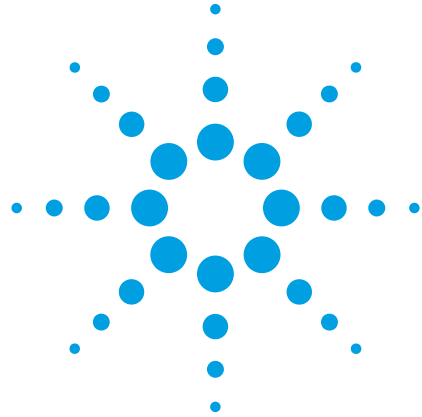
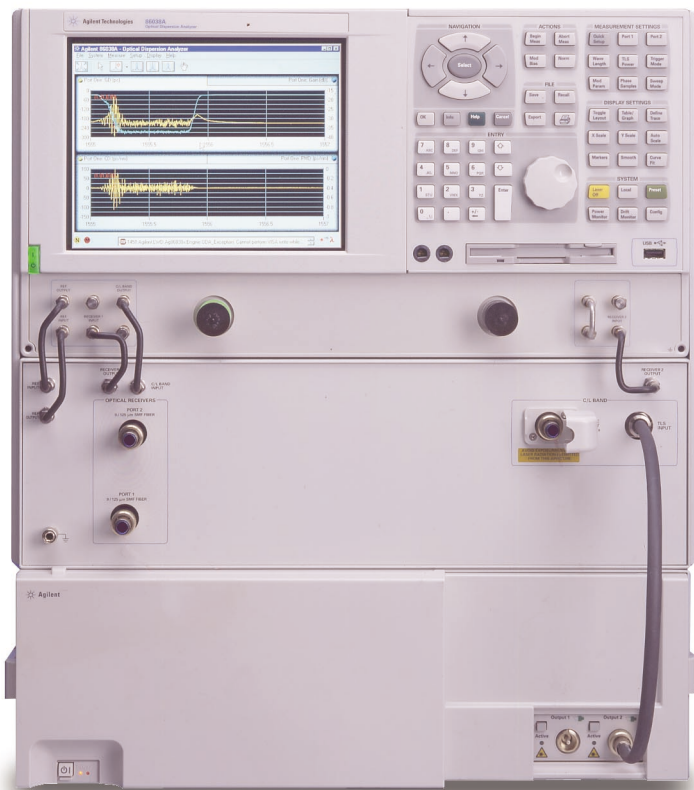


86038A

*Accelerating the development
of "next generation" optical networks*



Optical Dispersion Analyzer



Agilent 86038A Optical dispersion analyzer



Agilent Technologies

Introduction

Simultaneous measurements in the C- and L-Bands of:

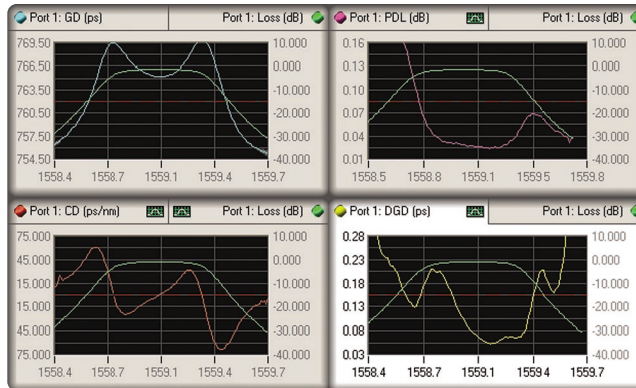
- Polarization mode dispersion (PMD)
- Chromatic dispersion (CD)
- Insertion loss (IL)
- Polarization dependent loss (PDL)

The telecommunications industry is undergoing the most significant series of changes since its inception, and next generation of high-speed DWDM networks will require testing above and beyond what is available today.

If you are involved in optical communications design or manufacturing, you know the challenges you face are complex:

- higher data transmission rates (10 and 40 Gb/s)
- dense wavelength division multiplexing (DWDM) (≤ 100 GHz channel spacing)

Dispersive effects are a major barrier to deploying 10 and especially 40 Gb/s DWDM networks. As data rates increase chromatic dispersion causes pulses to “spread out” into adjacent bit slots. Polarization mode dispersion also limits fiber optic transmission performance. This is due to birefringence in the optical transmission medium which causes polarization components of a signal to travel at different group velocities. Chromatic and polarization mode dispersion limit the performance of optical components and systems. Therefore, precise characterization becomes mandatory at data rates of 10 Gb/s and beyond.



