Agilent 86038A
Optical Dispersion Analyzer (ODA)

Accelerating the development of 40G optical networks

Technical Specifications

November 2004

Simultaneous measurements of Group Delay (GD) and Chromatic Dispersion (CD); Differential Group Delay (DGD) and Polarization Mode Dispersion (PMD); Insertion Loss (IL) and Polarization Dependent Loss (PDL) of components, fiber, amplifiers and systems.

- Very high accuracy and resolution measurement of DWDM devices
- Extremely fast swept measurements
- Two port testing of DUTs
- Total of eight measurement traces simultaneously
- CD measurements automatically corrected for PMD
- Wide wavelength operating range: 1260 nm to 1640 nm (O to L band).

Agilent Technologies

Agilent 86038A accelerating the development of the next generation networks

If you are involved in optical communications design or manufacturing, whether at component, sub system or system level, you know the challenges you face are complex. These challenges include:

- higher data transmission rates (10 and 40 Gb/s)
- dense wavelength division multiplexing (DWDM) channel spacing
- high demand for integrated measurements of dispersion and loss properties of optical components

Overcoming dispersion will likely be the biggest barrier in deploying 10 and 40 Gb/s WDM networks. Chromatic dispersion can limit the performance of optical components and signals. This is a problem at 10 Gb/s and a serious one at 40 Gb/s. Like chromatic dispersion, polarization mode dispersion can also limit fiber optic transmission performance. It is caused by birefringence in the optical transmission medium, which in turn causes polarization modes of a signal to travel at different group velocities. Therefore the precise characterization of dispersion properties and loss properties for all devices and systems becomes mandatory at data rates above 10 Gb/s. The 86038A optical dispersion analyzer provides the accuracy and repeatability that 40 Gb/s designers require.

Today optical components such as fiber Bragg gratings (FBG), thin film filters and array waveguide gratings (AWG) for 10 and 40 Gb/s networks can lead to system penalties or even failure by not meeting critical requirements of dispersion and loss parameters.

The value that the Agilent 86038A ODA offers is its ability to perform highly accurate Group Delay (GD) and Chromatic Dispersion (CD); Differential Group Delay (DGD) and Polarization Mode Dispersion (PMD); Insertion Loss (IL) and Polarization Dependent Loss (PDL) measurements. A single set up and connection guarantees minimum test uncertainty and test time, increased throughput and reduced cost of test. The 86038A is the ideal solution for R&D and manufacturing customers that require measurements of DWDM and CWDM components, dispersion compensating gratings, optical fiber, amplifiers and systems.

Agilent has always applied relentless innovation to help you meet your design challenges. Using an innovative technique developed by Agilent, the 86038A achieves best in class accuracy and repeatability for polarization mode dispersion, group delay, and chromatic dispersion. The 86038A uses the industry-standard modulation phase-shift (MPS) technique for absolute and relative group delay. The software allows very fast stepped measurements and ultra-fast swept mode measurements. The 86038A also offers a real time data update mode (continuous sweep) for fine tuning devices.

Key benefits

Simultaneous GD, CD, DGD, PMD, IL, and PDL measurements with a single connection and a single set up reduces measurement time and reduces test uncertainties.

Group delay repeatability: < ±0.02 ps (< ±20 fs)

Differential group delay accuracy:
±90 fs ±9% of measured DGD

Insertion loss accuracy: < 0.25 dB

Extremely high speed swept measurements: CD and IL measurements of 1601 wavelength points can be obtained in less than 10 seconds.

Wavelength accuracy (with Agilent 86122A wavelength meter) ±1.0 pm

CD measurements automatically corrected for PMD
Allows very accurate CD measurements

Two port DUT testing: Two ports allow simultaneous testing of two devices, two ports of the same DUT or simultaneous transmission and reflection measurements to increase throughput.

Wide dynamic range: >50 dB

Wide operating wavelength range:
1260 nm to 1640 nm (O to L band)

Dynamic drift reduction: Provides excellent stability and accuracy when the environmental conditions of the room or the test device are gradually changing.

Automatic modulation frequency selection: Saves measurement time by automatically choosing the best modulation frequency and avoiding phase wrap errors for fiber test.

External CD-RW drive (standard): Easily store data.

