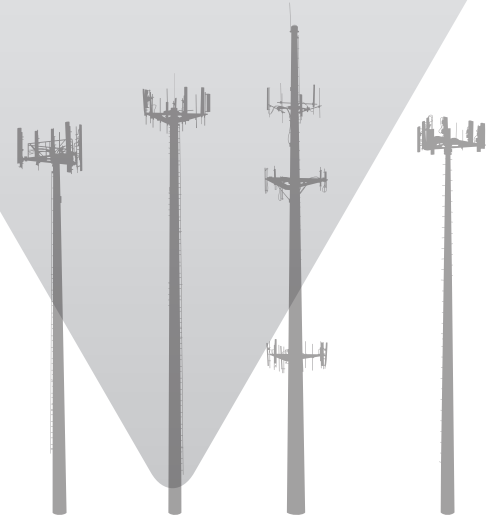


Viavi Test Solutions for Fiber-to-the-Antenna



Staggering increases in bandwidth demand are forcing network operators to new models of mobile infrastructure like fiber-to-the-antenna (FTTA) to improve user experience and reduce costs. The proliferation of intelligent mobile devices such as tablets and smartphones, media-rich and bandwidth-intensive applications, and high-performing processors and operating systems is relentless. These changing demands require a substantial increase in antennas in addition to an accelerated rollout of new technologies such as long-term evolution (LTE).

These new 3G and 4G technologies are driving a macrocell architecture modernization to provide greater coverage and capacity availability per subscriber. For macrocells, this evolution typically means physically separating the baseband unit (BBU) and the radio remote unit (RRU). A remote fiber-feeder (RFF) cable connects the BBU (housed inside the base station hut) and the RRU (located next to the antenna at the top of the tower). This architecture reduces power requirements, tower load, installation costs, improves reliability, and, most importantly, addresses the bandwidth and signal limitations of traditional architectures.

Another emerging strategy for cost-effectively improving mobile coverage is the cloud radio access network (cloud RAN). This approach, developed by a number of key industry players, deploys lower-cost, lower-power RRUs closer to subscribers while centralizing the more complex and costly component, the BBU, in a data center or base-station hotel. A cloud RAN improves performance, uses capital and human resources more efficiently, and requires significantly less power.

The key consideration of this approach is that a new, different type of backhaul — referred to as fronthaul — is required between the RRU and the BBU. The common public radio interface (CPRI) communications protocol is used between RRU and BBU equipment, which can be physically separated by more than 40 km, new solutions are required to support this FTTA network architecture.

Key Benefits

- Ensure reliable, robust, and future-proof installation and operation of the mobile infrastructure
- Optimize network component and equipment performance
- Drive best practices and field operational efficiencies
- Troubleshoot and monitor fiber infrastructure to maintain optimum performance of equipment and components
- Enable new fronthaul revenue through continuous service assurance, demarcation, fault isolation, and detecting performance degradation

Applications

- Macrocell modernization involving fiber-fed remote radio units
- Distributed base stations using RRUs and centralized BBUs
- Fiber-fed repeater (FFR) deployments
- Installation, maintenance, and troubleshooting within mobile cell deployments
- CPRI, OBSAI, RF over fiber pre-qualification and fronthaul service assurance

Testing FTTA

Network professionals must ensure network uptime and reliability while maximizing the customer experience. To this end, Viavi Solutions offers a comprehensive suite of test solutions that directly address the needs of operators, engineers, and installers who manage cell-site infrastructure and networks—whether they are engaged with installation or maintenance, ongoing testing, or deploying new applications or services.



Typical FTTA radio access network layout

Fiber-Optic Cell Acceptance Test (FOCAT) Certification

FOCAT Tier 1 and Tier 2 certification provides the confidence that network components are optimized to provide a full lifetime of high performance and the delivery of world-class services.

