

HighFinesse
The Standard of Accuracy

HighFinesse Tutorial

HighFinesse Digital PID Option: Laser Control

How to ...

... set up the HighFinesse Digital PID Option:
Laser Control

This option can be used with TOPTICA lasers controlled by a DLC pro only.

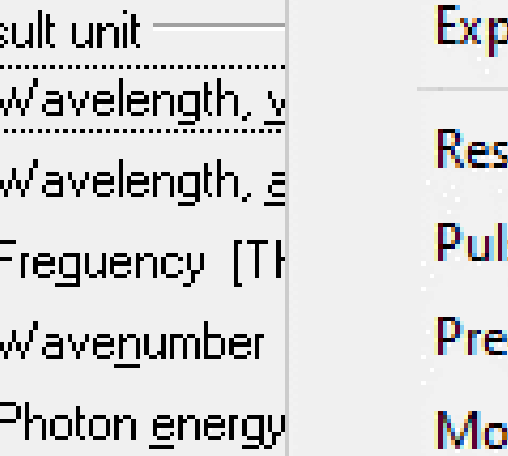
This quickstart guide is intended to give you a brief overview of how to configure the HighFinesse laser control settings. The guide does not replace reading the manual. Make sure you have read and understood it (especially section 3.5) before you start the regulation. Setting voltage bounds incorrectly might cause damage to your laser.

Here we assume that the laser is already successfully connected with a fiber to the wavelength meter. If you have any questions about that refer to the quickstart guide “HighFinesse Wavelength Meter”

Quick Start Guide

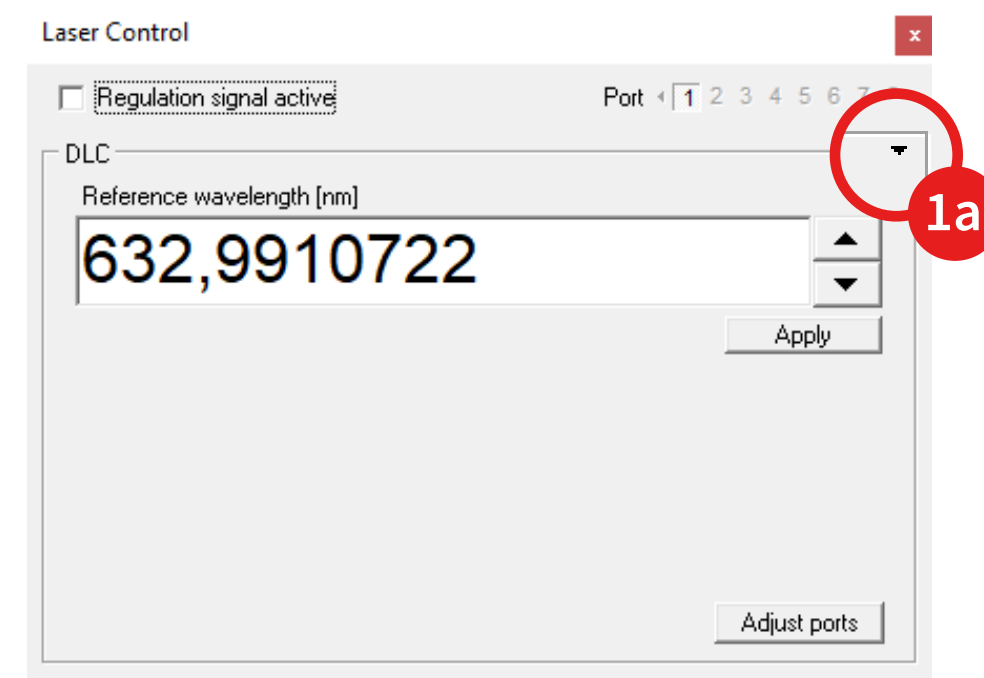
HighFinesse Wavelength Meter

<https://www.highfinesse.com/en/support/quick-start-guide.html>



The screenshot shows the 'Settings' menu of the software. The menu is open, displaying various configuration options. The 'Laser Control Settings ...' option is highlighted with a red box, indicating it is the selected item. Other options visible in the menu include 'Result unit', 'Pulse', 'Precision', 'Modes', 'Display', 'Switch Settings', 'Pulse Settings ...', 'COM Port Settings', and 'Extra Settings ...'. The 'File' and 'Operation' menus are also visible at the top of the interface.

| File | Operation | Settings | ? |
|------|--|----------------------------|---|
| | Result unit | Exposure 1 | > |
| | <input checked="" type="radio"/> Wavelength, μ m | Result unit | > |
| | <input type="radio"/> Wavelength, nm | Pulse | > |
| | <input type="radio"/> Frequency [THz] | Precision | > |
| | <input type="radio"/> Wavenumber [cm ⁻¹] | Modes | > |
| | <input type="radio"/> Photon energy [eV] | Display | > |
| | Pulse | Laser Control Settings ... | |
| | <input checked="" type="radio"/> Continuous | Switch Settings | > |
| | <input type="radio"/> Pulsed | Pulse Settings ... | |
| | Precision | COM Port Settings | > |
| | <input checked="" type="radio"/> Fine | Extra Settings ... | |
| | <input type="radio"/> Wide | | |



Start the software and set the **voltage bounds in the Laser Control Menu** such that you can exclude a damage to your laser and make sure the output range is suitable (e.g. as defined by a mode-hop-free scanning range).

