सत्यमेव जयते

अनंतिम टेस्ट गाइड

टीईसी 72011:2021

(सं: टीईसी/टीएसटीपी/टीएक्स/ओपीटी-001/01/जनवरी-13 को अधिक्रमित करता है)

PROVISIONAL TEST GUIDE

TEC 72011:2021

(Supersedes No. TEC/TSTP/TX/OPT-001/01/JAN-13)

for

ऑप्टिकल एक्सैस टेक्नालजी के लिए ऑप्टिकल स्प्लिटर और डबल्यूडीएम कप्लर

(मानक सं:टीईसी 72010:2021)

OPTICAL SPLITTER AND WDM COUPLER FOR OPTICAL ACCESS TECHNOLOGY

(STANDARD No.: TEC 72010:2021)

ISO 9001:2015

दूरसंचार अभियांत्रिकी केंद्र

खुर्शीदलाल भवन, जनपथ, नई दिल्ली-110001, भारत

TELECOMMUNICATION ENGINEERING CENTRE

KHURSHID LAL BHAWAN, JANPATH, NEW DELHI–110001, INDIA

www.tec.gov.in

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FOREWORD

Telecommunication Engineering Centre (TEC) is the technical arm of Department of Telecommunications (DOT), Government of India. Its activities include:

- Framing of TEC Standards for Generic Requirements for a Product/Equipment, Standards for Interface Requirements for a Product/Equipment, Standards for Service Requirements & Standard document of TEC for Telecom Products and Services
- Formulation of Essential Requirements (ERs) under Mandatory Testing and Certification of Telecom Equipment (MTCTE)
- Field evaluation of Telecom Products and Systems
- Designation of Conformity Assessment Bodies (CABs)/Testing facilities
- Testing & Certification of Telecom products
- Adoption of Standards
- Support to DoT on technical/technology issues

For the purpose of testing, four Regional Telecom Engineering Centers (RTECs) have been established which are located at New Delhi, Bangalore, Mumbai, and Kolkata.

ABSTRACT

This Test Guide enumerates detailed test schedule and procedure for evaluating conformance / functionality / requirements / performance of TEC standard on 'Optical Splitter and WDM Coupler for Optical Access Technology' Number TEC 72010:2021.

CONTENTS

A. HISTORY SHEET

Sl. No.	***Standard / document No.***	***Title***	***Remarks***
1.	TEC/TSTP/TX/OPT-001/01/JAN-13	TSTP for optical splitter for Passive Optical Network (PON) Technology	Release 1
2.	TEC 72011:2020	Provisional Test Guide for Optical Splitter And WDM Coupler for Optical Access Technology	Release 2

B. INTRODUCTION

This document enumerates detailed test schedule and procedure for evaluating conformance / functionality / requirements / performance of TEC standard 'Optical Splitter and WDM Coupler for Optical Access Technology' number TEC 72010:2021.

Note: Though every care has been taken to cover all the parameters of the standard for product/equipment correctly in this Test guide, yet to avoid any inadvertent error/ misprint, the testing officer shall ensure that all the parameters of the standard for product/equipment have been tested & verified in accordance with the provisions of the standard for product/equipment.

C. GENERAL INFORMATION:

Sn.	General Information	Details *(to be filled by testing team)*	
1	Name and Address of the Applicant		
2	Date of Registration		
3	Name and No. of TEC Standard against which the approval sought	Optical Splitter and WDM Coupler for Optical Access Technology	TEC 72010:2021
4	Details of Equipment		
	Type of Equipment	Model No.	Serial No.
(i)			
(ii)			
5	Any other relevant Information:-		

D. TESTING TEAM: *(to be filled by testing team)*

S. no	Name	Designation	Organization	Signature
1.				
2.				

E. LIST OF THE TEST INSTRUMENTS:

S.no.	Name of the test instrument	Make /Model *(to be filled by testing team)*	Validity of calibration *(to be filled by testing team)*
1	PDL (Polarisation Dependent Loss) Meter – 1 No along with its RS232 cable connected to testing PC. PC should be connected to Printer.		Dd/mm/yyy
2	Optical Spectrum Analyzer		
3	PON Power meter		
4	Any other Test instrument which measures with the following parameters, with Valid Calibration Certificate, is also acceptable. 1. Insertion Loss 2. Maximum (dB)(CR) 3. Uniformity Maximum (db)		

