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**AMENDED FINAL REPORT FOR:**

**CUSTOMER NAME:** Schneider Electric India Pvt. Ltd.  
# 12A, Attibele Industrial Area  
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562107 Karnataka, India

**PRODUCT NAME:** LC-SC OM3 Fiber Channel


**Tested To:**

**ANSI/TIA-568.3-D-2016  
Optical Fiber Cabling and Components Standard  
October 2016**

**Annex E (Informative) Guidelines for Field-Testing Length, Loss & Polarity  
Of Optical Fiber Cabling, Section 5.1.3 Multimode.**

**Date: November 15, 2017  
Project: G103024699  
Report: 103024699LEX-001.3**

**Responsible Engineer:**  **Date:** 11/15/2017  
**Paul Alt, Senior Project Engineer**

**Approved By:**  **Date:** 11/15/2017  
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## TABLE OF CONTENTS

	<b>Page</b>
Declaration of Compliance .....	3
Sample Condition and Receive Date.....	3
1    ANSI/TIA 568.3-D-2016 Optical Fiber Cabling and Components Standard.....	3
1.1 Annex E (Informative) Guidelines for Field-Testing Length, Loss & Polarity of Optical Fiber Cabling, Section 5.1 Optical Cabling Attenuation.....	3
References.....	13

## LIST OF TABLES

	<b>Page</b>
Table 1: History of Revision .....	2
Table 2: Section 7.3.7 Channel Attenuation Allowance Calculation Component Values .....	3
Table 3: Part Numbers and Quantities.....	6
Table 4: Insertion Loss Forward Reading at 850 nm .....	9
Table 5: Insertion Loss Reverse Reading at 850 nm .....	10
Table 6: Insertion Loss Average Reading at 850 nm .....	11

## LIST OF FIGURES

	<b>Page</b>
Figure 1: Launch Lead Reference and Verification .....	6
Figure 2: Mated Jumper Test Leads Cable Reference and Verification Configuration .....	7
Figure 3: Link Channel Test Configuration .....	7
Figure 4: LC-SC OM3 Fiber Channel Test Setup.....	12

**Table 1: History of Revision**

Revision	Date	Section #	Description of Revision
Original	September 27, 2017	All	Original Document Issued
1	October 16, 2017	1.1.1.4 Test Configurations and Conditions, Table 3	Table was revised to change the product description for Item #6 from 48 fiber cable to 24 fiber cable.
2	November 6, 2017	1.1.1.4 Test Configurations and Conditions, Table 3	The following statement was added below Table 3: “*Digilink Fiber Cables are also available in different configurations and different fiber count.”
3	November 15, 2017	1.1.1.4 Test Configurations and Conditions, Table 3	The following statement was modified below Table 3: “*Actassi Fiber Cables are also available in different configurations and different fiber count.”

## Declaration of Compliance

The LC-SC OM3 Fiber Channel was evaluated and found to be **compliant** with all applicable criteria of ANSI/TIA-568.3-D Optical Fiber Cabling and Components Standard, October 2016, Annex E (Informative) Guidelines for Field-Testing Length, Loss & Polarity of Optical Fiber Cabling, Section 5.1.3 Multimode.

## Sample Condition and Receive Date

Schneider Electric India Pvt. Ltd. selected and provided the test samples for evaluation to the criteria of ANSI/TIA-568.3-D. The samples arrived on 9/8/2017 in used condition. The equipment tested was the 24 fiber Multimode LC-SC OM3 Fiber Channel link system.

## 1 ANSI/TIA 568.3-D-2016 Optical Fiber Cabling and Components Standard

### 1.1 Annex E (Informative) Guidelines for Field-Testing Length, Loss & Polarity of Optical Fiber Cabling, Section 5.1 Optical Cabling Attenuation

#### 1.1.1 Annex E Section 5.1.3 Multimode

##### 1.1.1.1 Conformance Criteria

The cable link system shall not exhibit a change greater than the value determined in Section 7.3.7 Channel attenuation allowance calculation. The calculation is as follows:

$$\text{Channel Attenuation Allowance (dB)} = \text{Cabled Fiber Attenuation Allowance (dB)} + \text{Connections Attenuation Allowance (dB)} + \text{Fiber Splices Attenuation Allowance (dB)} + \text{Optical Branching Components Attenuation Allowance (dB)}$$

