User's Guide

*Co**Brite**DX1*

Tunable Laser Instrument

E-Mail: info@id-photonics.com

www.id-photonics.com

ID PHOTONICS GMBH SHAPING LIGHT

ID Photonics GmbH, Neubiberg, Germany

V1.1

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.

**INVISIBLE LASER RADIATION
DO NOT VIEW WITH
OPTICAL INSTRUMENTS
CLASS 1M LASER PRODUCT
(IEC 60825-1/2007)**

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$_{DX1}$ operates from any single-phase AC power source that supplies 100 ~ 240VAC at a frequency at 47-63 Hz. You do not need to adjust the input line voltage setting because CoBrite$_{DX1}$ power supply automatically selects an input line voltage in the range specified above.

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.

2 Packaging List

The instrument is shipped with following parts

1. Laser instrument
2. Power supply
3. Power cord
4. USB cord
5. Manual
6. Data medium containing installation software

3 Instrument short description

This instrument contains a tunable laser module which is controlled via USB and a Windows based GUI.

Note: Instrument operates autonomously once set up using the GUI. You may pull USB connection, device will still operate.

Note: If USB is plugged in again, Laser will be reset in order to generate a defined starting point for operation.

3.1.1   Front panel

Two LED based indicators signal state of the instrument:

A blue LED indicates if there is power supplied to the instrument.

A red LED indicates if Laser emits light.

An FC/APC connector, small key, is used to connect single Mode Fibers to the instrument. The laser features a polarization maintaining Fiber output which can be both used with standard single mode fibers and polarization maintaining fibers.
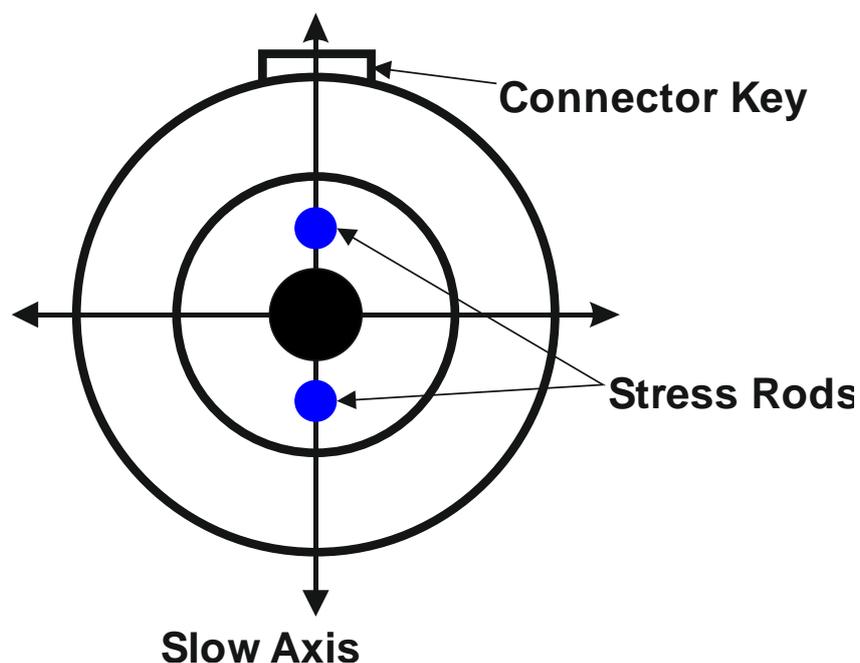
3.1.2 Back panel

Back panel contains connectors for power to supplied power supplier as well as a USB connector for control of the instrument. There is no separate on/off switch.

4 Getting Started

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

4.1 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 root Directory which now should be apparent on your computer

- Double Click on "setup.exe". Your computer should return the following start screen
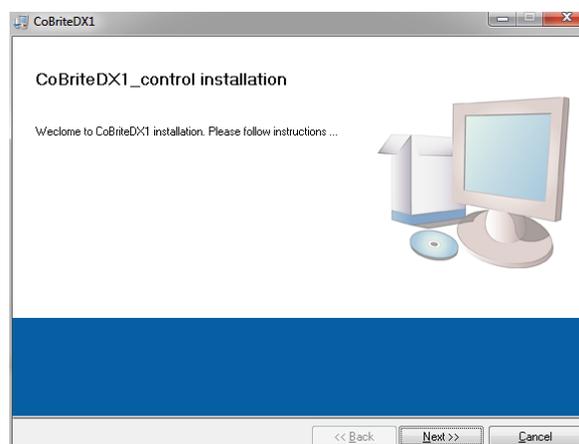
- Follow instructions given by installer software. You may chose custom options in the process.