	4. PDL (dB) 5. Operating Wave Length 6. Return Loss		
5	Internet Service in the same PC to fetch the Splitter Module's database		
6	Splitter Assembly and Testing Software installed in a Personal Computer		
7	Splitter Assembly Administration software installed in the same Personal Computer		
8	FC/APC cable – 1 No		
9	SC/PC Adapter – 1 No		
10	SC/UPC to FC/APC cable – 2 Nos		
11	IsoPropyl Alcohol solution		
12	Tissue Paper		

F. EQUIPMENT CONFIGURATION OFFERED: *(to be filled by testing team)*

(a) <Equipment/product name> Configuration:

S.No.	Item	Details	Remarks

Relevant information like No. of cards, ports, slots, interfaces, size etc. may be filled as applicable for the product

(b) <OTHER EQUIPMENT NAME> CONFIGURATION:

S.No.	Item	Details	Remarks

Relevant information like No. of cards, ports, slots, interfaces, size etc. may be filled as applicable for the product

G. EQUIPMENT/SYSTEM MANUALS: *(to be filled by testing team)*

Availability of Maintenance manuals, Installation manual, Repair manual & User Manual etc. **(Y/N)**

H. CLAUSE-WISE TEST TYPE AND TEST NO.:

Clause No.	***Clause***	***Type of Test / Test No. etc.*** *(Physical Check/Declaration/Documentation/ Report from Accredited test lab/ Functional verification / Information / Test No.)*
1.0	**INTRODUCTION:**	Information
1.1	**Optical Splitter:** Optical Splitter is one of the passive components of PON Technology. It may be installed in the Central Office/Remote Office/Cabinet/MDU/MTU/FDMS-OD/OJC etc. Optical splitters are capable of providing m: N splits where m = 1 or 2 and N = 2, 4, 8, 16, 32, 64, 128 and 256. The user may use a combination of these split options.	Information
1.2	**WDM device:** A wavelength selective branching device (used in WDM transmission systems) in which optical signals can be transferred between two predetermined ports, depending on the wavelength of the signal (clause 6.51 in [IEC/TR 61931]). Both wavelength multiplexers (MUXs) and wavelength demultiplexers (DMUXs) are generally called 'WDM devices' since often the same device can be used to multiplex and demultiplex channels	Information

	Use of WDM devices is shown in figure-2 and figure-3 along with splitter. WDM can also be used in place of splitter for point to multipoint architecture. WDM is a must requirement for co-existence of different wavelength on same optical fibre (ODN). Figures 2 and 3 are reference diagrams of optical access network (OAN) architectures and assume that wavelength blocking filters (WBF) are used when G-PON, video and NGA share the same ODN	
2.0	**Physical Requirement:**	Information
2.1	The WDM coupler may be mounted in 19" rack when installed in Central office and mounted in box when installed on pole/wall etc.	Type (Rack/pole/ wall) offered should be reflected in the Type Approval Certificate.
2.2	The Optical Splitter may be characterize by place of installation/environment and form. The Optical splitter may be mounted in 19" rack when installed in Central office and mounted in box when installed on pole/wall etc.	Types/chara cterization offered should be reflected in the Type Approval Certificate.
2.2.1	The detailed characterization of Optical Splitter is given below: a) **Type 1- Bare splitter** shall be offered in following category: **i. Bare splitter with 250µm Fiber in input and output** This type of splitter shall be mounted in a Joint Closure/Outdoor FDMS OR Box where inputs and output needs to be directly spliced to the fibers of the cable. ii. **Bare splitter with 250µm Fiber/Ribbon in input and 4F/6F/ 8F/12F Ribbon output** This type of splitter shall be mounted in a Joint	Functional verification/ Report from Accredited test lab

