User's Guide

CoBrite DX4

Tunable Laser Instrument Series

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V1.4

Content

1 General Information

1.1 Warning

1.1.1 Laser Safety

The laser sources specified by this user guide are classified according to IEC 60825-1 (2007) Laser Notice No. 50 dated 2007-June-24.

Please pay attention to the following laser safety warning: Under no circumstances look into the end of an optical cable attached to the optical output when the device is operational. The laser radiation can seriously damage your eyesight. Do not enable the laser when there is no fiber attached to the optical output connector. The laser is enabled by pressing the 'Laser on' button in the operating software delivered with the instrument. The laser is on when the red LED on the front panel of the instrument is lit. The use of optical instruments with this product will increase eye hazard.

In doubt about laser safety requirements consult a trained laser safety instructor for local safety requirements of this product.

1.2 Line Voltage Selection

CoBrite Mainframes operate from any single-phase AC power source that supplies 100 ~ 240VAC at a frequency at 47-63 Hz. The input line voltage setting is done automatically by *CoBrite* power supply.

1.3 Service

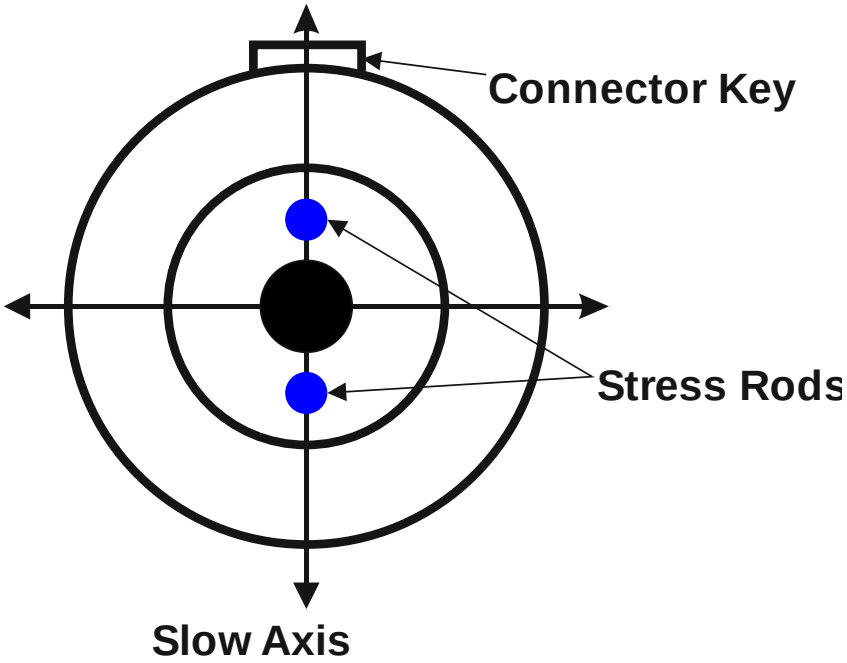
Do not attempt to service or adjust this instrument unless an authorized person is present. Do not install substitute parts or perform any unauthorized modifications to this instrument. Contact ID Photonics or your local distributor to obtain service support.

1.4 User feedback

ID Photonics GmbH is dedicated to continuously improve customer experience of our products. Thus, if you have any feedback that might help us to improve our products send us an E-Mail to: feedback@id-photonics.com .

1.5 Optical output of Laser Ports

Each laser port features a polarization maintaining Fiber output which can be both used with standard single mode fibers and polarization maintaining fibers.



2 Getting Started

This instrument can only be operated using Software under Windows 2000, XP& Windows 7.

Note: Do not connect instrument to host USB Port before installing the supplied software including drivers.

2.1 Installation of Control Software

Insert the supplied CD and start “CoBrite_Installer.exe” in installer directory if it is not automatically executed.

Note: If the Installer is executed in a Windows7 or Windows Vista environment, it must be executed using administrative rights which are granted by a right click on “CoBrite_Installer.exe” an selecting “Run as Administrator”.

Follow the instructions shown on the screen. Once finished, an icon is installed on your computer to start the GUI. Note that the software uses the Microsoft .NET framework R3.5 or higher. This is available won any Windows XP PC with Service pack 2 or later.

Note: Please install the GUI **including according drivers** before using connecting the instrument to a computer!

Once the software is installed, connect to either to one of the available USB Ports or the Ethernet Port. See section 1 for details. If the USB Port is connected for the first time, it will now automatically install a required driver to operate the instrument.

2.2 Troubleshooting

2.2.1 Instrument was not detected by the GUI

Please change to the directory “Driver” on the supplied installation medium and execute the file “CDM20802.exe” which installs a driver.

Reconnect the USB connection to your computer. The instrument should now correctly be detected.

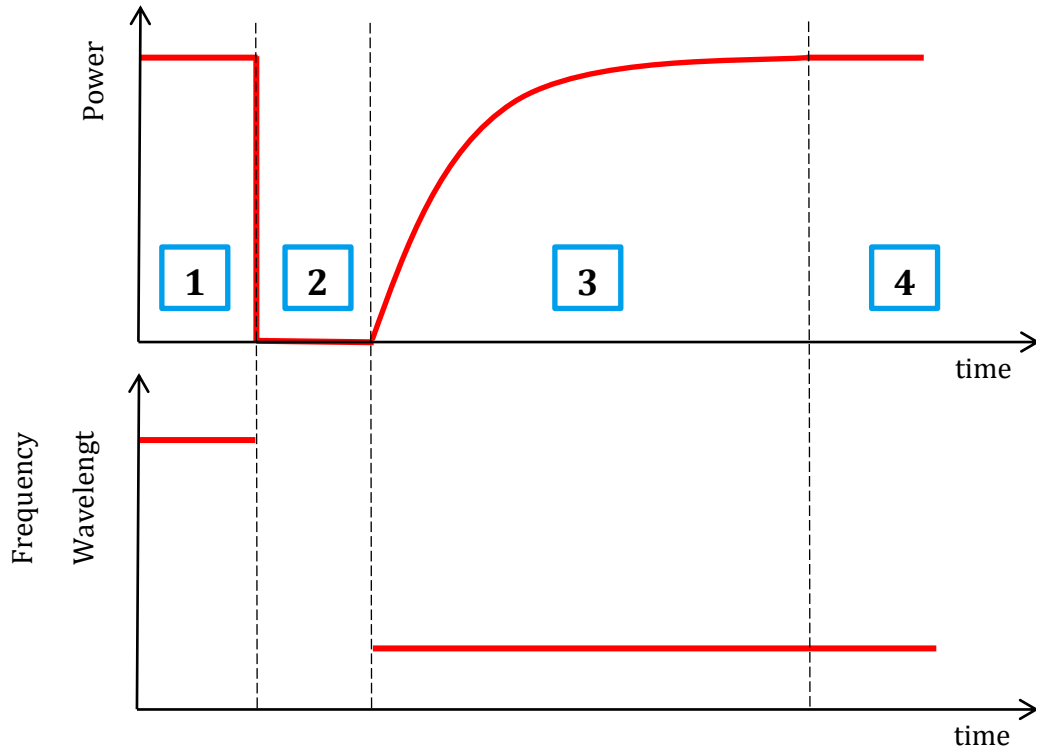
2.3 Laser tuning features

Each Laser port offers two different tuning features:

2.3.1 Coarse tuning

This tuning mode allows tuning the laser to any frequency of the available range specified for the laser port. The tuning process will require the output to be disabled for a short period of time.

