



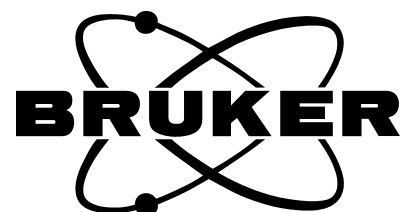
OPUS

Spectroscopy Software

Version 6

User Manual

MAP



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This manual is the original documentation for the OPUS spectroscopic software.

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1 Introduction

The purpose of the OPUS/MAP package is to perform a sequence of sample measurements using a motorized x/y stage. The user has only to define several measurement positions in advance. Then, the software collects data at the pre-defined measurement positions automatically. All data are stored in one 3D file. In combination with the OPUS/3D software package, surface maps of the sample can be generated.

2 Hardware Requirements

Computer System

The following requirements should be met to ensure an optimum operation of OPUS/MAP:

- 256 Megabyte RAM
- 300 MHz CPU (or faster)
- 1 - 2 Gigabyte of free disk space

X/Y Sample Stage

The OPUS/MAP and the OPUS/VIDEO software can only be used in conjunction with an x/y stage driven by either a LANG controller or a CANBUS controller. LANG controllers are connected to the PC via the RS-232 interface and therefore require one RS-232 channel (COM 1 or COM 2).

Note: OPUS no longer supports stages driven by Bruker stage controllers. As the stepper motors of the former stages differ from those of the current stages, it is not sufficient to simply replace the Bruker controller with a LANG controller; the stage itself has to be equipped with new stepper motors.

3 Setting up the Mapping Device

If you use a computer-controlled x/y stage you have to set up the x/y stage controller. Select the *Optic Setup and Service* function in the *Measure* menu. A dialog box opens. Click on the *Devices/Options* tab. Activate the *Mapping Device* check box as shown in figure 1 and click on the *Setup* button.

Note: If no x/y stage is connected to your microscope, make sure the *Mapping Device* check box is not activated.

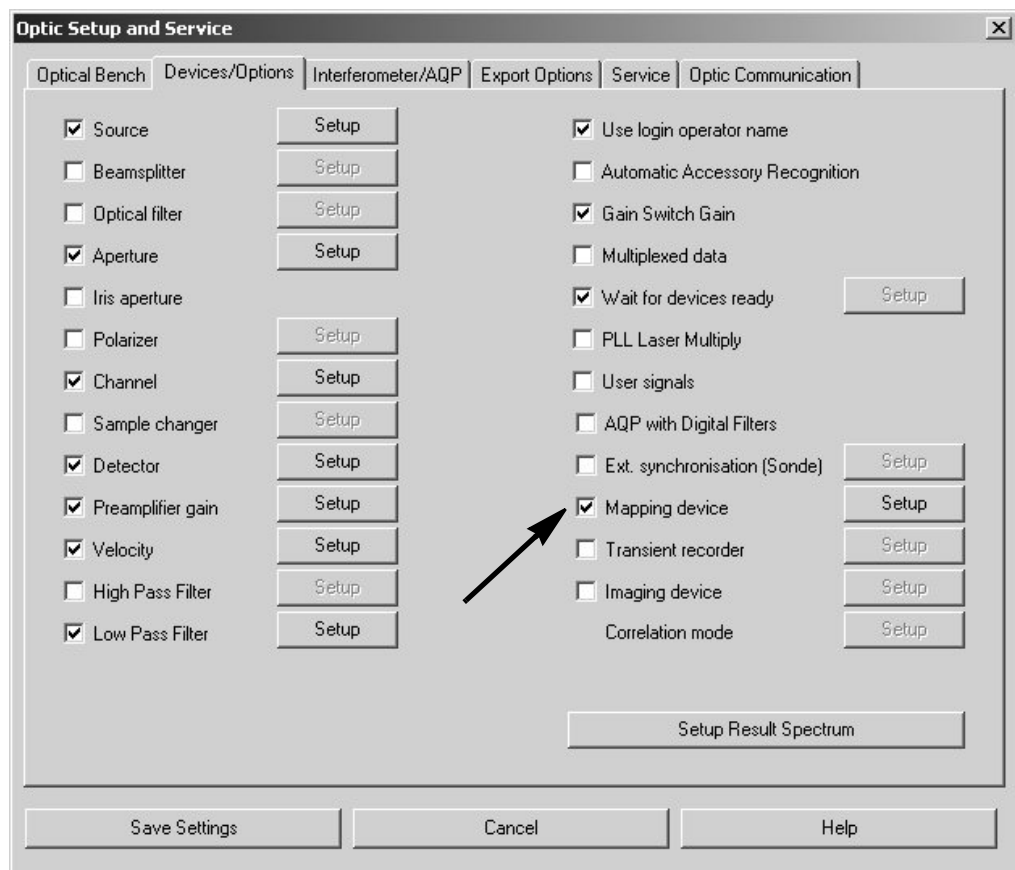


Figure 1: Optic Setup and Service Dialog Box – Setting up the Mapping Device

The *Devices/Options* dialog box (figure 2) opens. Enter the type of x/y stage controller installed on your microscope. As shown in figure 2, two types of x/y stage controllers (LANG and CANBUS) are available for video mapping. When using a LANG controller, the first line must contain the entry “MCL”. (See figure 2.) Otherwise, the software automatically assumes a CANBUS controller.

