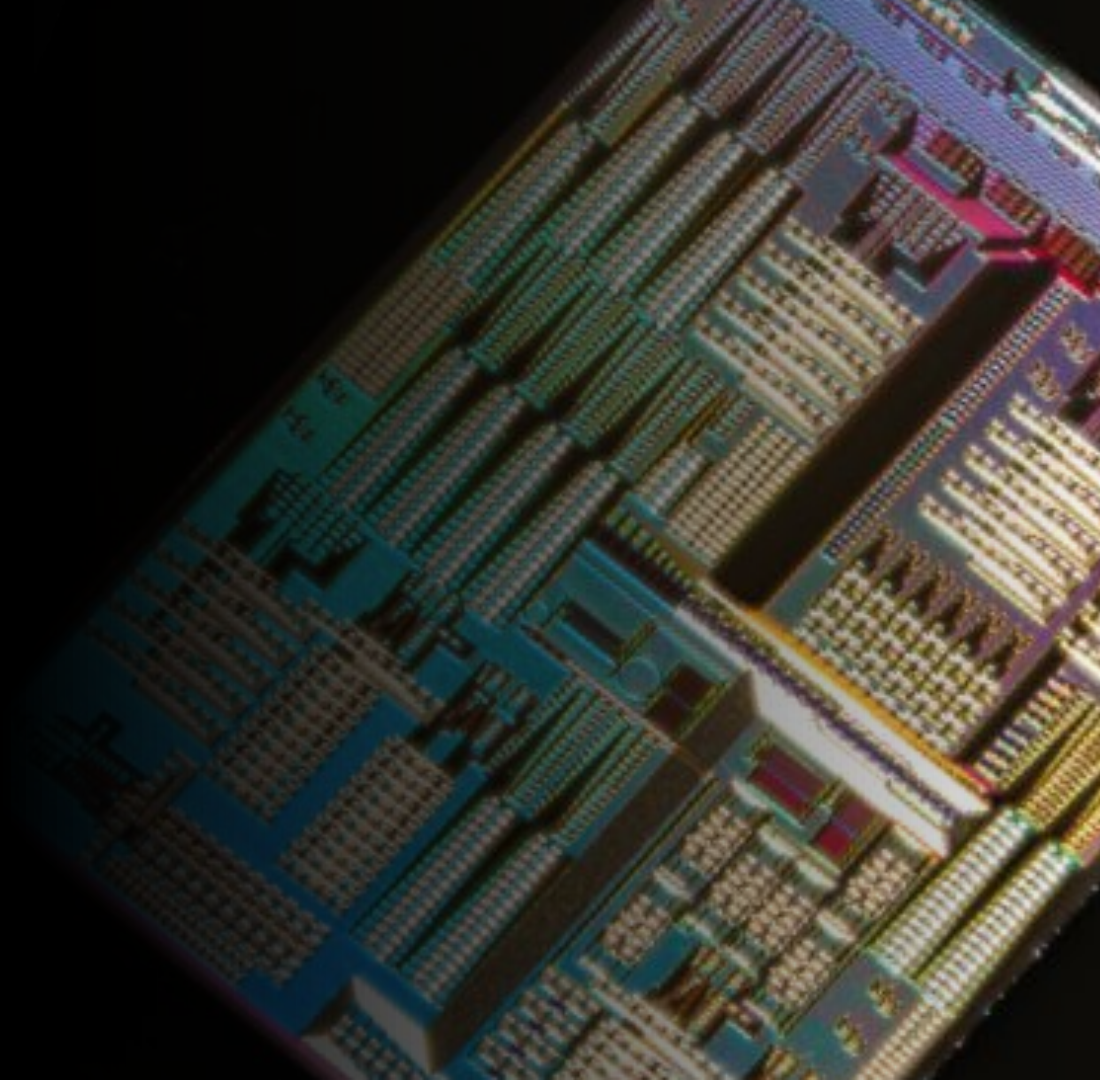


PyOptomip User's Guide

11/9/2022



Purpose

PyOptomip is a python application which aims to facilitate testing of silicon electronic photonic integrated circuits by controlling testing equipment through a user interface.

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Creating Transform Matrices

Creating Test Routines

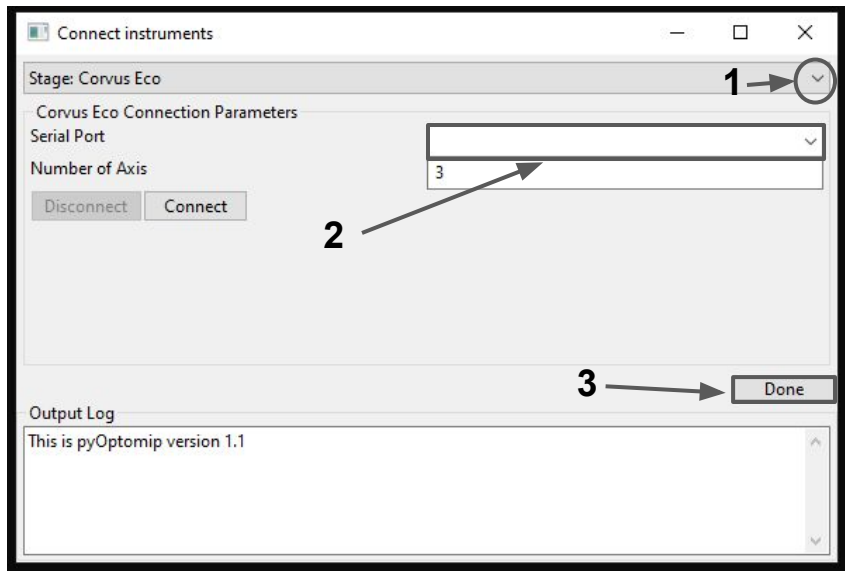
4. Advanced

Requirements

PyOptomip Github Repo

Getting Started

To begin using PyOptomip to perform measurements you'll first need to connect any instruments you will be using.



1. Select the device you wish to connect to from the drop-down menu on the connect instrument page.
2. Once the desired device is selected, enter its GPIB address in the designated space.
3. After all necessary instruments are connected, press done.

IDA Stage Instrument Connections

The GPIB addresses for the instruments at the IDA stage in KAISER 4060 are as follows:

Stage: Corvus Eco - ASRL7::INSTR

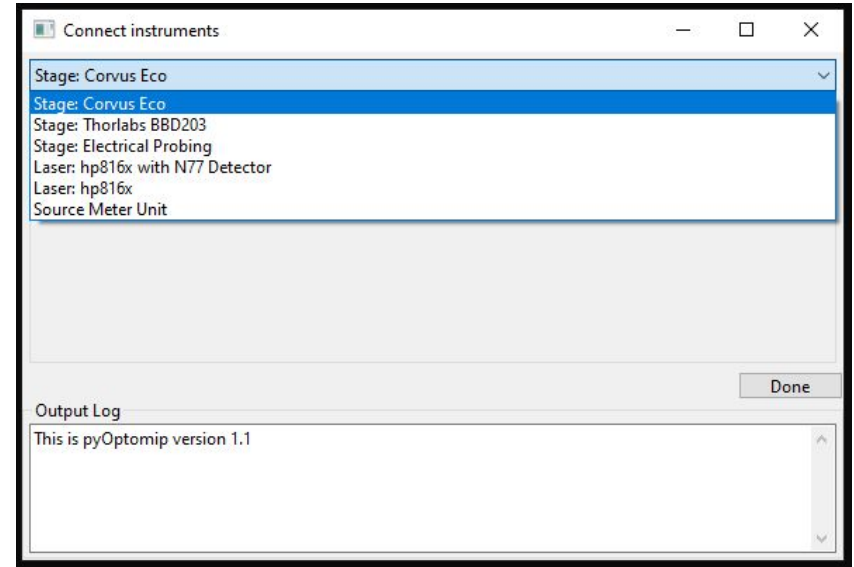
Stage: Electrical Probing - ASRL9::INSTR

Laser: hp816x with N77 Detector -

GPIB0::20::INSTR

USB0::0x0957::0x3718::MY48102149::INSTR

Source Meter Unit - GPIB0::26::INSTR



Instrument Control

PyOptomip has five tabs which are used to control instruments and automate measurements.

