High Accuracy/High Speed Optic Loss and PDL Multimeter

Fast 2 ms measurement speed, 400-2400 nm, silicon-photonic devices

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The FPDL is a high-accuracy, ultra-fast fiber-optic instrument designed for production testing and characterization of silicon photonic devices, including insertion loss (IL) and polarization-dependent loss (PDL). The system is based on a three-electro-optic-crystal polarization controller. For insertion loss measurements, the input polarization is scrambled at an ultra-high speed of 2 MHz, providing accurate polarization-independent measurements. For PDL measurements, the three-crystal polarization controller scans the entire Poincaré sphere at 500 Hz. The IL scrambling mode and PDL scanning mode can be switched via the USB or RS-232 interface. The FPDL is available in three configurations: Pass-through configuration with front-panel input and output optical ports for integration into existing automated test systems. Integrated power meter configuration for high-accuracy PDL measurements with an advanced maximum/minimum search algorithm determines the PDL with an accuracy better than 0.05 dB in less than 2 m. Integrated laser source (optional), including a tunable C-band laser for wavelength-dependent loss (WDL) characterization.

The instrument offers high-speed measurements, a wide dynamic range, a bright display, and analog/digital I/O for easy integration into automated production stations. It operates over a wide wavelength range without requiring wavelength calibration. Standard communication interfaces include USB, Ethernet, GPIB, and RS-232. The FPDL is ideally suited for rapid, accurate characterization of silicon photonic devices, DWDM components, fiber-optic sensors, and other passive optical components in both manufacturing and laboratory environments. Multi-channel systems in a compact 1U rack-mount configuration with Ethernet or RS-232 control are also available.

Features

- Optical Power and PDL measurement
- 2 ms measurement speed
- 400 to 2500 nm
- Tunable laser source integration
- Wide wavelength range
- High PDL accuracy
- Analog/Digital
- Power meter function

Applications

- PDL vs. wavelength measurement
- DWDM device characterization
- Fiber sensor component characterization

RoHS COMPLIANT

Specifications

Parameter	Min	Typical	Max	Unit
Wavelength Center	400		2420	nm
Wavelength Bandwidth	60		120	nm
Resolution		0.01		dB
PDL Accuracy [1], [2], [3]		± (0.01 + 5% of PDL)		dB
PDL Repeatability [1]		± (0.005 + 2% of PDL)		dB
PDL Dynamic Range [4]	0		45	dB
IL Accuracy [1], [5]		± (0.01 + 5% of IL)		dB
IL Repeatability [1]		± (0.005 dB + 2% of IL)		dB
IL Dynamic Range [4]	0		45	dB
Optical Power Range (at DUT output port)	-40		+6	dBm
Optical Power Accuracy		±0.25		dB
Measurement Speed (for input > -30 dBm)		30 ms/measurement		dB
Operating Temperature	0		50	°C
Storage Temperature	-20		70	°C
Optical Connector Type	FC/APC			
Analog Output	0 to 4V PDL monitor voltage (0 to 3.5V linear with PDL, 4V indicates power low) User-configurable PDL range			
Power Supply	100 – 240 VAC, 50 – 60 Hz			
Communication Interfaces	USB, Ethernet, RS-232, and GPIB			
Dimensions	2U, 19” half rack width 14" (L) x 8.5" (W) x 3.5" (H)			

Notes:

[1]. For 10 sample average.

[2]. At 23 ± 5°C.

[3]. Accurate PDL measurement also depends on test setup. Optimize your test environment with suggestions from General Photonics’ PDL measurement application note.

[4]. For input power ≥0 dBm.