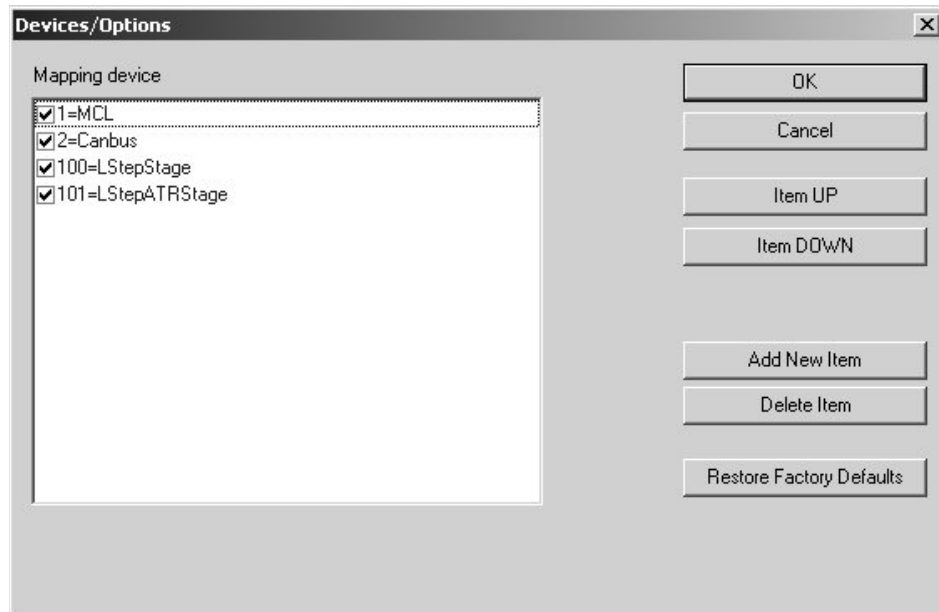


Figure 2: Devices/Options Dialog Box – Selecting the Mapping Device

4 Configuring the Software

Select the *Motorized Stage Control* function in the *OPUS Measure* menu.

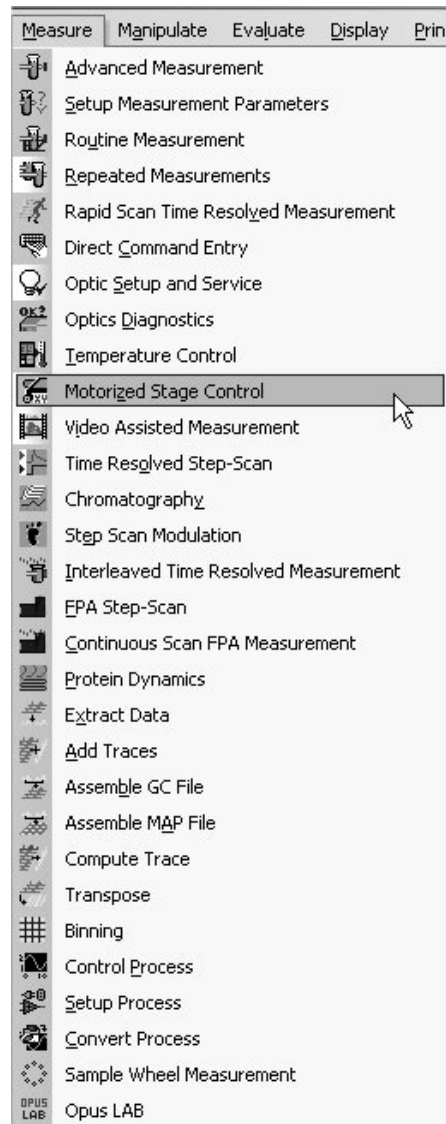


Figure 3: Measure Menu – Selecting Motorized Stage Control

If this function is disabled (i.e. grayed), you may not have the appropriate access rights to run the software. Make sure the *Show all functions* check box is activated in the *Customize Menus* dialog box (*OPUS Setup* menu). If the problem persists, a new registration key is required which enables the OPUS/VIDEO software. A registration key can only be generated by Bruker. (For detailed information refer to the OPUS Reference Manual.)