Tier 1	Tier 2
Check fiber continuity	Check fiber continuity
Certify fiber-connector end-face quality for all RFF components	Certify fiber-connector end-face quality for all RFF components
Check power levels of the active equipment at the BBU and RRU	Check power levels of the active equipment at the BBU and RRU
Measure total fiber link loss of the RFF cable	Measure total fiber link loss of the RFF cable
—	Measure fiber link length
—	Measure discrete losses of the fibers and connectors/joints of the RFF

Use a VFL to Check Patch Cords and Link Continuity

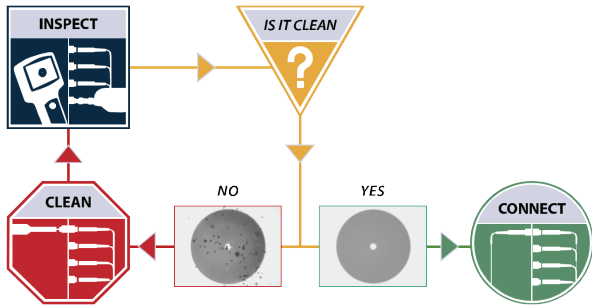
One of the most valuable and lowest-cost tools for FTTA is the visual fault locator (VFL). The VFL uses brightly visible light (630 – 650 nm) to:

- check patch cords for microbends, macrobends, breaks, or bad terminations
- verify continuity (determining whether fiber X on this end really matches up with fiber Y on the other end)

Always Inspect Before you Connect

Dirty connectors are the number one cause for troubleshooting in optical networks. Microscopic particles of dirt can create enough signal loss and back reflection to cause significant downtime and network damage. The increasing bandwidth requirements in today's mobile networks leave little room for the errors caused by dirt.

Easily overcome these problems with the right tools and best practices. Using a fiber-inspection microscope to certify connector end-face quality is in accordance with IEC standards or the customer's specification is the cornerstone of proper fiber deployment. Ensuring fiber connector end-face quality guarantees the link will perform at the highest level possible.



Inspect before you connect process

Certify that Fiber Cable Installation Meets System Optical Budget Requirements (FOCAT Tier 1)

A minimum basic Tier 1 test is to perform a link or channel insertion loss measurement using an optical light source (OLS) and optical power meter (OLP or MP) to verify receipt of the correct range of power (not too little, not too much), ensuring that equipment functions at peak performance with maximum optical budget headroom.

Inspection Date		4/12/2012 11:52:46 AM	
Company Name		Fiber TestCo	
Location		3545 Cell Site X	
Operator		John Smith	
Fiber Information			
File Name		PSG FOCAT TIER 1	
Fiber Type		Simplex	
Job ID		Operator Y	
Cable ID		RFF - 1	
Connector ID		BBU SCPC	
Fiber ID		Channel 1	
Comments			
Inspection Summary			
Profile Name		SM LUPC (IEC-61300-3-35)	
Zone	Defects	Scratches	
Zone A (0 to 25)	PASS	PASS	
Zone B (25 to 120)	PASS	PASS	
Zone C (120 to 130)	PASS	PASS	
Zone D (130 to 250)	PASS	PASS	
Power Measurement			
Level	Unit	Wavelength	Frequency
4.28	dBm	1310	
Low Magnification		High Magnification	
Analysis Details			

Fiber certification report (insertion loss and endface quality)

Characterize and Troubleshoot the Fiber Cable Installation with an OTDR (FOCAT Tier 2)

With installations in elevated locations, it is hard to judge installation quality or any impairment on the cable itself. Tier 2 certification involves optical time-domain reflectometers (OTDRs) which are the only devices that can characterize and measure fiber loss, locate events and impairments, measure the impact (loss) of each, and provide the distance to each one.

