BLL OEM Ultra-Compact Light Source

Preliminary Product Description
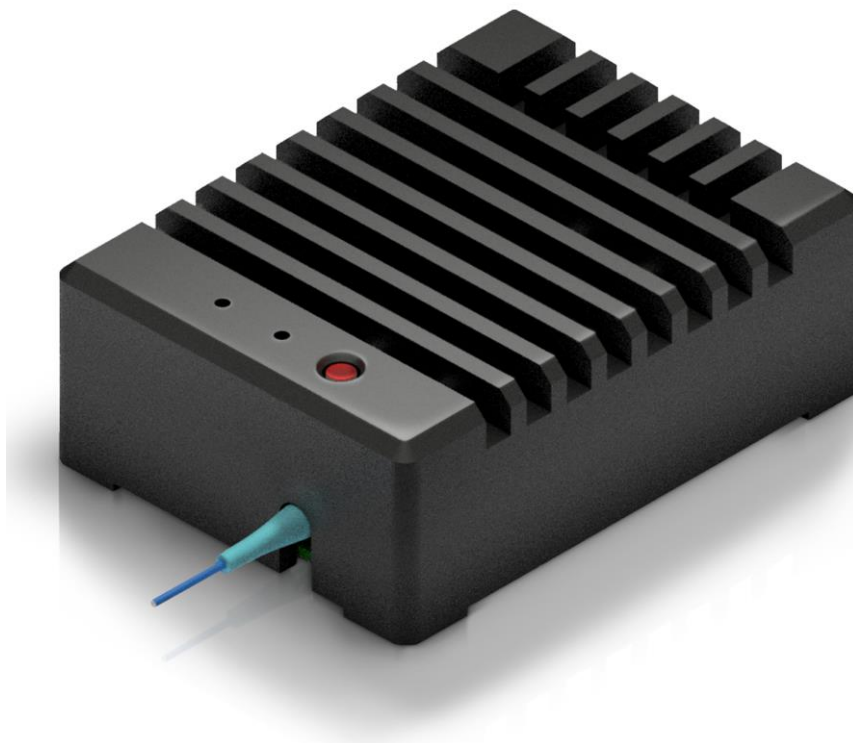
ATTENTION
ELECTROSTATIC
SENSITIVE DEVICES

ABSOLUTE MAXIMIM RATINGS WARNING

Failure to comply with the following requirements may result in the catastrophic failure of the Light Source.

Parameter	Max
DC supply voltage, V	5.6
DC supply current, A	1.5

LASER SAFETY WARNING

This Light Source emits invisible light that may have a potential hazard associated with CLASS 3R to 3B of IEC 60825-1. For further information regarding laser safety and laser classification of the Light Source please contact SUPERLUM.

1 Light Source Description

1.1 General Description

BLL Ultra-Compact Broadband Light Sources are wide spectrum SM- or PM-fiber coupled light source modules for applications requiring a reliable, powerful, stable, and low-noise SLD light source with a broad and flat spectrum and a short coherence length. A high-precision current and temperature controller powers the SLD module inside the light source. The SLD output can be modulated (ON/OFF) at the rate of up to 10 kHz. BLL Light source is designed to be mounted on a PCB or a Superlum BLL Evaluation Board[1]. An optional BLL Evaluation Board allows for a quick and easy BLL light Source setup and testing.

BLL Light Source allows various options to control the optical output: by the pushbutton on the case, by logic signals via the 12-pin connector, or from a USB interface via a Superlum BLL Evaluation Board[1] .

Superlum OEM light sources are designed and intended for integration into Customer equipment and must be considered components.

1.2 Optical Performance

The optical design is based on SM or PM optical fiber. Non-isolated Light Source can tolerate no more than -30dB feedback.
The optical output can be a FC/APC or SC/APC terminated fiber pigtail in a 0.9 mm tube.

NOTE – The ultra compact BLL is customizable. Please contact sales@superlum.ie for more information on the optical performance and other spec options available with all our product line.

1.3 Package Contents

This Light Source is supplied with the following accessories as standard (these parts are to be found in the shipping box which should be kept and carefully stored):

-   1 x connector for 12-pin connector port;
-   1 x USB card containing Superlum Companion Software and a copy of this Manual;
-   1 x Acceptance test report (ATR).

