

## GMTRS: a SCADA class UI & code for extended automation of IBA experiments

- allows automation of Ion Beam Analysis (IBA) experiments
- provides step-by-step SCADA (supervisory command and data acquisition) with full authoritative digital positional motors control

GUI looks...



... and features

- Buttons set/select configurations
- Buttons trigger single/multiple (automated) actions
- Buttons labels attempt titled to be self-explainable...
- Greyed out buttons/groups are temporarily unavailable (option/ /context dependent)
- Buttons tool-tips available: try hover the mouse cursor over a button you want to know about

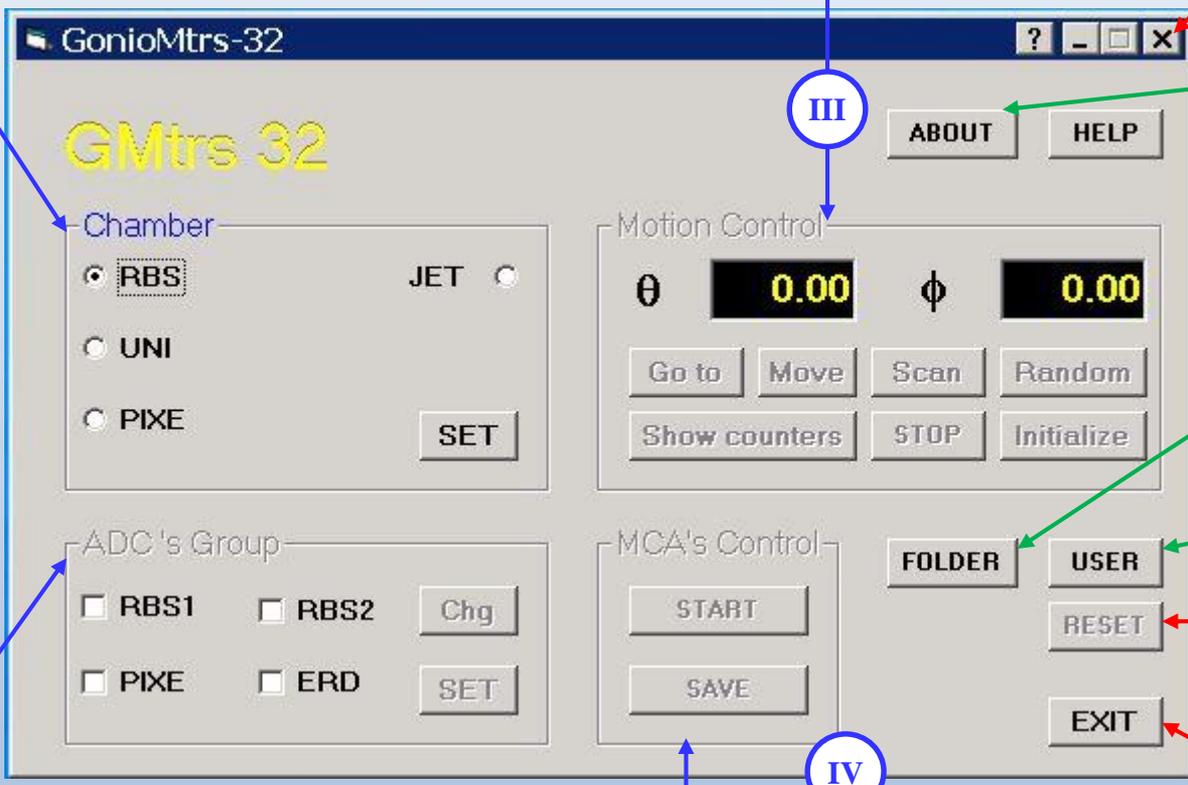
Allows to select the the beam line:  
 - select one and press SET to set it

Motion control and coordinates display:  
 - only active after beam line has been set  
 - Scan and Random only available after the ADCs have been set  
 - STOP only active whence there is motion

ENDs program  
 - same as EXIT  
 (allows reversing)

I

III



Authorship and current version

Changes working folder (should be set at beginning)...

Sets users private parameters...

FULL RESET:  
 - resets beam line and ADCs groups  
 (only after I and II set)

II

IV

Allows to select the ADCs to work with:  
 - only active after beam line has been set  
 - select wanted ADCs  
 - press SET to set it...