	Closure/Outdoor FDMS OR Box where inputs and output needs to be directly spliced to the fibers of the cable with 4F/6F/8F/12F ribbon. iii. **Bare splitter with 900µm Fiber in input and output** This type of splitter shall be mounted in a Joint Closure/Outdoor FDMS OR Box where inputs and output needs to be directly spliced to the fibers of the cable. This type may also find use in indoor applications such as Type-I FDMS where-in 900µm will be more rigid in routing. iv. **Bare splitter with 900µm Fiber in input and output** The input and outputs are connectrised with SC / LC type with APC / UPC endface. This type of splitter shall be mounted in a box where inputs and output needs to be patched to connectorised input / output of fibers using suitable adapters. b) **Type 2: Rack mounted splitter**: These shall be mounted on a rack which has 19" / ETSI mounting frames. The unit shall be supplied with suitable Mounting brackets movable or fixed (as desire by the user). In general, unit may have following dimensions; (i) mx2 / mx4 / mx16 shall be supplied in 1U, (ii) mx32 in 2U and (iii) mx64 shall be supplied in 3U where m is number of inputs. However exact requirement of “dimension” shall be specified by the user. The Input and output shall be terminated with suitable connectors for connecting to the adapters in the front panel. The front panel should have adapters mounted. The maximum depth of the unit shall not exceed 280mm. The adapters shall be clearly numbered and inputs and outputs be clearly identified. The type of splitter premounted in the unit shall be as described in 2.2.1.a. c) **Type 3: Box mounted Splitter**: The splitters shall be pre mounted in a box. The Box mounted Splitter shall be able to be installed on wall / Pole. The	

	splitter box is expected to be deployed in any of the IC, IN, OA, OG environments. The box body can be of metal or of plastic. In case of metal, it shall be made out of 0.75 mm thick MS sheet with powder coating (minimum 70-100 microns). In case of plastic, it shall be made of ABS and have UV resistance. The unit shall have the following features: i. Shall be able to accommodate splitters as described in 2.2.1. a. ii. The box shall have proper inside arrangement for fixing the s plitter module and patching Connectors & Adapters. iii. Adequate arrangement for incoming and outgoing optical fibr es/ patch cord/ pig tail shall be made inside the box. iv. Box shall have a mid span cable port which can accommodat e mid span cables. v. All incoming & outgoing holes/ports shall be covered by good quality rubber grommet. vi. The wall/pole mounting fixing/sliding arrangement shall be pr ovided in the box. vii. The box shall have front cover and shall be provided with gas ket for sealing and should be tightly screwed for proper lockin g arrangement. viii. For indoor applications (IC or IN), the minimum recommende d protection level against ingress of objects is IP 40. For box above or at ground level (OA and OG), the minimum recomme nded protection level against ingress of objects and water is I P 55 according to IS/IEC 60529. ix. The box shall be qualified as per the test procedures mention ed in clause 4 of TEC 87030:2010 (Old No. TEC / GR/ TX/FT B-02/02/APR-2010). x. In general, box may have following mountings, however exact requirement of “number of splitters, number of splice sleeve mounting capacity, splice position for mid-span cable splice,	

	number of SC type adopters, dimension of mid-span cable, and number, diameter and shape of drop cable" shall be specified by the user: x.1 Box may accommodate mx2 / mx4 / mx8 / mx16. x.2 It may have up to 24 no's of splice sleeve mounting capacity. x.3 Splice provision on base of box may be provided for mid-span cable splice. x.4 It may have up to 4/6/10/18 nos of SC type adapter holding capability. x.5 It may have a mid-span cable port which can accommodate a mid-span cable of 6~15mm in diameter. x.6 The box may have number of drop cable port equal or greater than the number of splitter output. x.7 Box may accommodate drop cable of 3~8mm in diameter. x.8 The drop cable can be of flat or round shape.	
2.3	**Splitter Module:**	
2.3.1	Configuration of the GPON-Splitter should be supplied as below: i) 1:2 PON-Splitter ii) 1:4 PON-Splitter iii) 1:8 PON-Splitter iv) 1:16 PON-Splitter v) 1:32 PON-Splitter vi) 1:64 PON-Splitter vii) 1:128 PON-Splitter viii) 1:256 PON- Splitter ix) 2:2 PON-Splitter x) 2:4 PON-Splitter xi) 2:8 PON-Splitter xii) 2:16 PON-Splitter xiii) 2:32 PON-Splitter xiv) 2:64 PON-Splitter xv) 2:128 PON-Splitter xvi) 2:256 PON- Splitter	Functional verification Type of splitter offered is to be reflected in the **Type Approval Certificate.**
2.4	**WDM coupler Configuration requirements**	Functional

