



Agilent 86120B, 86120C, 86122A Multi-Wavelength Meters Technical Specifications

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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 86122A.

This technical specifications sheet describes the measurement accuracy and operating conditions of the Agilent 86120B, 86120C and 86122A Multi-Wavelength Meters. The **specifications** apply to all functions over the temperature range of 0 to 55 °C and relative humidity <95% (unless otherwise noted). 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.

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 are 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 | 86122A | Notes |
|---|--|---|--|--|
| Wavelength | | | | |
| Range | 700-1650 nm (182-428 THz) | 1270-1650 nm (182-236 THz) | 1270-1650 nm (182-236 THz) | |
| Absolute Accuracy | ±3 ppm | ±2 ppm | ±0.5 ppm (Opt.001) +0.2 ppm (Opt.002) | |
| at 1550 nm | +0.005 nm | +0.003 nm | +0.75 pm (Opt. 001), ±0.3 pm (Opt. 002) | |
| at 1310 nm | +0.004 nm | +0.003 nm | +0.65 pm (Opt. 001), ±0.3 pm (Opt. 002) | |
| for laser lines separated by | ≥30 GHz | ≥15 GHz | ≥10 GHz | |
| Differential Accuracy ¹ | ±2 ppm | ±1 ppm | ±0.25 ppm (Opt. 001) ±0.15 ppm (Opt. 002) | |
| Minimum Resolvable Separation ¹ (equal power lines input) | | | | For lines separated by less than the specified amount, wavelength accuracy is reduced. |
| at 1550 nm | 20 GHz 0.16 nm | 10 GHz 0.08 nm | 5 GHz 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 | |
| Display Resolution | 0.001 nm | | 0.0001 nm | |
| Fast update mode | 0.01 nm | | N/A | |
| Units | nm (vacuum or standard air), cm ⁻¹ , THz | | | |
| Power | | | | |
| Calibration Accuracy | ±0.5 dB (at ±30 nm from 780, 1310, and 1550 nm) | ±0.5 dB (at ±30 nm from 1310 and 1550 nm) | | |
| Flatness ¹ | ±0.2 dB (1200 to 1600 nm) ±0.5 dB (700 to 1650 nm) | ±0.2 dB (1270 to 1600 nm) ±0.5 dB (1270 to 1650 nm) | | 30 nm from any wavelength |
| 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) ±1.0 dB ¹ (700 to 1650 nm) | ±0.5 dB (1270 to 1600 nm) ±1.0 dB ¹ (1600 to 1650 nm) | | |
| Display Resolution | 0.01 dB | | | |
| Units | dBm, mW, μW | | | |
| Sensitivity ² | | | | Characteristic noise floor -60 dBm |
| Single Line Input | -20 dBm (700 to 800 nm) -25 dBm (800 to 1200 nm) -40 dBm (1200 to 1600 nm) -30 dBm (1600 to 1650 nm) | -40 dBm (1270 to 1600 nm) -30 dBm (1600 to 1650 nm) | -32 dBm (1600 to 1650 nm) -22 dBm (1600 to 1650 nm) | |
| Multiple Lines Input ^{1,3} | 30 dB below total input power, but not less than single line input sensitivity | | | |
| Selectivity ¹ | 25 dB spacing ≥100 GHz 10 dB spacing ≥30 GHz | 25 dB spacing ≥50 GHz 10 dB spacing ≥15 GHz | 25 dB spacing ≥90 GHz 10 dB spacing ≥10 GHz | |
| Input Power | | | | |
| Maximum Displayed Level | +10 dBm | | | sum of all lines input |
| Maximum Safe Input Level | +18 dBm | | | |
| Return Loss | | | | |
| With Non-Angled (PC) Connectors | 35 dB | | | |
| With Angled (PC) Connectors (Option 022) | 50 dB | | | |
| Measurement Cycle Time | 1.0 s | | 0.5 s | |
| Maximum Number of Lines | 100 | 200 | 1000 ⁴ | |
| 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 86122A. |
| Delta Modes | Delta wavelength, delta power, delta wavelength and power | | | |

Specifications (cont'd)