Home tab:

Stage control, detector measurements and settings

Electrical tab:

SMU control, IV sweeps

Optical tab:

Laser control, wavelength sweeps

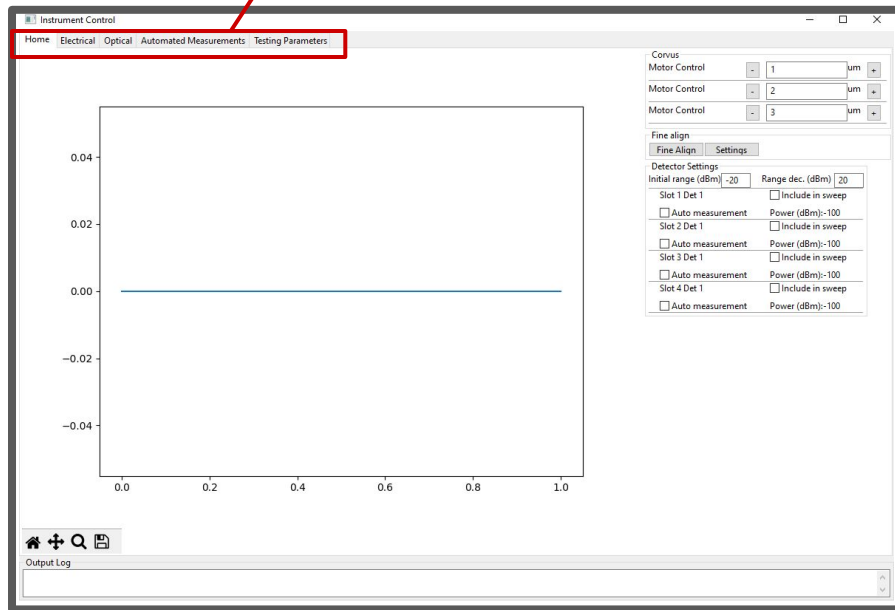
Automated Measurements:

Automated measurement settings

Testing Parameters:

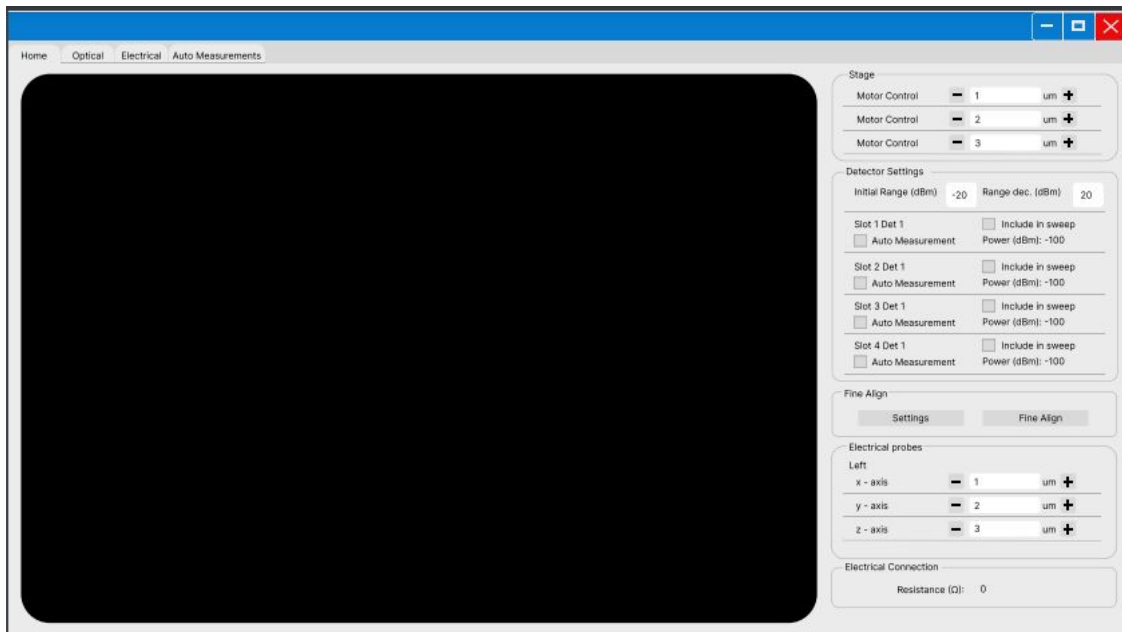
Testing routine creation

Home Electrical Optical Automated Measurements Testing Parameters



Home Tab

The home tab can be used to move the stages on which the chip and wedge probe rest, respectively. It can also be used to gauge alignment with a device using the detector.



Corvus Eco

The three axes of the stage on which the chip rests can be controlled by entering a number of micrometres and pressing either the + or - button for that axis.

Select **Auto measurement** for the detector channels whose readings you want to see. You can use these readings to determine when the laser is more or less aligned.

At this point, **Fine Align** can be used to optimize the light coupled to the detector.

The screenshot displays the Corvus Eco control interface. At the top, under the 'Corvus' header, there are three 'Motor Control' rows. Each row has a minus button, a text input field containing the value '1', '2', and '3' respectively, followed by 'um' and a plus button. Below this is a 'Fine align' section with two tabs: 'Fine Align' (selected) and 'Settings'. Under the 'Fine Align' tab, there is a 'Detector Settings' section. It includes 'Initial range (dBm)' set to '-20' and 'Range dec. (dBm)' set to '20'. Below these are four rows for detector settings: 'Slot 1 Det 1', 'Slot 2 Det 1', 'Slot 3 Det 1', and 'Slot 4 Det 1'. Each row has an 'Auto measurement' checkbox (unchecked), an 'Include in sweep' checkbox (unchecked), and a 'Power (dBm):-100' label.

Corvus		
Motor Control	-	1 um +
Motor Control	-	2 um +
Motor Control	-	3 um +
Fine align		
Fine Align Settings		
Detector Settings		
Initial range (dBm)	-20	Range dec. (dBm) 20
Slot 1 Det 1	<input type="checkbox"/> Include in sweep	
<input type="checkbox"/> Auto measurement	Power (dBm):-100	
Slot 2 Det 1	<input type="checkbox"/> Include in sweep	
<input type="checkbox"/> Auto measurement	Power (dBm):-100	
Slot 3 Det 1	<input type="checkbox"/> Include in sweep	
<input type="checkbox"/> Auto measurement	Power (dBm):-100	
Slot 4 Det 1	<input type="checkbox"/> Include in sweep	
<input type="checkbox"/> Auto measurement	Power (dBm):-100	

Electrical Stage

The stage on which the wedge probe sits can be controlled by entering a number of micrometres and pressing either the + or - button for that axis.

Electrical probes

Left

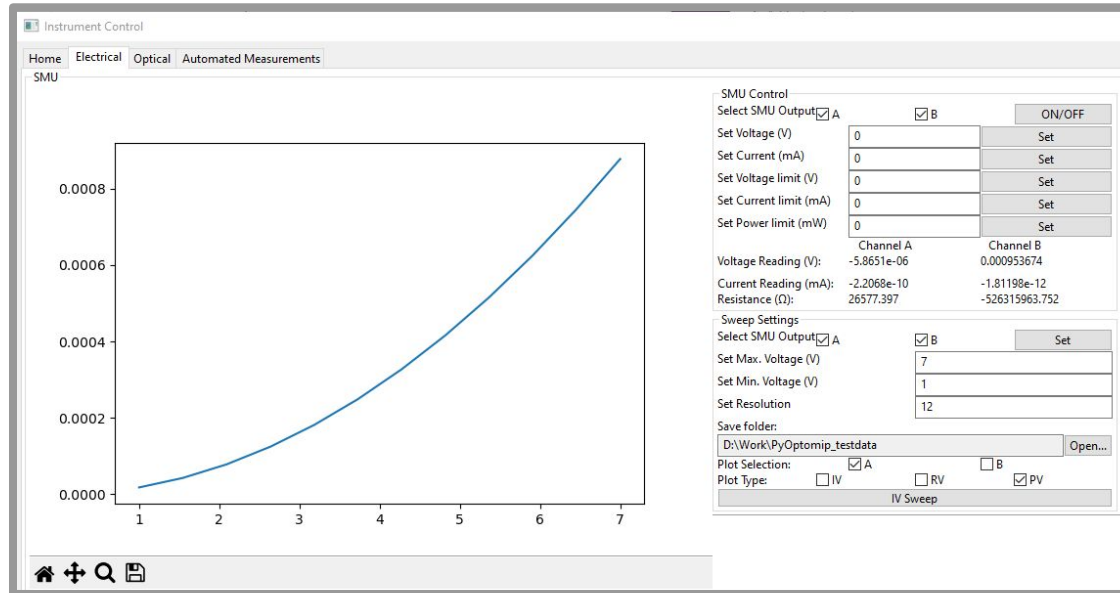
x - axis	-	1	um	+
y - axis	-	2	um	+
z - axis	-	3	um	+