The calculation was determined with the values noted in Table 2:

**Table 2: Section 7.3.7 Channel Attenuation Allowance Calculation Component Values**

Calculation Formula Requirement	Component of LC-SC OM3 Fiber Channel	Maximum dB Allowed	Calculation
Cabled Fiber Attenuation Allowance	0.452 km spool of cabled fiber	3.0 dB/km	1.36 dB
Fiber Splices Attenuation Allowance	2 fusion splices from spool to pigtail	0.3 dB per splice	0.6 dB
Connections Attenuation Allowance	0.5 dB per connection	1 dB	1 dB
Optical Branching Components Attenuation Allowance	NA	NA	NA
Total Maximum loss allowed per channel			2.96 dB

NA: Not Applicable

### 1.1.1.2 Sample Size

One LC-SC OM3 Fiber Channel was tested for compliance to ANSI/TIA 568.3-D-2016, Annex E, Section 5.1.3 Multimode.

### 1.1.1.3 Test Method

#### I. Test Methodology and Setup

1. The RIFOCS test system was setup and allowed to stabilize for one hour prior to testing.
2. One ST/LC 2.0 mm jacketed cable lead was connected to the RIFOCS 850 nm source.
3. One ST/SC 2.0 mm jacketed cable lead was connected to the RIFOCS detector.
4. Per ANSI/TIA-568.3-D, Section E, the following test method steps were established. All references from this test method to clause and sub-clause refer directly back to this standard and section for development of the procedures used.
5. The basic steps taken to measure and calculate singlemode cabling attenuation include:
  - a. Verifying test jumper quality (once before testing; see clause E.5.1.2)
  - b. Setting the reference (once before testing; see clause E.5.1.3.2)
  - c. Verifying the reference (once before testing; see clause E.5.1.3.3)
  - d. Measuring link attenuation (each link; see clause E.5.1.3.4)

#### II. Setting the Reference

1. The following procedure verified that test jumpers are in acceptable condition for multimode cabling. All jumper cables selected were verified to have the proper cord quality for test leads per ANSI/TIA-568.3-D, Section E, clause 5.1.2.
2. The first jumper (J1) having five non-overlapping wraps around an 18 mm (0.71 inch) mandrel was connected to the 850 nm source.
3. To verify that the test jumper was in acceptable condition, the light source was referenced to the optical power meter with the launch (see Figure 1).
4. The resulting measurements recorded as the initial, or P1, measurements.

#### III. Verifying the Reference

1. The first jumper (J1) having five non-overlapping wraps around an 18 mm (0.71 inch) mandrel was connected to the 850 nm source.
2. The test jumper (J1) was disconnected from the power meter (only) and a second test jumper (J2) was inserted by connecting it to (J1) with a mating adapter and then to the power meter to record the measurement (see Figure 2).
3. Both ends of J2 were disconnected. The ends were then interchanged, reconnected and the measurement was read again.
4. All resulting measurements were within the appropriate connector loss specification for reference quality test jumpers  $\leq 0.1$  dB.

#### IV. Measuring Cabling Attenuation

1. TIA-526-14, Annex A was used to test multimode cabling attenuation.
2. The LC-SC OM3 Fiber Channel was setup per the manufacturer's instructions. All connections were cleaned, mated and verified to be functional prior to the beginning of testing.
3. The reference measurements were established prior to each connection to verify there was no change or drift from the initial reference measurements.
4. The link measurement was then performed on the first channel by disconnecting this test jumper from the optical meter (only), placing a second jumper (J2) previously verified as reference quality on the optical meter, and then measuring the link attenuation by connecting the test jumper of the source to one end of the cabling link and the test jumper of the meter to the other end of the cabling link.
5. The resulting measurements recorded as the final, or P2, measurements in the forward direction.
6. Both ends of the cabling link were disconnected. The ends were then interchanged, reconnected and the measurement was read again.
7. The resulting measurements recorded as the final, or P2, measurements in the reverse direction.