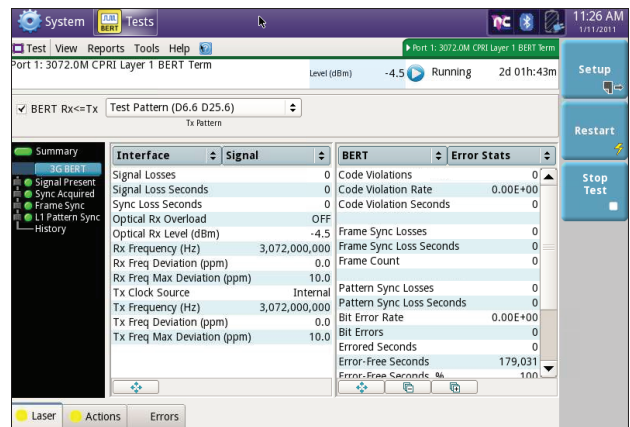


OTDR trace report

Common Public Radio Interface (CPRI) Validation

Use a Bit-error Rate Tester to Detect Bit Errors and/or Latency Issues

Mobile networks use CPRI as a low-cost way to distribute/aggregate cell traffic. It is the communication protocol used between a radio base station and a controller. It is important to qualify fiber facilities to transport CPRI data error free. At installation, a bit-error rate (BER) tester ensures the QoS of CPRI transport, using a wide array of stress patterns to quickly identify causes of problems.



Completed CPRI Layer 1 BERT at 3.1G illustrating the test pattern selected

BER Testing (BERT)

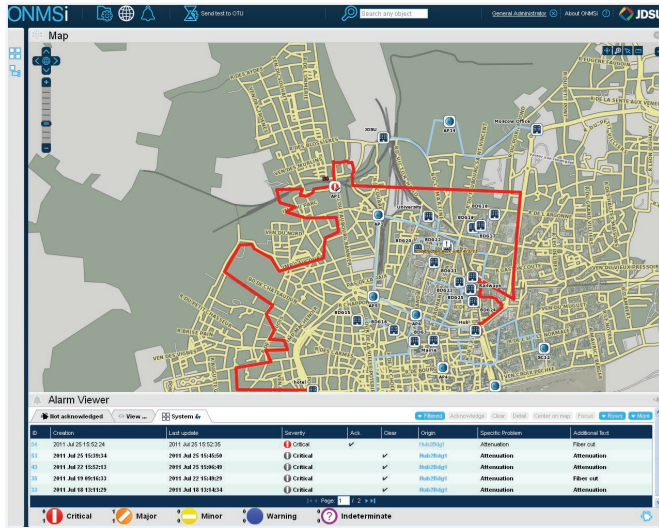
Measure BERT at 3.072 G optical Layer 1

Measure latency

Fiber Monitoring

Use Fiber Monitoring Solutions to Analyze and Monitor Network Performance

Remote fiber monitoring measures QoS and detects and predicts network performance issues, reducing network outages and truck rolls/dispatches.



ONMSi event map

Fiber Monitoring

- Measure the impact of QoS
- Detect fiber performance degradation
- Isolate failure points in the network
- Optimize truck rolls or dispatches

Key Tools for FTTA—Fiber Inspection and Optical Test

Do you know the quality of the fiber in your FTTA network? Is your fiber future-proof and scalable to support the technologies of tomorrow? Viavi offers a complete range of essential fiber tools to make it fast and easy to certify that every component in a FTTA network is optimized and future-proof.

Visual Fault Locator

The FFL-050 visual fault locator provides continuity checking of the link and helps locate sharp bends, breaks, and damages in fiber. It comes in a compact, ergonomic design for ultimate portability and can be used on 2.5 or 1.25 mm (optional) connector types.



FFL-050

Hands-free, Integrated Inspection/Test Kits

Safety is a primary concern when working on cell towers. Dropping tools and adaptors can be highly dangerous when working in elevated cell locations. Get the job done right and maintain safety! Integrated inspection/test kits make it possible to inspect, clean, and test fiber interconnects in less than half the time with an integrated, portable system. It combines all the essential tools in one hands-free system that eliminates interchanging adaptors and devices: a critical requirement when working in elevated environments. It drives users to follow best practices for fiber handling in a way that optimizes their workflow and overall performance.



Inspection Kit

Digital Analysis Fiber Connector Certification Kits

Turn cell technicians into fiber experts! Digital analysis kits with FiberChekPRO™ software eliminate human subjectivity from end-face evaluation by providing automated connector pass/fail analysis at the push of a button. This evaluation capability includes digital, live-image viewing to certify compliance to customer specifications or industry standards, including IEC 61300-3-35. Perform standard fiber inspection, analysis, and grading processes throughout the fiber network and generate certification reports of connector end faces—including link loss results when used with the Viavi MP-60 USB optical power meter.