The Agilent 86038A optical dispersion analyzer—The future of optical dispersion measurements

Designed for the development of a wide range of devices including DWDM optical components, optical fiber and amplifiers, the 86038A provides industry leading accuracy and repeatability of polarization mode dispersion, group delay, and chromatic dispersion. The 86038A combines the Agilent performance network analyzer (PNA), the next generation optical test set and the Agilent 81640B tunable laser source. Very low noise and high speed capability give you unprecedented group delay resolution and the freedom to trade off resolution for measurement speed. The 86038A can also automatically correct CD measurements for the variations produced by PMD.



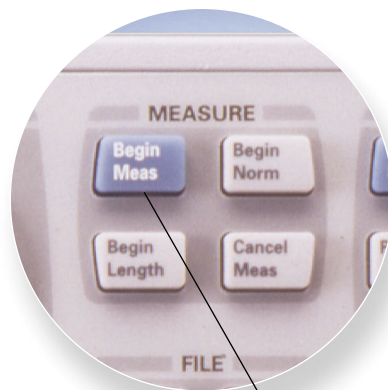
The software allows fast stepped measurements and ultra-fast swept mode measurements. The 86038A also offers a real time data update mode (continuous sweep) for fine tuning of test devices or monitoring of dynamic chromatic dispersion compensator performance.

Measurement capabilities

- Simultaneous measurements of DGD/PMD, GD, CD, IL and PDL
- Extremely fast swept measurement
- Very high accuracy and repeatability
- Two optical receiver ports for greater flexibility
- 8 traces measured simultaneously
- Transmitted and reflected signals measured simultaneously
- CD measurements automatically corrected for the DGD produced by PMD

Dispersive effects are a major barrier to deploying 10 and 40 Gb/s DWDM networks.

Do you need to reduce your time to market on 10 and 40 Gb/s devices and systems?



One-button measurements

Time to Market

Maximize performance while minimizing the cost of test

The Agilent 86038A ODA performs highly accurate dispersion and loss measurements with a single setup and connection, saving time and reducing the chances of error. The 86038A is the ideal solution for R&D and manufacturing customers testing DWDM components, optical fibers, amplifiers and systems.

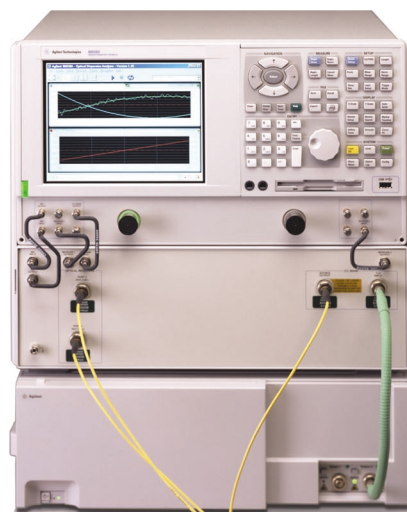
Reduce your time-to-market on devices and systems?

Simultaneous measurements of PMD, CD, PDL and IL allow you to verify that your products met their specifications. Chromatic dispersion measurements are automatically corrected for the group delay variations induced by PMD. Combined with the system's excellent sensitivity, you have the most accurate CD measurements in the industry.

The 86038A is designed for high throughput measurements in the entire C- and L-bands (1495-1640 nm).

Increased throughput for manufacturing

Parallel testing of the devices under test allows high volume manufacturers to double their throughput. The two receiver ports allow simultaneous measurement of reflection and transmission. Up to 8 traces of measurement attributes can be displayed simultaneously.