1. Output will be switched off (~1 second)
2. Output is switched on using new frequency
3. Power is increased until final output power is reached (up to 15seconds)
4. Power is stabilized

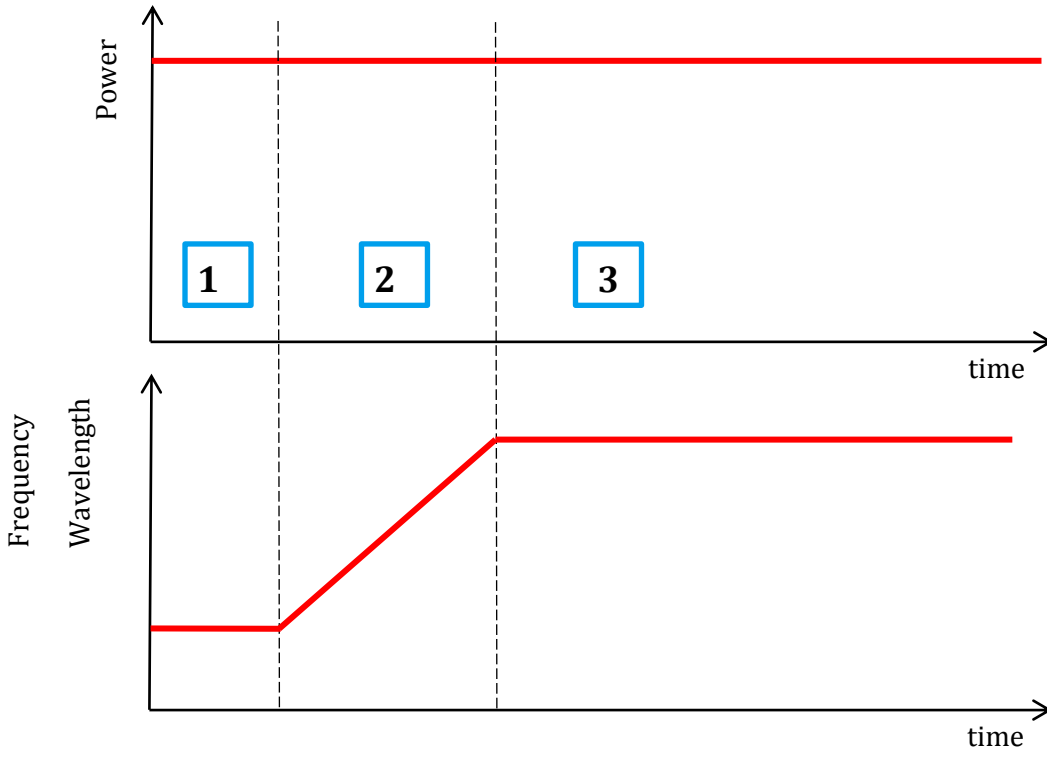


2.3.2 Fine tuning (FTF)

Fine tuning allows detuning the laser within a small range of +/- 12GHz from the

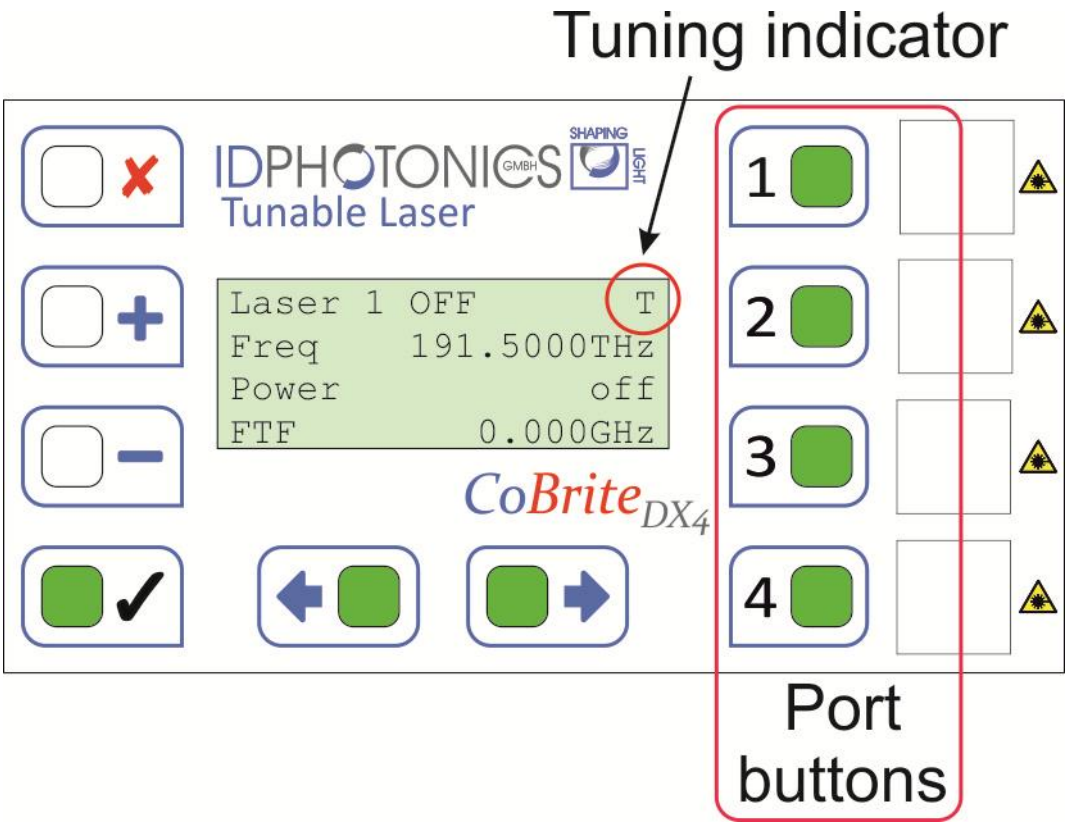
target frequency set using the coarse tuning parameter. The laser will detune to the target setting with output power on during the tuning process which changes the output frequency in a linear ramp.

