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DATA SHEET

8160xA Family of Tunable Laser Sources

Introduction

The Keysight Technologies 8160xA Family of Tunable Laser Sources offers the full wavelength range from 1240 nm to 1650 nm. All 8160xA TLS are modules for the Keysight 8164B Lightwave Measurement System mainframe, providing a wide choice of configurations.

Investing in the Keysight 8160xA TLS family can realize the cost efficiency and performance required for volume testing of components for coarse and dense wave-length division multiplexing (DWDM, CWDM), and passive optical networks (PON).



Modular Solution

The Keysight 8160xA TLS modules fit into the bottom slot of the 8164B mainframe. The 8164B mainframe hosts up to four additional, small form factor modules, such as optical power meters, optical switches, optical attenuators or return loss meters.

KEYSIGHT TECHNOLOGIES

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Fast Two-Way Sweeps and High Power with Low SSE

The Keysight 81606A top-line TLS has been designed to reach a new accuracy level and to increase test efficiency with faster wavelength-dependency measurements and lower cost of ownership. Automated adjustment of wavelength-selective devices is accelerated with the new two-way sweep mode at up to 200 nm/s with sub-picometer repeatability and best-in-class accuracy. The output power above +12 dBm at the product family's lowest spontaneous emission level enables the validation of extremely deep filters and parallel measurements of multiple devices.

Through a major redesign, the 81606A reaches:

- 15 dB more dynamic range through high signal power at lowest spontaneous emission, enabled by the new cavity and laser module design.
- A 4-fold improvement in absolute accuracy with increased real-time tracking speed and resolution, enabled by the novel wavelength reference unit.
- Faster sweeps at up to 200 nm/s in both directions without impacting the specified dynamic accuracy, enabled by enhanced feedback controls and drive mechanics.

The new value and basic line models share the 81606A's new design with low spontaneous emission and narrow line width, its industry-leading power repeatability and long-term stability. The new modules offer additional price-performance options based on output power, tuning speed, wavelength accuracy and repeatability. Whether you need to verify the design of demanding optical components or adjust more wavelength-selective switches per hour, or you simply need a stable, tunable optical source, the 8160xA family of tunable lasers offers a suitable model.

Keysight 8160xA Family of Tunable Laser Sources

The Keysight 8160xA TLS modules fit into the bottom back-loadable slot of the Keysight 8164B Lightwave Measurement System mainframe. The 81606A, 81607A and 81608A have continuous-sweep functionality, scanning the wavelength at a fixed rate while triggering wavelength logging and external devices at a chosen interval. All the models, including the 81609A, support stepped sweeps, during which the wavelength successively advances by a chosen interval and dwells at each step for a desired duration before the next step.

The Keysight 81606A top-line tunable laser source

The 81606A, features up to 200 nm tuning range at an outstanding dynamic wavelength accuracy and repeatability. The combination of highest swept-wavelength accuracy and high-power low-SSE signal make this the best fit for measuring DWDM and other high-performance devices, especially when splitting the power to multiple devices for efficient parallel measurements.

The Keysight 81607A, 81608A value-line tunable laser sources

The 81607A value line TLS complements the top line 81606A model at a moderately reduced output power. With a typical wavelength repeatability of ±1 pm even during two-way sweeps with up to 200 nm/s, it is ideal for economical DWDM device test and adjustment when the higher power is not needed.

The 81608A, another member of the value line TLS, offers a peak output power of more than +12 dBm, at least 75 dB/nm above its SSE level. The 81608A features a typical wavelength repeatability of ±1.5 pm at two-way sweeps up to 200 nm/s. The laser's balance of features, performance and price makes it suitable for both, coherent transmission experiments and cost-effective manufacturing-floor component testing, especially for CWDM and other wider-band devices.

The Keysight 81609A basic-line step-tunable laser source

The 81609A basic line module can step within 300 milliseconds, for short steps, with a resolution of 0.1 pm and a typical wavelength repeatability of ±3 pm, making it ideal for cost-effective testing of broadband optical devices. Like the other modules in the family, it delivers more than +12 dBm peak output power with low spontaneous emission levels. At ±0.01 dB power stability over an hour, it can also serve as a widely tunable, static local oscillator for receiver testing or as input to optical modulators, including the Keysight N437x Lightwave Component Analyzers, supported by the standard PMF output.

