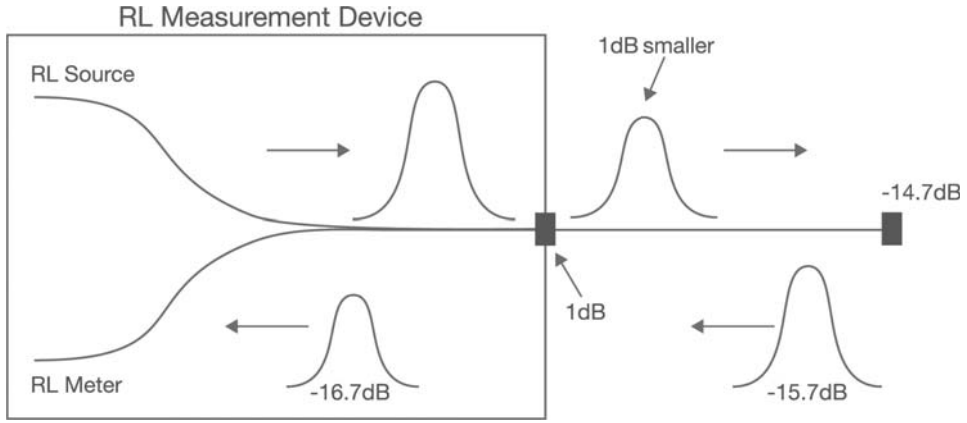
OptoTest

Your Partner in Fiber Optic Test Solutions

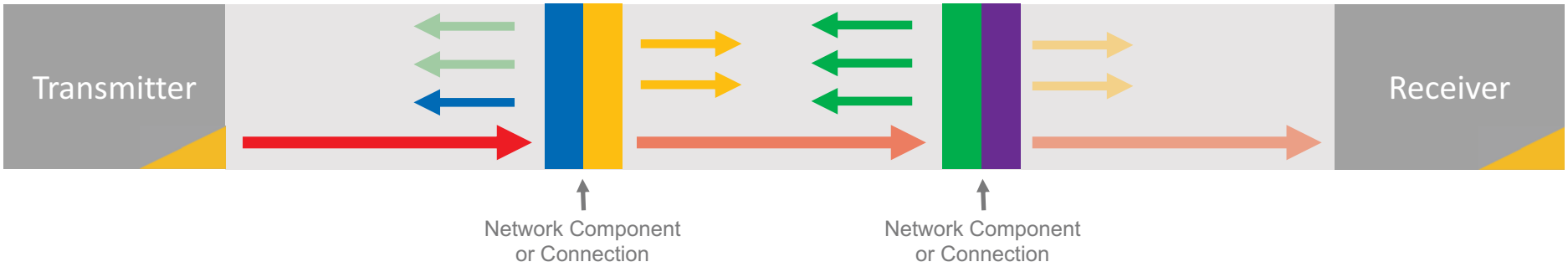
Fiber Optic Training Sessions

Ensuring Accurate Return Loss Measurements

March 2019



Return Loss in Networks

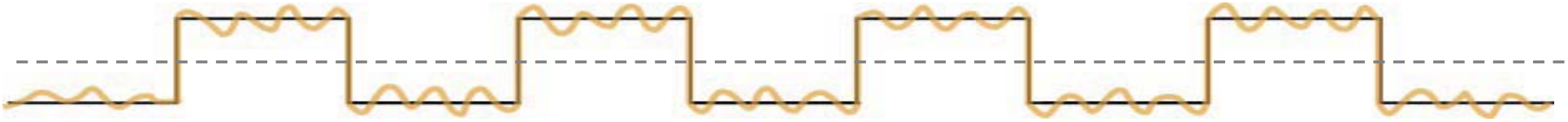


- At every connection point along the path between the transmitter and receiver, some light will be reflected back towards where it came from (solid arrow) and some light will continue on down the path (faded arrow).
- Reflection can occur every time light reaches a connector along the path, regardless if the overall direction is towards the transmitter or towards the receiver.
- As light is reflected back, the outgoing signal is distorted.
- The more light there is reflected back towards the transmitter, the more distorted light emitting from the transmitter becomes.