On site verification and training: Included in the system price is one day of on site system verification and training by Agilent personnel.

1 year warranty: Industry leading 1 year warranty is offered standard on all 86038A systems.

Technology Leadership

Agilent 86038A
an innovative solution for simultaneous dispersion and loss measurements

The 86038A was designed specifically for the development of a wide range of devices that include DWDM optical components such as fiber Bragg gratings, AWGs, optical fiber, amplifiers and systems. The 86038A ODA is based on the Agilent E8801A performance network analyzer (PNA) that was named the RF and Microwave product of the year in 2001. It also includes the next generation optical test set and an Agilent 81600B tunable laser source. The very low noise and high speed capability of the 86038A optical dispersion analyzer allows it to perform dispersion measurements with the highest accuracy and speed. The excellent group delay resolution offered by the 86038A reveals the true details of your narrowband devices. The 86038A can also automatically correct CD measurements for PMD.

Agilent E8801A
performance network analyzer

The Agilent E8801A performance network analyzer (PNA) is the premium vector network analyzer in Agilent's product portfolio. The PNA is optimized for speed, dynamic range and accuracy. The PNA analyzer was designed with maximum throughput in mind. It can be easily integrated with an existing test set up and test data can be directly stored on a remote server. The PNA allows highly accurate and extremely fast phase measurements on the 86038A optical dispersion analyzer.

Next generation optical test set

The 86038A test set was designed for single connection integrated dispersion and loss measurements. The test set mainly consists of the high speed polarization scanner, a modulator and two high-speed optical receivers. The internal modulator converts the RF electrical signals from the PNA and modulates the tunable laser source optical signal. Two low noise and high speed receivers are used to ensure stable and accurate recovery of the optical signal back to electrical for phase analysis by the network analyzer.

Agilent tunable laser source wavelength range: 1260 – 1640 nm

The 86038A standard option 86038A-111 covers the C and L bands (1495 nm to 1640 nm) and uses the Agilent 81600B-160 tunable laser source (TLS). Other Series 81600B tunable laser modules can be added to extend the operating wavelength range.

The Agilent 81600B TLS has an internal wavelength meter and provides mode-hop free sweeps. The wavelength setting resolution of the tunable laser is 0.1 pm.

The 86038A has an option for a customer-provided Agilent TLS: 86038A-321. Customers can purchase the system without a new TLS and save money.

The TLS can be easily used for other measurement purposes when it is not being used for 86038A measurements.

Features and Benefits

Highly accurate and repeatable Group Delay (GD) and Differential Group Delay (DGD) measurements

As data rates increase to 10 Gb/s and beyond, the accuracy of your chromatic and polarization mode dispersion measurements is critical and all components must fulfill stringent requirements. The 86038A achieves repeatable group delay and differential group delay for components, fiber, amplifiers and systems. The 86038A allows for fast stepped measurements and extremely fast swept measurements that are ideal for a manufacturing environment. An optional multi-wavelength meter can be integrated for improved absolute wavelength accuracy.

The 86038A uses the industry-standard Modulation Phase Shift (MPS) method for CD measurements. Chromatic Dispersion measurement systems based on the MPS method are extremely sensitive, capable of resolving a fraction of a picosecond of relative group delay.

On the manufacturing floor, business success depends on high volume throughput, fast ramp-up and reduced cost of test. Therefore, trust in your measurement results is vital. The 86038A using the MPS method provides highly repeatable and stable measurements for all devices and systems. The MPS method used on the 86038A avoids sensitivity to thermal drifts and mechanical vibrations.

With the press of a single button you can activate the Dynamic Drift Reduction feature of the 86038A to guarantee highly repeatable and stable measurements even in an unstable environment.

Polarization Mode Dispersion measurements

The 86038A uses the industry-standard modulation phase shift (MPS) method with randomized polarization scanning to measure differential group delay, polarization mode dispersion, and polarization dependent loss simultaneously. At each wavelength all states of polarization are sampled. All measurements can be obtained with excellent wavelength resolution. Extremely fast and accurate transmission and reflection characteristics can be easily measured on the 86038A.

CD measurements automatically corrected for PMD

CD measurements can vary with the polarization of the light due to DGD, which limits the accuracy of the measurement. The inherent uncertainty can be up to half of the differential group delay. The 86038A takes advantage of the polarization scanning process to evaluate the impact of DGD on the group delay and remove it, allowing the system to produce group delay and CD traces that are free of the effects of DGD.