The *Motorized Sample Stage Control* dialog box opens:

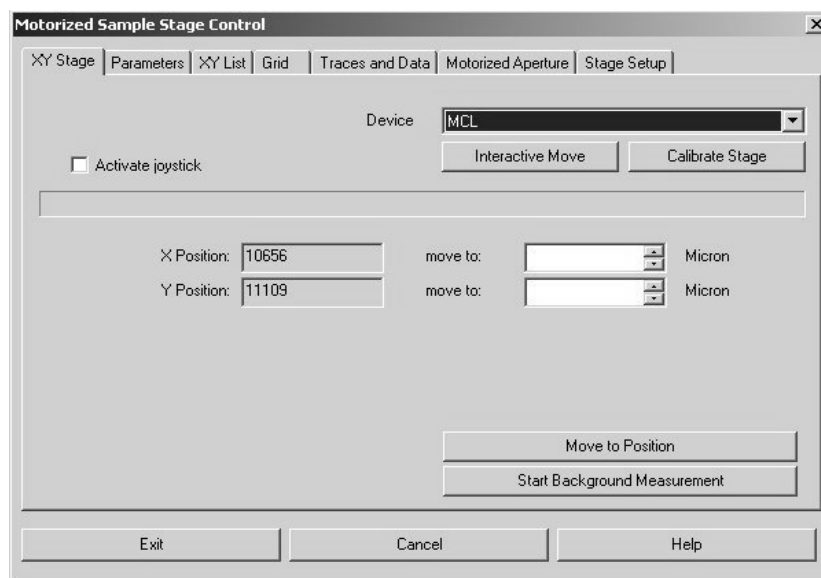


Figure 4: Motorized Stage Control – X/Y Stage Dialog Window

4.1 X/Y Stage

This dialog window allows you to control the x/y stage and start a background measurement. If you set up the instrument for the first time, it is advisable to check whether the x/y stage performs correctly.

If a LANG controller is connected to the x/y stage, select MCL from the *Device* drop-down list. In case of a communication error between controller and computer, the message *Error in writing to com port* will be displayed. A communication error can occur, for example, if the controller has been connected to the wrong serial port or if the joystick switch on the front panel of the LANG controller is set to *H* instead of *A*.

To test the communication with the stage, activate and deactivate the *Activate joystick* check box. If this command works properly, the message “*Wait...*” pops up. If this message does not appear and the communication with the stage fails, an error message will be displayed.

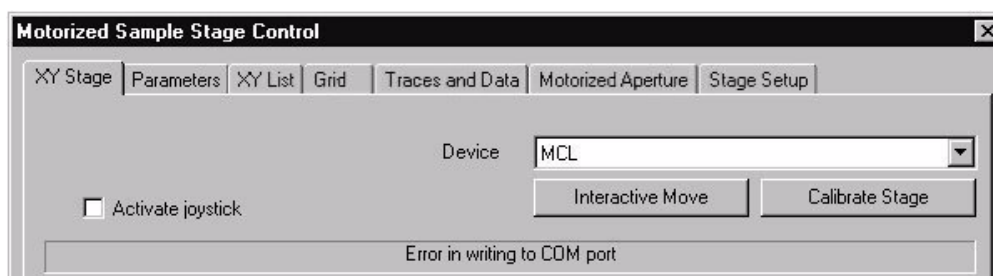


Figure 5: Error Message – Communication Error

Possible causes of the failure may be:

- the stage controller is connected to the wrong COM port of the PC
- the cable is defective
- the joystick switch on the front panel of the LANG controller is set to *H* (manual mode) instead of *A* (automatic mode).

Clicking on the *Calibrate Stage* button moves the stage to its zero position and resets the counters to zero. If the stage works correctly, this command moves the stage backwards and to the right side of the microscope.

The *X Position* and *Y Position* counters indicate the current stage position. You can maneuver the stage by entering the desired X and Y position in the *Move to* fields and clicking on the *Move to Position* button. As soon as the stage has reached its new position the *X Position* and *Y Position* counters will be updated to show the new stage position.

To check the stage for correct operation, move it a certain distance and measure the distance with a ruler. If the result is not correct, the spindle factors may be incorrectly set (LANG controller) or the microns per step need to be changed (CANBUS controller).

If the following error message is displayed, the motors assigned to the X and Y-axis are not known to the electronics (CANBUS):

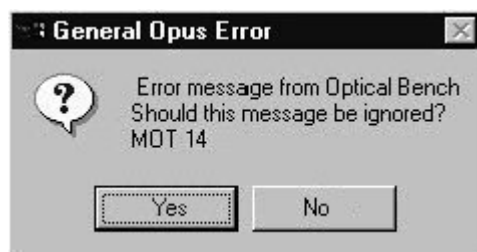


Figure 6: Optical Bench Error

Switch the instrument off and on. Then, check the x/y stage again for proper operation. If the problem persists, either the wrong motor number has been selected (see section 4.2) or the motors are not supported by the current firmware. A firmware update may be required. Contact the Bruker service.

Clicking on the *Interactive Move* button opens a dialog box which provides interactive stage movement control.



