Design Specifications for the Next Generation of Optical Power Meters (OPMs)

Growing investments in telecom and the increased adoption of optical fiber continue to drive a booming global growth in optical fiber networks. This growth includes the rapid replacement of existing copper cable with optical fiber, as well as the installation of new fiber optic networks—to the home, to the business, and to the cell site—all in response to continuing demands for increased reliability and higher bandwidth.

As the number and connectivity of these optical networks continue to rise, the testing and certification requirements of optical channels also increases. Measuring optical signal power is an essential task for all fiber technicians, and the OPM is the primary test instrument for fiber optic networks.

A growing body of network technicians has little or no previous fiber experience. Yet, they are held responsible for constructing and activating high-speed fiber connections and for maintaining critical network performance. The lack of fiber experience, coupled with the nonstop increase in optical network growth, is prompting the development of a new generation of OPMs. These next-generation OPMs enable any technician, regardless of fiber experience, to safely and reliably measure optical signal power, store the readings in real time, generate reports, and share network performance data faster and easier than is possible with today's instruments.

This white paper describes some of the important factors affecting testing and outlines the design specifications that these next-generation OPMs must include in order to ensure that reliable testing and certification of optical fiber networks can be completed by any technician safely, quickly, and easily, regardless of optical fiber experience.

Ideal OPM Feature List

- Connectors
  - Interchangeable
  - SC, LC, SC-APC, LC-APC, OptiTap
  - Always safe connections
- Bluetooth enabled
- On-board storage
  - Up to 150 readings
  - Micro-USB 2.0 input
  - Export stored data, etc.
- Charging (4.5 hr from empty)
  - Re-chargeable Li-ion battery
  - 12 hours continuous
- Touch-screen display
  - Dedicated screens for different functions
- Measures all standard wavelengths
  - 850, 1310, 1490, 1550, 1625 nm

The Importance of Clean Connectors

Fiber optic connectors terminate the ends of optical fiber cables to enable plug-and-play connections where a disconnect or connect capability is required. They are critical to installing, maintaining, and expanding a optical fiber network. As the universal points of entry into the network by technicians, connectors present the biggest potential for fiber end-face contamination. In a study by NTT-Advanced Technology, 98% of cable installers and 80% of network owners reported connector end-face contamination as the root cause of network failures.

With the rapid growth of optical networks, the amount of optical fiber testing required has increased tenfold. This also increases the opportunity for connector damage that can potentially impact network performance. It is increasingly critical that network technicians, of all skill and fiber experience levels, are able to maintain the condition of the fiber connector end face throughout the testing process.

Eliminating the Test Lead

Traditional OPMs have a female interface and most field measurements are made on female interface connectors (located behind a bulkhead). Technicians taking optical power measurements must keep up with an assortment of patch cords (for different fiber types) that are used as test leads during the testing process.

Using a test lead is problematic for several reasons. One, it increases the opportunity to introduce damaging debris into the network via the mating of possibly contaminated patch cords to connectors. Two, because fiber optic components are sensitive to physical stress, the need for multiple test patch cords creates inefficiencies as additional time is required for the careful use, storage, and transportation of multiple patch cords. This extra care is needed to keep them free of the damage and debris that inevitably occur over time with normal industrial use.

Since debris from a contaminated end face is most likely to become embedded during fiber mating, the best way to prevent the possibility of connector contamination is to eliminate contact with the connector end face.

This can be achieved if the OPM has male interface connectors that enable direct attachment of the test arm to the female interface of the bulkhead without contacting the fiber being tested. This design eliminates the troublesome test lead and all the problems associated with it, and it ensures that physical contact is made only on the outer ferrule. When the fiber core and cladding do not make physical contact, contact occurs only on the ceramic ferrules, not the fiber, ensuring a controlled distance between end faces. Both ends of the fiber can still be inspected and cleaned after a test is performed.

Maintaining ferrule-only contact at the connection end and no contact at the sensor end prevents the opportunity for debris to become embedded in fiber end faces. This ensures a safe connection every time, eliminating all chances of cross-contamination during testing.

Fully-Adjustable Test Arm

To easily reach bulkhead ports located within the confines of network hardware environments, a next-generation OPM should have a fully adjustable test arm. This lets the technician quickly reach a bulkhead port from the right or the left side of the cabinet as necessary, speeding up the testing process.

Long-Life Rechargeable Battery

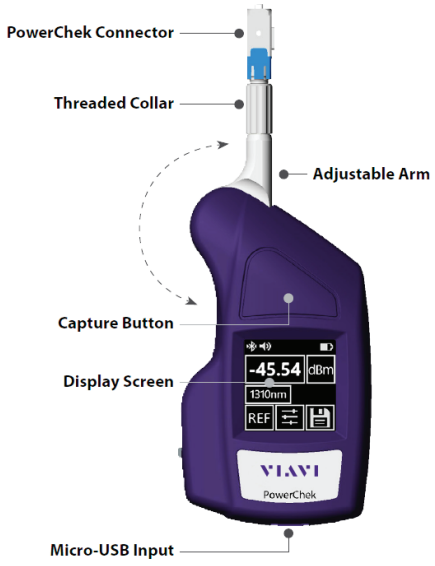
To further increase technician efficiency, a next-generation OPM should have enough data storage capability and rechargeable battery power to ensure uninterrupted testing, reading storage, and data reporting during the course of a long day of testing.

Bluetooth Pairing Capability

Smartphones and tablets are quickly becoming essential field gear to the optical fiber network technician. To let a technician take advantage of the administrative and reporting capabilities made possible through these mobile devices, a next-generation OPM must be equipped with Bluetooth pairing capability. In addition, it should be compatible with tablet and smartphone optical network testing software applications. The design should facilitate full OPM operation through on-screen and touchscreen user interfaces. Plus, it should provide the capability to measure and store a practical number of readings in real time, generate certification reports, and export readings and reports to mobile reporting applications for fast and easy data distribution.

Rugged, Durable, and Portable Construction

As the primary tool of the network technician, the OPM must be durable and portable. A streamlined, rugged housing lets a technician quickly access, test, store, and transport the OPM without fear of damage to the casing or the instrumentation. Durable, rugged construction makes the testing process more efficient and protects the investment in the testing equipment.



Example of a next-generation OPM (PowerChek™ from Viavi)

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