Effect of Loss on Signals

Ideal Signal

Resulting Signal with Acceptable Amount of Return Loss

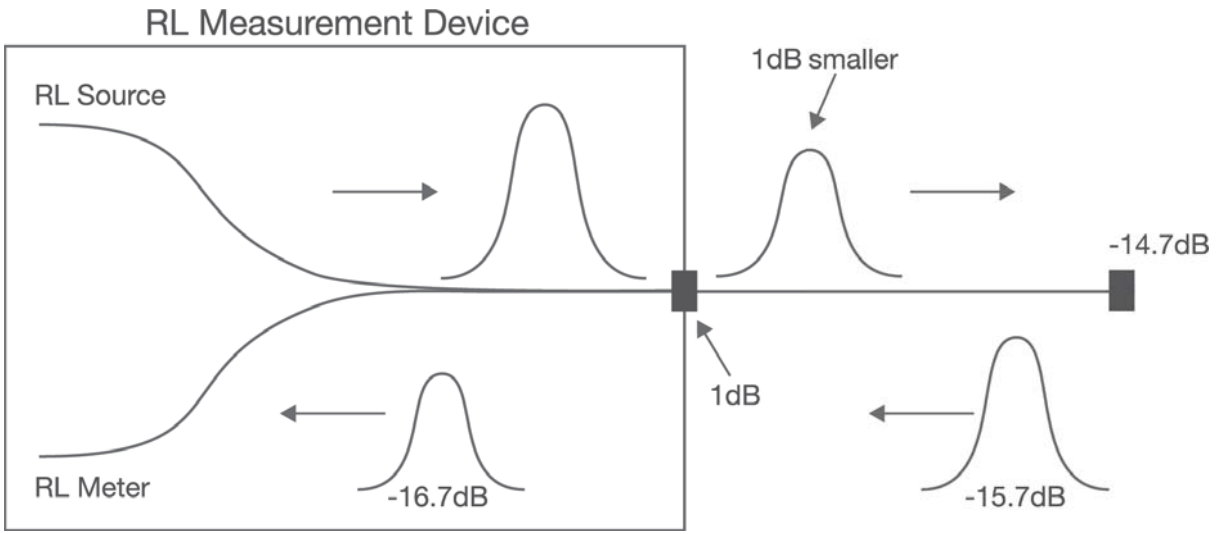


With acceptable RL, the signal is still pretty clear about ON and OFF (1s and 0s)

Resulting Signal with Excessive Amount of Return Loss

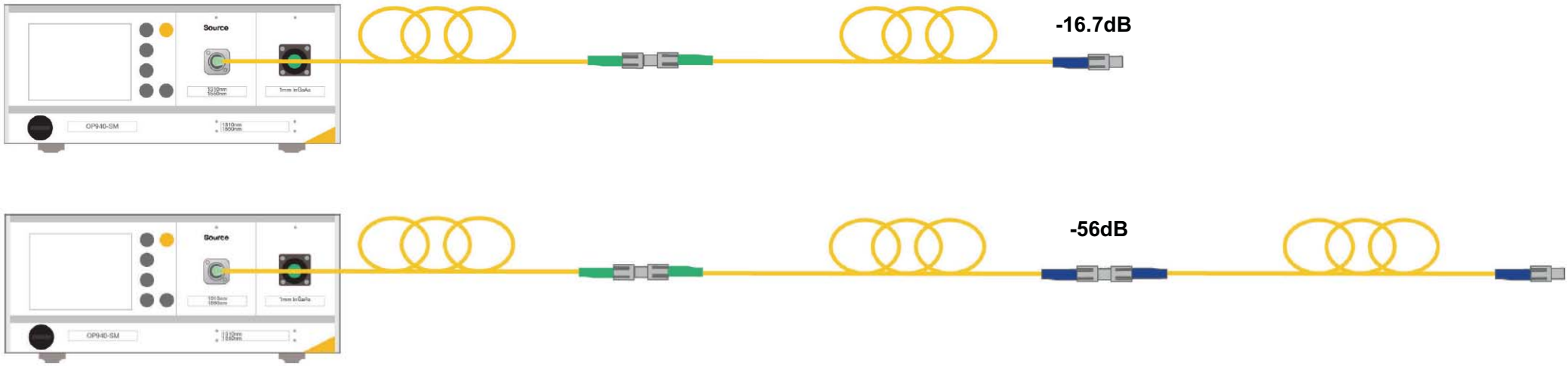
Excessive RL muddies the signal, making it harder to distinguish ON and OFF

RL Measurement Process



- A pulse of light is generated at a known magnitude.
- At the end of the reference cable, some light bounces back and the RL meter inside the unit measures how large the back reflection is.
- The light of the back reflection is subject to the same IL as the forward light signal, so light is lost along the path twice.