1. –Tuning is triggered
2. Tuning process taking ~1second per GHz. Power remains constant – Power remains constant
3. Laser settles on new value



3 Description of front panel operation

After the device has initialized, the front panel will look as depicted below:



The following Parameters and Menus are available:

- Power
- Frequency
- Fine tuning Frequency (FTF)
- Grid: This will allow the laser frequency to be operated on the according
- Dither state (on certain laser modules)
- Device status – Information about Laser base temperature and diode current
- Limits – tuning limits of laser port
- System Version – Information about hardware revision
- Slot Version– Information about hardware revision

3.1 General rules and hints for front panel operation

- After the boot sequence has finished, start editing the Laser state by pressing the ✓ button
- Available buttons are lighted green
- Pressing the +/- buttons will move the cursors through the different lines of the display
- Parameters can be edited by moving the cursor to the parameter value section using the left/right buttons
- Values are altered using +/- buttons and confirmed by the ✓ button
- Editing can be cancelled by pressing the “x” button
- Color of the Port buttons indicate the whether the according laser port is switched on (red) or off (green)
- Pressing the Port button will select the according port for editing
- Pressing the Port button for more than 2 seconds will cycle the port on/off status
- Pressing the left/right buttons simultaneously for more than 2 seconds will cycle the on/off status of **all** ports
- Pressing the ✓ button if cursor is in the “Freq” line will cycle to Wavelength mode
- A Laser tuning state is indicated by a small “T” in the upper right corner of the alphanumeric display

4 Interfaces

4.1 Available Interfaces for different chassis variants

4.1.1 CoBrite$_{DX1}$

This chassis provides connectivity via USB located at the rear side of the instrument.

4.1.2 CoBrite$_{DX4}$

This chassis series provide connectivity via USB & Ethernet located at the rear side of the instrument.

4.1.3 CoBrite$_{MX}$

This chassis series provide connectivity via USB located at the faceplate, 1 USB & Ethernet located at the rear side of the instrument.

4.2 USB Ports

USB ports are available on all chassis variants and offer identical functionality in case several USB Ports are available on a chassis.

Note: Please install the GUI including according drivers before using these ports as there are special drivers required to operate them!

If the standard GUI is used to connect to those Ports, it will be automatically detected by the GUI software.

4.2.1 Usage of USB Port for custom remote control

USB ports will install as virtual COM Ports to the attached computer and therefore allow quick and easy access by any standard Terminal Program such as the Windows built in “Hyper Terminal”.

Note: Use the following settings for operation:

Serial speed: 115.200

Data format: 8N1 (= 8 bits, no parity bit, 1 stop bit)

Flow control must be off

4.3 Ethernet Port (not available for CoBrite$_{DX1}$)

This port is accessed using Telnet protocol. The most common freeware telnet Tool is “Putty” which can be easily set up to connect to the Ethernet Port. Putty can be found on the installation CD.

If the standard GUI is used, there is no dedicated Telnet functionality needed as it is built into the software. Just enter the IP Address and the GUI program will connect.

Note: The standard IP address of this port is: 192.168.0.1, Port# 10001

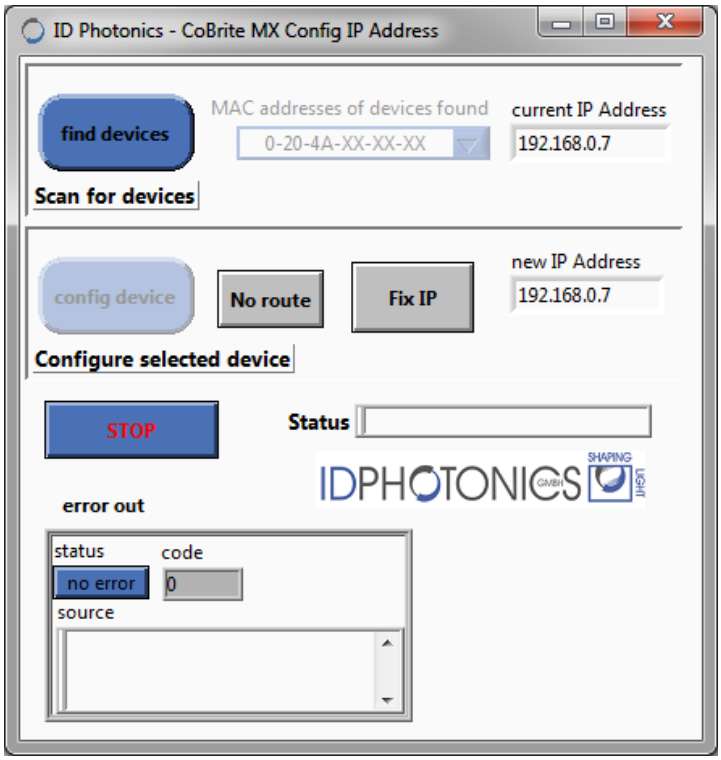
4.3.1 Changing the IP address

The IP address can be changed by a separate program that is located in directory “IP Address Config Tool” of the Installation CD. This program requires an installation before it can be used.

Execute the Setup.exe File to install the tool.

The “find devices” Button allows to find all CoBrite MX chassis connect to the network. If device are found, the Dropdown list allows selecting the device to be configured by showing the MAC Address as well as the current IP Address.

Note: Configuring a new Address is only possible if the current target IP is reachable.



Once the device is selected, enter a valid new IP Address using the Option “Fix IP Address” or select DHCP for automatic configuration. Press “Config Device” to initiate the programming process. The Status bar will inform about the progress. Once finished, the program will scan again for available devices. The new IP address should now be shown in the upper right.

Note: In case the current Chassis is located in a different IP Subnet than the host computer, please either change the host IP or Press the Button “No route” which will change to “Add route”. This will tunnel the subnet to the target subnet. This will require the program to be executed with Administrative rights if the host computer operates using Windows Vista or Windows7.

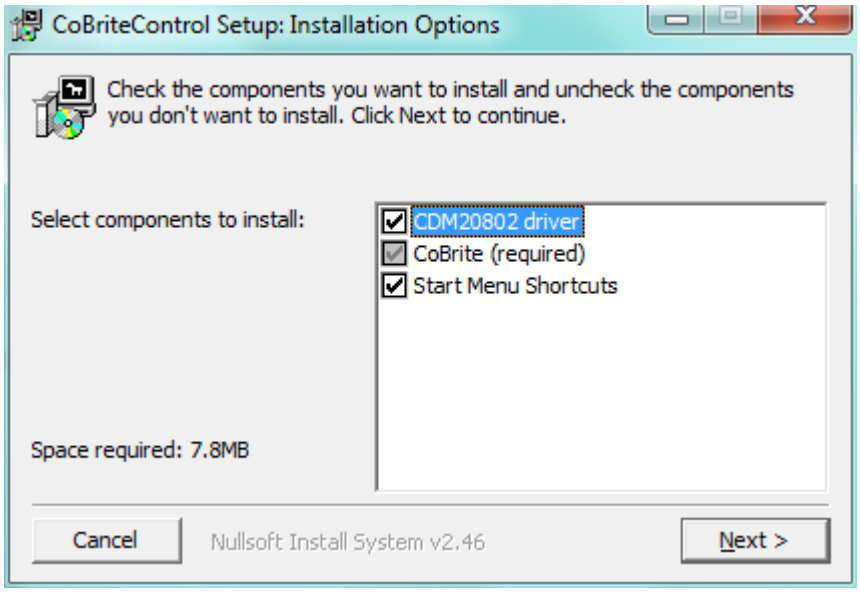
5 Description of instrument operation using pictographic GUI

5.1 Installation of Control Software

Before connecting the USB Port from your computer to the instrument follow the Software installation procedure.

