



Low Noise Tunable Laser

Clean Light portfolio – PPCL200 – Application Note

The **Pure Photonics** full-band tunable laser solution provides a very narrow linewidth (~15 kHz), significantly reduced low-frequency AM and FM noise and a range of operating modes in this low-noise setting. The product can access any desired frequency set-point in either the C-band or L-band. Output power can be set as low as 7dBm and as high as 18dBm.

In this application note the installation and operation of the PPCL200 product are described. In addition, the operation of the GUI for further product development and access to the different operation modes is described and the integration with the PPEB200 evaluation platform.



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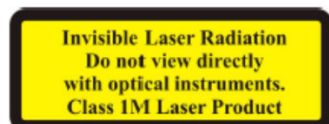
2. Disclaimer

The PPCL200 product complies with 21 CFR 1040.10 except for deviations pursuant to Laser Notice No. 50 dated June 24, 2007.

This product is a component laser device and as such, does not include all end product safety controls or design features as required by international laser safety standard, IEC 60825-1, or by the U.S. Food and Drug Administration (FDA), Center for Devices and Radiological Health (CDRH), regulation CFR 1040.10.

This device is a class 1M laser product for use only under the recommended operating conditions and ratings specified in this document. Use of controls or adjustments or performance of procedures other than these specified in this product datasheet may result in hazardous radiation exposure.

Invisible laser radiation – Do not view the laser output from this device directly with optical instruments (e.g., eye loupes, magnifiers, microscopes). Viewing the laser output with certain optical instruments within a distance of 100mm may pose an eye hazard. Class 1M laser product.



3. Operating Principle

The PPCL200 is the highest performance ITLA on-the-market (MSA form-factor, www.oiforum.com/public/documents/OIF-ITLA-MSA-01.2.pdf), controlled through a digital interface. The user can control the product without having to control or understand the underlying technology.

The PPCL200 has an External Cavity Laser design (see figure), with tunable filters embedded in the cavity for frequency control. The Cavity consists out of an InP front-facet coated gain chip with back-facet AR coating and a high-reflection end-mirror, mounted on a PZT element. By changing the injection current into the gain-chip and the built-in photo-diode tap, the product accurately controls the operating power to the user-defined power target.

Within the cavity two Silicon etalon filters, with slightly different Free Spectral Range (FSR), utilize the Vernier effect to select one dominant cavity mode. The frequency is controlled through micro-temperature sensing and heating elements on the filters. The dominant cavity mode is aligned with the etalon transmission peaks through adjustment of the cavity temperature.

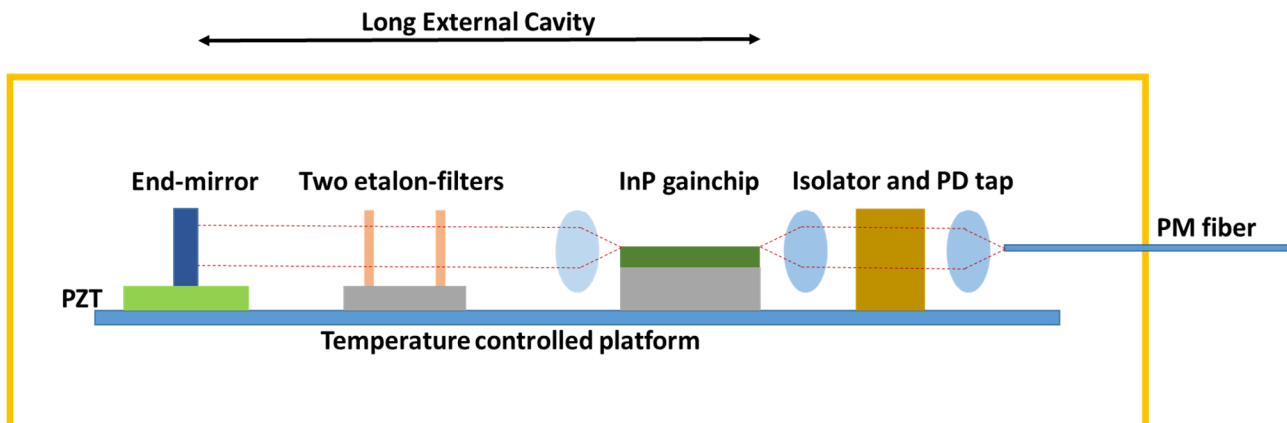


Figure 1: illustration of optics engine

4. Installation Instructions

The PPCL200 product is shipped in a transparent clamshell package. Before breaking the seals on the package, please verify that the package is not damaged or compromised in any way. Please refer to the datasheet for the maximum storage conditions.

Please ensure that a proper ESD-safe environment is present before opening the clamshell. The product is rated for 500V HMB (Human Body Model) ESD protection, but we recommend to ensure a much lower ESD level on your working surface.

