

TEST KEEPS PACE WITH FIBER DEPLOYMENTS

By Rick Nelson, Contributing Technical Editor

📷 ID 170391754 © Danciaba | Dreamstime.com

▶ Optical technology innovations extend from photonics integrated circuit wafer-level test to field-test applications and the cloud-based ecosystem. Effective optical test has implications for fields including edge computing, 400G/800G Ethernet, and 5G. Instrumentation extends from handheld optical-fiber multimeters to real-time and sampling oscilloscopes. OFC, The Optical Networking and Communication Conference & Exhibition, scheduled for March 8-12 in San Diego, will provide an opportunity to delve into these and other topics. Two companies who will participate in the event have highlighted their recent optical-test product introductions and previewed their plans for OFC.

Speaking for EXFO, Olivier Tremblay-Lavoie, portfolio marketing leader at the company, said, “Through 2019, we launched a series of new test solutions as well as improvements in terms of features and options both into our lab and field optical testing portfolios. I would especially highlight three specific aspects of our solution which are a direct reflection of EXFO’s DNA.”

First, Optical Explorer, released June 2019, is a handheld solution that evaluates the quality of fiber links in seconds, he said, adding that it closes the gap between traditional troubleshooting methodologies based on a power meter and VFL (visual fault locator) and methodologies based on more advanced test

equipment, such as optical time-domain reflectometers (OTDRs), which require more expertise.

Tremblay-Lavoie said the accelerating pace of fiber deployments is causing a major transformation in approaches to testing. “Optical Explorer has been designed from the ground up to tackle the challenges ahead and simplify testing,” he said. “Optical Explorer allows streamlined procedures that reduce delays and escalation costs in the field while freeing up expert technicians to focus on more relevant tasks.”

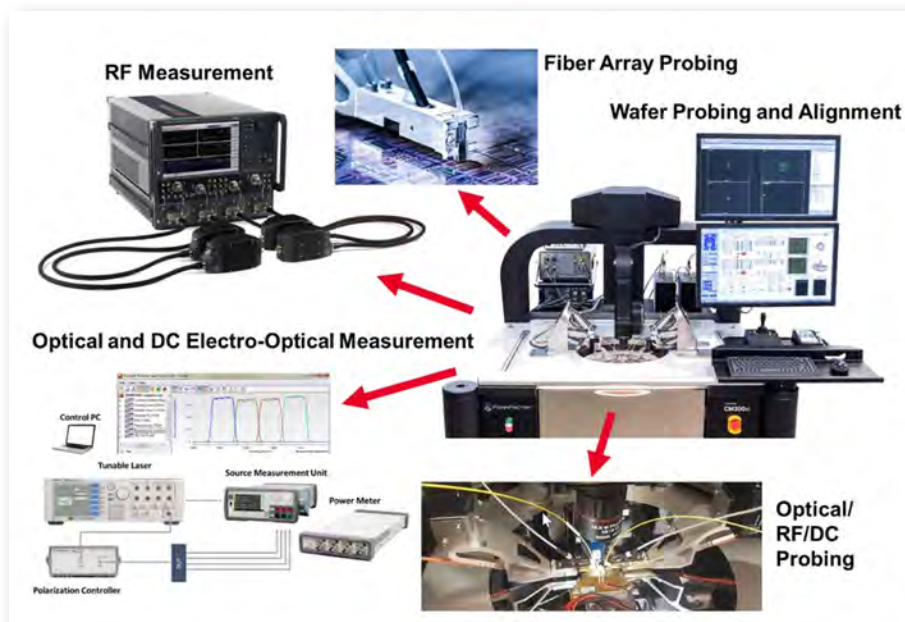
He described Optical Explorer as “...the industry’s first optical fiber multimeter (OFM), a new purpose-built category of tools empowering frontline techs to effectively carry out installation, activation, and repair operations. Optical Explorer speeds up link health verification with embedded fault tracking—all in one single-ended test that’s quick and easy.”

Optical Explorer has been designed from the start to equip large crews of frontline technicians to cope with the increasing volume of fiber being rolled out, he said. “It is optimized for utmost user experience, being highly intuitive and easy to use for any technician regardless of experience in fiber optics or other technologies (such as copper or DSL),” he added. It is designed to reduce total cost of ownership (TCO) throughout the product life cycle by cutting all hidden costs.”

