



# Agilent 81600B Tunable Laser Source Family

Data Sheet

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The Agilent 81600B Tunable Laser Source Family offers the full wavelength range from 1260 nm to 1640 nm with no wavelength gaps. This provides test instrumentation with maximum flexibility.

Investing in the Agilent 81600B Tunable Laser Source Family can realize the cost efficiency and performance required to test components for coarse and dense wavelength division multiplexing (CWDM, DWDM) and passive optical networks (PON).



## Agilent 81600B Tunable Laser Source Family

The Agilent 81600B Tunable Laser Source Family consists of seven modules that fit into the bottom slot of the Agilent 8164B Lightwave Solution Mainframe.

The 81600B Option 200 and 201 All-band Tunable Laser Sources are the flagship models, featuring the widest tuning range of 200 nm, respectively 185 nm, with a single laser and a 70 dB/nm signal-to-source spontaneous emission ratio (signal-to-SSE ratio). The excellent low-SSE performance typically allows crosstalk measurements of better than 70 dB/nm signal-to-source spontaneous emission ratio (signal-to-SSE ratio). This and the high signal power permit measurements of wavelength isolation to 100 dB, most often limited by power meter sensitivity.

### Full wavelength range from 1260 nm to 1640 nm

The Agilent 81600B Tunable Laser Source Family offers the full wavelength range from 1260 nm to 1640 nm with no wavelength gaps. The N7700A software suite has a measurement engine for IL and PDL that can combine the sweeps of up to 3 tunable laser wavelength ranges. Such a setup can be used for testing CWDM multiplexers.

### O-band models for the latest applications

The 81600B options 130 and 132 cover the wavelength range from 1260 nm to 1375 nm for an important set of applications. With the PMF output fiber, these are a good match for testing and developing components with silicon photonics technology. And especially with low-SSE, the Option 130 is the best tool for testing wavelength filters for LR4 components.

## Integrated solutions for swept-wavelength spectral measurements

The 81600B is supported with the N7700A software suite for spectral measurements of insertion loss, polarization dependent loss and dispersion in combination with power meters and polarization instruments. These provide optimal swept-wavelength accuracy dynamic range. See the N7700A brochure for details.

### Low SSE output port for high dynamic range

The 81600B option 201, 200, 160, 150, 140 and 130 Tunable Laser Sources are equipped with two optical outputs.

The low-SSE output port of the dual-output models delivers a signal with ultra-low source spontaneous emission. It enables accurate crosstalk measurement of DWDM, CWDM and PON wavelength filtering components by producing light only at the desired wavelength.

The second output port provides high optical power, adjustable over a power range of more than 60 dB via a built-in optical attenuator.

### High power output for multipurpose component tests

The Agilent 81600B Options 142 and 132 provide one output port with high stimulus power for applications where the SSE level is not critical.

The 81600B Option 142 can also be equipped with a built-in optical attenuator, so providing an adjustable power range of 60 dB.

### Built-in wavelength meter for optimum tuning precision

The Agilent 81600B Tunable Laser Source Family includes a built-in real time wavelength meter which realizes an absolute wavelength accuracy of  $\pm 10$  pm (typical  $\pm 3.6$  pm) as a stand-alone instrument.

## 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 Agilent 81600B Tunable Laser Source Family can sweep as fast as 80 nm/s with specified accuracy during the sweep.

### Realize the cost efficiency and performance benefits in WDM component tests

The testing of optical filters is based on a generic principle, namely the stimulus-response test. The state-of-the-art approach is a wavelength-resolved stimulus-response measurement utilizing a tunable laser source that is capable of fast and precise sweeps across the entire wavelength range, and optical power meters.

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 type 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 Agilent 81600B Tunable Laser Source Family can realize both the cost efficiency and performance benefits required.

### Polarization maintaining fiber for the test of integrated optical devices

The 81600B Tunable Laser Source Family is ideal for characterizing integrated optical devices. Its PMF output ports provide a well-defined state of polarization to ensure constant measurement conditions for waveguide devices. A PMF cable easily connects to an external optical modulator.