Improved O-band models for silicon photonics and data center applications

The 8160xA option 113 covers the wavelength range from 1240 nm to 1380 nm for an important set of applications. Equipped with PMF output fiber, these are a good match for testing and developing components with silicon photonics technology. Verifying the spectral responsivity and the sensitivity of receiver optical subassemblies (ROSA) benefit from more than +10 dBm output power - enough to allow for external modulation in BER testing. Combined with very low SSE levels, Option 113 is ideal for testing wavelength filters for O-band CWDM components, such as for 100G and 400G Ethernet standards.

The 81602A option 013 employs a different cavity design to reach an optical power level of over +18 dBm. The high output power helps compensate for the coupling loss of optical surface probes or the insertion loss of external modulators during the verification of integrated photonic designs. This allows testing photonic devices at relevant signal levels and wavelengths. With a tuning range of 1250 nm to 1370 nm, the laser addresses the latest Silicon Photonics research. For specifications, please refer to the 81602A technical data sheet, publication number 5992-1472EN.

New E-band model for CWDM8 component testing

The new 8160xA option 114 covers the wavelength range from 1340 nm to 1495 nm. Combined with the other options, this allows measurements over all CWDM channels, such as for CWDM8 devices. Components for Raman amplification also use this wavelength range.

Realize the cost efficiency and performance benefits in WDM component tests

The testing of optical filters and multiplexers is based on a generic principle, namely the stimulus-response test. The state-of-the-art approach uses a tunable laser source that is capable of fast and precise sweeps across the entire wavelength range with one or more optical power meters to simultaneously measure all output ports of the component.

For DWDM components, high wavelength accuracy and dynamic range are critical. For CWDM and PON components, a wide wavelength range, dynamic range and tight costing are key targets. If the investment in the test solution can be shared among many different types of filters, the contribution to each individual filter is minimized. In this way, cost targets for CWDM and PON components can be met without sacrificing accuracy.

Investing in the Keysight 8160xx TLS family can realize both the cost efficiency and performance benefits required.

Integrated solutions for swept-wavelength spectral measurements

The 8160xA family is supported with the N7700 photonic application suite (PAS) for spectral measurements of insertion loss, polarization dependent loss and polarization mode dispersion in combination with Keysight power meters and polarization instruments. These provide optimal measurement performance and quick time-to-measurement by simplifying system integration. The PAS software has a measurement engine for IL and PDL that can combine the sweeps of up to 3 tunable laser wavelength ranges. See the N7700 brochure for details. www.keysight.com/find/n7700

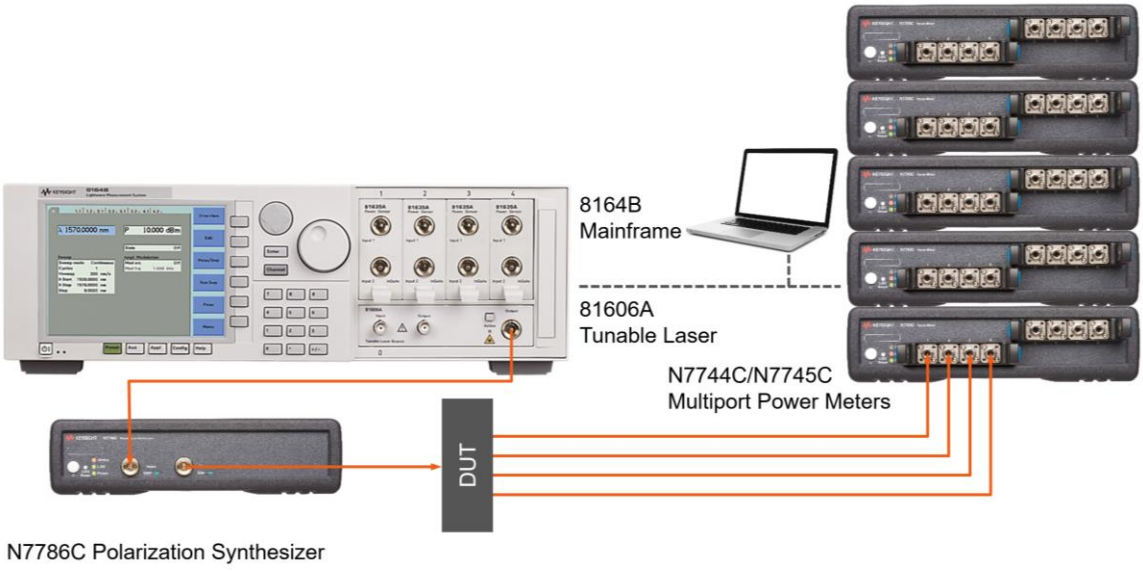


Figure 1. Test setup for swept-wavelength, IL/PDL measurements of a demultiplexer

