

## Technical Note 003

### Channel Testing of Optical Fibres to the requirements of ISO/IEC 14763-3:2014

Text in *blue Italics* is derived from the standards

#### 1. Applicability

The following applies to optical fibre channel testing of cabling installations seeking performance conformance to AS/NZS 3080 and/or ISO/IEC 14763.3: 2014 using light source and power meter (LSPM) testing methods.

#### 2. Background

The test configuration reference planes of a channel contains the equipment cords at both ends and all the cable and components between the equipment cords, but not the connectors on the equipment cords that interface to the equipment.

This Technical Note explains how to test an optical fibre channel using the Enhanced Channel Testing procedure to exclude the contribution of the two equipment cord end connectors and meet the requirements of AS/NZS ISO/IEC 14763.3 <sup>1</sup>.

#### 3. Bi-directional Testing of Channel

AS/NZS ISO/IEC 14763.3:2012, Appendix ZZ2, Cl 9.1.1.2 states;

*For Australia and New Zealand testing of permanent links and channels with light source and power meter shall be bi-directional and at least at two appropriate wavelengths.*

AS/NZS ISO/IEC 14763.3:2012, Clause 9.1.1.3 for bi-directional testing states;

*the higher of the two measured results shall be considered as the overall measured result.*

#### 4. Test Cords

For both multimode and singlemode fibre, the method of reference setting uses the following test cords;

- LTC Launch Test Cord (1 – 5 m long; reference connectors Channel interface end)
- NEC Near Equipment Cord (the customer's near-end equip/patch cord at the light source)

Note: The customer's far-end equipment/patch cord FEC (at the other end of the channel i.e. the power meter end) is not used during reference setting but it is used during the channel test.

The LTC for multimode channels shall meet the launch modal condition <sup>2</sup> at the output of the launch test cord. This is also known as meeting **Encircled Flux** requirements.

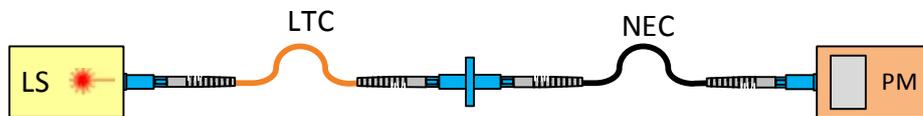
The LTC for multimode and singlemode should have the end face that will mate with the equipment cords, inspected and cleaned before reference setting and before each and every individual channel test.

The equipment cords NEC and FEC should also have the end face that will mate with the LTC and with the power meter, inspected and cleaned before reference setting and before each and every individual channel test.

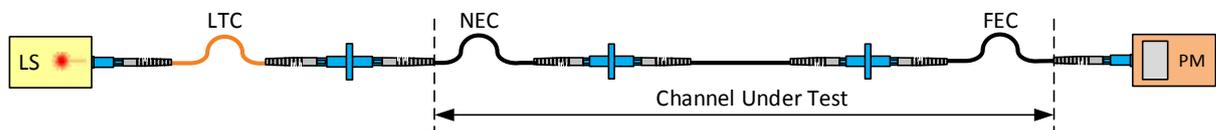
## 5. Enhanced Channel Test Reference Method

Clause 9.1.1.2 of ISO/IEC 14763.3 Ed2: 2014 sets out the following method:-

- 5.1. Ensure the launch test cord is qualified/verified as functioning properly.
- 5.2. Allow the light source to warm up following the tester manufacturer's recommendations. This could take up to 15 minutes.
- 5.3. Connect LTC to the light source at one end and the equipment cord NEC at the other end. Ensure EF compliance of the LTC for multimode fibre. Connect the other end of the NEC to the power meter.



- 5.4. Set the reference to 0.0 dB or record the reference power in dBm or watts.
- 5.5. Connect the LTC-NEC combination to the fixed cable of the fibre channel under test.
- 5.6. At the far end of the channel, connect the FEC to the power meter. Do not disturb the joint between the fixed fibre cable and FEC as this is part of the channel under test.



- 5.7. Measure the attenuation of the fibre Channel, which includes the two customer equipment cords but not the two end connectors.

Note: This enhanced channel test is a one-direction test. To test from the far end back to original near end, the reference must be re-set using the LTC-FEC combination and repeat steps 5.3 to 5.7.

### Test Procedure Rational

- 5.8. By channel definition, the first and last connectors are not part of the channel.
- 5.9. The first connector on NEC is referenced out during reference setting.
- 5.10. The last connector on FEC is not measured because it is connected to the power meter.
- 5.11. This test procedure meets the reference planes in ISO/IEC 14763-3 and ISO/IEC 11801.
- 5.12. This procedure is called the **Enhanced Channel Test** for optical fibre in ISO/IEC 14763.3.

## 6. Treatment of Channel Test Results

- 6.1. Clause 9.1.1.7 of ISO/IEC 14763.3 Ed2 states;  
*Using the enhanced channel test reference method specified in clause 9.1.1.2, the limit of testing for channel attenuation is;* See Table 6 below.

$$\text{Channel Attenuation Limit} = \Sigma (\text{cable attenuation}) + \Sigma (\text{embedded connector attenuation})$$

- 6.2. There is a second and more important limit that the channel must also pass. Appendix F.2 of AS/NZS 3080 requires that a channel not exceed the maximum attenuation allowable for the customer's intended application.

The channel must pass the lower limit of 6.1 and 6.2.

## 7. Apparent Gains

*Apparent gains shall not exceed the measurement uncertainty.* <sup>3</sup>

- *Measurement uncertainty using the 3-test cord reference method for; MMF is  $\leq 0.2$  dB, and SMF is  $\leq 0.4$  dB* <sup>4</sup>
- *Measurement uncertainty using the 1-test cord reference method for; MMF and SMF is 0.0 dB* <sup>5</sup>

## 8. Mated Connections in Close Proximity

Mated connections in close proximity *shall be considered as two mated connector interfaces when determining optical attenuation budget.* <sup>6</sup> This applies to MPO Cassettes, Stub connectors and Pigtailes.

**Table 6 Allowable Attenuation Values**

Component and Wavelength	AS/NZS ISO/IEC 14763-3:2012 Attenuation (Loss) Maximum
Mated Ref to Ref Connection at 850 & 1300 nm at 1310 & 1550 nm	MMF 0.10 dB SMF 0.20 dB
Mated Ref to Non-Ref Connection at 850 & 1300 nm at 1310 & 1550 nm	MMF 0.30 dB SMF 0.50 dB
Non-Ref to Non-Ref at all wavelengths	MMF & SMF 0.75 dB
Splice at 850 & 1300 nm at 1310 & 1550 nm	0.30 dB
MMF All multimode fibres at 850 nm at 1300 nm	3.50 dB/km 1.50 dB/km
SMF at 1310 & 1550 nm OS1 OS2	1.00 dB/km 0.40 dB/km

Ref = Reference Connector

Non-Ref = Non-reference (embedded) Connector

### References

<sup>1</sup> AS/NZS ISO/IEC 14763.3: 2012

<sup>2</sup> AS/NZS ISO/IEC 14763.3 Clause 6.4

<sup>3</sup> AS/NZS ISO/IEC 14763.3 Appn Z22 Cl 5.3

<sup>4</sup> AS/NZS ISO/IEC 14763.3, Appn Z22 Cl 10.2.2

<sup>5</sup> AS/NZS ISO/IEC 14763.3 Appn Z22 Cl 10.2.2

<sup>6</sup> AS/NZS ISO/IEC 14763.3 Appn Z22 Cl 9.1.1.3