Second, he cited Optical Wave Expert,

which combines a DWDM (dense wavelength division multiplexing) channel checker and OTDR functionality. “The Optical Wave Expert integrates channel power validation and reflectometry characterization on a single port,” he said. “This means that technicians can automatically identify faulty channels and follow through with fault location by leveraging intelligent OTDR capabilities. The integration of channel checker and OTDR capabilities on a single port means less unnecessary manipulation of the optical fiber and improved field efficiency. This translates into faster mean-time-to-repair and makes the trial and error approach—which can disable nodes—obsolete.” He described the tool as suitable for MSOs (multiple system operators) working in converged fiber architectures having to deploy DWDM networks in the context of fiber-deep (the effort to drive optical technology as close as possible to the customer) and remote-PHY architectures.

Last, he cited Optical Power Expert and a general expansion of the company’s ecosystem of cloud-connected essential optical test equipment. “A power meter represents one of the most basic tools to any fiber technician,” he said. “With the release of the Optical Power Expert, we proposed an updated version of our best-selling power meters, while adding Bluetooth connectivity, a wide touchscreen, and best-in-class optical performances. This state-of-the-art test device



▲ Keysight measurement solution for integrated photonics.

📷 Copyright Keysight Technologies. Reproduced with Permission.

serves essential basic needs, but is now ready to cope with today's reality, including cloud-based connectivity for reporting, automated results storage, and job management."

He continued, "This represents further proof that EXFO constantly invests in its traditional product lines, but with a clear vision to make field handheld devices more and more connected to enable new types of functionality made possible through the cloud and to drive better efficiencies in the field and higher quality networks. With these recent additions to our portfolio, we can claim we have the most connected fleet of optical test equipment that covers all essential optical testing needs, from fiber inspection probes (FIPs), to power meters, optical fiber multimeters (OFM), optical loss test sets (OLTS), and optical time-domain reflectometers."

You can now access your test data in real-time and provide automated results processing in accordance with standardized methods and procedures across all your field teams, either for in-house or subcontracted jobs, he said, adding, "In the end, data is power, and gaining visibility and control over fiber infrastructures in terms of quality, performance, and readiness for future generation applications (video, edge computing, 5G, etc.) is paramount."

Tremblay-Lavoie noted that EXFO will be exhibiting at OFC this year. "OFC is a major event for EXFO and has been always very successful for us," he said. "Given our broad portfolio of test and measurement solutions offerings, covering multiple applications from R&D, labs, and field, it is a perfect place to showcase our 35-plus years of expertise."

For the 2020 edition, he said, EXFO will showcase its T&M portfolio within key categories, the first being solutions for network equipment vendors. This first category covers applications including passive optical component test as well as 400G/800G

test and addresses an approach to testing optical transceivers at every step of their lifecycle.

Second will be solutions for high-speed optical transformations. "Here we can think of test scenarios covering datacenter applications, interconnect—anything from core to edge," he said. "The various technologies now available in a context of 5G transformation bring an unseen level of complexity in the optical transport layer. This is where we will demonstrate the interoperability between various systems and show the flexibility and ease of use of EXFO solutions in the process." He added that once again the company will partner with other Ethernet Alliance members in spe-

cific interop events to demonstrate switching and mixing from different line rates (25G, 50G, 100G, 200G, 400G, and beyond) with different protocols, including Ethernet, CPRI (Common Public Radio Interface), eCPRI (enhanced CPRI), and RF over CPRI.

Still addressing the second category, he said, "Related to 5G networks, we will be demonstrating interoperability related to X-haul architectures with Xilinx." He further explained, "As a foundational 5G topic, we see that operators and network owners are joining forces to re-use their fiber assets to expand the network capacities and allocate fibers previously used for FTTH/PON (fiber to the home/passive optical network), or in a metro ring, to now support the distribution of fiber bandwidth to 5G antennas. In such context, the use of DWDM technology is ramping up, and so EXFO will be presenting all its portfolio of xWDM test solution for fiber-deep and fiber-convergence applications—in this case, mainly optical spectrum analyzers (OSA) and channel checkers."

The third category addresses the company's field-testing portfolio, test-automation, and the cloud-based ecosystem. "This represents most of our optical portfolio designed for field applications," he said. "This is a trend we are leading in the market, and we will be focusing on showing the benefits of leveraging the cloud in day-to-day test processes."