Low SSE output for high dynamic range

A laser signal with low source spontaneous emission (SSE) is required for accurate crosstalk measurement of DWDM, CWDM and PON wavelength filtering components by producing light only at the desired wavelength. The 81606A features a single optical output with more than +12 dBm output power. It combines the highest power level with the lowest SSE level in the 8160xx product family, 80 dB/nm below the signal. The 81607A comes with +8 dBm peak output power, 81608A and 81609A with more than +12 dBm, 75 dB/nm above their spontaneous emission level. The excellent low-SSE performance of better than 80 dB/nm signal-to-source spontaneous emission ratio (signal-to-SSE ratio) and the high signal power permit measurements of wavelength isolation to 100 dB, most often limited only by power meter sensitivity.

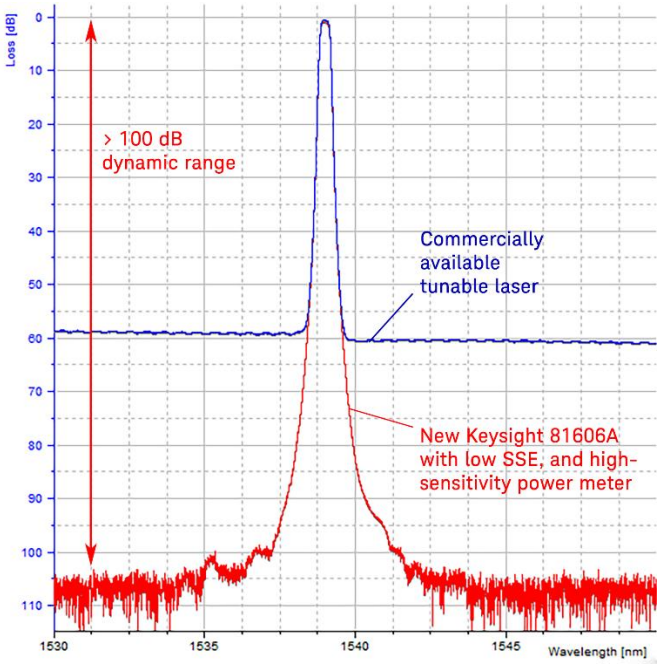


Figure 2. Crosstalk of a 50 GHz DWDM filter, measured with the N7747A high-sensitivity power meter

For all 8160xA modules, the output power can be adjusted between the maximum power and 0 dBm (81602A: 6 dBm min.). Such adjustment can be used to optimize the dynamic range of a measurement by matching the signal range output from the device under test to the best-fitting power range of the optical power meter.

Built-in wavelength meter for optimum tuning precision

The Keysight 8160xA TLS family includes a built-in real-time wavelength meter, used to set and stabilize the wavelength and provide wavelength logging data for the steps of continuous sweeps.

The 81606A takes this concept even further by adding a gas cell for long-term stability and absolute referencing. The wavelength reference unit's faster response and finer wavelength resolution enable the 81606A to sweep with sub-picometer repeatability. It is the key to the 81606A's superior accuracy and temperature stability and enables a greater degree of self-diagnosis than previously possible. The 81607A, 81608A and 81609A share the 81606A's long-term stability due to the built-in gas cell, yet mark different performance levels with respect to wavelength accuracy and repeatability.

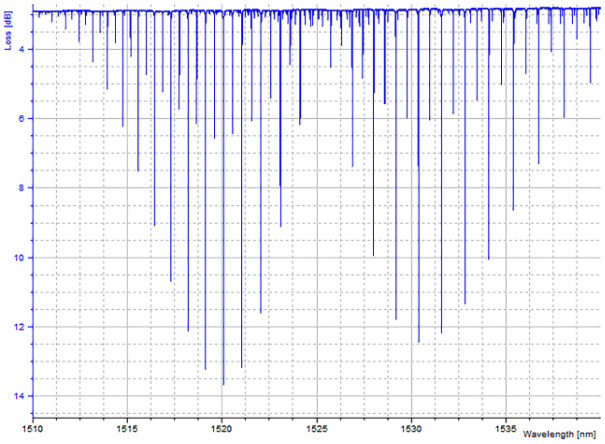


Figure 3. Absorption lines of a C_2H_2 gas cell acquired at 200 nm/s sweep speed with the 81606A tunable laser.