Figure 7: Interactive Stage Movement Control

Once started, the stage control window remains active even if you close the OPUS/MAP software. Thus, it can be used to control the stage movement interactively as long as OPUS is open.

4.2 Stage Setup

Click on the *Stage Setup* tab. This window displays the information about the driver that has been installed for the stage controller.

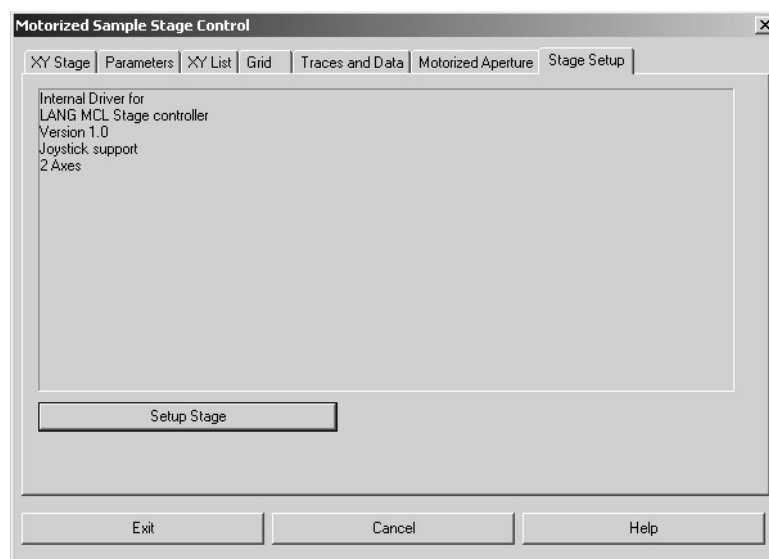


Figure 8: Stage Settings

You can change the stage settings by clicking the *Setup Stage* button. A dialog box (shown for a LANG controller) opens. See figure 9.

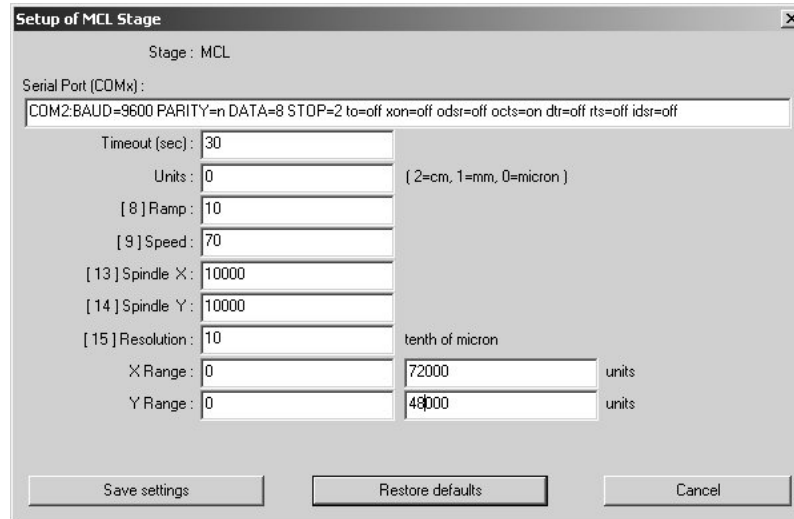


Figure 9: Setup of a LANG Controller

By default, the *Serial Port* field is set to COM2. In case you have connected the LANG controller to COM1, you have to change this value.

The *Timeout* value defines the duration before an error message will be displayed in case of a communication error with the controller. The default value is 30 and should not be changed.

Specify the unit for lateral stage movement control in the *Units* field. Valid units are centimeters (value 2), millimeters (value 1) and microns (value 0). The X and Y range is set in these units.

In the *Ramp* field you define the acceleration of the stage. The default value is 50. We recommend you to lower the value to 10 if you operate the stage at a higher speed (70).

Enter the stage speed in the *Speed* field. The default value is 50. This value means a rather low speed and should be used when the stage is heavily loaded. Otherwise, you can set the speed to 70.

Adjust the *X Spindle* and *Y Spindle* value until the reading of the LANG controller is identical to the actual stage movement. Options are 10000 and 20000. The correct value depends on the stage model.

The *Resolution* values can be smaller than one step of the stepper motor, since the motor can also perform fractional steps. Enter the desired value in the corresponding field. Note that the resolution unit is microns.

The values for the *X Range* and the *Y Range* depend on the stage model. Note that these values must be given in the unit specified in the *Unit* field. If you change the unit in the *Units* field, you also have to correct the *X Range* and *Y Range* values accordingly.

Save your settings by clicking on the *Save settings* button.

After selecting the correct COM port and switching the LANG controller to automatic (A), communication should be established. Check the correct cable connection by calibrating the stage. Switch to the *XY Stage* page of the *Motorized Stage Control* dialog box and click on the *Calibrate stage* button. Now, the stage should move towards the microscope (y direction) and to the right (x direction). If this is not the case, either the connection of the X and Y cables has to be changed, or the stage is not mounted correctly.