[5]. In power meter measurement mode with user-defined reference

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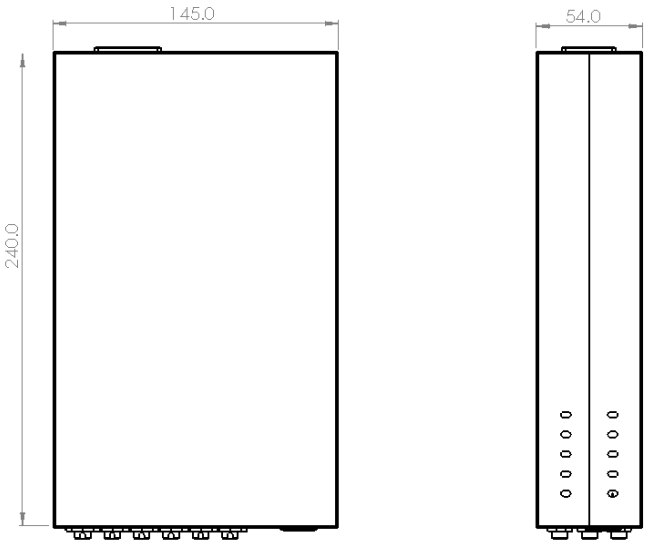
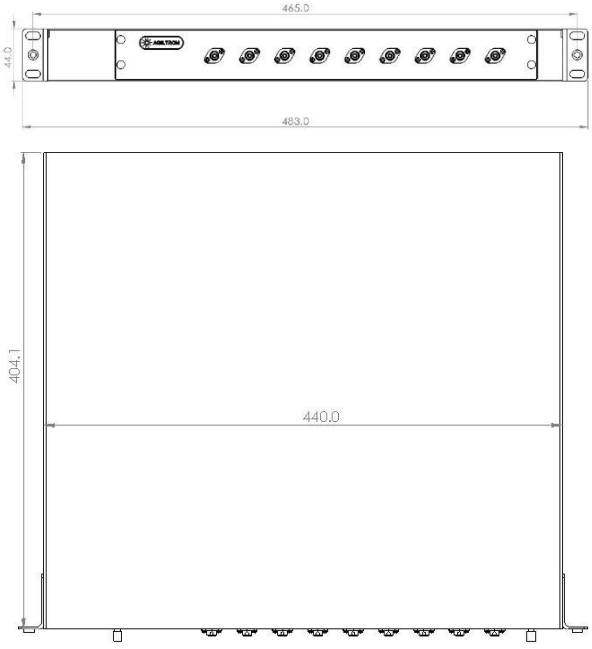
Mechanical Dimensions (Unit: mm)

Benchtop



1U Rack Mount



*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

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Ordering Information (Part Number)

	☐	☐☐	☐	☐	☐	☐☐	☐
Prefix	**Laser Source**	**Channel**	**Wavelength**	**Package**	**Interface**	**Fiber Type**	**Connector [1]**
FPDL-	None = N Tunable C-band = T 1550nm = 5 1310nm = 3 1060nm = 1 780nm = 7 850nm = 8 450nm = 4 550nm = 5 Special = 0	Single = A1 Dual = A2 3 = A3 4 = A4 5 = A5 6 = A 5 10 = 10 12 = 12	1260-1650 = 1 1060 = 1 1310 = 3 2000 = 2 650 = 6 780 = 7 850 = 8 350 = B 450 = C 520 = D Special = 0	Benchtop = 1 1U Rack = 2	RS232 = 1 USB = 2 Ethernet = 3 GPIB = 4	SMF-28 = 01 ***Select below***	None = 1 FC/PC = 2 FC/APC = 3 SC/PC = 4 SC/APC = 6 LC/PC = 7 LC/APC = 8 Special = 0

[1]. The default connector configuration uses fiber with 0.9 mm buffer protection. The connector cannot be installed directly onto bare fiber because the bare fiber is prone to damage during shipping. However, the connector can be assembled on bare fiber if a 3 cm protective loose tube is added for reinforcement. The customer may remove this protective tube after testing. The optical power handling of a standard connector is less than 0.5 W for SMF-28 fiber and decreases further for smaller-core fibers.

Fiber Type Selection Table:

01	**SMF-28**
02	
03	
04	**SM450**
05	**SM1950**
06	**SM600**
07	**780HP**
08	**SM800**
09	**Hi980**
10	**Hi1060**
11	**SM400**
12	**Hi980**
13	

Application Notes

Fiber Core Alignment

Note that the minimum attenuation for these devices depends on excellent core-to-core alignment when the connectors are mated. This is crucial for shorter wavelengths with smaller fiber core diameters that can increase the loss of many decibels above the specification if they are not perfectly aligned. Different vendors' connectors may not mate well with each other, especially for angled APC.

