112

APPLICATION NOTE

OPTIMIZED TESTING, OPTIMIZED BUDGETS

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Many companies test insertion loss according to the TIA (the procedure and methodology for certification loss testing on optical fiber is governed by standard number TIA FOTP-171, *Cable Assembly Loss Measurement*) with a power meter and a source and, from a practical standpoint, what can be simpler? Nothing, really, but beware, this practice presents certain dangers. Although it may seem easy to maintain the typical 3 dB loss budget set by the network engineer, it is not always the case. In fact, blindly testing this way can have a significant impact on both loss and financial budgets.

Loss Budget

A few years ago, loss budget tolerance was not really an issue. Now, with higher data rates and optimized costs, the budget tolerance has shrunk considerably, and it is an accepted standard in the industry that budget loss tolerance should be no greater than 3 dB. At first glance, this seems easy enough since a typical power meter has an uncertainty of 5 % or approximately 0.2 dB, but there is a lot more to it. Let's review what can be easily forgotten or tested inadequately, and you will see that maintaining a 3 dB margin is not that easy after all…

Let's assume, for the purpose of the example, that technicians are qualifying an 80 km cable. Prior to leaving, both technicians reference the power meter with a source at the given wavelengths and agree on a test plan. However, this isn't always enough:

The instruments purchased were specified to include a yearly calibration. Is this done consistently? Not always.	Calibration drift: up to **0.5 dB**
Connector repeatability is typically 0.2 dB. Since there are two instruments, this doubles. Whatever the quality of the test instrument, this error remains during testing.	Uncertainty: **0.4 dB**
Once on location, both technicians turn the units on and start testing. A typical 30-minute warm-up time is normally required for the source, while an offset nulling must be performed on the power meter. The question is, do technicians really wait for the warm-up time and/or perform the required nulling? Difficult to determine.	Offset nulling uncertainty: up to **0.5 dB** Warm-up instability: up to **0.4 dB**
In addition, it is assumed that the reference taken previously is still valid now that the source and meter are reactivated. But was the required offset nulling performed prior to taking the reference?	Lack of correct reference: up to **0.4 dB**
During testing, when the source user changes the test wavelengths, he must notify the power meter user to change the calibrated wavelength on the meter. Mismatched wavelengths will result in error.	Error generated by mismatched wavelengths: up to **1 dB**
And, of course, every power meter has an intrinsic uncertainty.	Uncertainty: **0.2 dB**

So you see, a 3 dB margin can be easily exceeded in such probable conditions. To prevent the effects of such uncertainty, EXFO designed a new handheld series, which includes the FOT-300 Loss Test Set, the FPM-300 Power Meter and the FLS-300 source–truly optimized for the real world:

Key Features

- Offset nulling is not required on the power meter
- Source warm-up period is greatly reduced[1], and power meter does not require it at all[2]
- Power meter automatically detects the incoming wavelength
- Calibration is good for three years
- Source can send power-level information digitally for remote referencing (even if technicians are in different locations)

All that is left from the above list, in all conditions, is the connector repeatability and the intrinsic uncertainty of the power meter. Nothing else. That's the test optimization brought to you by EXFO.

1. *15 minutes for ± 0.05 dB*
2. *For ± 0.05 dB*

Financial Budget

Now, let's assume the potential financial impact of non-optimized products:

Arriving on-site, engineers need to wait for the warm-up time to be over	Wasted time: 30 minutes
They will also need to perform an offset nulling each time they change environment. From CO to manhole to CO again, this adds up.	Wasted time: 15 minutes
They will call each other on the cell phone (if they are allowed in the CO environment) each time they switch wavelength.	Waste a cell phone charges, if cell phone allowed
In addition, units must be checked for calibration on a yearly basis.	Administration time and costs
If the power meter or source drifts, they will need to find a new meeting point to re-reference.	Wasted time: well above an hour
If the unit gets damaged, it is quite possible that the warranty is over because most units are only covered for one year.	Additional purchasing costs for new test equipment
The probability of the batteries dying is quite high (usually at the worst possible time, such as in a manhole). Why? Because they are usually only good for 40 hours.	Must abort testing; more wasted time
Once one fiber is tested, it's on to the next one. But wait; there are so many fibers in the cable that it's hard to tell which one is the next one.	Several minutes can be lost at each new test

In addition to the features mentioned previously, the FOT-300 Loss Test Set, FPM-300 Power Meter and FLS-300 Light Source offer the following:

Key Features

- All units come with a three-year warranty
- Recommended calibration cycle is three years
- All units can generate and detect a 2 kHz tone for fiber identification
- Battery life of these units is by far the longest in the industry: up to 120 hours for the source, and 300 hours for the power meter.

Isn't it time to dramatically reduce your cost of ownership?

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