# 81600B Option 201 All-Band Tunable Laser, 1455 nm to 1640 nm, Low SSE

## 81600B Option 200 All-Band Tunable Laser, 1440 nm to 1640 nm, Low SSE

Agilent 81600B Option 201, 200				
Wavelength range	1455 nm to 1640 nm (81600B Option 201) 1440 nm to 1640 nm (81600B Option 200)			
Wavelength resolution	0.1 pm, 12.5 MHz at 1550 nm			
Mode-hop free tunability	Full wavelength range; see page 10 for conditions to assure mode-hop free continuous sweeps			
Maximum sweep speed	80 nm/s			
	<b>Stepped mode</b>	<b>Continuous sweep mode (typical)</b>		
		At 5 nm/s	At 40 nm/s	At 80 nm/s
Absolute wavelength accuracy <sup>1</sup>	± 10 pm, typical ± 3.6 pm	± 4.0 pm	± 4.6 pm	± 6.1 pm
Relative wavelength accuracy <sup>1</sup>	± 5 pm, typical ± 2 pm	± 2.4 pm	± 2.8 pm	± 4.0 pm
Wavelength repeatability	± 0.8 pm, typical ± 0.5 pm	± 0.3 pm	± 0.4 pm	± 0.7 pm
Wavelength stability <sup>4</sup> (typical)	≤ ± 1 pm, 24 hours			
Linewidth (typical), coherence control off	100 kHz			
Effective linewidth (typical), coherence control on	> 50 MHz (1475 nm to 1625 nm, at max. constant output power)			
Maximum output power (continuous power during sweep)	<b>Output 1 (low SSE)</b>	<b>Output 2 (high power)</b>		
	≥ +3 dBm peak (typical)	≥ +9 dBm peak (typical)		
	≥ +2 dBm (1520 nm to 1610 nm)	≥ +8 dBm (1520 nm to 1610 nm)		
	≥ -2 dBm (1475 nm to 1625 nm)	≥ +4 dBm (1475 nm to 1625 nm)		
	≥ -7 dBm <sup>5</sup>	≥ -1 dBm <sup>5</sup>		
Attenuation		Max. 60 dB		
Power repeatability (typical)	± 0.003 dB			
Power stability <sup>4</sup>	± 0.01 dB, 1 hour Typical ± 0.03 dB, 24 hours			
Power linearity	± 0.1 dB	± 0.1 dB (± 0.3 dB in attenuation mode)		
Power flatness versus wavelength	± 0.25 dB <sup>3</sup> , typical ± 0.1 dB	± 0.3 dB <sup>3</sup> , typical ± 0.15 dB		
	<b>Continuous sweep mode</b>			
	At 5 nm/s	At 40 nm/s	At 80 nm/s	
Dynamic power reproducibility (typical)	± 0.005 dB	± 0.01 dB	± 0.015 dB	
Dynamic relative power flatness (typical)	± 0.01 dB	± 0.02 dB	± 0.04 dB	
Side-mode suppression ratio (typical)	≥ 60 dB (1520 nm to 1610 nm)			
Signal to source spontaneous emission ratio <sup>2</sup>	<b>Output 1 (low SSE)</b>	<b>Output 2 (high power)</b>		
	≥ 70 dB/nm (1520 nm to 1610 nm)	≥ 48 dB/nm (1520 nm to 1610 nm)		
	≥ 80 dB/0.1 nm (typical, 1520 nm to 1610 nm)	≥ 58 dB/0.1 nm (typical, 1520 nm to 1610 nm)		
	≥ 66 dB/nm (typical, 1475 nm to 1625 nm)	≥ 43 dB/nm (1475 nm to 1625 nm)		
	≥ 60 dB/nm (typical) <sup>5</sup>	≥ 37 dB/nm <sup>5</sup>		
Signal to total source spontaneous emission ratio <sup>2</sup>	≥ 65 dB (1520 nm to 1610 nm)	≥ 30 dB (typical, 1520 nm to 1610 nm)		
	≥ 57 dB (typical) <sup>5</sup>			
Relative intensity noise (RIN) (0.1 to 6 GHz) (typ.) <sup>2</sup>	-145 dB/Hz (1520 nm to 1610 nm)			

1. Valid for one month and within a ± 4.4 K temperature range after automatic wavelength zeroing.
2. At maximum output power as specified per wavelength range.
3. Wavelength range 1455 nm to 1640 nm (81600B Option 201); 1440 nm to 1630 nm (81600B Option 200).
4. At constant temperature ± 1 K.
5. Wavelength range 1455 nm to 1640 nm (81600B Option 201); 1440 nm to 1640 nm (81600B Option 200).

