

# Agilent 86120B, 86120C, 86122C Multi-Wavelength Meters

## Data Sheet



Agilent's 8612xx family of multi-wavelength meters is known for reliability and durability on the manufacturing floor, on engineer's benches, and it is robust enough to be installed on ships. Statistical data from a large share of the industry's installed wavelength meters enables Agilent to continuously fine-tune its instruments for lower cost of ownership and longer usage. Current updates include an extended recommended re-calibration period of two years and a doubled lifetime of the built-in reference laser. The new 86122C multi-wavelength meter includes five years, the 86120B and 86120C three years of warranty without additional cost. The warranty covers not only the reference laser, but all opto-mechanical and electronic parts.



Agilent multi-wavelength meters are Michelson interferometer-based instruments that measure wavelength and optical power of laser light over a specified wavelength range. Simultaneous measurements of multiple laser lines are performed allowing measurements of DWDM signals and multiple lines of Fabry-Perot lasers. Each laser line is assumed to have a linewidth (including modulation sidebands) of less than:

- 10 GHz for the 86120B,
- 5 GHz for the 86120C and
- 2.5 GHz for the 86122C

This technical specifications sheet describes the measurement accuracy and operating conditions of the Agilent 86120B, 86120C and 86122C Multi-Wavelength Meters. The specifications apply to all functions within the specified environmental conditions. All specifications apply after the instrument's temperature has been stabilized after 15 minutes continuous operation, and when the instrument is in NORMAL UPDATE mode (86120B and 86120C).

## Definitions of Terms

### Characteristics and Specifications

The distinction between specifications and characteristics is described as follows:

- *Specifications* describe warranted performance.
- *Characteristics* provide useful, but non-warranted information about the functions and performance of the instrument.
- *General Characteristics* give additional information for using the instrument. These are general descriptive terms that do not imply a level of performance.

### Wavelength

- *Range* refers to the allowable wavelength range of the optical input signal.
- *Absolute accuracy* indicates the maximum wavelength error over the allowed environmental conditions.
- *Differential accuracy* indicates the maximum wavelength error in measuring the wavelength difference between two signals that are simultaneously present.
- *Minimum resolvable separation* indicates the minimum wavelength separation of two laser lines input required to measure each wavelength simultaneously. Two laser lines closer in wavelength than the minimum resolvable separation are not resolved and one average wavelength is displayed.
- *Display resolution* indicates the minimum incremental change in displayed wavelength.

### Power

- *Calibration accuracy* indicates the maximum power calibration error at the specified wavelengths over the allowed environmental conditions.
- *Flatness* refers to the maximum amplitude error in a measurement between two lines that are separated in wavelength by no more than the specified amount.
- *Linearity* indicates the maximum power error in measuring the change in power of one laser line.
- *Polarization dependence* indicates the maximum displayed power variation as the polarization of the input signal is varied.
- *Display resolution* indicates the minimum incremental change in displayed power.

### Sensitivity

- *Sensitivity* is defined as the minimum power level of a single laser line input to measure wavelength and power accurately. A laser line with less than the minimum power may be measured but with reduced wavelength and power accuracy. For multiple laser lines input, sensitivity may be limited by total input power.

### Selectivity

- *Selectivity* indicates the ability to measure the wavelength and power of a weak laser line in the proximity of a specified stronger laser line and separated by the specified amount.

### Input power

- *Maximum displayed level* indicates the maximum total input power (total of all laser lines present) to accurately measure wavelength and power.
- *Maximum safe input power* indicates the maximum total input power (total of all laser lines present) to avoid permanent optical damage to the instrument.

### Maximum number of lines input

*Maximum number of lines input* is the maximum number of displayed lines. If more than the specified number of lines is input, only the longest wavelength lines are displayed.

### Input return loss

*Input return loss* indicates the optical power reflected back to the user's fiber cable relative to the input power. It is limited by the return loss of the front panel connector, and assumes the user's connector is good.