Note: If connecting the instrument before Software installation, the instrument will not be detected correctly.

- Insert Data medium supplied with instrument into computer
- Change to Directory “GUI_installer” which now should be apparent on your computer
- Right Click on “CoBrite_Install.exe” and select “Run as Administrator”. Your computer should return the following start screen



- Make sure that the option “CDM20802 driver” is selected

- Follow instructions given by installer software. You may chose custom options in the process.
- Now, supply power to the instrument. A red status LED should light up that indicates power to the instrument
- Plug in the USB cable to the instrument and your computer
- Once plugged in, your computer should start automatically configuring drivers for the instrument. Your computer will signal once installation is done

- Now start the Software under “Start – Programs – CoBrite

5.2 Troubleshooting

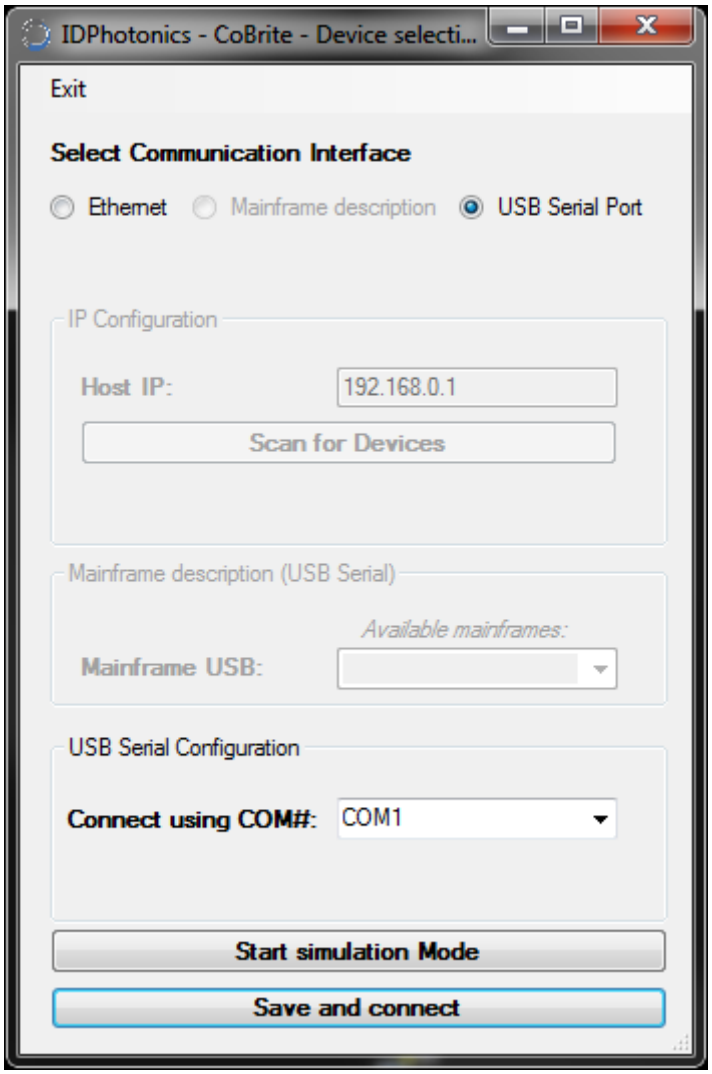
5.2.1 Instrument was not detected by the GUI

Please change to the directory “Driver” on the supplied installation medium and execute the file “CDM20802.exe” which installs a driver.

Reconnect the USB connection to your computer. The instrument should now correctly be detected.

5.3 Start screen

After starting the GUI software the following screen will appear:



It allows choosing which interface is used to connect to the instrument.

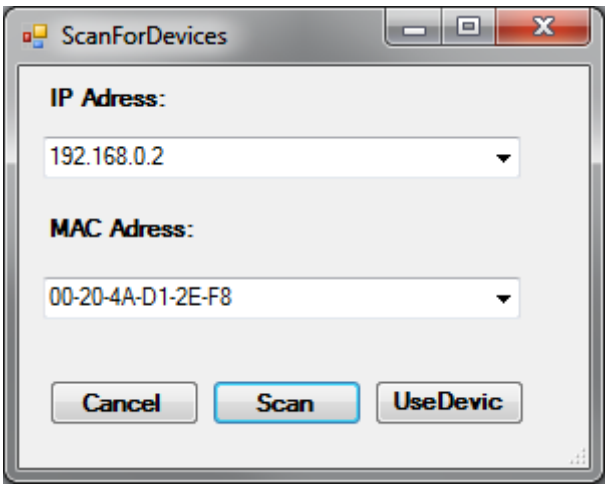
5.3.1 Ethernet

(Not applicable for CoBriteDX1 as this instrument provides no Ethernet port)

This option will require entering the IP address of the mainframe. See section 4.3 for details how to set this. Once the parameters are entered, press the “Save and connect” button to connect to the instrument.

5.3.1.1 *Scan for devices*

Allows to scan and auto detect for chassis connected to the local area network. This achieved by sending a broadcast token to all Ethernet devices attached to the local area network. Please make sure that firewalls are configured correctly to allow this function to operate properly to use it.



5.3.2 Mainframe description

The default option will automatically detect all *CoBrite* chassis connected to the host computer via USB and list them by their serial number in a drop down menu.

Once a mainframe is selected, press the “Save and connect” button to connect to the instrument.