RL Measurement in Action

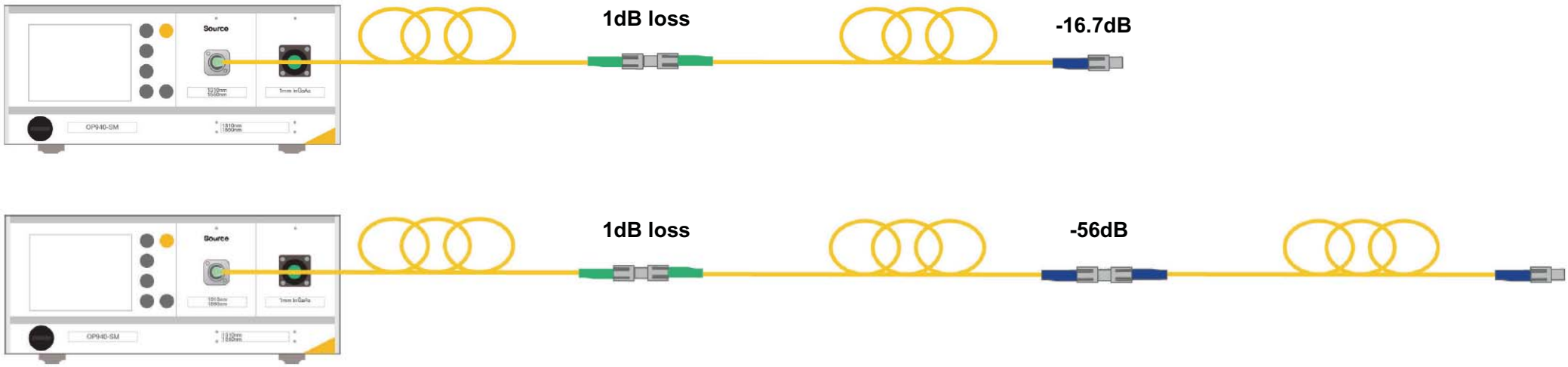


Let's look at a simple test setup as an example:

- Here is a test set measuring a simplex UPC connection.

- The light travels down and -56dB of return loss is measured. This cable passes our threshold of -55dB and goes out to the customer.

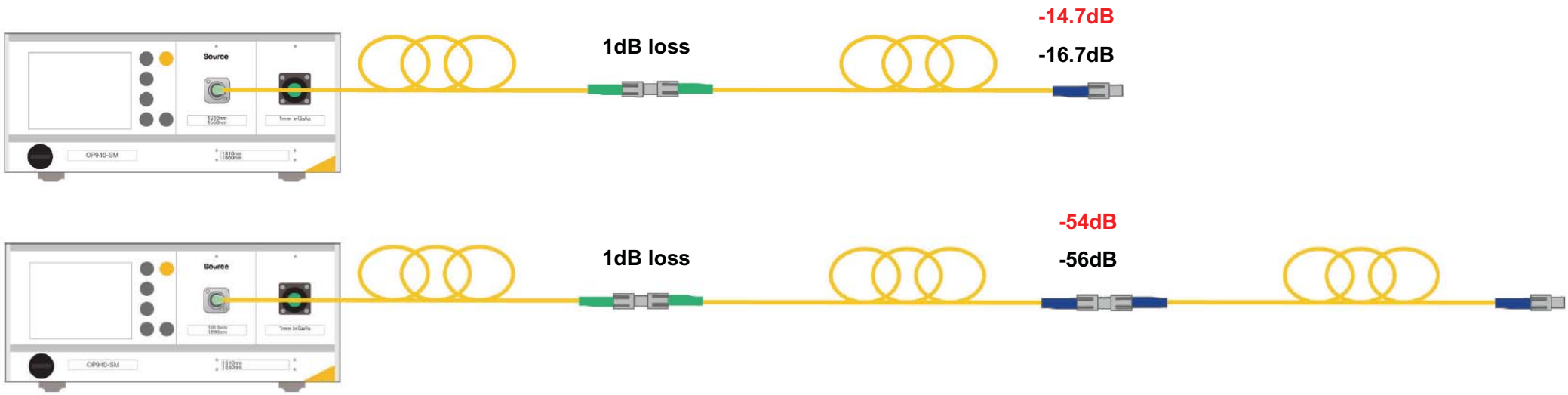
Loss in the Setup



- But let's consider this: when the operator connected the reference cable and the DUT, there was some dirt on the endface and there was about 1dB of loss at the connection between the reference cable and the DUT.

- That means that the pulse of light is unexpectedly losing 1dB of magnitude on the way out from the front panel and another 1dB of magnitude when it passes back through that connection for a total of 2dB of effect on the RL measurement.