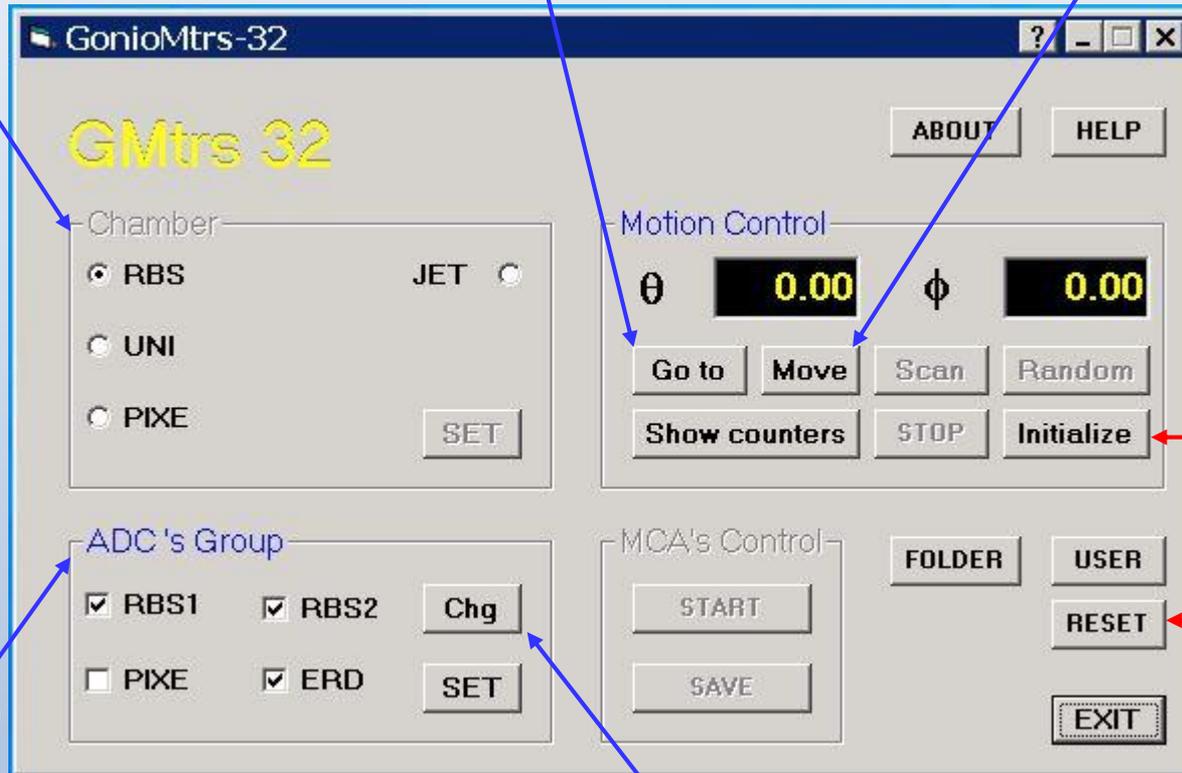
Data collection and storage:  
 - only active after ADCs have been set  
 - COLLECT/STOP: toggles ADCs on/off  
 - SAVE: saves active ADCs data to disk

Stops active ADCs ,  
 removes ADCs GUI,  
 removes SCADA UI,  
 and ENDs program

Beam line selected  
- changes unavailable after setting  
- to change press RESET button

Used to set coordinates displacements (relative)

Used to set targeted coordinates (absolute)



Set/reset position coordinates

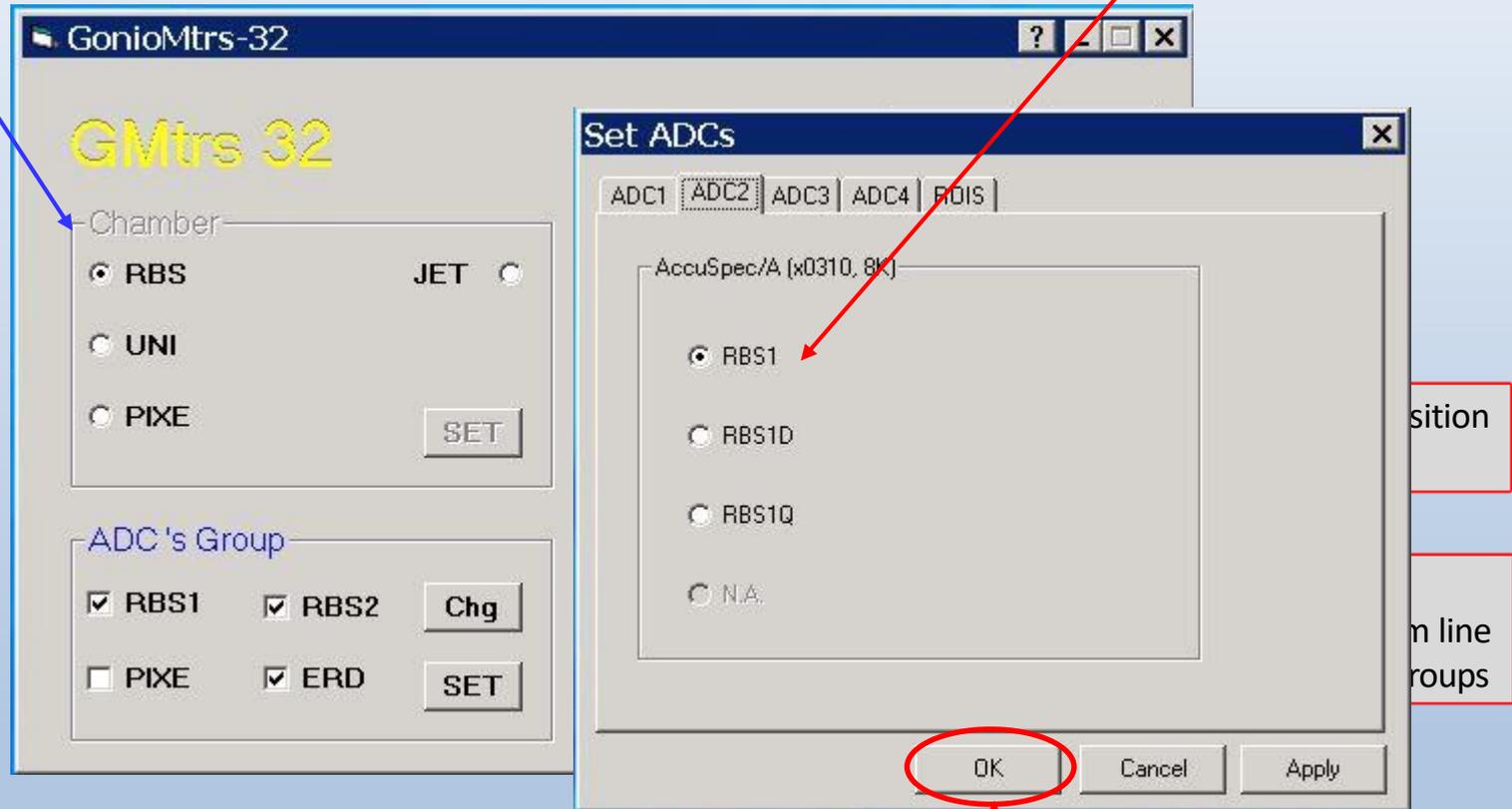
FULL RESET:  
- resets beam line and ADCs groups