In the dialog box for the CANBUS controller (figure 10) you specify the type of stage (xy or xyz), the numbers of the internal motors, the microns per step, and the maximum number of steps the motor can perform.

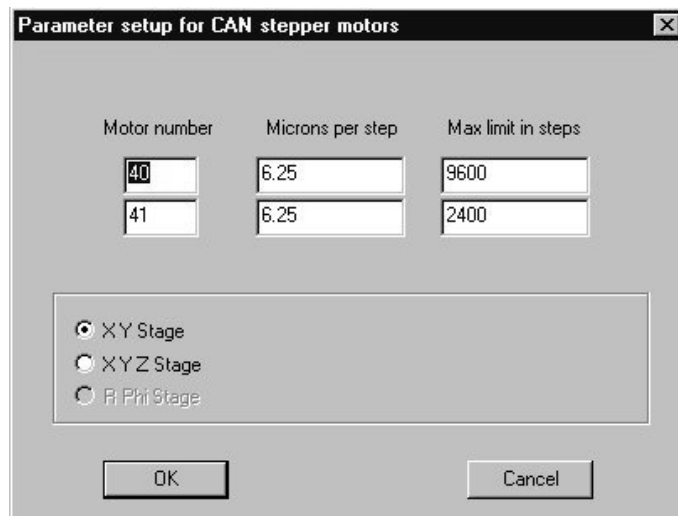


Figure 10: Setup of a CANBUS Controller

5 Selecting the Measurement Parameters

Before starting a measurement, you need to select a parameter set used for the experiment. It is important that you specify this parameter set in advance. To do this, select the *Measurement* function in the *Measure* menu. For more information on how to specify a parameter set, refer to the OPUS Reference Manual.

To load a parameter set, click on the *Parameters* tab, then on the *Select* button. Browse the directory to locate an appropriate parameter set.

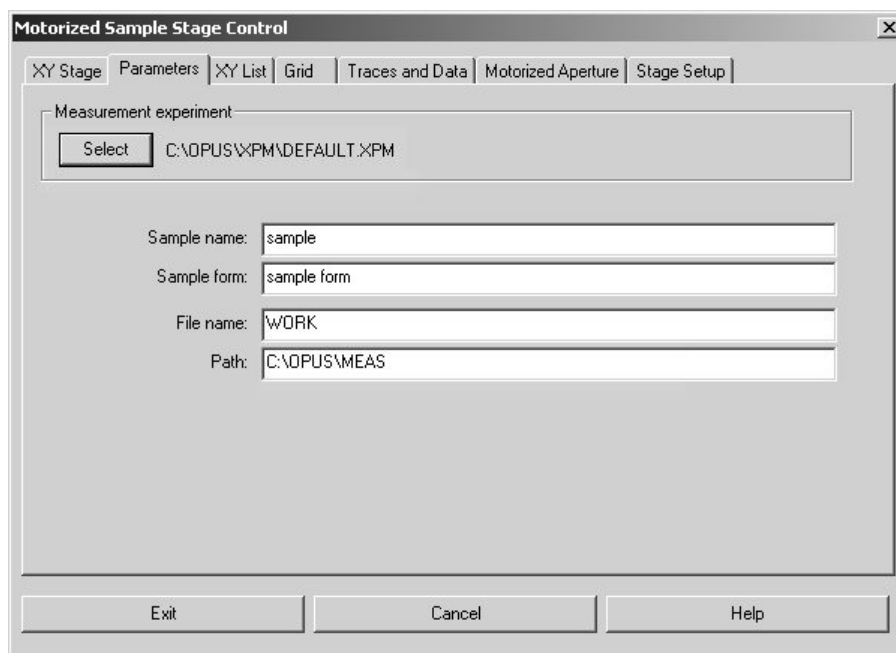


Figure 11: Selecting the Parameter Set

You can specify information about your sample (*Sample Name* and *Sample Form*), and the name and path for the data file resulting from the measurement.

5.1 XY List

The list of measurement positions can either be entered individually as a list of arbitrarily set XY-coordinates or as a regular grid (see section 5.2).

The *XY List* dialog window contains an entry field in which the x and y coordinates can be entered manually. The syntax has to be “X-position<separator>Y-position”. The <separator> can be a space, a comma, or a tab.

Alternatively, you can select a measurement position using the joystick, and click on the *Add to List* button. The current x/y stage position is added to the list.