Laser Control

☒ Regulation signal active

Port 1 2 3 4 5 6 7 8

Modify | Altering sensitivity | Errorsignals | Calibration

DL C | Reference | Regulation & Sensitivity | Bounds | Various

Signal bounds [mV]

Minimum 0 Maximum 140000

☒ Adjust reference midway (70.000,0 mV)

☐ Adjust reference at 70000 mV

Behaviour on exceeding bounds

☒ Only cut at signal bounds

☐ Output errorvalue [mV]

at min. 0 at max. 0

☒ Clear integral history

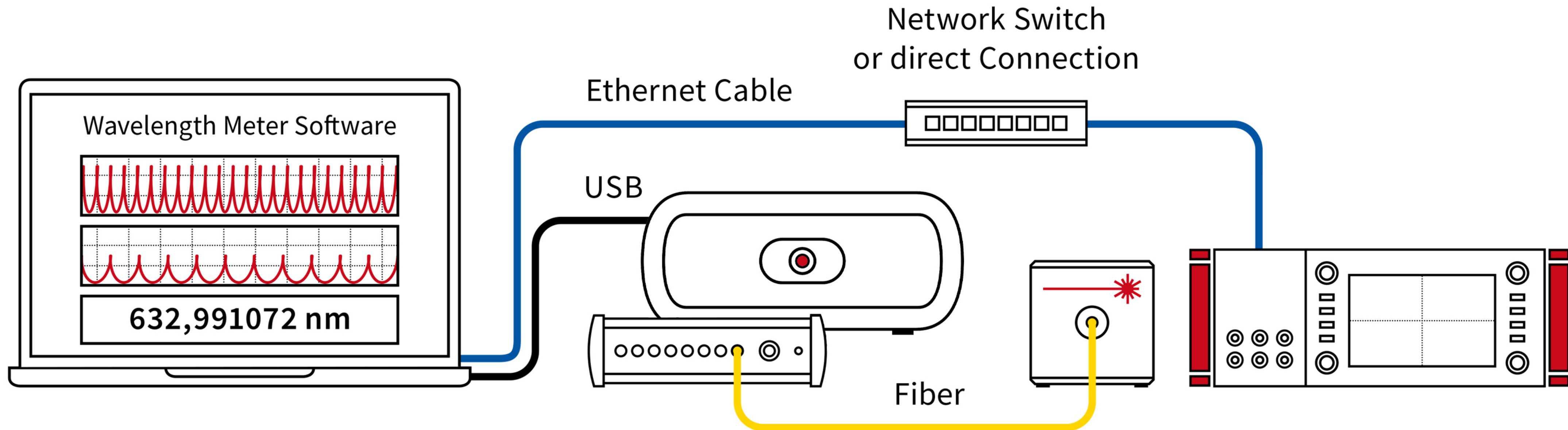
☐ Maximum shot-per-shot change [mV]

10000

☒ allow towards zero

☐ drive immediately

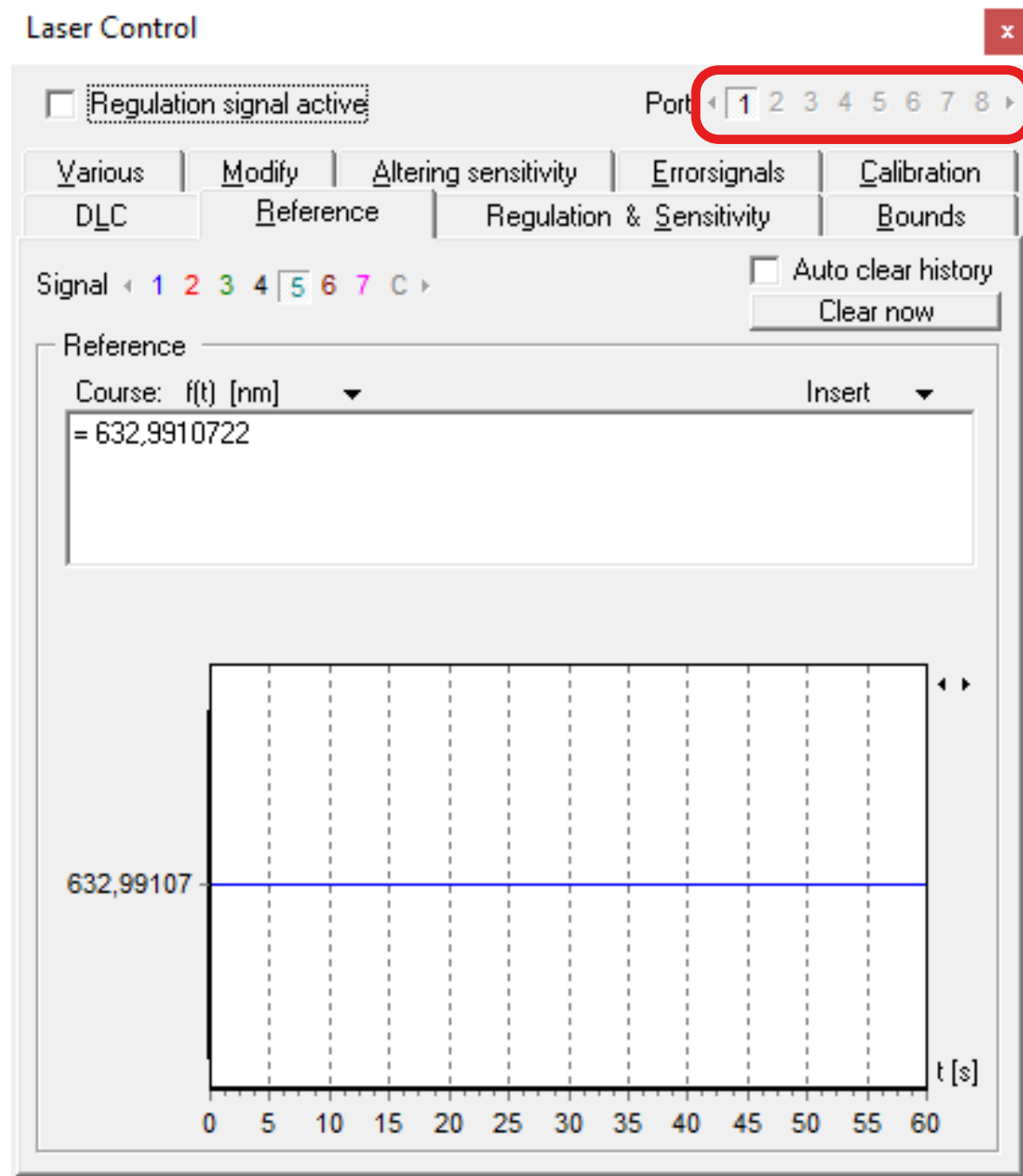
Click on the black triangle **1a** to obtain more settings. Move to the frame bounds to enter the correct bounds.