	The WDM, WDM1, WDM1r, CEx and CEMx devices can have several different configurations depending on whether a video overlay service or an optical time-domain reflectometer (OTDR) is provided. This standard also presents various methods for the coexistence of multiple PON generations on a common ODN, which allow the reuse of already deployed fibre and splitters when evolving an operator's network to a higher capacity	verification Type of coupler configuration offered is to be reflected in the **Type Approval Certificate.**
3.0	**Specifications**	
3.1	**Optical splitter specifications:** Passive optical splitter bank must include 1xN, 2xN (with 1 & 2 representing number of input ports and 'N' several output ports). The fibre types used in the manufacturing of Passive Optical Splitter, connectors shall be compliant with ITU-T Rec. G.652/G.657A and ITU-T Rec. L.404/L36. The overall permissible maximum insertion loss (dB) for a splitter is given in tables below.	Test No 1
3.2	**Specifications of WDM coupler based on the applications and requirements** **Case1: WDM Coupler with GPON and RF video** The first case is defined by WDM Coupler is used to combine the downstream video wavelength of 1550nm. Multiple dedicated wavelengths may be used, as per the ITU-T Rec. G.984.x, for various applications e.g. voice, video, internet, data etc., and enabling combined optical transmission through a single fiber. For example, two dedicated wavelengths may be used for downstream and upstream (~1490nm & 1310nm respectively) for data and voice transport and other one (~1550nm) may be used for downstream video. **Case2: WDM Coupler with GPON and OTDR** This case is defined by WDM Coupler is combining GPON band	Test No 2

	with OTDR. For GPON, two dedicated wavelengths may be used for downstream and upstream (~1490nm & 1310nm respectively) for data and voice transport. The wavelength range 1615-1660 nm may be used for OTDR signal. **Case3: WDM1r Coupler with GPON, XGPON, OTDR and Video** This case is defined by GPON network coexisting XGPON along with video and OTDR. The wavelength range assumed for the OTDR is referred from [ITU-T L.66]. Figure 3 shows the reference diagram of this filter. **Case4: WDM1r Coupler (CEx) with GPON, XG-PON, OTDR andNGPON2** This case is defined by GPON coexisting with NGPON2, XGS-PON and OTDR Assumptions for this scenario are listed below Total tolerated penalty (caused by finite isolation and directivity) = 0.5 dB i. ODN maximum differential loss = 15 dB ii. ODN Class = C+ iii. Number of NG-PON2 channels = 8 TWDM + 8 PTP WDM iv. No isolation is assumed to be provided by the NG-PON2 WM v. NG-PON2 OPP values corresponding to the 8 ch, 20 km case vi. OTDR equipment is assumed to include an input filtering device providing 30 dB of isolation OTDR pulse power = +23 dBm, ER=10 dB, Rate = 100 Mbit/s **Case5: WDM1r Coupler (CE) with GPON, XGS-PON, NGPON2 and PtP WDM** This case is defined by GPON coexisting with NGPON2, XGS-PON and PtP WDM **Case 6: WDM Coupler for NGPON2** WDM for NG-PON2 wavelengths.	
3.3	**Connectors & Adapters**: The SC/UPC, SC/APC, LC/UPC or	Verification

	LC/APC connectors and adapters shall be used in the system. The following optical specifications must be met under any combination of environmental, mechanical and polarization conditions:	List of connectors offered should be reflected in the Type Approval certificate.
	PART-II	
4.0	**General Requirement**	*Declaration/ Documentation/* Information
4.1	Optical Splitter/WDM coupler shall be manufactured as per the latest state-of-art technology	
4.2	It shall be compact in design and its construction shall be inherently robust and rigid for all conditions of operation adjustment, replacement, storage and transport.	
4.3	The equipment shall be composite in construction and light weight. The manufacturers shall furnish the actual dimensions and weight of the equipment.	
4.4	All the connectors shall be reliable and of standard type to ensure failure free operation over long periods and under specified environmental conditions.	
4.5	All the connectors and the cable shall be of low loss type and suitably shielded	
4.6	Optical Splitter /WDM coupler for PON Technology shall be protected against the entry of dust and insect.	
4.7	It shall be able to work without any degradation in saline atmosphere in coastal areas and should be protected against corrosion.	
4.8	It shall be accessible for operation, testing and easy handling from front side.	
4.9	The thickness of powder coating shall be 70-100 microns minimum in case of metal enclosure.	
5.0	**Operational Requirement**	*Declaration/*