### Measurement cycle time

*Measurement cycle time* refers to the cycle time when measuring wavelength and power of laser lines. Specific advanced applications may require longer cycle times.

## Specifications

|   | 86120B   | 86120C   | 86122C                              | Notes  |  |
|---|--|--|-------------------------------------|--|--|
| <b>Wavelength</b>   |  |  |                                     |  |  |
| Range   | 700 to 1650 nm<br>(182 to 428 THz)   | 1270 to 1650 nm<br>(182 to 236 THz)            | 1270 to 1650 nm<br>(182 to 236 THz) | For lines separated by less than the specified amount, wavelength accuracy is reduced. |  |
| <b>Absolute accuracy</b>  |  |  |                                     |  |  |
|   | ± 3 ppm  | ± 2 ppm  | ± 0.2 ppm                           |  |  |
| • At 1550 nm  | ± 0.005 nm   | ± 0.003 nm                                     | ± 0.3 pm                            |  |  |
| • At 1310 nm  | ± 0.004 nm   | ± 0.003 nm                                     | ± 0.3 pm                            |  |  |
| • For laser lines separated by  | ≥ 30 GHz   | ≥ 15 GHz                                       | ≥ 10 GHz                            |  |  |
| Differential accuracy <sup>1</sup>  | ± 2 ppm  | ± 1 ppm  | ± 0.15 ppm                          |  |  |
| <b>Minimum resolvable separation <sup>1</sup> (equal power lines input)</b> |  |  |                                     |  |  |
|   | 20 GHz   | 10 GHz   | 5 GHz                               |  |  |
| • At 1550 nm  | 0.16 nm  | 0.08 nm  | 0.04 nm                             |  |  |
| • At 1310 nm  | 0.11 nm  | 0.06 nm  | 0.03 nm                             |  |  |
| • For laser lines separated by  | ≥ 30 GHz   | ≥ 15 GHz                                       | ≥ 10 GHz                            |  |  |
| <b>Display resolution</b>   |  |  |                                     |  |  |
|   | 0.001 nm   |  | 0.0001 nm                           |  |  |
| Fast update mode  | 0.01 nm  |  | N/A                                 |  |  |
| Units   | nm (vacuum or standard air), cm <sup>-1</sup> , THz                            |  |                                     |  |  |
| <b>Power</b>  |  |  |                                     |  |  |
| Calibration accuracy <sup>5</sup>   | ± 0.5 dB (at ± 30 nm from 780 nm <sup>1</sup> , 1310 nm, and 1550 nm)          | ± 0.5 dB (at ± 30 nm from 1310 nm and 1550 nm) |                                     |  |  |
| Flatness <sup>1</sup>   | ± 0.2 dB (1200 to 1600 nm)   | ± 0.2 dB (1270 to 1600 nm)                     |                                     | 30 nm from any wavelength  |  |
|   | ± 0.5 dB (700 to 1650 nm)  | ± 0.5 dB (1270 to 1650 nm)                     |                                     |  |  |
| Linearity   | ± 0.3 dB (1200 to 1600 nm)   | ± 0.3 dB (1270 to 1600 nm)                     |                                     | Lines above -30 dBm  |  |
| Polarization dependence   | ± 0.5 dB (1200 to 1600 nm)   | ± 0.5 dB (1270 to 1600 nm)                     |                                     |  |  |
|   | ± 1.5 dB <sup>1</sup> (700 to 1650 nm)   | ± 1.0 dB <sup>1</sup> (1600 to 1650 nm)        |                                     |  |  |
| Display resolution  | 0.01 dB  |  |                                     |  |  |
| Units   | dBm, mW, μW  |  |                                     |  |  |
| <b>Sensitivity</b>  |  |  |                                     |  |  |
| Single line input   | -20 dBm (700 to 900 nm)  | -40 dBm (1270 to 1600 nm)                      | -32 dBm (1270 to 1600 nm)           |  |  |
|   | -25 dBm (800 to 1200 nm)   | -30 dBm (1600 to 1650 nm)                      | -22 dBm (1600 to 1650 nm)           |  |  |
|   | -40 dBm <sup>6</sup> (1200 to 1600 nm)   |  |                                     |  |  |
|   | -30 dBm <sup>6</sup> (1600 to 1650 nm)   |  |                                     |  |  |
| Multiple lines input <sup>1</sup>   | 30 dB below total input power, but not less than single line input sensitivity |  |                                     |  |  |
| Selectivity <sup>1</sup>  | 25 dB spacing ≥ 100 GHz  | 25 dB spacing ≥ 50 GHz                         | 25 dB spacing ≥ 90 GHz              |  |  |
|   | 10 dB spacing ≥ 30 GHz   | 10 dB spacing ≥ 15 GHz                         | 10 dB spacing ≥ 10 GHz              |  |  |

