Agilent N7788B/BD Optical Component Analyzer

Data Sheet

Figure 1. N7788BD bench-top mainframe with built-in PC

Figure 2. N7788B bench-top mainframe

Introduction

Agilent Technologies pushes the limits of component measurements with the N7788B component analyzer. Its proprietary technology is comparable with the well-known **Jones-Matrix-Eigenanalysis (JME)** which is the standard method for measuring polarization mode dispersion (PMD) or differential group delay (DGD) of optical devices.

Compared to the JME, Agilent's new **single scan technology** offers a range of advantages:

A complete set of parameters:

- DGD/PMD
- PDL
- Power/loss
- TE/TM-loss
- Jones matrices
- Mueller matrices
- 2nd-order PMD (depolarization + PCD)
- Principal states of polarization (PSPs)

Key Benefits

- **Highest accuracy** in a single sweep: no averaging over multiple sweeps required
- **High measurement speed:** Complete measurement across C/L-band in less than 10 seconds (no need to wait for many averages)
- **Robustness** against fiber movement/ vibration and drift: Fixing fibers with sticky tape on the table or even operation on isolated optical table is not required!
- **No limitation on optical path length** of component
- The **internal referencing scheme** guarantees reliable and accurate measurements.

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Applications

- Fiber characterization: SMF, PMF, DCF
- Passive component testing: filters, isolators, circulators
- Dynamic component / module testing: OADM / ROADM
- Active component testing: EDFAs, SOAs, VOAs
- Link test: in-channel measurements across amplifiers

Designed for the manufacturing floor

High throughput
A complete analysis across the C and the L band is performed in less than 10 seconds!

Software drivers
A range of software drivers is available for external control of the system. This allows easy integration in common ERP systems.

Remote control
Control of the instrument through LAN or via the Internet is supported. This supports automation as well as trouble shooting.

Report generation
Generating PDF reports is supported. The content including layout is configurable by the user.

Real time power readout
High throughput measurement of non-connectorized components is supported by providing a real time power readout which enables fiber coupling of the new device

Barcode scanner
Barcode scanning is supported for quick transfer of the DUT serial number

Agilent N7788B Instrument Setup and Application Examples

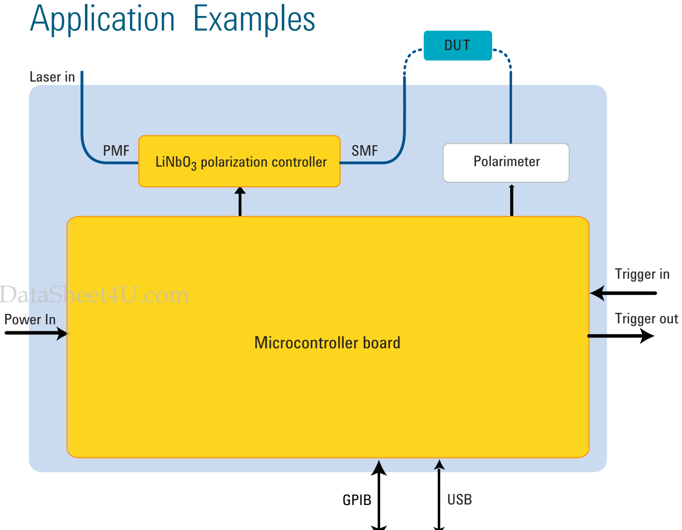

Figure 3. Instrument setup

The instrument setup is shown in the Figure 3. A LiNbO3 polarization controller determines the input polarization to the DUT. While the tunable laser source is sweeping over the desired wavelength range, a polarimeter analyzes the output state of polarization while input polarization is being modified. The result will be a highly accurate device characterization with respect to DGD/PDL/loss, etc. Furthermore, the internal optical switch provides continuous self calibration for excellent repeatability.

Resolving TE/TM insertion loss
The TE/TM-function allows accurate determination of the minimum and maximum loss of the DUT at each wavelength.

Due to birefringence, optical filters tend to show different transmission functions depending on the polarization state. As shown in Figure 4, these functions are typically shifted in wavelength depending on the amount of birefringence.

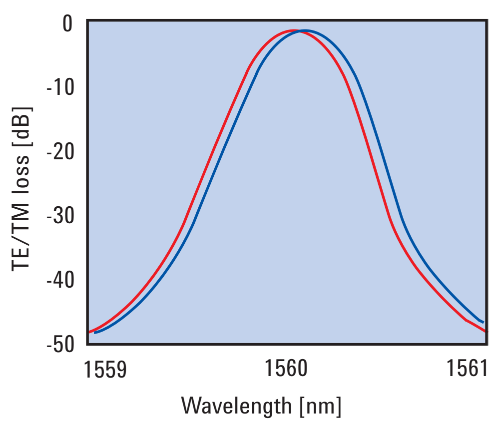

Figure 4. Polarization-dependent wavelength shift (PD-λ) of a filter.

The capability of performing quick PMD-measurements makes this measurement system well-suited for collecting long-term PMD data. The PC software allows to continuously collect the spectral PMD data and store it on the hard disc. The data can then be visualized as pseudo-color plot (see Figure 5).