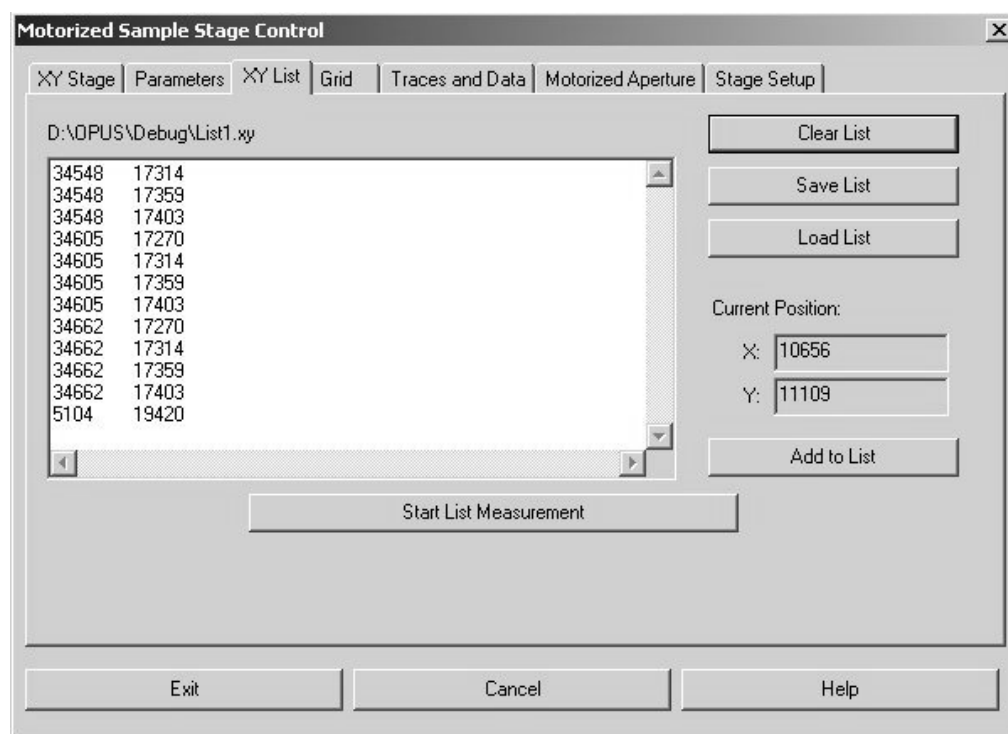


Figure 12: Motorized Sample Stage Control - XY-List Dialog Window

If the same positions are to be measured repeatedly, the XY list can be saved with a user-defined name in a text file with the extension *.XY*. The x and y positions can be recalled for later measurements by clicking on the *Load List* button. The stored lists are compatible with those generated with the OPUS/VIDEO software and can therefore be used in both software packages.

Once all measurement positions have been defined, start the measurement by clicking on the *Start List Measurement* button.

5.2 Grid

If the measurement positions should form a regular grid, they need not be defined individually. Click on the *Grid* tab and define the starting point of the grid, i.e. the lower left corner. Furthermore, you need to enter the number of points in x and y direction, and the grid spacing in both directions. The starting point of the grid can be the current measurement position, if appropriate. To start the measurement click on the *Start Grid Measurement* button.

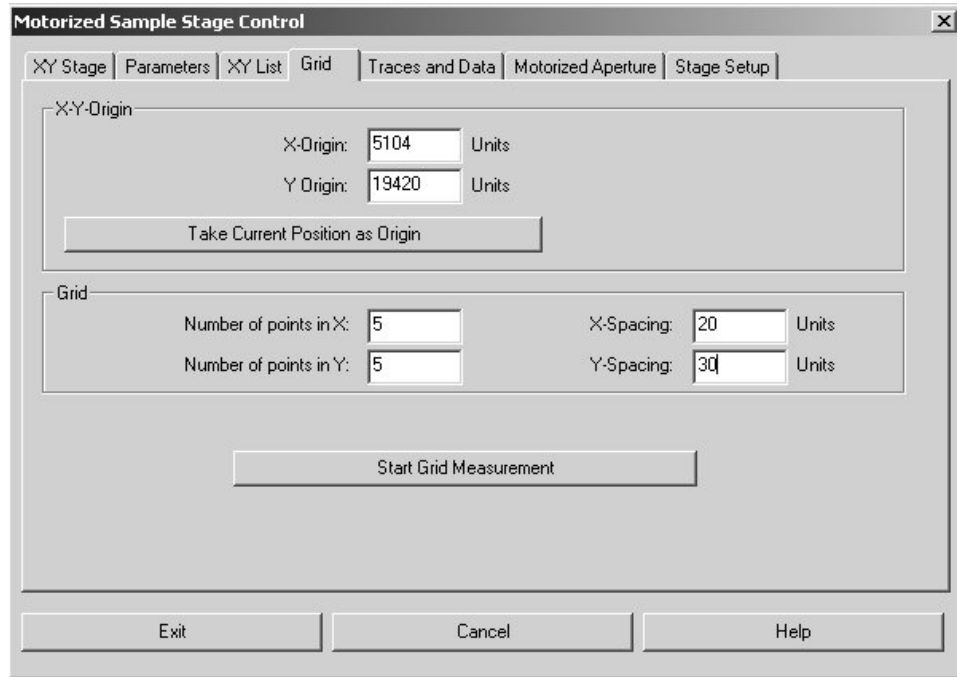


Figure 13: Motorized Sample Stage Control - Grid Dialog Window

5.3 Traces and Data

The *Traces and Data* dialog window contains options to calculate traces from the spectra.