II  
Allows to select the ADCs to work with:  
- only active after beam line has been set  
- select wanted ADCs  
- press SET to set it...

Only available before ADC's group SET:  
- allows changing ADCs configurations  
- allows changing maximum number of ROIs  
- unavailable after ADC's SET

Beam line selected  
- changes unavailable after setting  
- to change press RESET button

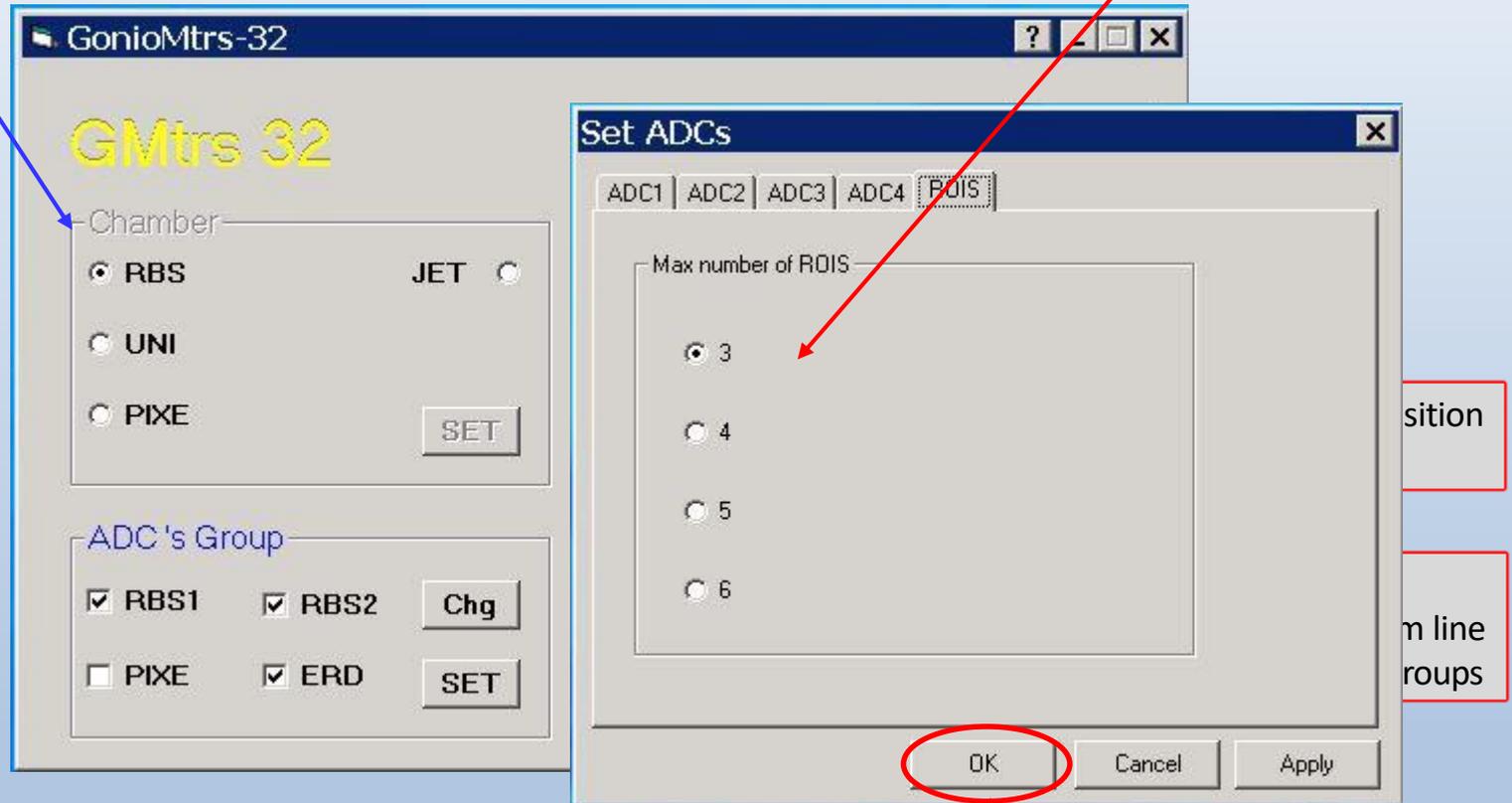
For as many ADC configurations list panels as needed (up to 4) choose one of the available ADC configurations by selecting the selection button corresponding to the targeted one...