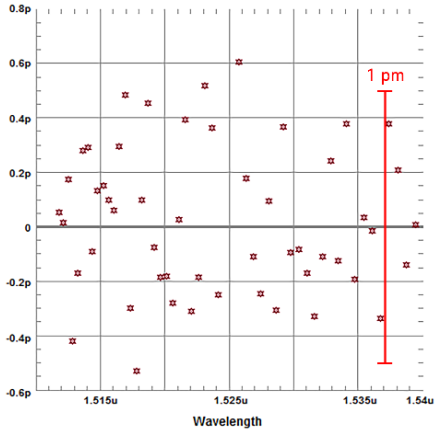


Figure 4. Less than ± 1 pm deviation of the measured center wavelengths from the known values according to NIST.

Specified performance in the continuous sweep mode

As manufacturing yield expectations becomes more and more stringent, it is important that all instruments deliver optimum performance under all measurement conditions.

The Keysight 81606A, 81607A and 81608A can perform two-way sweeps with up to 200 nm/s. The dynamic specifications for swept operation apply in both directions. The new Keysight 81609A Basic Line module tunes in wavelength steps of 0.1 pm resolution.

Polarization maintaining fiber for the test of integrated optical devices

The standard PMF output port provides a well-defined state of polarization. Using PM fiber to wafer probes can be used ensure constant input polarization to wafer and waveguide devices. Such a connection is also required to most optical modulators or devices requiring a local oscillator signal. Using a PMF connection to following instruments, like to a polarization controller can also help stabilize the setup. In all these cases, the starting point is PMF at the source.

Purge gas and dry air connector

The high selectivity of the laser cavity of the 8160xA family makes it possible to detect water molecules in the atmosphere. If measurements are carried out in wavelength areas with a high density of water absorption lines, such as 1350 nm to 1420 nm, it is recommended to operate the laser in dry air or nitrogen. This eliminates the influence of the atmosphere on the laser's wavelength accuracy and repeatability. An optional dry air connector (part number 81606-64100) can be mounted to the rear plate of the laser module.

Certified Quality

The 8160xA TLS are produced to the ISO 9001 international quality system standard as part of Keysight's commitment to continually increasing customer satisfaction through improved quality control.

Specifications describe the instrument's warranted performance. They are verified at the end of a 2-meter-long patch cord and are valid after warm-up, and for the stated output power and wavelength ranges.

Every instrument is delivered with a commercial certificate of calibration and a detailed test report.

Specifications

Describe guaranteed product performance that is valid under stated conditions. The confidence level is 95%, as recommended by the ISO standard.

Typical values and supplementary performance characteristics

Describe product performance that is usually met but not guaranteed. Because of the modular nature of the instrument, these performance specifications apply to these modules rather than the mainframe unit.

For further details on specifications, refer to Chapter 3 in the Keysight 8160xA Series Tunable Laser Family User's Guide (publication number 81606-90B01).

8160xA Family of Tunable Lasers, Wavelength Options

Wavelength range	81606A, 81608A, 81609A	81607A
	1240 nm to 1380 nm (Option 113) 1340 nm to 1495 nm (Option 114) 1490 nm to 1640 nm (Option 116) 1440 nm to 1640 nm (Option 215) 1450 nm to 1650 nm (Option 216)	1490 nm to 1640 nm (Option 116)
Maximum output power	**81606A, 81608A, 81609A Option 113**	**81607A Option 116**
	> +13 dBm peak [1] > +11 dBm (1290 nm – 1340 nm) > +10 dBm (1260 nm – 1360 nm) > +5 dBm (1240 nm – 1380 nm)	> +8 dBm peak [1] > +7 dBm (1515 nm – 1620 nm) > +4 dBm (1490 nm – 1640 nm)
Maximum output power	**81606A, 81608A, 81609A Option 114**	**81606A, 81608A, 81609A Option 116**
	> +12 dBm peak [1] > +11 dBm (1410 nm – 1470 nm) > +8 dBm (1370 nm – 1490 nm) > +5 dBm (1340 nm – 1495 nm)	> +12 dBm peak [1] > +11 dBm (1515 nm – 1620 nm) > +8 dBm (1490 nm – 1640 nm)
Maximum output power	**81606A, 81608A, 81609A Option 216**	
	> +12 dBm peak [1] > +11 dBm (1515 nm – 1620 nm) > +9 dBm (1480 nm – 1630 nm) > +5 dBm (1450 nm – 1650 nm)	
Minimum output power setting	**81606A, 81607A, 81608A, 81609A**	
	0 dBm	

