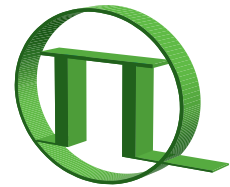


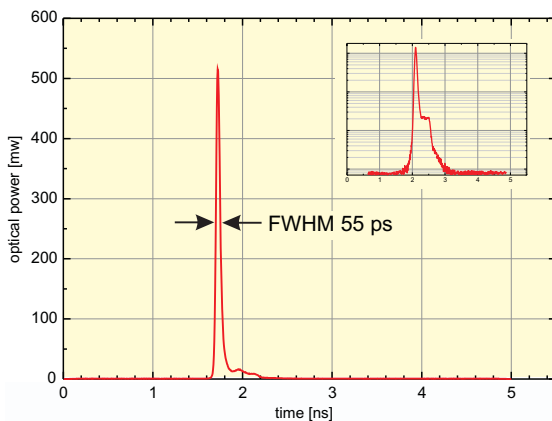
LDH Series



PICOQUANT
Unternehmen für optoelektronische
Forschung und Entwicklung

Picosecond Laser Diode Heads for PDL 800-B / -D / 808 / 828

<http://www.picoquant.com>



- Wavelengths from 375 to 1550 nm
- Peak power up to 1 W
- Pulse widths as short as 70 ps (FWHM)
- Repetition rates from single shot to 80 MHz
- Collimating optics, optional fiber coupler and peltier cooling
- cw option



Applications

- Time-resolved fluorescence spectroscopy
- Biochemical analytics
- Time-response characterization of opto-electronic devices
- Quantum cryptography
- Diffuse Optical Tomography (DOT)
- FLIM, FRET, FCS

Picosecond Laser Diode Heads

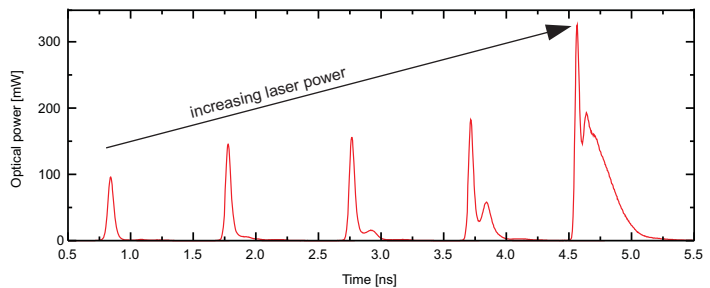
The system consists of a pulsed diode laser driver of the PDL Series (PDL 800-B, PDL 800-D, PDL 808 "Sepia" or PDL 828 "Sepia II") and interchangeable laser heads (LDH Series). Laser heads with wavelengths from 375 to 1550 nm are available, including even a compact green laser diode head (see separate data sheet of LDH-P-FA-530). The LDH Series laser heads include an integrated collimator. A TE cooler is mandatory for some laser heads and can be provided for other laser heads as an option.

The LDH Series picosecond diode laser heads produce light pulses as short as 70 ps FWHM at repetition rates from single shot to 80 MHz. The pulse widths of these diode lasers perfectly match the time resolution characteristics of standard detectors, but at one tenth the price of typical Ti:Sa or Argon-ion lasers. A combination of interchangeable LDH Series laser heads, together with a driver of the PDL Series, satisfies the demand for a compact and affordable excitation source that covers a wide range of wavelengths. The LDH Series pulsed diode laser sources offer the benefits of low cost and compact size in an integrated turn-key system, together with the high repetition rates desired for fast Time-Correlated Single Photon Counting (TCSPC). These capabilities open the door for entirely new applications beyond the research lab, e.g. in bioanalytics, biochemistry, genetics, semiconductor characterization and quality control.

The latest generation of laser heads, the LDH-D Series, work in pulsed and cw mode. This dual feature is only supported by the PDL 800-D or the PDL 828 "Sepia II" driver.

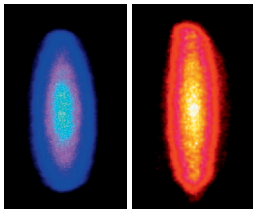
Pulse shape vs. output power

The PDL Series of laser drivers feature easy-to-use controls for laser power level either by means of a potentiometer on the front panel or by a setting in the control software (PDL 828). The pulse width can, however, not be controlled directly. Instead, the pulse width and pulse shape depend on the laser power level. An example of this behaviour is shown on the right for a typical LDH-P-780 @ 40 MHz. The different curves are generated by simply changing the laser power level. "Clean" and near symmetrical pulses can only be achieved close to the lasing threshold (*Low Power Level*) while at maximum power the pulse is broadened by shoulder and/or additional peaks (*High Power Level*). As a second effect, a shift in the central emission wavelength can sometimes also be seen with increasing laser power.



