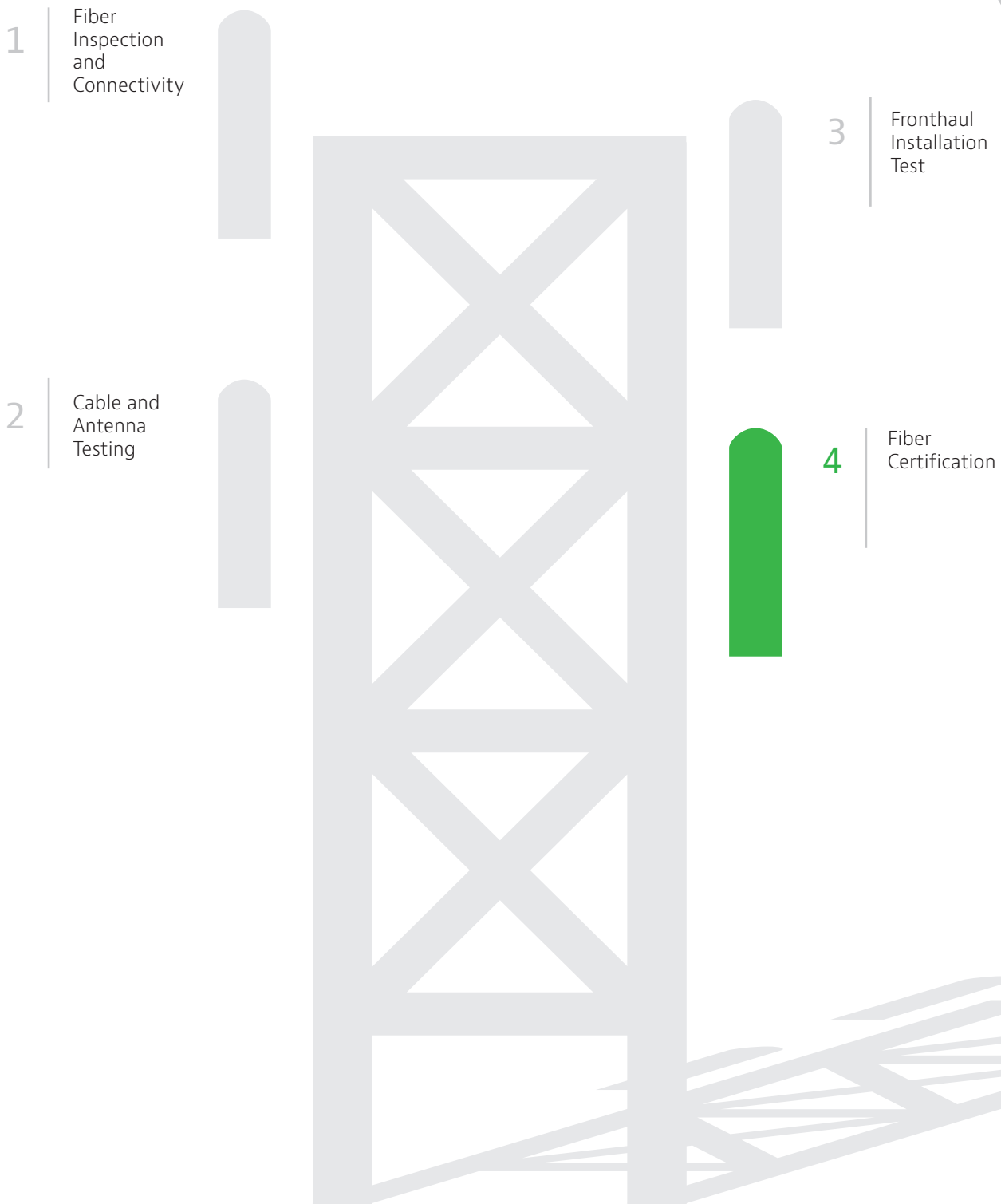


Essentials of Fiber to the Antenna: Fiber Certification



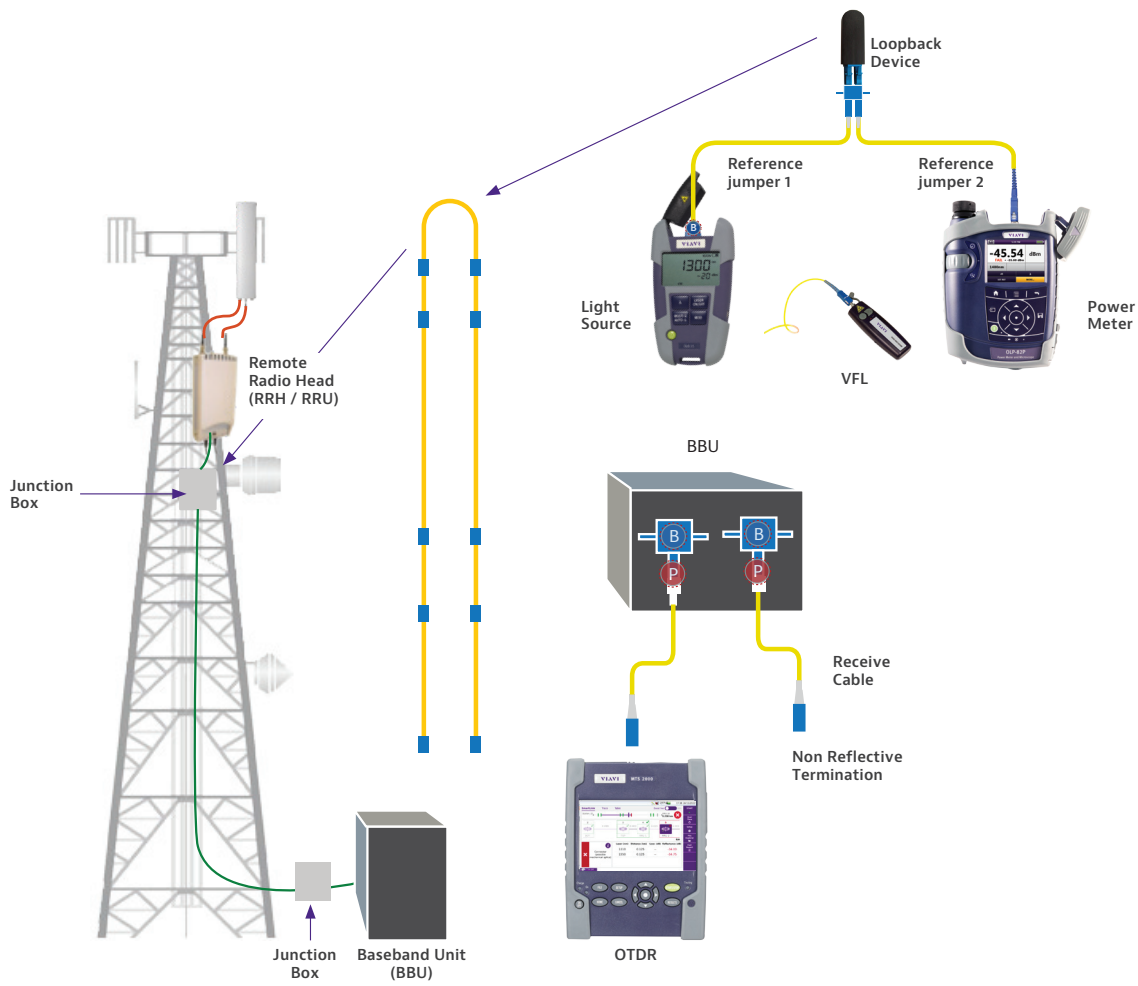


Figure 1. FTTA Fiber Testing

Inspect Before You Connect

Before performing any fiber test, it is essential to inspect and clean all fiber connectors involved in the test.

Fiber Certification

The following table describes the fiber certification tests and the VIAVI solutions that provide unique, valuable advantages:

Fiber Certification	Description	VIAVI Advantage
Continuity	A potential problem with newly installed fiber links is incorrect polarity (duplex or MPO) or lack of fiber continuity, meaning the light did not end up where it was supposed to be and was directed toward the wrong location. This can occur if ports are mislabeled or fibers are connected to incorrect ports. A continuity test simply inserts visible light (typically 650nm) at one end a fiber using a visual light source (or Visual Fault Locator - VFL) which allows a tech to identify the same fiber at the far end. If no light makes it to the far end, the VFL can also be used to locate the fiber break. However, this is frequently where an OTDR would be used.	Lowest TCO <ul style="list-style-type: none">• Comprehensive SmartOTDR and T-BERD/MTS 2000 test solutions equip field technician with all the traditional fiber tests• Cuts testing time in half with fewer connections and disconnections, automatic continuity check, and an intelligent fault finder• Minimizes training and gets reliable measurements using a single connection port that combines a fully automated process with easy-to-read results