Wavelength Tuning and Spectral Performance

Wavelength tuning	81606A, 81607A, 81608A	81609A
Wavelength resolution	0.1 pm (17.5 MHz at 1310 nm, 14.3 MHz at 1450 nm, 12.5 MHz at 1550 nm)	
Continuous tuning range	Full wavelength range, mode-hop free	
Tuning time (characteristic) [1]	300 ms (1 nm step, max. output power) 1.5 s (100 nm step, max. output power)	
Continuous sweep range	Full wavelength range [6 7], continuous power during sweep	not applicable
Max. sweep speed	200 nm/s, bidirectional	not applicable

Spectral performance	81606A	81607A	81608A, 81609A
Side-mode suppression ratio (SMSR) (typical) [2, 8]	≥ 70 dB [3] ≥ 60 dB [4]	≥ 65 dB [3] ≥ 55 dB [4]	≥ 70 dB [3] ≥ 60 dB [4]
Relative intensity noise (RIN) (typical, 0.1 to 6 GHz) [2, 3]	< -150 dB/Hz	< -135 dB/Hz	< -150 dB/Hz
Signal to source spontaneous emission ratio [2, 5]	≥ 80 dB/nm ≥ 90 dB/0.1 nm	≥ 75 dB/nm ≥ 85 dB/0.1 nm	≥ 75 dB/nm ≥ 85 dB/0.1 nm
Signal to total source spontaneous emission ratio [2, 5]	≥ 75 dB	≥ 70 dB	≥ 70 dB
Linewidth (typical), coherence control off	< 10 kHz	< 10 kHz	< 10 kHz
Effective linewidth (typical), coherence control on [2, 3]	not applicable	not applicable	> 50 MHz

1. Including power stabilization. When “step finished” trigger is received.
2. At maximum output power.
3. 1290 nm – 1340 nm (Option 113), 1410 nm – 1470 nm (Option 114), 1515 nm – 1620 nm (Options 116, 216).
4. 1250 nm – 1380 nm (Option 113), full wavelength range (Options 114, 116, 216)
5. 1320 nm – 1350 nm (Option 113), 1410 nm – 1460 nm (Option 114), 1520 nm – 1580 nm (Options 116, 216).
6. Full wavelength range for sweep speeds ≤ 50 nm/s.
   Full wavelength range reduced by 0.5 nm on both ends for 80 nm/s sweep speed.
   Full wavelength range reduced by 3 nm on both ends for sweep speeds ≥ 100 nm/s and ≤ 150 nm/s.
   Full wavelength range reduced by 5 nm on both ends for ≥ 160 nm/s sweep speed.
7. Mode-hop free tunable across the full wavelength range, except:
   Stop wavelength below 1345 nm (Option 113).
   Start wavelength above 1420 nm (Option 114).
8. Measures the impact of side-modes on RIN. Contributions from upper and lower side-modes cancel partially

81606A Tunable Laser Source, Top Line, High Power with Low SSE

Wavelength accuracy	Stepped mode	Continuous sweep mode, both directions (typical) [3 4]
Absolute wavelength accuracy [1]	± 2 pm typical ± 1.5 pm	± 1.5 pm
Relative wavelength accuracy [1]	± 1.5 pm typical ± 1 pm	± 1 pm
Wavelength repeatability	± 0.5 pm typical ± 0.2 pm	± 0.3 pm
Wavelength stability [2]	≤ ± 0.5 pm, 24 hours (typical)	not applicable
Power repeatability (typical)	± 0.002 dB	not applicable
Power stability [2]	± 0.01 dB, 1 hour typical ± 0.025 dB, 24 hours	not applicable
Power linearity	± 0.05 dB	not applicable
Power flatness versus wavelength	± 0.25 dB typical ± 0.1 dB, Options 116, 216 typical ± 0.15 dB, Options 113, 114	not applicable
Dynamic power reproducibility	not applicable	± 0.01 dB
Dynamic relative power flatness	not applicable	± 0.02 dB [5]