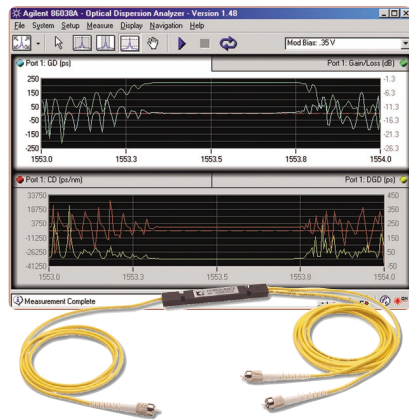
The 86038A provides complete testing of dispersion and loss for a wide ranges of devices. An intuitive user interface saves you time by minimizing training and helping to increase user efficiency. High speed measurement capability and parallel testing of devices allows you to reduce equipment inventory and decrease test time. An option to delete the tunable laser source reduces the cost of the solution by allowing you to use an existing TLS.

Easy to use desk top solution

The 86038A is a stand alone, compact, desk top solution ideal for either space constrained R&D lab or manufacturing floor. The 86038A has a simple user interface that lets manufacturing and R&D users focus on their measurement process. With the push of a single button measurements can be acquired. An extensive set of data smoothing and curve fitting functions are built into the ODA software. The data can be easily exported for data processing. The instrument is fully remote controllable and can easily be integrated into an existing test set up.



Do you need to make fast, accurate dispersion measurements?



Group delay

As data rates increase beyond 10 Gb/s the accuracy of your chromatic and polarization mode dispersion measurements is critical and all components must fulfill stringent requirements. The 86038A uses the standardized modulation phase shift (MPS) method for CD measurements. Measurement systems based on the MPS method are extremely sensitive and capable of resolving a fraction of a pico-second of relative group delay. The 86038A applies an innovative technique based on the MPS method to achieve group delay for narrow-band components, fiber, amplifiers and systems. An optional multi-wavelength meter can be integrated for improved absolute wavelength accuracy.

Differential group delay

The 86038A uses the standardized modulation phase shift method and an innovative statistical randomized polarization scanning to obtain comprehensive, simultaneous measurements of polarization mode dispersion, group delay, chromatic dispersion, insertion loss and polarization dependent loss. At each wavelength all states of polarization are scanned and measurements are taken with a resolution that is only limited by the spectral width of the intensity modulation. The polarization scanner provides a statistically uniform polarization scanning.

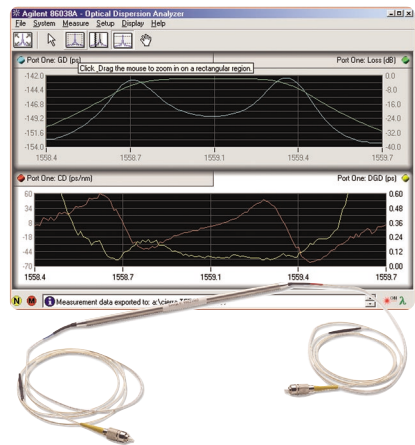
Measurement speed

The 86038A provides extremely 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 the measurement accuracy. An ultra fast continuous sweep mode that provides real time data update is also provided for fine-tuning of devices in R&D and manufacturing.

Highly-accurate stepped measurements of polarization mode dispersion and polarization dependent loss using a high speed polarization scanner allows you to measure DGD and PDL at each wavelength.

Optical frequency resolution

The 86038A can perform measurements with modulation frequencies as low as 5 MHz that correspond to a wavelength resolution of 0.08 pm. The extremely low noise floor on the PNA combined with phase dynamic accuracy corrections gives you group delay, CD, loss and PDL measurements with high accuracy and repeatability at low modulation frequencies. You can perform measurements with wavelength step size down to 0.1 pm. High-measurement resolution capability shows you the fine details of group delay ripple of fiber Bragg gratings and amplitude characteristics and chromatic dispersion of DWDM optical components. The sensitivity of DGD measurements is reduced when modulation frequency is decreased.



You'll feel confident that your design meets its required specifications with the 86038A's best in class accuracy.