FiberCheckPRO with P5000i

SmartPocket™ Optical Loss Test Kits

The OMK-35 SmartPocket kits are pocket-sized and rugged loss-test instruments for installing and maintaining fiber-optic networks. The units incorporate a single-port laser source OLS-35 and a power meter with a universal parallel port (UPP) interface for power-level and loss-test measurements in access, metro, and core networks.



OMK kit

SmartPocket Optical Light Source

The OLS-35 is a small and rugged optical light source for quick, easy, and convenient field insertion-loss measurements and continuity checks at 1310 and 1550 nm. All sources are equipped with Auto-λ and Multi-λ functions compatible with any Viavi power meter. And, they include one-button operation for simple and error-free testing.



SmartPocket OLS-35

SmartPocket Optical Power Meters (OPMs)

The Viavi OLP-34 and OLP-35 are small and rugged OPMs for quick, easy, and convenient field measurements of optical power level and loss in fiber networks. These instruments provide an ergonomic design with a large and sharp display, providing all relevant results and settings. Intuitive, one-button operation combined with automatic wavelength recognition makes the SmartPocket OLPs the products of choice for technicians who test fiber. With unprecedented data storage capacity for this class of product (saving up to 100 results), and an optional micro-USB port to download results to a PC, the SmartPocket instruments offer all you need from testing to reporting.



SmartPocket OLP-35

USB OPM

The MP-60A provides a small-form-factor OPM that can connect to a PC/laptop and other Viavi devices via USB 2.0. It integrates with FiberChekPRO software and can be used in combination with a digital microscope for link loss/connector certification. One-button operation combined with automatic or manual results archiving are ideal features for fiber loss testing.



MP-60A

FI-60 Live Fiber Identifier

The FI-60 LFI lets users easily detect an optical signal without disconnecting fiber or disrupting network traffic. The FI-60 LFI also includes the unique Viavi SafeChek™ system, which ensures safe and repeatable engagement with most fiber types without the hassle of changing out costly dies. The FI-60 also converts to an OPM, providing twice the value for your investment and reducing the number of tools carried on the job.



FI-60 LFI

T-BERD®/MTS-2000

The T-BERD/MTS-2000 handheld modular test set helps install, turn-up, and maintain optical fibers across enterprise, mobile, metro, and FTTx/access point-to-point or point-to-multipoint networks (PONs). Test capabilities include a range of OTDR modules for multimode and single-mode testing, as well as a range of FiberComplete™ modules for automated insertion loss/optical return loss (IL/ORL) and fault finding. Both OTDR and FiberComplete modules are PON optimized. The unit is also ready for connector end-face pass/fail analysis to IEC standards with a digital analysis microscope. Modules are fully cross-compatible with the T-BERD/MTS-4000.



T-BERD/MTS-2000

T-BERD/MTS-4000

The T-BERD/MTS-4000 is a small, compact handheld test platform for all phases of the network life cycle, such as the installation and maintenance of access/FTTx (various fiber) networks and triple-play services. Similar to the T-BERD/MTS-2000, the modular design of the T-BERD/MTS-4000 offers field service technicians the highest performance and superior levels of scalability and upgradeability.



T-BERD/MTS-4000

Optical Channel Checker

The OCC-5x units are the industry's smallest and lightest coarse (CWDM) and dense wavelength division multiplexing (DWDM) channel checkers, providing compact and low-cost alternatives to full optical-spectrum analyzers. They measure channel power levels according to the ITU-T wavelength grid. Coupled with outstanding battery lifetimes and easy data transfers, these solutions are ideal for quick, simple channel power identification, verification, and testing.



OCC-56

Optical Spectrum Analyzer

The COSA-4055 is the smallest CWDM optical spectrum analyzer (OSA) on the market. The COSA-4055 module for the T-BERD/MTS-4000 and T-BERD/MTS-2000 platform offers the functionality and speed of an OSA in a handheld form factor at a fraction of the price of a traditional OSA. It is an ideal test tool for service providers to install, maintain, and upgrade metro/access links and CWDM systems. It measures wavelengths and power levels of CWDM channels and displays the complete spectrum.