## Specifications (continued)

|  | 86120B   | 86120C  | 86122C  | Notes  |
|--|--|---|---|--|
| <b>Input power</b>                                 |  |   |   |  |
| Maximum displayed level                            |  | +10 dBm   |   | Sum of all lines input   |
| Maximum safe input level                           |  | +18 dBm   |   |  |
| <b>Return loss</b>                                 |  |   |   |  |
| • With non-angled (PC) connectors (Option 021)     |  | 35 dB   |   |  |
| • With angled (APC) connectors (Option 022)        |  | 50 dB   |   |  |
| • Measurement cycle time                           |  | 1.0 s   | 0.5 s   |  |
| • Maximum number of lines                          | 100  | 200   | 1000 <sup>2</sup>   |  |
| Measurement modes                                  | List by wavelength table, list by power table, signal wavelength and power, average wavelength and total power   |   |   | Data logging and sorting by any parameter are included in the 86122C |
| Delta modes  | Delta wavelength, delta power, delta wavelength and power  |   |   |  |
| <b>Built in automatic measurement applications</b> |  |   |   |  |
| <b>Signal to noise ratio<sup>1,4</sup></b>         |  |   |   |  |
| Channel spacing                                    |  |   |   |  |
| • ≥ 200 GHz  | > 35 dB with 100 averages  |   |   | 0.1 nm noise bandwidth, lines above -25 dBm                          |
| • ≥ 100 GHz  |  | > 35 dB with 100 averages   | > 35 dB with 100 averages   |  |
| • ≥ 50 GHz   |  | > 27 dB with 100 averages   | > 27 dB with 100 averages   |  |
| <b>Drift</b>                                       |  |   |   |  |
|  | Maximum, minimum, total drift (max-min) of wavelengths and powers over time  |   |   |  |
| <b>Fabry-Perot characterization</b>                |  |   |   |  |
|  |  | Mean wavelength, peak wavelength, mode spacing, full-width half maximum, peak amplitude, total power, sigma |   |  |
| <b>Coherence length<sup>1</sup></b>                |  |   |   |  |
|  | <ul style="list-style-type: none"> <li>Fabry-Perot lasers</li> <li>1 to 200 mm coherence length</li> <li>Accuracy to within ± 5%, 0.75 cycle time</li> </ul>                                     |   |   |  |
| <b>Additional features</b>                         |  |   |   |  |
|  | Power offset, power bars (on or off), user adjustable peak excursion and peak threshold, user adjustable start and stop wavelength limits, graphical display, save and recall instrument states. |   |   |  |
| <b>Inputs/outputs</b>                              |  |   |   |  |
| Optical input                                      | 9 μm/125 μm single-mode fiber  |   |   |  |
| Rear panel connectors                              | GPIB, parallel printer port, AC line   |   | LAN, PS/2 for keyboard and mouse, SVGA and DVI for external monitor, GPIB, USB, AC Line |  |