Importance of Loss Correction

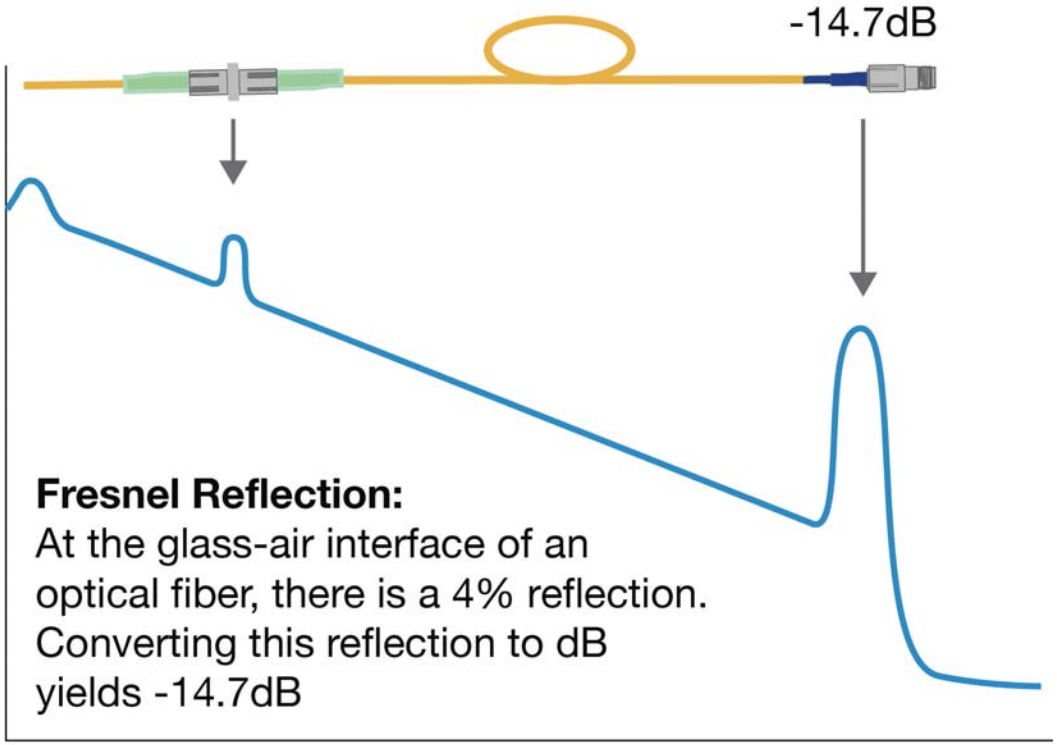


- If we account for the 2dB that was contributed from the setup, not the DUT, we find that the RL should be measuring at -54dB which is below our pass/fail threshold.

- When your customer tests this cable, it could be rejected at quality inspection.

Fresnel Reflection

- Referencing using a known artifact allows us to correct for additional loss in the setup.
- If we know to subtract a given amount of loss from our measurements (or automate that calculation through software or on the equipment display), then the true loss of the DUT is found.
- The most cost-effective RL artifact is a standard UPC connector left open to air; the -14.7dB Fresnel reflection is a reliable, repeatable value that most manufacturing facilities already have lying around.

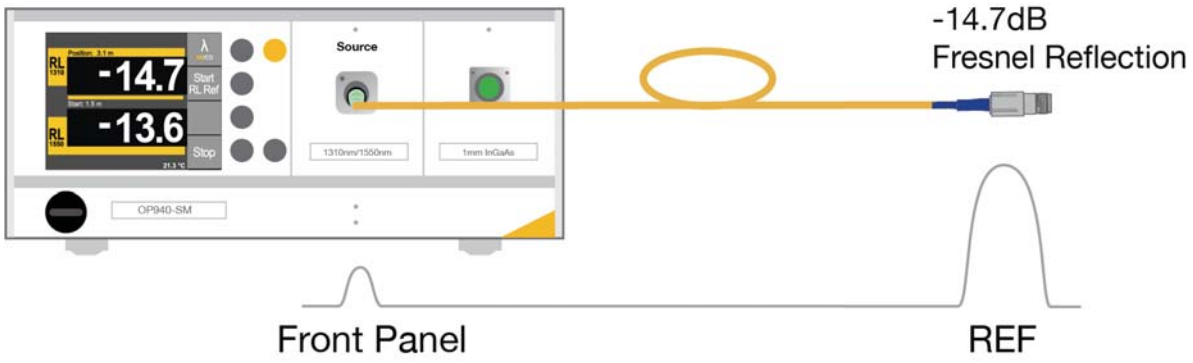


The Challenge & Our Solution

- In order to use the Fresnel reflection as your RL artifact, you must make sure that the test set used is accurate down to -10dB or -12dB.

- Many pulse-based systems are only calibrated down to about -30dB and their RL meters become saturated between -20dB and -25dB.

- These systems are unable to accurately measure the Fresnel reflection, rendering this artifact unusable.



- OptoTest RL meters are calibrated in a range from -10dB to -80dB.

- This range makes it possible for OptoTest equipment to accurately measure both the Fresnel reflection and the RL for APC connectors which can measure well beyond -70dB.

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For more details, see our Application Note and White Paper:

AN128 Ensuring Accurate Return Loss Measurement

https://www.optotest.com/an-128-assuring-accurate-return-loss-measurement/

White Paper: The Importance of Verifying a Reference Reflection for Accurate RL Measurements

https://www.optotest.com/importance-verifying-reference-reflection-accurate-rl-measurements/

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