# 81600B Option 160 Tunable Laser Source, 1495 nm to 1640 nm, Low SSE

Agilent 81600B Option 160				
Wavelength range	1495 nm to 1640 nm			
Wavelength resolution	0.1 pm, 12.5 MHz at 1550 nm			
Mode-hop free tunability full	Full wavelength range; see page 10 for conditions to assure mode-hop free continuous sweeps			
Maximum sweep speed	80 nm/s			
	<b>Stepped mode</b>	<b>Continuous sweep mode (typical)</b>		
		At 5 nm/s	At 40 nm/s	At 80 nm/s
Absolute wavelength accuracy <sup>1</sup>	± 10 pm, typical ± 3.6 pm	± 4.0 pm	± 4.6 pm	± 6.1 pm
Relative wavelength accuracy <sup>1</sup>	± 5 pm, typical ± 2 pm	± 2.4 pm	± 2.8 pm	± 4.0 pm
Wavelength repeatability	± 0.8 pm, typical ± 0.5 pm	± 0.3 pm	± 0.4 pm	± 0.7 pm
Wavelength stability <sup>3</sup> (typical)	≤ ± 1 pm, 24 hours			
Linewidth (typical), coherence control off	100 kHz			
Effective linewidth (typical), coherence control on	> 50 MHz (1510 nm to 1620 nm, at max. constant output power)			
Maximum output power (continuous power during sweep)	<b>Output 1 (low SSE)</b>	<b>Output 2 (high power)</b>		
	≥ -2 dBm peak (typical)	≥ +7 dBm peak (typical)		
	≥ -4 dBm (1520 nm to 1610 nm)	≥ +5 dBm (1520 nm to 1610 nm)		
	≥ -6 dBm (1510 nm to 1620 nm)	≥ +3 dBm (1510 nm to 1620 nm)		
	≥ -7 dBm (1495 nm to 1640 nm)	≥ -1 dBm (1495 nm to 1640 nm)		
Attenuation	Max. 60 dB			
Power repeatability (typical)	± 0.003 dB			
Power stability <sup>3</sup>	± 0.01 dB, 1 hour Typical ± 0.03 dB, 24 hours			
Power linearity	± 0.1 dB	± 0.1 dB (± 0.3 dB in attenuation mode)		
Power flatness versus wavelength	± 0.25 dB, typical ± 0.1 dB (1495 nm to 1630 nm)	± 0.3 dB, typical ± 0.15 dB		
	<b>Continuous sweep mode</b>			
	At 5 nm/s	At 40 nm/s	At 80 nm/s	
Dynamic power reproducibility (typical)	± 0.005 dB	± 0.01 dB	± 0.015 dB	
Dynamic relative power flatness (typical)	± 0.01 dB	± 0.02 dB	± 0.04 dB	
Side-mode suppression ratio (typical) <sup>2</sup>	≥ 40 dB (1520 nm to 1610 nm)			
Signal to source spontaneous emission ratio <sup>2</sup>	<b>Output 1 (low SSE)</b>	<b>Output 2 (high power)</b>		
	≥ 64 dB/nm (1520 nm to 1610 nm)	≥ 45 dB/nm (1520 nm to 1610 nm)		
	≥ 74 dB/0.1 nm (typical, 1520 nm to 1610 nm)	≥ 55 dB/0.1 nm (typical, 1520 nm to 1610 nm)		
	≥ 62 dB/nm (typical, 1510 nm to 1620 nm)	≥ 42 dB/nm (1510 nm to 1620 nm)		
	≥ 59 dB/nm (typical, 1495 nm to 1640 nm)	≥ 37 dB/nm (1495 nm to 1640 nm)		
Signal to total source spontaneous emission ratio <sup>2</sup>	≥ 59 dB (1520 nm to 1610 nm)	≥ 27 dB (typical, 1520 nm to 1610 nm)		
	≥ 56 dB (typical, 1495 nm to 1640 nm)			
Relative intensity noise (RIN) (0.1 to 6 GHz) (typical) <sup>2</sup>	-145 dB/Hz (1520 nm to 1610 nm)			

