Frequently Asked Questions for the Polarization Extinction Ratio Meter

1. Q: What is the operating principle of the polarization extinction ratio (PER) meter?

A: GP's polarization extinction ratio meter is composed of a rotating polarizer with ultra high PER and a photodetector circuit with low polarization dependent responsivity and very high dynamic range. For every polarizer rotation cycle, the PER meter measures the maximum power P_{max} and minimum power P_{min} and calculates and displays the polarization extinction ratio $PER=10\ log(P_{max}/P_{min})$ and input light power $P=P_{max}+P_{min}$.

The displayed angle is the orientation angle of the internal polarizer, with respect to the connector key, at which maximum power is detected during each polarizer rotation cycle. Looking into the connector, an angle rotated counterclockwise from the key slot is positive.

2. Q: Should a narrow band or broadband laser source be used for PER measurement?

A: A broadband laser source is recommended for PER measurement. Its coherence length should be shorter than $\lambda_{center} * L_{PM}$ / beat length where λ_{center} is the center wavelength of the laser source and L_{PM} is the length of PM fiber under test.

When a narrow band laser source with a coherence length much longer than $\lambda_{center} * L_{PM}$ /beat length is used, the polarization components of the light aligned to the slow and fast axes will be coherent. If they are either in phase or antiphase, the output light will be linearly polarized even if the input light is misaligned. Generally, the instantaneous PER values are not stable because of the variable phase difference between the slow and fast axes caused by stress changes in the PM fiber or temperature fluctuations, so the instantaneous PER cannot be used for device performance specification. In this case, the PER meter should be operated in minimum search mode and the performance specification should be the minimum ER measured by the PER meter as the fiber is stretched or heated/cooled.

3. Q: What are the differences between PER measurement with this PER meter and polarimeter-based PER measurements?

A: Polarimeters such as those used in the POD-101D and PSGA-101 can also measure the PER by measuring the polarization state change while the input wavelength is swept, or while the fiber is stretched or heated/cooled. However, this method cannot measure the depolarization information of devices under test. The PER meter directly measures the PER by monitoring the power change during polarizer rotation, and its test results include both the polarization and depolarization information of the device under test. Therefore, the PER meter can provide a more conservative and reliable result than the polarimeter method.

PER measurement instruments such as the PER meter and PSGA, for which the input is free space, can accurately measure the PM connector orientation angle. However, a fiber-coupled polarimeter like the POD-101D cannot give key alignment information because there is single mode fiber between the input connector and the polarimeter optical head.

Finally, polarimeter based measurements characterize the effects of DUT input connector stress and misalignment, as well as fiber effects, but do not measure the effects of the DUT output connector. The PER meter measures the effects of the output connector as well as those of the input connector and the fiber.

4. Q: What is the minimum input power needed to measure high PER values up to 50dB?

A. The power range is limited by the extinction ratio of the internal polarizer and by the dynamic range of the detection circuit. For power levels above -25 dBm, the PER meter can measure PER values up to about 30 dB. For power levels above -5 dBm, the integrated head PER meter can measure PER values up to 50 dB, and the remote head PER meter can measure PER values up to 45 dB