Insertion Loss (IL)	IL testing assesses how much optical power is lost across an optical link. If there is too much link loss, an optical receiver (SFP) will not function correctly. Contributors to link loss include fiber attenuation and loss through mated connectors or splices. Contaminated, damaged, or poorly mated connectors are the most common sources for excess link loss. Stress on the fiber by over-bending, pinching, or kinking is also a frequent source of problems.	<ul style="list-style-type: none">• Integrated CW light source on OTDR port• Built-in optical power meter and VFL options Ensures fast and easy measurements and reporting <ul style="list-style-type: none">• One touch operation, automatic analysis, and tailored OTDR user interface for different skill levels• Easy setup and interpretation of results with SmartConfigs and Smart Link Mapper (SLM) OTDR applications• Optimizes workflow by compiling tests results and automatically storing all measurements in one folder• Manage test data from anywhere in the network with VIAVI StrataSync™, a cloud-based asset and data management platform
Optical Return Loss (ORL)	ORL is the ratio of reflected over transmitted optical power levels for the end-to-end fiber link. The largest contributor to reflected optical power is connectors. Exceeding ORL limits can cause data errors, increase system noise, and can sometimes damage transmitters in higher-power environments.	
Optical Time Domain Reflectometry (OTDR)	OTDR testing is the only way to characterize and locate any in-line element of a fiber link, such as optical connectors, splices, bends, and breaks. Testing a fiber link with an OTDR also helps document the system for future verification.	