1. Valid for one month and within a ± 4.4 K temperature range after automatic wavelength zeroing.

2. At maximum output power as specified per wavelength range.

3. At constant temperature ± 1 K.

# 81600B Option 150 Tunable Laser Source, 1450 nm to 1590 nm, Low SSE

Agilent 81600B Option 150				
Wavelength range	1450 nm to 1590 nm			
Wavelength resolution	Wavelength resolution 0.1 pm, 12.5 MHz at 1550 nm			
Mode-hop free tunability	Full wavelength range; see page 10 for conditions to assure mode-hop free continuous sweeps			
Maximum sweep speed	80 nm/s			
	<b>Stepped mode</b>	<b>Continuous sweep mode (typical)</b>		
		At 5 nm/s	At 40 nm/s	At 80 nm/s
Absolute wavelength accuracy <sup>1</sup>	± 10 pm, typical ± 3.6 pm	± 4.0 pm	± 4.6 pm	± 6.1 pm
Relative wavelength accuracy <sup>1</sup>	± 5 pm, typical ± 2 pm	± 2.4 pm	± 2.8 pm	± 4.0 pm
Wavelength repeatability	± 0.8 pm, typical ± 0.5 pm	± 0.3 pm	± 0.4 pm	± 0.7 pm
Wavelength stability <sup>3</sup> (typical)	≤ ± 1 pm, 24 hours			
Linewidth (typical), coherence control off	100 kHz			
Effective linewidth (typical), coherence control on	> 50 MHz (1480 nm to 1580 nm, at max. constant output power)			
Maximum output power (continuous power during sweep)	<b>Output 1 (low SSE)</b>	<b>Output 2 (high power)</b>		
	≥ -1 dBm peak (typical)	≥ +7 dBm peak (typical)		
	≥ -3 dBm (1520 nm to 1570 nm)	≥ +5 dBm (1520 nm to 1570 nm)		
	≥ -6 dBm (1480 nm to 1580 nm)	≥ +4 dBm (1480 nm to 1580 nm)		
	≥ -7 dBm (1450 nm to 1590 nm)	≥ -1 dBm (1450 nm to 1590 nm)		
Attenuation	Max 60 dB			
Power repeatability (typical)	± 0.003 dB			
Power stability <sup>3</sup>	± 0.01 dB, 1 hour Typical ± 0.03 dB, 24 hours			
Power linearity	± 0.1 dB		± 0.1 dB (± 0.3 dB in attenuation mode)	
Power flatness versus wavelength	± 0.2 dB, typical ± 0.1 dB		± 0.3 dB, typical ± 0.15 dB	
	<b>Continuous sweep mode</b>			
	At 5 nm/s	At 40 nm/s	At 80 nm/s	
Dynamic power reproducibility (typical)	± 0.005 dB	± 0.01 dB	± 0.015 dB	
Dynamic relative power flatness (typical)	± 0.01 dB	± 0.02 dB	± 0.04 dB	
Side-mode suppression ratio (typical) <sup>2</sup>	≥ 40 dB (1480 nm to 1580 nm)			
Signal to source spontaneous emission ratio <sup>2</sup>	<b>Output 1 (low SSE)</b>	<b>Output 2 (high power)</b>		
	≥ 65 dB/nm (1520 nm to 1570 nm)	≥ 45 dB/nm (1520 nm to 1570 nm)		
	≥ 75 dB/0.1 nm (typical, 1520 nm to 1570 nm)	≥ 55 dB/0.1 nm (typical, 1520 nm to 1570 nm)		
	≥ 61 dB/nm (typical, 1480 nm to 1580 nm)	≥ 42 dB/nm (1480 nm to 1580 nm)		
	≥ 59 dB/nm (typical, 1450 nm to 1590 nm)	≥ 37 dB/nm (1450 nm to 1590 nm)		
Signal to total source spontaneous emission ratio <sup>2</sup>	≥ 60 dB (1520 nm to 1570 nm)	≥ 30 dB (typical, 1520 nm to 1570 nm)		
	≥ 50 dB (typical, 1450 nm to 1590 nm)			
Relative intensity noise (RIN) (0.1 to 6 GHz) (typical) <sup>2</sup>	-145 dB/Hz (1480 nm to 1580 nm)			