... then press the OK (or the Apply) button to confirm and pass the new configurations to the program.  
**WARNING:** if you do not understand the configurations, ask someone knowledgeable prior to commit them.  
**NOTICE:** once set the new settings can only be changed through FULL RESET.

Beam line selected  
- changes unavailable after setting  
- to change press RESET button

The default maximum number of ROIs can be extended from 3 up to 6.  
Upon choosing more ROIs be warned that the display with the scan results may get cluttered



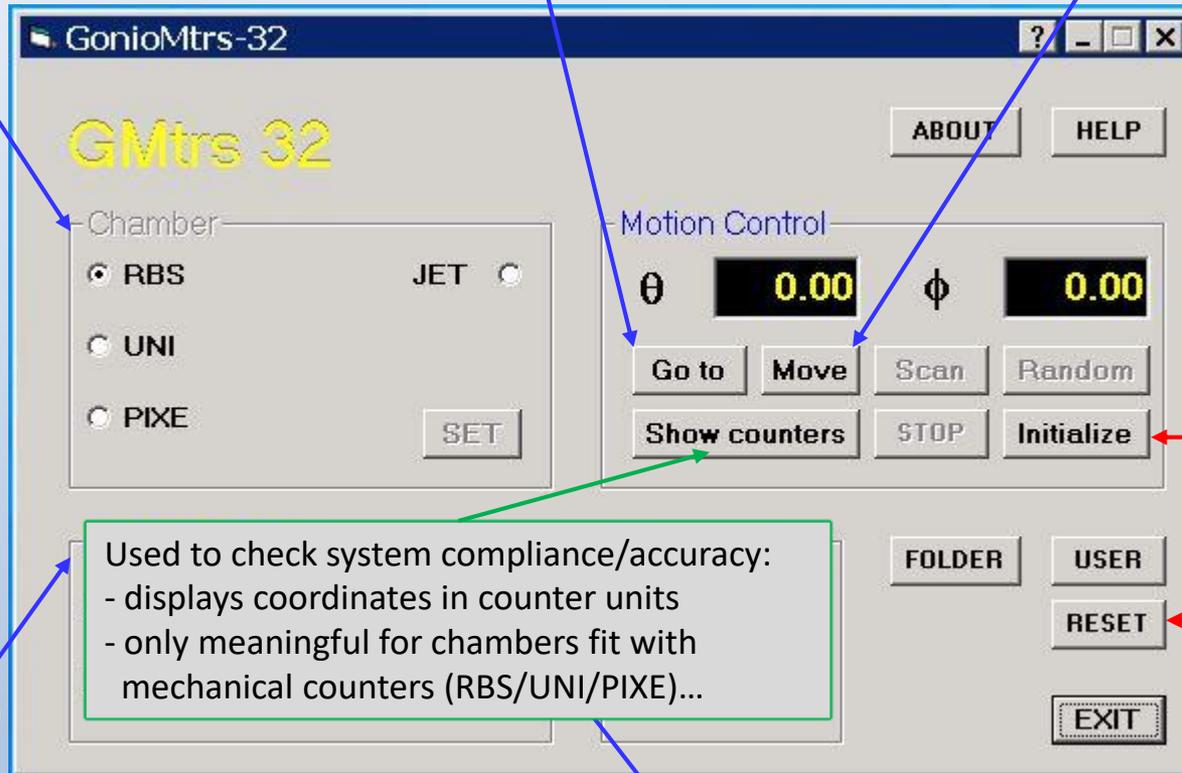
... then press the OK (or the Apply) button to confirm and pass the new limit to the program.

NOTICE: once set the new settings can only be changed through FULL RESET.

Beam line selected  
- changes unavailable after setting  
- to change press RESET button

Used to set coordinates displacements (relative)

Used to set targeted coordinates (absolute)