Fiber Certification Test Criteria

Shown below are the pertinent criteria, pass/fail thresholds, and associated standards for testing fiber. VIAVI fiber test solutions measure all these parameters.

Parameter	VIAVI Recommended Criteria	Relevant international standard
Fiber Slope	0.35 dB / km @ 1310nm 0.25 dB / km @ 1550nm	ITU-T G.650.3, IEC-60793-1-22, TIA-455-133-A-2003
Insertion Loss (IL)	Varies by span	ITU-T G.650.1, EC 60793-1-40, TIA/EIA-455-78B
Optical Return Loss (ORL)	>30dB	IEC 61300-3-6, IEC 61300-3-7, EIA/TIA-455-107A
Splice Loss	<0.15dB	ITU-T G.650, IEC 60874-1, IEC 61073-1, TIA/EIA-455-8
Connector Loss	<0.3dB	ITU-T G.650, IEC 60874-1, IEC 61073-1, TIA/EIA-455-8
Connector Reflectance	<-35dB	ITU-T G.650, IEC 60874-1, IEC 61073-1, TIA/EIA-455-8

The fiber continuity test helps technicians identify any fiber continuity/polarity issues. It also helps to identify if the correct fiber is routed to the correct remote radio head port. By using a visual fault locator (VFL) emitting visible light, this test enables technicians to easily see light escaping from bends or breaks in the fiber or wrong termination points. VFL can be independent or integrated into an OTDR tester.



Figure 2: Fiber continuity test

Insertion Loss (IL) measures the optical power loss across a fiber, a passive element (connector or splice), or the entire optical link. It is a frequent practice to make a simple IL measurement using an optical light source (OLS) at the BBU and an optical power meter at the RRU to check the link insertion loss. However, to minimize the operations and tools required at the remote end, a loopback device is often used to enable measuring the loss of the entire channel (both send and receive fibers). If this test fails (i.e. too much loss), then an OTDR test is required to find the fault.

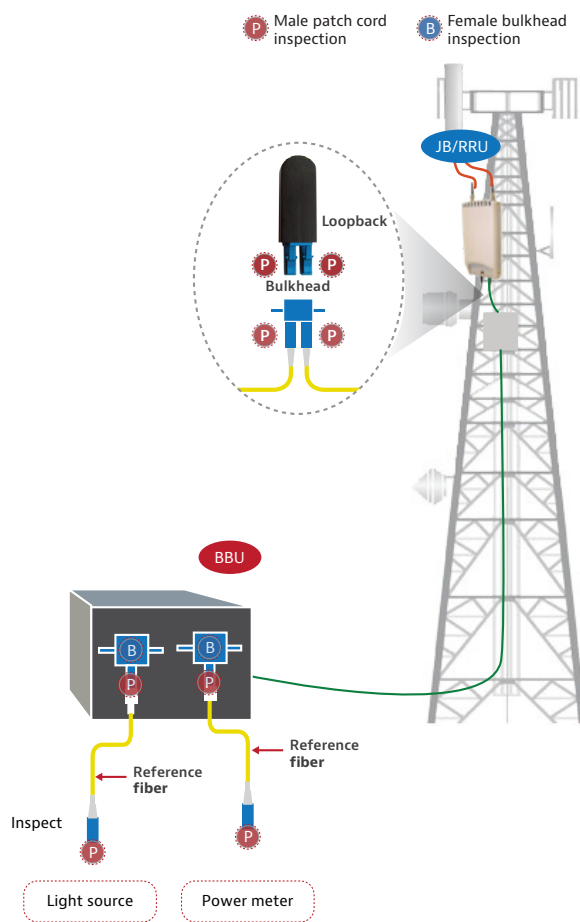


Figure 3. Look back test (channel test)

OTDRs are the only devices that can characterize and measure fiber loss, optical return loss, locate events and impairments, measure the impact (optical loss) of each impairment, and provide the distance to each one. With FTTH and C-RAN installations, where RRHs are located in remote and elevated locations, it is hard to judge installation quality or any impairment on the fiber cable itself. OTDR tests are a must in those scenarios to certify the complete fiber link.