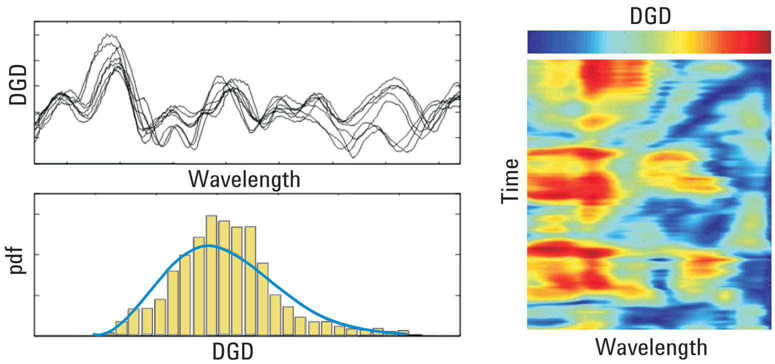

Figure 5. Long term DGD measurements.

Particularly for characterizing optical filters, the high dynamic range of the N7788B allows accurate resolution of the filter's side lobes.

The internal reference path allows measurement of insertion loss spectra with excellent accuracy, minimizing the influence of the power characteristics of the tunable laser source.

Due to the excellent spectral resolution, the Agilent N7788B is best suited for intra-channel DGD/PDL characterization.

The all-parameter-JME algorithm allows flexible adjustments of the wavelength resolution without the need to repeat the measurement. This allows the user to easily find the optimum trade-off between PDL/DGD accuracy and wavelength resolution.

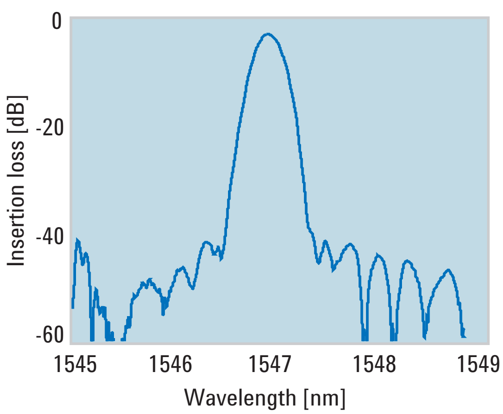

Figure 6. Side lobes of an optical filter.

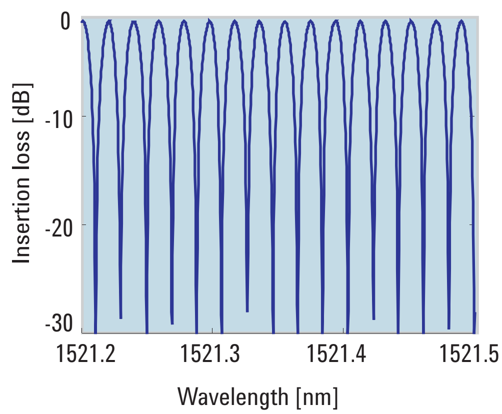

Figure 7. Loss curve of a DPSK demodulator.

Table 1: Specifications[1)] N7788B/BD Optical Component Analyzer

Wavelength		
Specification wavelength range	1270 nm ... 1375 nm (Opt 300, O-Band) 1270 nm ... 1375 nm, 1460 nm ... 1620 nm (Opt 400, O/C/L-Band) 1460 nm ... 1620 nm (Opt 500, C/L-Band)	
Operating wavelength range[2)]	1260 nm ... 1640 nm	
Differential Delay		
DGD uncertainty	Resolution 2,0 nm: Resolution 0,1 nm:	± (30 fs + 0.3% · DGD) ± (30 fs + 3.0% · DGD)
DGD measurement range[3)]	0 ... 1000 ps	
PMD uncertainty[4)]	±(30 fs + 2.0% · DGD)	
PMD repeatability (typical)	±3 fs	
PMD measurement range[4)]	0 ... 300 ps	
Loss		
PDL uncertainty (typical)[5)]	C/L-Band: O-Band:	± (0.05 dB + 4% · PDL) ± (0.05 dB + 4% · PDL)
PDL repeatability (typical)	±5 mdB	
Insertion loss uncertainty (typical)[3)]	C/L-Band: O-Band:	± 0.03 dB ± 0.07 dB
Insertion loss dynamic range (typical)[3)]	> 41 dB (for higher TLS power levels, increase value accordingly)	
Polarization Analysis		
See N7781B		

1) Ambient temperature change max ± 0.5°C since normalization. Valid for 81600B Tunable Laser Source Family. TLS power set to -6 dBm. Sweep over specification wavelength range. Specification does not include instability in test device. Specified loss ranges include loss of test device and any additional switches or connections in the optical path. Specification valid on day of calibration.
2) SOP/DOP measurements are only possible outside the specification wavelength range if the user performs a manual calibration.
3) DUT properties: Insertion loss < 30 dB, PDL < 1 dB, DGD < 150 ps. Specification is typical for DGD > 150 ps.
4) DUT properties: Insertion loss < 41 dB, PDL < 3 dB, PMD < 50 ps. Applies for highly mode-coupled devices such as single mode fibers. Specification applies for PMD being averaged DGD over a wavelength span of 100 nm. Specification is typical for PMD < 50 ps.
5) DUT properties: Insertion loss < 25 dB, PDL < 6 dB. Note: DUT connectors are considered as being part of the DUT. Thus, angled connectors will add to the device PDL.

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

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