1. Valid for one month and within a ± 4.4 K temperature range after automatic wavelength zeroing.

2. At maximum output power as specified per wavelength range.

3. At constant temperature ± 1 K.

# 81600B Option 140 Tunable Laser Source, 1370 nm to 1495 nm, Low SSE

Agilent 81600B Option 140				
Wavelength range	1370 nm to 1495 nm			
Wavelength resolution	0.1 pm, 15 MHz at 1450 nm			
Mode-hop free tunability full	Full wavelength range; see page 10 for conditions to assure mode-hop free continuous sweeps			
Maximum sweep speed	80 nm/s (1372 nm to 1495 nm)			
	<b>Stepped mode</b>	<b>Continuous sweep mode (typical)</b>		
		At 5 nm/s	At 40 nm/s	At 80 nm/s
Absolute wavelength accuracy <sup>1</sup>	± 10 pm, typical ± 3.6 pm	± 4.0 pm	± 4.6 pm	± 6.1 pm
Relative wavelength accuracy <sup>1</sup>	± 5 pm, typical ± 2 pm	± 2.4 pm	± 2.8 pm	± 4.0 pm
Wavelength repeatability	± 0.8 pm, typical ± 0.5 pm	± 0.3 pm	± 0.4 pm	± 0.7 pm
Wavelength stability <sup>4</sup> (typical)	≤ ± 1 pm, 24 hours			
Linewidth (typical), coherence control off	100 kHz			
Effective linewidth (typical), coherence control on	> 50 MHz (1430 nm to 1480 nm, at max. constant output power)			
Maximum output power (continuous power during sweep)	<b>Output 1 (low SSE)</b>	<b>Output 2 (high power)</b>		
	≥ -4.5 dBm peak (typical)	≥ +5.5 dBm peak (typical)		
	≥ -5 dBm (1430 nm to 1480 nm)	≥ +5 dBm (1430 nm to 1480 nm)		
	≥ -7 dBm (1420 nm to 1480 nm)	≥ +3 dBm (1420 nm to 1480 nm)		
	≥ -13 dBm (1370 nm to 1495 nm)	≥ -3 dBm (1370 nm to 1495 nm)		
Attenuation	Max 60 dB			
Power repeatability (typical)	± 0.003 dB			
Power stability <sup>4</sup>	± 0.01 dB, 1 hour (1420 nm to 1495 nm)			
	Typical ± 0.01 dB, 1 hour (1370 nm to 1420 nm)			
	Typical ± 0.03 dB, 24 hours			
Power linearity	± 0.1 dB (1420 nm to 1495 nm)		± 0.3 dB (1420 nm to 1495 nm)	
	Typical ± 0.1 dB (1370 nm to 1420 nm)		Typical ± 0.3 dB (1370 nm to 1420 nm)	
Power flatness versus wavelength	± 0.2 dB		± 0.3 dB	
	Typical ± 0.1 dB (1420 nm to 1495 nm)		Typical ± 0.2 dB (1420 nm to 1495 nm)	
	Typical ± 0.2 dB (1370 nm to 1420 nm)		Typical ± 0.3 dB (1370 nm to 1420 nm)	
	<b>Continuous sweep mode <sup>3</sup></b>			
	At 5 nm/s	At 40 nm/s	At 80 nm/s	
Dynamic power reproducibility (typical)	± 0.005 dB	± 0.01 dB	± 0.015 dB	
Dynamic relative power flatness (typical)	± 0.01 dB	± 0.015 dB	± 0.03 dB	
Side-mode suppression ratio (typical) <sup>2</sup>	≥ 40 dB (1430 nm to 1480 nm)			
Signal to source spontaneous emission ratio <sup>2</sup>	<b>Output 1 (low SSE)</b>	<b>Output 2 (high power)</b>		
	≥ 63 dB/nm (1430 nm to 1480 nm)	≥ 42 dB/nm (1430 nm to 1480 nm)		
	≥ 73 dB/0.1 nm (typical, 1430 nm to 1480 nm)	≥ 52 dB/0.1 nm (typical, 1430 nm to 1480 nm)		
	≥ 61 dB/nm (1420 nm to 1480 nm)	≥ 40 dB/nm (1420 nm to 1480 nm)		
	≥ 55 dB/nm (typical, 1370 nm to 1495 nm)	≥ 35 dB/nm (typical, 1370 nm to 1495 nm)		
Signal to total source spontaneous emission ratio <sup>2</sup>	≥ 60 dB (1430 nm to 1480 nm)		≥ 28 dB (typical, 1430 nm to 1480 nm)	
	≥ 58 dB (1420 nm to 1480 nm)			
	≥ 53 dB (typical, 1370 nm to 1495 nm)			
Relative intensity noise (RIN) (0.1 to 6 GHz) (typical) <sup>2</sup>	-145 dB/Hz (1430 nm to 1480 nm)			

1. Valid for one month and within a ± 4.4 K temperature range after automatic wavelength zeroing.
2. At maximum output power as specified per wavelength range.
3. Valid for absolute humidity of 11.5 g/m<sup>3</sup> (For example, equivalent to 50% relative humidity at 25 °C).
4. At constant temperature ± 1 K.