#### V. Calculating Cabling Attenuation

1. The following formula is used to calculate the loss on each channel:
  - a. Initial measurements of launch lead (P1) minus Final measurements of individual link channel (P2) = Loss of link channel in dB.
2. The loss for each channel is calculated in the forward and reverse directions, as well as an averaging of these losses for complete channel loss calculations.
3. The loss for each channel, as well as the measurement direction the loss was calculated in, was reported individually in the **Test Results** section of this report.

**1.1.1.4 Test Configurations and Conditions**

The test was conducted at lab ambient atmospheric conditions;  $23 \pm 2^{\circ}\text{C}$ ,  $\sim 75\%$  RH.

Optical measurements were taken at  $850 \text{ nm} \pm 20 \text{ nm}$ .

The mandrel used was 18 mm (0.71 inch) for 2.0 mm jacketed launch lead.

The launch lead used was verified to be reference quality per the standard.

The test condition setup and referencing is demonstrated in Figure 1.

The cable reference and verification configuration is demonstrated in Figure 2.

The test measurement configuration is demonstrated in Figure 3.

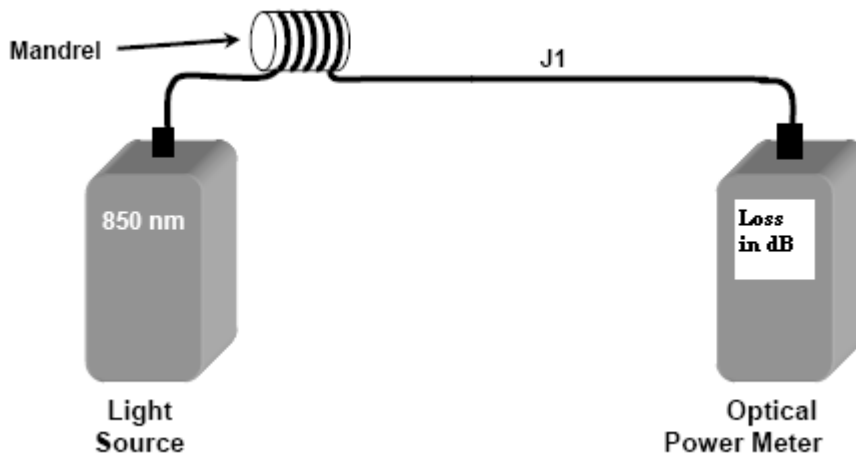
The customer’s equipment individual part identification numbers are listed in Table 3.

**Table 3: Part Numbers and Quantities**

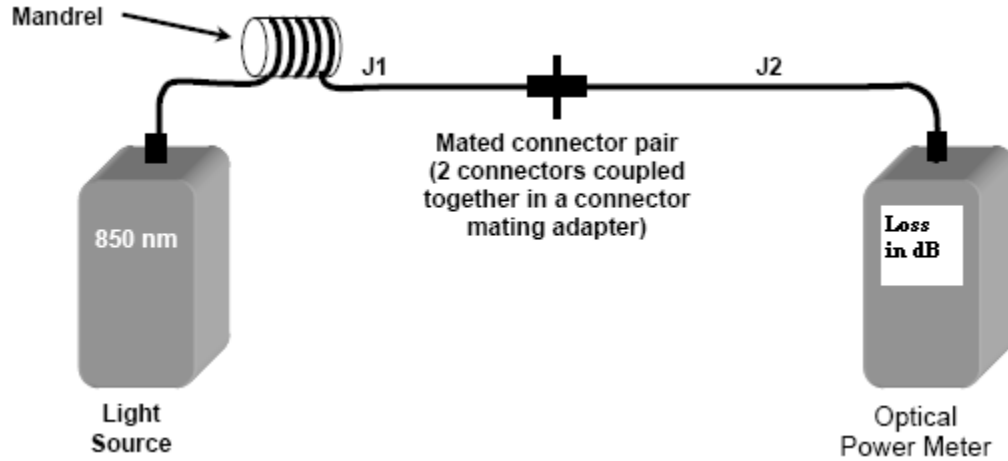
Item	Schneider Electric India Pvt. Ltd. Part Number	Description	Qty
1	ACTFMD1URS24_E	24 port LIU Blank	2
2	ACTFT1C1M35M10_E	SC Pigtail	24
3	ACTFMD1PSC6PMM_E	SC Adaptor Panel	4
4	ACTFT1L1M35M10_E	LC Pigtail	24
5	ACTFMD2PLC6PMM_E	LC Adaptor Panel	2
6	ACTUDGST24MM5T_E	24-FIBER, OM3, 0.452KM SPOOL, Armoured GST Fiber Cable	1

\*Actassi Fiber Cables are also available in different configurations and different fiber count.

