Essential Requirements For GPON Equipment

Scope

This document describes the essential requirements for **GPON Equipment** under Mandatory Testing & Certification of Telecommunication Equipment (MTCTE) notified by Government of India vide Gazette Notification no. G.S.R. 113 (E) dated 5th September 2017.

Table I: List of products and product variants					
Division: FA					
Varients →	Variant1	Variant2	Variant3	Variant4	Variant5
Products ↓					
ONT	ONT GPON	ONT EPON	ONT XGPON	ONT XGSPON	ONT WDMPON
ONU	ONU GPON	ONU EPON	ONU XGPON	ONU XGSPON	ONU WDMPON
OLT					

1.0 EMI/EMC Requirements

The equipment shall conform to the EMC requirements as per the following standards and limits indicated therein.

Sr. No.	Test Parameter	Test Result
i)	**Conducted and radiated emission (applicable to telecom equipment):** **Name of EMC Standard:** "CISPR 22 (2008) - Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment". **Limits:-** i. To comply with Class A of CISPR 22 (2008). ii. The values of limits shall be as per TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16**.** iii. For Radiated Emission tests, limits below 1 GHz shall be as per Table 4 (a1) (for Class B) or 5 (a1) (for Class A) for measuring distance of 3m. OR **Name of EMC Standard: "**CISPR 32 (2015) - Electromagnetic compatibility of multimedia equipment - Emission requirements" i. To comply with Class A of CISPR 32 (2015). ii. For Radiated Emission tests, limits below 1 GHz shall be for measuring distance of 3m. *Note: Test Reports as per limits of CISPR 22 (2008) mentioned above shall be acceptable only upto March 31, 2019.*	Test results from Designated CAB of TEC to be submitted for compliance.
ii)	**Immunity to Electrostatic discharge:** **Name of EMC Standard:** IEC 61000-4-2 {2008) "Testing and measurement techniques of Electrostatic discharge immunity test". **Limits: -** **i)** Contact discharge level 2 {± 4 kV} or higher voltage; **ii)** Air discharge level 3 {± 8 kV} or higher voltage; Performance Criteria shall be as per Table 1 under Clause 6 of TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16. Applicable Performance Criteria shall be as per Table 3 under Clause 7.2 of TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16	Test results from Designated CAB of TEC to be submitted for compliance.
iii)	**Immunity to radiated RF**: **Name of EMC Standard:** IEC 61000-4-3 (2010) "Testing and measurement techniques-Radiated RF Electromagnetic Field Immunity test" **Limits: -** i) Under Test level 2 {Test field strength of 3 V/m} for general purposes in frequency range 80 MHz to 1000 MHz and	Test results from Designated CAB of TEC to be submitted for compliance.

	ii) Under test level 3 (10 V/m) for protection against digital radio telephones and other RF devices in frequency ranges 800 MHz to 960 MHz and 1.4 GHz to 6.0 GHz. **For Telecom Terminal Equipment without Voice interface (s)** Under Test level 2 {Test field strength of 3 V/m} for general purposes in frequency range 80 MHz to 1000 MHz and for protection against digital radio telephones and other RF devices in frequency ranges 800 MHz to 960 MHz and 1.4 GHz to 6.0 GHz. Performance Criteria shall be as per Table 1 under Clause 6 of TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16. Applicable Performance Criteria shall be as per Table 3 under Clause 7.2 of TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16	
iv)	**Immunity to fast transients (burst):** **Name of EMC Standard:** IEC 61000- 4- 4 {2012) "Testing and measurement techniques of electrical fast transients/burst immunity test" **Limits: -** Test Level 2 i.e. a) 1 kV for AC/DC power lines; b) 0. 5 kV for signal / control / data / telecom lines; Performance Criteria shall be as per Table 1 under Clause 6 of TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16. Applicable Performance Criteria shall be as per Table 3 under Clause 7.2 of TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16.	Test results from Designated CAB of TEC to be submitted for compliance.
v)	**Immunity to surges:** **Name of EMC Standard:** IEC 61000-4-5 (2014) "Testing & Measurement techniques for Surge immunity test" **Limits: -** i) For mains power input ports: (a) 1.0 kV peak open circuit voltage for line to ground coupling; (b) 0.5 kV peak open circuit voltage for line to line coupling; (c) 4.0 kV peak open circuit voltage for line to ground coupling; (d) 2.0 kV peak open circuit voltage for line to line coupling ii) For telecom ports: (a) 1.0 kV peak open circuit voltage for line to ground; (b) 0.5 KV peak open circuit voltage for line to line coupling; (c) 4.0 kV peak open circuit voltage for line to ground; (d) 2.0 KV peak open circuit voltage for line to line coupling. Performance Criteria shall be as per Table 1 under Clause 6 of TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16. Applicable Performance Criteria shall be as per Table 3 under Clause 7.2 of TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16.	Test results from Designated CAB of TEC to be submitted for compliance.
vi)	**Immunity to conducted disturbance induced by Radio frequency fields:** **Name of EMC Standard:** IEC 61000-4-6 (2013) with amendment 1 (2004)	Test results from Designated CAB of

