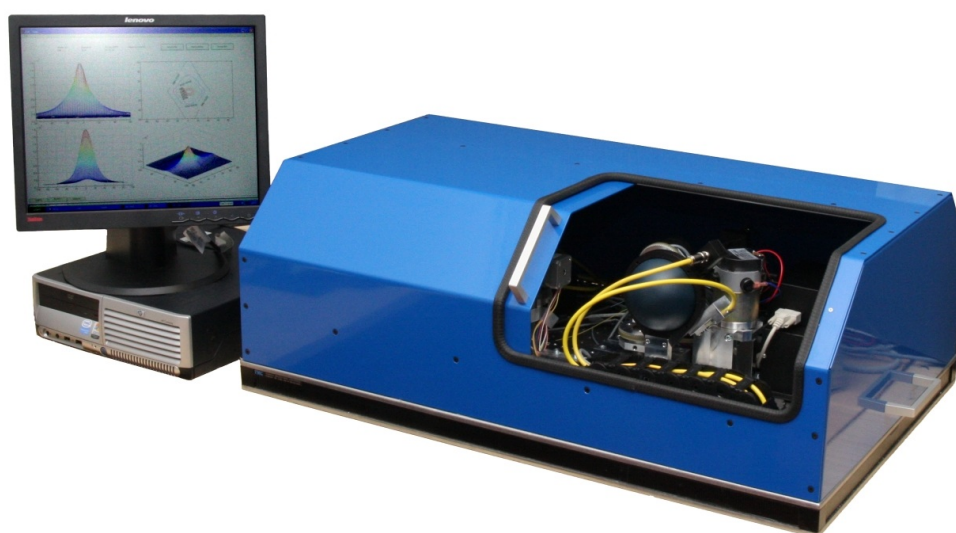


LDC 5000 – A MULTIFUNCTIONAL LASER DIODE CHARACTERISATION SYSTEM



LDC 5000 is a fully configurable, all-in-one laser diode and LED characterization system for R&D laboratories and industry. It is designed to measure and analyze all major characteristics of laser diodes and LEDs in a fast and reproducible way. It is ideal tool for data sheet generation, quality control, failure analysis and research activities with semiconductor emitters.

LDC 5000 is a customizable tool to meet various needs required by different activities. It can measure devices from UV-LEDs to telecom laser diodes and high power emitters. LDC 5000's bigger brother LBC 8000 is designed to measure high power laser bars and stacks.

MAJOR CONTRIBUTIONS

With respect to laser diode parameter characterization, **the LDC 5000 system provides an outstanding list of analysis features**, which are mostly divided into the subsets as follows:

- LIV and derived analysis units
- Beam profile analysis
- Spectral analysis
- Nearfield analysis

Comparable systems in market provide up to two parameter sets considering the feature list above.

Secondly, the LDC 5000 provides a **wide operating range** and is applicable for both to the low and high power laser diodes.

Thirdly, the system is a set-up for an enhanced test station due to the components selected by experts. Accordingly, the whole system is fulfilled to meet **high quality standards and modularity** as stated in the table of technical data

Key part of the system is easy to use C# written software that can be used to make, store and run fully configurable measurement recipes. User can easily run complicated measurement routines and analysis with single click. Software stores data and analysis results to SQL- database and to Excel files. In addition software can generate customizable datasheet in PDF file or hard copy.

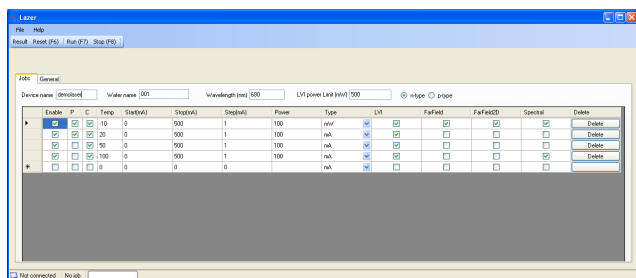


Fig.1. Test batch waiting for execution

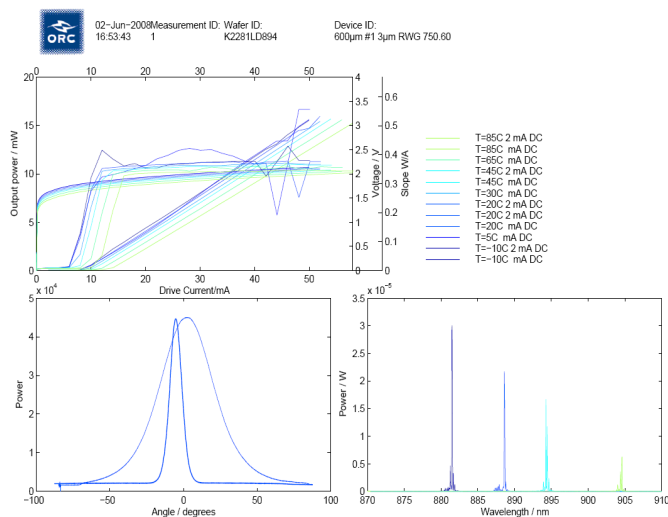


Fig.2. Measurement results from ILV, 2D-Far Field and Spectrum Measurement

MAJOR CONTRIBUTIONS

The overall configuration is configurable based on customer needs.

LIV-measurement

Standard range

- Standard DC current drives deliver currents ranges from 0-100mA to all the way up to 0-10A. These units provide DUT voltage measurement with 1mV resolution and 0.1µA photodiode resolution for power measurement.
- Pulsed option, three possibilities, 200/500mA range, 3A range and 10A range
- High sensitivity option provides astonishing 10fA resolution for photodiode current reading.

