



Optical Test and Calibration Ltd.

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Customer: [REDACTED]

Certificate No: [REDACTED]

* [REDACTED] *

Certificate of Calibration

Equipment Information

Make: [REDACTED]

Model: [REDACTED]

Description:

Serial No: [REDACTED]

Reference: [REDACTED]

Calibration Category

A01 In specification: no adjustment performed.

Comments

Calibration Information

This instrument was calibrated against laboratory standards which are either traceable to SI units (as realised by National or International Standards) or have been derived by approved ratio techniques. Any uncertainty quoted refers to the measured values only, with no account being taken of the ability of the instrument to maintain its calibration.

The calibration was performed in such a manner as to comply with the requirements of BS EN ISO 10012:2003 in accordance with our BS EN ISO 9001:2008 Registration. (Certificate Number FS 11427)

Temperature and Relative Humidity conditions are shown on the results sheet unless not relevant to the measurements performed.

Calibration results are held on file for a minimum period of 3 years and can be made available if required.

Calibrated by: [REDACTED]

Date of calibration: [REDACTED]

Approved: [REDACTED]

Re-calibration date: [REDACTED]

Date: [REDACTED]

CERTIFICATE OF CALIBRATION

Certificate Number
101976/AA

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Make: [REDACTED]
Model: [REDACTED]

Serial Number: [REDACTED] Ref: [REDACTED]

SPECTRAL RESPONSE MEASUREMENTS:

Measurements were performed as shown in the table below:

Laser Diode Wavelength (nm)	Fibre Type (um)	Connector Type: (Customer Supplied)	Nominal Power Level (dBm)	Unit Under Test Wavelength set (nm)	Unit Under Test Specification
850	50/125	FC/PC	-10	850	± 0.25 dB
630	200/240	FC/PC		630	± 0.25 dB
780	200/240	FC/PC		780	± 0.25 dB

The equipment was allowed to stabilise for at least 30 minutes before measurements were made. The meter was allowed to auto-range at all power levels. The optical power was determined by measuring the emission from a length of optical fibre, coupled to the laser diode source, by reference to sensors traceable to national standards in accordance with OTC calibration procedure(s) OPT39 & OPT39A. The ambient temperature and relative humidity (rh) during the calibration was 20 ± 2 °C and $53 \%rh \pm 10 \%rh$.

SPECTRAL RESPONSE RESULTS:

The sensor window was visually inspected and cleaned of any loose contamination using a light air duster prior to calibration. The sensor window condition on receipt was found to be satisfactory.

As received from customer:

	Wavelength	Applied Mean Reference Power	Mean Unit Under Test Indication	UUT Meter Error ¹	Expanded Uncertainty	UUT Meter Error ¹	Expanded Uncertainty	V_{eff}	Coverage Factor	Comment
	nm	dBm	dBm	%	%	dB	dB		k	
a	850	-10.021	-10.05	-0.67	4.00	-0.03	0.18	>10000	2.00	PASS
b										
c										
d										
e										
f										

As despatched after cleaning:

	Wavelength	Applied Mean Reference Power	Mean Unit Under Test Indication	UUT Meter Error ¹	Expanded Uncertainty	UUT Meter Error ¹	Expanded Uncertainty	V_{eff}	Coverage Factor	Comment
	nm	dBm	dBm	%	%	dB	dB		k	
a	850	-10.020	-10.05	-0.69	4.00	-0.03	0.18	>10000	2.00	PASS
b	630	-40.499	-40.47	0.67	6.00	0.03	0.27	>10000	2.00	PASS
c	780	-35.096	-35.07	0.60	6.00	0.03	0.27	>10000	2.00	PASS
d										
e										
f										

Notes:

1. A negative meter error denotes that the meter is indicating a lower power than the actual power. A positive meter error denotes that the meter is indicating a higher power than the actual power.
2. It is important to note that some power meters exhibit a non-linearity of response at power levels close to the range changes.
3. Measurement wavelengths quoted are "in air" values. Wavelength uncertainty ± 1 nm
4. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k . The value of k in each case is stated in the results table which for a t -distribution and V_{eff} (the effective degrees of freedom), provides a coverage probability of approximately 95 %.

These results are valid when the unit under test is used under similar conditions to those that applied during the calibration. No allowance has been made for subsequent ageing and the polarisation sensitivity and wavelength effects of the unit under test have not been considered in this calibration.

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LINEARITY MEASUREMENTS:

Measurements were performed as shown in the table below:

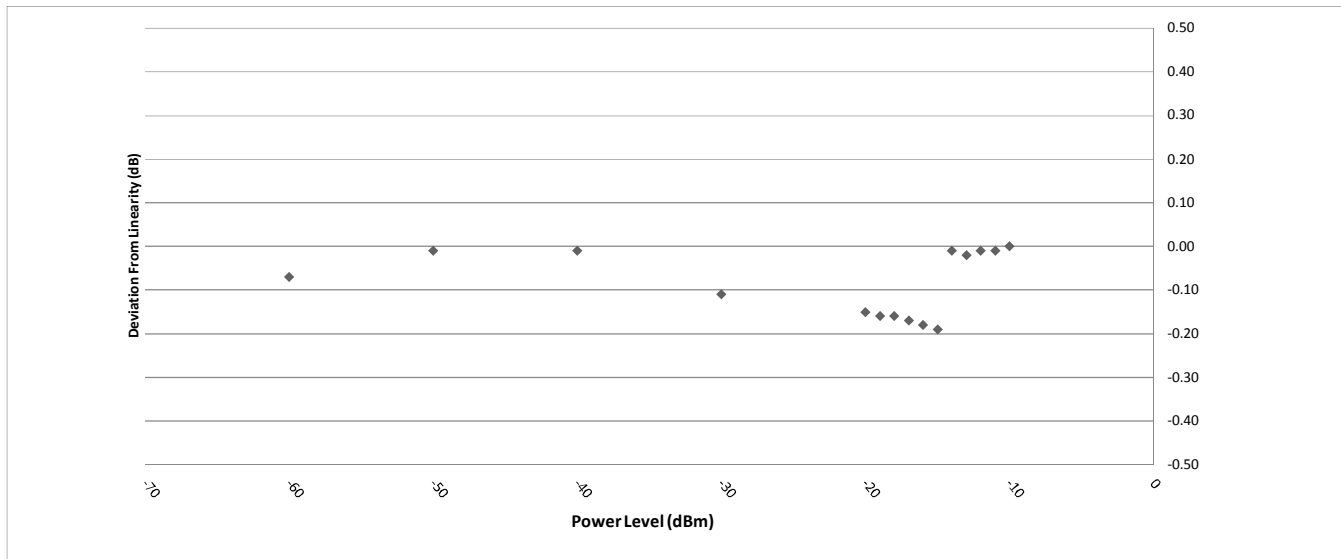
Laser Diode Wavelength (nm)	Fibre Type (um)	Connector Type: (Customer Supplied)	Measurement Range	Unit Under Test Wavelength set (nm)	Unit Under Test Specification
850	50/125	FC/PC	-10 dBm to -60 dBm	850	±0.1 dB over -3 dBm to -50 dBm ±0.5 dB over -50 dBm to -60 dBm

The optical power of -10 dBm was determined by measuring the emission from a length of optical fibre, coupled to the laser diode source, by reference to standards directly traceable to national standards. Measurements were then made over the specified range relative to the -10 dBm point.

LINEARITY RESULTS:

The table shows the deviation from a linear response of the meter with reference to the -10 dBm point. A negative dB deviation indicates the meter is indicating a higher relative power level when referenced to the -10 dBm point.

Nominal Power Level	Applied Mean Reference Power	Mean Unit Under Test Indication	Deviation From Linearity	% Deviation	Expanded Uncertainty	Expanded Uncertainty	V_{eff}	Coverage Factor	Comment
dBm	dBm	dBm	dB	%	+/- dB	+/- %		k	
-10	-9.985	-10.06	0.00	0.0	0.10	2.20	>10000	2.00	PASS
-11	-10.985	-11.05	-0.01	-0.2	0.10	2.20	>10000	2.00	PASS
-12	-11.994	-12.06	-0.01	-0.2	0.10	2.20	>10000	2.00	PASS
-13	-12.990	-13.05	-0.02	-0.5	0.10	2.20	>10000	2.00	PASS
-14	-13.998	-14.06	-0.01	-0.2	0.10	2.20	>10000	2.00	PASS
-15	-14.995	-14.88	-0.19	-4.5	0.10	2.20	>10000	2.00	PASS
-16	-15.992	-15.89	-0.18	-4.2	0.10	2.20	>10000	2.00	PASS
-17	-16.985	-16.89	-0.17	-4.0	0.10	2.20	>10000	2.00	PASS
-18	-17.986	-17.90	-0.16	-3.8	0.10	2.20	>10000	2.00	PASS
-19	-18.975	-18.89	-0.16	-3.8	0.10	2.20	>10000	2.00	PASS
-20	-19.978	-19.90	-0.15	-3.5	0.10	2.20	>10000	2.00	PASS
-30	-29.988	-29.95	-0.11	-2.6	0.10	2.20	>10000	2.00	PASS
-40	-39.986	-40.05	-0.01	-0.2	0.10	2.20	>10000	2.00	PASS
-50	-49.961	-50.03	-0.01	-0.2	0.10	2.20	>10000	2.00	PASS
-60	-59.988	-59.99	-0.07	-1.6	0.10	2.20	>10000	2.00	PASS



Equipment Used: CAL916,983,866,604,604D,449,449A,449B,090,627,048

CAL CAT: A01 In specification: no adjustment performed.

Calibrated By:

Date:

CERTIFICATE OF CALIBRATION

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Functional Tests:

During the calibration this unit was powered by Alkaline Batteries

<u>Battery Tests:</u>	<u>Condition:</u>	
Battery Type	2 x AA Alkaline	
Battery Voltage on Receipt	1.48 + 1.48	Volts
New Battery Fitted	NO	
New Battery Voltage		
Charge Function	N/A	

<u>Power Meter Functional Tests:</u>	<u>Condition:</u>	
Zero Function	N/A	
dB Rel Function	SATIS	
Calibration Factors	N/A	
Maths Function	N/A	
Internal Calibration Date Changed	N/A	