VTI SERVICES

TB Number	009
Version	1.2
Supersedes	1.1
Date:	08.10.19
Media	Optical Fibre

VTI Services Technical Bulletin (TB)

Optical Fibre Testing, Enhanced Three-Test-Cord Reference Method To AS/NZS 14763.3:2017

Text in *Blue Italics* is derived from Standards.

Applicability

The following applies to optical fibre permanent link and link testing of cabling installations seeking performance conformance to AS/NZS 11801.x series using AS/NZS 14763.3:2017 light source and power meter (LSPM) Enhanced Three-Test-Cord reference method.

Summary

- The previous Three-Test-Cord Reference Method has been removed from the Standard.
- An Enhanced Three-Test-Cord Reference Method has been established for mismatched connector Links and Permanent Links.
- Connector loss budget values for reference-to-random are relaxed, i.e. larger loss allowance.
- Optical fibre channel testing is not covered in this technical bulletin.

Conformance requirements

For Conformance to AS/NZS 11801.x series and AS/NZS 14763.3:2017, LSPM reference setting shall use either the one-test-cord reference method or the *Enhanced three-test-cord reference setting,* instead of the previous three-test-cord method, and

LSPM testers must use 'Test Limits' set to:-
- ISO 14763-3:2018 or
- ISO/IEC 14763-3:2018 or
- AS/NZS 14763.3:2017 (if available in the tester)

For Australia and New Zealand, unless states otherwise in the Quality Plan;
*Testing of links with light source and power meter **shall** be bi-directional and at least at two appropriate wavelengths.*

For bi-directional testing using LSPM, *the worst one of the two measured results **shall** be considered as the overall measured result.*

1. Previous Three-Test-Cord Reference Method - Removed

The previous three-test-cord reference method has been removed from the standard and its use for reference setting is no longer acceptable for compliance to AS/NZS 11801.x series and AS/NZS 14763.3:2017.

This method has been replaced by the Enhanced Three-Test-Cord Reference Method that has better accuracy, less possibility of 'gains' and less measurement uncertainty.

2. Test Cords

Both multimode and singlemode fibre reference setting should for most applications use the following test cords;

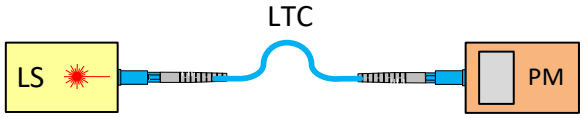
- LTC Launch Test Cord (2 – 10 m with reference connector at link interface end)
- STC Substitution Test Cord (2 – 10 m with reference connector at link interface end)
- TTC Tail Test Cord (2 – 10 m with reference connector at link interface end)

The LTC for multimode fibres *shall meet the launch modal distribution condition* at the output of the launch test cord to meet **Encircled Flux** (EF) requirements.
The LTC for singlemode fibre meets its launch condition through the test instrument. Alternatively, *the singlemode LTC shall contain a minimum of two single air-coiled turns or mandrel wraps of 35 to 50 mm diameter.*

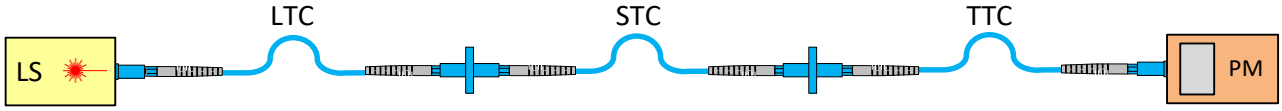
3. Enhanced Three-Test-Cord Reference Method

The Enhanced Three-Test-Cord Reference Method is available for Links and Permanent Links whose connectors on each end are different from each other. The power meter must be capable of accepting different adaptors to suit if different connectors are involved in the test.

