

Measure Lasers Better

Getting the right reading from your laser is a passion for us here at Pro-Lite. Which is why we teamed up with Coherent – the company that sets the standard in laser test & measurement. We have been working with lasers for over 20 years and we understand the science of radiometry. Choosing equipment from us means you can tap into our expertise and have confidence you are making your measurements the correct way.

This newsletter provides an introduction to two exciting developments from Coherent: LabMax is the new high performance laser power & energy meter; and EnergyMax represents the next-generation of pyroelectric sensors which provide new levels of accuracy in pulsed laser measurements.

Also reviewed are instruments for measuring laser beam shape and mode as well as laser wavelength and spectrum.

Pro-Lite – helping you to measure better.



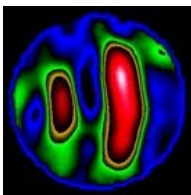
Introducing the Latest Coherent Laser Power & Energy Meters

Model	Measures		Computer Interface	Key Features
	Power	Energy		
LabMax TOP	•	•	•	Performance star with energy capability
LabMax TO	•		•	High performance laser power meter
FieldMax TOP	•	•	•	Versatile meter with energy capability
FieldMax P		•	•	The entry-level energy meter
FieldMax TO	•		•	Versatile meter, power-only
FieldMate	•			Value champion with fast, analogue needle
LaserCheck	•			Pocket-sized and highly affordable

See Us at the Following Events:

August 27-28: Photon 08 conference & exhibition (Heriot Watt University, Edinburgh).

www.photon.org.uk



October 15-16: Photonex 08 conference & exhibition (Stoneleigh Park, Coventry).

www.photonex.org



LabMax is Coherent's new performance laser power and energy meter. LabMax is compatible with all of Coherent's optical, thermal and pyroelectric sensor heads. What sets LabMax apart is its ability to capture and report every pulse at kHz rep rates, multiple interface options and compatibility with LM-series quadrant thermopiles for beam power and position analysis.



FieldMax II is Coherent's all-round performance star. Small enough for field service, but smart and versatile enough for use in the lab, FieldMax is available in three models compatible with thermal and photodiode heads (FieldMax TO), pyroelectric sensors (FieldMax P) or all three (FieldMax TOP). A USB interface, LabView® library and ability to measure every pulse at up to 300Hz complete the picture.



FieldMate is Coherent's value champion. Small in price but big on performance, FieldMate is compatible with all Coherent's optical and thermal heads. Measure the power from pulsed and CW lasers from the UV to far infrared, from nW to 10kW. The easy-to-use analogue needle display responds faster and with less overshoot than most digital meters, enabling rapid, precise laser adjustment.



LaserCheck is a highly affordable, pocket-sized meter for low power CW lasers.



Max Your Measurements with LabMax – Our New Performance Laser Power & Energy Meter

LabMax is Coherent's new performance laser power and energy meter. LabMax is compatible with all of Coherent's optical, thermal and pyroelectric sensor heads. What sets LabMax apart is its ability to capture and report every pulse at kHz rep rates, multiple interface options and compatibility with LM-series quadrant thermopiles for beam power and position analysis.



LabMax is available in two versions: the LabMax TO is compatible with Coherent's thermal and photodiode sensors for average power measurements; while the LabMax TOP adds the capability of pulsed energy measurements when used with an EnergyMax series pyroelectric sensor.

LabMax majors on flexibility: the large LCD can be tilted from 0-60°, while the console itself can also be tilted on its kick-stand which provides for very flexible viewing. The meter is also compatible with all Coherent sensors, including PM- and LM-series thermopiles, OP- and LM-series photodiode sensors and EnergyMax and legacy DB25 pyroelectric heads. This allows users of existing Coherent and Moletron meters to upgrade.

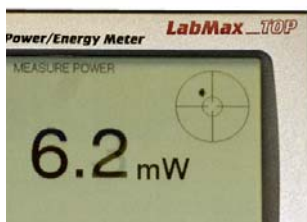
Pulsed laser measurements are another strong point for LabMax, with every pulse measured from single shot to 1kHz, and pulse sampling at up to 10kHz. Coherent's EnergyMax pyroelectric sensors are the perfect complement to LabMax and set new standards for accuracy (see article on next page).

For a meter so powerful, data storage and export becomes an important consideration. LabMax doesn't disappoint, with serial RS232 and USB interfaces as standard, an analogue output, on-board 32MB flash memory and the capability to log to a USB flash stick. A GPIB interface is available as an option on the LabMax TOP model. PC application software and a full library of LabView® drivers are provided for remote control of LabMax.

A stand-out feature available only on LabMax is a bull's-eye target that displays the beam's position and makes laser alignment so much simpler to perform. This facility is available in conjunction with Coherent's LM-series sensors that employ quadrant thermopiles. LabMax further exploits this with a selectable plot of beam position (XY) with time for beam pointing stability testing.



