value="20"/> | Points number. Number of steps for the scan. |
| Count time (s) : <input type="text" value="1.000"/> | Count time. Acquisition time per point of measurement. |
|  | Start/Stop/Abort. Start: Starts beam stability recording. Stop: Ends acquisition early, saves data. Abort: Stops acquisition, discards data. |
|  | Show Curve. Opens display window. |
| L50 (V) : <input type="text" value="N/A"/> | L50 (V): ??? |
| CL (V) : <input type="text" value="N/A"/> | CL (V): Focuses signal maximum into the selected detector. |
| <input type="button" value="Apply CL"/> | Apply CL. Applies potential CL(V) to detector plates to center the signal peak in the detector. |
| Selected Value (V) : <input type="text"/> | Selected Voltage (V). Alternative voltage selected in the displayed curve of the secondary ion beam scan. |
| <input type="button" value="Apply"/> | Apply. Applies the selected potential from above to the deflector plates. |
| <input type="button" value="Save To Def Analysis"/> | Save to Def Analysis. Writes values to Def Analysis file. |

b) Secondary Ion Beam - Display

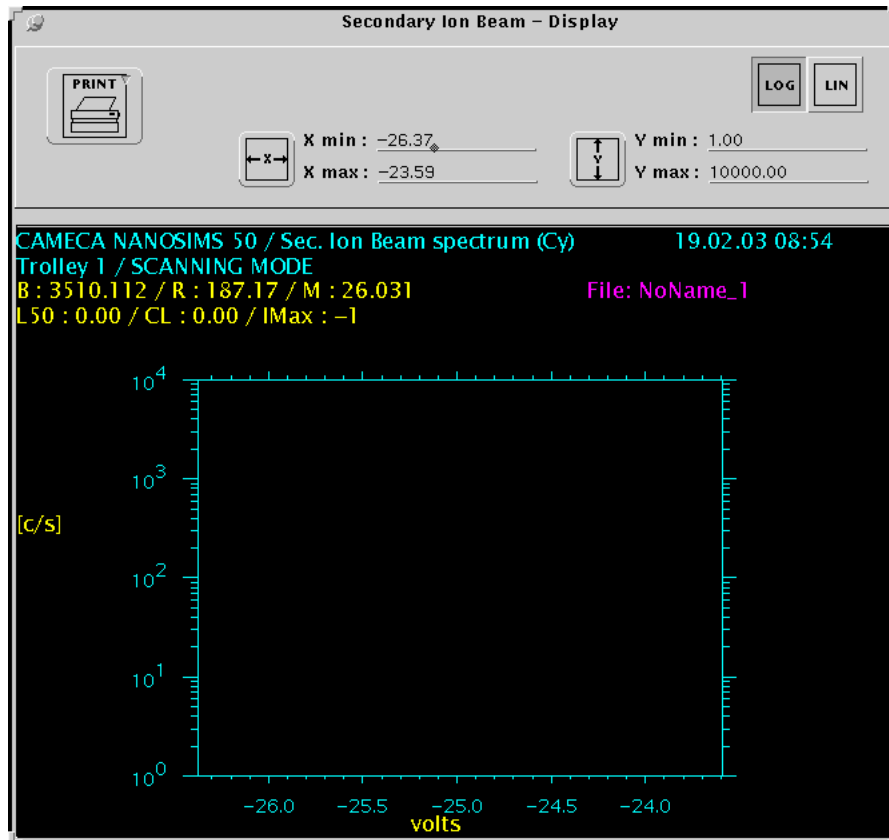





Figure 2-23:Secondary Ion Beam Display Window.

| Menu Details: b) Secondary Ion Beam - Display | |
|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
|  X min : -26.37 X max : -23.59 | x-Axis. x-axis range |
|  Y min : 1.00 Y max : 10000.00 | y-Axis. y-axis range |
|  | Log/Lin. Format of the y-axis (logarithmic or linear) |

12. RTI Menu RTI

a) Real Time Imaging - Conditions

Scanning field (265x256 max) and offset from center via range and starting point

Detection mode for secondary ions - Total ions or mass-filtered

Physical dimension of scanned field

Parameters carried over from trolley set-up

Data from RTI scans are not saved as a file - Stop/Abort choice.

Figure 2-24: View of Real Time Imaging (RTI) Menu.

| Menu Details: a) Real Time Imaging - Conditions | |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Counting time / pixel (us) | Counting Time/pixel. Acquisition time per pixel. has to be balanced between signal intensity and scan rate. |
| NXMax : 256 <input type="text"/> | NXMax. Right limit for scanned range |

| | |
|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Width : 256 | Width. Number of scanned points in the horizontal. |
| NXLow : 1 | NXLow. Left limit for scanned range. |
| NYMax : 256 | NYMax. Upper limit for scanned range |
| Height : 256 | Height. Number of scanned points in the vertical |
| NYLow : 1 | NYLow. Lower limit for scanned range |
| Total Ion Current <input type="checkbox"/> Multicollection <input type="checkbox"/> | TIC/MC. Detection of either total (TIC) or mass-filtered secondary ions. |
| Detector : 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> | Detector. Selection of up to two detectors in multi-collection mode. |
| Scale : Lin <input type="checkbox"/> Log <input type="checkbox"/> | Scale. Linear or log(10) scale for counts per pixel representation in the real time scan. |
| Raster (um) : 28,600 | Raster. Physical dimension of scanned field. This setting determines the magnification of the final image. |
| Init <input type="button"/> | Init. Transfers the settings for the scanned field to the instrument. |
| Full Scale : 20 | Full scale. Counts per pixel for maximal signal in representation of the real time scan. |
| Offset : 0 | Offset. Lower cut-off for representation of counts in real time scan. |
| Symbol : 12C 14N | Symbol. Label for the detected ion. Carried over from set-up panel. |
| a.m.u : 26.031 | a.m.u. Nominal mass of the detected isotope |
| Radius : 187.172 | Radius. Position of the trolley. |
| EM/FC : EM | EM/FC. Detector type - selected in the set-up menu, either the moveable electron multipliers or the Faraday cup behind the mass spectrometer stage. |