Excellent optical resolution for narrowband devices

The 86038A can perform measurements with modulation frequencies as low as 5 MHz with wavelength steps of 0.1 pm. The extremely low noise floor on the PNA combined with phase dynamic accuracy corrections enables measurements with high accuracy and repeatability at low modulation frequencies. The very high-resolution capability of the 86038A enables measurements of the fine details of group delay ripple of fiber Bragg gratings and the measurements of amplitude characteristics and chromatic dispersion of DWDM optical components.

High speed measurements

The 86038A allows fast group delay, chromatic dispersion and insertion loss measurements in the swept mode. It can perform a 1601 wavelength point measurement in less than 10 seconds. The high speed measurements minimize environmental influences that affect accuracy. A continuous sweep mode that provides real-time data update is also provided for fine-tuning of devices in R&D and manufacturing. The 86038A also provides highly accurate stepped measurements of polarization mode dispersion and polarization dependent loss using a high speed polarization scanner that allows measurements of DGD and PDL at each wavelength.

Extremely high wavelength accuracy

The high wavelength accuracy resulting from the tunable laser can be further enhanced using the Agilent 86122A multi-wavelength meter (MWM). The MWM provides a very precise wavelength reference to automatically measure and provide feedback of the tunable laser source's output wavelength. The 86122A is not included in the standard configuration, but can be ordered as an option on the 86038A. The 86122A MWM can be easily used for other measurement purposes when it is not being used for 86038A measurements.

Wide dynamic range

The 86038A has a dynamic range that can easily measure optical transmission amplitude characteristics of optical filters and other devices. Furthermore, the 86038A can also measure group delay and chromatic dispersion characteristic over a wide dynamic range.

Easy to use solution for R&D and high volume manufacturing

This instrument is a stand-alone, compact desk-top solution ideal for either a space-constrained R&D lab or manufacturing floor. The 86038A has an easy-to-operate user interface designed to meet the individual needs of R&D and manufacturing environments. With the push of a single button, the measurements can be acquired.

The 86038A is designed for high throughput measurements over an entire wavelength band. The two ports enable greater equipment utilization to measure devices in transmission or reflection modes that provides a total of eight traces simultaneously.

Since manufacturing test equipment is primarily used remotely, instrument control must be easy, reliable and robust. The 86038A offers complete instrument control using DCOM via LAN interface. The LAN interface provides for easy data storage via the network with the push of a single button.

Extensive curve fitting and smoothing algorithms for group delay ripple analysis

The 86038A offers an extensive set of data processing and smoothing algorithms for post-processing of data. Custom curve fitting or smoothing algorithms can be easily imported into the 86038A as well. The data can also be easily exported for data processing and smoothing.

Dynamic Drift Reduction feature provides excellent stability

The 86038A has a unique and powerful feature that can improve the accuracy of the system when the temperature of the room or the test device is gradually changing. At each wavelength, the phase is measured many times and averaged. However, if temperature is changing, the test paths and DUT length change with it, and the phase from which relative group delay is calculated also drifts. To reduce the drift, select the dynamic drift reduction feature to automatically interleave group delay measurements at test and reference wavelengths. Variations of group delay in the reference wavelength data are caused by drift due to changes in environmental conditions. This information is used to correct the test data. All data is time-stamped, allowing the system to interpolate in time for maximum accuracy. This drift reduction feature delivers excellent stability and repeatability of measurements even in an unstable environment.

Continuous sweep mode provides real time update of data

A continuous sweep mode provides real time update of CD and IL data. This mode allows R&D and manufacturing customers to fine tune their devices and obtain real time data.

Compact desktop solution

The 86038A ODA is a stand alone compact desktop solution ideal for either a space constrained R&D lab or manufacturing floor. Setting up the 86038A requires only connecting a few cables and it can therefore be easily moved and relocated. No complicated system calibrations are required on the 86038A.