DWDM device measurements with ultra-high speed and accuracy

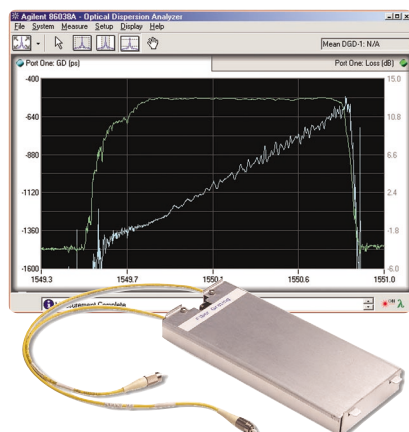
DWDM

Narrowband components

- Thin film
- FBG
- Bulk gratings
- AWG
- Interferometric
- Filters
- Multiplexers
- Demultiplexers
- Interleavers

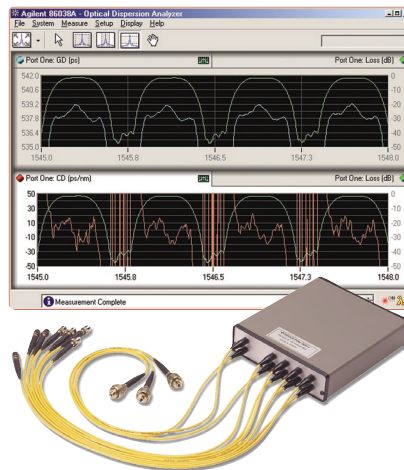
Measurement of a chromatic dispersion compensating fiber Bragg grating

Narrowband components often show rapid variations of group delay over their narrow operating wavelength range. The figure below shows a chromatic dispersion and insertion loss measurement of a dispersion-compensating fiber Bragg grating (FBG) using the 86038A. This measurement clearly shows a complex variation of the relative group delay that is unique to this device. The measurement was acquired in the swept mode in less than 10 seconds, with a modulation frequency of 100 MHz. High-wavelength resolution and the ability to set the modulation frequency to lower values allow measurement of the fine details of the group delay variation. Measurement data can be easily exported for post-analysis using other software tools.



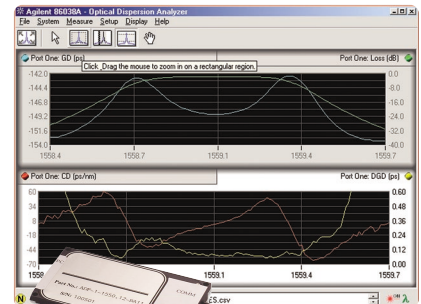
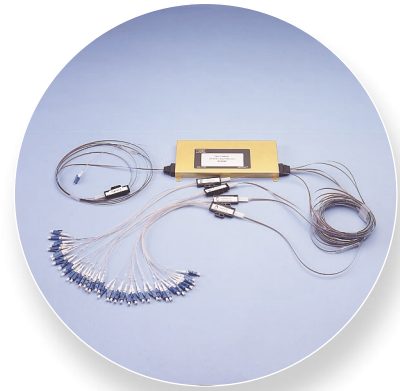
Measurement of a 50 GHz interleaver

The figure below shows a group delay, chromatic dispersion and insertion loss measurement of a 50 GHz interleaver. The extremely low noise measurements provide very clean dispersion measurement traces even at high loss levels of 42 dB or more. CD measurements are automatically corrected for the group delay contributions of PMD, which combined with other system advantages gives you the most accurate measurements in the industry. This measurement of 1601 wavelength points for GD/CD and IL was acquired in 10 seconds in the swept mode.



Measurement of a 50 GHz thin film filter

The following figure shows the group delay, chromatic dispersion, differential group delay and insertion loss measurements of a thin film filter. Thin film filters require very clean low noise dispersion traces and high accuracy and repeatability of measurements. This measurement shows clean group delay traces at a high loss of 30 dB or more. The two ports allow you to make simultaneous transmission and reflection measurements.



Chromatic dispersion Compensating devices

- Tunable chromatic dispersion compensators

Broadband components

- Couplers
- Circulators
- Gain flattening filters

The 86038A performs highly-accurate, high-speed measurements of broadband devices such as couplers, circulators, gain flattening filters, etc.

The 86038A provides performance that is crucial for characterizing the next generation optical networks.

The future of optical dispersion measurements

CD-RW drive

External CD-RW drive (standard on all instruments) for easy storage of data and for easy software upgrades.