An OTDR measures the following.

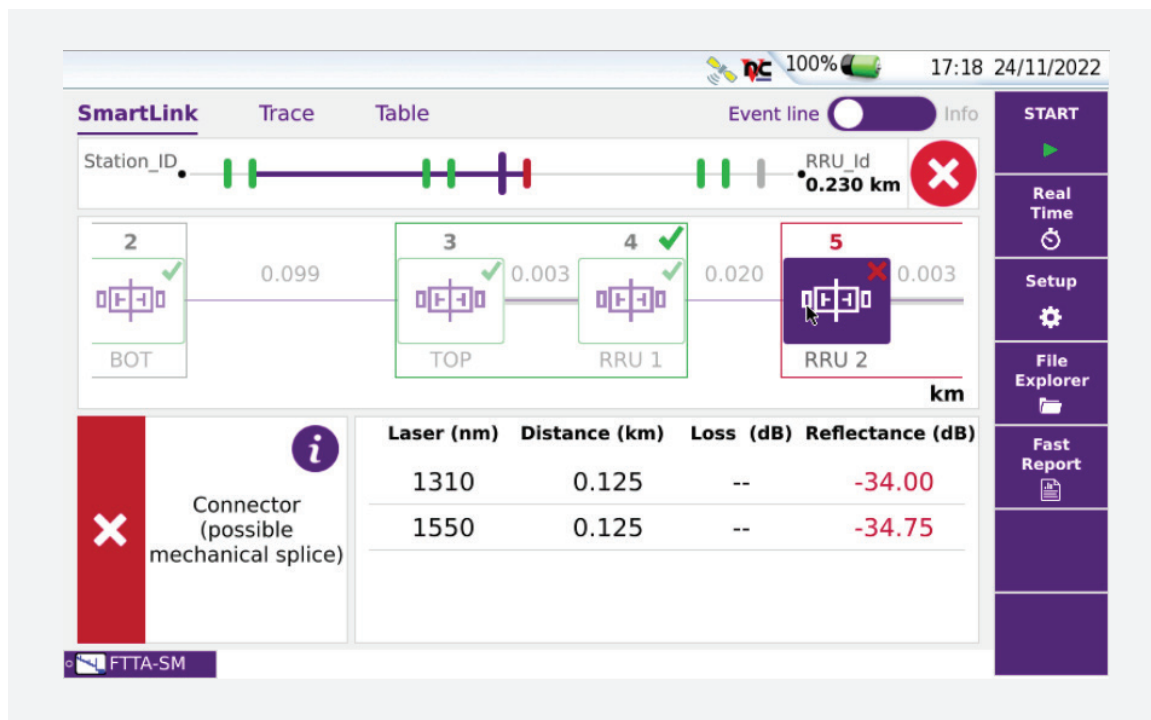
Optical Distance

- To elements: splices, connectors, splitters, multiplexers
- To faults
- To end of fiber

Loss, Optical Return Loss (ORL)/Reflectance

- Loss of splices and connectors
- ORL of link or section
- Reflectance of connectors
- Total fiber attenuation

To simplify interpretation of OTDR traces, VIAVI OTDR solutions offer a dedicated version of the Smart Link Mapper (SLM) application for FTTA (FTTA-SLM). This application option provides an easy to read icon based view of a fiber link (connector, splice, etc.) with event icons, labels and descriptions customized specifically for the FTTA industry, reducing the risk of OTDR trace interpretation errors and misdiagnosing faults, leading to faster job completion and reduced truck rolls.



FTTA-SLM results view

Reporting

VIAMI test solutions deliver easy and comprehensive reporting that meets service provider test criteria, via cloud based or on-board report generation. Our reports provide documented, authentic proof (birth certificate) of the quality of installation, that an installation meets industry standards and equipment specification requirements, and that the site is ready to go live.

Conclusion

Whether you are managing existing fiber links or building new ones, it is important to know which tests are required to ensure a quality network. It is also important to be aware of tests that can be performed to provide added visibility into the network, especially when troubleshooting problems.

Technicians should consider the following key points related to fiber certification:

- Inspect before you connect all fiber interfaces and connectors.
- Certify every optical component in the fiber link
- Perform OTDR testing to certify, characterize and locate impairments in the fiber link. Use SLM to take out any guess work.

VIAMI test solutions are designed to streamline workflows and simplify operations with centralized inventory and test equipment management, and consistent presentation of results.