5.3.3 USB serial port

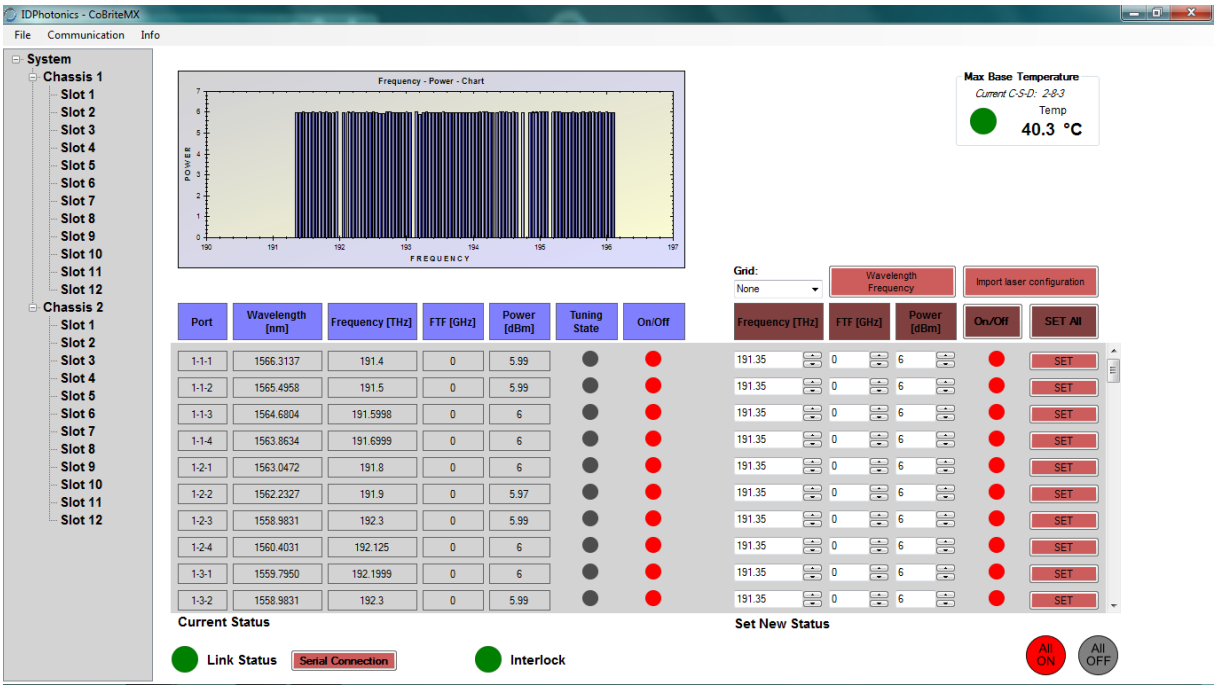
This option can be used to connect to the instrument via the virtual Com Port option as described in chapter 4.2. It is recommended using the default option to connect via Mainframe description to the instrument.

5.3.4 Simulation mode

This mode allows operating the GUI without Hardware attached by configuring any arbitrary Shelf configuration. It is used for demonstration and test purposes.

5.4 System view

Once the connection to the instrument is made, the software will retrieve the current card configuration and will give a system overview as depicted below which shows an example of 96 laser ports.



5.4.1 Tree view

Tree view is located on the left hand side of the GUI and gives a quick overview on installed laser ports. It also allows switching to chassis and slot level view by clicking on the according chassis or Slot.

5.4.2 Spectral viewer

This diagram gives a quick overview of the current laser configuration. Each bar represents one laser port. The height of represents the laser power. Right click on the diagram for options for zooming and viewer manipulation.

Laser ports that are turned off are not displayed.

5.4.3 Status table "Current Status"

The status table is located displays the current status of all optical parameters for all lasers. It is continuously updated. Use the scroll control on the right hand side to browse through all available lasers.

5.4.4 Set table "Set new Status"

The right hand side of the table allows setting all optical parameters and the state of the output. Dial in the required values and press the according "Set" Button to configure the laser. The set command will set all parameters shown to the according laser. All parameters dialed in will be automatically coerced to the minimum or maximum value permissible.

Available Parameters are:

5.4.4.1 Laser frequency

Use this button to dial in frequency to be used by laser. This control is automatically coerced to maximum and minimum possible frequency.

> **Note**: If Laser is currently operating at a different frequency, Laser light will be shut off for tuning process. A warning window appears before the operation is executed. If you require continuous tuning, refer to the Fine tuning feature described below

5.4.4.2 Fine tuning (FTF)

This option allows deviating Laser frequency from initial set value. As opposed to "Laser frequency" tuning, the Laser remains switched on during tuning and keeps optical specifications stable. Furthermore, relative tuning granularity is superior over "Laser frequency" tuning.

> **Note**: If Laser was previously set using the "Laser frequency" option, Fine tuning will be temporarily disabled for a few seconds to let the laser stabilize before fine tuning can be performed.

5.4.4.3 Output Power

This control allows configuring output power of Laser. Control coerces to available power range.

5.4.4.4 Tuning state (Current status only)

Tuning state indicates whether a laser port is currently tuning. A red light indicates tuning activity while a grey color indicates the devices is settled and has achieved its optical performance.

5.4.4.5 Dither on/off

This option is available only for special versions of the laser. It Dis or enables a carrier frequency dither tone applied to the laser line which is used to keep the laser frequency fixed to a given setting. The dither tone may be disabled if the laser is in a settled state. If a new parameter setting is sent to the laser and dither is off, the laser will temporarily switch on the tone and switch it off again once settled.

5.4.4.6 Laser on

Button allows switching on and off the Laser. A Pop-up will appear requiring confirmation if Laser is switched on for Laser safety reasons. This Popup window can be disabled by editing the .ini File in the Program application directory. This directory is depending on Windows system path settings.

5.4.5 Grid

Use this drop down menu to select ITU grids from 25 GHz to 400GHz in order to allow easily dial in those Frequencies using the rocker switch button control “Laser Frequency”.

If “None” is selected, any arbitrary Frequency can be adjusted to the laser in 100MHz increments within available Frequency range.

5.4.6 Import Laser configuration

This button will open a File dialog that allows loading a configuration in to the set table. This can be either a file that was saved previously or a configuration generated

by the user. Press the according set buttons or use the “Set all” button to activate the configuration.

The file format is ASCII csv based:

Example:

```
Chassis#,Slot#,Laser#,Frequency,FTF,Power,State
1,1,1,191.4,0,5.99,1
1,1,2,191.5,0,5.99,1
1,1,3,191.5998,0,6,1
1,1,4,191.6999,0,5.99,1
1,2,1,191.8079,0,5.96,1
1,2,2,191.905,0,6.01,1
1,2,3,192.2754,0,5.99,1
1,2,4,192.1069,0,6,1
```

5.4.7 Set All

This button will configure the current parameters in the set table to all laser ports available.

5.4.8 Wavelength/Frequency button

This button allows entering the Laser Frequency in either frequency or wavelength format. Current values in the set table will automatically be converted.

5.4.9 Max. Base Temperature

The maximum laser housing temperature of all lasers is displayed including location identifier of this laser. This value is displayed for information only as all lasers are temperature compensated and will operate within specification for specified ambient temperatures if air flow to the chassis is not blocked. Note that Lasers will be switched off if the base temperature exceeds 60°C to prevent hardware damage.

5.4.10 Link status

This indicator signals status of communication between GUI and chassis controller.

5.4.11 Serial connection

This button will open a window that traces the communication between chassis controller and GUI. See section 4 for details on command structure of the mainframe.

5.4.12 Interlock

This indicator will remain on status green as there is no interlock feature on the chassis. Interlock is not available for $CoBrite_{DX1}$ and $CoBrite_{DX4}$.

5.4.13 All On/Off

Pressing this button will switch on or off all laser ports available.