## Specifications (continued)

|                              | 86120B   | 86120C  | 86122C   | Notes  |
|------------------------------|--|---------|--|--|
| <b>Reliability</b>           |  |         |  |  |
| Warranty                     | 3 years  | 3 years | 5 years  |  |
| Recommended re-calibration   | 2 years  | 2 years | 2 years  |  |
| <b>Dimensions and weight</b> |  |         |  |  |
| Dimensions (H x W x D)       | 140 mm x 340 mm x 465 mm<br>(5.5 in x 13.4 in x 18.3 in) |         | 138 mm x 425 mm x 520 mm<br>(5.2 in x 16.7 in x 20.5 in) |  |
|                              | 9 kg (19 lb)   |         | 14.5 kg (32 lb)  |  |
| <b>Environmental</b>         |  |         |  |  |
| <b>Operational</b>           |  |         |  |  |
| Temperature                  | 0 to +55 °C  |         | 15 to 35 °C  |  |
| Humidity <sup>3</sup>        | < 95% R.H. at +40 °C, 5 day soak                         |         | < 75% R.H. at 35 °C<br><i>Indoor use only</i>            |  |
| Shock <sup>3</sup>           | 300 g  |         | 120 g  | Half sine,<br>2 msec pulse   |
| Vibration <sup>3</sup>       | 5 g rms  |         | 2 g rms  | Random,<br>5 Hz to 500 Hz,<br>10 min./axis Sine,<br>5 Hz to 500 Hz,<br>1 octave/min. |
|                              | 0.75 g (0 to peak)                                       |         | 0.5 g (0 to peak)  |  |
| <b>Storage</b>               |  |         |  |  |
| Temperature                  | -40 °C to +70 °C   |         |  |  |
| Humidity <sup>3</sup>        | 90% R.H. at +65 °C for 24 hrs.                           |         | 95% R.H. at +40 °C<br>5 day cycle                        | Non-condensing   |
| <b>Power requirements</b>    |  |         |  |  |
| Voltage and frequency        | 100 V / 115 V / 230 V / 240 V~, 50 Hz /<br>60 Hz         |         | 100 V / 115 V / 230 V / 240 V~,<br>50 Hz / 60 Hz         |  |
| Maximum power                | 70 W max (125 VA max)                                    |         | 310 VA max   |  |

1. Characteristic.
2. For 86122C number of laser lines may be limited by signal power requirements for accurate wavelength measurements.
3. Type tested means tested, but not warranted, for continuous operation.
4. At 1550 nm.
5. Excluding polarization effects.
6. Spurious free under Preset conditions.

## General Characteristics

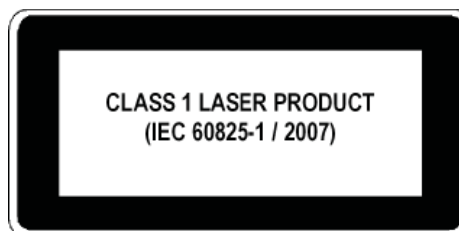
The 8612x wavelength meters contain HeNe reference lasers, which have limited operating lifetimes, like all gas-discharge lasers. With the latest enhancement of the reference lasers used in the new 86122C, the average laser lifetime has doubled. Together with the 2-year recommended re-calibration period and the included 5-year warranty (3 years for 86120B, 86120C), this helps minimizing planned and unplanned downtimes and cost of ownership.

