OM2210 Coherent Receiver Calibration Source

OM2210 Data Sheet

Features & Benefits

- Measure Key Performance Parameters for Coherent Receivers such as Quadrature Phase Angle, Path Gains, and Channel Skew
- Obtain Calibration Data over Wavelength for Use in Calibrated Optical Field Measurements
- Calibrate Any Sufficiently Stable Coherent Receiver to Make it Capable of Optical Field Measurements
- Measure Receiver Hybrid Parameters at Any Heterodyne Frequency within the Oscilloscope Bandwidth
- Measure Optical Hybrid Properties in Higher-level Receiver Modules

Tunable Laser Features*[1]

- Full C-band and/or L-band Tunable Continuous Wave Laser
- Integrated Wavelength Locker to Support 50 GHz ITU Wavelength Grid
- Settable Grid Down to 10 GHz
- Off-grid Tuning for Custom Wavelength Applications
- User-adjustable Transmit Power Output (+6 to +14.5 dBm) and Wavelength Adjustment During Operation
- Supports Advanced Features for DWDM Networks such as SBS Dither and TxTrace Tone
- Designed and Verified as RoHS Compliant
- Class 1M Laser Safety Product
- IEC/UL 60950-1 Safety Certified

Applications

- Calibration of Coherent Receiver Front-end Characteristics for Use in Calibrated Optical Signal Measurements
- Integrated Dual Polarization Intradyne Coherent Receiver Frequency-domain Characterization
- Tunable Lasers for Design and Manufacturing Test of 2.5, 10, 40, 100 Gb/s Optical Networking Equipment, including the following:
  - Multi-Service Provisioning Platform (MSSP)
  - Cross Connects
  - Optical Switches
  - Optical Add/Drop Multiplexers
  - Dense Wavelength Division Multiplex (DWDM) Terminals
  - Other Wavelength Division Multiplex (WDM) Metro System Equipment

*[1] The OM2210 can be configured with up to 2 tunable lasers. Order the OM2012 if only the tunable laser source is desired.

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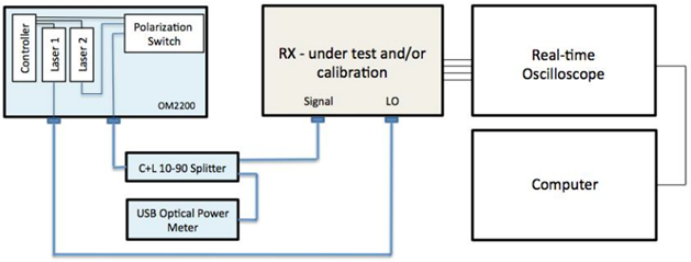

Figure 1 – OM2210 Coherent Receiver Calibration Source includes the materials and software needed for receiver calibration.

To measure coherent optical modulation using a minimum of assumptions about the transmitter, it is necessary to measure and correct for any imperfections in the coherent receiver. The OM2210 uses two independent free-running lasers and a precision polarization switch to excite the coherent receiver with a known-polarization signal so that the receiver's linear transfer function (optical electric field to voltage matrix) can be extracted. The lasers can be tuned across an entire band to obtain measurements vs. channel frequency. The results are plotted and saved in .MAT format. Configuration information is stored in an SQL database.

OM2210 Parameter Measurements

Measurement Typical Uncertainty Note:

- Channel Skew 0.5 ps between any 4 channels
- Crosstalk –40 dB Min measurable between any pair of the 4 channels
- Quadrature phase error 0.2 degrees between quadrature channels
- Optical phase 0.4 degrees between polarization channels
- Path gains 0.1 dB relative gains between channels

The lasers used in the OM2210 and OM2012 products integrate a cooled External-cavity Diode Laser (ECDL). The ECDL uses a thermally tuned etalon filter to achieve single-mode operation at selectable wavelengths. The tunable laser has no moving parts and shares many design elements of standard Distributed Feedback Lasers (DFB).

The tunable laser has low Relative Intensity Noise (RIN), a high Side-mode Suppression Ratio (SMSR), a narrow linewidth, and accurate wavelengths over typical operating conditions. The product complies with the stringent requirements of 300-pin Multisource Agreement (MSA) transponders and discrete line cards.

The following operating specifications were used in the design of the tunable laser:

- ITU-T G.692
- Telcordia GR-253
- Telcordia GR-63 CORE NEBS
- Telcordia GR-468 CORE