Measurement Examples

High speed and high accuracy measurements of DWDM devices

Measurement of a dispersion compensating fiber Bragg grating

Narrow band components often show rapid variations of group delay over their operating wavelength range. Figure 1 shows a group delay and insertion loss measurement of a dispersion-compensating fiber Bragg grating (FBG) using the 86038A. This measurement clearly shows the variation of the relative group delay that is complex and unique for this device. This measurement was acquired in swept mode. Figure 2 shows the CD derived from this measurement. The high wavelength resolution and the ability to set the modulation frequency to lower values allows measurement of the fine details of the group delay variation. The modulation frequency in this case was set to 100 MHz. This relative group delay data can be easily exported for post-analysis using other software tools.

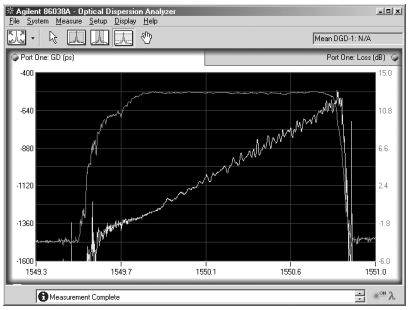

Figure 1. Group delay of a dispersion compensating fiber Bragg grating

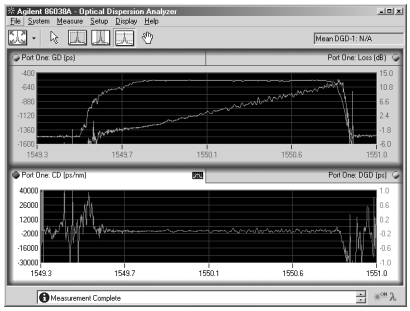

Figure 2. CD, group delay and insertion loss measurement of a dispersion compensating fiber Bragg grating

Measurement of a 50 GHz thin film filter

Figure 3 shows the measurement of a thin-film interference filter of the type that is used in a DWDM multiplexer. The extremely low noise capability of the 86038A provides very clean dispersion measurement traces even at high loss. It also provides CD measurements that are corrected for PMD artifacts. The two ports allow simultaneous transmission and reflection measurements.

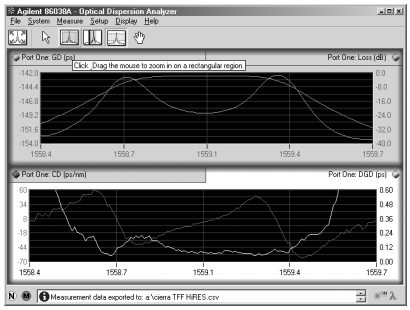

Figure 3. PMD, CD, group delay and insertion loss measurement of a 50 GHz thin film filter

Figure 4.

Measurement of an AWG optical demultiplexer

The transmission characteristics of an AWG optical demultiplexer measurement are given in Figure 5. The 86038A provides a wide dynamic range for measuring amplitude characteristics and group delay. The high speed measurement capability combined with the two ports for DUT testing increase the measurement throughput and reduce measurement time for this 40 port demultiplexer. The continuous sweep mode provides real time data to fine tune devices in manufacturing and R&D.

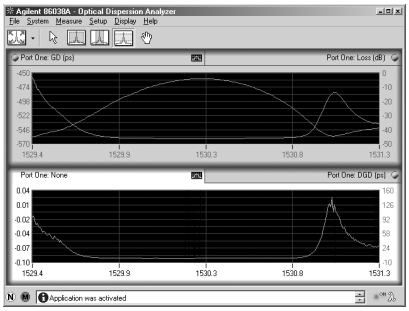

Figure 5. PMD, group delay and insertion loss measurement of an AWG demultiplexer

Low noise high accuracy chromatic dispersion and polarization mode dispersion measurements of optical fiber

Measurement of a dispersion shifted fiber

The 86038A can perform highly accurate measurements on a wide range of optical fiber (Figure 6) including standard SMF, dispersion shifted fiber, reverse dispersion fiber, large effective area fiber, HOM fiber, and PM fiber. High accuracy measurements of the length of the optical fiber can also be made with an accuracy of 0.01%.

The automatic modulation frequency selection feature on the 86038A saves measurement time by automatically choosing the best modulation frequency and avoiding phase wrap errors for fiber test.

The accuracy of chromatic dispersion measurements in optical fibers is greatly improved by fitting one of the curve fitting algorithms provided on the system to the measured relative group delay data. The 86038A can calculate all measurement results from a polynomial curve fitted to the raw data. This avoids the increase in noise normally associated with the differention of raw data.