5.5 Chassis view

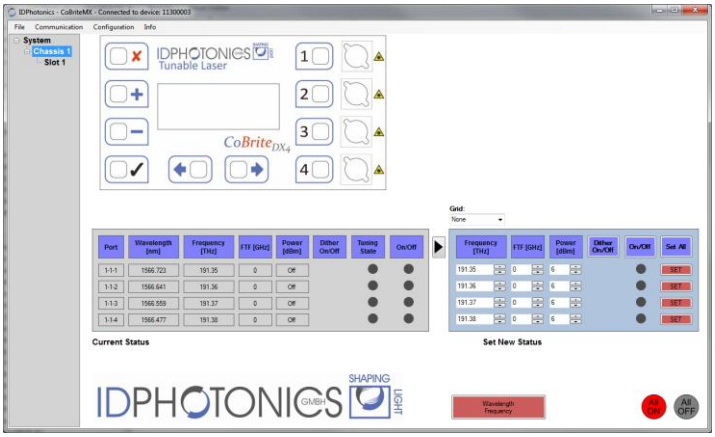
Chassis view is accessed by clicking on the chassis of the left hand side tree view.

The current shelf layout is represented by a pictographic view of the chassis in the center of the GUI. Note that a restart of the GUI is required in case a new card is installed or removed.

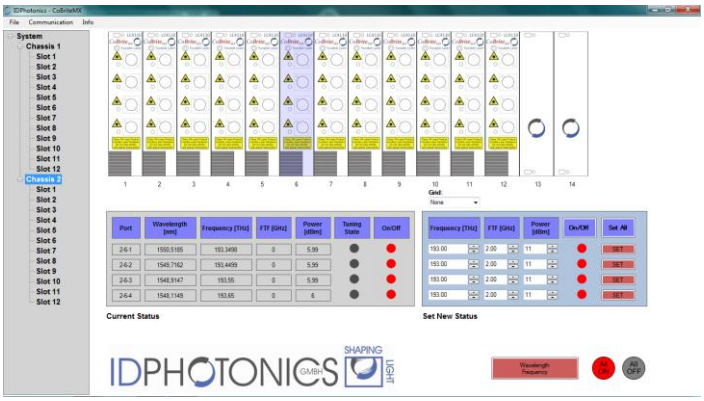
Click on any slot to access parameters of laser ports located on that card which are represented in the table in the lower part of the GUI. Refer to section 5.4 on features available by this table.

CoBrite$_{DX1}$:

CoBrite$_{DX4}$:

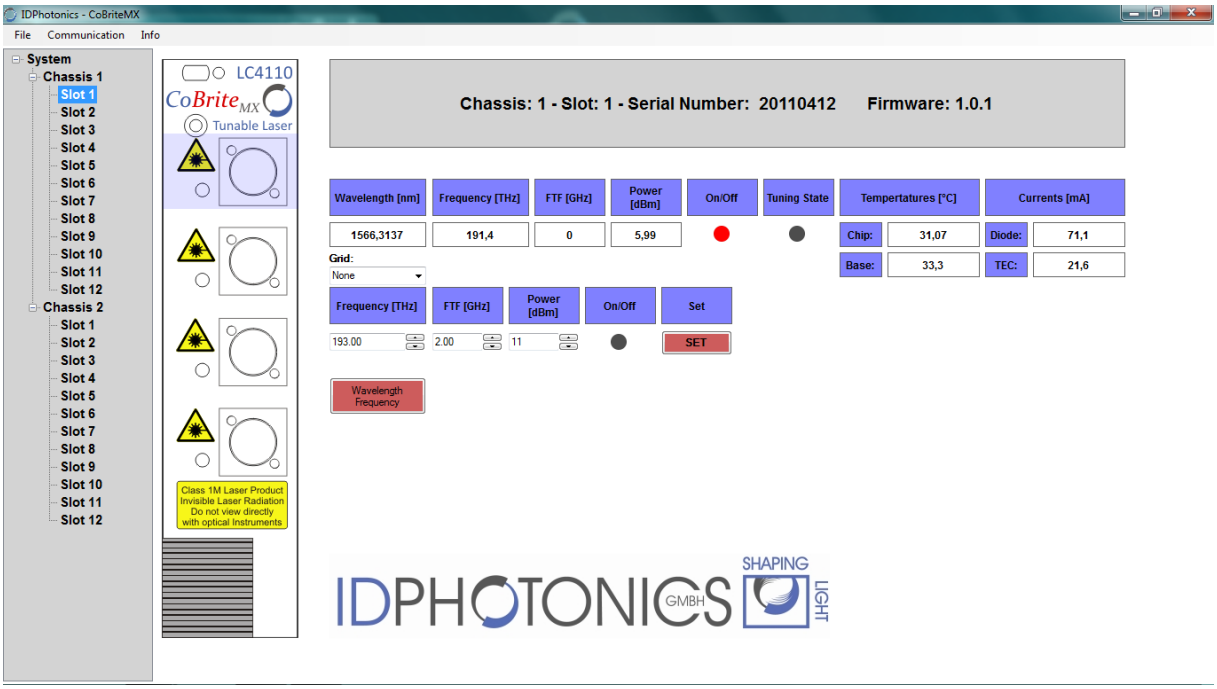


CoBrite$_{MX}$:



5.6 Slot view

Slot view is accessed by clicking on any slot of the left hand side tree view.



Click on any port to access parameters of laser ports located on that card which are represented in the left hand side of the GUI. Refer to section 5.4 on features available by this table.

5.6.1 ITLA temps & currents

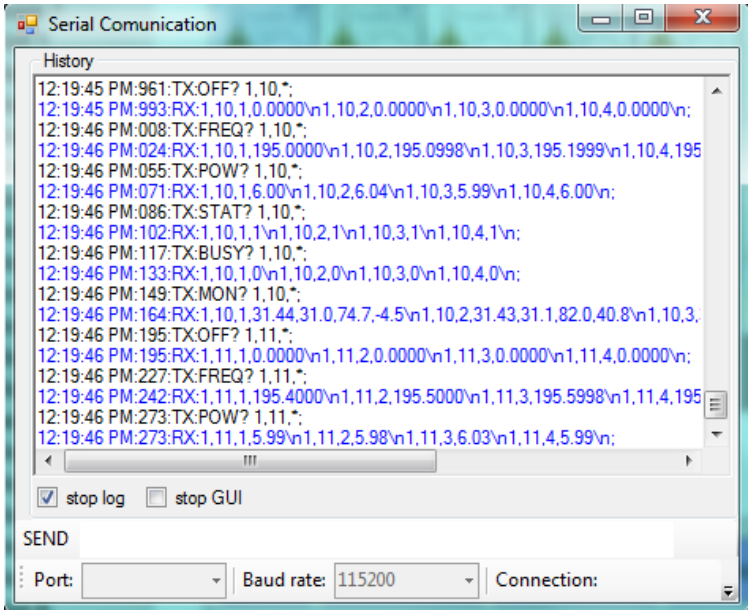
This view allows reading the current Laser chip and Base temperature of each laser as well as current laser diode current and TEC current.

5.6.2 Limits

This section displays the minimum and maximum values that can be adjusted to the according laser port.