# 81600B Option 130 Tunable Laser Source, 1260 nm to 1375 nm, Low SSE

Agilent 81600B Option 130				
Wavelength range	1260 nm to 1375 nm			
Wavelength resolution	0.1 pm, 17.7 MHz at 1300 nm			
Mode-hop free tunability	Full wavelength range; see page 10 for conditions to assure mode-hop free continuous sweeps			
Maximum sweep speed	80 nm/s			
	<b>Stepped mode</b>	<b>Continuous sweep mode (typical)</b>		
		At 5 nm/s	At 40 nm/s	At 80 nm/s
Absolute wavelength accuracy <sup>1</sup>	± 10 pm, typical ± 3.6 pm	± 4.0 pm	± 4.6 pm	± 6.1 pm
Relative wavelength accuracy <sup>1</sup>	± 5 pm, typical ± 2 pm	± 2.4 pm	± 2.8 pm	± 4.0 pm
Wavelength repeatability	± 0.8 pm, typical ± 0.5 pm	± 0.3 pm	± 0.4 pm	± 0.7 pm
Wavelength stability <sup>4</sup> (typical)	≤ ±1 pm, 24 hours			
Linewidth (typical), coherence control off	100 kHz			
Effective linewidth (typical), coherence control on	> 50 MHz (1270 nm to 1350 nm, at max. constant output power)			
Maximum output power (continuous power during sweep)	<b>Output 1 (low SSE)</b>	<b>Output 2 (high power)</b>		
	≥ -4 dBm peak (typical)	≥ +5 dBm peak (typical)		
	≥ -6 dBm (1290 nm to 1370 nm)	≥ +4 dBm (1290 nm to 1370 nm)		
	≥ -9 dBm (1270 nm to 1375 nm)	≥ +1 dBm (1270 nm to 1375 nm)		
	≥ -13 dBm (1260 nm to 1375 nm)	≥ -3 dBm (1260 nm to 1375 nm)		
Attenuation	Max 60 dB			
Power repeatability (typical)	± 0.003 dB			
Power stability <sup>4</sup>	± 0.01 dB, 1 hour (1260 nm to 1350 nm) Typical ± 0.01 dB, 1 hour (1350 nm to 1375 nm) Typical ± 0.03 dB, 24 hours			
Power linearity	± 0.1 dB (1260 nm to 1350 nm) Typical ± 0.1 dB (1350 nm to 1375 nm)	±0.3 dB (1260 nm to 1350 nm) Typical ± 0.3 dB (1350 nm to 1375 nm)		
Power flatness versus wavelength	± 0.2 dB Typical ± 0.1 dB (1260 nm to 1350 nm) Typical ± 0.2 dB (1350 nm to 1375 nm)	± 0.3 dB Typical ± 0.15 dB (1260 nm to 1350 nm) Typical ± 0.3 dB (1350 nm to 1375 nm)		
	<b>Continuous sweep mode <sup>3</sup></b>			
	At 5 nm/s	At 40 nm/s	At 80 nm/s	
Dynamic power reproducibility (typical)	± 0.005 dB	± 0.01 dB	± 0.015 dB	
Dynamic relative power flatness (typical)	± 0.01 dB	± 0.02 dB	± 0.04 dB	
Side-mode suppression ratio (typical) <sup>2</sup>	≥ 40 dB (1290 nm to 1370 nm)			
Signal to source spontaneous emission ratio (typical) <sup>2</sup>	<b>Output 1 (low SSE)</b>	<b>Output 2 (high power)</b>		
	≥ 63 dB/nm (1290 nm to 1370 nm)	≥ 42 dB/nm (1290 nm to 1370 nm)		
	≥ 61 dB/nm (1270 nm to 1375 nm)	≥ 40 dB/nm (1270 nm to 1375 nm)		
	≥ 55 dB/nm (1260 nm to 1375 nm)	≥ 35 dB/nm (1260 nm to 1375 nm)		
Signal to total source spontaneous emission ratio (typical) <sup>2</sup>	≥ 58 dB (1290 nm to 1370 nm) ≥ 56 dB (1270 nm to 1375 nm) ≥ 51 dB (1260 nm to 1375 nm)	≥ 26 dB (1290 nm to 1370 nm)		
Relative intensity noise (RIN) (0.1 to 6 GHz) (typical) <sup>2</sup>	-140 dB/Hz (1270 nm to 1375 nm)			

1. Valid for one month and within a ± 4.4 K temperature range after automatic wavelength zeroing.
2. At maximum output power as specified per wavelength range.
3. Valid for absolute humidity of 11.5 g/m<sup>3</sup> (For example, equivalent to 50% relative humidity at 25 °C).
4. At constant temperature ± 1 K.



# 81600B Option 142 Tunable Laser Source, 1370 nm to 1495 nm, High Power

Agilent 81600B Option 142				
Wavelength range	1370 nm to 1495 nm			
Wavelength resolution	0.1 pm, 15 MHz at 1450 nm			
Mode-hop free tunability	Full wavelength range; see page 10 for conditions to assure mode-hop free continuous sweeps			
Maximum sweep speed	80 nm/s (1372 nm to 1495 nm)			
	<b>Stepped mode</b>	<b>Continuous sweep mode (typical)</b>		
		At 5 nm/s	At 40 nm/s	At 80 nm/s
Absolute wavelength accuracy <sup>1</sup>	± 10 pm, typical ± 3.6 pm	± 4.0 pm	± 4.6 pm	± 6.1 pm
Relative wavelength accuracy <sup>1</sup>	± 5 pm, typical ± 2 pm	± 2.4 pm	± 2.8 pm	± 4.0 pm
Wavelength repeatability	± 0.8 pm, typical ± 0.5 pm	± 0.3 pm	± 0.4 pm	± 0.7 pm
Wavelength stability <sup>4</sup> (typical)	≤ ± 1 pm, 24 hours			
Linewidth (typical), coherence control off	100 kHz			
Effective linewidth (typical), coherence control on	> 50 MHz (1430 nm to 1480 nm, at max. constant output power)			
Maximum output power (continuous power during sweep)	≥ +8.5 dBm peak (typical) ≥ +7.5 dBm (1430 nm to 1480 nm) ≥ +5 dBm (1420 nm to 1480 nm) ≥ 0 dBm (1370 nm to 1495 nm)			
With option 003	Reduced by 1.5 dB			
Power repeatability (typical)	± 0.003 dB			
Power stability <sup>4</sup>	± 0.01 dB, 1 hour (1420 nm to 1495 nm) Typical ± 0.01 dB, 1 hour (1370 nm to 1420 nm) Typical ± 0.03 dB, 24 hours			
Power linearity	± 0.1 dB (1420 nm to 1495 nm) Typical ± 0.1 dB (1370 nm to 1420 nm)			
With option 003	Add ± 0.2 dB			
Power flatness versus wavelength	± 0.2 dB Typical ± 0.1 dB (1420 nm to 1495 nm) Typical ± 0.2 dB (1370 nm to 1420 nm)			
With option 003	Add ± 0.1 dB			
	<b>Continuous sweep mode <sup>3</sup></b>			
		At 5 nm/s	At 40 nm/s	At 80 nm/s
Dynamic power reproducibility (typical)	± 0.005 dB	± 0.01 dB	± 0.015 dB	
Dynamic relative power flatness (typical)	± 0.01 dB	± 0.015 dB	± 0.03 dB	
Side-mode suppression ratio (typical) <sup>2</sup>	≥ 40 dB (1430 nm to 1480 nm)			
Signal to source spontaneous emission ratio <sup>2</sup>	≥ 42 dB/nm (1430 nm to 1480 nm) ≥ 52 dB/0.1 nm (typical, 1430 nm to 1480 nm) ≥ 40 dB/nm (1420 nm to 1480 nm) ≥ 35 dB/nm (typical, 1370 nm to 1495 nm)			
Signal to total source spontaneous emission ratio (typical) <sup>2</sup>	≥ 28 dB (1430 nm to 1480 nm)			
Relative intensity noise (RIN) (0.1 to 6 GHz) (typical) <sup>2</sup>	-145 dB/Hz (1430 nm to 1480 nm)			