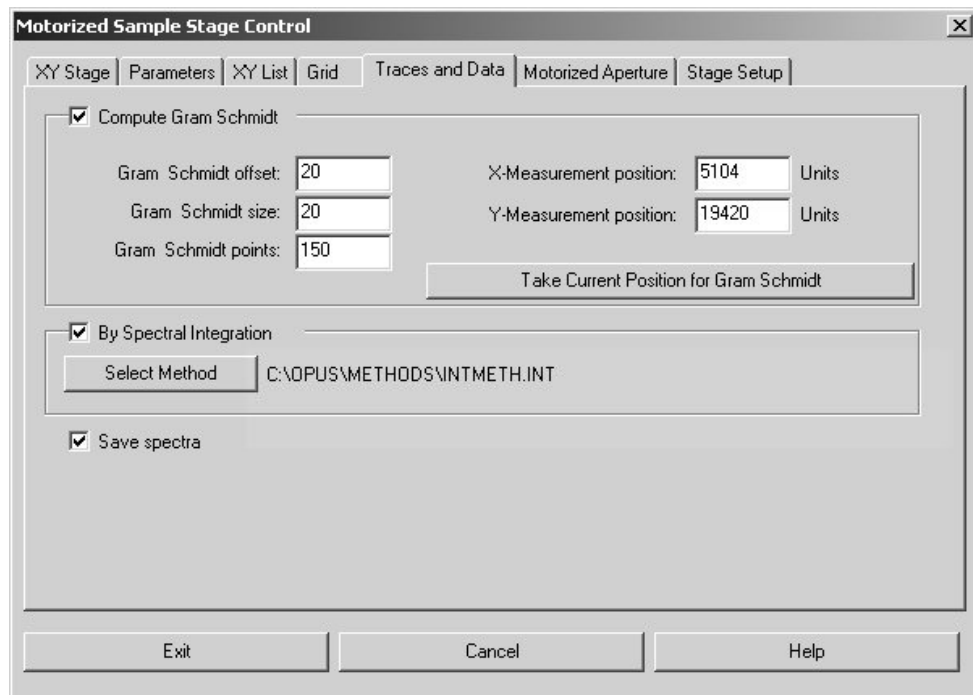


Figure 14: Motorized Sample Stage Control - Traces and Data Dialog Window

A trace consists of data points, one per spectrum, which are specific for the composition of the spectrum. Traces are useful if the measurement positions form a regular grid. In this case the trace intensity can be displayed as a function of the area using the OPUS/3D software. (See the OPUS/3D software manual.) The following figure shows an example:

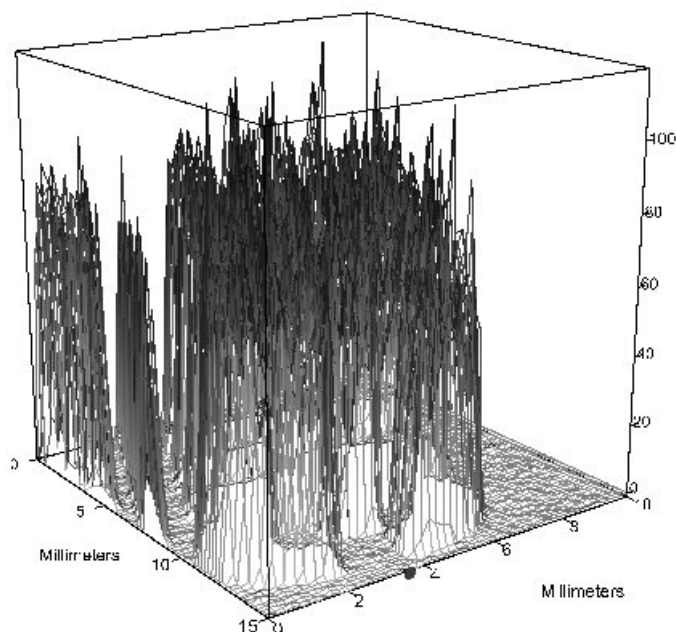


Figure 15: 3D Display of Area vs. Intensity

Traces can either be directly computed from the interferogram using the Gram Schmidt method or calculated by spectral integration.

The Gram Schmidt parameters determine the way the reference data are used. They affect the sensitivity of the calculated Gram Schmidt trace.

Gram Schmidt Size:

The number of interferograms, or basis vectors, which is used for the calculation of the basis set. This number of interferograms will be acquired before the main measurement starts.

Gram Schmidt Offset:

The distance between the interferogram centerburst and the beginning of interferogram points that are used as the basis vectors.

Gram Schmidt Points:

The number of points from each interferogram that is used for the basis vectors.