| | 86120B | 86120C | 86122A | Notes |
|---|--|--|---|---|
| Built in Automatic Measurement Applications | | | | |
| Signal to Noise Ratio ^{1,6} Channel Spacing \geq 200 GHz Channel Spacing \geq 100 GHz Channel Spacing \geq 50 GHz | >35 dB with 100 averages | >35 dB with 100 averages >27 dB with 100 averages | >35 dB with 100 averages >27 dB with 100 averages | 0.1 nm noise bandwidth. Lines above -25 dBm. |
| Drift | Maximum, minimum, total drift (max-min) of wavelengths and powers over time | | | |
| Fabry-Perot Characterization | Mean wavelength, peak wavelength, mode spacing full-width half maximum, peak amplitude total power, sigma | | | |
| Coherence Length ¹ | Fabry-Perot lasers, 1 to 200 mm coherence length, accuracy to within \pm 5%, 0.75 cycle time | | | |
| Additional Features | 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. | | | |
| Inputs/Outputs | | | | |
| Optical Input | 9/125 μ m single-mode fiber | | | |
| Rear Panel Connectors | GPIB, parallel printer port, AC line | | LAN, PS/2 for Keyboard & Mouse, SVGA for external monitor, GPIB, parallel printer port, AC Line, optional optical input | |
| Dimensions and Weight | | | | |
| Dimensions | 140 mm high x 340 mm wide x 465 mm deep (5.5 in x 13.4 in x 18.3 in) 9 kg (19 lb) | | 138 h x 425 w x 520 mm d (5.2 in x 16.7 in x 20.5 in) 14.5 kg (32 lb) | |
| Environmental | | | | |
| Operational Temperature | 0°C to +55°C | | | 15°C to 35°C, <75% R.H. at 35°C for 86122A Opt.002 |
| Humidity ⁵ | <95% R.H. at +40°C, 5 day soak | | | |
| Shock ⁵ | 300 g | | 120 g | Half sine, 2 msec pulse |
| Vibration ⁵ | 5 g rms 0.75 g (0 to peak) | | 2 g rms 0.5 g (0 to peak) | Random, 5 to 500 Hz, 10 min./axis Sine, 5 to 500 Hz, 1 octave/min. |
| EMC | Conducted and radiated interference is in compliance with CISPR Pub 11, IEC 801-2, IEC 801-3, IEC 801-4 and IEC 555-2 | | | |
| Storage Temperature | -40°C to +70°C | | | |
| Humidity ⁵ | 90% R.H. at +65°C for 24 hrs. | | 95% R.H. at +45°C, 5 day cycle | Non-condensing |
| Power Requirements | | | | |
| Voltage and frequency Maximum Power | 100 / 115 / 230 / 240 V~, 50 / 60 Hz 70 watts max (125 VA max) | | 100 / 115 / 230 / 240 V~, 50 / 60 Hz 310 VA max | |

¹ Characteristic

² Contact Agilent Technologies for availability of special instruments with higher sensitivity.

⁴ For 86122A number of laser lines may be limited by signal power requirements for accurate wavelength measurements.

⁵ Type tested means tested, but not warranted, for continuous operation.

⁶ At 1550 nm

Ordering Information

For the most up-to-date ordering information, please contact your Agilent sales representative or visit our website at: www.agilent.com/comms/lightwave

86120B/C Multi-Wavelength Meter

Optical Connectors

| | |
|------------|--|
| 86120x-012 | FC Connector (default) |
| 86120x-013 | DIN Connector |
| 86120x-014 | ST Connector |
| 86120x-017 | SC Connector |
| 86120x-020 | Straight (non-angled) Contact Interface-PC |
| 86120x-022 | Angled Contact Interface-APC |

Fixed External 10 dB Attenuators

| | |
|------------|--|
| 86120x-412 | Attenuator with FC/PC Connector (must be ordered with 86120x-020 option) |
| 86120x-417 | Attenuator with FC/APC Connector (must be ordered with 86120x-022 option) |

Accessories

| | |
|------------|---|
| 86120x-AXE | Rack Flange Kit with Handles |
| 86120x-IA4 | Rack Flange Kit without Handles |
| 86120x-UK5 | Nylon Carrying Case with Shoulder Strap |
| 86120x-UK6 | Commercial Calibration Certificate with Test Data |
| 86120x-UK7 | Hard Carrying Case |

Documentation

| | |
|------------|------------------------------------|
| 86120x-ABA | English Operation Manual (default) |
| 86120x-OBO | Do not include an Operation Manual |

86122A Multi-Wavelength Meter

Performance Options

| | |
|------------|--------------------------------|
| 86122A-001 | Standard Performance (default) |
| 86122A-002 | High Accuracy Performance |

Optical Connectors

| | |
|------------|--|
| 86122A-020 | Straight (non-angled) Contact Interface-PC (default) |
| 86122A-022 | Angled Contact Interface-APC |
| 86122A-400 | Front Panel Fiber Input (default) |
| 86122A-401 | Rear Panel Fiber Input |
| 81000FI | FC Connector (default) |
| 81000KI | SC Connector |
| 81000SI | DIN Connector |

Fixed External 10 dB Attenuators

| | |
|------------|--|
| 86122A-412 | Attenuator with FC/PC Connector (must be ordered with 86122A 020 option) |
| 86122A-417 | Attenuator with FC/APC Connector (must be ordered with 86122A-022 option) |

Accessories

| | |
|------------|---|
| 86122A-1CM | Rack Mount Kit without Handles |
| 86122A-1CN | Handle Kit |
| 86122A-1CP | Rack Mount Kit plus Handles |
| 86122A-UK6 | Commercial Calibration Certificate with Test Data |

Documentation

| | |
|------------|------------------------------------|
| 86122A-ABA | English Operation Manual (default) |
| 86122A-OBO | Do not include an Operation Manual |



Agilent Technologies' Test and Measurement Support, Services, and Assistance

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