## Ordering Information

For the most up-to-date ordering information, please contact your Agilent sales representative.

| Connector interfaces (order separately) |  |
|---|--|
| 81000FI                                 | FC connector interface (FC/PC)                           |
| 81000HI                                 | E-2000 connector interface                               |
| 81000KI                                 | SC connector interface                                   |
| 81000LI                                 | LC connector interface                                   |
| 81000MI                                 | MU connector interface                                   |
| 81000NI                                 | FC connector interface (FC/APC with narrow key)          |
| 81000SI                                 | DIN connector interface                                  |
| 81000VI                                 | ST connector interface                                   |
| 86120B/C multi-wavelength meter         |  |
| Optical connectors                      |  |
| 86120x-021                              | Straight (non-angled) connector interface-PC             |
| 86120x-022                              | Angled contact interface-APC                             |
| Accessories                             |  |
| 86120x-AXE                              | Rack flange kit with handles                             |
| 86120x-IA4                              | Rack flange kit without handles                          |
| 86120x-UK6                              | Commercial calibration certificate with test data        |
| Warranty and calibration                |  |
| R-51B-001-5C                            | Warranty Assurance Plan – Return to Agilent – 5 years    |
| R-50C-011-3                             | Calibration Assurance Plan – Return to Agilent – 3 years |
| R-50C-011-5                             | Calibration Assurance Plan – Return to Agilent – 5 years |
| R-50C-021-3                             | ANSI Z540-1-1994 Calibration – 3 years                   |
| R-50C-021-5                             | ANSI Z540-1-1994 Calibration – 5 years                   |

| 86122C multi-wavelength meter |  |
|-------------------------------|--|
| Optical connectors            |  |
| 86122C-021                    | Straight (non-angled) connector interface-PC             |
| 86122C-022                    | Angled contact interface-APC                             |
| Accessories                   |  |
| 86122A-1CM                    | Rack mount kit without handles                           |
| 86122A-1CN                    | Handle kit   |
| 86122A-1CP                    | Rack mount kit plus handles                              |
| 86122C-UK6                    | Commercial calibration certificate with test data        |
| Calibration                   |  |
| R-50C-011-3                   | Calibration Assurance Plan – Return to Agilent – 3 years |
| R-50C-011-5                   | Calibration Assurance Plan – Return to Agilent – 5 years |
| R-50C-021-3                   | ANSI Z540-1-1994 Calibration – 3 years                   |
| R-50C-021-5                   | ANSI Z540-1-1994 Calibration – 5 years                   |



## Optical Instruments Online Information

|                                      |  |
|--------------------------------------|--|
| Optical test instruments             | <a href="http://www.agilent.com/find/oct">www.agilent.com/find/oct</a>                       |
| Lightwave component analyzers        | <a href="http://www.agilent.com/find/lca">www.agilent.com/find/lca</a>                       |
| Polarization solutions               | <a href="http://www.agilent.com/find/pol">www.agilent.com/find/pol</a>                       |
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| Mexico        | 01800 5064 800 |
| United States | (800) 829 4444 |

#### Asia Pacific

|                    |                |
|--------------------|----------------|
| Australia          | 1 800 629 485  |
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| Hong Kong          | 800 938 693    |
| India              | 1 800 112 929  |
| Japan              | 0120 (421) 345 |
| Korea              | 080 769 0800   |
| Malaysia           | 1 800 888 848  |
| Singapore          | 1 800 375 8100 |
| Taiwan             | 0800 047 866   |
| Other AP Countries | (65) 375 8100  |

#### Europe & Middle East

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| Belgium        | 32 (0) 2 404 93 40               |
| Denmark        | 45 45 80 12 15                   |
| Finland        | 358 (0) 10 855 2100              |
| France         | 0825 010 700*<br>*0.125 €/minute |
| Germany        | 49 (0) 7031 464 6333             |
| Ireland        | 1890 924 204                     |
| Israel         | 972-3-9288-504/544               |
| Italy          | 39 02 92 60 8484                 |
| Netherlands    | 31 (0) 20 547 2111               |
| Spain          | 34 (91) 631 3300                 |
| Sweden         | 0200-88 22 55                    |
| United Kingdom | 44 (0) 118 927 6201              |

*For other unlisted countries:*

[www.agilent.com/find/contactus](http://www.agilent.com/find/contactus)

*(BP-3-1-13)*

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© Agilent Technologies, Inc. 2013  
Published in USA, March 8, 2013  
5988-5422EN



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