Electrical Connection

Resistance (Ω): 0

Electrical Tab

The electrical tab can be used to control an SMU to set the voltage and current on its channels. It can also be used to perform IV sweeps and plot the results.



SMU Control

Channel A, or B, or both, of the SMU can be set by checking off the desired channel, inputting parameters and pressing **Set**.

Once parameters are set, the selected channels can be turned on.

Readings from each channel are displayed at the bottom of the panel.

SMU Control		
Select SMU Output	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> B
		ON/OFF
Set Voltage (V)	0	Set
Set Current (mA)	0	Set
Set Voltage limit (V)	0	Set
Set Current limit (mA)	0	Set
Set Power limit (mW)	0	Set
	Channel A	Channel B
Voltage Reading (V):	-5.8651e-06	0.000953674
Current Reading (mA):	-2.2068e-10	-1.81198e-12
Resistance (Ω):	26577.397	-526315963.752

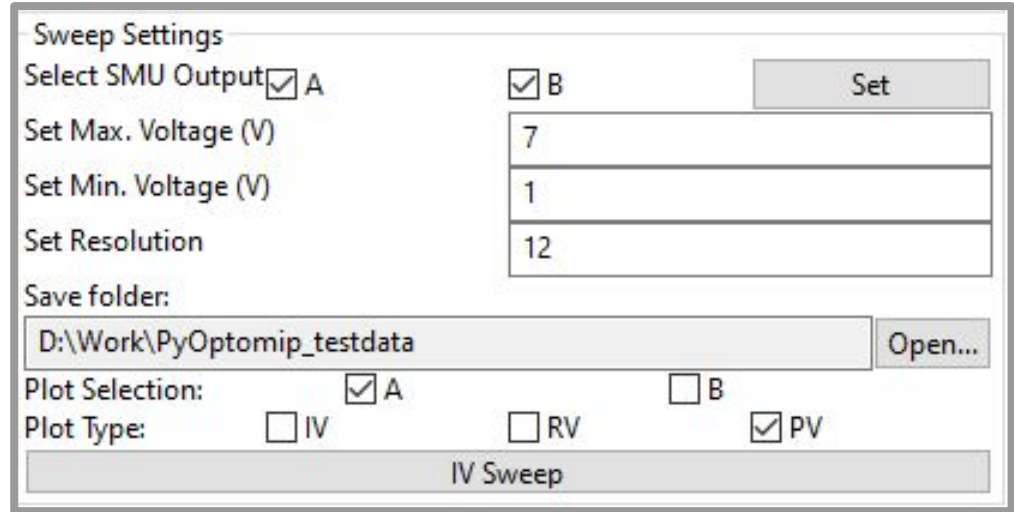
Sweep Settings

IV Sweeps can be performed with channel A or B by checking their respective boxes and clicking **Set**.

Choose the minimum and maximum Voltage in *Volts* as well as the resolution in *Volts*.

If you wish to save the sweep results You can choose a folder to do so.

You can also choose which channel to plot as well as the type of plot. When ready, press the **IV Sweep** button.

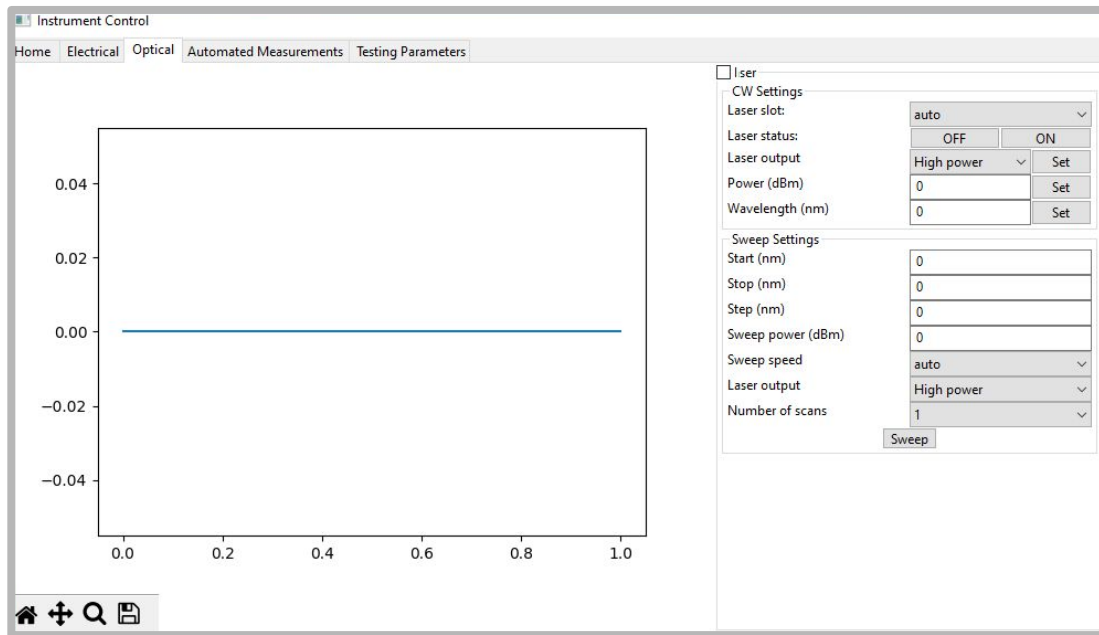


The image shows a software window titled "Sweep Settings". It contains several input fields and checkboxes. At the top, "Select SMU Output" has two checkboxes, "A" and "B", both of which are checked. To the right of these is a "Set" button. Below this are three input fields: "Set Max. Voltage (V)" with the value "7", "Set Min. Voltage (V)" with the value "1", and "Set Resolution" with the value "12". Underneath these is a "Save folder:" label followed by a text box containing "D:\\Work\\PyOptomip_testdata" and an "Open..." button. The "Plot Selection:" section has checkboxes for "A" (checked), "B" (unchecked), "IV" (unchecked), "RV" (unchecked), and "PV" (checked). At the bottom of the window is a large button labeled "IV Sweep".

Parameter	Value / Selection
Select SMU Output	<input checked="" type="checkbox"/> A, <input checked="" type="checkbox"/> B
Set Max. Voltage (V)	7
Set Min. Voltage (V)	1
Set Resolution	12
Save folder:	D:\\Work\\PyOptomip_testdata
Plot Selection	<input checked="" type="checkbox"/> A, <input type="checkbox"/> B, <input type="checkbox"/> IV, <input type="checkbox"/> RV, <input checked="" type="checkbox"/> PV
IV Sweep	Button

Optical Tab

The optical tab can be used to control the laser as well as perform and plot optical spectrum sweeps.



CW Settings

The laser output parameters can be set using the CW settings

The laser slot should be set to auto by default and should in most cases stay this way.

Use the laser status **ON OFF** buttons to toggle the laser On and Off

Select the desired laser output and that click the **Set** button to push output to laser.

The power and wavelength of the laser can be set in dBm and nm respectively.