Using these curve-fitting algorithms, the 86038A can measure group delay, chromatic dispersion and polarization mode dispersion per unit length, chromatic dispersion slope per unit length as well as the zero dispersion wavelength of optical fiber with very low noise and high accuracy and repeatability.

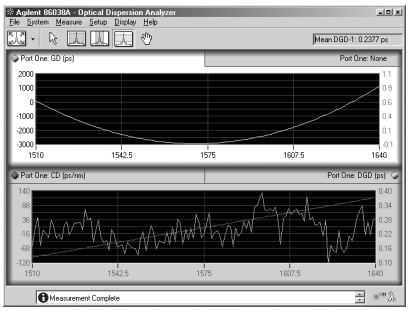

Figure 6. Optical fiber measurement for CD, PMD and group delay

Figure 7.

Measurement capabilities

- Group Delay (GD), Chromatic Dispersion (CD), Differential Group Delay (DGD), Polarization Mode Dispersion (PMD), Insertion Loss (IL) and Polarization Dependent Loss (PDL) measurements simultaneously
- Relative group delay
- Chromatic dispersion slope
- Spectral gain/loss measurements
- Transmitted and reflected signal

Narrowband components

- AWG based devices
- Fiber Bragg grating (FBG)
- Thin film filter (TFF)
- Multiplexer (MUX) and demultiplexer (DeMUX)
- Optical cross connects
- Interleavers

Broadband components

- Couplers
- Circulators
- Gain flattening filters (GFF)

Optical fiber

- Standard SMF
- Dispersion shift fiber
- Non-zero dispersion fiber
- Reverse dispersion fiber
- Large effective area fiber
- HOM fiber
- PM fiber

Optical amplifiers

- EDFA
- Raman
- Semiconductor

Optical transmission systems

- Very long amplified lightwave transmission systems
- 10 and 40 G subsystems and systems

Dispersion compensating devices

- Tunable dispersion compensators
- Dispersion compensating fiber (DCF) modules
- Fiber Bragg grating dispersion compensators

General Specifications

Assembled dimensions: (H x W x D)

50 cm x 42 cm x 55 cm
19.6 in x 16.7 in x 21.5 in

Net weight

Standard system: 57 kg (130 lbs)

Specifications

Table 1. Group Delay and Differential Group Delay Measurement

Stepped Relative Group Delay Repeatability [a, b, c]	
0 dB level	± 20 fs
<0 dB to –10 dB level (characteristic)	*± 50 fs*
<–10 dB to –20 dB level (characteristic)	*± 150 fs*
<–20 dB to–30 dB level (characteristic)	*± 500 fs*
<–30 dB to –40 dB level (characteristic)	*± 5 ps*
Stepped Differential Group Delay Accuracy (characteristic) [a, b]	*± 90 fs ± 9% of Measured DGD*
Stepped Differential Group Delay Repeatability [a, c, d]	± 20 fs ± 7% of Measured DGD
Group Delay Time Resolution	1 fs
Modulation Frequency Range	5 MHz to 2.5 GHz

a At the same temperature as the normalization temperature ± 0.5°C

b Measured using a 2.2 meter thermally isolated SMF patch cord. Modulation frequency = 2 GHz. IFBW = 30 Hz, 51 phase samples per trace point, 10 nm wavelength step size, receiver input power –12 dBm to –18 dBm across the wavelength range (TLS output approximately –5 dBm). Normalization performed with Phase Dynamic Accuracy selected. The level is relative to a 0.5 m SMF patch cord normalization device.

c Repeatability is defined as the worst (plus or minus) standard deviation over the wavelength range 1520 nm to 1610 nm from 10 sweeps.

d Verified with two characterized standards that have 1.45 ps and 0.19 ps DGD in the operating wavelength range. Modulation frequency = 2 GHz, IFBW = 70 Hz, 801 phase samples per trace point, 10 nm wavelength step size, receiver input power –12 dBm to –18 dBm across the wavelength range (TLS output approximately –5 dBm). Normalization performed with Phase Dynamic Accuracy selected.