1. Valid for 24 hours and within ± 5 K temperature range after wavelength zeroing.
2. At constant temperature ± 1 K.
3. Full wavelength range for sweep speeds ≤ 50 nm/s.
   Full wavelength range reduced by 0.5 nm on both ends for 80 nm/s sweep speed.
   Full wavelength range reduced by 3 nm on both ends for sweep speeds ≥ 100 nm/s and ≤ 150 nm/s.
   Full wavelength range reduced by 5 nm on both ends for ≥ 160 nm/s sweep speed.
4. Mode-hop free tunable across the full wavelength range, except:
   Stop wavelength below 1345 nm (Option 113).
   Start wavelength above 1420 nm (Option 114).
5. Add ± 0.01 dB for sweep speeds > 80 nm/s.

81607A Tunable Laser Source, Value Line, Low SSE

Wavelength accuracy	Stepped mode	Continuous sweep mode, both directions (typical) [3] [4]
Absolute wavelength accuracy [1]	± 5 pm typical ± 3 pm	± 3 pm
Relative wavelength accuracy [1]	± 3 pm typical ± 2 pm	± 2 pm
Wavelength repeatability	± 1.5 pm typical ± 1 pm	± 1 pm
Wavelength stability [2]	≤ ± 1 pm, 24 hours (typical)	not applicable
Power repeatability (typical)	± 0.005 dB	not applicable
Power stability [2]	± 0.01 dB, 1 hour typical ± 0.025 dB, 24 hours	not applicable
Power linearity	± 0.05 dB	not applicable
Power flatness versus wavelength	± 0.25 dB typical ± 0.1 dB	not applicable
Dynamic power reproducibility	not applicable	± 0.01 dB
Dynamic relative power flatness	not applicable	± 0.02 dB [5]

1. Valid for 24 hours and within ± 5 K temperature range after wavelength zeroing.
2. At constant temperature ± 1 K.
3. Full wavelength range for sweep speeds ≤ 50 nm/s.
   Full wavelength range reduced by 0.5 nm on both ends for 80 nm/s sweep speed.
   Full wavelength range reduced by 3 nm on both ends for sweep speeds ≥ 100 nm/s and ≤ 150 nm/s.
   Full wavelength range reduced by 5 nm on both ends for ≥ 160 nm/s sweep speed.
4. Mode-hop free tunable across the full wavelength range.
5. Add ± 0.01 dB for sweep speeds > 80 nm/s.

81608A Tunable Laser Source, Value Line, High Power with Low SSE

Wavelength accuracy	Stepped mode	Continuous sweep mode, both directions (typical) [3] [4]
Absolute wavelength accuracy [1]	± 20 pm typical ± 5 pm	± 10 pm
Relative wavelength accuracy [1]	± 10 pm typical ± 3 pm	± 5 pm
Wavelength repeatability	± 2.5 pm typical ± 1 pm	± 1.5 pm
Wavelength stability [2]	≤ ± 2.5 pm, 24 hours (typical)	not applicable
Power repeatability (typical)	± 0.01 dB	not applicable
Power stability [2]	± 0.01 dB, 1 hour typical ± 0.03 dB, 24 hours	not applicable
Power linearity	± 0.1 dB	not applicable
Power flatness versus wavelength	± 0.25 dB typical ± 0.1 dB, Options 116, 216 typical ± 0.15 dB, Options 113, 114	not applicable
Dynamic power reproducibility	not applicable	± 0.01 dB
Dynamic relative power flatness	not applicable	± 0.02 dB [5]

1. Valid for 24 hours and within ± 5 K temperature range after wavelength zeroing.
2. At constant temperature ± 1 K.
3. Full wavelength range for sweep speeds ≤ 50 nm/s.
   Full wavelength range reduced by 0.5 nm on both ends for 80 nm/s sweep speed.
   Full wavelength range reduced by 3 nm on both ends for sweep speeds ≥ 100 nm/s and ≤ 150 nm/s.
   Full wavelength range reduced by 5 nm on both ends for ≥ 160 nm/s sweep speed.
4. Mode-hop free tunable across the full wavelength range, except:
   Stop wavelength below 1345 nm (Option 113).
   Start wavelength above 1420 nm (Option 114).
5. Add ± 0.01 dB for sweep speeds > 80 nm/s.