- A new Folder "CoBriteDX1_Control" is automatically generated.

- If the installation program asks for a reboot of the computer pls. follow instructions before proceeding.

- Now, supply power to the instrument. A blue 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 - CoBriteDX1_Control - CoBriteDX1_Control". A GUI is started that should resemble this screenshot:
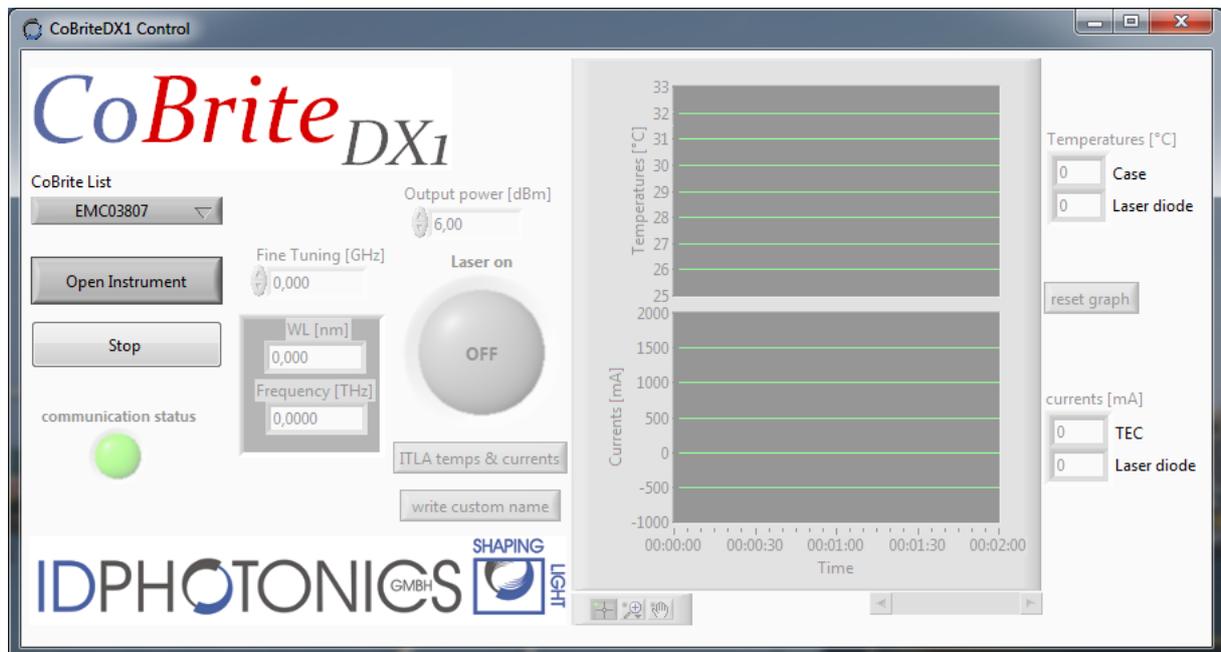
- Select from "List of 1ITLA's" the Laser that you like to control and press "Open Instrument". If only 1 Laser is connected to the computer it will be automatically selected