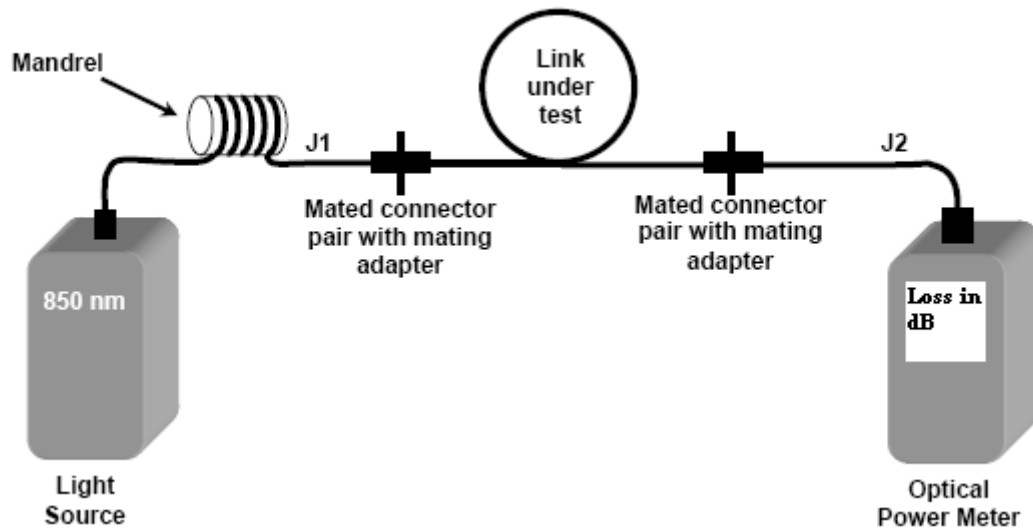
**Figure 1: Launch Lead Reference and Verification**



**Figure 2: Mated Jumper Test Leads Cable Reference and Verification Configuration**



**Figure 3: Link Channel Test Configuration**



**1.1.1.5 Test Equipment Used**

Link System Loss Testing					
Equipment Type	Manufacturer	Model Number	Local ID Number	Last Cal Date	Next Cal Date
Fiber Optic Cleaning Reels	CLETOP	Type A	NA	NA	NA
850 nm ( $\pm 20$ nm) LED Source	RIFOCS	655R	1999	NA	NA
InGaAs Power Meter	RIFOCS	675RE	1999	7/30/2017	7/30/2018
SuperController	RIFOCS	671	1999	7/30/2017	7/30/2018
Mandrel Size = 18 mm (0.71 inch)	Intertek	NA	NA	NA	NA
Optical Fiber Multi Mode OM3 2mm Jacketed Cable Test Leads (QTY 2)	NA	NA	NA	NA	NA

NA: Not Applicable

**1.1.1.6 Summary of Test Results****Conformance/Nonconformance**

Criteria	Conforms? C/NC
The cable link system shall not exhibit a change greater than the value determined in Section 7.3.7 Channel attenuation allowance calculation. For this evaluation, the criterion is 2.96 dB per individual fiber channel.	C

**Actual Sample Size and Test Method Deviations**

One LC-SC OM3 Fiber Channel was tested for compliance to this section. There were no deviations from, additions to, or exclusions from, the documented test method here.

**Failure History**

There was no history of failure for the testing in this section.

**Disposition of Nonconformance**

There was no failure for the testing in this section.



