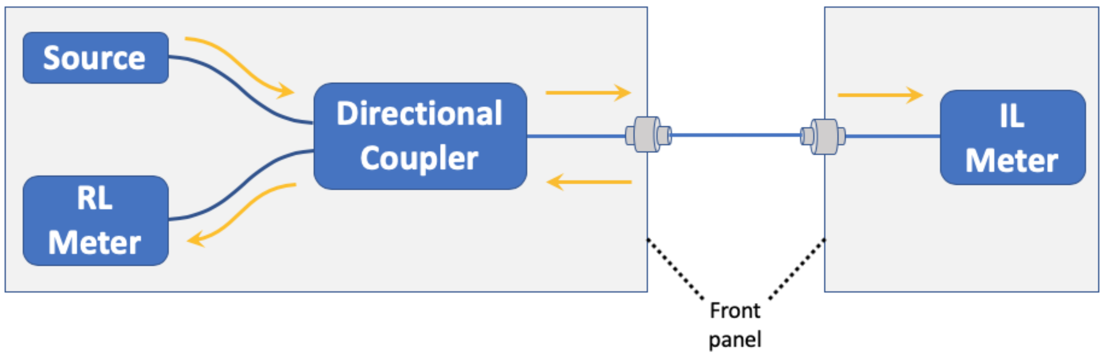
OP925 Continuous Wave RL and IL Meter

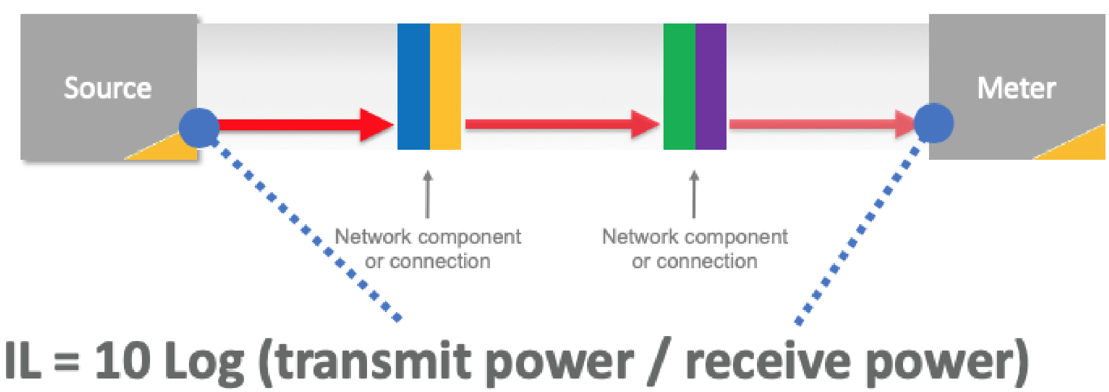
This is the new OptoTest OP925 Insertion Loss (IL) & Return Loss (RL) benchtop meter. It is based on the use of a CW (continuous wave) source.

The OP925 will measure insertion loss, return loss and optical power. Power measurements can be made in absolute (dBm) or relative (dB) modes. It supports single and dual wavelength sources. It has a high dynamic range and has a simple user interface.

This is the block diagram of a typical benchtop IL/RL meter. A source sends a signal through a directional coupler out the front panel. Reflections travel back through the directional coupler and into the RL meter. A separate optical power meter (OPM) is also found on the front panel, is used for IL measurements.

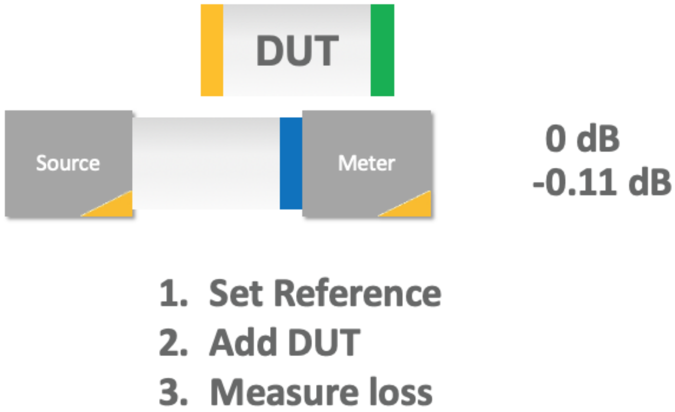


Insertion loss measurements are quite straight forward. Here we see an assembly consisting of three fibers. The signal, shown here as the red arrows, leaves the source and travels through the fibers and is then terminated in the IL power meter. Each length of fiber and interface introduces losses. The total insertion loss is calculated as the ratio of the source and received signal strengths expressed in dB.