BLL Evaluation Board[1] comes with a USB cable and a power supply.

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[1] Sold separately.

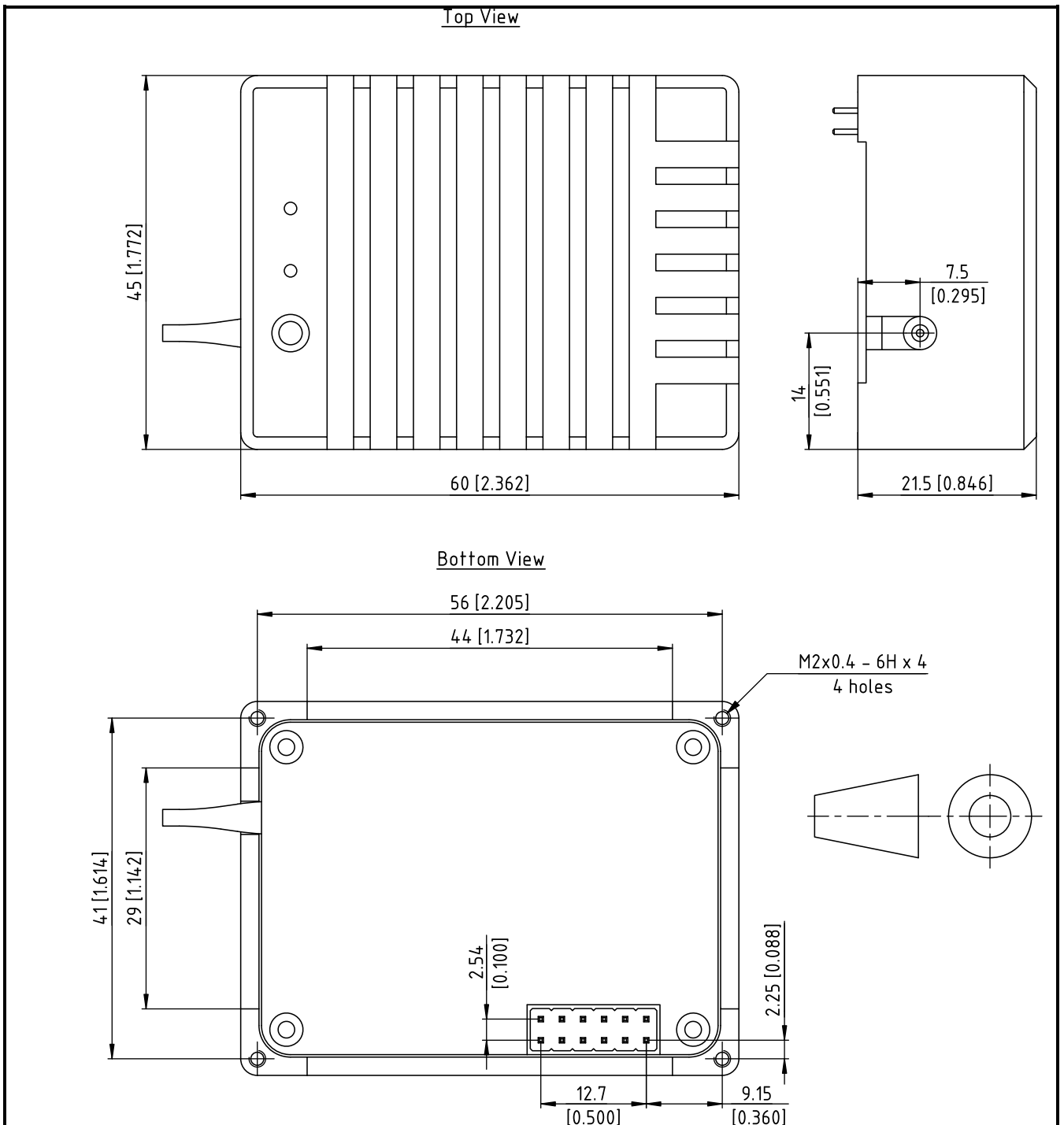## 1.4 Outlines and Dimensions

Top View

Bottom View

Figure 1. Drawings of Light Source. Dimensions are in millimeters [inches]
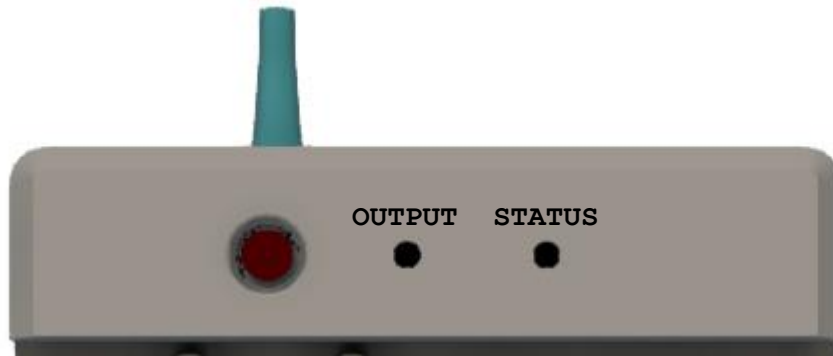
1.5 Control LEDs

Figure 2**.** LED indicators of the Light Source.

There are two LEDs on the front panel. These LEDs are a visual indication of the device status as described in the Table 1 below.

Table 1. Statuses of control LEDs

LED Name	LED State	System status
"OUTPUT"	No light	The optical output is off.
	Flickering green	The optical output is starting (soft start).
	Green	The optical output is on.
	Yellow	SLD or PD current limit reached (SLD degradation or optical feedback). Time to service.
"STATUS"	No light	No power. No active SLDs.
	Flickering green	Temperature stabilization is in process.
	Green	SLD temperature is stabilized at the pre-set level. The optical output can be switched on. No errors detected.
	Flickering red	The optical output and all controls are disabled once the interlock has been actuated (correspondent terminals on the REMOTE port are open circuited). Interlock is only operable if the correspondent option is computer activated
	Red	Common Error. Failure of the temperature controller.