Optionally, the chromatograms can be calculated by integrating the spectra. This integration is activated by checking the *By Spectral Integration* check box. The currently selected integration method is displayed. To use another integration method, click on the *Select Method* button. You can select an integration method you have created before. (See the OPUS Reference Manual.) This option enables you to integrate a representative peak of your spectrum.

If you activate the *Save Spectra* check box, all spectra generated during the measurement are saved. If this check box is deactivated, only the traces are saved. This is recommended if no further post run manipulations of the spectra itself are intended to reduce the amount of data significantly. For example, a grid of 10 by 10 measurement points will generate 100 data points if only the traces are saved. One single spectrum consists of several thousand data points, depending on the wave number range and resolution. Therefore, the spectrum data block is several thousand times larger than the trace data block.

Further processing and displaying options of 3D files are described in the OPUS/3D Manual.

5.4 Motorized Aperture

The dialog box shown in figure 16 is only of relevance if your microscope (IRScopeII or Hyperion) is equipped with a motorized knife-edge aperture. In this case activate the *Motorized Aperture available* check box to enable the controls for setting the aperture.

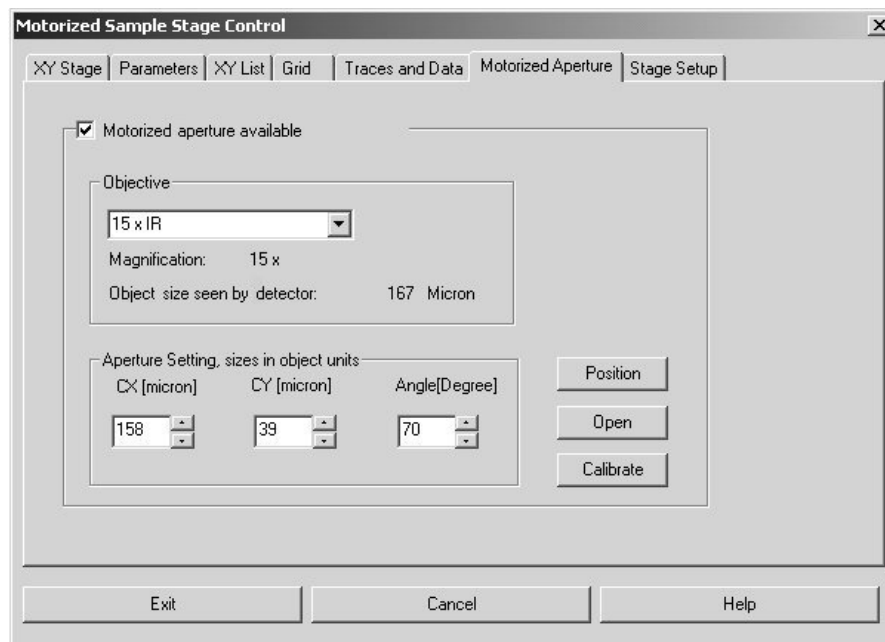


Figure 16: Motorized Sample Stage Control - Motorized Aperture

The aperture is located symmetrically relative to the IR beam. The meaning of *CX*, *CY* and *Angle* is illustrated in figure 17.

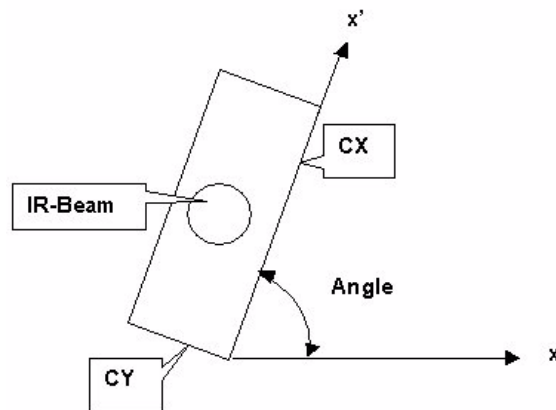


Figure 17: Motorized Knife-Edge Aperture (Schematic Diagram)

The aperture openings CX and CY are given in microns of the object plane. The corresponding opening in the aperture plane depends on the magnification of the objective. Thus, it is necessary to select the objective used during the measurement in the drop-down list. For comparison the detector size ('object size seen by detector') is also displayed: the aperture will have no effect if the aperture openings CX and CY are larger than the detector size.

Clicking on the *Position* button moves the motorized knife-edge aperture to the position specified in the CX , CY and *Angle* entry fields. Click on this button only before you start the first measurement. Then, all measurements of the MAP experiment will be performed with the same aperture setting.

Clicking on the *Open* button opens the motorized knife-edge aperture.

Clicking on the *Calibrate* button closes the motorized knife-edge aperture and sets the rotation angle to the minimum position. All motor positions are set to zero (minimum). Click on this button only after the microscope has been switched on, or the motorized knife-edge aperture has been installed in the microscope.

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