Connect the DLC pro Controller and the computer running the wavelength meter software to the same network (UDP has to be allowed for automatic recognition).

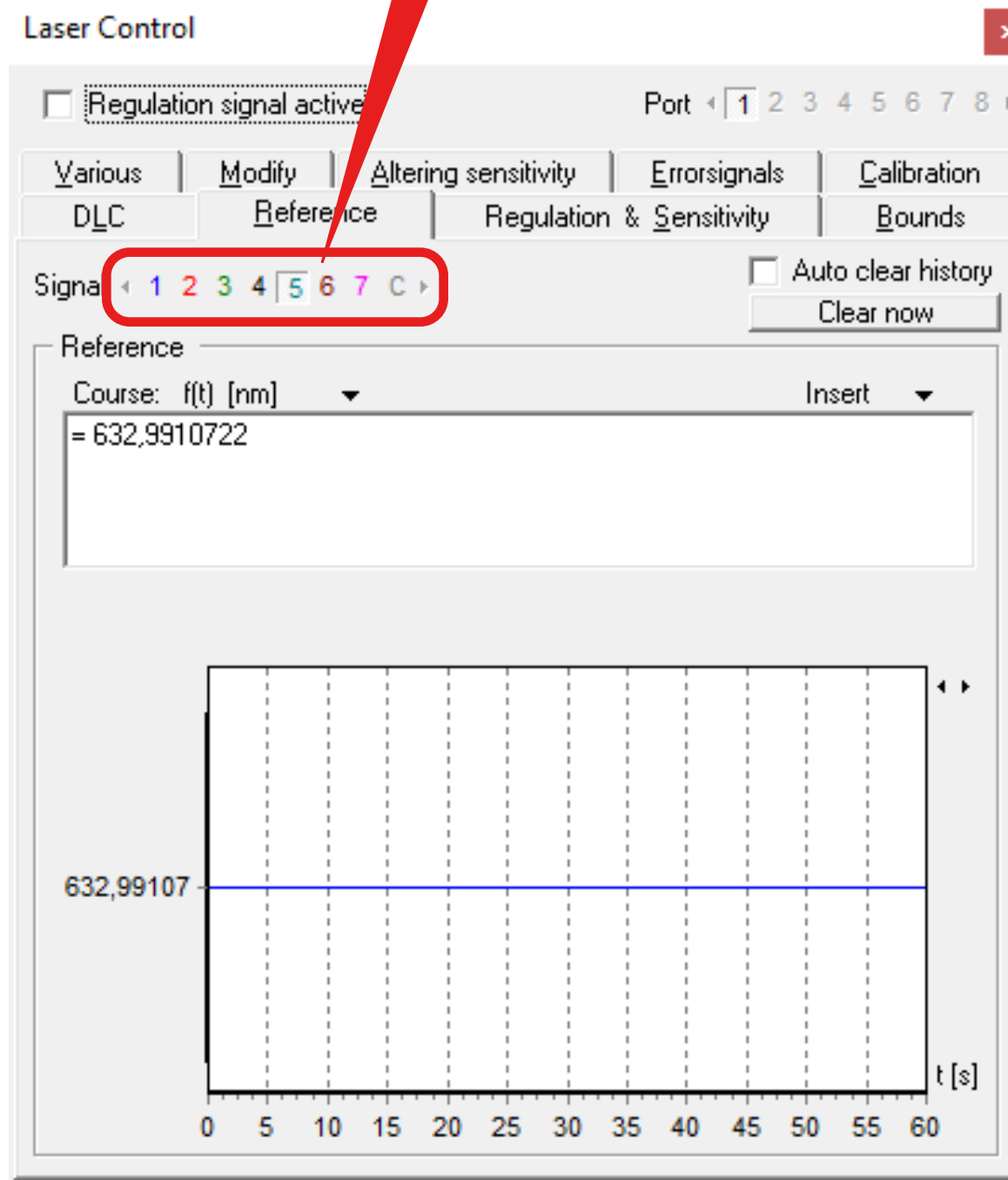
In **restrictive network** it might be necessary to **specify** the IP address and the port of the DLC pro Controller (Standard port: 1998) in the “**Adjust ports**” menu → “**Additional IPs**”.