- All items in GUI should now be enabled and the instrument is ready to operate
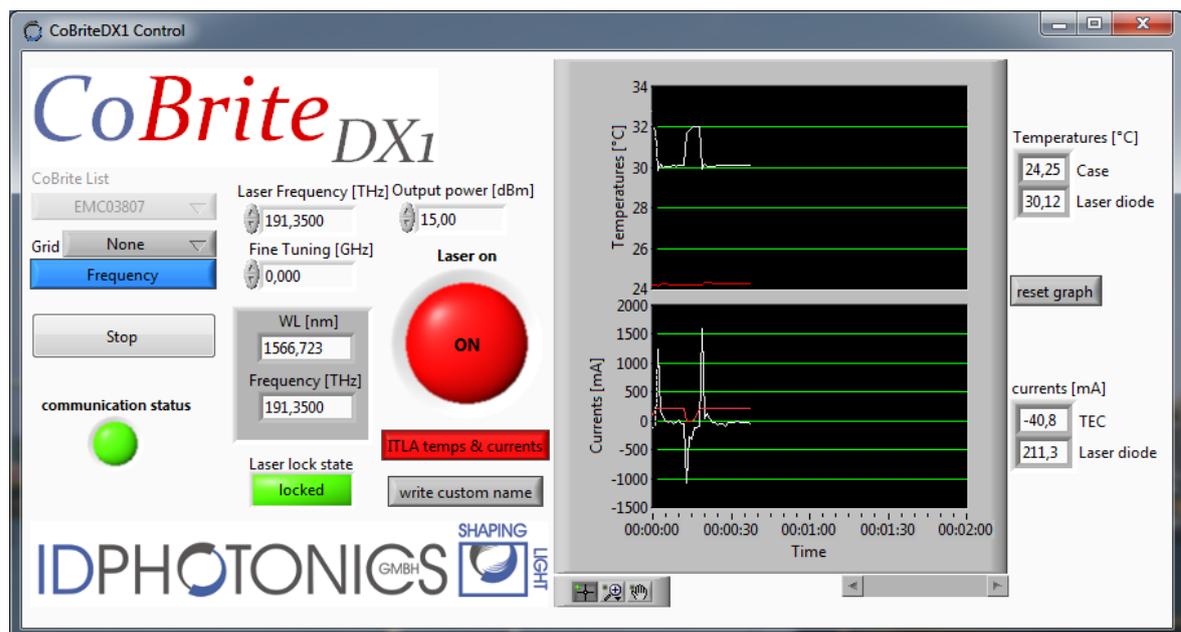
5 Description of instrument operation

5.1 Controls

5.1.1 List of 1ITLA's

If multiple CoBrite$_{DX1}$ instruments are connected to one host computer this drop down list contains all devices found by the program and are not used by other instances. If multiple devices are connected, each devices can be controlled by starting the according number of instances.

5.1.2 Open instrument

Press this button to open the selected instrument. If a laser has been controlled previously, GUI resumes from previous setting.

5.1.3 Stop

Allows stopping GUI in a controlled way. Alternatively, standard Windows application close function in upper right part of window may be pressed.

> **Note**: Laser will continue to operate with last setting.

5.1.4 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.

5.1.5 WL/Frequency select

If "None" is selected for Grid this button allows to cycle the Laser Frequency control to Wavelength mode allowing to dial in Lambda instead of Frequency.

5.1.6 Laser frequency

Use this button to dial in frequency to be used by laser. Control is automatically coerces 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. If you require continuous tuning, refer to the Fine tuning feature described below

5.1.7 Fine tuning

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.

5.1.8 Output Power

Control allows to configure output power of Laser. Control coerces to available power range.

5.1.9 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.

5.1.10 ITLA temps & currents

Button allows enabling or disabling monitoring of TEC & Laser diode currents and Case temperature at Laser housing and Laser diode chip temperature. Values and graphs are displayed at right hand side of GUI

5.1.11 Write custom name

Pressing this button will open a Pop-Up that allows writing arbitrary names into EEPROM of instrument. As limited space is available, a button is used to check remaining available space for custom name.

This feature is very helpful if multiple instruments are connected to one computer where it is difficult to distinguish devices.

Note: Custom name will remain in instrument even after power reset. Default custom name is serial number of device.

5.1.12 Reset Graph

Will reset data currently displayed in graphs left to button.

5.2 Indicators

5.2.1 Communication status

Indicates communication status between Program and Laser. In case of failure, program will stop operating. One may restart software by right arrow apparent if Software stops operating.

5.2.2 WL & Frequency

Displays currently set Wavelength and Frequency of Laser which is calculated out of Laser frequency setting and Fine tuning setting.