<table>
<tr><td>5.1</td><td>System for Optical Splitter/WDM coupler shall be able to accommodate module, incoming and outgoing cables/Patch Cords (PC)/Pig Tails (PT) in a systematic manner.</td><td rowspan="7">Documentation/ Information</td></tr>
<tr><td>5.2</td><td>It shall have sufficient provision for storing the extra length of Optical Fibre/Patch Cords/Pig Tails.</td></tr>
<tr><td>5.3</td><td>It shall allow an easy opening and closing without any degradation in the performance of Patch Cords/Pig tail.</td></tr>
<tr><td>5.4</td><td>Identification mechanism of incoming (1XN or 2XN) and outgoing (1,2…N) cables/ Patch Cords/Pig Tails shall be provided.</td></tr>
<tr><td>5.5</td><td>Suitable cap shall be provided for all connectors to avoid entry of dust for unused connectors</td></tr>
<tr><td>5.6</td><td>Marking for port numbering for Optical Splitter/WDM coupler shall be provided.</td></tr>
<tr><td>5.7</td><td>Marking shall be provided on the body of WDM coupler for input and output port as well as on the adapter panel. Marking for indication of line side or customer side should also be provided on the adapter panel.</td></tr>
<tr><td>6.0.</td><td>Quality Requirements</td><td></td></tr>
<tr><td>6.1</td><td>It shall be manufactured in accordance with the international quality standards ISO 9001:2015 series of standards for which the manufacturer shall be duly accredited.</td><td>Declaration</td></tr>
<tr><td>6.2</td><td>The product shall conform to the requirements for environment as specified in the latest TEC GR SD: QM-333 - “Standard for Environmental Testing of Telecommunication Equipment”. The applicable tests shall be conducted for respective environmental categories as follows:

<table>
<tr><th colspan="2"><u>1xN & 2xN symmetrical splitters</u></th></tr>
<tr><td>At Cabinet/Pole (Outdoor):</td><td>QM-333 ‘D’ category.</td></tr>
<tr><td>At MDU/MTU/ Central Office (Indoor):</td><td>QM-333 ‘B2’ category</td></tr>
</table>

<table>
<tr><th><u>WDM Coupler</u></th></tr>
</table>
</td><td>Report from Accredited test lab</td></tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><td>At Cabinet/Pole (Outdoor):</td><td>QM-333 ‘D’ category.</td></tr>
<tr><td>At MDU/MTU/ Central Office (Indoor):</td><td>QM-333 ‘B2’ category</td></tr>
</table>

<table>
<tr><th colspan="2"><u>Connectors</u></th></tr>
<tr><td>At Cabinet/Pole (Outdoor):</td><td>QM-333 ‘D’ category.</td></tr>
<tr><td>At MDU/MTU/ Central Office (Indoor):</td><td>QM-333 ‘B2’ category</td></tr>
</table>

Note: The Environmental category of product will be based on declaration of intended use by manufacturer.
</td><td></td></tr>
<tr><td>7.0</td><td>Marking: Marking should be provided on the box of the splitter indicating the following information by the method of screen printing or other suitable method.
i. Logo/ Name of the Service Provider :
ii. Type of PON Splitter with capacity & Model No.:
iii. Type of WDM coupler with wavelength & Model No.:
iv. Serial No.:
v. Batch No. & Date/Year of Production:
vi. Name of the Manufacturer:</td><td>Physical Check</td></tr>
<tr><td>8.0</td><td>Type Approval: Type approval may be taken for either of optical splitters or WDM coupler against this standard.</td><td>Information</td></tr>
</table>