Easy-to-read graphical display

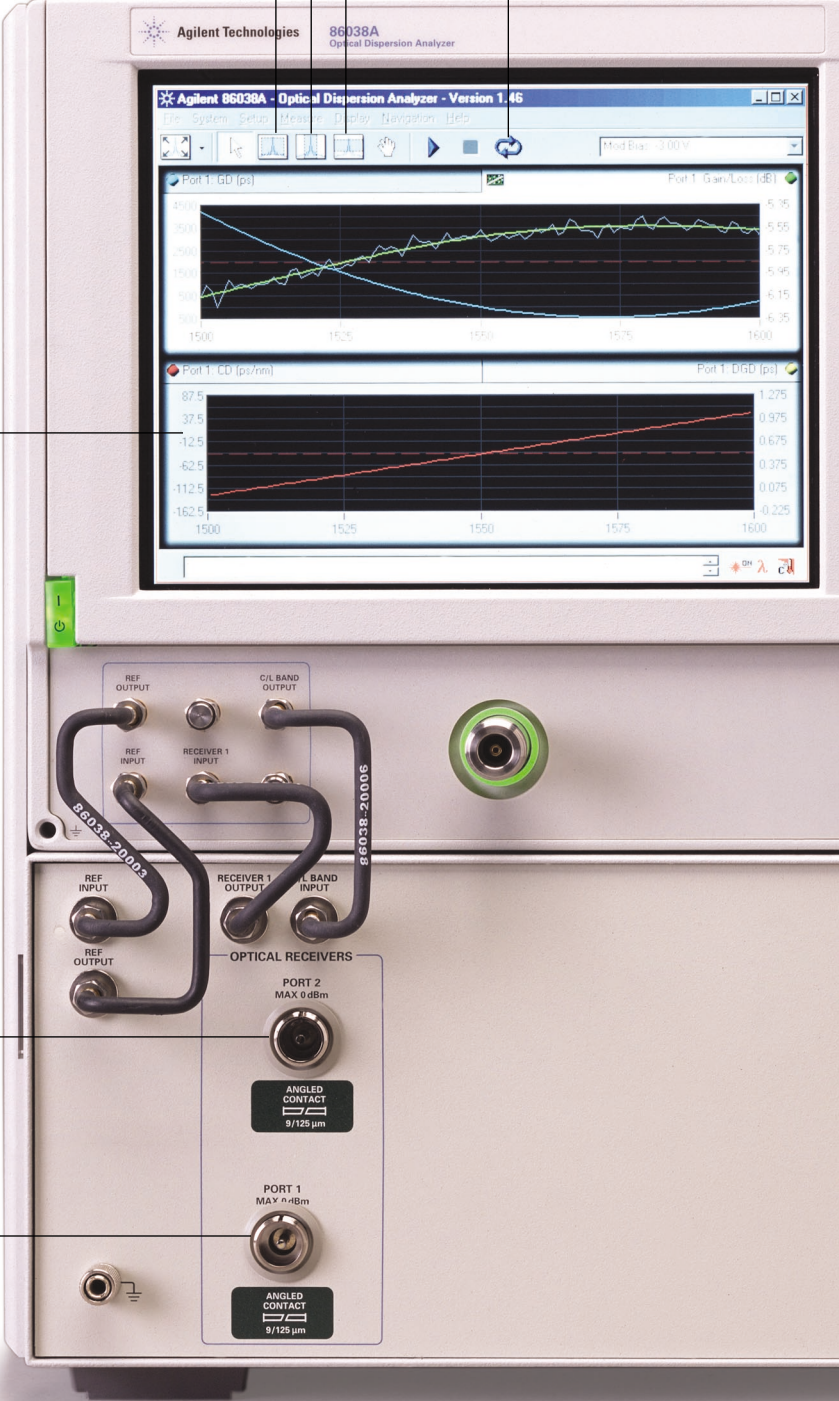
Display GD, CD, DGD, IL and PDL. Marker allows fast quantitative analysis of input signals.

2 port measurement

2 ports allow increased measurement throughput

Zoom into data

Ultra-fast continuous sweep mode for real time data update



Features

Ease of use from the front panel. Perform all measurements using the front panel.

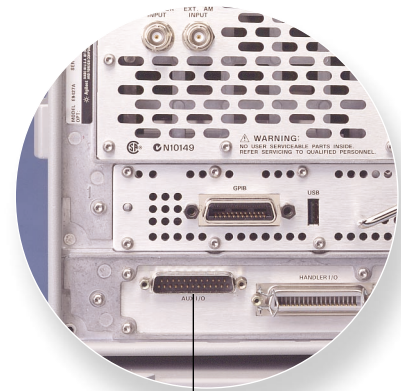
One button measurements

Print a complete report of data with the hit of a single button.