Table 2. Swept Relative Group Delay Measurement

Swept Relative Group Delay Offset (characteristic) [a, b]	*± 250 fs*
Swept Relative Group Delay Repeatability (characteristic) [b, c]	*± 25 fs*

a Offset is defined as the difference in relative group delay between stepped and swept measurements.

b Measured using a 2.2 meter thermally isolated SMF patch cord. Modulation frequency = 2 GHz. IFBW = 30 Hz, receiver input power –12 dBm to –18 dBm across the wavelength range (TLS output approximately –5 dBm). Swept measurements performed with 51 trace points, stepped measurements performed with 1.8 nm step size. Normalization performed with Phase Dynamic Accuracy selected.

c Repeatability is defined as the worst (plus or minus) standard deviation over the wavelength range 1520 nm to 1610 nm from 10 sweeps.

Table 3. Amplitude Measurement

Polarization Dependent Loss Accuracy (characteristic) [a]	*± 0.25 dB*
System dynamic range (characteristic) [b, c]	*50 dB*
Gain Loss Accuracy (characteristic) [d]	*± 0.25 dB*

a Verified with a PDL standard that has 0.46 dB PDL in the operating wavelength range. Modulation frequency = 2 GHz. IFBW = 70 Hz, with 201 samples per trace point, 10 nm step size, receiver input power –12 dBm to –18 dBm across the wavelength range (TLS output approximately –5 dBm). Normalization performed with Phase Dynamic Accuracy selected.

b TLS power set to +2 dBm

c Measured at 1550 nm, Modulation Frequency = 2 GHz, IFBW = 70 Hz, 801 phase samples per trace point, 10 averages.

d Excludes connector repeatability.

Table 4. Wavelength Measurement

Wavelength Range	
with Agilent 81600B-200 Tunable Laser Source	1440 nm to 1640 nm
with Agilent 81600B-160 or 81640B	1495 nm to 1640 nm
with Agilent 81600B-150	1450 nm to 1590 nm
with Agilent 81600B-140	1370 nm to 1495 nm
with Agilent 81600B-130	1260 nm to 1375 nm
with Agilent 81640A	1510 nm to 1640 nm
Minimum Wavelength Step Size	0.1 pm
Absolute Wavelength Accuracy [a, b]	
Stepped mode with Agilent 86122A (characteristic)	*± 1 pm*
Stepped mode without Agilent 86122A and with 81600B or 81640B	± 10 pm
Stepped mode without Agilent 86122A and with 81640A	± 15 pm
Relative Wavelength Accuracy [a, c]	
Stepped mode without Agilent 86122A and with 81600B or 81640B	± 5 pm
Stepped mode without Agilent 86122A and with 81600B or 81640B (characteristic)	*± 2 pm*
Stepped mode without Agilent 86122A and with 81640A	± 7 pm
Stepped mode with Agilent 86122A and with 81640A (characteristic)	*± 3 pm*

a Valid for one month and within a ±4.4 K temperature range after automatic wavelength zeroing. Measured with wavelength meter based on wavelength in vacuum.

b For details, refer to tunable laser's absolute wavelength accuracy specification.

c For details, refer to tunable laser's relative wavelength accuracy specification.

Table 5. Optical Fiber Chromatic Dispersion Measurement

Zero Dispersion Wavelength Accuracy (characteristic) [a, b, c, d]	*± 150 pm*
Zero Dispersion Wavelength Repeatability (characteristic) [a, b]	*± 9 pm*
Accuracy of dispersion slope at the zero dispersion wavelength (characteristic) [a, e]	*± 25 fs/nm²*
Repeatability of dispersion slope at the zero dispersion wavelength (characteristic) [a, e]	*± 3 fs/nm²*

a Measurements performed with modulation frequency = 2 GHz, IFBW = 30 Hz, stepped mode with 51 phase samples per trace point, 1 nm wavelength step size, 1515 nm to 1580 nm wavelength range, receiver input power –43 dBm to at 1550 nm. Normalization performed with Phase Dynamic Accuracy selected and an Agilent 86122A multi-wavelength meter attached to the system.

b Based on measurements of NIST Standard Reference Material 2524, Serial No. 0001, using a quadratic fit to each raw relative group delay trace.

c Includes the characteristic uncertainty of the zero dispersion wavelength as quoted by NIST of ± 60 pm (2 standard deviations).

d Includes the uncertainty of the temperature measurement used to correct the zero dispersion wavelength of ± 30 pm (2 standard deviations).

e Based on measurements of NIST Standard Reference Material 2524, Serial No. 0001, using a 5-term Sellmeier fit to each raw group delay trace.