Fiber Cleanliness

Fibers with smaller core diameters (<5 μm) must be kept extremely clean, contamination at fiber-fiber interfaces, combined with the high optical power density, can lead to significant optical damage. This type of damage usually requires re-polishing or replacement of the connector.

Maximum Optical Input Power

Due to their small fiber core diameters for short wavelength and high photon energies, the damage thresholds for device is substantially reduced than the common 1550nm fiber. To avoid damage to the exposed fiber end faces and internal components, the optical input power should never exceed 20 mW for wavelengths shorter 650nm. We produce a special version to increase the how handling by expanding the core side at the fiber ends.

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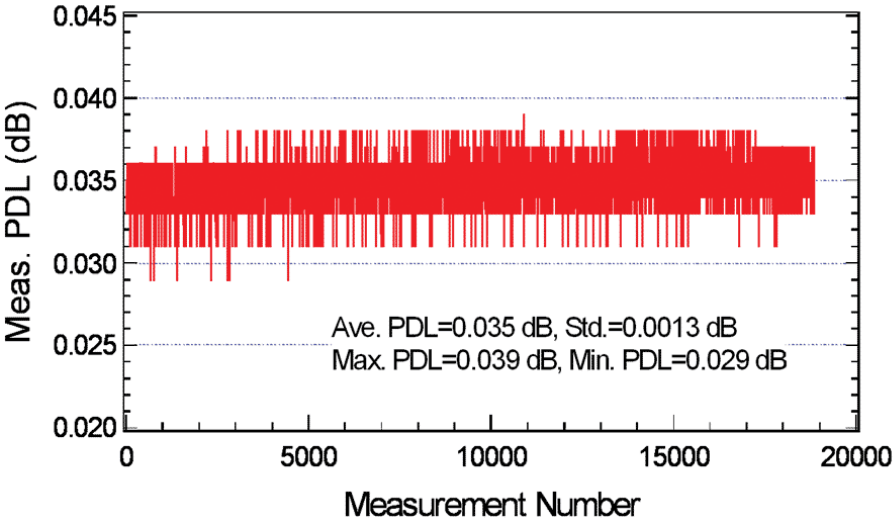
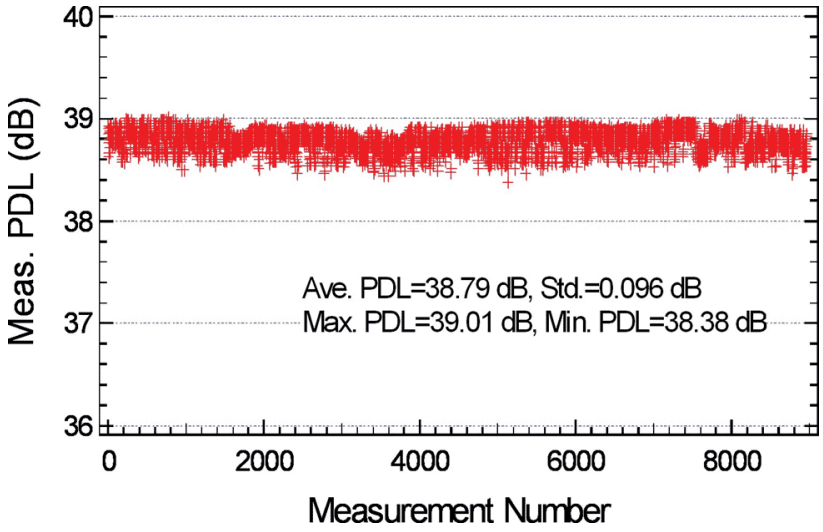
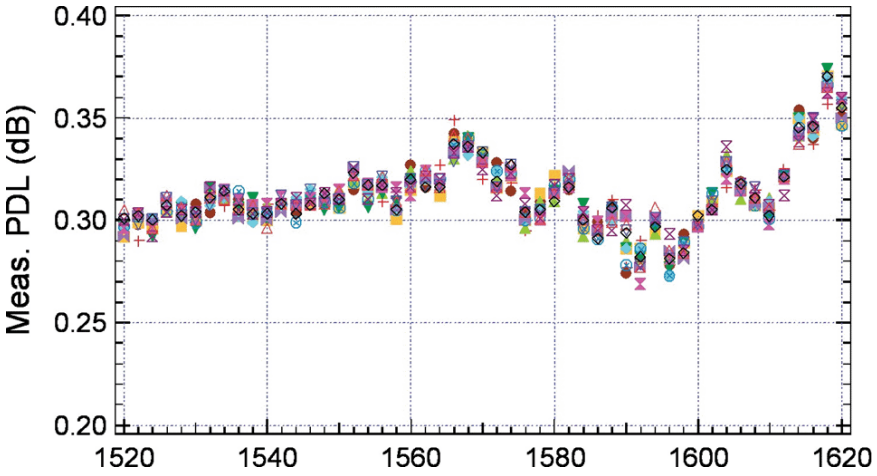
Typical Performance Data:



Measurement of a low PDL sample: APC Connector

Measurement of high PDL sample: Polarizer





Wavelength scan and multiple (12) scan repeatability

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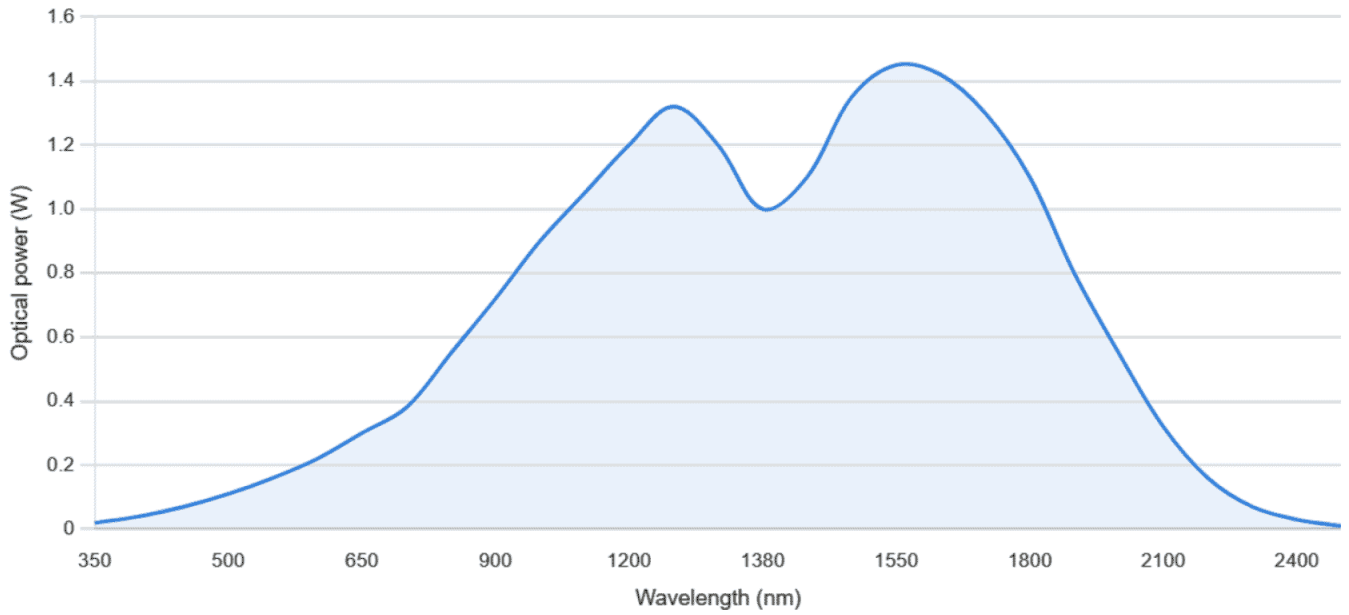
Regular Single Mode / Polarization Maintaining Fiber Optical Power Handing vs Wavelength



Single mode fiber optical power is limited by nonlinear effects in addition to absorption that increase loss and generate heat. The curve shows the approximate safe CW power envelope for standard single-mode fiber. Actual limits depend on fiber design, core size, length, and laser characteristics. Specialty fibers can significantly increase the power limit.

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