2 Technical Specification
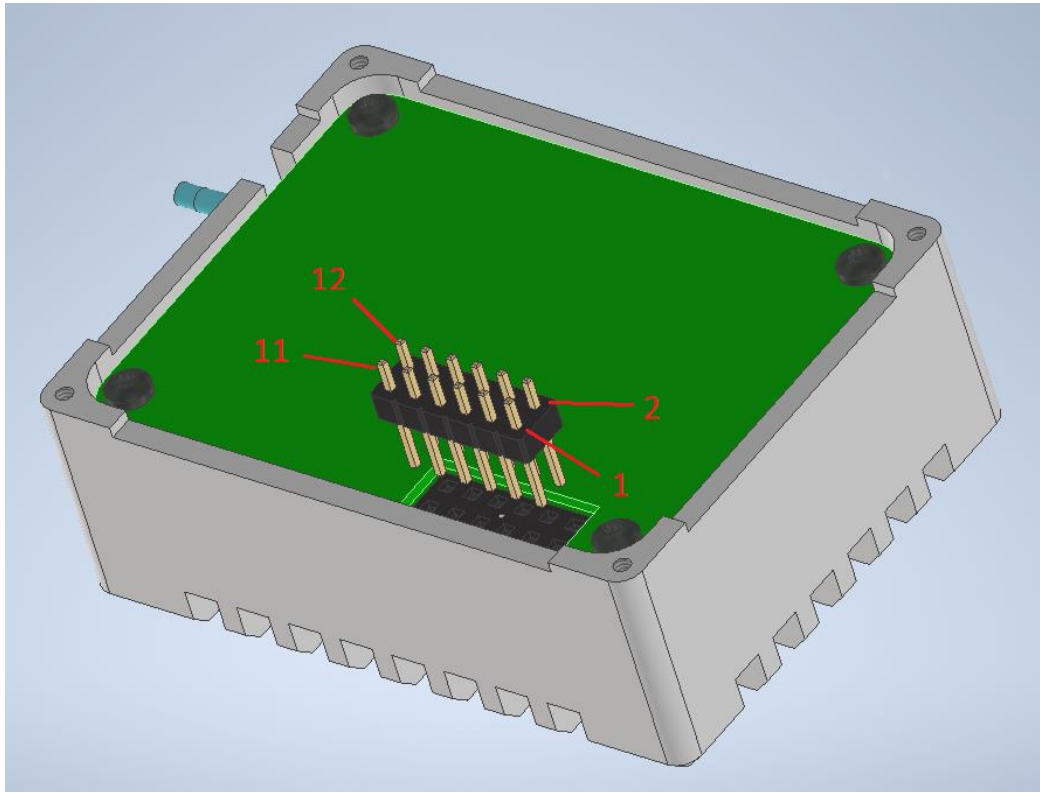
2.1 Electrical Connections

Figure 3. Light Source electrical pin configuration

Table 2. Light Source electrical pin description.

Pin Number	Pin Name	Pin Type	Pin Description
1, 2	VCC	Power Input	Input voltage supply (5 VDC +/- 5%)
3, 4	GND		Ground
5	RMD	Input	Modulation input. Active high.
6	RON	Input	ON/OFF optical output power. Active high.
7	REN	Input	ENABLE/DISABLE optical output. Optical output disabled if this pin not connected or tied to ground. Apply VCC to enable optical output.
8	RDY	Output	Readiness status. Low state indicates that the device is ready to accept RON signal.
9	OUT	Output	Output status. Low state indicates that the optical output is ON.
10	SRV	Output	Service status. Low state indicates that the service required.
11	RXD	Input	UART data input
12	TXD	Output	UART data output

All outputs are open – collector type. An external resistor must be connected to VCC. Recommended resistor value is 4.7 KOhm.

3 General Information

3.1 Mounting

Temperature control is an essential factor when considering where and how you will integrate this light source into your application. Please contact Superlum should you have any queries about the BLL thermal management during installation and operation. A forced air circulation system around the enclosure is strongly recommended. To ensure the maximum effective heat dissipation, the Light Source may be mounted to an appropriate heatsink in any spatial orientation with 25mm of free space around the sides and cover to allow air circulation. The Light source should be anchored to a flat plate heatsink large enough to accommodate the light source base's entire footprint *(see section 1.4; Figure 1. Drawing of Light Source)* using the Four (4) anchoring holes.