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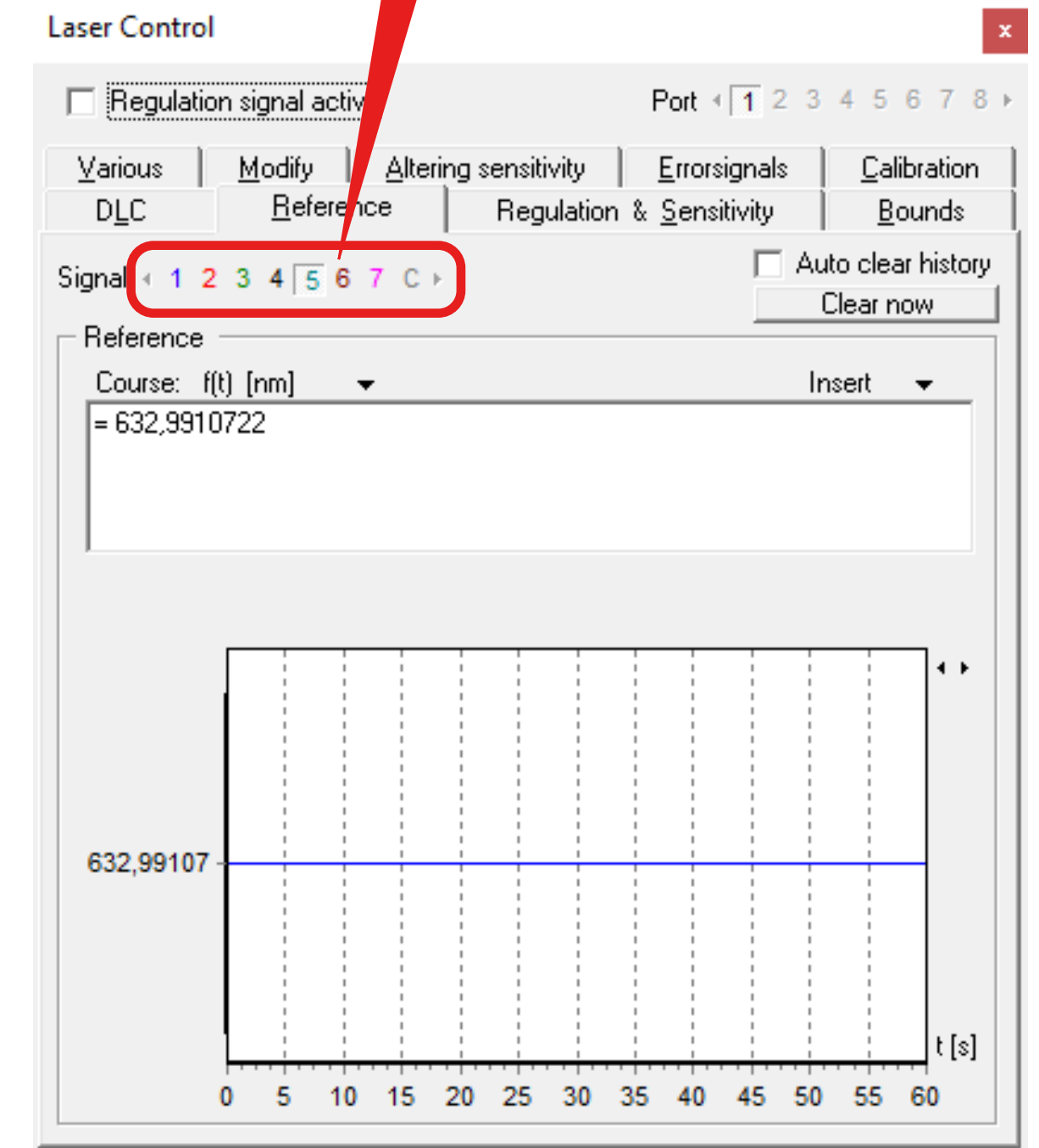
4a

Click to assign ...



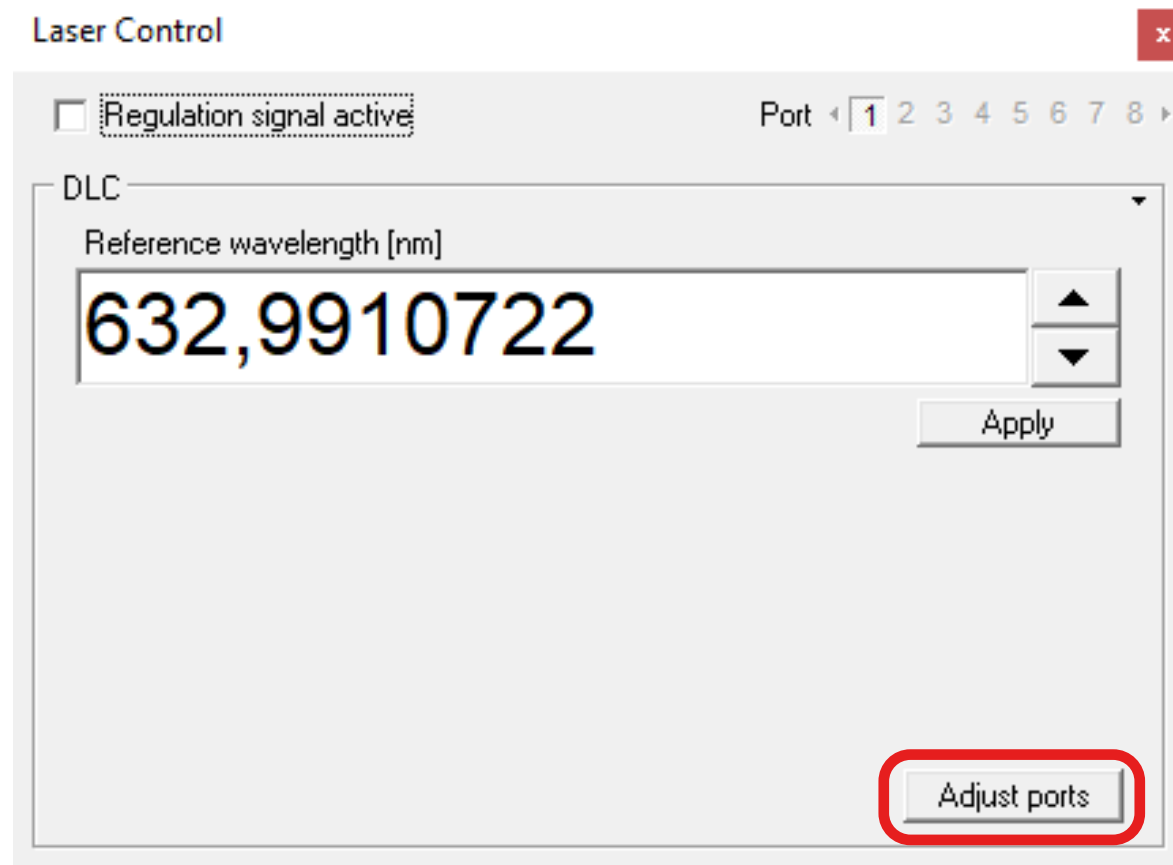
4b

Click again to unassign ...