Set/reset position coordinates

FULL RESET:  
- resets beam line and ADCs groups

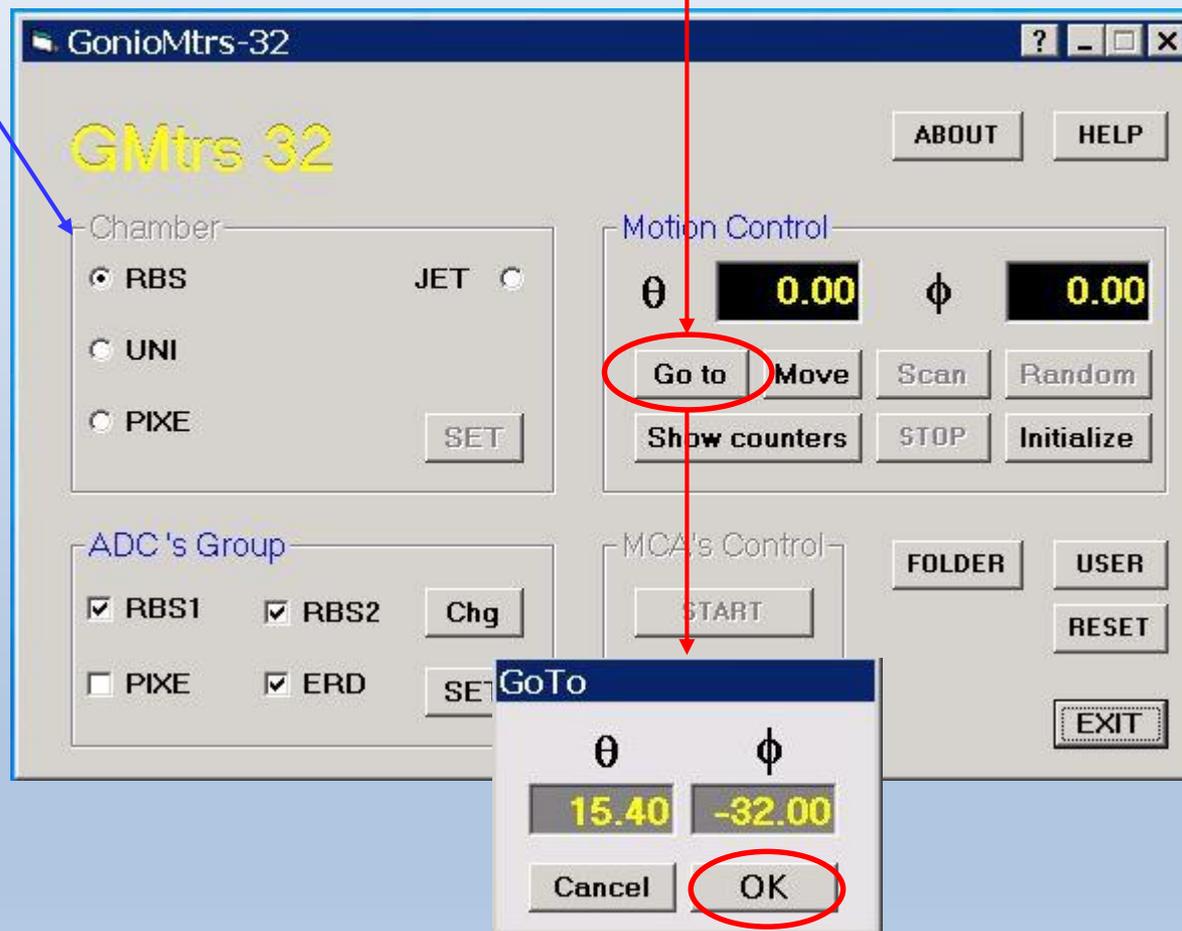
Used to check system compliance/accuracy:  
- displays coordinates in counter units  
- only meaningful for chambers fit with mechanical counters (RBS/UNI/PIXE)...

Allows to select the ADCs to work with:  
- only active after beam line has been set  
- select wanted ADCs  
- press SET to set it...

Only available before ADC's group SET:  
- allows changing ADCs configurations  
- allows changing maximum number of ROIs  
- unavailable after ADC's SET

Beam line selected

Insert new target coordinates (absolute) and press OK (Cancel to abort)



Beam line selected

Insert new displacements (relative) and press OK (Cancel to abort)

The screenshot displays the GoniMtrs-32 software interface. The main window has a title bar 'GonioMtrs-32' and a menu bar with '?' and window control icons. The interface is divided into several sections:

- Chamber:** Radio buttons for RBS (selected), UNI, and PIXE. A 'JET' radio button is also present. A 'SET' button is at the bottom right.
- ADC's Group:** Checkboxes for RBS1 (checked), RBS2 (checked), PIXE (unchecked), and ERD (checked). 'Chg' and 'SET' buttons are at the bottom right.
- Motion Control:** Displays  $\theta$  and  $\phi$  angles as 0.00. Buttons include 'Go to', 'Move' (circled in red), 'Scan', 'Random', 'Show counters', 'STOP', and 'Initialize'.
- MCA's Control:** Includes 'START', 'FOLDER', 'USER', 'RESET', and 'EXIT' buttons.

A 'Move' dialog box is open in the foreground, showing input fields for  $\theta$  (-5.00) and  $\phi$  (-8.00). The 'OK' button is circled in red, and a red arrow points from the 'Move' button in the main window to this dialog box.

Beam line selected

Insert present coordinates (absolute) and press OK (Cancel to abort)

The screenshot displays the GoniMtrs-32 software interface. The window title is "GonioMtrs-32". The main title is "GMtrs 32".

**Chamber:** RBS (selected), UNI, PIXE. JET (radio button). SET button.

**ADC's Group:** RBS1 (checked), RBS2 (checked), PIXE (unchecked), ERD (checked). Chg and SET buttons.

**Motion Control:**  $\theta$  0.00,  $\phi$  0.00. Buttons: Go to, Move, Scan, Random, Show counters, STOP, Initialize (circled in red).

