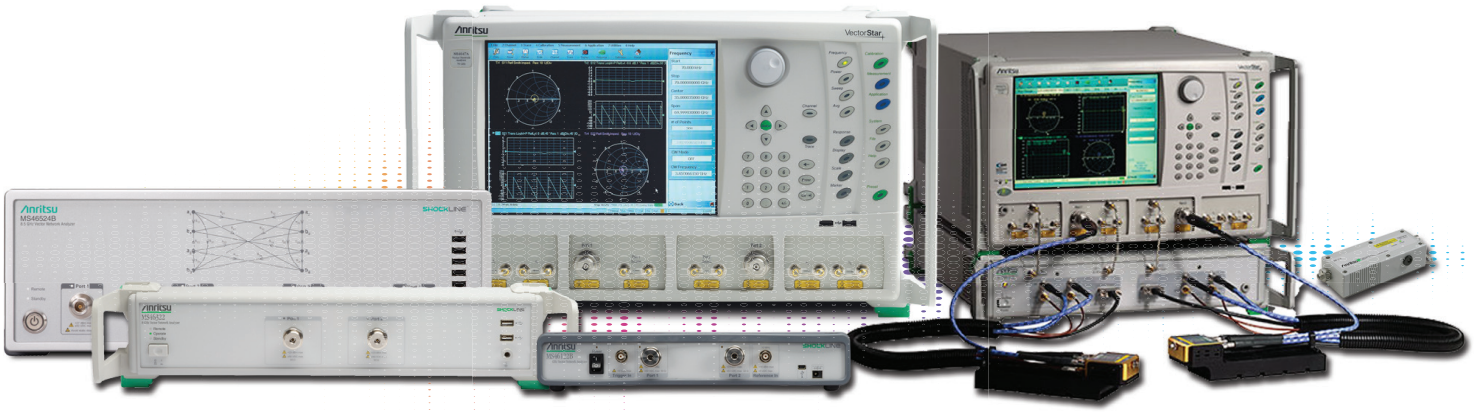
Anritsu Advancing beyond

Anritsu Vector Network Analyzers

The Perfect Tool for Electro-optical Measurements



Electro-Optical Measurements

As data rate requirements for optical communication systems increase, the characterization of optical transmit and receive modules to wider bandwidths is required. Components like optical modulators (E/O devices) and photo detectors and receivers (O/E devices) can be characterized accurately using vector network analyzers (VNAs). This flyer describes the techniques and hardware required to characterize these components more economically and with more setup flexibility than with current lightwave component analyzers (LCAs).

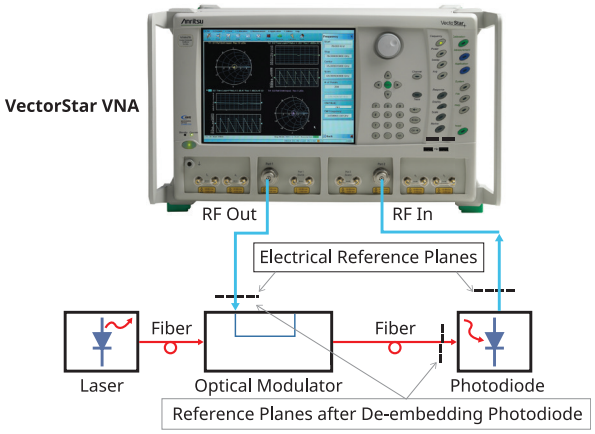


Figure 1. Basic E/O and O/E Setup Showing the Calibrated RF Reference Planes and Reference Planes after De-embedding

E/O Measurements

Using a photodiode, characterized in magnitude and phase, it is possible to de-embed the photodiode from the combined measurement. This effectively moves the calibration planes to those shown in the basic E/O and O/E setup (Figure 1). This will account for the photodiode response and effectively remove it from the set-up. The result is an accurate E/O measurement of optical transmitters, modulators, and other E/O devices. Anritsu provides a characterization file with each O/E calibration module that allows the photodiode to be removed from the measurement. This file is obtained using a primary standard characterized by National Institute of Standards (NIST).

Anritsu can now accurately measure an optical modulator's electrical to optical characteristics, such as bandwidth, amplitude flatness, phase linearity and group delay. In addition, Anritsu can measure electrical return loss at the optical modulator's RF input.

By using instrument-grade O/E calibration modules characterized by Anritsu and de-embedding techniques included in both VectorStar™ and ShockLine™ software, Anritsu VNAs can make S-parameter measurements of high-speed optical components just like their electrical counterparts.

O/E Measurements

If we want to measure an O/E device, like an unknown photodiode, we can use the same setup as shown in Figure 2. Since we have de-embedded the characterized photodiode, we can now characterize the magnitude and phase performance of the optical modulator that we subsequently will use in our O/E measurement. This new transfer function file can then be de-embedded to measure the intended O/E device. At that point, the unknown photodiode is inserted in place of the characterized photodiode and we can now measure its performance.

The uncertainty of this measurement will be slightly higher than the E/O measurement because of the second level of de-embedding involved in the measurement.

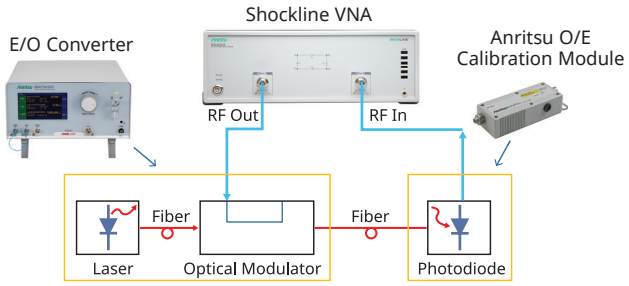


Figure 2. E/O and O/E Solutions Available from Anritsu

Anritsu MN4765B O/E Calibration Module

Anritsu manufacturers several instrument-grade O/E calibration modules that can be used to perform these O/E and E/O measurements with our VectorStar and ShockLine VNAs. The MN4765B module is available in different optical wavelengths (850, 1060, 1310, and 1550 nm) with various RF bandwidths (up to 145 GHz) to support the requirements of the industry.

These modules enable error-corrected transfer function, group delay, and return loss measurements of E/O and O/E components and subsystems when used with Anritsu VNAs.

Solutions for Electro-Optical Testing

Anritsu provides an accurate, flexible, and cost-effective technique to perform electro-optical testing of fiber optic components, like laser modulators and photodiodes, using VNAs. The simplicity of Anritsu's MN4765B O/E calibration module allows highly accurate, vector-error-corrected, and stable measurements with the full line of Anritsu VectorStar and ShockLine VNAs.

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Specifications are subject to change without notice.

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