5.2.3 Laser lock state

Indicates if the Laser is currently tuning to a new operating state if user changed a laser parameter. Indicator is update each 100ms.

Note: Laser might not comply to all specifications during tuning

5.2.4 Graphs

Graphs are enabled by "ITLA temps&currents" control and traced over time. This view is not needed to operate the unit but might be helpful to trace the Laser operation.

5.2.5 Temperatures & Currents indicators

Indicate current value of according parameters which are shown in graphs at same time.

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

A DLL is supplied on installation medium that allows remote control of the instrument. Depending on your PC configuration, you might have to run an installer in according subdirectory before DLL can be used.

A LabView example is provided on accompanied data medium to illustrate usage of the DLL.

7.1 Description of DLL functions

Please note the Header File "CoBriteDX1_control.h" in the according DLL directory on the supplied data medium. It provides a description of each function available including data type description.

7.1.1 DLL_CoBrite_list_devices

This function will return description of all $CoBrite_{DX1}$ devices connected to the PC. Refer to section 5.1.11 for more details on user name and description.

Output		
Var Name	Type	Description
ListOfDevicesInclName	Char	User names of $CoBrite_{DX1}$ of all lasers connected to PC. Description of each Laser is separated by carriage return.
LNge	int32	Length of char array returned

7.1.2 DLL_CoBrite_init

Will initialize connection the Laser and provide its current status as well as its optical tuning capabilities. This function must always be executed before running any of the

other functions. "Handle" needs to be stored as it is a reference for the opened connection. Make sure to keep all set values using other functions within limits of values returned from this function. In case a value outside the window is handed over, an error is returned and the command is not executed.

Input		
Var Name	**Type**	**Description**
CoBrite_number	int32	Number of laser to be opened starting from 0
Output		
Var Name	**Type**	**Description**
Handle	uint32	Reference number to the opened connection, required for execution of any other function that accesses the laser.
ProtocolVersion	double	An internal variable required for special some functions to be executed.
FrequencyStepGHz	uint16	Minimum Frequency Step supported [GHz]
FrequencyMaxGHz	double	Maximum Frequency supported by Laser [THz]
FrequencyMinGHz	double	Minimum Frequency supported by Laser [THz]
currLaserFrequencyTHz	double	Current Laser Frequency [THz]
PowerStepDBm	double	Minimum Power step supported [dB]
PowerMaxDBm	double	Maximum Power supported by Laser [dBm]
PowerMinDBm	double	Minimum Power supported by Laser [dBm]
currentOpticalPowerDBm	double	Current optical Power [dBm]
FineTuneRangeStepGHz	double	Min. Fine Tune Frequency Step supported [GHz]
FineTuneRangeMaxGHz	double	Max. Fine Tune Frequency supported by Laser [GHz]
FineTuneRangeMinGHz	double	Min. Fine Tune Frequency supported by Laser [GHz]
currentFineTuneFrequencyGHz	double	Current Fine Tune Frequency [GHz]
LaserOnOff	int16	Laser On/Off state. On: 1; Off: 0
Error_code_out	int32	Error state; 0: ok; >0: Error

7.1.3 DLL_CoBrite_set_power

Function will change output power of laser.

Input		
Var Name	**Type**	**Description**
Handle	uint32	Input handle retrieved from DLL_CoBrite_init
OutputPowerDBm	double	Hand over desired Output power [dBm]
Error_code_in	int32	If any value other than 0 is handed over; function will not execute command to laser. Hand over state from previous function call for error handling.
Output		
Var Name	**Type**	**Description**
Error_code_out	int32	Error state; 0: ok; >0: Error

7.1.4 DLL_CoBrite_fine_tune

Function will set new fine tuning frequency to laser. Note that function might return an error if executed shortly after a DLL_CoBrite_set_frequency command. Wait more than 15 seconds before executing this command.

Input		
Var Name	**Type**	**Description**
Handle	uint32	Input handle retrieved from DLL_CoBrite_init
ProtocolVersion	uint16	Hand over value retrieved from DLL_CoBrite_init
Error_code_in	int32	If any value other than 0 is handed over; function will not execute command to laser. Hand over state from previous function call for error handling.
Output		
Var Name	**Type**	**Description**
Error_code_out	int32	Error state; 0: ok; >0: Error

7.1.5 DLL_CoBrite_set_frequency

Function will change Frequency of laser. Note that any Frequency can be dialed in.