5.7 Communication logging window

This window can be opened from the system view and allows tracing the communication between the GUI software and the chassis controller.



5.8 Info

This Menu item provides info of the Firmware version currently installed on the mainframe as well as the version of the User Interface. This information is helpful for debugging of issues.

6 Calibration requirements

The Laser does not require any regular calibration in order to function correctly. If calibration traceability according to i.e. ISO 9001 standard is required, an approved laboratory shall calibrate the instrument for Frequency accuracy and output power.

Please find below a table with relevant accuracy parameters to be checked against for calibration of the device.

Parameter	Specification
Optical output power accuracy over Lifetime	+/- 1dB
Frequency accuracy over Lifetime	+/- 1.5GHz

7 Remote Control

The CoBrite series operates based on the SCPI standard commands which are ASCII based and allow easy communication and interpretation with the instrument. Refer to chapter 1 on how to establish communication to the ports available at the instrument. More detailed information on SCPI syntax can be found here: http://www.ivifoundation.org/docs/SCPI-99.PDF

7.1 Operating multiple Interface Ports

CoBrite mainframes support parallel usage of al remote control ports available. Note that responses to commands issued are only returned to the according port from where the command was issued.

Commands are generally executed in order of time wise arrival to the controller and buffered into a FIFO stack. If a stack overflow occurs, an error is issued.

Note that there is not control exclusivity is given to any laser port for a specific interface or user. Thus, commands issued to the same port by different instances might lead to inconsistencies. It is recommended to poll current parameter status to ensure integrity of set vs. actual parameters.

7.2 Syntax conventions for commands

7.2.1 Long and short form

The key words feature a long form and a short form. Either the short form or the long form can be entered, other abbreviations are not permissible.

Example: STATus:QUEStionable:ENABle 1= STAT:QUES:ENAB 1

Note: The short form is marked by upper-case letters, the long form corresponds to the complete word. Upper-case and lower-case notation only serve the above purpose, the instrument itself does not make any difference between upper-case and lowercase letters.

Note: All commands are case insensitive.

7.2.2 Query commands

Most commands serve a double function that allows either setting or executing a query on a parameter.

Note: Query commands are terminated by a “?” character.

7.2.3 Parameter

Parameters must be separated from the header by a "white space". If several parameters are specified in a command they are separated by a comma ",".

7.2.4 Colon Character

A leading colon character `: ' instructs the instrument to interpret the command starting at the root (highest level) of the command tree. Since the Instrument also starts at the root each time you send it a new command, the leading colon is not required (although the instrument will accept it if you send it). You can send multiple commands to the Instrument in a single message. You separate the commands with a semi-colon character `;'. When the Instrument encounters a command following a semi-colon, it attempts to interpret the command starting at the level of the previous command, unless you precede the second command with a colon.

7.2.5 Command Termination character

Each command must be terminated either by a “;” character or a carriage return (ASCII #13) to signal completion of the command telegram to the controller

7.2.6 Wild card character

A special wild card character “*” is used to address several ports at a time. This can be used for both set commands and query commands

Example: SOUR:WAV 1,2,* 1555.1234;: will set all Lasers of slot 2 in chassis 1 to 1555.1234nm.

If a query is executed using a wildcard character, the parameter will be preceded a location identifier. Parameters returned for each port are separated by a „\n“ (=ASCII Code #10) for easier readability.

Example: SOUR:WAV? 1,2,*;
Will query current wavelength of all lasers of slot 2 in chassis 1 and will return:
1,2,1,nnnn.nnnn\n
1,2,2,nnnn.nnnn\n
1,2,3,nnnn.nnnn\n
1,2,4,nnnn.nnnn;\n

7.2.7 Acknowledgement of executed commands

The mainframe controller will always acknowledge successful execution of commands by a “;” character. If the echo option is set (for details, see command list), the accordingly sent command is returned first.

7.3 Laser port addressing scheme

Laser ports are addressed by a three level port identifier that allows easy identification of the port and are issued as parameters with according commands. Each level parameter is separated by a “,” character.

Identifier	Description
<C>	Chassis identifier 1: Always 1 for CBDX1 device
<S>	Slot identifier. Range: 1 : Always 1 for CBDX1 chassis
<D>	Device identifier for Laser port on each card. Range: 1 : Always 1 for CBDX1 chassis

Example: SOUR:WAV? 1,1,1; queries the current wavelength.

7.4 Notation of Syntax for command defintion

Syntax and Type	Description
[ ]	Optional command level that can be omitted. Example: Definition `[:SOURce:]WAVelength/? <C>,<S>,<D>,/<P>` Allows sending the command: `WAV? 1,2,3`
< >	Denotes a parameter. Placeholder is replaced with parameter value defined for according command. Definition `[:SOURce:]WAVelength/? <C>,<S>,<D>,/<P>` Allows setting the parameters: `WAV 2,5,2,1552`
/?	Denotes the optional character "?" that is used if the command can also be used as a query. Example: Definition `[:SOURce:]WAVelength/? <C>,<S>,<D>,/<P>` "?" is used to query current wavelength of device 2,52: `WAV? 2,5,2`
/	Denotes a parameter is omitted in case of a query. Example: Definition `[:SOURce:]WAVelength/? <C>,<S>,<D>,/<P>` The parameter <P> is omitted if a query is sent: `WAV? 2,5,2`
:	Usage of Colon see 7.2.4

7.5 Commands on system level

<table>
<tr><th>Syntax and Type</th><th>Description</th></tr>
<tr><td>[:SYStem:]ECHO/?

/<P></td><td>Set or query echo of commands sent to controller
Example write: SYS:ECHO 1
Example read: ECHO?
Answer: 1
If echo is enabled, any sent command and ASCII 10 is returned by controller before answer is sent.
Example:
Command: :SOUR:WAV?
Answer: SOUR:WAV?\n
1555.1234;</td></tr>
<tr><td>[:SYStem:]LAYout?</td><td>Query configuration of attached system.
Format of response:
SYSTEM <Master chassis type>, <slave chassis type>,<slave chassis type>\n
<Slot Address>,<card type>\n
…
<Slot Address>,<card type>;\n

Slot Address is to be used as defined, i.e. 1,3,

Possible chassis types:
<table>
<tr><th>Response</th><th>Meaning</th></tr>
<tr><td>CBMA48</td><td>Master chassis 12 slots</td></tr>
<tr><td>CBMA24</td><td>Master chassis 6 slots</td></tr>
<tr><td>CBSL56</td><td>Slave chassis, 14slots</td></tr>
<tr><td>CBDX4</td><td>CoBriteDX4 chassis</td></tr>
<tr><td>CBDX1</td><td>CoBriteDX1 chassis</td></tr>
</table>
Possible card types in slot
<table>
<tr><th>Response</th><th>Meaning</th></tr>
<tr><td>EMP</td><td>Empty slot</td></tr>
<tr><td>TLS<n></td><td>Tunable laser with <n> Lasers equipped</td></tr>
<tr><td>TLC<n></td><td>ITU Tunable laser with <n> Lasers equipped</td></tr>
</table>
Example write: SYS:LAY?
Response for a system with maximum number of slots:
SYSTEM CBMA48,CBSL56,PMUX,PMUX\n
1,1,TLS4\n
1,2,TLC4\n
1,3,TLS2\n
1,4,EMP\n
1,5,TLC2\n
…</td></tr>
</table>