81609A Step-Tunable Laser Source, Basic Line, High Power with Low SSE

Wavelength accuracy	
Absolute wavelength accuracy [1]	± 30 pm; typical ± 10 pm
Relative wavelength accuracy [1]	± 15 pm; typical ± 5 pm
Wavelength repeatability	± 5 pm; typical ± 3 pm
Wavelength stability [2]	≤ ± 5 pm, 24 hours (typical)
Power repeatability (typical)	± 0.01 dB
Power stability [2]	± 0.01 dB, 1 hour typical ± 0.03 dB, 24 hours
Power linearity	± 0.1 dB
Power flatness versus wavelength	± 0.25 dB typical ± 0.1 dB, Options 116, 216 typical ± 0.15 dB, Options 113, 114

1. Valid for 24 hours and within ± 5 K temperature range after wavelength zeroing.
2. At constant temperature ± 1 K.

Specification Conditions

Environmental conditions	
Storage temperature	–40 °C to +70 °C
Operating temperature	+10 °C to +35 °C
Humidity	< 80% R.H. at +10 °C to +35 °C, non-condensing
Specifications apply for wavelengths not equal to any water absorption line. Note: if the laser is operated in a dry box filled with dry air or nitrogen, specifications also apply at water absorption lines.	
All specifications are typical at wavelengths < 1250 nm	
Warm-up time	60 minutes; immediate operation after boot-up; 30 minutes if previously stored at the same temperature.
Sweep speed	**Continuous sweep range (81606A, 81607A, 81608A)**
≤ 50 nm/s	Full wavelength range
80 nm/s	Full wavelength range reduced by 0.5 nm on both ends
≥ 100 nm/s and ≤ 150 nm/s	Full wavelength range reduced by 3 nm on both ends
≥ 160 nm/s	Full wavelength range reduced by 5 nm on both ends

Supplementary Performance Characteristics

External wavelength locking	81606A
Modulation depth	> ± 70 pm at 10 Hz > ± 7 pm at 100 Hz
Modulation input	± 5 V
Coherence control	**81608A, 81609A**
For measurements on components with 2 m long patch cords and connectors with 14 dB return loss, the effective linewidth results in a typical power stability of < ± 0.025 dB over 1 minute by significantly reducing interference effects in the test setup. Available at max. output power, for wavelength range 1290 nm – 1340 nm (Option 113), 1420 nm – 1470 nm (Option 114), 1515 nm – 1620 nm (Options 116, 216).	
Output isolation	**81606A, 81607A, 81608A, 81609A**
	Built-in optical isolator