High end range

High end range DC current drives and photodiode readers provide a wide selection of current ranges, integrated in one unit. Additionally these units are highly accurate and able to perform fast LIV sweeps. High sensitivity option and extremely accurate voltage measurement is always used with these drives. Compared to standard drives these units provide compliance voltages that exceed all typical requirements. DC current sources are available up to 5 Amperes and pulsed option is available up to 10 Amperes.

Spectrum measurement

Three different spectrum measurement options are available, each providing certain advantages. Optimum, but also most costly solution is to combine optical spectrum analyzer (OSA) and spectrometer because OSA delivers utmost accuracy and spectrometer delivers very fast measurement cycle. However also monochromator can be used in some applications since it has low cost and it can be configured to have high resolution and accuracy. See table 1 comparing different solutions.

Farfield measurement

One of the most important properties of the emitter is the shape and divergence of the Far Field (FF). LDC 5000 can measure FF with scanning arm setup from broad range of wavelengths. Due innovative custom electronics, measurement cycle is fast, accurate and has high dynamic range. Typically 0.045° resolution is used and measurement time can vary from seconds (2 line measurement) to tens of seconds (high resolution mapping).

Nearfield measurement

Measurement of the near field gives important information about internal operation of emitter. If can detect filamentation or current spreading problems and therefore provide feedback to the fabrication process. LDC 5000 can be equipped with CCD microscope in order to easily and safely measure near field.

Small footprint option

The system can be delivered with 19" rack but it is possible to order system with small footprint option. Then instruments and computer are stored under custom made table as in figure 3.

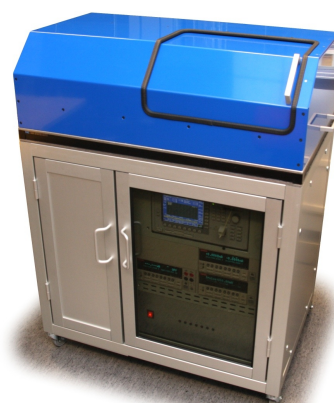


Fig. 3 The system with small footprint option.

DELIVERY, PRICING, CONTACT DETAILS

Due to the modular structure, LDC 5000 can be customized as per the customer's preferences.

We shall be pleased to make a proposal and at the same time provide you pricing information. Please contact Nanofoot:

Contact: jukka.viheriala@nanofoot.fi; or call + 358-50-595 4147

Web: www.nanofoot.fi

TECHNICAL DATA

Laser driver options				
	Low current range 3-options	High current range 4-options	High End Range 3-options	Pulsed sources 2-options
Max CW current range	0.1A / 0.5A / 1A	2A / 4A / 8A / 20A	1A / 3A / 5A In all three models ranges start from 0-1μA	0.5A ⁽¹⁾ / 3A
Pulsed current	NA	Yes ⁽²⁾	NA	Yes
Setpoint resolution	Better than max current / 5000	Better than max current / 5000	i.e. 50μA for 1A range	10μA / 1mA
Setpoint accuracy	0.05% + 0.07 – 0.2 mA depending on max current	0.05% + 0.4 – 4 mA depending on max current	i.e. 0.067% + 900 μA for 1A range	0.5% / 2.5%
Compliance voltage	7V / 7V / 4V	5V	20V / 60V ⁽³⁾ / 40V ⁽⁴⁾	25V / 10V
Pulse widths	NA	10μs to 600ms	NA	100ns-1ms / 100ns-10ms
Voltage reading resolution	1mV	1mV	10μV @ 2V range 100μV @ 20V range	NA
Voltage reading accuracy	+/-0.05% + 1mV	+/-0.05% + 5mV	+/-0.012% + 300μV	NA
Photodiode Reading Range	Single range: 0-5mA	Single range: 0-20mA	Multiple ranges from 0-20nA to 0-20mA	NA
Photodiode Accuracy	+/-0.05% + 1μA	+/-0.05% + 2μA	Better than 1%	NA

Spectrum measurement options			
	OSA	Spectrometer	Monochromator
Cost	From high to very high	Costly, unless wavelength is between 200-1100 nm	Low
Resolution	Extremely high, down to 10pm	Average starting from 1nm, High if narrow measurement band	Average, high if narrow band measurement is satisfactory
Dynamic range	Extremely high	Average	Average
Requires fiber alignment	Typically yes	No	No
Wavelength range	600nm to 2400nm ⁽⁵⁾	200nm to 1700nm	Almost any
Measurement speed	Average	Very fast	Fast

Temperature control

Range	-10 to +150 °C, stability ±0.1 °C
Setting time	Setting speed 1 °C/second typ.

Far field measurement

Range	±90°
Resolution	0.045°
2D FF Execution time	5 seconds
3D FF Execution time ^(c)	15 to 60 seconds

Data analysis features

Optical: I_{th} , Slope Efficiency, Wall plug efficiency
Electrical: R_s , V_{bias}
Thermal: T_0 , T_1
Spectrum: $d\lambda/dT$, SMSR, peak λ , FWHM
Far Field: FWHM, Beam Steering

1) Has also 200mA range with higher accuracy. Accuracy is 0.5% from full range.
 2) Available as an option.
 3) Depends on max current. Ask for details. Max power 60W.
 4) Depends on max current. Ask for details. Max power 50W.
 5) Typically up to 1700nm.