3.2 Mounting on PCB

BLL light source is designed to be mounted on a PCB. Recommended PCB drilling outline is shown below:
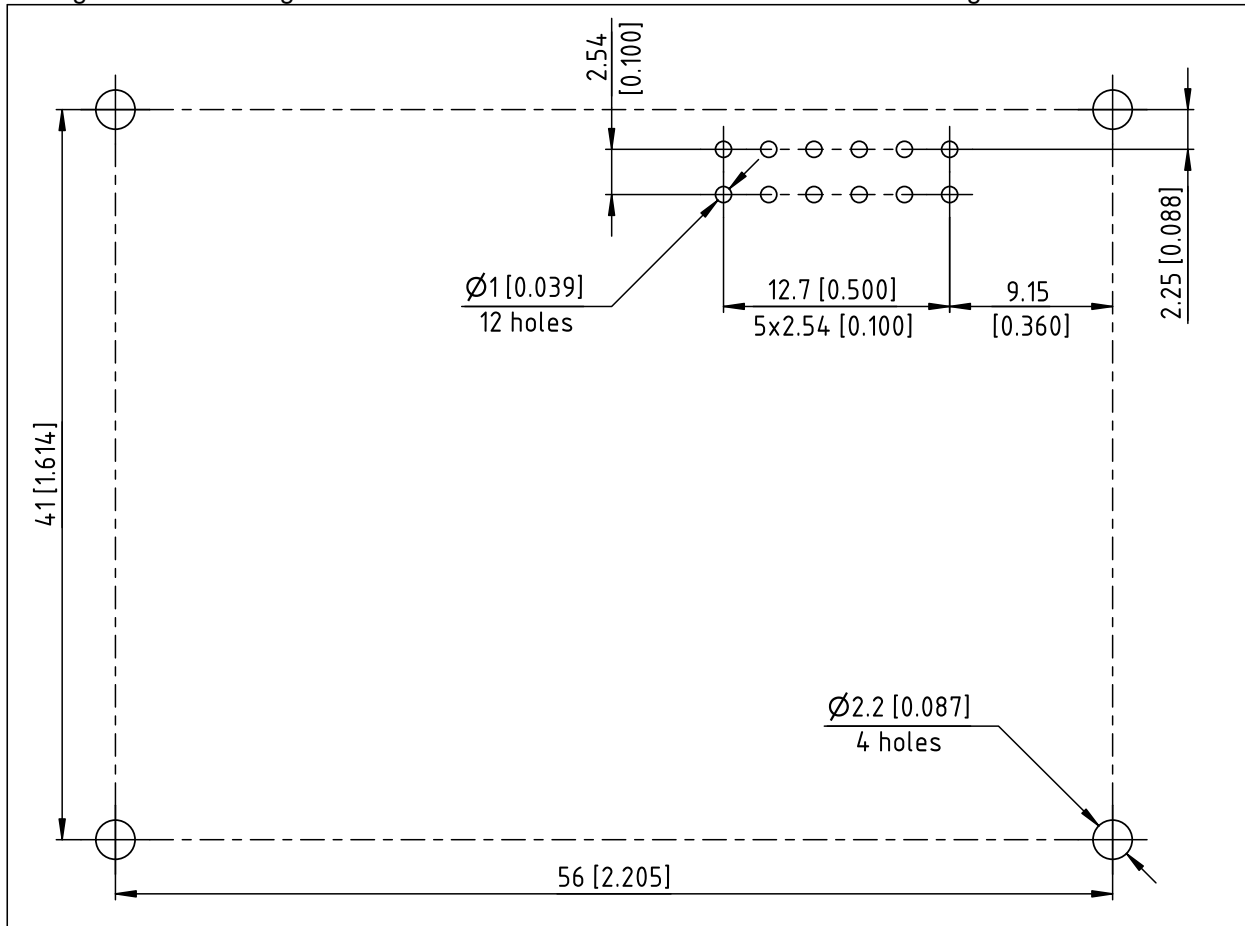