I. TEST SETUP & PROCEDURES:

Test Number: 1

Test Set Up for Optical Splitter

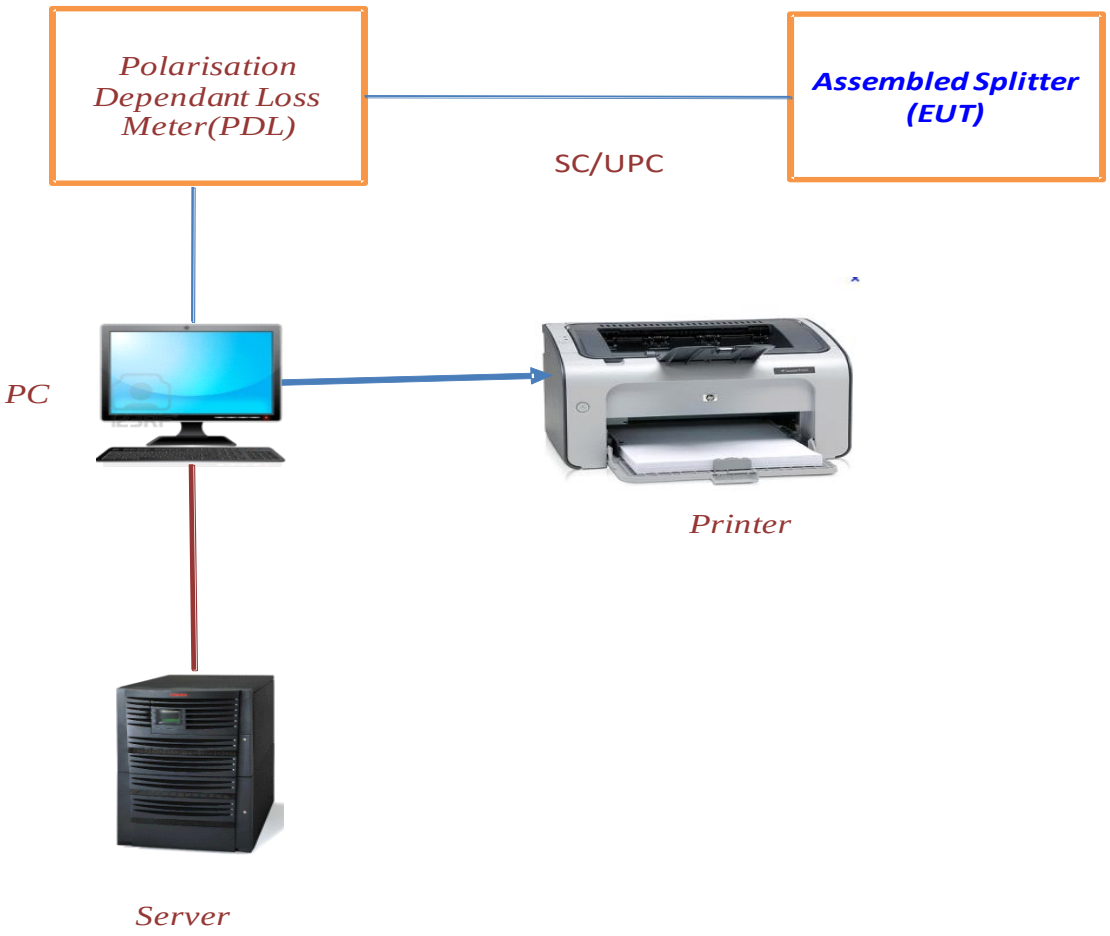


Figure 1: Test Setup

Testing of 1xN, 2xN PON Splitter (with 1 & 2 representing number of input ports and 'N' several output ports)

Test Case ID	
Description	Test the Assembled 1XN, 2XN PON Splitter module
Test Setup	Refer Figure.1
Pre-requisite	Refer section E : list of test instrument.

Procedure	1. Launch the Program "Splitter Assembly and Testing". 2. Ensure the "Part #" is 1XN, 2XN splitter as per requirement. 3 Enter the assembly's serial number by scanning the barcode or typing in the part number and press "Enter" key 4. Enter the module's serial number by scanning the barcode or typing in the part number and press "Enter" key 5. Click the "Test" button or press any key if the "Test" button is highlighted yellow to start the testing. 6. Proceed the testing as per the instructions given in the program and select "Next" till completion of all the ports. 7. If any error occurs do the trouble shooting and select Retry 8. Check whether all measurements are completed and the result is displayed. If some parameter fails, the cell is displayed in red on blue background. Click "Accept" to save and upload the data or "Reject" to discard it. 9. If the "Print datasheet" box is checked, a datasheet will be generated and printed if upload is successful.
Results	1. Tested values should meet the standards/specifications. 2. Testing should be completed without error and data sheet should be printed.