After opening the package, please take the product out of the clamshell and perform a visual inspection to ensure no damage is visible. When taking out the product, please only use the side of the Printed Circuit Board (PCB). When picking up the product, please take the utmost care with the fiber, as this is fragile.

Now, transfer the product to the desired heatsink surface. This may be the metal plate that is shipped with the evaluation board, or a custom, self-defined metal plate. We recommend to use thermal compound between the gold-box and the heatsink. The surface onto which the gold-box is mounted will need to have a surface flatness better than 25 micron. The drilled screw-holes need to accommodate an M2 screw (the product comes with 8mm long screws).

Without removing the plastic installation tabs, start inserting the screws in the holes. Do not tighten the screws. After the screws around the gold-box are inserted, you can remove the installation tabs. Now, start tightening the screws until the first sign of resistance is felt. Follow a sequence that creates a zig-zag pattern between screws (first the closest left screw, then farthest middle, closest right, farthest right, closest middle, farthest left). Then repeat that pattern while the screws are tightened to a torque of 1 Inch-pound.

After completion of this step, install the heatsink at the desired location and connect the RS-232 interface to the flex-cable (or remove the flex-cable and attach to the black connector). Please make sure that no voltage is applied to the supplies, as an incorrect set-point or a hot-plugging event can damage the product.

5. Integration with the PPEB200 evaluation board

The PPEB200 evaluation board is a convenient interface board to the PPCL200 product. It takes the input voltage of a laptop power supply (17V) and converts it to the +3.3V and -5.2V that are needed for the PPCL200 product. It also offers the option to supply these voltages through the banana-plugs on the evaluation board (allows for monitoring the current on the individual channels).

The evaluation board also provides controls for the digital in- and output. The MS, RST and DIS hardware lines are pulled in the right set-point and can be reset by push-buttons. The SRQ hardware line is monitored. 8 LEDs are present on the board to indicate the state of the product.

The RS-232 on the PPCL200 requires a 3.3 V signal, known as Low-Voltage TTL (LV-TTL). Laptops/computers typically provide 12V RS-232 signal. The evaluation board will convert the 12V signal to a 3V signal to facilitate the communication with the product.

When the PPCL200 product is mounted onto the heatsink that comes with the evaluation board, the assembly can be pushed below the plastic brackets. For most operations, this provides enough thermal contact. However, for low and high temperature operation, we recommend to tighten the screws in the plastic brackets. The black and white connectors will be aligned and can easily be connected. In case a different heatsink is used, the heatsinking and electrical contact will need to be optimized. Please ensure that when the electrical connections are made, the laptop power supply is not connected.

To ensure that the power supply from the laptop power supply is used, the switch on the left side of the board needs to be to the right. The switch between the BNC connectors needs to be set to the left.

6. Operating the PPCL200 without the GUI

When operating the product without the GUI, only the RS-232 interface is accessible. The commands on this interface follow the OIF MSA for ITLAs (www.oiforum.com/public/documents/OIF-ITLA-MSA-01.2.pdf) and can be send by any arbitrary program that can write on the RS-232 port.

The evaluation board comes with the 'SunShell.exe' program that provides a line-editor interface to the RS-232 port. It is essentially a python shell with the RS-232 interface defined as **it**. The below provides some examples on how to access and change the product through this interface. The '**it**.' comes with auto-completion and will allow you to access any register in the ITLA. This program has advanced features that may come in useful if a custom behavior is desired.

Turning the laser on and off

```
it.connect(1,9600)    # opens up the RS-232 port #1 at baudrate 9600
it.oop()              # reads the output power (validates comms with the product)
it.fcf(193.4359)      # sets the First Channel Frequency
it.grid(340)          # sets the grid to 34GHz
it.channel(3)         # frequency = 193.4359 + (3-1) * 0.034
it.pwr(800)           # sets the output power to 8dBm
it.resena(sena=1)     # turns the laser on
it.oop()              # reads the laser output power
it.resena(sena=0)     # turns the laser off
it.disconnect()       # closes the RS-232 port
```

Executing a script

```
execfile('c:\test.py') # runs the python script c:\test.py
```

Writing or reading arbitrary register

```
it.oop()              # read an arbitrary register
read_frame=it.packetToModule() # gets the last 4 bytes send to the product
read_frame.register(45) # changes the register to 45
it.packet(read_frame) # reads channel 45
write_frame=read_frame # create write frame
write_frame.data(900) # changes the data in the packet to 900
write_frame.mode(1)   # set the mode to write
it.packet(write_frame) # write the value 900 to register 45
```

7. Operating the PPCL200 with the GUI

Pure Photonics is making a GUI suite available to access the full functionality and capability of the product. This GUI is available for free download at <http://www.pure-photonics.com>.

After download, activate the .exe file that corresponds to what you want to do. The first step will be to establish communication with the device (STEP1). After this is completed, the other buttons will become available and the desired action can be completed. Each GUI comes with a manual on the website.