Figure 4. Recommended PCB drilling layout. Dimensions are in millimeters [inches].
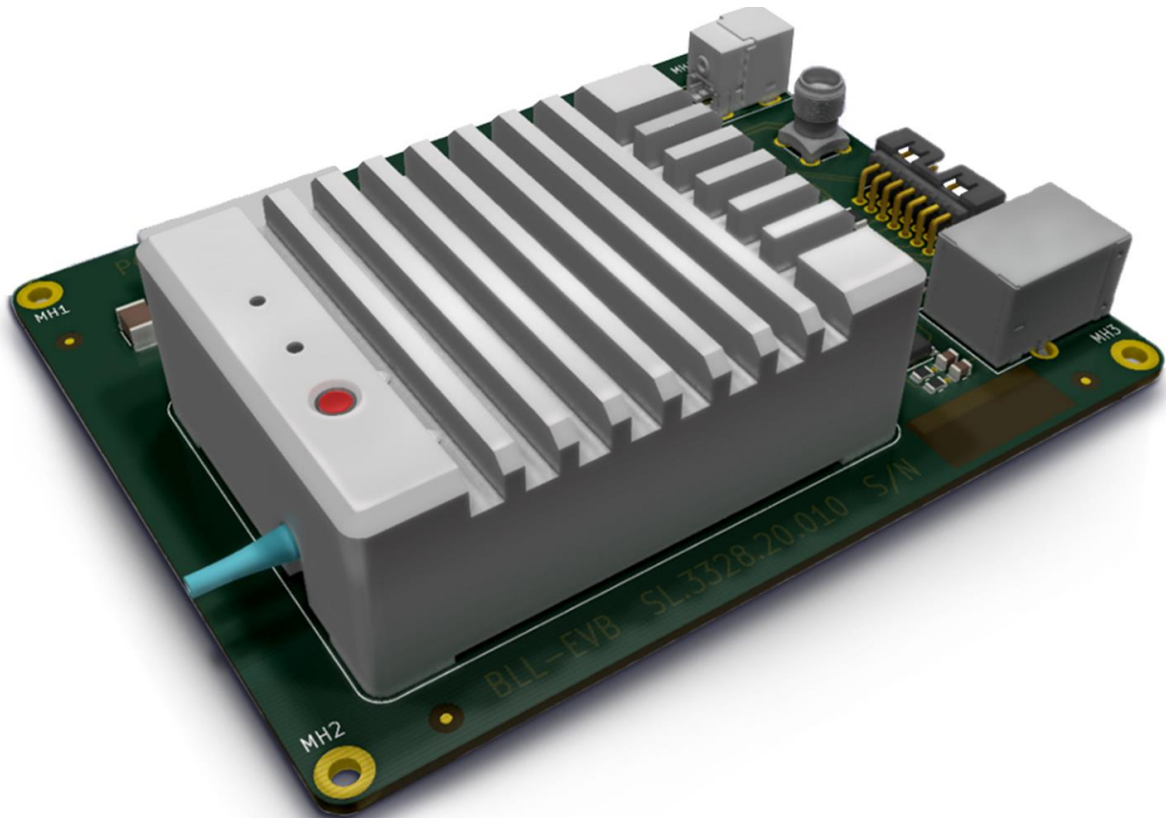
3.3 Mounting on Superlum Evaluation Board