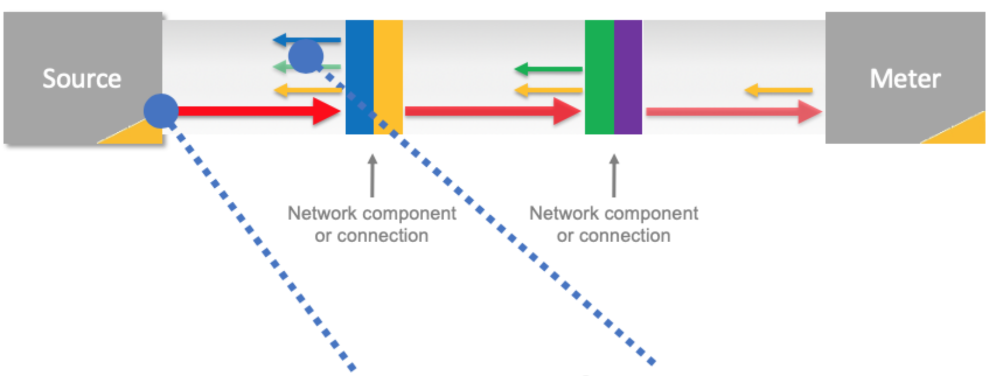


Next, we'll look at how one can measure the insertion loss of just one cable.

Many set ups include the use of a reference cable attached to the source. To measure the loss of just one length of fiber, one needs to compensate for the loss of the reference cable. This is done by attaching the meter directly to the end of the reference cable and setting the 0 dB reference point. Next the DUT cable is inserted and the IL meter reads the loss directly.

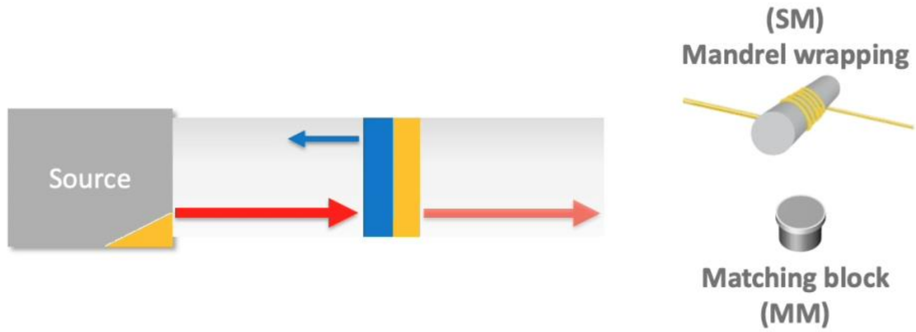


Return loss is measured with the internal power meter attached to the direction coupler. Here we see a multi-fiber assembly. The red arrows show the signal transmitted from the source. Each interface in the assembly reflects a small amount of power back to the source. These reflections are shown by the small blue, green and yellow arrows. Backscatter caused by Rayleigh scattering inherent to the fiber itself is also part of the reflected power. The source power is compared to the total reflected power and the ratio is expressed in dB.

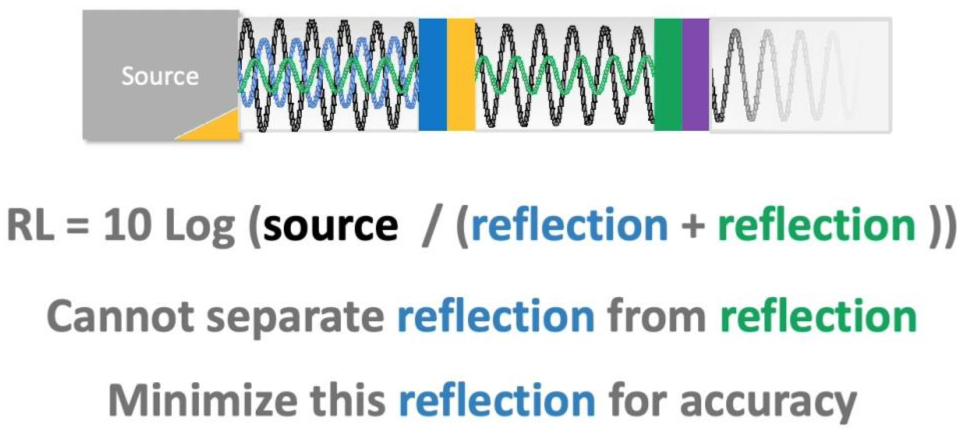


RL = 10 Log (Source power / Reflected power)

The end reflection of a cable or assembly will prevent accurate measurement of its first connector. One can eliminate this reflection by using a mandrel wrap on single-mode fiber or a matching block with single mode fiber (including the bend-insensitive types) and multi-mode fiber. The cable can then be reversed to measure the return loss from the other connector.



Here we see the mechanics of a CW RL test. The black wave represents the signal from the source. The blue and green waves represent the reflections from each interface. The end reflection is not shown because it has been terminated as shown in the previous slide. The return loss includes the sum of both the blue and green reflections and they cannot be separated from each other. The magnitude of the blue reflection thus limits the measurement accuracy of the green reflection. This is why extra cables and switches should be avoided between the source and the DUT but if necessary, should be of extremely low return loss such as with the OptoTest reference and SAVer cables.



The benefits of the CW system are several. The test equipment itself is simple and straightforward. You get a total RL measurement that includes the Rayleigh scattering. The OPM is of high accuracy and the overall cost of the meter is relatively low.