## Test Data

Table 4: Insertion Loss Forward Reading at 850 nm

Test Performed By:			Test Date		
Paul Alt			9/18/2017		
Test Channel	Test Configuration	Directional Reading	Max Value (dB)	Loss Criteria	Complies? Y/N
1	24 Channel MM (OM3)	Forward	-1.97	$\leq \pm 2.96$ dB	Y
2	24 Channel MM (OM3)	Forward	-1.87	$\leq \pm 2.96$ dB	Y
3	24 Channel MM (OM3)	Forward	-2.45	$\leq \pm 2.96$ dB	Y
4	24 Channel MM (OM3)	Forward	-1.71	$\leq \pm 2.96$ dB	Y
5	24 Channel MM (OM3)	Forward	-2.36	$\leq \pm 2.96$ dB	Y
6	24 Channel MM (OM3)	Forward	-2.00	$\leq \pm 2.96$ dB	Y
7	24 Channel MM (OM3)	Forward	-2.47	$\leq \pm 2.96$ dB	Y
8	24 Channel MM (OM3)	Forward	-1.99	$\leq \pm 2.96$ dB	Y
9	24 Channel MM (OM3)	Forward	-1.95	$\leq \pm 2.96$ dB	Y
10	24 Channel MM (OM3)	Forward	-1.88	$\leq \pm 2.96$ dB	Y
11	24 Channel MM (OM3)	Forward	-2.43	$\leq \pm 2.96$ dB	Y
12	24 Channel MM (OM3)	Forward	-2.06	$\leq \pm 2.96$ dB	Y
13	24 Channel MM (OM3)	Forward	-2.05	$\leq \pm 2.96$ dB	Y
14	24 Channel MM (OM3)	Forward	-1.97	$\leq \pm 2.96$ dB	Y
15	24 Channel MM (OM3)	Forward	-2.57	$\leq \pm 2.96$ dB	Y
16	24 Channel MM (OM3)	Forward	-1.79	$\leq \pm 2.96$ dB	Y
17	24 Channel MM (OM3)	Forward	-2.45	$\leq \pm 2.96$ dB	Y
18	24 Channel MM (OM3)	Forward	-2.10	$\leq \pm 2.96$ dB	Y
19	24 Channel MM (OM3)	Forward	-2.56	$\leq \pm 2.96$ dB	Y
20	24 Channel MM (OM3)	Forward	-2.11	$\leq \pm 2.96$ dB	Y
21	24 Channel MM (OM3)	Forward	-2.05	$\leq \pm 2.96$ dB	Y
22	24 Channel MM (OM3)	Forward	-1.99	$\leq \pm 2.96$ dB	Y
23	24 Channel MM (OM3)	Forward	-2.55	$\leq \pm 2.96$ dB	Y
24	24 Channel MM (OM3)	Forward	-2.15	$\leq \pm 2.96$ dB	Y