Display 8 traces of measurement simultaneously

Data can be easily exported for data processing

Quick setup button allows you to perform measurements optimized for speed and accuracy.



Connectivity
LAN, USB and parallel ports

One button length measurements

Easily smooth data
Extensive set of data smoothing functions are built into the ODA software.

Easily curve fit data
Extensive set of data curve fitting functions are built into the ODA software.

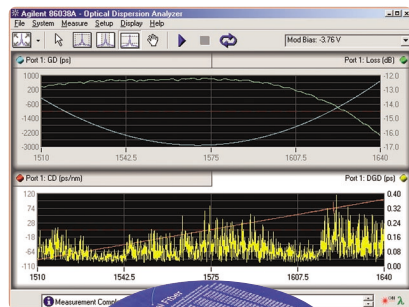


Complete system shown with TLS.

Complete solutions for dispersion and loss testing of optical fiber, amplifiers and systems

Optical fiber

- Standard SMF
- Dispersion compensating fiber modules (DCM)
- Non-zero and dispersion shift fiber
- PM fiber, etc.

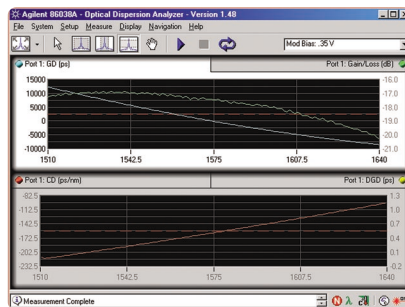


Measurement of standard SMF

The 86038A performs highly-accurate, very low-noise measurements on a wide range of optical fiber including standard SMF, dispersion shifted fiber, reverse dispersion fiber, large effective area fiber, HOM fiber, PM fiber. You can measure optical fiber with an accuracy of 0.01% of the length of the fiber.

The automatic Modulation Frequency selection feature saves you 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 four curve fitting algorithms provided on the system to the measured relative group delay data. The 86038A calculates all measurement results from a polynomial curve fitted to the raw data. This avoids the increase in noise normally associated with differentiating of raw data.



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.

Optical amplifiers

- EDFA
- Raman
- Semiconductor

Optical transmission systems

Very long amplified lightwave transmission systems

EDFAs, Raman and Semiconductor optical amplifiers can be easily measured with high accuracy and speed on the 86038A. Very long amplified optical transmission systems up to 100,000 km in length, can be measured for dispersion and loss using the 86038A.

Built-in smoothing and curve fitting functions make critical measurements fast and easy.

Ideal solution—design through manufacturing



Research and development

Overcoming dispersion will likely be the biggest barrier in deploying the next generation of DWDM networks. Chromatic dispersion can limit the performance of optical components and signals. Like chromatic dispersion, polarization mode dispersion can also limit fiber optic transmission performance. Today optical components such as fiber Bragg gratings, thin film filters and array waveguide gratings 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. Therefore, your measurement tools must have the performance to enable characterization of next-generation systems. These tools must also have features that maximize user efficiency in a laboratory environment.

Measurement capabilities focussed on saving you development time.

Designed to meet your needs in R&D, the new graphical user interface with markers and zoom capabilities allows quick and easy characterization of the relevant device parameters.

CD measurements automatically corrected for PMD artifacts

CD measurements of optical fiber and devices are inherently uncertain by up to one half of the differential group delay, an artifact of PMD. The 86038A takes advantage of the polarization scanning process to explore the impact of PMD on the group delay and remove it, allowing the system to produce group delay and CD traces that are free of the effects of PMD. These unique features available on the 86038A make it the most advanced dispersion analyzer available in the market today.

The 86038A optical dispersion analyzer provides the performance that is crucial for characterizing next generation optical networks for dispersion and loss.



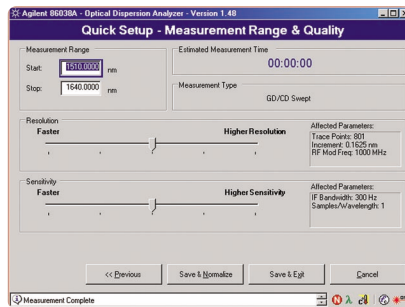
Manufacturing

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 overcomes the instability caused by thermal drifts and mechanical vibrations inherent in other methods such as the Interferometry method and the Differential Phase shift method (Reference: Optical Society of America Trends in Optics and Photonics Series Vol.33 - Bragg Gratings).