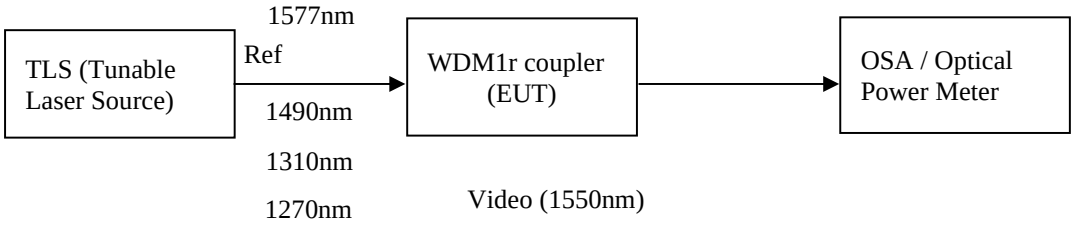
Requirement: Measure all the Parameters in the Table -1 and Table 2 of the Specification mentioned in standard (No.TEC 72010:2020). List of Testing insturments used with Calibration Certifícate also to be recorded.

Remarks: Record the readings and certify whether it meets the specification or not.

Test Number: 2

Test Set Up for WDM1r Coupler

To allow co-existence of G-PON, XG-PON, XGS-PON and NG-PON2, multiple dedicated wavelengths may be used, as per ITU-T Recs. G.984.5, G.987.x, G.9807.1, G989.x for various applications and enabling combined optical transport through a single fibre.



1596- 1603nm (NG-PON2 DS Wavelength)
1524-1544nm (NG-PON2 US Wavelength)

Insertion loss for 1577nm (OLT to ONT/ONU direction)

Individual Port Insertion Loss(WDM coupler)								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference (dBm)								
Actual reading								
Insertion Loss								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference								
Actual reading								
Insertion Loss								

Insertion loss for 1490nm (OLT to ONT/ONU direction)

Individual Port Insertion Loss(WDM coupler)								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference (dBm)								
Actual reading								
Insertion Loss								

Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference								
Actual reading								
Insertion Loss								

Insertion loss for 1550nm (OLT to ONT/ONU direction)

Individual Port Insertion Loss(WDM coupler)								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference (dBm)								
Actual reading								
Insertion Loss								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference (dBm)								
Actual reading								
Insertion Loss								

Insertion loss for 1310nm (ONT/ONU to OLT direction)

Individual Port Insertion Loss(WDM coupler))								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference (dBm)								
Actual reading								
Insertion Loss								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference (dBm)								
Actual reading								
Insertion Loss								

Insertion loss for 1270nm (ONT/ONU to OLT direction)

Individual Port Insertion Loss(WDM coupler))

Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference (dBm)								
Actual reading								
Insertion Loss								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference (dBm)								
Actual reading								
Insertion Loss								

Insertion loss for 1524-1544 nm (ONT to OLT direction)

Individual Port Insertion Loss(WDM coupler))								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference (dBm)								
Actual reading								
Insertion Loss								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference (dBm)								
Actual reading								
Insertion Loss								

Insertion loss for 1596-1603 nm (OLT to ONT direction)

Individual Port Insertion Loss(WDM coupler))								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference (dBm)								
Actual reading								
Insertion Loss								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference (dBm)								
Actual reading								
Insertion Loss								

Optical Return Loss: - ORL For an optical network, as a system, ORL is a measure of the total reflected signal relative to the signal being transmitted into the network (the incident signal).ORL includes all components, end to end, such as fiber, connectors, splices etc. in the link. ORL is expressed as a positive value and the larger the value, the better the performance. For example, 60 dB means the total signal reflected back is 60 dB below the incident being transmitted into the network

Return loss for 1577nm (OLT to ONT/ONU direction)