	1,12,TLS2\n 2,1,TLS4\n 2,2,EMP\n 2,3,TLS3\n 2,4,TLS1\n … 2,14,EMP;
[:SYStem:]INTLock?	Query the status of the system interlock. The system interlock is a system hardware line which is connected to all cards. When activated, it forces all interlocked devices in the system to be immediately disabled. When the interlock is deactivated a three-second delay is observed prior the re-enabling interlocked devices. When the system interlock is activated, the interlock LED on the master local interface will be lit in the red color, when the system interlock is disabled, this LED will be green in color. Control of the interlock line is achieved via a key on the master local interface.
[:SYStem:] AUTOSTArt /<P>	<P> may be {0,1} Allows to en or disable automatic setting of stored EEPROM parameters after Laser power up. If invalid data is stored in the EEPROM, the laser state is not recovered after reset.

7.6 Commands on card level

Syntax and Type	Description
[:SOURce:]WAVelength/? <C>,<S>,<D>,/<P>	Set or query Wavelength of Laser in location C-S-D in Nanometers Wavelength Format : nnnn.nnnn Example write: SOUR:WAV 1,2,3,1555.1234 Example read: SOUR:WAV? 1,2,3 Answer: 1,2,3,1555.1234;
[:SOURce:]WAVelength:LIMit? <C>,<S>,<D>	Read Wavelength limits of Laser. Format: nnnn.nnnnn Example: SOUR:WAV:LIM? 1,2,3 Answer: 1530.12345,1560.12345;
[:SOURce:]FREQuency/? <C>,<S>,<D>,/<P>	Set or query Frequency of Laser in location C-S-D in Terahertz Frequency Format : nnn.nnnn Example: SOUR:FREQ 1,2,3,194.1234;
[:SOURce:]FREQuency:LIMit? <C>,<S>,<D>	Query Frequency limits of Laser. Format: nnn.nnnn Example: SOUR:FREQ:LIM? 1,2,3 Answer: 192.1234,196.12345;
[:SOURce:]OFFset/? <C>,<S>,<D>,/<P>	Set or query Fine tuning of Laser (=Offset) in location C-S-D in Gigahertz Parameter Format : nn.nnn Example: SOUR:OFF 1,2,3,11.1234;
[:SOURce:]OFFset:LIMit? <C>,<S>,<D>	Query Offset limits of Laser. Format: nn.n Example: SOUR:OFF:LIM? 1,2,3 Answer: 12.5;
[:SOURce:]POWer/? <C>,<S>,<D>,/<P>	Set or query Power of Laser in location C-S-D in dBm Format : nn.nn Example: SOUR:POW 1,2,3,15.12;
[:SOURce:]POWer:LIMit? <C>,<S>,<D>	Query Power setting limits of Laser. Format: nn.nn Example: SOUR:POW:LIM? 1,2,3 Answer: 6,15.12;
[:SOURce:]STATe/? <C>,<S>,<D>,/<P>	Set or query on/off output Laser in location C-S-D Off: 0 On: 1 Example: :SOUR:STAT 1,2,3,1
[:SOURce:]LIMit? <C>,<S>,<D>	Query maximum tuning Parameters of Laser in location C-S-D in csv format. Minimum Frequency Maximum Frequency Fine tuning Range Minimum Power

	Maximum Power Example: `SOUR:LIM? 1,2,3` returns `191.1,194.1,12.5,6,16;`
`[:SOURce:]CONFiguration/?` `<C>,<S>,<D>,/<P>`	Set or Query current configuration of Laser in location C-S-D in csv format: Frequency Fine tuning Value Output Power Output state (0/1) Busy state (0/1), (only for query, parameter is ignored if set) Dither state (will be ignored if Laser does not support this option). If queried, "-1" is reported if not supported Example: `SOUR:CONF? 1,2,3` returns `191.1234,10.1234,6.12,1,1;`

`[:SOURce:]BUSY? <C>,<S>,<D>`	Query state of a device. If 1, the laser is currently tuning and not settled.
	Response: <state>, 0/1
	Example 1: `:SOUR:BUSY? 1,2,3;`
	Returns
	`1`
	Example for Query of multiple Lasers:
	Example 2: `:SOUR:BUSY? 1,2,*;`
	Returns
	`1,2,1,1\n`
	`1,2,2,1\n`
	`1,2,3,0\n`
	`1,2,4,1;`

`[:SOURce:]MONitor?` `<C>,<S>,<D>`	Query monitor readings from laser. Response: <LD chip Temperature>, format nn.nn, unit °C <LD base Temperature>, format nnnn.n, unit mA <LD chip current>, format nnnn.n, unit mA <TEC current>, format nnnn.n, unit mA Example 1: `:SOUR:MON 1,2,3;` Returns `29.23,25.12,125.1,1043.2`
`[:SOURce:]DITher/?` `<C>,<S>,<D>,/<P>`	Set or query dither tone enable/disable of laser in location C-S-D -1: Not available 0: Off 1: On Example: `:SOUR:DIT 1,2,3,1;` Note that this is supported only by special versions of

	the laser.
[:SOURce:]SBS_STATus/? <C>,<S>,<D>,/<P>	Set or query status of SBS suppression (enabled “1” or disabled “0”)
[:SOURce:]SBS: FREQuency/? /<P>	Set or query SBS suppression amplitude in GHz in 100MHz increments, valid values: 0, 0.1, …, 1 Value is set system wide for all lasers Example: SBS:FREQ 0.5;
[:SOURce:]SaveCurrSTATe <C>,<S>,<D> (only CoBriteDX1)	Permanently saves the current laser port state which will be loaded again after a power on/off cycle or reset. Note that parameter [:SYStem:]AUTOSTArt must be set to “1” to enable this feature. Example: SCSTAT 1,1,1; will save the current laser state for port 1,1,1.
[:SYStem:] AUTOSTArt/? /<P> (only CoBriteDX1)	Set or query autostart behavior of laser: 0: saved Laser settings are not loaded upon powerup 1: saved Laser settings are set upon powerup Example: AUTOSTA 1; will save the current laser state

7.7 Error code definition

Error code	Description
4	Timeout communication to laser
5	Command was sent to laser several times but not accepted
100	Command error
101	Syntax error
102	Illegal Parameter error
103	Too much data, buffer overflow
104	Device not ready
105	Command execution error
106	EEPROM error

8 Uninstalling CoBrite Software

Software may be uninstalled by either using the well-known central Windows built-in “Add/remove Programs” function or by running “setup.exe” from installation medium again.

9 User Memos

(following pages are intentionally left blank for user notes)