The Agilent optical dispersion analyzer offers the fastest group delay, chromatic dispersion and insertion measurements in the industry today. It can perform a swept measurement of 1601 wavelength points in less than 10 seconds. The 86038A also provides highly accurate stepped measurements of polarization mode dispersion (PMD) and polarization dependent loss (PDL). An ultra-fast continuous sweep mode provides real time data update for fine-tuning of devices in R&D and manufacturing.



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



The user friendly interface allows you to quickly perform measurements from the front panel. The quick set-up button allows you to perform measurements optimized for speed and accuracy.

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. 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. Variations of group delay in the reference wavelength data are evidence of a change in the temperature of the room or the test device. This information is used to correct the test data. This drift reduction feature delivers excellent stability and repeatability of measurements even in an unstable environment. With the press of a single button you can activate the Dynamic Drift Reduction feature of the 86038A.

Spend time making measurements, not on learning how to use the instrument

86038A—a complete product solution

Complete Solution

The performance of the optical dispersion analyzer is only a small part of what you get from Agilent Technologies. Agilent strives to provide complete solutions that go beyond our customer's expectations. Only Agilent offers the depth and breadth of enhancements, service, connectivity and support to help our customers reach their measurement objectives.



Accessories

- External CD-RW drive (standard on all instruments) for easy storage of data
- External keyboard and mouse



Pre-sales service

- Rentals, leasing and finance
- Application engineering services
- Application and product notes



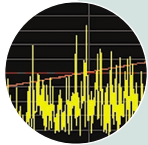
Post-sales support

- On-site verification and training by Agilent personnel included in the price of the system
- Standard one-year global warranty
- Worldwide call center and service center support network



Remote control connectivity

- .net remote control environment with support for com
- Remote control programming examples for VB6 and .net
- No external PC – makes remote control easy to set up and operate



Serviceability

- Recovery disk to restore factory defaults



PC connectivity

- LAN, parallel, VGA, and 2 USB ports



Training and access to information

- English manuals available in hardcopy or via the web
- Application notes for optimizing your measurements'

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

86038A Optical dispersion analyzer

At least one TLS option must also be ordered with the instrument:

- | | |
|------------|--|
| 86038A-100 | Add 86122A multi-wavelength meter for ± 1 pm accuracy |
| 86038A-111 | Standard CD/PMD/PDL/IL solution for C and L bands (1495 to 1640 nm using the Agilent 86140B TLS) |
| 86038A-321 | Customer supplied Agilent 81640B tunable laser source |

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 onsite 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.



Agilent Email Updates

www.agilent.com/find/emailupdates

Get the latest information on the products and applications you select.

Agilent T&M Software and Connectivity

Agilent's Test and Measurement software and connectivity products, solutions and developer network allows you to take time out of connecting your instruments to your computer with tools based on PC standards, so you can focus on your tasks, not on your connections. Visit www.agilent.com/find/connectivity for more information.

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

Phone or Fax

United States:

(tel) 800 452 4844

Canada:

(tel) 877 894 4414

(fax) 905 282 6495

China:

(tel) 800 810 0189

(fax) 800 820 2816

Europe:

(tel) (31 20) 547 2323

(fax) (31 20) 547 2390

Japan:

(tel) (81) 426 56 7832

(fax) (81) 426 56 7840

Korea:

(tel) (82 2) 2004 5004

(fax) (82 2) 2004 5115

Latin America:

(tel) (305) 269 7500

(fax) (305) 269 7599

Taiwan:

(tel) 0800 047 866

(fax) 0800 286 331

Other Asia Pacific Countries:

(tel) (65) 6375 8100

(fax) (65) 6836 0252

Email: tm_asia@agilent.com

Online Assistance:

www.agilent.com/find/assist

Product specifications and descriptions in this document subject to change without notice.

© Agilent Technologies, Inc. 2002
Printed in U.S.A., December 2, 2002
5988-7200EN



Agilent Technologies