Figure 5. BLL Light Source mounted on a BLL evaluation Board.

BLL Light Source can be mounted on a Superlum BLL Evaluation Board to enable external USB control. Refer to the BLL companion software for remote control via computer using the USB port. The computer interface fitted to this device is a non-standard USB interface. It provides a virtual COM port for remote control via USB connection.

A summary of the most relevant remote-control features (also those available with SUPERLUM's companion software) are given in Table 3 below:

Table 3. Remote control features via BLL Connectivity Board.

USB (virtual COM port)
- ON/OFF control of the optical output;
- SLD module ON/OFF control;
- Monitoring of relevant driving parameters of SLD module;
- Self-test option – remote diagnostics feature;
- Controlling of optical performance.

3.3 Safety Considerations

Superlum OEM light source modules are sold as components. Therefore, they are not required to conform to European or U.S. safety regulations and rules in force in any other country/destination. The buyer/user's responsibility is to design and certify any equipment incorporating any OEM source of Superlum to meet all local safety regulations before sale to the public. The texts of these regulations are available from the countries' respective governing bodies where the equipment is to be sold.

All Superlum OEM light source modules except the models with emission wavelength below 690 nm emit invisible radiation. They have a potential laser safety hazard classified as CLASS 3R or 3B under IEC 60825-1:2014. Superlum OEM light source modules may not have ALL the required laser safety features in terms of IEC 60825-1 like remote interlock, key-operated master control, warning signals, and labels. Superlum OEM light source modules are designed for integration into other equipment. It is the Buyer/User's responsibility to develop and certify any equipment incorporating any OEM source of Superlum to meet all local safety regulations and applicable standards.

The Light Source is designed for integration into an OEM application and, as such, is outside the scope of laser safety standards. The BLL Light Source is not supplied with laser safety devices, e.g., key-operated master control.

Please contact Superlum for more details about laser safety and other safety issues of each light source module P/N.

APPENDIX A
BLL UART Command Protocol

UART configuration:

Baud Rate = 57600;
Start Bits = 1;
Stop Bits = 1;
Parity = None;
Flow Control = None.

1   SYSTEM COMMANDS

1.1   Read Light Source type, firmware version and serial number

Request:	[I] [CR] [LF]
Acknowledge:	[I] [:] [TYPE] [:] [VH] [VL] [:] [SN] [CR] [LF]
Error message:	[!] [E] [CR] – common error message.

[CR] [LF] – line termination sequence ([CR] – ASCII13, [LF] – ASCII10)

[TYPE] – Light Source type, five ASCII printable chars:
  "BLC-S" – one channel Light Source;
  "BLC-D" – two channels Light Source;
  "BLC-T" – three channels Light Source;
  "BLC-E" – one channel Light Source with electronic output power control function.
[VH] – Major part of firmware version [0…9], one ASCII chars;
[VL] – Minor part of firmware version [0…9], one ASCII chars;
[SN] – Serial number, six ASCII printable chars.