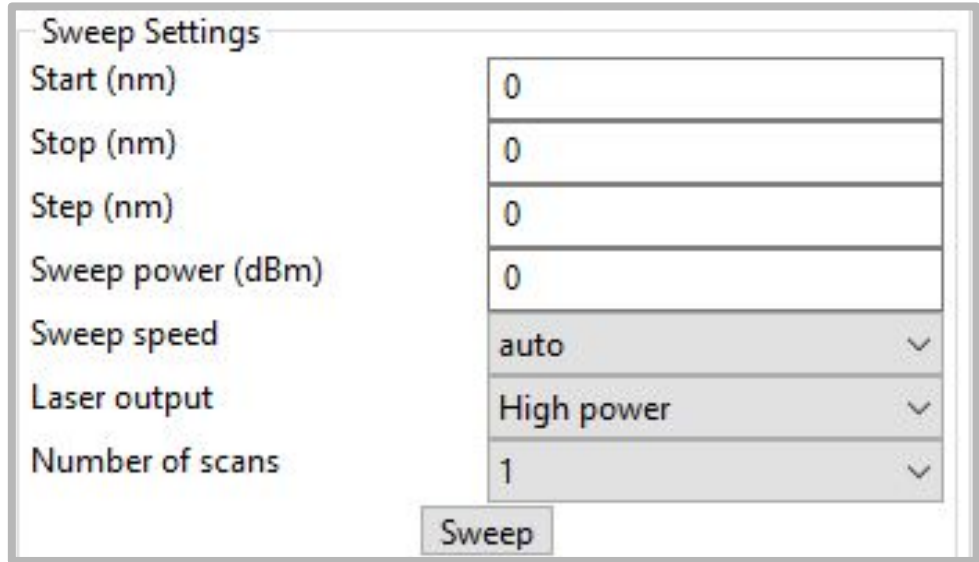
CW Settings		
Laser slot:	auto ▾	
Laser status:	OFF	ON
Laser output	High power ▾	Set
Power (dBm)	0	Set
Wavelength (nm)	0	Set

Sweep Settings

In the sweep settings frame all parameters required for an optical sweep can be set.

Starting wavelength, stop wavelength and step size between wavelengths can all be set here in nm.

Choose which detectors you wish to include in the sweep in the Home tab.



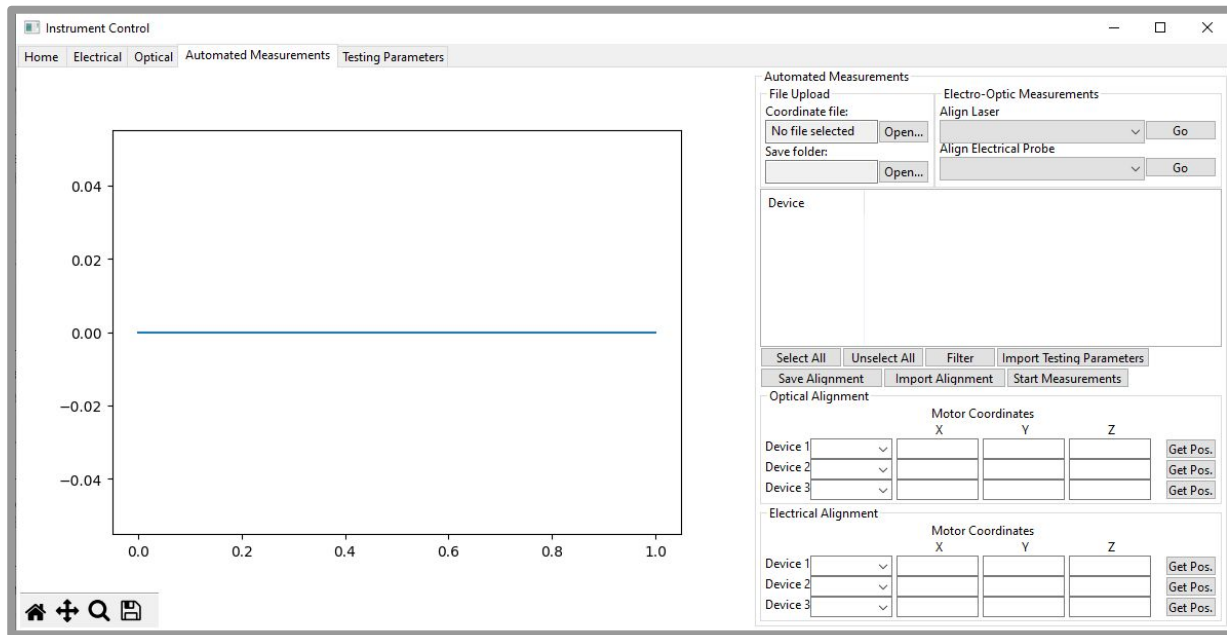
The image shows a software window titled "Sweep Settings". It contains several input fields and dropdown menus for configuring an optical sweep. The parameters and their current values are as follows:

Parameter	Value
Start (nm)	0
Stop (nm)	0
Step (nm)	0
Sweep power (dBm)	0
Sweep speed	auto
Laser output	High power
Number of scans	1

At the bottom right of the window is a button labeled "Sweep".

Performing Automated Measurements

The automated measurements tab can be used to align your equipment automatically to selected devices by creating transform matrices.



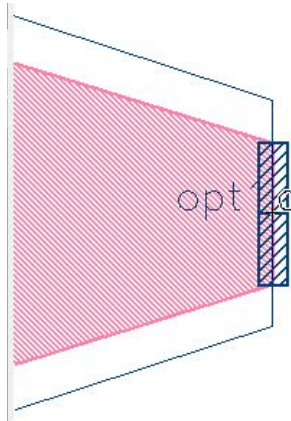
Labelling Devices

In order to perform automated measurements, you'll need to generate a coordinate text file from the GDS of the chip you wish to measure. You'll need to install the [SiEPIC-Tools package](#) for KLayout and the [SiEPIC-EBeam-PDK](#) to do this.

For every device in your design ensure you place labels for the optical and electrical connections as necessary. Make sure to follow the labelling standards and design standards outlined in the next pages.

Optical Labels

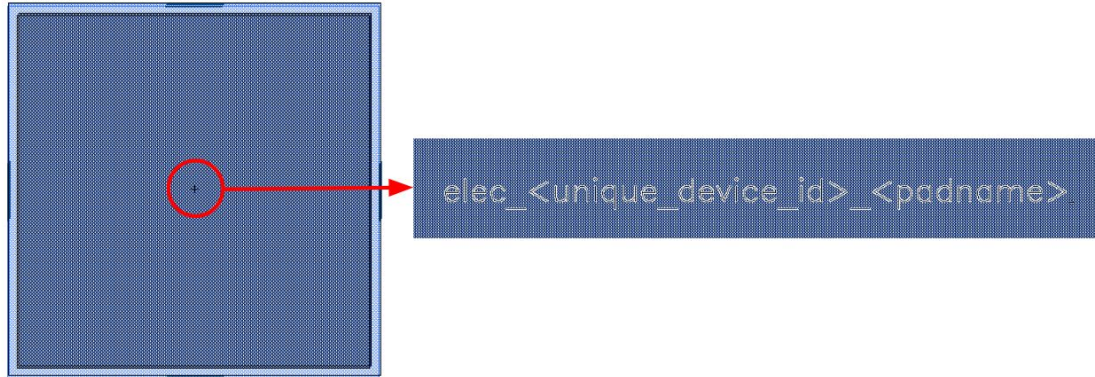
Optical labels should be placed at the tip of the grating coupler to be connected to the laser. Labels should follow the format **opt_<polarization>_<wavelength>_<device>_<unique-device-id>**. Each electro-optic device should have an id which is unique from any other on the same chip.



opt_@opt_TE_1550_device_<unique_device_id>

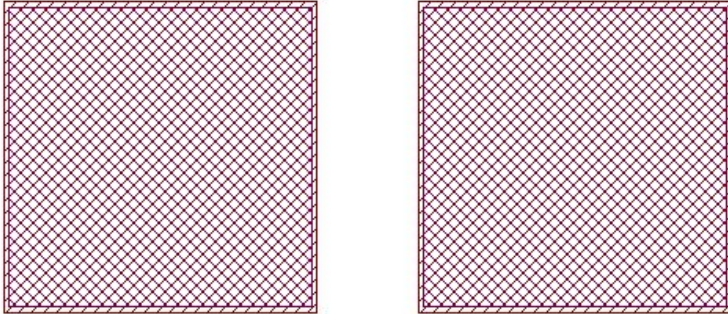
Electrical Labels

Electrical labels should be placed at the center of each bond pad and should follow the format ***elec_<unique-device-id>_<pad-name>***.