- Valid for one month and within a ± 4.4 K temperature range after automatic wavelength zeroing.
- At maximum output power as specified per wavelength range.
- Valid for absolute humidity of 11.5 g/m<sup>3</sup> (For example, equivalent to 50% relative humidity at 25 °C).
- At constant temperature ± 1 K.



# 81600B Option 132 Tunable Laser Source, 1260 nm to 1375 nm, High Power

Agilent 81600B Option 132				
Wavelength range	1260 nm to 1375 nm			
Wavelength resolution	0.1 pm, 17.7 MHz at 1300 nm			
Mode-hop free tunability	Full wavelength range; see page 10 for conditions to assure mode-hop free continuous sweeps			
Maximum sweep speed	80 nm/s			
	<b>Stepped mode</b>	<b>Continuous sweep mode (typical)</b>		
		At 5 nm/s	At 40 nm/s	At 80 nm/s
Absolute wavelength accuracy <sup>1</sup>	± 10 pm, typical ± 3.6 pm	± 4.0 pm	± 4.6 pm	± 6.1 pm
Relative wavelength accuracy <sup>1</sup>	± 5 pm, typical ± 2 pm	± 2.4 pm	± 2.8 pm	± 4.0 pm
Wavelength repeatability	± 0.8 pm, typical ± 0.5 pm	± 0.3 pm	± 0.4 pm	± 0.7 pm
Wavelength stability <sup>2</sup> (typical)	≤ ± 1 pm, 24 hours			
Linewidth (typical), coherence control off	100 kHz			
Effective linewidth (typical), coherence control on	> 50 MHz (1270 nm to 1350 nm, at max. constant output power)			
Maximum output power (continuous power during sweep)	≥ +9 dBm peak (typical) ≥ +7 dBm (1290 nm to 1370 nm) ≥ +3 dBm (1270 nm to 1375 nm) ≥ 0 dBm (1260 nm to 1375 nm)			
Power repeatability (typical)	± 0.003 dB			
Power stability <sup>4</sup>	± 0.01 dB, 1 hour (1260 nm to 1350 nm) Typical ± 0.01 dB, 1 hour (1350 nm to 1375 nm) Typical ± 0.03 dB, 24 hours			
Power linearity	± 0.1 dB (1260 nm to 1350 nm) Typical ± 0.1 dB (1350 nm to 1375 nm)			
Power flatness versus wavelength	± 0.2 dB Typical ± 0.1 dB (1260 nm to 1350 nm) Typical ± 0.2 dB (1350 nm to 1375 nm)			
	<b>Continuous sweep mode <sup>3</sup></b>			
		At 5 nm/s	At 40 nm/s	At 80 nm/s
Dynamic power reproducibility (typical)	± 0.005 dB	± 0.01 dB	± 0.015 dB	± 0.015 dB
Dynamic relative power flatness (typical)	± 0.01 dB	± 0.015 dB	± 0.03 dB	± 0.03 dB
Side-mode suppression ratio (typical) <sup>2</sup>	≥ 40 dB (1270 nm to 1375 nm)			
Signal to source spontaneous emission ratio <sup>2</sup>	≥ 45 dB/nm (1290 nm to 1370 nm) ≥ 55 dB/0.1 nm (typical, 1290 nm to 1370 nm) ≥ 40 dB/nm (1270 nm to 1375 nm) ≥ 35 dB/nm (typical, 1260 nm to 1375 nm)			
Signal to total source spontaneous emission ratio (typical) <sup>2</sup>	≥ 28 dB (1290 nm to 1370 nm)			
Relative intensity noise (RIN) (0.1 to 6 GHz) (typical) <sup>2</sup>	-145 dB/Hz (1270 nm to 1375 nm)			

1. Valid for one month and within a ± 4.4 K temperature range after automatic wavelength zeroing.
2. At maximum output power as specified per wavelength range.
3. Valid for absolute humidity of 11.5 g/m<sup>3</sup> (For example, equivalent to 50% relative humidity at 25 °C).
4. At constant temperature ± 1 K.