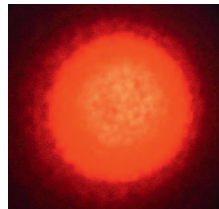
Beam shape

Due to diffraction, the beam diverges rapidly after leaving the laser chip, typically at 30 degrees at the vertical (fast) axis by 10 degrees at the horizontal (slow) axis. This leads to an elliptical beam shape after the collimating optics with typical dimensions of 1.5 x 3.5 mm. The beam shape can be influenced using optical fibres or an anamorphic beam shaper:



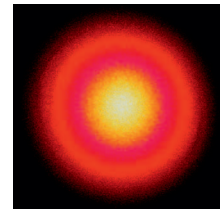
Direct emission

All lasers emit a collimated beam with an elliptical beam shape with typical dimensions of 1.5 x 3.5 mm.



Behind a multi mode fibre

In case of a multi mode fibre, the beam shape after the fibre is nearly round. A speckle pattern emerges by interference of multiple modes inside the fibre.



Behind a single mode fibre

In case of a single mode fibre, the beam shape after the fibre is a nice gaussian profile as only one mode is transmitted within the fibre.

Specifications

Beam Parameters

Optics focus length	f = 4.5 mm
Numerical aperture	0.55
Typical divergence with optics	Theta 0.32 mrad, Theta ⊥ 0.11 mrad*
Polarisation	typ. linear, perpendicular to the fast axis*
Polarisation degree	>90 %*
Sidemode suppression ratio (SMSR)	<0.01*

Cooling (optional)

Peltier cooling stability better than 1 K for ambient temperature between 15°C and 30°C

Spectral Width¹⁾ <900 nm: approx. 2-8 nm, >900 nm: approx. 10-20 nm, cw: <1 nm

Power Stability (cooled)

12 hours, ΔT_{ambient} <3 K. 1% RMS, 3% Peak to Peak

Dimensions

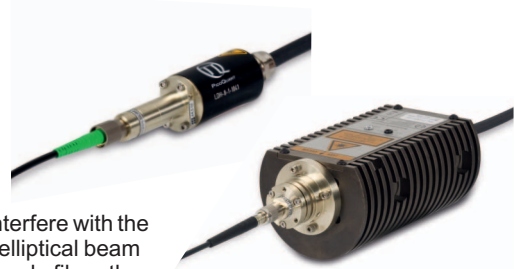
Cooled (l x w x h) 110 x 75 x 60 mm, with fibre coupling 145 x 75 x 60 mm
 Uncooled (∅ x length with collimator) 25 x 76, with fibre coupling 25 x 106

1) for spectral width of laser heads with narrow bandwidth, please see table on third page

* typical values

Fibre coupling

All laser heads of the LDH Series can be coupled to optical fibres: multi mode, single mode or polarisation maintaining single mode with different connector types. For the majority of applications an angled FC/APC connector is recommended to prevent backreflections into the fibre that could interfere with the laser stability. Coupling of the laser into an optical fibre has the benefit that the elliptical beam shape is transformed into a round beam at the output of the fibre. For a single mode fibre, the resulting beam is nicely gaussian shaped. However, fibre coupling also leads to a reduced output at the end of the fibre. Typical coupling efficiencies are around 40% for a single mode fibre and around 80% for a multi mode fibre.



Available laser heads

Dual mode: cw and pulsed operation (LDH-D Series)						These laser heads can only be driven by the PDL 800-D or the PDL 828 "Sepia II" driver units.			Option C: Laser head with Peltier / Temperature stabilization Option M: Transversal multi mode structure, reduced coupling efficiency into single mode fibres. *different coupling efficiency into optical fibres for pulsed and cw operation due to assignment **pulse width independent from selected power level
Wavelength (± 10 nm) nm	Type	CW Power mW	Low Power Level (Narrow Pulse)			High Power Level (Wide Pulse)			
			Pulse (FWHM) ps	Average Power 40 MHz 80 MHz mW		Pulse (FWHM) ps	Average Power 40 MHz 80 MHz mW		
375	LDH-D-C-375	10	<70	0.3	n/a	<300	3.0	n/a	
405	LDH-D-C-405	20	<70	1.0	n/a	<300	3.0	n/a	
405	LDH-D-C-405M	400	<70	2.5	n/a	<600	20.0	n/a	
440	LDH-D-C-440	20	<70	0.3	n/a	<500	3.0	n/a	
440	LDH-D-C-440M	400	<70	3.0	n/a	<500	20.0	n/a	
450	LDH-D-C-450	10	<70	0.7	n/a	<300	5.0	n/a	
470	LDH-D-C-470	10	<90	0.3	n/a	<500	3.0	n/a	
485	LDH-D-C-485*	10	<90	0.3	n/a	<500	2.0	n/a	
635	LDH-D-C-635	50	<90	1.5	3.0	<300	10.0	20.0	
635	LDH-D-C-635M	100	<90	1.0	2.0	<400	4.5	9.0	
640	LDH-D-C-640	20	<90	0.7	1.5	<400	4.5	9.0	
660	LDH-D-C-660	30	<70	0.7	1.5	<500	4.5	9.0	
670	LDH-D-C-670	15	<70	0.4	0.8	<600	4.0	8.0	
690	LDH-D-C-690	20	<70	0.5	1.0	<500	4.0	8.0	
730	LDH-D-C-730	8	<120	0.3	0.7	<800	1.7	3.5	
1080	LDH-D-C-1080**	30				<50	2.5	5.0	
1120	LDH-D-C-1120**	20				<90	2.5	5.0	