COSA-4055 module

The OSA-110M is the smallest, lightest full-wavelength-range optical spectrum analyzer in its class. This module for the T-BERD/MTS-6000/6000A and T-BERD/MTS-8000 platforms offers flexibility and reduced CapEx investment: it is one solution for all CWDM and DWDM applications. The easy-to-use solution lets you drive productivity by equipping more field technicians with a low-cost, fully-featured, fast OSA (one second per scan in C-Band).



T-BERD/MTS-6000/6000A and T-BERD/MTS-8000 with OSA-110M module

Key Tools for FTTA — CPRI Validation

Physical-layer problems such as bad fibers and dirty connections—typically caused by poor practices during deployment—can introduce significant system bit errors and latency. Critically important to any installation is ensuring that infrastructure is optimized for successfully operating the CPRI protocol.

T-BERD/MTS-5800

This platform is an all-in-one handheld tool that reduces the complexity of multi-technology testing. It is optimized for ease-of-use in the field and addresses emerging network technologies, guaranteeing maximum efficiency and success in the evolution of carrier Ethernet and mobile backhaul networks. It dramatically improves service life cycle management, integrating both installation and troubleshooting capabilities in one instrument. The T-BERD/MTS-5800 also provides full Ethernet test and support for OBSAI and/or CPRI.



T-BERD/MTS-5800

T-BERD/MTS-6000A

This compact, lightweight network test platform works with all phases of network life cycle from installation through maintenance. Modular in design, the T-BERD/MTS-6000A offers an extensive portfolio of test functionality for multiple network layers. A single multi-services application module provides an integrated solution for Ethernet, SONET/SDH, and higher-layer tests. Optical modules allow thorough testing of short-haul, long-haul, FTTx, CWDM, and high-speed 40 G networks.



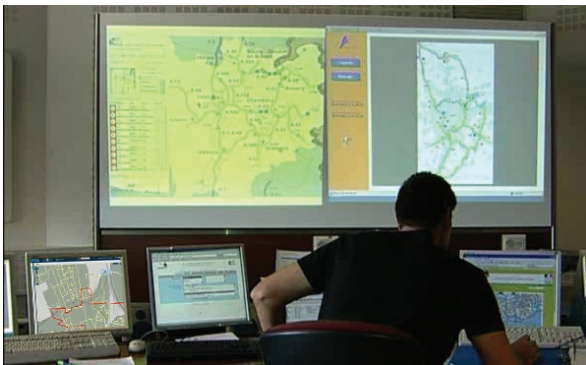
T-BERD/MTS-6000A

Key Tools for FTTA — Fiber Monitoring

Using a centralized monitoring solution can reduce fiber fault location from 5 hours to 5 minutes and give the visibility to demarcate between providers. Anticipate service disruptions before services are affected and protect your network with long-term performance monitoring from Viavi.

Optical Network Monitoring System (ONMSi)

The ONMSi increases workforce productivity and facilitates the management of fiber-optic networks with fewer technicians through fiber remote testing and accurate fiber plant documentation. Ideal for core, metro, access, and FTTH and mobile backhaul networks, the system accurately detects and locates fiber degradation, alerting operators and managers with pinpoint details of faults and their location on the fiber. Measurement schedules let network operators assess long-term fiber performance to form the basis of efficient asset management.



ONMSi in the NOC

Other Mobility Solutions — Wireless Test Solutions

Viavi wireless test solutions set a new standard for optimizing mobile network performance on multiple levels. By reducing operating costs and deployment time, Viavi offers value-based solutions that create new revenue opportunities as well as service differentiation. Our products and services ensure agile operation, whether you need drive testing, mobile assurance, base station, or network protocol test solutions. The portfolio can be fully integrated to fit a variety of applications from R&D through network monitoring, from the core to access devices, and in laboratory settings or live networks. Viavi makes wireless a breeze.

Viavi is committed to the continuing evolution of the industry-leading LTE solutions for end-to-end testing and real-time monitoring. Let us help you monetize your network by providing:

- Control and confidence to meet revenue goals and demanding subscriber requirements
- The most commonly used commercial tool set in LTE networks
- Complete life cycle support
- The ability to deploy LTE services quickly, cost-effectively, and in compliance with service-level agreements.



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