Characteristics

OM2210 and OM2012 Tunable Laser Optical Specifications*2

Parameter	Symbol	Min.	Typ.	Max.	Unit
Optical Output Power Adjustment Range (BOL set points)	PcwBOL	+7	—	+13.5	dBm
Optical Power Accuracy EOL	PsEOL	—	—	±1	dB
Optical Output Power Step Size	—	—	.01	—	dB
LsDisable Optical Output Power	—	—	—	–45	dBm
Operating Frequency Range (50 GHz channel spacing on ITU grid)	v (C-band)	196.25	—	191.50	THz
	v (L-band)	190.95	—	186.35	nm
Operating Wavelength Range (50 GHz channel spacing on ITU grid)	λ (C-band)	1527.60	—	1565.50	nm
	λ (L-band)	1570.01	—	1608.76	nm
Wavelength Accuracy EOL*3	Δλacc	—	—	±2.5	GHz
Linewidth [FWHM (–3 dB), instantaneous]	Δλ	—	—	100	kHz
Side Mode Suppression Ratio	SMSR	40	55	—	dB
RIN for 13 dBm Output Power*4	RIN13	—	—	–145	dB/Hz
RIN for 7 dBm Output Power*4	RIN7	—	—	–140	dB/Hz
Back Reflection	Rb	—	—	–14	dB
Optical Isolation	—	30	—	—	dB
Polarization Extinction Ratio (Unconnectorized)	Er, p	20	—	—	dB
SSER	SSER	40	55	—	dB
Time to Frequency and Power Lock (Warm start)*5	t1	—	15	25	sec
Time to Frequency and Power Lock (Cold start)	t2	—	—	60	sec
Time to Light from LsEnable (Warm start)	—	—	—	10	sec

*2 Specifications are for case operating temperature = –5 to 75 °C and over operating wavelength range.

*3 Measured from center with path to ±10 pm.

*4 RIN is specified for 10 MHz to 40 GHz.

*5 Maximum time for high-power version: 30 seconds.

Additional Requirements

All hardware needed for coherent receiver calibration is provided with the OM2210 with the following exceptions:
1) Either the OM4000 Series OMA or OM1106 Software is required.
2) The computer is not included. See the OM4000 Series data sheet for computer requirements.
3) The oscilloscope is not provided. The software is compatible with many oscilloscopes. Check for compatibility at time of order. The minimum requirements include: >10 GS/s per channel, >2.5 GHz bandwidth per channel, 4 channels, LAN connection.
4) The DUT is not provided. The DUT must be a dual-polarization intradyne receiver. If the outputs are differential, only 4 may be measured at one time.

Operating Specifications

The OM2012 Tunable Laser is designed for metro and long-haul DWDM applications at 50 GHz grid spacing and below. The performance of the laser allows high-performance, extended transmission distances depending on the modulation, optical amplifier noise figure and amplifier spacing, dispersion map, and other link design factors.

Environmental

Characteristic	Description
Temperature	
Operating	+10 to +35 °C
Storage	–20 to +70 °C, noncondensing humidity
Humidity	15% to 80% relative humidity, noncondensing
Power Requirements	100/115/230 V AC, ~50 to 60 Hz, 1 power cable, max. 100 VA

Calibration and Warranty

Characteristic	Description
Calibration Interval	1 year

CAUTION

This device is a Class 1M laser product for use only under the recommended operating conditions and ratings specified in the data sheet. Use of controls or adjustments or performance of procedures other than those specified in the data sheet may result in hazardous radiation exposure.

Invisible laser radiation – Do not view the laser output from this device directly with optical instruments.

This device complies with 21CFR1040.10 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

Ordering Information

OM2210

Coherent Receiver Calibration Source. Contains the laser source(s), polarization switch, optical power meter, power splitter, hardware control drivers, and calibration software needed for optical receiver characterization. It is used together with the OM4000 or OM1106 products to provide calibrated optical signal measurements.

OM2012

Tunable Laser Source. May be ordered if only the laser sources are required without the polarization switch or calibration software.

OM2210 Coherent Receiver Calibration Source or OM2012 Tunable Laser Source require choice of laser configuration options.

Options

Option	Description
OM2210	
C	1 C-band laser, polarization switch
L	1 L-band laser, polarization switch
CC	2 C-band lasers, plus polarization switch
LL	2 L-band lasers, plus polarization switch
CL	Coupled C- and L-band lasers, plus polarization switch
NL	No laser, C+L polarization switch only
OM2012	
CC	2 C-band lasers
LL	2 L-band lasers
CL	Coupled C- and L-band lasers

User Manual Options

Option	Description
Opt. L0	English manual

Power Plug Options

Option	Description
Opt. A0	US plug, 115 V, 60 Hz
Opt. A1	Universal Euro plug, 220 V, 50 Hz
Opt. A2	UK plug, 240 V, 50 Hz
Opt. A3	Australian plug, 240 V, 50 Hz
Opt. A5	Swiss plug, 220 V, 50 Hz
Opt. A6	Japanese plug, 100 V, 110/120 V, 60 Hz
Opt. A10	China plug, 50 Hz
Opt. A11	India plug, 50 Hz
Opt. A12	Brazilian plug, 60 Hz

Service Options

Option	Description
Opt. C3	Calibration Service 3 Years
Opt. C5	Calibration Service 5 Years
Opt. D1	Calibration Data Report
Opt. D3	Calibration Data Report 3 Years (with Opt. C3)
Opt. D5	Calibration Data Report 5 Years (with Opt. C5)
Opt. R3	Repair Service 3 Years (including warranty)
Opt. R5	Repair Service 5 Years (including warranty)
Opt. R3DW	Repair Service Coverage 3 Years (includes product warranty period). 3-year period starts at time of customer instrument purchase. This option is available if the instrument is within product warranty. It is not available once instrument exits warranty period
Opt. R5DW	Repair Service Coverage 5 Years (includes product warranty period). 5-year period starts at time of customer instrument purchase. This option is available if the instrument is within product warranty. It is not available once instrument exits warranty period

CE

Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

GPIB IEEE-488

Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

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