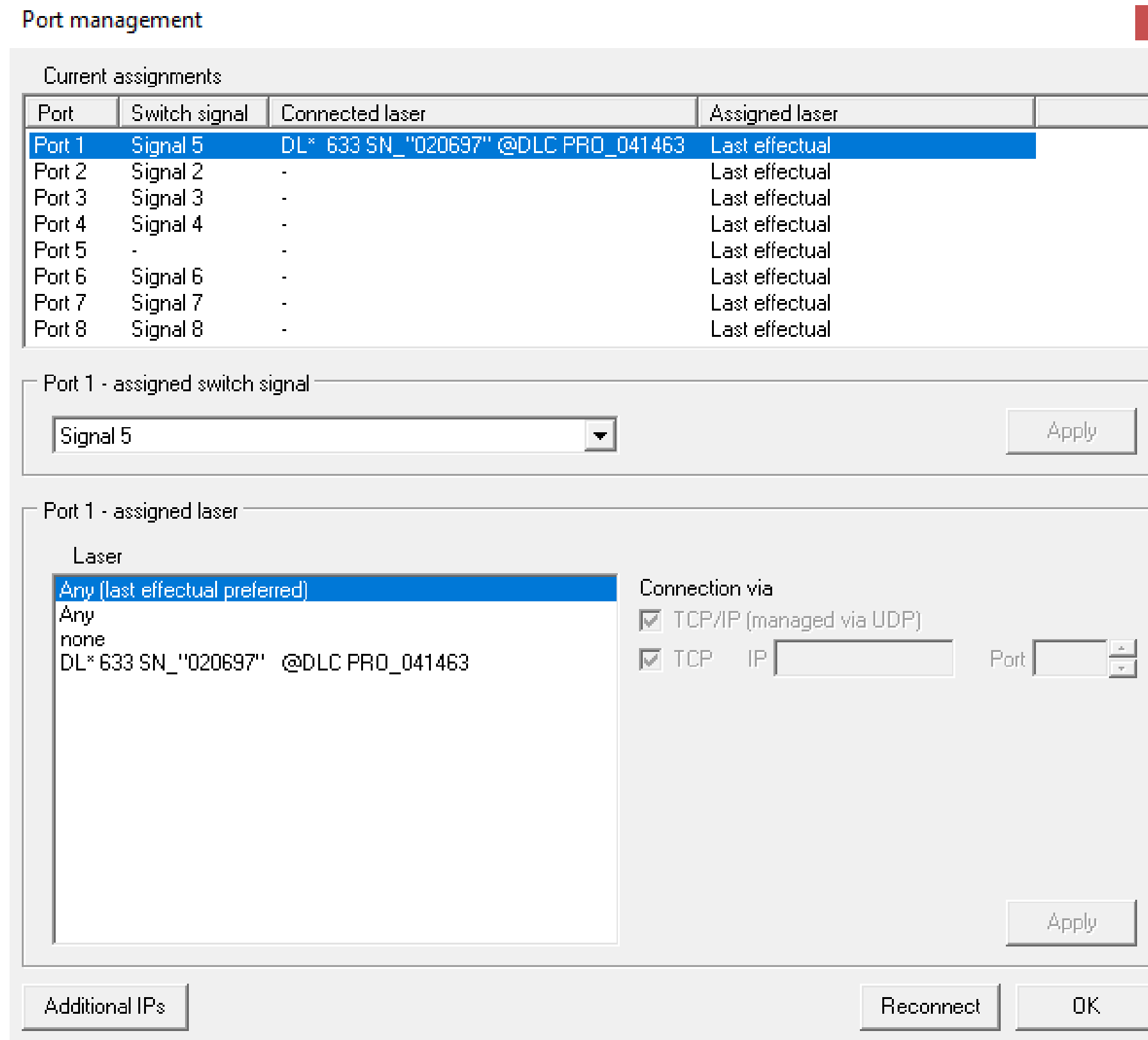


You can **unassign** it by clicking on the **same number again**. In the example the Switch signal 5 is assigned to port 1.

4c



You can use the “Adjust ports” menu for assigning the lasers to the ports.



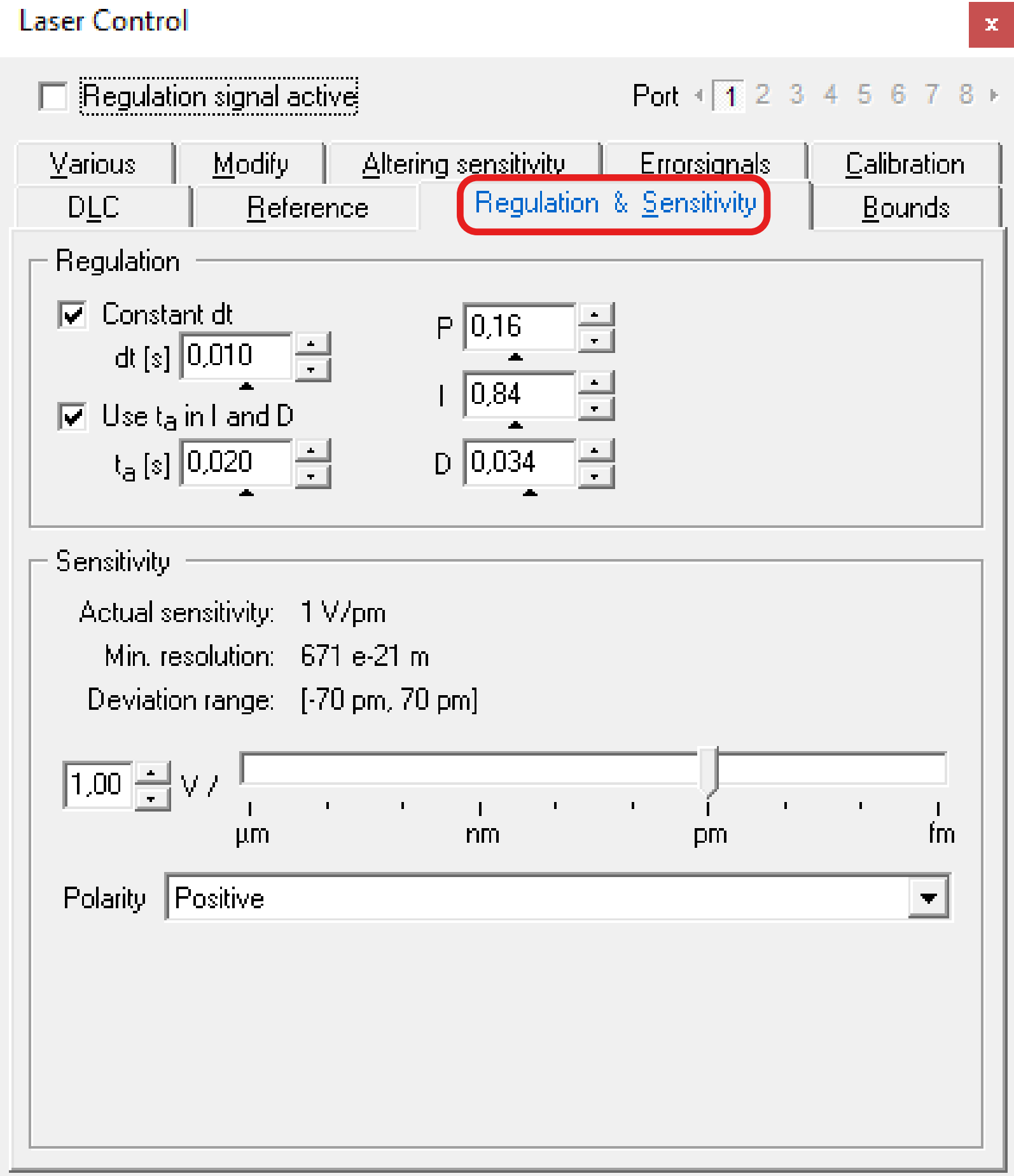
In this example, the **light output of the laser** is connected to **channel 5 on the switch**.