Individual Port Return Loss(WDM coupler)								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference(dBm)								
Actual reading								
Return Loss								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference(dBm)								
Actual reading								
Return Loss								

Return loss for 1490nm (OLT to ONT/ONU direction)

Individual Port Return Loss(WDM coupler)								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference(dBm)								
Actual reading								
Return Loss								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference(dBm)								
Actual reading								
Return Loss								

Return loss for 1550nm (OLT to ONT/ONU direction)

Individual Port Return Loss(WDM coupler)

Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference(dBm)								
Actual reading								
Return Loss								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference(dBm)								
Actual reading								
Return Loss								

Return loss for 1310nm (ONT/ONU to OLT direction)

Individual Port Return Loss(WDM coupler)								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference(dBm)								
Actual reading								
Return Loss								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference(dBm)								
Actual reading								
Return Loss								

Return loss for 1270nm (ONT/ONU to OLT direction)

Individual Port Return Loss(WDM coupler)								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference(dBm)								
Actual reading								
Return Loss								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference(dBm)								
Actual reading								
Return Loss								

Return loss for 1596-1603 nm (OLT to ONT/ONU direction)

Individual Port Return Loss(WDM coupler)								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference(dBm)								
Actual reading								
Return Loss								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference(dBm)								
Actual reading								
Return Loss								

Return loss for 1524-1544 nm (ONT/ONU to OLT direction)

Individual Port Return Loss(WDM coupler)								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference(dBm)								
Actual reading								
Return Loss								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference(dBm)								
Actual reading								
Return Loss								

Directivity: -

Directivity is the ratio of the optical power launched into an input port to the optical power returning to any other input port. Directivity has been referred to as near-end isolation or near-end crosstalk. Directivity should be > 55dB.

Directivity for 1270nm (ONT/ONU to OLT direction)

Individual Port Directivity (WDM coupler)								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference i/p								
Actual reading at adjacent port								
Directivity								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference i/p								
Actual reading at adjacent port								
Directivity								

Directivity for 1310nm (ONT/ONU to OLT direction)

Individual Port Directivity (WDM coupler)								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference i/p								
Actual reading at adjacent port								
Directivity								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference i/p								
Actual reading at adjacent port								
Directivity								

Directivity for 1490nm (OLT to ONT/ONU direction)

Individual Port Directivity (WDM coupler)								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference i/p								
Actual reading at adjacent port								

Directivity								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference i/p								
Actual reading at adjacent port								
Directivity								

Directivity for 1577nm (OLT to ONT/ONU direction)

Individual Port Directivity (WDM coupler)								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference i/p								
Actual reading at adjacent port								
Directivity								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference i/p								
Actual reading at adjacent port								
Directivity								

Directivity for 1550nm (OLT to ONT/ONU direction)

Individual Port Directivity (WDM coupler)								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference i/p								
Actual reading at adjacent port								
Directivity								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference i/p								
Actual reading at adjacent port								
Directivity								

Directivity for 1596-1603 nm (OLT to ONT/ONU direction)

Individual Port Directivity (WDM coupler)								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference i/p								
Actual reading at adjacent port								
Directivity								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference i/p								
Actual reading at adjacent port								
Directivity								

Directivity for 1524-1544 nm (ONT to OLT direction)

Individual Port Directivity (WDM coupler)								
Measurement	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Reference i/p								
Actual reading at adjacent port								
Directivity								
Measurement	Port 9	Port 10	Port 11	Port 12	Port 13	Port 14	Port 15	Port 16
Reference i/p								
Actual reading at adjacent port								
Directivity								

J. SUMMARY OF TEST RESULTS

TEC Standard No._____

TEC Test Guide No._____

Equipment name & Model No._____

Clause No.	***Compliance*** *(Complied /Not Complied / Submitted/Not Submitted / Not Applicable)*	***Remarks / Test Report Annexure No.***

[Add as per requirement]

Date:

Place: ***Signature & Name of TEC testing Officer***

/

**** Signature of Applicant / Authorized Signatory***

**** Section J as given above is also to be submitted by the Applicant/ Authorised signatory as part of in-house test results along with Form-A. The Authorised signatory shall be the same as the one for Form 'A'.***