1.2   Set Light Source operation mode. Read current mode.

Request:	[M] [CMD] [CR] [LF]
Acknowledge:	[M] [MODE] [CR] [LF]
Error message:	[!] [E] [CR] [LF] – common error message.

[CMD]	DESCRIPTION
[?]	Read current mode
[L]	Set LOCAL mode
[U]	Set UART CTRL mode

[MODE]	DESCRIPTION
[L]	Device operated in LOCAL mode
[U]	Device operated in UART CTRL mode
[E]	FATAL ERROR mode

2   UART CTRL MODE COMMANDS [U]

2.1 Switch SLD ON/OFF. Read Channel status data

Request: [U] [C] [CH] [CR] [LF]
Acknowledge: [U] [C] [IL] [ST1] [CR]
Error message: [!] [E] [CR] [LF] – common error message;
                         [!] [M] [CR] [LF] – wrong mode set message.

[CH]	DESCRIPTION
[?]	Read CH status data
[1]	Switch SLD ON/OFF
[9]	Switch SLD ON/OFF

[IL] – Remote interlock data [0] or [1]:
              [0] – output disabled;
              [1] – output enabled.
[ST1] – Channel 1 status, [00…FF], two ASCII chars in hexadecimal code. See table below for signal
              identification.

SIGNAL	BIT	DESCRIPTION
OME	0	'1' – Optical module enabled '0' – Optical module disabled
TON	1	'1' – TEC ON; '0' – TEC OFF
TGD	2	'1' – Optical module temperature stabilized '0' – Optical module temperature not stabilized
TER	3	'1' – TEC (Thermistor) error
SMD	4	'1' – SLD operated in ACC mode '0' – SLD operated in APC mode
SON	5	'1' – SLD ON; '0' – SLD OFF
SLM	6	'1' – SLD current limit reached
SER	7	'1' – SLD error

2.2 Switch control

Request: [U] [S] [CMD] [CR] [LF]
Acknowledge: [U] [S] [SWDATA] [CR] [LF]
Error message: [!] [E] [CR] [LF] – common error message;
                         [!] [M] [CR] [LF] – wrong mode set message.

[CMD]	DESCRIPTION
[?]	Read current Switch Data
[1]	Switch Channel #1 (CH1)
[5]	Enabling / Disabling Interlock
[6]	Enabling / Disabling REMOTE port
[7]	Enabling / Disabling External Modulation
[S]	Store current Switch Data to EEPROM

[SWDATA] – Switch status, [00…FF], two ASCII chars in hexadecimal code. See table below for signal
                identification

[SWDATA]	DESCRIPTION
Bit#0	'1' – Channel #1 (CH1) enabled '0' – Channel #1 (CH1) disabled
Bit#1	Reserved, reads as null
Bit#2	Reserved, reads as null
Bit#3	Reserved, reads as null
Bit#4	'1' – Interlock enabled '0' – Interlock disabled
Bit#5	'1' – REMOTE port enabled '0' – REMOTE port disabled
Bit#6	'1' – External Modulation enabled '0' – External Modulation disabled
Bit#7	'1' – Output Power Monitor enabled '0' – Output Power Monitor disabled

2.3 Measure optical module parameter (read data from ADC)

Request: [U] [M] [CH] [PN] [CR] [LF]
Acknowledge: [U] [M] [CH] [PN] [ADATA] [CR] [LF]
Error message: [!] [E] [CR] [LF] – common error message;
                        [!] [M] [CR] [LF] – wrong mode set message.

[CH] – Channel number [1], one ASCII character;
[PN] – Parameter number [1…8], one ASCII character;
[ADATA] – Parameter value [0000…FFFF], four ASCII characters in hexadecimal code.

[PN]	DESCRIPTION	ADATA RANGE
1	Real TEC current	[0000] = 0,00A [00FF] = +2,55A [0101] = -0,01A [01FF] = -2,55A
2	SLD current (maximum current) set value	[0000]=0,00 mA [FFFE]=655,34mA
3	Optical module photo-diode current (HP) set value	[0000]=0,0µA [FFFE]=6553,4µA
4	Optical module photo-diode current (LP) set value	[0000]=0,0µA [FFFE]=6553,4µA
5	Real Optical module temperature value	[0000]=0Ω [FFFE]=65534Ω
6	Real SLD current value	[0000]=0,00 mA [FFFE]=655,34mA
7	Real PD current value	[0000]=0,0µA [FFFE]=6553,4µA
8	Optical module temperature set point value	[0000]=0Ω [FFFE]=65534Ω

Note - ADATA overload string is [FFFF].