**MCA's Control:** START, SAVE, FOLDER, USER, RESET, EXIT buttons.

**Reset Dialog:**  $\theta$  0.00,  $\phi$  0.00. Buttons: Cancel, OK (circled in red).

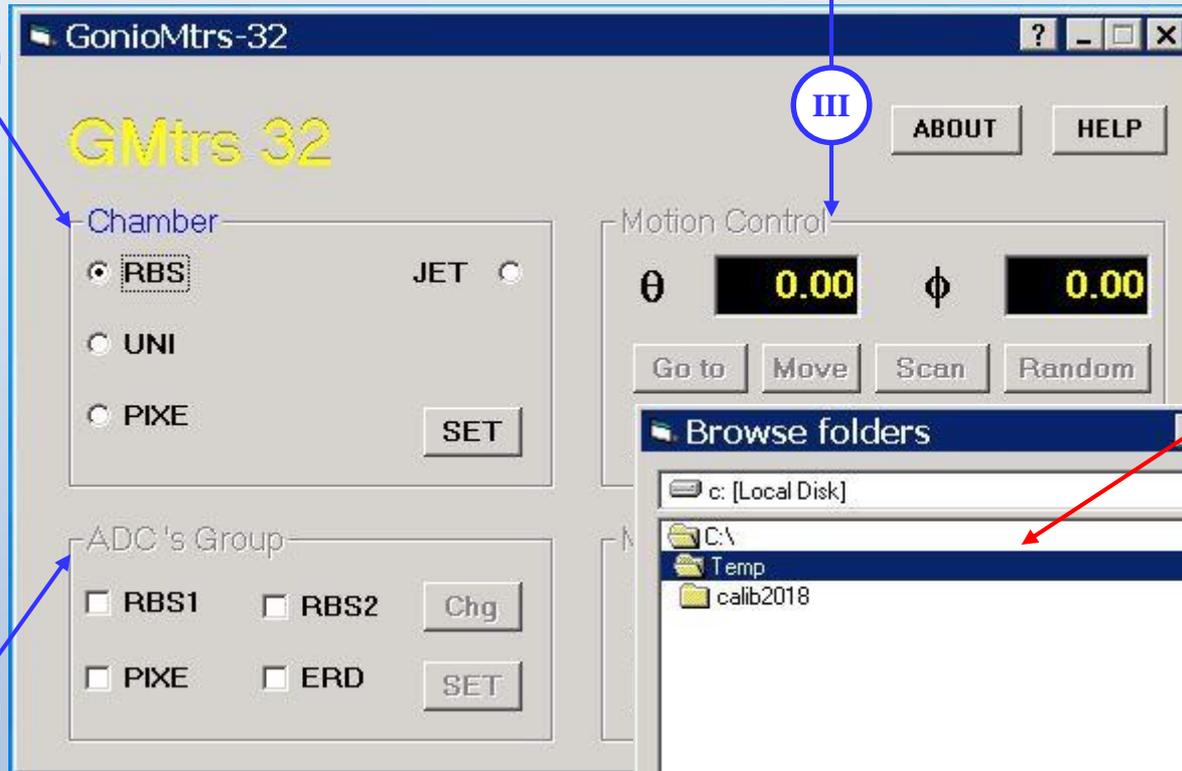
Allows to select the beam line:  
- select one and press SET to set it

Motion control and coordinates display:  
- only active after beam line has been set  
- Scan and Random only available after the ADCs have been set  
- STOP only active whence there is motion

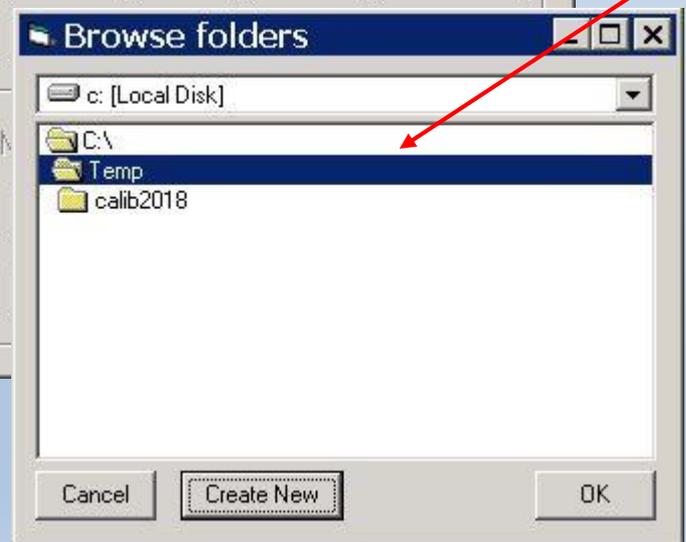
I

III

II



Changes working folder (should be set at beginning)



Allows to select the ADCs to work with:  
- only active after beam line has been set  
- select wanted ADCs  
- press SET to set it...

- Select an existing working folder and press OK  
- Create (and select) a new folder and press OK