Finally, he mentioned a T&M Center PIC (photonic integrated circuit) testing demonstration. "One of the interesting collaborations EXFO will be involved with at OFC this year will be our participation with MPI Corp. and HPE to present a true wafer chipset production test leveraging our photonic integrated circuit testing solutions (CTP10). Hosted at the T&M Center, this demonstration will be a replica of a real manufacturing use case. People will definitively be impressed by the dimensions of the demo setup, realizing the paradox in between the size of the system required to produce what is in fact, the smallest piece of optical components (PIC)."

From analyzers to scopes

For its part, Keysight Technologies has recently introduced several optical-test products, including the N4372E 110-GHz lightwave component analyzer, the N4391B 110-GHz optical modulation analyzer for terabit coherent communication, and the 110-GHz Infiniium UXR-Series real-time oscilloscope, according to Dr. Joachim Peerlings, VP and GM of Keysight's Network and Data Center Solutions group. He also cited the N77xxC family of optical component test products, the A400G-QDD Layer 1 BERT and KP4 FEC multiport test system, and the N1092A DCA-M sampling oscilloscope with integrated clock recovery. He also mentioned the N4377A lightwave detector, which offers high speed for frequency-domain and time-domain applications.

"The 110-GHz lightwave component analyzer enables parametric electro-optic S-parameter test of optical receivers and detectors, transmitters, and modulators targeted for 50 to 100 Gbaud transceivers," he said. "The 110-GHz optical modulation analyzer solution implements standard-conforming error vector magnitude (EVM) measurements according to ITU G.698.2 and the latest draft of OIF 400ZR standards. It provides high resolution and low EVM for the testing of 128-Gbaud QAM64 and beyond in 1.2-Tb/s transmission."

All of these products will be on exhibit at OFC, he said, adding that to help customers deal with the complexities, Keysight will provide at OFC the short courses "Hands-on: Test and Measurement for Signals with Complex Optical Modulation" and "Test and Measurement for Data Center/Short Reach Communications."

Peerlings also noted that in November, Keysight, FormFactor Inc., and CompoundTek announced they have joined forces to accelerate integrated photonics (or silicon photonics) innovations. The three companies have jointly developed an advanced photonics on-wafer testing solution that delivers capabilities including automated alignment as well as simultaneous optical-optical and optical-electrical device tests, which will be demonstrated at OFC.

The joint solution, to be offered by CompoundTek, includes these products:

- the FormFactor CM300xi-SiPh, with automated wafer level photonics positioning combined with Keysight's industry-standard IL/PDL engines and N7700A Photonics Application Suite (PAS), to support wavelength repeatability of ± 1.5 pm at 2-way sweeps up to 200 nm/s within 1,240 nm to 1,650 nm to ensure accuracy and repeatability from O-band to L-band;
- Keysight's N4373E 67-GHz lightwave component analyzer, which delivers the necessary bandwidth for both optical receiver testing and optical transmitter testing with guaranteed specifications for electro-optical S-parameter measurements for device traceability;
- Keysight's PathWave software platform, which provides a consistent user experience as well as common data formats and control interfaces; and
- FormFactor's SiPh software, which enables automated calibrations and alignments and simplifies integration with

Keysight's PathWave software platform, as well as optical instrumentation, to ensure ease of use.

"Innovation in optics is critical to connect the world and help the industry to monetize 5G, as well as datacenter and telecom services," said Peerlings. "Advancing in speed as well as power and cost efficiency requires a tightly connected ecosystem to jointly solve the challenges ahead."

CompoundTek plans to establish a state-of-the-art silicon photonics testing services hub in Singapore. The company's chief operating officer, K.S. Ang, commented in a press release, "With added on-wafer level, automated Si photonics optical/electrical/RF testing with this solution, customers will be able to limit packaging costs to avoid module packaging-level testing turnaround time losses. This test solution complements our current services in mass-production volume with fast cycle-time ..."

"FormFactor's industry-leading silicon photonics wafer test capability allows our customers to obtain repeatable, consistent results with unsurpassed throughput," added Claus Dietrich, vice president and general manager of the Systems Business Unit at FormFactor. "The system's automated and high-speed calibration and optical alignment, as well as precision measurement capability in collaboration with Keysight, enable CompoundTek to offer customers faster time to market."

CompoundTek and FormFactor, as well as Keysight, are scheduled to exhibit OFC. [EE](#)