## 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.	
Warm-up time	1 h; immediate operation after boot up
<b>Output power</b>	
Specifications are valid at the following output power levels:	
Options 201, 200, 160 and 150	≥ -7 dBm (for Output 1); ≥ -1 dBm (for Output 2, -60 dB in attenuation mode)
81600B Option 140 and 130	≥ -13 dBm (for Output 1); ≥ -3 dBm (for Output 2, -60 dB in attenuation mode)
81600B Option 142	≥ -3 dBm; ≥ -4.5 dBm (with Option 003: -60 dB in attenuation mode)
81600B Option 132	≥ 0 dBm
<b>Continuous sweep mode</b>	
Specifications are valid for mode-hop free sweeping. Maximum 50 nm at constant output power levels as follows:	
81600B Option 200, 201	1475 nm to 1620 nm; ≥ -2 dBm (for Output 1); ≥ +4 dBm (for Output 2)
81600B Option 160	1510 nm to 1620 nm; ≥ -6 dBm (for Output 1); ≥ +3 dBm (for Output 2)
81600B Option 150	1520 nm to 1570 nm; ≥ -6 dBm (for Output 1); ≥ +3 dBm (for Output 2)
81600B Option 140	1430 nm to 1480 nm; ≥ -9 dBm (for Output 1); ≥ 0 dBm (for Output 2)
81600B Option 130	1300 nm to 1350 nm; ≥ -9 dBm (for Output 1); ≥ +1 dBm (for Output 2)
81600B Option 142	1430 nm to 1480 nm; ≥ -3 dBm; ≥ +1.5 dBm (with Option 003)
81600B Option 132	1300 nm to 1350 nm; ≥ +3 dBm
Operating temperature within	+20 °C and +35 °C

## General Specifications and Supplementary Characteristics

Supplementary performance characteristics	
Internal digital modulation	
	50% duty cycle, 200 Hz to 300 kHz
	Displayed wavelength represents average wavelength.
Modulation output	TTL reference signal
External digital modulation	
	> 45% duty cycle, delay time
	< 300 ns, 200 Hz to 1 MHz
	Displayed wavelength represents average wavelength.
Modulation input	TTL signal
External analog modulation	
	$\geq \pm 15\%$ modulation depth, 5 kHz to 20 MHz
Modulation input	5 V <sub>p-p</sub>
External wavelength locking	
	> $\pm 70$ pm at 10 Hz
	> $\pm 7$ pm at 100 Hz
Modulation input	$\pm 5$ V
Coherence control	
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 $< \pm 0.025$ dB over 1 minute by significantly reducing interference effects in the test setup.	
General	
Output isolation (typical)	
	50 dB
Return loss (typical)	
	60 dB (Option 072)
	40 dB (Option 071)
Polarization maintaining fiber (Option 071, 072)	
Fiber type	Panda
Orientation	TE mode in slow axis, in line with connector key
Polarization extinction ratio	
	16 dB typical
	14 dB typical (Option 200, 201)
Recommended re-calibration period	
	2 years

# Ordering Information

## Lightwave solution mainframe 8164B



### Tunable laser module: 81600B

One of the following is required:

Option 200	All-band tunable laser source 1440 nm to 1640 nm, low SSE
Option 201	All-band tunable laser source 1455 nm to 1640 nm, low SSE
Option 160	Tunable laser source 1495 nm to 1640 nm, low SSE
Option 150	Tunable laser source 1450 nm to 1590 nm, low SSE
Option 140	Tunable laser source 1370 nm to 1495 nm, low SSE
Option 130	Tunable laser source 1260 nm to 1375 nm, low SSE
Option 142	Tunable laser source 1370 nm to 1495 nm, high power
Option 132	Tunable laser source 1260 nm to 1375 nm, high power

### Connector option

One of the following is required:

Option 071	PMF, straight contact output connector
Option 072 (recommended)	PMF, angled contact output connector

### Other option

Option 003	Built-in optical attenuator, 60 dB attenuation (for Option 142)
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### Connector interface

One Agilent 81000xl-series connector interface is required for Options 142 and 132

Two Agilent 81000xl-series connector interfaces are required for Options 201, 200, 160, 150, 140 and 130

### Custom-made TLS

A 1650 nm Tunable Laser Source is available on request. Please contact your local Agilent Sales Office.

### Laser safety information

All laser sources specified by this data sheet are classified as Class 1M according to IEC 60825-1 (2007).

All laser sources comply with 21 CFR 1040.10 except for deviations pursuant to Laser Notice No. 50, dated 2007, June 24.





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