Application Note

Generating Fiber Characterization Reports

High-speed and high-quality transmission systems require verification of network fiber infrastructure performance to ensure reliable equipment operation and to meet rigorous performance standards. At 10 G and 40 G line rates, dense wavelength division multiplexing (DWDM) and optical transport network (OTN) technologies require a detailed conventional measurement suite and additional tests to measure dispersion.

The number of optical tests needed to comprehensively characterize fiber can generate a large amount of data that must then be delivered to the network operator. However, compiling and formatting the test results into a comprehensive, professional report quickly with minimal risk for errors can be challenging.

Why is a Fiber Characterization Report Essential?

Failure to characterize the fiber before installing system components can substantially delay service provisioning or increase repair times. It can also potentially postpone projects or cause providers to miss turn-up commitments. Detailed records must be generated for the test parameters that can affect transmission quality, and network managers must know the system's limitations for future provisioning. Fiber characterization reports serve as a contractual document that installers or third-party fiber characterization companies must provide to all service providers.

If the network fails to perform as contracted and reported, the network provider must be able to test the network to pinpoint the trouble source. Comprehensive, complete fiber characterization reports provide key information for troubleshooting because it lets providers quickly compare measurements recorded during fiber installation against current test results. They can then use this information to isolate and sectionalize problems or to assign responsibility to fix the issue.

Furthermore, verifying fiber performance and comparing it to commissioning/acceptance test values becomes useful for ongoing network analysis and to spot trends. A complete and comprehensive fiber characterization report helps providers investigate fiber behavior or degradation.

Professional, Optimized Test Reports

Professional, optimized fiber characterization test reports provide critical information used throughout the network life cycle, therefore, quality reports are a necessity. Generated reports must be professional-looking and must provide all relevant link information including detailed measurements. Furthermore, reports must meet the end-customer's content and format requirements.

Managing Multiple Test Results

As transmission system performance increases, the number of test parameters becomes increasingly important. Conventional tests, the core of the fiber characterization report, include insertion loss (IL), optical return loss (ORL), and bidirectional OTDR measurements for 1310/1550/1625 nm wavelengths. The OTDR provides loss, distance, and reflectance values for each of the in-line components on the link, such as splices and connectors. Reporting these conventional measurements already produces an extensive, complex report.

In addition, the final report must include dispersion tests because they assure the link's or DWDM transmission systems' ability to run at very high bit rates. Dispersion tests measure both polarization mode dispersion (PMD) and chromatic dispersion (CD) end to end. However, the CD measurement's wavelength-dependent characteristics can generate a large table of data for the entire 1250 to 1650 nm wavelength band, such as those in a CWDM transmission system.

DWDM systems require factoring in the attenuation profile (AP), which provides the fiber attenuation according to the wavelength over the entire link, resulting in additional test results and an additional table in the final acceptance report.

Software currently available helps to compile a partial report using some of these individual parameters. However, only VIAVI Solutions Optical FiberCable2 software simultaneously provides all of these capabilities and manages the test results so that one technician can generate professional cable acceptance test reports with OTDR, PMD, AP, IL, and ORL results simultaneously.
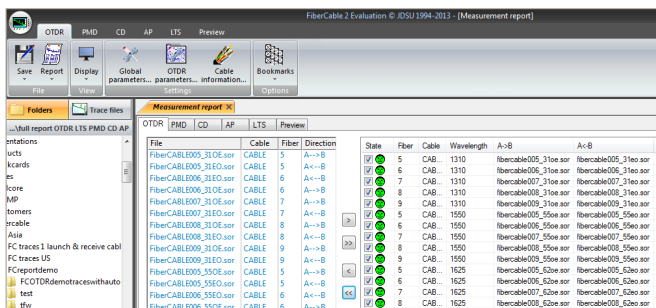

Figure 1. The complete set of test results VIAVI FiberCable2 software manages
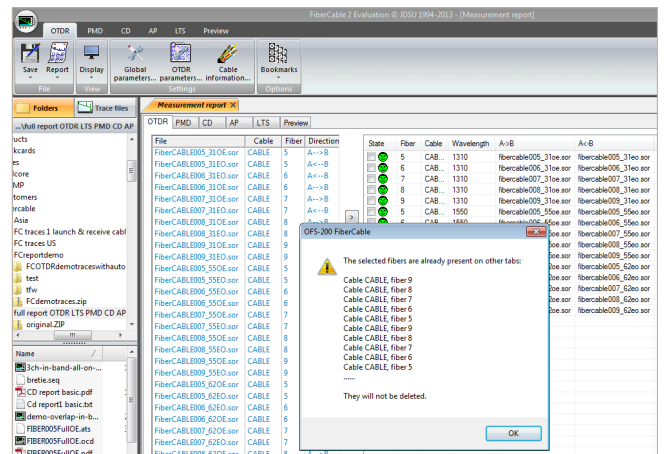

Figure 2. VIAVI FiberCable2 software tests for consistency during report generation

Achieving Consistent Measurement Results

Several test results must be compiled and certified which requires extracting thousands of values, sorting them, and then organizing them into dedicated tables. Each value defines the network's ability to transmit at a certain rate; therefore, report consistency is critical for reducing the risk of manipulation errors. Dealing with large amounts of data can cause OTDR traces from cable A to mix with PMD values from cable B, and so on. This new reporting software reliably compiles all of the data into a single-staged process, with step-by-step check points for consistently permanent results. VIAVI FiberCable2 software not only compiles all the data together, but it also screens results to verify compatibility between related fiber cables and then creates an error-free report.