other wavelengths are available upon request

Narrow spectral bandwidth						These laser heads can be driven by the PDL 800-B, PDL 800-D, PDL 808 "Sepia" or PDL 828 "Sepia II" driver units.			Only available with option C: Laser head with Peltier / Temperature stabilization *pulse width independent from selected power level
Wavelength Central nm	Wavelength Variation nm	Spectral width (FWHM) nm	Low Power Level (Narrow Pulse)			High Power Level (Wide Pulse)			
			Pulse (FWHM) ps	Average Power 40 MHz 80 MHz mW		Pulse (FWHM) ps	Average Power 40 MHz 80 MHz mW		
772	± 3	<1.0	<120	1.2	2.5	<350	3.5	7.0	
784	± 3	<0.3	<100	0.9	1.6	<500	4.0	8.0	
852	± 3	<0.3	<90	2.0	3.5	<350	5.0	9.0	
976*	± 3	<0.5				<90	5.0	10.0	
1062	± 3	0.4 - 0.8	<120	0.7	1.4	<400	5.0	10.0	
1275	± 7	0.2	<100	0.01	0.03	<400	0.5	1.0	
1300	± 7	0.2	<100	0.01	0.03	<400	0.5	1.0	
1310	± 20	0.2	<100	0.01	0.03	<400	0.5	1.0	
1325	± 7	0.2	<100	0.01	0.03	<400	0.5	1.0	
1349	± 7	0.2	<100	0.01	0.03	<400	0.5	1.0	
1417	± 3	0.2	<100	0.01	0.03	<400	0.5	1.0	
1490	± 3	0.2	<100	0.01	0.03	<400	0.5	1.0	
1510	± 3	0.2	<100	0.01	0.03	<400	0.5	1.0	
1530	± 3	0.2	<100	0.01	0.03	<400	0.5	1.0	
1550	± 3, ± 20	0.2	<100	0.01	0.03	<400	0.5	1.0	
1570	± 3	0.2	<100	0.01	0.03	<400	0.5	1.0	
1590	± 3	0.2	<100	0.01	0.03	<400	0.5	1.0	
1610	± 3	0.2	<100	0.01	0.03	<400	0.5	1.0	

Available upon request (± 3 nm): 760, 763, 780, 795, 937, 1083 nm

Short pulses (on selection)				These laser heads can be driven by the PDL 800-B, PDL 800-D, PDL 808 "Sepia" or PDL 828 "Sepia II" driver units.	
Wavelength (± 10 nm) nm	typ. pulse width (FWHM) ps	Average Power			
		40 MHz	80 MHz		
655	54	0.4	0.9		
670	39	0.3	0.7		
690	54	0.5	1.0		
785	54	0.5	1.0		
830	44	0.3	0.7		

