



## Configuration Selection

Application note: Selecting the right configuration

The Pure Photonics tunable laser provides a very low-noise tunable laser source for use in sensing and scientific applications. It comes with a wide range of configuration options, which sometimes can be confusing to customers. This application note tries to make the selection process easier.

The base configuration or starting point in our discussions will be the PPCL200 laser with a PPEB200 evaluation board. This provides a good low-noise laser with a complete evaluation solution. The PPCL200 comes loaded with a standard 50GHz Clean Sweep function and the Clean Jump function. The PPEB200 provides a mechanical interface (a mounting plate), electrical interface (wall-plug power supply that is converted to the required -5.2V and +3.3V filtered supplies) and communications interface (RS-232 serial connector, converting the high voltage RS-232 signal from the PC to the low-voltage RS-232 signal required for the ITLA). The ITLA and the evaluation board are connected by flex-cable.



## 1. Device Selection

Device selection should first and foremost be driven by the functional requirements of the application. Without firm requirements, it is recommended to purchase the best possible tunable laser (PPCL300), as it has the best chance of success. Naturally this may involve a measure of over-specification for the target application.

The below selection guide is for low-volume applications. For higher volumes further customization or feature mix is possible, tailored to the application and cost requirements.

The PPCL200 is a middle-of-the-road solution with low-noise performance and basic frequency flexibility options (Clean Sweep and Clean Jump). It can be customized in frequency range and output power setting. At the lower price-end, the PPCL100 is a good telecom tunable laser, with more limited options and at the higher-end, we provide the PPCL300, with a lower noise performance (thanks to a hardware change) and more modulation options. The below table lists the different configuration options available for the different versions.

	PPCL100	PPCL200	PPCL300
<b>In-operation power adjustment</b>	S (7dBm-MAX)	S (7dBm-MAX)	S (7dBm-MAX)
<b>In-operation frequency adjustment</b>	S (12 GHz)	S (30GHz) O (100GHz)	S (30GHz) O (100GHz)
<b>Clean Sweep</b>		Y (50GHz)	Y (50GHz)
<b>Clean Sweep Extended</b>		O (up to 250GHz)	O (up to 250GHz)
<b>Clean Scan</b>		O	O
<b>No Drift Calibration</b>		O	O
<b>Up to 60nm tuning range</b>	C or L-band	O	O
<b>Up to 18dBm output power</b>	13.5 or 15.5 dBm	O	O
<b>Clean Modulation FM</b>			O
<b>Clean Modulation AM</b>			O
<b>Clean Measurement</b>			O (1 or 2 channels)
<b>Micro-USB input</b>			O

S = Standard; O = Optional

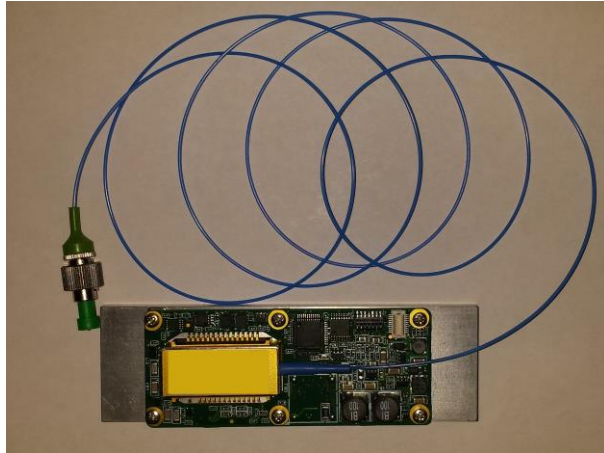
### PPCL500 / PPCL550

The PPCL500 is an enclosure version of the PPCL200 products (15.5 mm height). The PPCL550 is an enclosure version of the PPCL300 version (20 mm height). The standard versions with wall-plug power supply and micro-USB interface are suitable for lab applications. Further customization is possible for OEM applications (for which the micro-USB and barrel-plug are not the best solution).