Both channel 5 and the correct laser are assigned to digital Port 1.

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Use the **PIDSim2 Tool** to simulate good starting parameters.

Alternatively, you can set PID parameters manually in the laser control settings/frame: **“Regulation & Sensitivity”**.



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Start ...



PIDSim2.exe

Type: Application

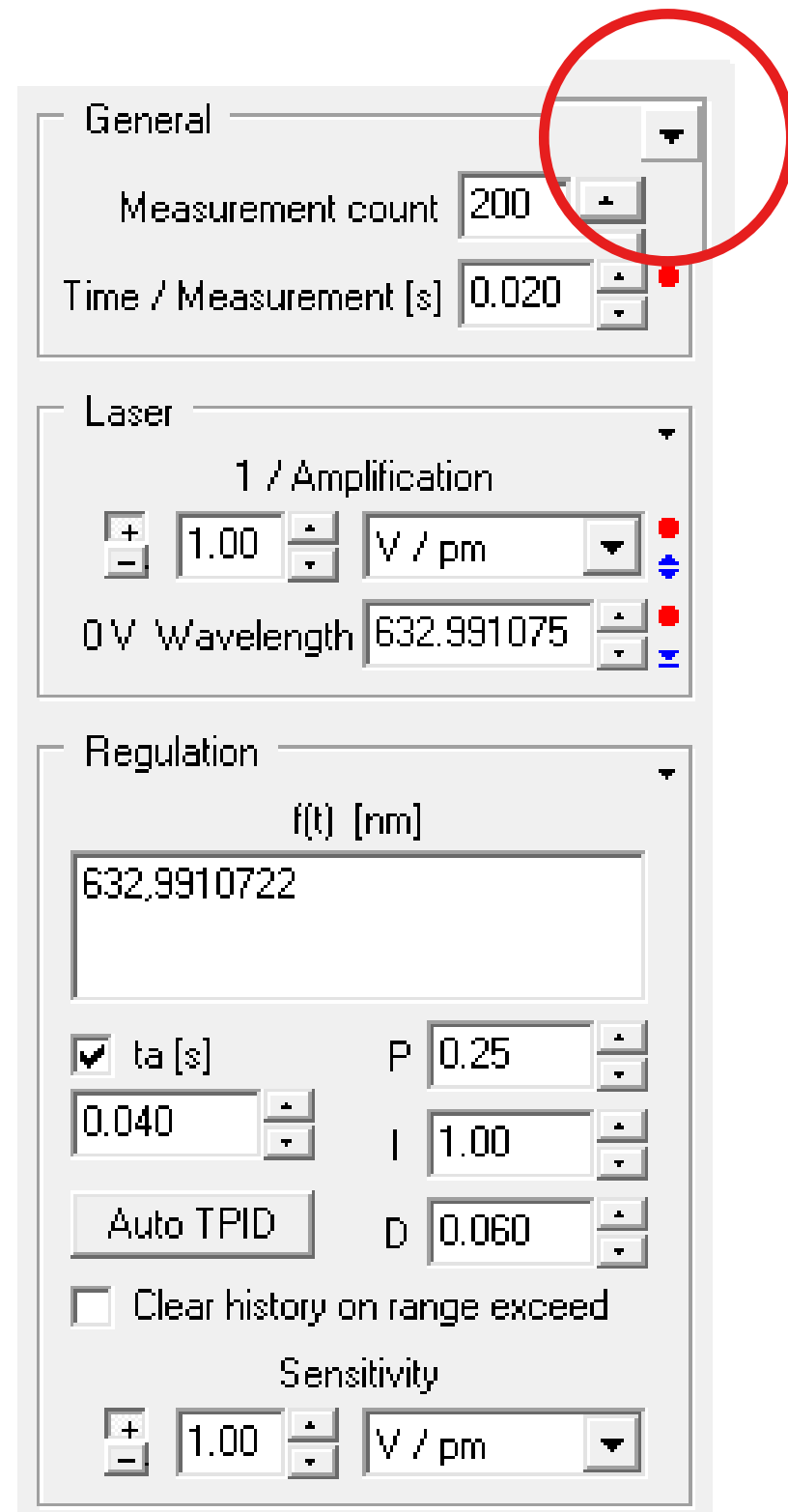
Start the PIDSim2 application
located in the path ...