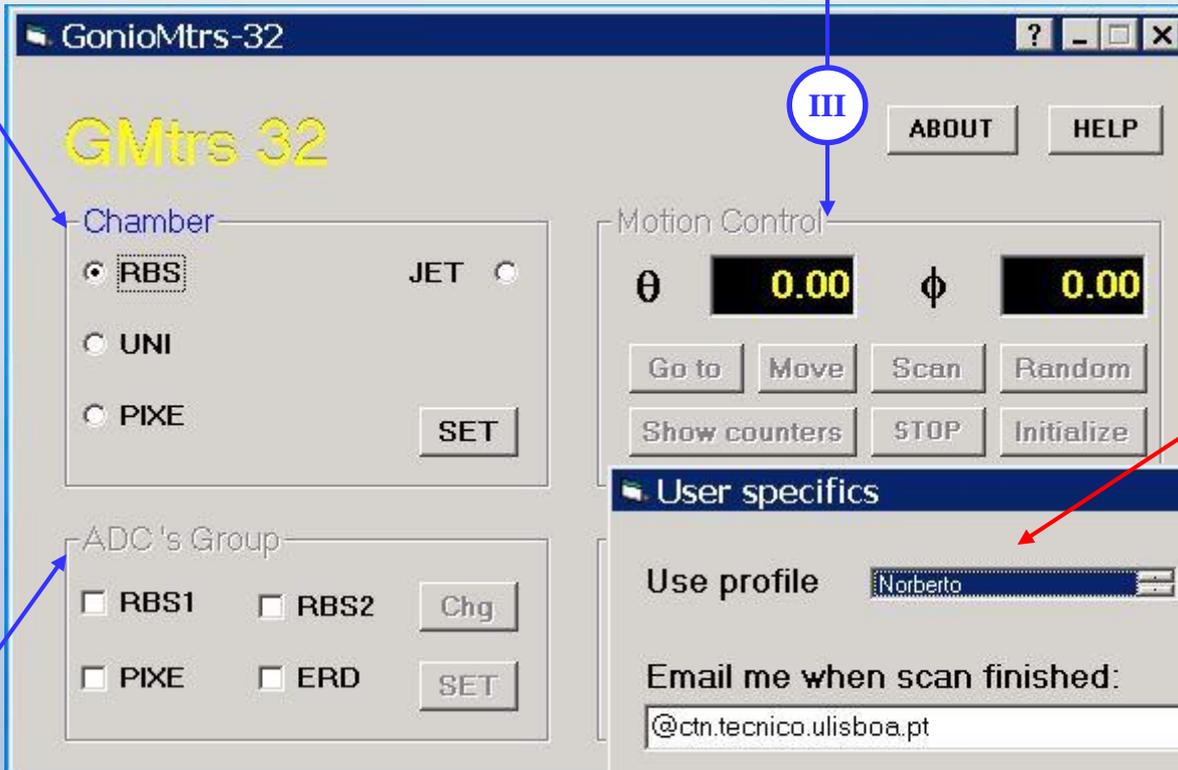
Allows to select the beam line:  
- select one and press SET to set it

Motion control and coordinates display:  
- only active after beam line has been set  
- Scan and Random only available after the ADCs have been set  
- STOP only active whence there is motion

Sets users specific choices...  
- detector ids. for file names  
- end-of-run info issued by email

Notice:  
Must be set after step I, before step II (disabled after step II)

I



II

Allows to select the ADCs to work with:  
- only active after beam line has been set  
- select wanted ADCs  
- press SET to set it...

- Check the 'Use profile' check box  
- select an existing user profile and press OK  
NOTICE: selection is mandatory (or profile will be ignored)

The screenshot shows the GoniMtrs-32 software interface. It features several control panels: 'Chamber' with radio buttons for RBS, UNI, and PIXE; 'Motion Control' with angle displays for  $\theta$  and  $\phi$  and buttons for 'Go to', 'Move', 'Scan', 'Random', 'Show counters', 'STOP', and 'Initialize'; 'ADC's Group' with checkboxes for RBS1, RBS2, PIXE, and ERD; and 'MCA's Control' with 'START', 'SAVE', 'FOLDER', 'USER', 'RESET', and 'EXIT' buttons. Callouts provide detailed information about these controls.

**Beam line selected** (I)

Used to set differential scan:  
- each data point/spectrum saved individually

Used to set cumulative scan:  
- data points added together  
- only total spectra are saved

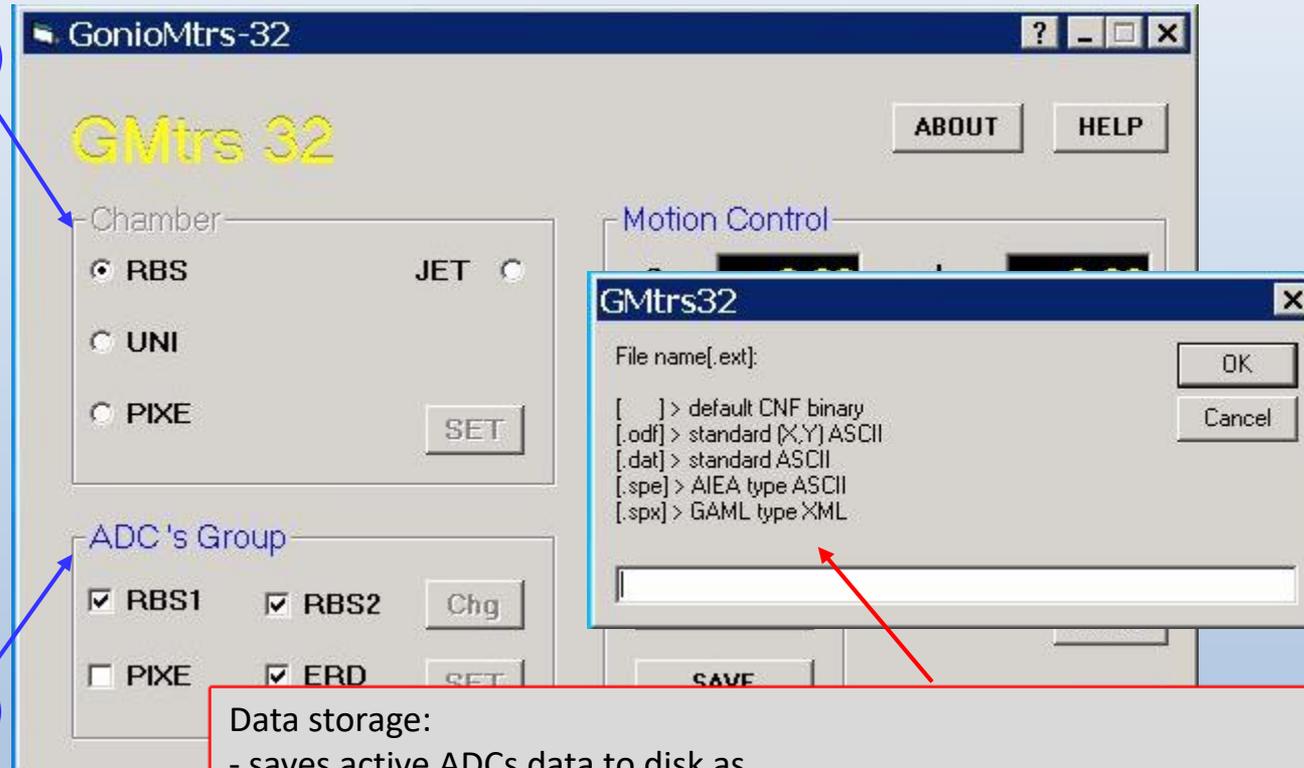
**ADCs selected** (II)