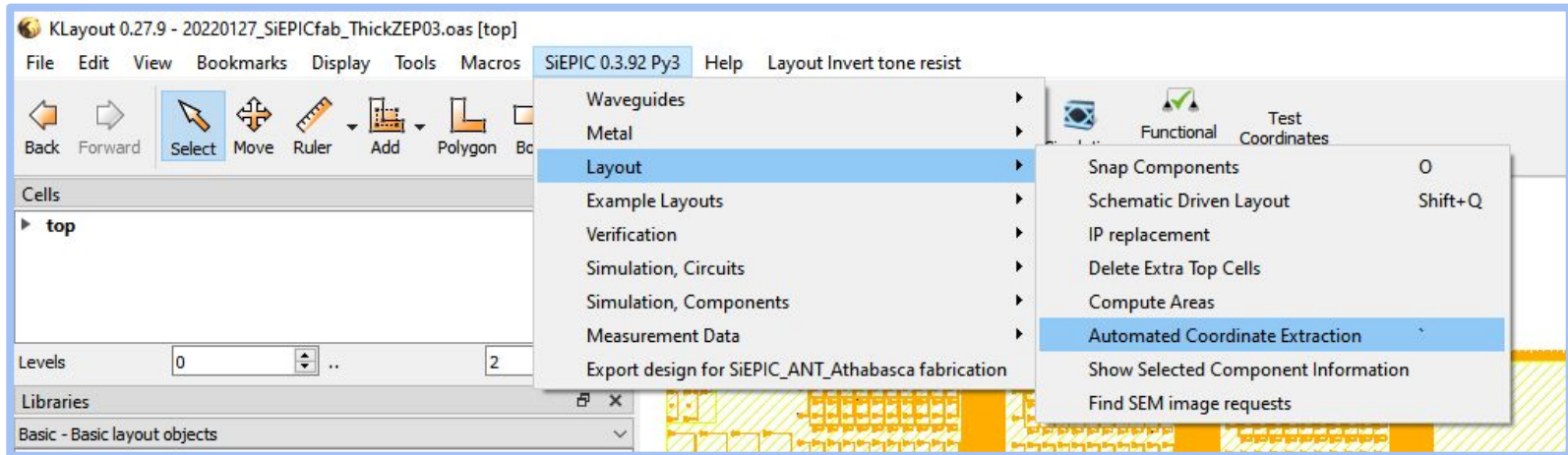
Electrical Pad Arrangement

Bond pads should be $75\mu\text{m}$ by $75\mu\text{m}$ and be spaced $100\mu\text{m}$ apart. There should be at least two bond pads and the leftmost pad should be signal ground.



Generating Coordinate Files

Once you've finished your design and labelled all devices you can export a text file of device coordinates by clicking on the **SiEPIC** toolbar and then selecting **Layout** followed by **Automated Coordinate Extraction**. A pop up window will open which will allow you to review and then save your text file.



Importing Coordinate Files

The screenshot displays the 'Automated Measurements' window, which is divided into two main sections: 'File Upload' and 'Electro-Optic Measurements'.

File Upload Section:

- Coordinate file:** A text box containing 'EBeam (2).txt' with an 'Open...' button to its right.
- Save folder:** An empty text box with an 'Open...' button to its right.

Electro-Optic Measurements Section:

- Align Laser:** A dropdown menu with a downward arrow and a 'Go' button.
- Align Electrical Probe:** A dropdown menu with a downward arrow and a 'Go' button.

Device List:

A scrollable list of devices, each preceded by an unchecked checkbox:

- ☐ mdowning
- ☐ X:2399Y:559mdowning
- ☐ X:2344Y:813mdowning
- ☐ X:2344Y:559mdowning
- ☐ X:2289Y:813mdowning
- ☐ X:2289Y:559mdowning

Buttons:

At the bottom of the window, there are four buttons: 'Select All', 'Unselect All', 'Filter', and 'Import Testing Parameters'. Below these, there are three more buttons: 'Save Alignment', 'Import Alignment', and 'Start Measurements'.

Import the coordinate text file in the file upload panel. The checklist should populate with devices on your chip.

If there are multiple devices with the same ID, PyOptomip will distinguish them by appending the x and y coordinates from the GDS file to the front of each ID.

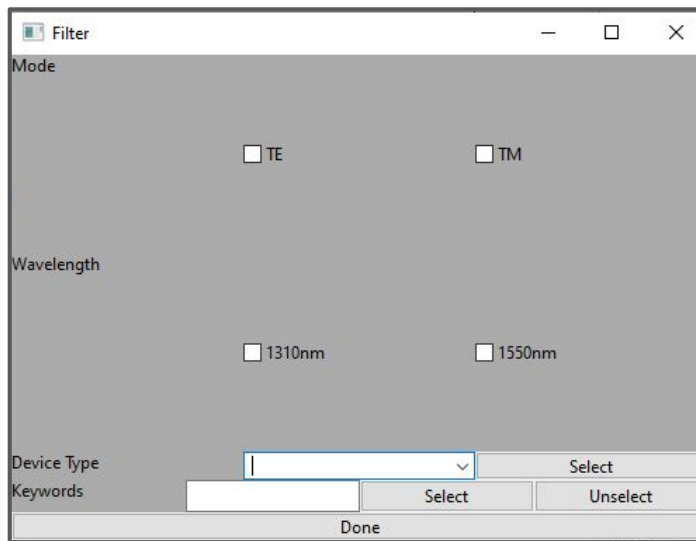
From here you can select which devices to perform measurements on using the **Select All**, **Unselect All** and **Filter** buttons.

Filtering Devices

Within the filter frame you can select which modes and wavelengths you wish to measure. For example, selecting **TE** will select all TE devices.

You can also select the device types that you wish to include by choosing them from the drop down menu then pressing **Select**.

Keywords can be used to select or unselect any device which contains the desired keyword in its ID.



The screenshot shows a 'Filter' dialog box with the following sections:

- Mode:** Contains two checkboxes, ☐ TE and ☐ TM.
- Wavelength:** Contains two checkboxes, ☐ 1310nm and ☐ 1550nm.
- Device Type:** A dropdown menu with a downward arrow.
- Keywords:** A text input field.
- Buttons:** 'Select' and 'Unselect' buttons are located to the right of the 'Device Type' and 'Keywords' fields respectively. A 'Done' button is at the bottom center.

Creating Transform Matrices

Before automated measurements can commence the transform matrices must be created. Within the automated measurements tab are the electrical and optical alignment boxes. Align the fibre array manually (through the home tab) onto a device. Once the array is aligned, choose the device you have aligned to from the drop down menu and hit the **Get Pos.** button to save the current coordinates. Repeat this until all boxes have been filled.

Choose alignment device
from dropdown

Once the array is aligned click the
Get Pos. Button

The screenshot shows a software interface with two main sections: 'Optical Alignment' and 'Electrical Alignment'. Each section contains a table for recording motor coordinates (X, Y, Z) for three different devices. In the 'Optical Alignment' section, the first row is highlighted, and the 'Device 1' dropdown menu and the 'Get Pos.' button are circled in red. A red arrow points from the text 'Choose alignment device from dropdown' to the dropdown menu, and another red arrow points from 'Once the array is aligned click the Get Pos. Button' to the 'Get Pos.' button. The 'Electrical Alignment' section is identical but currently empty.