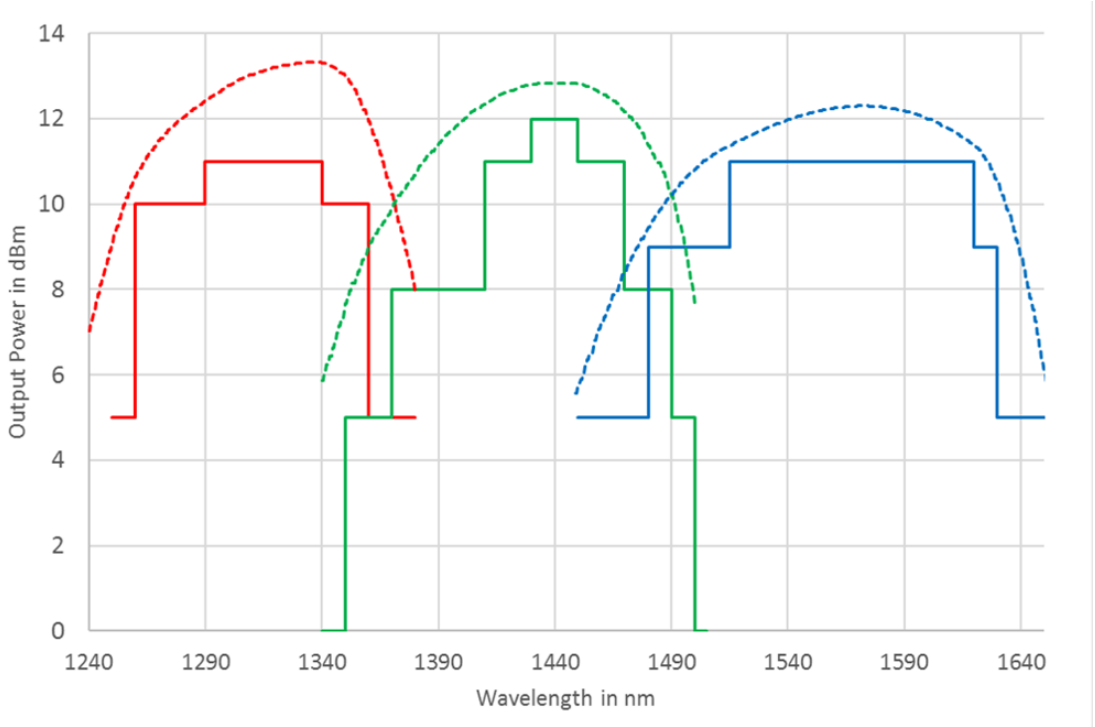


Figure 5. Wavelength coverage of options 113 (red), 114 (green) and 216 (blue).
Typical maximum output power (dotted line) vs. specified output power (solid lines)

General Specifications

Return loss	81606A, 81607A, 81608A, 81609A
Return loss, typical	60 dB
Optical connector	**81606A, 81607A, 81608A, 81609A**
	All modules come with PMF, angled contact output connector
Polarization maintaining fiber	**81606A, 81607A, 81608A, 81609A**
Fiber type	Panda
Orientation	Electrical field is oriented in slow axis, in line with the connector key
Polarization extinction ratio	16 dB typical
Re-calibration	
Recommended re-calibration period	2 years
Laser safety information	
All laser sources specified by this data sheet are classified as Class 1M according to IEC 60825-1 (2014).	
All laser sources comply with 21 CFR 1040.10 except for deviations pursuant to Laser Notice No. 50, dated 2007, June 24. 	

Ordering Information

Tunable laser module: 81606A top-line, ±1.5 pm typical wavelength accuracy (choose one of the following)	
81606A-113	Tunable laser source 1240 nm to 1380 nm, top-line, high power with lowest SSE
81606A-114	Tunable laser source 1340 nm to 1495 nm, top-line, high power with lowest SSE
81606A-116	Tunable laser source 1490 nm to 1640 nm, top-line, high power with lowest SSE
81606A-216	Tunable laser source 1450 nm to 1650 nm, top-line, high power with lowest SSE
Tunable laser module: 81607A value line, ±3 pm typical wavelength accuracy (choose one of the following)	
81607A-116	Tunable laser source 1490 nm to 1640 nm, value line, low SSE
Tunable laser module: 81608A value line, ±5 pm typical wavelength accuracy (choose one of the following)	
81608A-113	Tunable laser source 1240 nm to 1380 nm, value line, high power with low SSE
81608A-114	Tunable laser source 1340 nm to 1495 nm, value line, high power with low SSE
81608A-116	Tunable laser source 1490 nm to 1640 nm, value line, high power with low SSE
81608A-216	Tunable laser source 1450 nm to 1650 nm, value line, high power with low SSE
Tunable laser module: 81609A basic line, ±10 pm typical wavelength accuracy (choose one of the following)	
81609A-113	Step-tunable laser source 1240 nm to 1380 nm, basic line, high power with low SSE
81609A-114	Step-tunable laser source 1340 nm to 1495 nm, basic line, high power with low SSE
81609A-116	Step-tunable laser source 1490 nm to 1640 nm, basic line, high power with low SSE
81609A-216	Step-tunable laser source 1450 nm to 1650 nm, basic line, high power with low SSE

Tunable laser module: 81602A top line, +18 dBm peak power, ±1.5 pm typical wavelength accuracy	
81602A-013 [1]	Extra high power tunable laser source 1250 nm to 1370 nm, top line
Custom-made tunable laser	
Additional wavelength ranges or higher output power are available on request. Please contact your local Keysight Sales Office.	
Required Accessories	
Mainframe compatibility	One 8164B Lightwave Measurement System mainframe is required per tunable laser module
Connector interface	One Keysight 81000xI-series connector interface is required per tunable laser module
Recommended Accessories	
81606-64100	Dry air connector for 8160xA tunable laser modules

1. For specifications, please refer to the 81602A technical data sheet (publication number 5992-1472EN).

Learn more at: www.keysight.com

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