**Data acquisition:**  
- START/STOP toggles active ADCs on/off  
- ADCs start synchronously

**Data storage:**  
- saves active ADCs data to disk as  
- CANBERRA .CNF binary (default)  
- ASCII formats available (cf. below)

Beam line selected

I



II

ADCs selected

Data storage:

- saves active ADCs data to disk as
- CANBERRA binary (default, file extension not allowed)
- ASCII formats available: .odf, 2 columns [X,Y]  
.dat, 8 columns [Y] only, no header/footer  
.spe, 8 columns [Y] only, AIEA format, with header  
.spx, GAML type XML, AXS format

NOTICE: file extension required (determines the format)

Beam line selected

Used to set differential scan:  
- each data point/spectrum saved individually

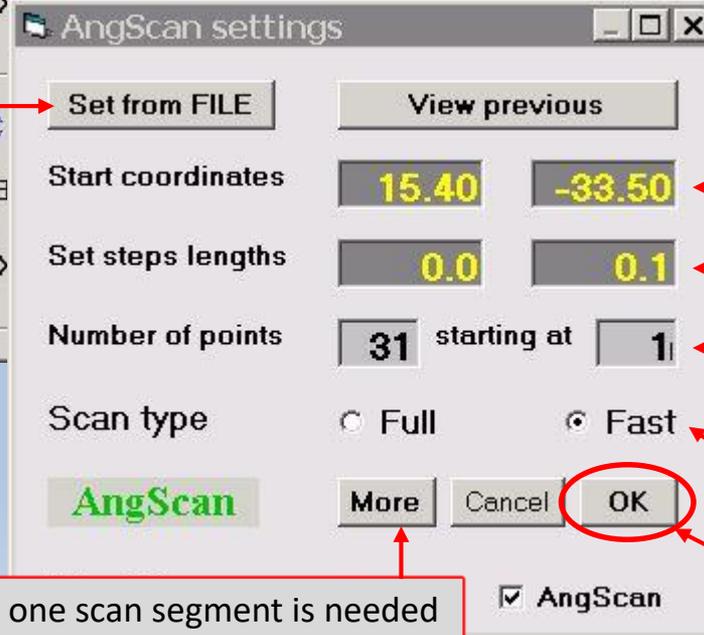
I



Enter the scan coordinates from file (if the scan points are not regularly spaced)...

II

ADCs selected



Enter the starting coordinates

Enter coordinates increments

Enter number of points desired and 1st point of the scan (us. 1)

Full: record every spectrum  
Fast: record only ROIs data...

OK when done

Use if more than one scan segment is needed

The image shows a screenshot of the GoniMtrs-32 software interface with an 'AngScan settings' dialog box open. The main window has a title bar 'GonioMtrs-32' and buttons for 'ABOUT' and 'HELP'. The title 'GMtrs 32' is displayed in yellow. Under 'Chamber', 'RBS' is selected. Under 'Motion Control', the theta angle is 0.00 and the phi angle is 0.00. Buttons for 'Go to', 'Move', 'Scan', and 'Random' are visible. The 'Random' button is circled in red. The 'AngScan settings' dialog box has a title bar 'AngScan settings' and buttons for 'Set from FILE', 'View previous', 'More', 'Cancel', and 'OK'. The 'OK' button is circled in red. The dialog box contains the following settings:

- Start coordinates: 15.40 and -30.00
- Set steps lengths: 0.0 and 12
- Number of points: 30 starting at 1
- Scan type: Full (unselected) and Fast (selected)
- Buttons: Random, More, Cancel, OK
- Checkbox: AngScan (checked)

Annotations with arrows point to various elements:

- Beam line selected**: Points to a circled 'I' in the top left.
- Used to set cumulative scan (random)...**: Points to the 'Random' button in the main window.
- Not available in this mode**: Points to the 'Set from FILE' button in the dialog box.
- ADCs selected**: Points to a circled 'II' in the bottom left.
- Enter the starting coordinates**: Points to the '15.40' and '-30.00' input fields.
- Enter coordinates increments**: Points to the '0.0' and '12' input fields.
- Enter number of points desired and 1st point of the scan (us. 1)**: Points to the '30' and '1' input fields.
- Full: record every spectrum  
Fast: record only ROIs data...**: Points to the 'Fast' radio button.
- OK when done**: Points to the 'OK' button.
- Not available in this mode**: Points to the 'More' button.