

# White Paper

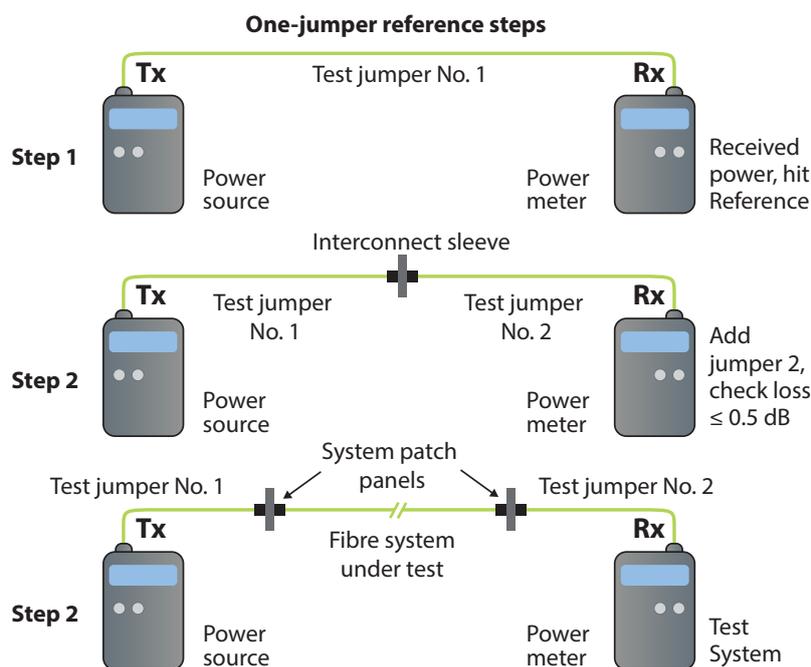
## Tier 1 or Tier 2 Optical Testing - Which is best?



Fibre optic cabling is the core of today's cabling networks. Optical fibre is the predominant media type for mission-critical data centre links, backbone within buildings and longer distances for campus networks. As network speeds and bandwidth demands increase, loss limits have decreased, making accurate fibre optic cabling certification testing more important than ever. To understand how to test fibre, first we must understand why we need to test it at all. Testing ensures that the link meets the performance expectation outlined by IEEE, ISO/IEC, TIA/EIA Standards. It is also a requirement when applying for an Excel 25-Year performance warranty, whilst providing the network user reassurance that the installed products will support their applicational needs.

There is often confusion, because in addition to the losses for each component in the link, an OTDR (optical time-domain reflectometer) will also show the total link loss like a LSPM (light-source/power meter) does but does not meet the requirements of Tier 1 testing. So why then does an OTDR not satisfy the requirement for Tier 1 certification?

There are differences between the total link loss reported by an LSPM and an OTDR. An LSPM measures the true optical loss of the link closely simulating actual network conditions while an OTDR calculates the total loss of the link. It uses reflections from the fibre itself (Rayleigh backscatter) and 'events' in the link, such as connectors, splices etc. (Fresnell reflections), to estimate the overall loss of the link. Although both may provide similar results when testing the same cable, the LSPM is always the most accurate way to determine the end-to-end loss of a link.



### Tier 1

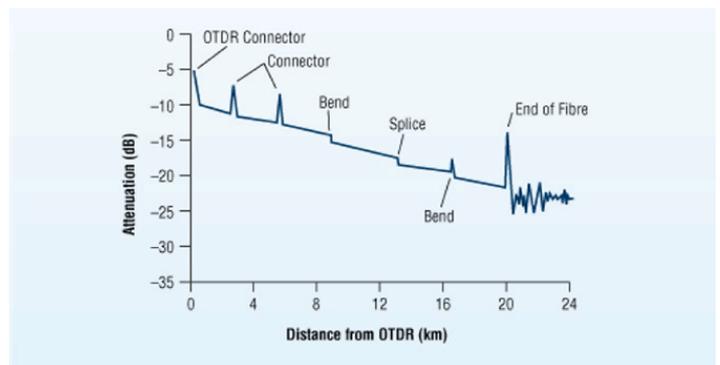
Tier 1 is a simple and accurate way of determining whether a fibre optic link will support an application or not.

The resulting insertion loss measurement can be compared to a specification or standard to provide a pass/fail status of each link for its intended use, it is the most common method of certifying fibre optic cabling. To perform Tier 1 certification, the test cord(s) used for testing with the LSPM units are first referenced/calibrated out so that their loss is not included in the test results. There are different reference methods available, using either 1, 2 or 3 test cords. The method used depends on several factors including the type of LSPM used.

Excel strongly recommends the single test cord or "1 jumper" method because it is recommended by both the ISO/IEC and ANSI/TIA standards organisations and is without doubt the most accurate method to use.

## Tier 2

Tier 2 certification uses an OTDR to characterise the link under test by measuring the fibre and each of the individual components that make up the entire cabling. An OTDR not only captures insertion loss but also reflective loss induced during installation, thus creating a visual representation of the link which allows the operator to see the contribution of each component to the link's total loss, making it a perfect tool for troubleshooting.



## Conclusion

Tier 2 certification of insertion loss is calculated from reflections within the link, not directly measured by the OTDR. This leads to potential inaccuracies in the reported insertion loss between the two methods. The LSPM is always the most accurate method of measuring insertion loss of a link, even though an LSPM can cost significantly less than an OTDR.

Ultimately, the required testing method is an agreement between the cabling contractor and their customer. However, when certification is required, it is good practice to always perform a Tier 1 test using an Excel approved LSPM test set, and optionally perform a Tier 2 test if required. Tier 2 certification supplements Tier 1 certification – it is not a replacement for it.

### European Headquarters

Excel House  
Junction Six Industrial Park  
Electric Avenue  
Birmingham B6 7JJ  
England

T: +44 (0) 121 326 7557  
E: sales@excel-networking.com

[www.excel-networking.com](http://www.excel-networking.com)

### Mayflex MEA DMCC

Office 22A/B  
AU (Gold) Tower  
Cluster I  
Jumeirah Lake Towers (JLT)  
Dubai  
United Arab Emirates  
PO Box 293695

T: +971 4 421 4352  
E: mesales@mayflex.com

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