Optical Alignment		Motor Coordinates			
		X	Y	Z	
Device 1	▼				Get Pos.
Device 2	▼				Get Pos.
Device 3	▼				Get Pos.

Electrical Alignment		Motor Coordinates			
		X	Y	Z	
Device 1	▼				Get Pos.
Device 2	▼				Get Pos.
Device 3	▼				Get Pos.

Creating Test Routines

Before the user can begin running automated tests they must create a set of routines for each device that they want to test. This is done using the testing parameters tab in pyOptomip or by running the standalone testing parameters python script.

The screenshot displays the 'Instrument Control' software window, specifically the 'Test Parameter Creation' tab. The interface is divided into several sections for configuring test routines.

Top Bar: Includes tabs for 'Home', 'Electrical', 'Optical', 'Automated Measurements', and 'Testing Parameters'. Below these is a 'Test Parameter Creation' section with a file selection area (currently showing 'No file selected') and buttons for 'Select All', 'Unselect All', 'Select keyword', 'Unselect keyword', 'Retrieve Data', and 'Enter name of User (optional):'.

Left Panel: Contains a 'Routine Select' section with instructions (1. Upload automated test coordinate file, 2. Select devices you wish to create routines for, 3. Select number of routines per type of routine, 4. Fill in routine data, 5. Click set button, 6. Repeat from step 2). Below this are dropdowns for 'Electrical Routine' and 'Optical Routine', and input fields for 'Set Voltage' and 'Set Wavelength'.

Main Content Area: Divided into two columns for 'Electrical' and 'Optical' settings.

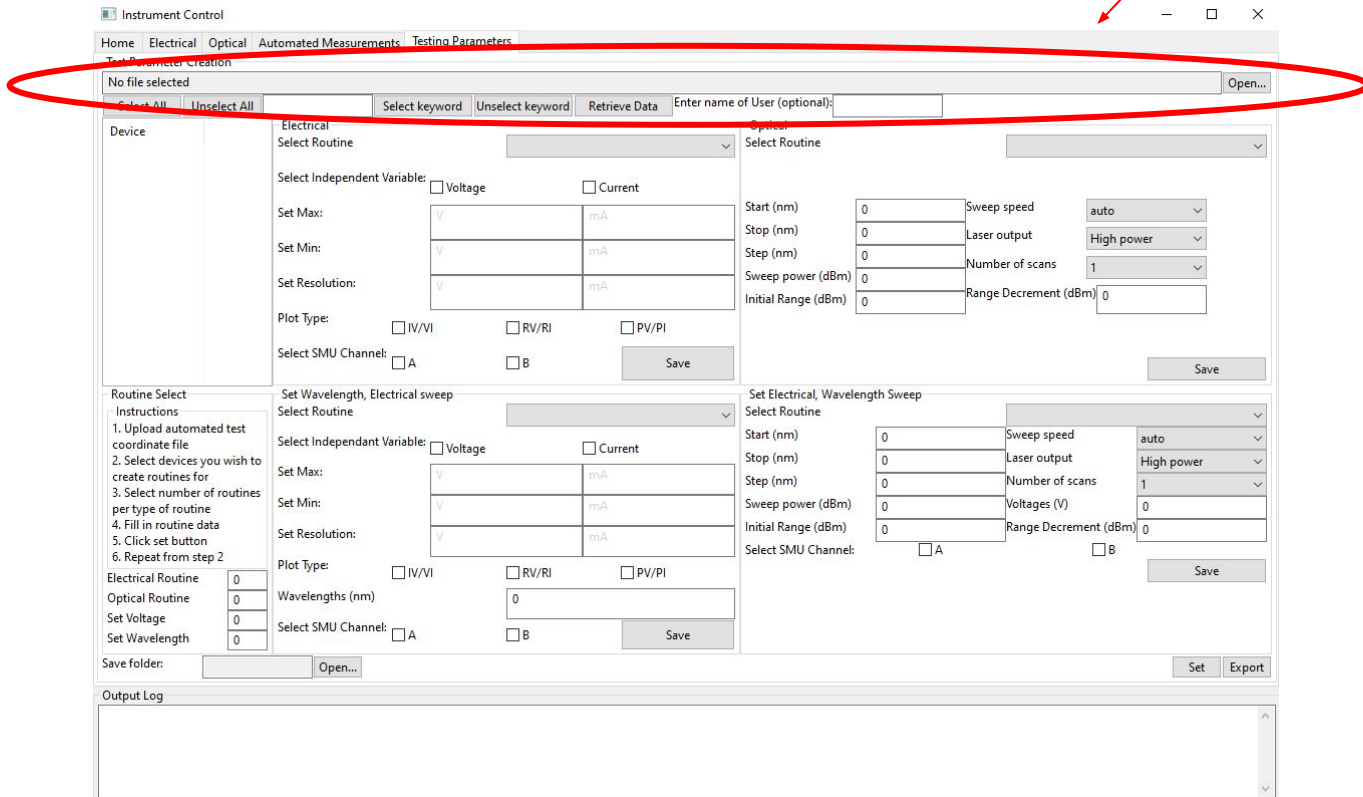
- Electrical Section:**
 - 'Select Routine': A dropdown menu.
 - 'Select Independent Variable': Radio buttons for 'Voltage' and 'Current'.
 - 'Set Max:', 'Set Min:', 'Set Resolution:': Each has two input fields (e.g., 'y' and 'm').
 - 'Plot Type': Radio buttons for 'I/V', 'R/I', and 'P/I'.
 - 'Select SMU Channel': Radio buttons for 'A' and 'B'.
 - 'Save' button.
- Optical Section:**
 - 'Select Routine': A dropdown menu.
 - 'Start (nm)', 'Stop (nm)', 'Step (nm)': Input fields.
 - 'Sweep speed': A dropdown menu (set to 'auto').
 - 'Laser output': A dropdown menu (set to 'High power').
 - 'Number of scans': A dropdown menu (set to '1').
 - 'Sweep power (dBm)', 'Initial Range (dBm)': Input fields.
 - 'Range Decrement (dBm)': An input field.
 - 'Save' button.

Bottom Section: Contains a 'Set Wavelength, Electrical sweep' section with similar controls to the Electrical section above, and a 'Set Electrical, Wavelength Sweep' section with similar controls to the Optical section above. Both have 'Save' buttons.

Bottom Bar: Includes a 'Save folder:' section with an 'Open...' button, and 'Set' and 'Export' buttons.

Uploading Device Coordinate Files

Use this to open folder and choose chip coordinate file



The screenshot shows the 'Instrument Control' software window. A red circle highlights the 'Open...' button in the 'No file selected' area of the 'Testing Parameters' tab. The interface includes various settings for device testing, such as 'Select Routine', 'Set Max', 'Set Min', 'Set Resolution', 'Plot Type', and 'Select SMU Channel'. The 'Output Log' section at the bottom is empty.

Instrument Control

Home Electrical Optical Automated Measurements **Testing Parameters**

No file selected

Select All Unselect All Select keyword Unselect keyword Retrieve Data Enter name of User (optional):

Device

Electrical Select Routine

Select Independent Variable: ☐ Voltage ☐ Current

Set Max: V mA

Set Min: V mA

Set Resolution: V mA

Plot Type: ☐ IV/VI ☐ RV/RI ☐ PV/PI

Select SMU Channel: ☐ A ☐ B Save

Optical Select Routine

Start (nm) 0 Sweep speed auto

Stop (nm) 0 Laser output High power

Step (nm) 0 Number of scans 1

Sweep power (dBm) 0 Range Decrement (dBm) 0

Initial Range (dBm) 0 Save

Routine Select

Instructions

1. Upload automated test coordinate file
2. Select devices you wish to create routines for
3. Select number of routines per type of routine
4. Fill in routine data
5. Click set button
6. Repeat from step 2

Electrical Routine 0

Optical Routine 0

Set Voltage 0

Set Wavelength 0

Save folder: Open...