Generate Reports Quickly to Improve Productivity

Nowadays, fiber installers and test contractors cannot afford to have technicians spending hours generating reports when characterizing fiber. Nor can they postpone job completion to wait for an acceptance report. So providers build in "time to report" as part of the overall fiber characterization process. The contract is complete once the end contractor receives the final report.

VIAVI FiberCable2 software can combine information from several independent reports into a single document and independently manages results, which cuts the reporting process considerably over other available solutions.
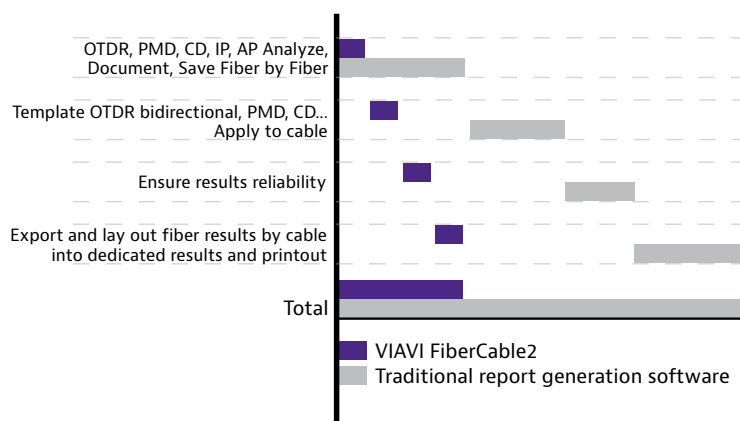
Figure 3. VIAVI FiberCable2 software saves time generating fiber characterization reports

Error-Free Fiber Characterization Reports

Generating error-free reports quickly is important but requires monitoring and verifying the automated software process step-by-step. Whereas FiberCable2 software uses dialog boxes and pop-up windows to warn technicians of potential problems during report generation.

In addition to the various check points, technicians can set thresholds and define other criteria to get more information about report quality. Corresponding pass/fail information shown in results tables display necessary warnings.

ID Cable	ID Fibre	Wavelength	Average	Total loss			1			2			3			4		
				A->B	A<-B	Average	A->B	A<-B	Average	A->B	A<-B	Average	A->B	A<-B	Average	A->B	A<-B	Average
CA...	5	1310	0,226	12,925	13,104	13,015	0,157	0,019	0,088	0,004	0,001	0,003	-0,003	0,003	0,000	0,000	-0,003	-0,001
CA...	6	1310	0,261	12,825	13,105	12,967	0,151	-0,004	0,073	0,003	-0,007	-0,002	-0,001	-0,003	-0,002		-0,003	
CA...	7	1310	0,227	12,906	13,085	12,996	0,157	0,022	0,090	0,004	0,000	0,002	-0,004	0,000	-0,002	-0,001	-0,003	-0,002
CA...	8	1310	0,225	12,942	13,060	13,001	0,157	0,019	0,088	0,003	-0,003	0,000	-0,004	0,000	-0,002	-0,001	-0,001	-0,001
CA...	9	1310	0,224	12,947	13,050	12,998	0,157	0,003	0,080	0,003	-0,010	-0,004	-0,001	-0,001	-0,001	0,001	-0,003	-0,001
CA...	5	1550	0,195	8,431	8,602	8,517	0,171	0,028	0,099	0,000	-0,003	-0,001	-0,003	-0,001	-0,002	0,000	-0,001	-0,001
CA...	6	1550	0,194	8,415	8,602	8,509	0,168	0,021	0,094	0,000	-0,003	-0,001	0,001	-0,001	0,000	0,003	-0,004	-0,001
CA...	7	1550	0,195	8,424	8,587	8,506	0,169	0,025	0,097	-0,001	0,000	-0,001	-0,001	0,003	0,001	0,000	-0,001	-0,001

Figure 4. Alarms help technicians locate reporting errors

Compiling data into spreadsheets can be tedious; therefore, technicians should review results prior to starting the final stage. FiberCable2 software lets technicians preview the report and it highlights missing information and inconsistencies. This capability eliminates technicians compiling multiple results unnecessarily which can add significant time to the final report-generation process.

Figure 5. Complete fiber characterization report preview

Conclusion

Professional, legible fiber characterization reports combine all the tests results, alarms, and other pertinent information providing end-users with complete information about the fiber installed. These reports complete the installation process and serve as reference tools for managers and technicians during fiber manipulations or future system upgrades. VIAVI created its FiberCable2 software to meet the increased demand for reporting efficiency and document quality needed by technicians and managers who characterize fiber.

Figure 6. FiberCable 2 software helps technicians generate comprehensive, error-free reports

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