Special options

Pulsed mode (LDH-P Series)			These laser heads can be driven by the PDL 800-B, PDL 800-D, PDL 808 "Sepia" or PDL 828 "Sepia II" driver units.				
Wavelength (± 10 nm) nm	Type	Low Power Level (Narrow Pulse)			High Power Level (Wide Pulse)		
		Pulse (FWHM) ps	Average Power 40 MHz 80 MHz mW		Pulse (FWHM) ps	Average Power 40 MHz 80 MHz mW	
375	LDH-P-C-375	<70	0.3	n/a	<300	1.0	n/a
375	LDH-P-C-375B	<70	0.3	n/a	<300	3.0	n/a
405	LDH-P-C-405	<70	0.4	0.8	<300	2.0	4.0
405	LDH-P-C-405B	<70	1.0	n/a	<300	3.0	n/a
405	LDH-P-C-405M	<70	2.5	n/a	<600	20.0	n/a
440	LDH-P-C-440	<90	0.3	n/a	<300	1.0	n/a
440	LDH-P-C-440B	<70	0.3	n/a	<500	3.0	n/a
440	LDH-P-C-440M	<70	3.0	n/a	<500	20.0	n/a
450	LDH-P-C-450B	<70	0.7	n/a	<300	5.0	n/a
470	LDH-P-C-470	<90	0.3	n/a	<300	1.0	n/a
470	LDH-P-C-470B	<90	0.3	n/a	<500	3.0	n/a
485	LDH-P-C-485	<90	0.3	n/a	<500	2.0	n/a
485	LDH-P-C-485B	<100	0.6	n/a	<550	5.0	n/a
531	LDH-P-FA-530			please see separate data sheet			
635	LDH-P-635	<90	0.3	0.6	<400	2.5	4.0
635	LDH-P-C-635B	<90	1.5	3.0	<300	10.0	20.0
640	LDH-P-C-640	<90	0.7	1.5	<400	4.5	9.0
655	LDH-P-650	<70	0.4	0.9	<400	3.0	6.0
660	LDH-P-660	<90	0.5	1.0	<500	5.0	10.0
670	LDH-P-670	<70	0.3	0.7	<300	1.0	2.0
665	LDH-P-670B	<90	0.3	0.7	<400	2.0	4.0
690	LDH-P-690	<70	0.5	1.0	<400	4.0	8.0
705	LDH-P-705	<70	1.2	2.5	<400	5.0	10.0
735	LDH-P-730	<130	0.3	0.6	<400	1.7	3.5
757	LDH-P-760	<90	0.4	0.9	<300	3.0	6.0
785	LDH-P-780	<70	0.5	1.0	<500	5.0	10.0
806	LDH-P-810	<90	0.4	0.9	<500	5.0	10.0
830	LDH-P-830	<70	0.3	0.6	<300	4.0	8.0
835	LDH-P-840	<90	1.0	2.0	<750	6.0	12.0
905	LDH-P-905	<90	0.5	1.0	<300	4.0	8.0
952	LDH-P-950	<90	0.2	0.4	<400	2.0	4.0
965	LDH-P-965	<90	1.2	2.5	<400	10.0	20.0
975	LDH-P-980	<90	0.6	1.6	<750	10.0	20.0
1060	LDH-P-1060	<90	0.5	1.0	<550	10.0	20.0
1080	LDH-P-C-1080*				<50	2.5	5.0
1120	LDH-P-C-1120*				<90	2.5	5.0
1310 (± 25 nm)	LDH-P-1310	<50	0.08	0.15	<400	1.0	2.0
1550 (± 30 nm)	LDH-P-1550	<50	0.01	0.02	<400	0.5	1.0

850 and 1025 nm: available upon request

Option B: High power version.
 Option C: Laser head with Peltier/Temperature stabilization.
 Option M: Transversal multi mode structure, reduced coupling efficiency into single mode fibres
 *pulse width independent from selected power level

Please check our webpage for all available wavelengths and latest changes of specs.

Other wavelengths as well as wavelength selection are available upon special request. All measurements shown may be subject to a 10% calibration error.

Each laser head undergoes an extensive burn-in test to ensure long-term stability and is shipped with a comprehensive set of test data. This test data is kept in our database, which already holds records of more than 10 years.



INVISIBLE OR VISIBLE
 LASER RADIATION
 AVOID DIRECT EXPOSURE TO BEAM
 CLASS 3B LASER PRODUCT
 IEC / EN 60825-1

Available drivers & other pulsed light sources

PDL 800-B / D

- driver for ps pulses
- up to 80 MHz repetition rate



PDL 808 "Sepia I"

- driver for ps pulses
- manual control for up to 8 channels



PDL 828 "Sepia II"

- driver for ps pulses
- computer control for up to 8 channels



PLS Series

- ps pulsed LEDs
- 255 to 600 nm



All Information given here is reliable to our best knowledge. However, no responsibility is assumed for possible inaccuracies or omissions. Specifications and external appearances are subject to change without notice. Trademarks or corporate names are used for explanation and identification, to the owner's benefit and without intent to infringe.

© PicoQuant GmbH, February 2010



PicoQuant GmbH
 Rudower Chaussee 29 (IGZ)
 D-12489 Berlin
 Germany

Phone +49-(0)30-6392-6929
 Telefax +49-(0)30-6392-6561
 Email info@picoquant.com
 WWW http://www.picoquant.com