Set Wavelength, Electrical sweep

Select Routine

Select Independent Variable: ☐ Voltage ☐ Current

Set Max: V mA

Set Min: V mA

Set Resolution: V mA

Plot Type: ☐ IV/VI ☐ RV/RI ☐ PV/PI

Wavelengths (nm) 0

Select SMU Channel: ☐ A ☐ B Save

Set Electrical, Wavelength Sweep

Select Routine

Start (nm) 0 Sweep speed auto

Stop (nm) 0 Laser output High power

Step (nm) 0 Number of scans 1

Sweep power (dBm) 0 Voltages (V) 0

Initial Range (dBm) 0 Range Decrement (dBm) 0

Select SMU Channel: ☐ A ☐ B Save

Set Export

Output Log

Selecting Devices for Routines

Use keywords in device names to select devices or select all

Manually
select
devices

Instrument Control

Home Electrical Optical Automated Measurements Testing Parameters

Test Parameter Creation

Keywords: Open...

Select All Unselect All Select keyword Unselect keyword Retrieve Data Enter name of User (optional):

Device

- ☐ CUTBACK0
- ☐ CUTBACK1
- ☐ CUTBACK2
- ☐ CUTBACK3
- ☐ CUTBACK4
- ☐ CUTBACK
- ☐ CUTBACK
- ☐ CUTBACK
- ☐ LOOPBACK23
- ☐ LOOPBACK61
- ☐ LOOPBACK62
- ☐ LOOPBACK63

Electrical

Select Routine:

Select Independent Variable: ☐ Voltage ☐ Current

Set Max: V mA

Set Min: V mA

Set Resolution: V mA

Plot Type: ☐ IV/VI ☐ RV/RI ☐ PV/PI

Select SMU Channel: ☐ A ☐ B Save

Optical

Select Routine:

Start (nm): Sweep speed: auto

Stop (nm): Laser output: High power

Step (nm): Number of scans: 1

Sweep power (dBm): Range Decrement (dBm): 0

Initial Range (dBm):

Save

Routine Select

Instructions

1. Upload automated test coordinate file
2. Select devices you wish to create routines for
3. Select number of routines per type of routine
4. Fill in routine data
5. Click set button
6. Repeat from step 2

Electrical Routine: 0

Optical Routine: 0

Set Voltage: 0

Set Wavelength: 0

Save folder: Open...

Set

Export

Output Log

Selecting Quantity of Routines

Instrument Control

Home Electrical Optical Automated Measurements Testing Parameters

Test Parameter Creation

testcoords.txt Open...

Select All Unselect All Select keyword Unselect keyword Retrieve Data Enter name of User (optional):

Device

- ☐ CUTBACK0
- ☐ CUTBACK1
- ☐ CUTBACK2
- ☐ CUTBACK3
- ☐ CUTBACK4
- ☐ CUTBACK
- ☐ CUTBACK
- ☐ CUTBACK
- ☐ LOOPBACK23
- ☐ LOOPBACK61
- ☐ LOOPBACK62
- ☐ LOOPBACK63

Electrical

Select Routine

Select Independent Variable: ☐ Voltage ☐ Current

Set Max: V mA

Set Min: V mA

Set Resolution: V mA

Plot Type: ☐ IV/VI ☐ RV/RI ☐ PV/PI

Select SMU Channel: ☐ A ☐ B Save

Optical

Select Routine

Start (nm) 0 Sweep speed auto

Stop (nm) 0 Laser output High power

Step (nm) 0 Number of scans 1

Sweep power (dBm) 0 Range Decrement (dBm) 0

Initial Range (dBm) 0 Save

Routine Select

Instructions

1. Upload automated test coordinate file
2. Select devices you wish to create routines for
3. Select number of routines per type of routine
4. Fill in routine data
5. Click set button
6. Repeat from step 2

Electrical Routine 3

Optical Routine 1

Set Voltage 2

Set Wavelength 4

Save folder: Open...

Set

Export

Output Log

Setting Routines

If more than one type of the same routine choose specific routine number

Input routine parameters

Instrument Control

Home Electrical Optical Automated Measurements Testing Parameters

Test Parameter Creation

testcoords.txt

Select All Unselect All Select keyword Unselect keyword Retrieve Data Enter name of User (optional): Open...

Device

- ☐ CUTBACK0
- ☐ CUTBACK1
- ☐ CUTBACK2
- ☐ CUTBACK3
- ☐ CUTBACK4
- ☐ CUTBACK
- ☐ CUTBACK
- ☐ CUTBACK
- ☐ CUTBACK
- ☐ LOOPBACK23
- ☐ LOOPBACK61
- ☐ LOOPBACK62
- ☐ LOOPBACK63

Routine Select

Instructions

1. Upload automated test coordinate file
2. Select devices you wish to create routines for
3. Select number of routines per type of routine
4. Fill in routine data
5. Click set button
6. Repeat from step 2

Electrical Routine

3

Optical Routine

1

Set Voltage

2

Set Wavelength

4

Electrical

Select Routine

2

Select Independent Variable

☒ Voltage ☐ Current

Set Max:

4

Set Min:

2

Set Resolution:

0.1

Plot Type:

☐ IV/VI ☒ RV/RI ☐ PV/PI

Select SMU Channel:

☒ A ☐ B

Save

Optical

Select Routine

Start (nm): 0 Sweep speed: auto

Stop (nm): 0 Laser output: High power

Step (nm): 0 Number of scans: 1

Sweep power (dBm): 0

Initial Range (dBm): 0 Range Decrement (dBm): 0

Save

Set Electrical, Wavelength Sweep

Select Routine

Start (nm): 0 Sweep speed: auto

Stop (nm): 0 Laser output: High power

Step (nm): 0 Number of scans: 1

Sweep power (dBm): 0 Voltages (V): 0

Initial Range (dBm): 0 Range Decrement (dBm): 0

Select SMU Channel:

☐ A ☐ B

Save

Set

Export

Save folder: Open...

Output Log

When all routines complete hit the save buttons to temporarily save the routine parameters

Setting the Data Array

Home Electrical Optical Automated Measurements Testing Parameters

Test Parameter Creation

testcoords.txt Open...

Select All Unselect All Select keyword Unselect keyword Retrieve Data Enter name of User (optional):

Device

- ☒ CUTBACK0
- ☒ CUTBACK1
- ☒ CUTBACK2
- ☒ CUTBACK3
- ☒ CUTBACK4
- ☐ CUTBACK
- ☐ CUTBACK
- ☐ CUTBACK
- ☐ LOOPBACK23
- ☐ LOOPBACK61
- ☐ LOOPBACK62
- ☐ LOOPBACK63

Electrical

Select Routine: 3

Select Independent Variable: ☒ Voltage ☐ Current

Set Max: 4

Set Min: 2

Set Resolution: 0.1

Plot Type: ☒ IV/VI ☒ RV/RI ☐ PV/PI

Select SMU Channel: ☒ A ☐ B Save

Optical

Select Routine: 1

Start (nm): 1310

Stop (nm): 1580

Step (nm): 1

Sweep power (dBm): 9

Initial Range (dBm): -20

Sweep speed: auto

Laser output: High power

Number of scans: 1

Range Decrement (dBm): 20

Save

Routine Select

Instructions

1. Upload automated test coordinate file
2. Select devices you wish to create routines for
3. Select number of routines per type of routine
4. Fill in routine data
5. Click set button
6. Repeat from step 2

Electrical Routine: 3

Optical Routine: 1

Set Voltage: 2

Set Wavelength: 4

Set Wavelength, Electrical sweep

Select Routine: 4

Select Independent Variable: ☐ Voltage ☒ Current

Set Max: 3

Set Min: 1

Set Resolution: 0.1

Plot Type: ☐ IV/VI ☒ RV/RI ☐ PV/PI

Wavelengths (nm): 1480, 1550, 1580

Select SMU Channel: ☒ A ☐ B Save

Set Electrical, Wavelength Sweep

Select Routine: 2

Start (nm): 1480

Stop (nm): 1550

Step (nm): 5

Sweep power (dBm): 5

Initial Range (dBm): -5

Sweep speed: auto

Laser output: High power

Number of scans: 1

Voltagess (V): 1, 2, 3, 4

Range Decrement (dBm): 20

Select SMU Channel: ☐ A ☒ B Save

Save folder: Open...

