IL and RL characterization of PM optical components

using the CTP10 test platform

app note

EXFO

Insertion loss and return loss characterization of polarization-maintaining optical components using the CTP10 test platform

app note

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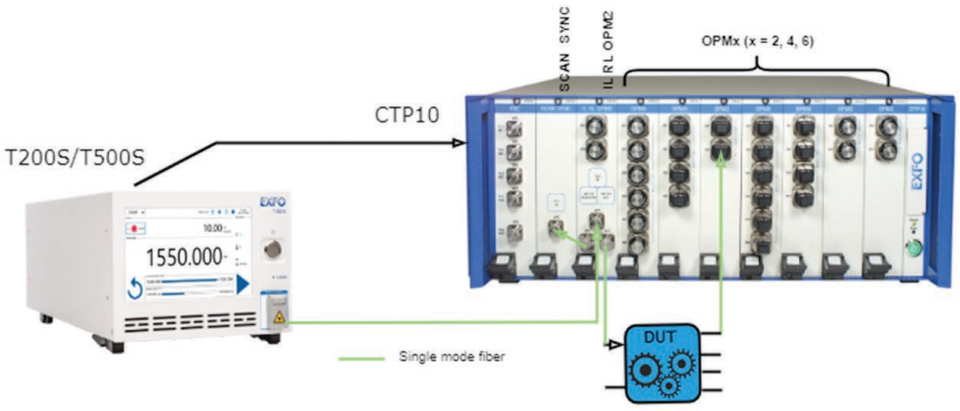
Introduction

This application note describes how swept insertion loss (IL) and return loss (RL) measurements can be performed on optical components requiring polarization-maintaining (PM) fiber input using the CTP10 test platform.

The CTP10 platform is a high performance multiport detection system that works with a tunable laser for swept passive component testing and can host the following modules:

- OPMx (x=2, 4, 6) optical detector module with 2, 4 or 6 detectors
- IL RL OPM2 insertion loss and return loss module, and two optical detectors
- SCAN SYNC optical triggering module
- FBC fullband combiner module

The IL RL OPM2 module serves as an interface between the tunable laser and the device under test (DUT) for real-time power monitoring of the laser source and to measure the backreflection light. For a singlemode fiber DUT, the standard measurement configuration is shown below.



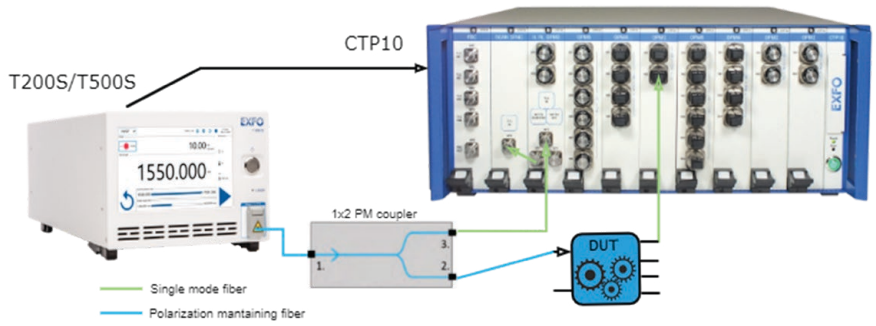
The IL RL OPM2 module uses single-mode fiber so DUTs with PM fiber input should not be connected directly to the IL RL OPM2 module. The following paragraphs explain the configurations that can be used for IL and IL-RL measurements of PM optical components using 1x2 or 2x2 PM couplers.

Whether a singlemode fiber or PM optical component is being measured, the reference measurements required to ensure best performance for IL and RL should be performed beforehand:

- Insertion loss
    1. Reference measurement without DUT
    2. Measurement with DUT
- Return loss
    1. Background noise reference measurement with mandrel wrap
    2. Loss reference measurement using a component of known return loss
    3. Measurement with DUT

Insertion loss

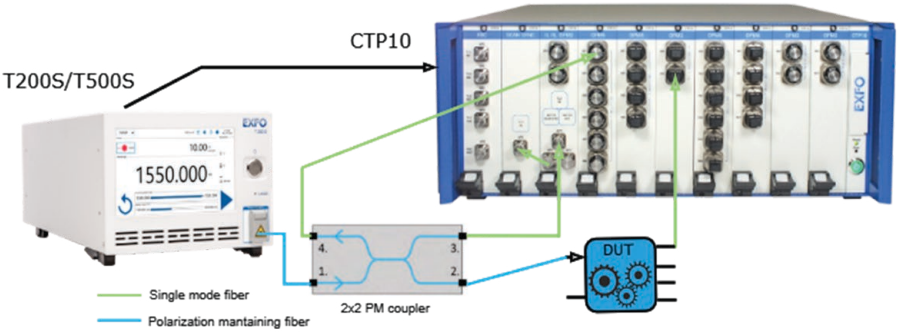
Insertion loss of a PM optical component requires a tunable laser with PM output fiber and a 1x2 PM coupler as shown in the image below.



If a full-band option is used, the output of the FBC module will be connected to the input of the PM coupler as in the case of a single laser. Real-time power monitoring is achieved by connecting one arm of the coupler (refer to 3. in the image above) to the IL RL OPM2 module, while the DUT is connected to the second arm (refer to 2.). Part of the laser light goes through the IL RL OPM2 module to the SCAN SYNC module for optical triggering. For this reason, the input power on the IL RL OPM2 module should be at least 0 dBm.

Insertion loss and return loss

For simultaneous insertion loss and return loss measurement, a 2x2 PM coupler can be used in the following configuration. In this case, the backreflection light is circulated to the 4th arm of the 2x2 coupler and measured by an OPM module, as opposed to the configuration shown in paragraph 1 where the backreflection is measured by the IL RL OPM2 module.



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CTP10 - Passive optical component testing platform

Conclusion

The CTP10 platform can be used to characterize PM optical components with multiple outputs using an external PM coupler. A 1x2 PM coupler allows to measure insertion loss whereas return loss requires a 2x2 PM coupler.

Component manufacturers such as Oplink or SQS Vlaknova optika offer a wide choice of PM couplers with different splitting ratio. Symmetrical 1x2 PM couplers typically operate over the 1260 – 1650 nm wavelength range with a 4-dB insertion loss and an excellent polarization extinction ratio (PER) of 25 dB. Please note that 2x2 PM couplers are also available but tend to have reduced specifications in terms of wavelength range, directivity and PER. Alternatively, two 1x2 couplers can be spliced head to head to provide the same function as a 2x2 coupler but with additional loss.

For any further questions relating to the characterization of insertion loss and return loss of PM optical components or to the CTP10 test platform, feel free to reach out to EXFO's experts.