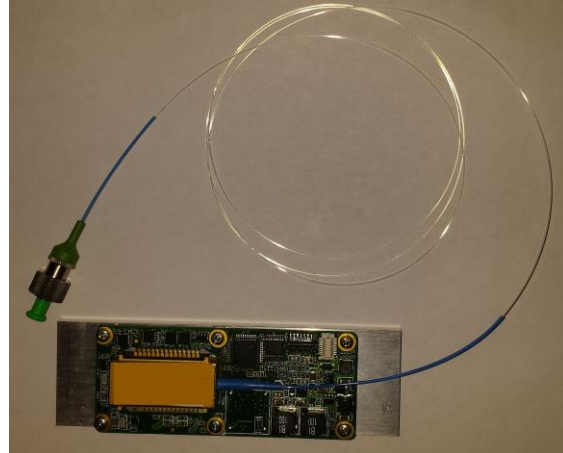
### Fiber buffer selection

The optical fiber is a 1550nm PANDA fiber with 9/125/400 micron core/cladding/buffer. The fiber can be configured with or without a 900um loose blue tubing (this loose tubing will be there over the first 5cm in both versions). The benefit of the loose tubing is extra protection, the disadvantage is reduced flexibility and increased bending radius.

There is no cost difference for this choice.



With buffer



No buffer

### Optical connector selection

In general, most optical connector types (FC/PC, FC/APC, LC, SC, etc) are supported at no extra cost. For exotic connector types we may need to confer with our connector supplier. The connectors are built onto a 1550nm PANDA fiber and the key is aligned to the slow axis.

### Micro-USB input

The PPCL300 can optionally be configured with a micro-USB interface to replace the RS-232. This is done at no additional cost and provides a good alternative for the PPEB400 and PPEB280 evaluation boards.

### Output power

The standard power level for all 3 versions is 13.5dBm. Higher output power options are available. The PPCL100 can be delivered with 13.5dBm or 15.5dBm output power setting. The PPCL200 and PPCL300 can be configured with output power up to 18dBm for C-band and up to 17dBm for L-band. In the past we have delivered 19dBm, though this is only supported when the right hardware is available.

### Frequency range

The standard frequency range is C-band (191.5-196.25THz) and L-band (186.35-190.95THz). Custom configurations are available where the customer can select a frequency range (up to 60nm) in the range 1515nm – 1580nm and 1560nm – 1625nm. Towards the edges of those ranges one would expect a 1.5dB power drop from the center frequency at 4nm from the edge. 0.75dB power drop 7nm from the edge. Consequently a better performing laser would be required to support the wider frequency range and the maximum available power will go down accordingly.

### In-operation power and frequency adjustment

All products come with the ability to change the power over the full range and the frequency over a +- 30GHz range from the set-point, while the laser is in operation.

Custom versions can be made available with up to 100GHz in-operation frequency adjustment.

#### Clean Sweep / Clean Sweep Extended

Clean Sweep allows the user to sweep the frequency in the low noise mode over a range of 50GHz (standard) up to 250GHz (optional). The sweep will continue until stopped by the user. The user can stop the sweep at an arbitrary point in the sweep.

#### Clean Jump

Clean Jump allows the use to switch from one frequency to another within a second (for some frequency combinations down to 0.3 seconds).

#### Clean Scan

Using the Clean Sweep and Clean Jump features, the full frequency range can be swept (or any subset thereof) with shorter stretches of 100GHz, followed by a jump to a new centerpoint.

#### No Drift calibration

Provides calibration over temperature, to minimize frequency drift over temperature. Typical over temperature drift is uncalibrated and can reach up to 400MHz. With the calibration, the frequency drift is within 75MHz. In addition, a special firmware version is available for operation of the laser in 'telecom' mode with the reduced drift and other noise terms reduced.