2.4 Read optical module parameter

Request: [U] [P] [MN] [PN] [CR] [LF]
Acknowledge: [U] [P] [MN] [PN] [DATA] [CR] [LF]
Error message: [!] [E] [CR] [LF] – common error message;
                [!] [M] [CR] [LF] – wrong mode set message.

[MN] – Optical module number, [1] (One ASCII character);
[PN] – Parameter number, [0…9] (One ASCII character);
[DATA] – Parameter data see table below.

[PN]	Description	DATA Range	Comments
0	Optical module serial number	[XXXXXX]	Six ASCII printable characters
1	Optical module operation mode	[0] or [1], one ASCII char	[0] – APC mode [1] – ACC mode
2	Optical module temperature set point value	[0000…FFFE], four ASCII chars	[0000] = 0 ohm [FFFF] = 65534 ohm
3	Optical module maximum current value	[0000…270F], four ASCII chars	[0000] = 0,0 mA [270F] = 999,9 mA
4	Optical module current value	[0000…270F], four ASCII chars	[0000] = 0,0 mA [270F] = 999,9 mA
5	Optical module photo-diode current value (HP)	[0000…270F], four ASCII chars	[0000] = 0 µA [270F] = 9999 µA
6	Optical module photo-diode current value (LP)	[0000…270F], four ASCII chars	[0000] = 0 µA [270F] = 9999 µA
7	Optical module photo-diode current maximum value	[0000…270F], four ASCII chars	[0000] = 0 µA [270F] = 9999 µA
9	Optical module operating time	[00000000]-[FFFFFFFF], Eight ASCII chars	00000000 – 0 s; 0000000A – 10 s; ….

2.5 Read optical module parameter (factory data)

Request: [U] [F] [MN] [PN] [CR] [LF]
Acknowledge: [U] [F] [MN] [PN] [DATA] [CR] [LF]
Error message: [!] [E] [CR] [LF] – common error message;
                    [!] [M] [CR] [LF] – wrong mode set message.

[MN] – Optical module number, [1] (One ASCII character);
[PN] – Parameter number, [0…8] (One ASCII character);
[DATA] – Parameter data. See table 2.4 above for details.

2.6 Adjust optical module parameter

Request: [U] [J] [MN] [PN] [DATA][CR] [LF]
Acknowledge: [U] [J] [MN] [PN] [DATA] [CR] [LF]
Error message: [!] [E] [CR] [LF] – common error message;
                        [!] [M] [CR] [LF] – wrong mode set message.

[MN] – Optical module number, [1] (One ASCII character);
[PN] – Parameter number, [4] or [5] (One ASCII character);
[DATA] – Parameter data. See table 2.4 above for details.

2.7 Store adjusted optical module parameters in EEPROM

Request: [U] [E] [CR] [LF]
Acknowledge: [U] [E] [Y] [CR] [LF]
Error message: [!] [E] [CR] [LF] – common error message;
                        [!] [M] [CR] [LF] – wrong mode set message.

[Y] – Result of data storing:
            '1' – all right;
            '0' – data storing error.

2.8 Read temperature and output power

Request: [U] [T] [CR] [LF]
Acknowledge: [U] [T] [TV] [PV] [CR] [LF]
Error message: [!] [E] [CR] [LF] – common error message;
                        [!] [M] [CR] [LF] – wrong mode set message.

[TV] – Temperature value [00…FF], two ASCII chars in hexadecimal code in two's complement form:
            [7F] = +127 ºC;
            [00] = 0 ºC;
            [FF] = -1 ºC;
            [81] = -127 ºC;

            [80] - no temperature sensor installed or temperature sensor error.

[PV] – Output power value [000…FFF], three ASCII chars in hexadecimal code.
            [000] = 0 mW;
            [FFF] = 409,5 mW.