LabMax provides flexible viewing options



LabMax provides a bull's-eye target for beam position monitoring

LaserCheck – the Affordable, Pocket-Sized Laser Power Meter

LaserCheck™ is an affordable*, pocket-sized laser power meter for CW laser powers from 0.5µW to 1W, 400 to 1064nm. At higher powers, the silicon sensor is protected from saturation with a built-in optical attenuator, and all measurements are displayed on a 3-digit LCD screen. LaserCheck is microprocessor-controlled with wavelength correction, auto-ranging (µW or mW displayed), optical attenuator compensation, power overload warning and automatic shut-off. Delivery is ex-stock, Pro-Lite. (* £245 + VAT, ex-works)



Thermal & Photodiode Sensors for Power Measurements

Coherent's LM-2 & OP-2 photodiode sensors are designed for low power measurements in the range from 1nW to 50mW in the 250 – 1550nm band. The responsivity of a photodiode sensor varies greatly with wavelength, so the correct spectral calibration factor must be used. Photodiode sensors have a small aperture (<8mm) and a low damage threshold so cannot be used with high peak power pulsed lasers.



Coherent's PM and LM thermal sensors are much more rugged and are available with apertures up to 200mm. Measure from less than 0.1mW up to 10kW. Thermal sensors are less spectrally selective and can work from the UV to far infrared. Surface absorbing sensors are ideal for high average power CW lasers, whereas for intense, short pulsed lasers, a volume absorber provides the necessary high damage threshold (up to 5J/cm²). Uniquely, LM-series sensors employ quadrant thermopiles for beam positional analysis when used in conjunction with the LabMax meter.

EnergyMax Pyroelectric Sensors - Raising the Pulse of Energy Measurements

For those who ever wondered how accurate their laser energy meter was, the answer is probably "not very". Research conducted by Coherent has revealed that traditional pyroelectric sensors suffer from a variety of errors that can make your measurements deviate significantly with the repetition rate of the laser, the pulse duration, the average power and with temperature. Now, though, help is at hand with Coherent's new EnergyMax family of advanced energy sensors.



Coherent designed its new EnergyMax line of pyroelectric energy sensors to set new standards for linearity, damage threshold, extended dynamic range and broad spectral response. Accuracy has also been enhanced with lower noise electronics, improved detector coatings and new, state-of-the-art calibration facilities.

What does all this mean? Put simply, EnergyMax sensors give readings you can trust. We invite you to compare the accuracy of EnergyMax with that of your existing meter.

Energy linearity: +/- 3% over full dynamic range	Wavelength compensation error: +/- 2% or +/- 3%
Average power linearity: +/- 2% (+/- 1% typically)	Pulse width error: 0.5% (for pulses < 10µs)
Repetition rate linearity: +/- 1% (+/- 0.5% typically)	Noise equivalent energy: 30:1 (for most sensors)

EnergyMax sensors provide measurements with all laser types, from nJ to Joules, from 190nm to 12µm and from femtosecond to 860µs pulse duration. EnergyMax also provides superior damage resistance at up to 14J/cm² as well as higher repetition rate operation, from single shot up to 10kHz. When used in conjunction with the new LabMax meter, the energy from each pulse at 1kHz can be recorded.

Flexibility is assured through a wider dynamic range (measure over 4 decades using a single sensor), and the choice of three, large sensor areas (10, 25 & 50mm). On-board temperature compensation and user-attachable heat-sinks provide for reliable operation with higher average power lasers. Take confidence not only in the improved accuracy of EnergyMax but also from the extensive testing which Coherent undertook to ensure that shocks, vibration and humidity do not affect your readings.

EnergyMax detectors are available in four types which are optimised for different applications: general purpose; YAG & harmonics; high rep rate; and excimer. EnergyMax sensors are compatible with the latest Coherent readouts (FieldMaxII P, FieldMaxII TOP and LabMax TOP).



EnergyMax sensors are available in 10, 25 & 50mm sizes

Integrating Sphere Radiometers for Difficult to Measure Lasers

An integrating sphere radiometer provides a simple solution to measuring the output of large area or divergent sources, for example laser diode bars and arrays as well as fibre-coupled diodes. Integrating spheres provides accurate and repeatable measurements of a laser regardless of the beam size, divergence, direction and any dynamic beam displacement.

Pro-Lite supplies LPMS integrating sphere laser power meters from Labsphere. Depending upon the version, an LPMS radiometer is suitable for measuring laser powers from less than 1µW to hundreds of Watts in the range from 190-1800nm. Labsphere's tests have demonstrated that its LPM sphere design is insensitive to changes in laser beam pointing or divergence at up to +/- 40°.

LPMS radiometer systems are modular and comprise the following:

LPM Integrating Sphere: available in sizes from 50 to 150mm, the LPM sphere is insensitive to differences in beam direction and divergence over a wide range of angles and accommodates either two detectors or one detector and a fibre optic coupling to an Ocean Optics CCD spectrometer. An SMA fibre coupling is available as an option.

Photodetector: choose from silicon (190-1100nm), germanium (800-1800nm) or InGaAs (700-1700nm) photodiodes.

Radiometer: the SC-6000 displays the measured flux and features an ethernet port for performing automated test sequences.