Output Log

Set Export

Once all parameters have been set and saved hit the set button to upload data to file and clear software for next set of routines

Repeat until all desired device routines are set

Manually select devices

Use keywords in device names to select devices or select all

The screenshot displays the 'Instrument Control' software interface, specifically the 'Test Parameter Creation' window. The window is divided into several sections. On the left, there is a list of routines: CUTBACK0, CUTBACK1, CUTBACK2, CUTBACK3, CUTBACK4, CUTBACK5, CUTBACK6, LOOPBACK23, LOOPBACK61, LOOPBACK62, and JUNCTION/KK6. A red circle highlights this list, with an arrow pointing to it from the text 'Manually select devices'. Above the list, there are buttons for 'Select All', 'Unselect All', 'Select keyword', 'Unselect keyword', 'Retrieve Data', and 'Enter name of User (optional)'. A red circle highlights the 'Select All' button, with an arrow pointing to it from the text 'Use keywords in device names to select devices or select all'. The main area of the window is divided into two columns. The left column is for 'Electrical' routines, and the right column is for 'Optical' routines. Each column has a 'Select Routine' dropdown, a 'Select Independent Variable' dropdown (with options for Voltage and Current), and a 'Set SMU Channel' dropdown (with options for A and B). There are also fields for 'Set Max', 'Set Min', and 'Set Resolution'. The right column has additional fields for 'Start (nm)', 'Stop (nm)', 'Step (nm)', 'Sweep power (dBm)', 'Initial Range (dBm)', 'Range Decrement (dBm)', 'Sweep speed', 'Laser output', 'Number of scans', and 'Voltages (V)'. At the bottom, there is an 'Output Log' section.

Finalize

If using the standalone testing parameters file, or just want an additional copy of the parameters saved in csv format choose save location

The screenshot shows the 'Instrument Control' software interface, specifically the 'Testing Parameters' tab. The window is titled 'Test Parameter Creation' and contains several sections for configuring testing parameters. The 'Device' section on the left lists various devices like CUTBACK0, CUTBACK1, etc. The 'Routine Selection' section includes instructions for creating routines. The 'Electrical' and 'Optical' sections contain fields for setting parameters like 'Start (nm)', 'Stop (nm)', 'Sweep speed', 'Laser output', 'Number of scans', 'Sweep power (dBm)', 'Initial Range (dBm)', and 'Range Decrement (dBm)'. The 'Save folder' field at the bottom left is highlighted with a red circle and an arrow pointing to it. The 'Export' button at the bottom right is also highlighted with a red circle and an arrow pointing to it.

When all devices have been set, finalize by hitting the export button

Retrieving Data

Instrument Control

Home Electrical Optical Automated Measurements Testing Parameters

Test Parameter Creation

testcoords.txt

Select All Unselect All Select keyword Unselect keyword Retrieve Data Enter name of User (optional): Open...

Device

- ☐ CUTBACK0
- ☐ CUTBACK1
- ☐ CUTBACK2
- ☐ CUTBACK3
- ☐ CUTBACK4
- ☐ CUTBACK
- ☐ CUTBACK
- ☐ CUTBACK
- ☐ LOOPBACK23
- ☐ LOOPBACK61
- ☐ LOOPBACK62
- ☐ LOOPBACK63

Electrical

Select Routine

Select Independent Variable: ☐ Voltage ☐ Current

Set Max:

Set Min:

Set Resolution:

Plot Type: ☐ IV/VI ☐ RV/RI ☐ PV/PI

Select SMU Channel: ☒ A ☐ B Save

Optical

Select Routine

Start (nm) Sweep speed auto

Stop (nm) Laser output High power

Step (nm) Number of scans 1

Sweep power (dBm) Range Decrement (dBm)

Initial Range (dBm)

Save

Routine Select

Instructions

1. Upload automated test coordinate file
2. Select devices you wish to create routines for
3. Select number of routines per type of routine
4. Fill in routine data
5. Click set button
6. Repeat from step 2

Electrical Routine

Optical Routine

Set Voltage

Set Wavelength

Set Wavelength, Electrical sweep

Select Routine

Select Independent Variable: ☐ Voltage ☐ Current

Set Max:

Set Min:

Set Resolution:

Plot Type: ☐ IV/VI ☐ RV/RI ☐ PV/PI

Wavelengths (nm)

Select SMU Channel: ☒ A ☐ B Save

Set Electrical, Wavelength Sweep

Select Routine

Start (nm) Sweep speed auto

Stop (nm) Laser output High power

Step (nm) Number of scans 1

Sweep power (dBm) Voltages (V)

Initial Range (dBm) Range Decrement (dBm)

Select SMU Channel: ☐ A ☐ B Save

Save folder: Open...

Set Export

Output Log

Testing parameters for CUTBACK set

Testing parameters for CUTBACK set

Testing parameters for CUTBACK set

Data has been set

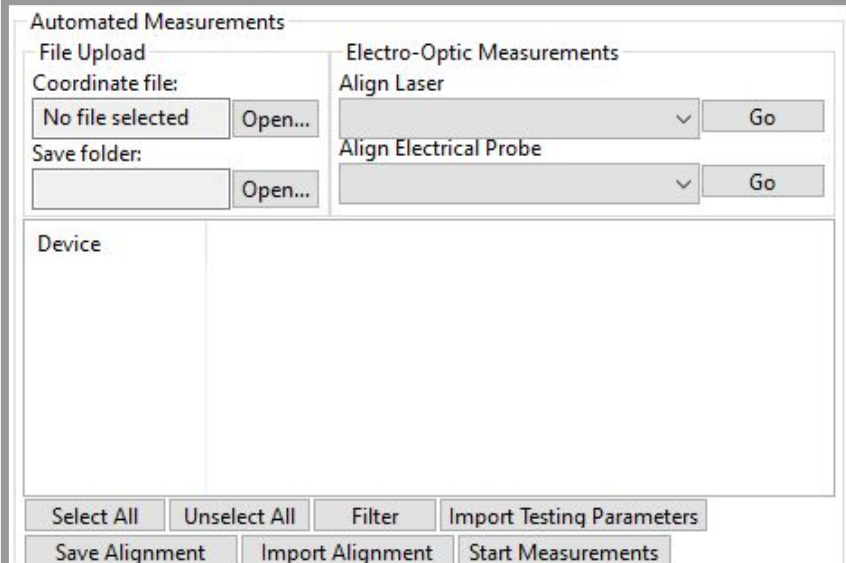
Starting Measurements

After uploading the coordinate file, creating the transform matrices and setting the testing parameters, you are ready to begin taking automated measurements.

Set the folder in which you wish to save your measurement data by clicking **Open...** beside the designated text box.

Next, import your testing parameters file using the **Import Testing Parameters** button.

Finally, select **Start Measurements**.



The screenshot shows a software window titled "Automated Measurements". It is divided into several sections:

- File Upload**: Contains a "Coordinate file:" label, a text box with "No file selected", and an "Open..." button. Below it is a "Save folder:" label, an empty text box, and another "Open..." button.
- Electro-Optic Measurements**: Contains two sections:
 - Align Laser**: A dropdown menu and a "Go" button.
 - Align Electrical Probe**: A dropdown menu and a "Go" button.
- Device**: A large empty rectangular area.
- Buttons**: A row of buttons at the bottom including "Select All", "Unselect All", "Filter", "Import Testing Parameters", "Save Alignment", "Import Alignment", and "Start Measurements".

PyOptomip Github Repo

To make changes to the PyOptomip code or to view how the software works, all related PyOptomip content can be found in the following github repo:

<https://github.com/SiEPIC/pyOptomip>

The ida-main-py3 branch is the version currently running on the IDA stage in KAISER 4060.

Requirements

Before one can begin using PyOptomip on their PC they must ensure their computer has the required modules and API's. To find all required python add-ons and modules use the **requirements.txt** file located in the PyOptomip folder in the Github repository.