**Table 5: Insertion Loss Reverse Reading at 850 nm**

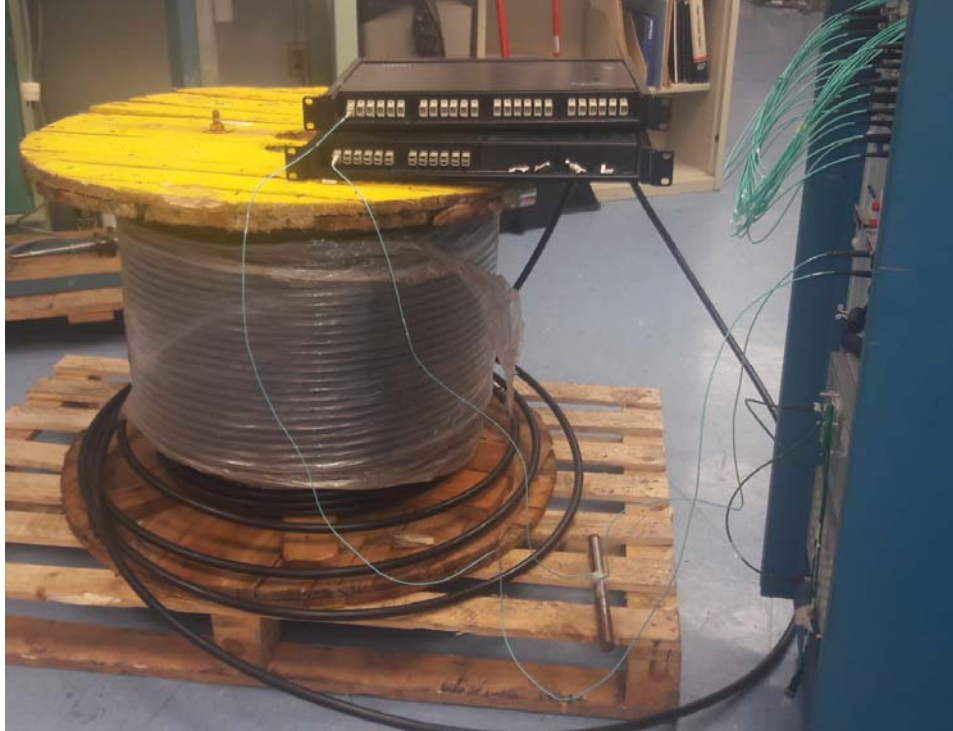
Test Performed By:			Test Date		
Paul Alt			9/18/2017		
Test Channel	Test Configuration	Directional Reading	Max Value (dB)	Loss Criteria	Complies? Y/N
1	24 Channel MM (OM3)	Reverse	-1.98	$\leq \pm 2.96$ dB	Y
2	24 Channel MM (OM3)	Reverse	-1.90	$\leq \pm 2.96$ dB	Y
3	24 Channel MM (OM3)	Reverse	-2.49	$\leq \pm 2.96$ dB	Y
4	24 Channel MM (OM3)	Reverse	-1.73	$\leq \pm 2.96$ dB	Y
5	24 Channel MM (OM3)	Reverse	-2.40	$\leq \pm 2.96$ dB	Y
6	24 Channel MM (OM3)	Reverse	-2.03	$\leq \pm 2.96$ dB	Y
7	24 Channel MM (OM3)	Reverse	-2.50	$\leq \pm 2.96$ dB	Y
8	24 Channel MM (OM3)	Reverse	-2.03	$\leq \pm 2.96$ dB	Y
9	24 Channel MM (OM3)	Reverse	-1.97	$\leq \pm 2.96$ dB	Y
10	24 Channel MM (OM3)	Reverse	-1.90	$\leq \pm 2.96$ dB	Y
11	24 Channel MM (OM3)	Reverse	-2.44	$\leq \pm 2.96$ dB	Y
12	24 Channel MM (OM3)	Reverse	-2.07	$\leq \pm 2.96$ dB	Y
13	24 Channel MM (OM3)	Reverse	-2.06	$\leq \pm 2.96$ dB	Y
14	24 Channel MM (OM3)	Reverse	-1.99	$\leq \pm 2.96$ dB	Y
15	24 Channel MM (OM3)	Reverse	-2.57	$\leq \pm 2.96$ dB	Y
16	24 Channel MM (OM3)	Reverse	-1.79	$\leq \pm 2.96$ dB	Y
17	24 Channel MM (OM3)	Reverse	-2.46	$\leq \pm 2.96$ dB	Y
18	24 Channel MM (OM3)	Reverse	-2.11	$\leq \pm 2.96$ dB	Y
19	24 Channel MM (OM3)	Reverse	-2.56	$\leq \pm 2.96$ dB	Y
20	24 Channel MM (OM3)	Reverse	-2.11	$\leq \pm 2.96$ dB	Y
21	24 Channel MM (OM3)	Reverse	-2.06	$\leq \pm 2.96$ dB	Y
22	24 Channel MM (OM3)	Reverse	-2.01	$\leq \pm 2.96$ dB	Y
23	24 Channel MM (OM3)	Reverse	-2.54	$\leq \pm 2.96$ dB	Y
24	24 Channel MM (OM3)	Reverse	-2.16	$\leq \pm 2.96$ dB	Y