Installation Path of the Wavelength Meter Software

\Tools
\PIDSim2.exe

... and make sure you can measure.

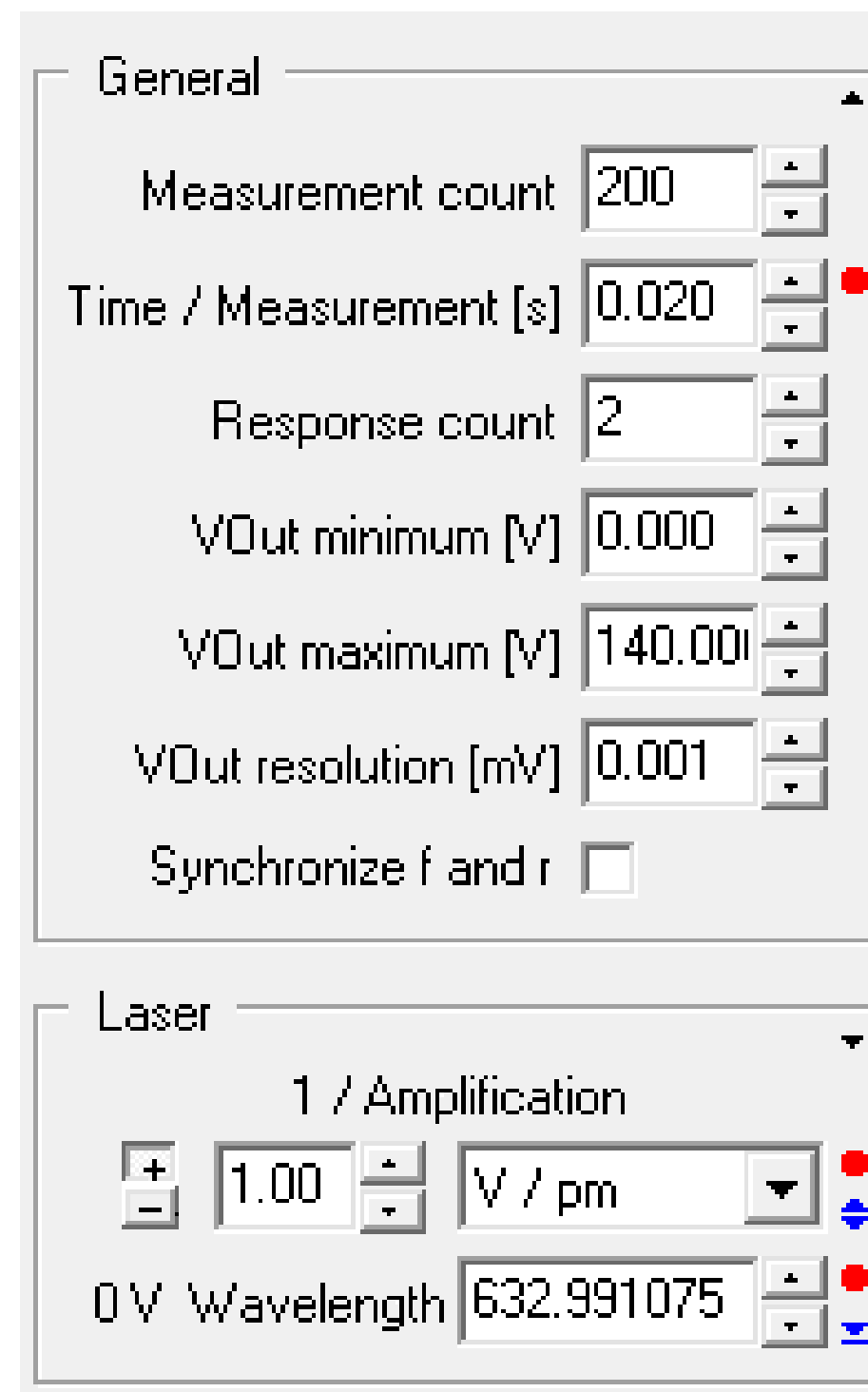
7



Clicking on the **small black triangle** will enable more settings.

7a

PIDSim2 Settings



Now you can **make your settings**
for simulation.

Measurement count:
number of points in the simulation.

Time/Measurement [s]:
get this live from the wavelength meter by clicking on the red dot and confirm by clicking on the checkmark.

Response Count:
2 for single channel, 1 for multichannel measurements.

Set the **minimum and maximum output** according to your system (voltage bounds set in 1.).

Set the **resolution** to obtain a realistic simulation of your system.

Regulation

$f(t)$ [nm]

= 632,9910722

☒ t_a [s] P 0.25

0.040 I 1.00

Auto TPID D 0.060

☐ Clear history on range exceed

Sensitivity

+ 1.00 V / nm

Synchronize WLM

Connection with WLM

In which direction shall be synchronized first?

WLM --> PIDSim

PIDSim2 --> WLM

Choose ...

Choose to **synchronize** the
PIDSim2 in the **section regulation**.

You can **alternatively also transfer all settings** you have made from the wavelength meter to the PIDsim2 tool.

Regulation

$f(t)$ [nm]

= 632,9910722

☒ ta [s] P 0.20

0.040 I 1.00

Auto TPID D 0.060

☐ Clear history on range exceed

Sensitivity 1.00

Port 1

Release WLM

9

Click on the blue triangles to enter the bounds **9a** (range should be smaller or equal to the bounds in 1.) and number of collection points used for calculation.

Then click on the red dot **9b** to automatically **determine the sensitivity**. Once this is determined transfer the result to the frame “Regulation” and enter it as the “Sensitivity” of the laser.

Caution: this will vary the output voltage, so a safe choice for the bounds is important.