Calibration: the LPMS radiometer is calibrated for spectral responsivity at user-defined wavelength(s) or across the full spectral range of the detector chosen. The calibration performed is traceable to NIST standards.

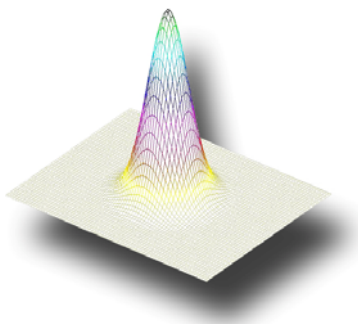


Top Hat or Tails? Our Laser Beam Analysers Can Profile Your Laser

Coherent offers a complete family of beam profilers that can precisely measure the intensity distribution, beam size and propagation factor (M^2) of your laser beam. The latest model in the family is the LaserCam HR which combines the speed and ease of use of a USB 2.0 computer interface with the power of the acclaimed BeamView Analyser PC beam diagnostic software.

LaserCam HR has recently received a number of upgrades. These include:

- BeamView 4.3 software now ships with a LabView® VI library
- TCP/IP & RS232 communications are now supported for remote control
- User-programmable trigger delay
- Images can be saved in a 16 bit standard PNG greyscale format
- Connect up to 8 LaserCam HR profilers to the same PC



The table below summarises the main features of the Coherent range of laser beam profilers.

Model	Type	Wavelength Range	Maximum Beam Size	Minimum Beam Size	Laser Type	
					CW	Pulsed
LaserCam HR	CMOS Camera-Based Profiler	300-1100nm	8.6 x 6.9mm	~200µm	•	•
Digital BeamView Analyser	CCD Camera-Based Profiler	190-1100nm	3.6 x 2.7mm 6.4 x 4.8mm	~200µm	•	•
Analogue BeamView Analyser	Camera-Based Profiler	190-1100nm 400-2200nm	8.8 x 6.6mm 12.5 x 9.4mm	~400µm	•	•
BeamMaster	Scanning Knife-Edge Profiler	190-1100nm 800-1800nm	9mm 5mm	~3µm	•	
ModeMaster™	M^2 Beam Propagation Analyser	220-680nm 340-1000nm 800-1800nm 1.8-15µm	Up to 12 or 25mm	0.2mm min beam size	•	

Are We On The Same Wavelength?

Coherent offer a range of instruments for measuring the wavelength or spectrum of your laser. The Coherent Laser Spectrum Analyser is a scanning Fabry-Perot interferometer which can examine the fine details of the line spectra of CW lasers, while the WaveMaster™ measures the wavelength of both CW and pulsed lasers of any repetition rate. WaveMate™ is the affordable option for wavelength measurement of pulsed and CW laser sources.



Model	Type	Wavelength Range	Resolution	Laser Type	
				CW	Pulsed
WaveMate™	Wavelength Meter	400-1000nm	0.1nm (0.01nm option)	•	•
WaveMaster™	Wavelength Meter	380-1095nm	0.001nm	•	•
Spectrum Analyser	Fabry-Perot Interferometer	275-1625nm	Free Spectral Range: 0.3, 1.5, 7.5, 30 GHz	•	

LabView is a registered trademark of National Instruments

iLiTES is published by:

Pro-Lite Technology LLP, Innovation Centre, University Way, Cranfield, MK43 0BT, United Kingdom
Tel: +44 (0) 1234 436110 Fax: +44 (0) 1234 436111 info@pro-lite.co.uk www.pro-lite.co.uk

Spectrometer Systems for Laser Analysis

Pro-Lite supplies CCD spectrometer systems from Ocean Optics. These can be configured for a wide variety of applications, including laser spectral analysis in the range from 200-2550nm. A popular configuration is based around the HR4000 optical bench. This can be user-configured at time of purchase to suit your particular needs.



Diffraction gratings can be chosen to match a particular spectral range. For example, the H6 grating with 1200 g/mm works over the 725-925nm range. If the spectrometer is equipped with a 5µm slit, the spectral resolution is 0.12nm. Higher resolution can be achieved using 1800 or 2400 g/m gratings, at the expense of spectral range.

The laser light is collected using an optical fibre. To decouple the spectrometer from any alignment sensitivity, a cosine diffuser is used at the input to the fibre. Alternatively, connect the fibre to a Labsphere integrating sphere that helps to attenuate the laser beam.

Please contact Pro-Lite for assistance in configuring your spectrometer.

At Your Service

Pro-Lite provides users of Coherent (LMC), Coherent (Auburn) and Moletron laser power & energy meters with prompt service, whether you need spares or repairs, or require your meter to be recalibrated.

Service is performed at a Coherent service centre either in Europe or the USA. Excluding transportation time, normal turnaround is within 6 working days of receipt. As the world's largest laser manufacturer, Coherent maintains the widest range of laser sources which means that we can offer calibrations at almost any wavelength and power level. Calibrations are performed using transfer standards that are traceable to national standardising laboratories.

To request service for your meter, call Pro-Lite and have the model and serial number(s) to hand.