The enhanced three-test-cord reference setting method is:-

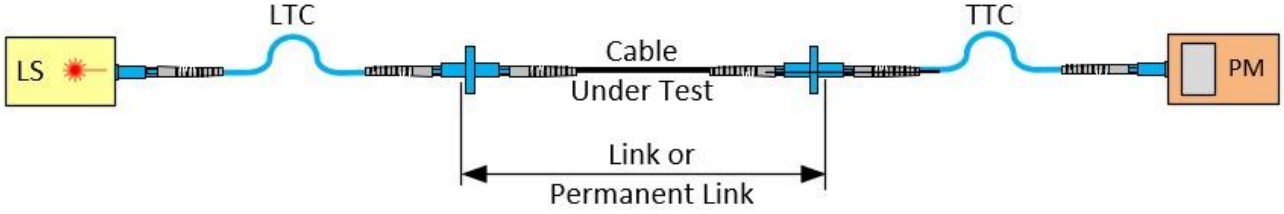


Step 1 Set the reference with just the Launch Test Cord (LTC)



Step 2 Join the Launch, Substitution and Tail Test Cords (LTC-STC-TTC) and test the loss

This will verify that the substitution and tail cords, whose interfacing connectors match those on the link under test, are less than the permitted attenuation for test cords. *The maximum permitted attenuation shall be the value of two sets of reference connections combined. That is; (≤0.20 dB multimode, ≤0.40 dB singlemode).*
It is strongly recommended that each reference result be saved with all other test results.



Step 3 Remove the STC, connect LTC and TTC to the link, and then test and save the results.

4. Treatment of Link Test Results

Using the One-Test-Cord Reference Method or the Enhanced Three-Test-Cord Reference Method, the PASS limit for link attenuation is;

MMF: Limit = (2 x 0.50 dB) + Σ (cable attenuation) + Σ (embedded connector attenuation)
SMF: Limit = (2 x 0.75 dB) + Σ (cable attenuation) + Σ (embedded connector attenuation)

5. Connector Attenuation Values for Loss Budgets

Table 6 Allowable Budget Attenuation Values

Component and Wavelength	AS/NZS 11801.1 Attenuation (Loss) Maximum
Mated Ref to Ref Connection	
MMF at 850 & 1300 nm	0.10 dB
SMF at 1310 & 1550 nm	0.20 dB
Mated Ref to Non-Ref Connection	
MMF at 850 & 1300 nm	0.50 dB
SMF at 1310 & 1550 nm	0.75 dB
Non-Ref to Non-Ref at all wavelengths	
MMF	0.75 dB
SMF	0.75 dB
Splice	
MMF at 850 & 1300 nm	0.30 dB
SMF at 1310 & 1550 nm	0.30 dB
Connector with splice at Link interface	
MMF	0.80 dB
SMF	1.05 dB
Connector with splice embedded in Link	
MMF	1.05 dB
SMF	1.05 dB
MPO/MTP Cassette at Link interface	
MMF	1.25 dB
SMF	1.50 dB
MPO/MTP Cassette embedded in Link	
MMF	1.50 dB
SMF	1.50 dB
MMF multimode OM3, OM4	
at 850 nm	3.50 dB/km
at 1300 nm	1.50 dB/km
MMF multimode OM5	
at 850 nm	3.00 dB/km
at 1300 nm	1.50 dB/km
SMF Singlemode at 1310 & 1550 nm	
OS1a	1.00 dB/km
OS2	0.40 dB/km

Ref = Reference Connector Non-Ref = Non-reference (Random) Connector

6. Apparent Gains

Apparent gains shall not exceed the measurement uncertainty

7. Measurement Uncertainty

Measurement uncertainty (for testing links) is the same for both the one-test-cord reference and the enhanced three-test-cord reference methods.

Measurement uncertainty for all link testing; (Note: Channel Testing has different measurement uncertainty)
SMF is ± 0.24 dB
MMF is ± 0.27 dB when attenuation is ≤1.9 dB
MMF is ± (0.14 x attenuation) when attenuation is >1.9 dB

8. Mated Connections in Close Proximity

Each MPO cassette shall be considered as two mated connector interfaces when determining optical attenuation budget. Also, connectors containing a mechanical or fusion splice with a pre-polished stub are deemed to be a connector and a splice for loss budget calculations.

9. Further Information

See Technical Note TN 004 Ver.1.12 for additional LSPM testing and references information.

Acknowledgement

VTI Services acknowledges the contribution of member and associated industry and standards writing organisations that contributed to the creation of Technical Bulletins.