Table 6: Insertion Loss Average Reading at 850 nm

Test Performed By:			Test Date		
Paul Alt			9/18/2017		
Test Channel	Test Configuration	Directional Reading	Max Value (dB)	Loss Criteria	Complies? Y/N
1	24 Channel MM (OM3)	Average	-1.98	$\leq \pm 2.96$ dB	Y
2	24 Channel MM (OM3)	Average	-1.89	$\leq \pm 2.96$ dB	Y
3	24 Channel MM (OM3)	Average	-2.47	$\leq \pm 2.96$ dB	Y
4	24 Channel MM (OM3)	Average	-1.72	$\leq \pm 2.96$ dB	Y
5	24 Channel MM (OM3)	Average	-2.38	$\leq \pm 2.96$ dB	Y
6	24 Channel MM (OM3)	Average	-2.02	$\leq \pm 2.96$ dB	Y
7	24 Channel MM (OM3)	Average	-2.49	$\leq \pm 2.96$ dB	Y
8	24 Channel MM (OM3)	Average	-2.01	$\leq \pm 2.96$ dB	Y
9	24 Channel MM (OM3)	Average	-1.96	$\leq \pm 2.96$ dB	Y
10	24 Channel MM (OM3)	Average	-1.89	$\leq \pm 2.96$ dB	Y
11	24 Channel MM (OM3)	Average	-2.44	$\leq \pm 2.96$ dB	Y
12	24 Channel MM (OM3)	Average	-2.07	$\leq \pm 2.96$ dB	Y
13	24 Channel MM (OM3)	Average	-2.06	$\leq \pm 2.96$ dB	Y
14	24 Channel MM (OM3)	Average	-1.98	$\leq \pm 2.96$ dB	Y
15	24 Channel MM (OM3)	Average	-2.57	$\leq \pm 2.96$ dB	Y
16	24 Channel MM (OM3)	Average	-1.79	$\leq \pm 2.96$ dB	Y
17	24 Channel MM (OM3)	Average	-2.46	$\leq \pm 2.96$ dB	Y
18	24 Channel MM (OM3)	Average	-2.11	$\leq \pm 2.96$ dB	Y
19	24 Channel MM (OM3)	Average	-2.56	$\leq \pm 2.96$ dB	Y
20	24 Channel MM (OM3)	Average	-2.11	$\leq \pm 2.96$ dB	Y
21	24 Channel MM (OM3)	Average	-2.06	$\leq \pm 2.96$ dB	Y
22	24 Channel MM (OM3)	Average	-2.00	$\leq \pm 2.96$ dB	Y
23	24 Channel MM (OM3)	Average	-2.55	$\leq \pm 2.96$ dB	Y
24	24 Channel MM (OM3)	Average	-2.16	$\leq \pm 2.96$ dB	Y

**Photograph:**

**Figure 4: LC-SC OM3 Fiber Channel Test Setup**



**References****External Reference Documents**

- ANSI Z136.2 ANS For Safe Use Of Optical Fiber Communication Systems Utilizing Laser Diode And LED Sources
- ANSI/TIA-526-14, Revision C, April 1, 2015: Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant; Modification of IEC 61280-4-1 edition 2, Fiber-Optic Communications Subsystem Test Procedures- Part 4-1: Installed Cable Plant-Multimode Attenuation Measurement
- ANSI/TIA-568.0-D-2015 Generic Telecommunications Cabling for Customer Premises
- ANSI/TIA-568.3-D-2016 optical Fiber Cabling and Components Standard
- IEC 61918-2007, Industrial Communication Networks - Installation of Communication Networks in Industrial Premises
- TIA-492AAAC, Detail Specification For 850-nm Laser-optimized, 50- $\mu\text{m}$  Core Diameter/125- $\mu\text{m}$  Cladding Diameter Class IA Graded-Index Multimode Optical Fibers
- TIA TSB-31-C, Telephone Terminal Equipment Rationale and Measurement Guidelines for US Network Protection 51

**Intertek Documents**

- LEX-OE-FIB-179, Fiber Training Program Description
- LEX-OE-FIB-178, General Fiber Safety Policy
- LEX-OE-FIB-185, Fiber Optic Handling Safety Rules and Practices for Optical Fiber Components and Systems Procedures
- LEX-OE-FIB-037, Fiber Optic Insertion Loss and Reflectance Measurements