#### Clean Modulation AM

Provides an analog input in the laser to modulate the laser current (AM modulation with associated FM). Bandwidth 1 MHz, DC coupled, input 0-10V, output up to 80%.

#### Clean Modulation FM

Provides an analog input in the laser to modulate the PZT (FM modulation with very limited/no AM). Bandwidth 100kHz, AC (standard) or DC (optional) coupled, input 0-6V, output 100MHz.

An experimental version is available with frequency range 10-75kHz, AC coupled, input 0-5V, output 1GHz.

#### Clean Measurement

Provides an analog input into the micro-processor. Firmware determines what is done with the input. One implementation is analog FM, where the voltage is measured to drive the FTF function, providing an analog means to move the frequency.

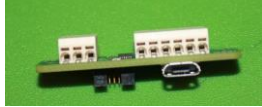

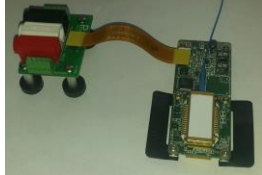


## 2. Evaluation Platform Selection

The PPEB200 is part of the base configuration, but dependent on budget other solutions exist. At all times, the user needs to provide a mechanical (heatsinking) interface, an electrical (+3.3V and -5.2V) interface and a communication (low voltage RS-232) interface.

The connector on the ITLA is a 14 or 20 pin Samtec connector. This is a convenient small connector, but it is sometimes hard to obtain (it has to be custom ordered). Hence, it sometimes is convenient to have a transition to a more common (typically larger connector).

The below table provides a listing of the different connection solutions, ordered by their cost.

		Mechanical	Electrical	Communications	Connector
DX4		Yes	Yes	Yes	USB, wall-plug
CoBrite		Yes	Yes	Yes	USB, wall-plug
PPEB200		Yes	Yes	Yes	RS-232, wall-plug
PPCL500		Partial	Yes	Yes	Micro-USB, wall-plug
PPEB300		No	Yes	Yes	Micro-USB, wall-plug

PPEB280*		No	No	Yes	Micro-USB, wire terminal block
PPEB400*		No	No	Yes	Micro-USB, Samtec
PPEB260		No	No	No	Banana plug, wire terminal block
PPEBx10-xx		No	No	No	IDC
PPEB250		Yes	No	No	None

\* note that the PPCL300 can be configured with a micro-USB interface (complimentary) and would not require these solutions.

#### DX4 and CoBrite

These solutions (CoBrite is a 1-up solution, DX4 can take up to 4 units) are offered in collaboration with ID Photonics and come with the ID Photonics software. They are also compatible with the Pure Photonics software controls. They provide a very nice laboratory solution with the unit integrated in an enclosure and a USB interface. They are powered with a wall-plug transformer. The main benefit is that the fiber is worked-away and that the unit can be easily transported/moved. There is a disadvantage that units cannot easily be swapped out.

#### PPEB200

The standard evaluation board provides all the required tools to operate the laser.

#### PPCL500

The enclosure version of the product comes with a micro-USB interface and a wall-plug power supply. It does not allow interchangeability. It can be configured with either a fiber connector/adaptor or with a fiber output.

#### PPEB300

This is the electronics board that comes with the PPCL500. It is experimental for now and is provided as-is.

#### PPEB280

This plug-out board routes the RS-232 to a micro-USB connector and routes all the other pins of the Samtec connector to a terminal block for wire insertion.

PPEB400

This plug-out board routes the RS-232 to a micro-USB connector and routes all the other pins to a Samtec connector.

PPEB260

This connection board takes signals from the Samtec connector to banana plug inputs (for the power supplies) and a terminal block for all other connections.

PPEB2x0-14/20

This connection board takes the 14 or 20 pin SAMTEC connector to a 14 or 20 pin IDC connector. A standard ribbon cable can be connected to this connector.

PPEB250

Mounting plate for the ITLA