Amplification settings

Collection points per cycle

Upper voltage border [mV]

Lower voltage border [mV]

Laser

1 / Amplification

1.00 V / pm

Wavelength 632.991075

Perturbation [pm]

0

Noise [pm] 0.000

Sudden hops [pm] 0.000

9b Click to determine the sensitivity ...

9a Click to enter the bounds ...

10

Reference Voltage

Reference Voltage [mV] 1000

Laser

1 / Amplification

1.00 V / pm

0 V Wavelength 632.991075

Perturbation [pm]

0

Noise [pm] 0.000

Sudden hops [pm] 0.000

10c Get the current wavelength

10a Click to enter the current voltage ...

Click on the **blue triangle** **10a**.

Enter the **current voltage** **10b**.

Get the corresponding wavelength by clicking on the red dot 10c.

Regulation

$f(t)$ [nm]

= 632.9910722

☒ ta [s] P 0.25

0.040 I 1.00

Auto TPID D 0.060

☐ Clear history on range exceed

Sensitivity

+ 1.00 - V / pm

Synchronize WLM

● ● ● ● ● ● ● ● ● ● ●

Regulation

$f(t)$ [nm]

= 632.9910722

☒ ta [s]

0.040

+

-

P

0.25

+

-

I

1.00

+

-

D

0.060

+

-

Auto TPID

☐ Clear history on range exceed

Sensitivity

+

-

1.00

+

-

V / pm

▼

Synchronize WLM

Regulation

$f(t)$ [nm²]
= 632,9910722

☒ t_a [s]
0.040

P 0.25

I 1.00

D 0.060

Auto TPID

☐ Clear history on range exceed

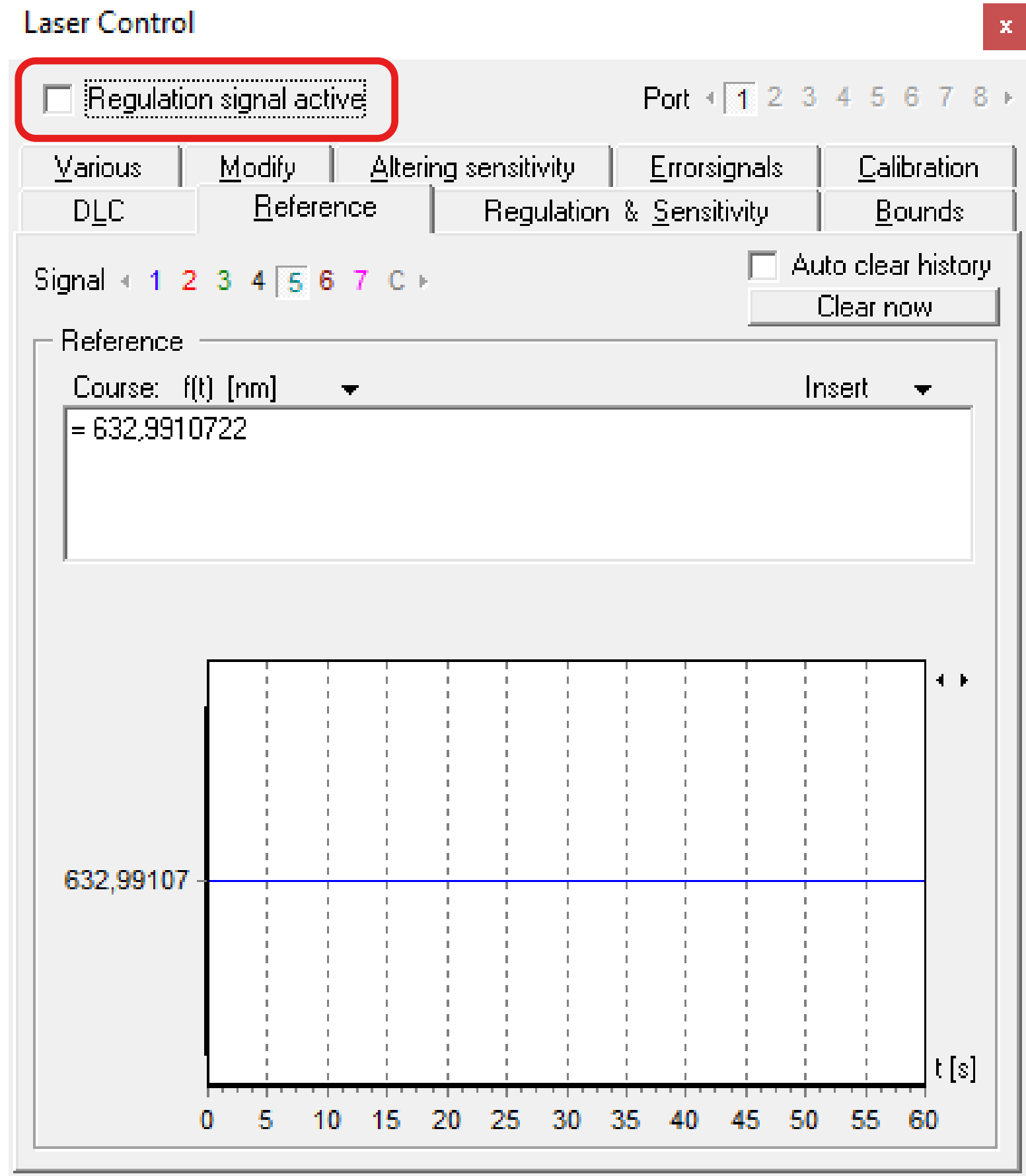
Sensitivity
1.00 V / pm

Synchronize WLM

Click to delete the PID parameter

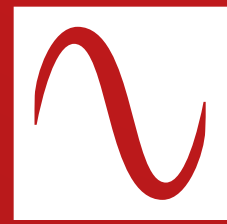
Press **“Auto TPID”** to determine the PID parameters. **Finally, you can close the PIDSim2.** Now the system should be ready for a test.

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For this **start the Regulation.**

You can **optimize the regulation** further by using the LongTerm application and minimizing possible unwanted effects by altering the PID parameters.



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