Documentation

The main system documentation is the operating manual that describes how to operate the Agilent 86038A. Individual instrument manuals will also be supplied with supplemental documentation of any special modifications. All documentation is shipped with the product but is also available on the Agilent web site at www.agilent.com/comms/lightwave

Warranty

Note—all system warranties and support agreements are dependent upon the integrity of the Agilent 86038A. Any modification of the system software or hardware will terminate any obligation that Agilent Technologies may have to the purchaser. Please contact your local Agilent field engineer before embarking in any changes to the system.

System

Included in the sales price is an industry leading one-year warranty. In addition to the one-year warranty, extended warranty periods, on-site troubleshooting, reduced response times and increased coverage hours can be negotiated under a separate support agreement and will be charged at an extra cost.

Instruments and computers

Faulty instruments will be repaired following procedure described in Appendix 1. The instrument standard support life period is five years. Application software is supported only on computer and instrument configurations specified at the time of installation.

Instrument level hardware support

See Appendix 1.

Ordering Information

The 86038A optical dispersion analyzer offers three standard options to satisfy customer specific measurement requirements. All configurations start with a basic system mainframe, and customers can select the desired options. The wavelength meter is not included in the system mainframe but can be added as an option. An option for a customer-provided TLS is also available for customers who have their own Agilent tunable laser source.* The complete list of options and accessories is described in Table 6.

All options are available at the time of purchase. Contact your local Agilent field representative or Test and Measurement Services and Consulting Operations for details and quotes.

Table 6. Agilent 86038A ordering options

86038A Optical dispersion analyzer	
At least one TLS option must be ordered with the instrument	
86038A – **100**	Add 86122A multi-wavelength meter for ± 1.0 pm accuracy
86038A – **111**	Standard CD/PMD/PDL/IL solution for C and L bands (1495 nm to 1640 nm using the Agilent 81600B-160 TLS)
86038A – **321**	Customer-supplied Agilent 81600B-160 or 81640B TLS and 8164A/B

* Customer supplied Agilent tunable laser sources must be equipped or retrofitted with the polarization maintaining (PM) fiber option. Contact the Agilent field sales staff for more information about performing retrofits.

Installation and training

Included in the system price is one day of verification and training by Agilent personnel. Training covers use of the system but not optimization of measurements. Further training can be purchased as needed.

The verification portion will include a system functional test using a characterized Agilent fiber spool, which is shipped with the system. A documented procedure for operational check purposes will be provided as part of the system documentation. No system level calibration is available. A system functional test should always be done after instrument level repair.

The instrument calibration cycle is one year from the system shipment date. No system level calibration is available. It is the customer's responsibility to make arrangements with Agilent for instrument level calibration requirements.

Appendix

Appendix 1: System repair strategy

Diagnostics are provided at the installation site by the Agilent local support system engineer. If the system instrumentation is faulty the System Support Strategy will be applied.

System repair strategy

Table 7. Agilent 86038A repair strategy

Description	Repair Strategy
Tunable laser source	Return to Agilent
Network analyzer	Return to Agilent
Test set	Return to Agilent
Multi-wavelength meter	Return to Agilent

Appendix 2: System support options

In addition to the standard one-year Agilent warranty, the Agilent 86038A's warranty plan can be tailored to meet customer needs. Agilent Service Centers offer two options for extending the duration of the standard warranty.
Option W30 increases the warranty to three years, and option W50 extends the standard warranty to five years.

For further information on availability, implementation and pricing of the various support options, please contact your local field engineer.

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

Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

Our Promise

Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you use Agilent equipment, we can verify that it works properly, help with product operation, and provide basic measurement assistance for the use of specified capabilities, at no extra cost upon request. Many self-help tools are available.

Your Advantage

Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and on-site education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

By Internet, phone, or fax, get assistance with all your test & measurement needs

Online assistance:

www.agilent.com/comms/lightwave

For related literature, please visit:

www.agilent.com/comms/oda

Phone or Fax

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