Input		
Var Name	**Type**	**Description**
Handle	uint32	Input handle retrieved from DLL_CoBrite_init
FrequencyTHz	double	Laser Frequency [GHz]
Error_code_in	int32	If any value other than 0 is handed over; function will not execute command to laser. Hand over state from previous function call for error handling.
Output		
Var Name	**Type**	**Description**
Error_code_out	int32	Error state; 0: ok; >0: Error

7.1.6 DLL_CoBrite_dis_enable_Laser

Function will Dis – or enable output of Laser.

Input		
Var Name	**Type**	**Description**
Handle	uint32	Input handle retrieved from DLL_CoBrite_init
Laser_on_off	int32	Set new state of Laser. 1: On; 0: Off
Error_code_in	int32	If any value other than 0 is handed over; function will not execute command to laser. Hand over state from previous function call for error handling.
Output		
Var Name	**Type**	**Description**
Error_code_out	int32	Error state; 0: ok; >0: Error

7.1.7 DLL_CoBrite_read_status

Function will read current status of Laser. Note that execution time of this command can be long.

Input		
Var Name	**Type**	**Description**
Handle	uint32	Input handle retrieved from DLL_CoBrite_init
ProtocolVersion	uint16	Hand over value retrieved from DLL_CoBrite_init
Error_code_in	int32	If any value other than 0 is handed over; function will not execute command to laser. Hand over state from previous function call for error handling.
Output		
Var Name	**Type**	**Description**
LaserFrequencyTHz	double	Current Laser Frequency [THz]
FineTuneFrequencyTHz	double	Current Fine Tune Frequency [GHz]
currentOpticalPowerDBm	double	Current optical Power [dBm]
LaserOnOff	Int32	Laser On/Off state. On: 1; Off: 0
LaserLockState	int32	Indicates whether Laser currently tunes to a new setting (value 0) or is stabilized (1)
Error_code_out	int32	Error state; 0: ok; >0: Error

7.1.8 DLL_CoBrite_laser_locked

Function will indicate whether Laser is locked and all optical parameters are within specification. Note that Laser will return state "tuning" if output is turned off.

Input		
Var Name	**Type**	**Description**
Handle	uint32	Input handle retrieved from DLL_CoBrite_init
Error_code_in	int32	If any value other than 0 is handed over; function will not execute command to laser. Hand over state from previous function call for error handling.
Output		
Var Name	**Type**	**Description**
LaserLockState	int32	Inditcates if laser is locked. 0: Laser tunes; 1: Laser locked
Error_code_out	int32	Error state; 0: ok; >0: Error

7.1.9 DLL_CoBrite_Temps_and_currents

Function will return relevant temperatures and currents of laser to indicate its state.

Please refer to section 5.1.10 for more details.

Input		
Var Name	**Type**	**Description**
Handle	uint32	Input handle retrieved from DLL_CoBrite_init
Error_code_in	int32	If any value other than 0 is handed over; function will not execute command to laser. Hand over state from previous function call for error handling.
Output		
Var Name	**Type**	**Description**
TECMA	Double	TEC current [mA] sign indicates whether TEC is in cooling or heating mode
LaserDiodeMA	Double	Laser diode current [mA]
CaseTempC	Double	Case temperature at base of Laser base [°C]
LaserTempC	Double	Laser diode temperature [°C]
Error_code_out	int32	Error state; 0: ok; >0: Error

7.1.10 DLL_CoBrite_laser_close

Use this function to close the connection to the laser. Always use this function to disconnect from Laser as no subsequent connections to the Laser are possible.

Input		
Var Name	**Type**	**Description**
Handle	uint32	Input handle retrieved from DLL_CoBrite_init
Error_code_in	int32	If any value other than 0 is handed over; function will not execute command to laser. Hand over state from previous function call for error handling.
Output		
Var Name	**Type**	**Description**
Error_code_out	int32	Error state; 0: ok; >0: Error

8   Uninstalling CoBriteDX1 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)