	& amendment 2 (2006) "Testing & measurement techniques-Immunity to conducted disturbances induced by radio- frequency fields" **Limits:-** Under the test level 2 {3V r.m.s.} in the frequency range 150 kHz-80 MHz for AC / DC lines and Signal /Control/telecom lines. Performance Criteria shall be as per Table 1 under Clause 6 of TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16. Applicable Performance Criteria shall be as per Table 3 under Clause 7.2 of TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16.	TEC to be submitted for compliance.
vii)	**Immunity to voltage dips & short interruptions (applicable to only ac mains power input ports, if any):** **Name of EMC Standard:** IEC 61000-4-11 (2004) "Testing & measurement techniques- voltage dips, short interruptions and voltage variations immunity tests" **Limits:-** i. a voltage dip corresponding to a reduction of the supply voltage of 30% for 500ms (i.e. 70 % supply voltage for 500ms) ii. a voltage dip corresponding to a reduction of the supply voltage of 60% for 200ms; (i.e. 40% supply voltage for 200ms) iii. a voltage interruption corresponding to a reduction of supply voltage of > 95% for 5s. **iv.** a voltage interruption corresponding to a reduction of supply voltage of >95% for 10ms. Performance Criteria shall be as per Table 1 under Clause 6 of TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16. Applicable Performance Criteria shall be as per Table 3 under Clause 7.2 of TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16	Test results from Designated CAB of TEC to be submitted for compliance.
viii)	**Immunity to voltage dips & short interruptions (applicable to only DC power input ports, if any):** **Name of EMC Standard:** IEC 61000-4-29:2000: Electromagnetic compatibility (EMC) - Part 4-29: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests Limits: i. Voltage Interruption with 0% of supply for 10ms. Applicable Performance Criteria shall be B. ii. Voltage Interruption with 0% of supply for 30ms, 100ms, 300ms and 1000ms. Applicable Performance Criteria shall be C. iii. Voltage dip corresponding to 40% & 70% of supply for 10ms, 30 ms. Applicable Performance Criteria shall be B.	Test results from Designated CAB of TEC to be submitted for compliance.

	iv.	Voltage dip corresponding to 40% & 70% of supply for 100ms, 300 ms and 1000 ms. Applicable Performance Criteria shall be C.	
	v.	Voltage variations corresponding to 80% and 120%of supply for 100 ms to 10s as per Table 1c of IEC 61000-4-29. Applicable Performance Criteria shall be B**.**	

Note-1: For checking compliance with the above EMC requirements, the method of measurements shall be in accordance with TEC Standard No. TEC/SD/RD/EMC-002/02.OCT.2016 and the references mentioned therein.

2.0 Safety Requirements

Sr. No	Requirements	Test Result
i.	**Optical safety requirements :** The equipment shall meet the optical safety requirement as per IEC-60825-1 and ALSD/APR procedure of ITU-T Rec. G.664 (latest edition) on Class B laser. If an RF video-overlay is used, there shall be additional safety requirements on the optical transmitters as these are high-power devices, in the range of +17dBm to +20dBm (in comparison, OLT and ONT max TX level is +4dBm).	Test results from Designated CAB of TEC to be submitted for compliance.
ii.	The equipment shall conform to IS 13252 part 1: 2010 "Information Technology Equipment Safety Part 1: General Requirements" [equivalent to IEC 60950-1 {2005} "Information Technology Equipment –Safety- Part 1: General Requirements"] and IS 10437 "{1986} "Safety requirements for Radio transmitting equipments" [equivalent to IEC 60215]".	Test results from Designated CAB of TEC to be submitted for compliance.

3.0 Technical Requirements

Refer Table II, III & IV for Essential Requirements of Fixed Access Division.

Table II: List of interfaces for products/ variants

Product → Interfaces ↓	ONT GPON	ONT EPON	ONT XGPON	ONT XGSPON	ONT WDMPON	ONU GPON	ONU EPON	ONU XGPON	ONU XGSPON	ONU WDM PON	OLT
2 Wires (POTS)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
10 Ethernet Electrical	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
100 Ethernet Electrical	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
1000 Ethernet Electrical	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
WI-FI (single band)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
WI-FI (dual band)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
USB	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
RF Video											Y
VDSL2						Y	Y	Y	Y	Y	
ADSL2+						Y	Y	Y	Y	Y	
G.Fast						Y	Y	Y	Y	Y	
G.hn						Y	Y	Y	Y	Y	
GPON	Y					Y					Y
E-PON		Y					Y				Y
XGPON			Y					Y			Y
XGSPON				Y					Y		Y
WDM_PON					Y					Y	Y
1G Ethernet Optical											Y
10G Ethernet			Y	Y	Y						Y
WDM couplers	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
E1 (2mb)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
STM-1											Y

Table III

Table III.(A)

Applicable to→ Test Parameter↓	**10 Base T Ethernet**	**10/100 Base T Ethernet**	**10/100/1000 Base T Ethernet**	**1000 Base LX, SX (Gigabit Ethernet) Interface**	**10 GE interface (SR/LR/ER)**	**40 GE base (SR4/LR 4)**	**100 GE (SR10/L R4/ER4)**	**FE or 100 Base (FX/SX/ LX)**
Auto negotiation Ethernet Interface	Functional Lab Test	Functional Lab Test	Functional Lab Test					
Differential output Voltage	Refer 14.3.1.2.1 IEEE 802.3 section 1	Refer 23.5.1.2.1 IEEE 802.3 section 2	Refer 40.6.1.2.1 IEEE 802.3 section 3					
Receiver Differential input impedance	Refer 14.3.1.3.4 IEEE 802.3 section 1	Refer 23.5.1.3.3 IEEE 802.3 section 2						
Output timing Jitter	Refer 14.3.1.2.3 IEEE 802.3 section 3	Refer 23.5.1.2.5 IEEE 802.3 section 3	Refer 40.6.1.2.6 IEEE 802.3 section 3					
Mean Launch power				Refer cl. 38.3.1 for SX and 38.4.1 for LX of IEEE	Refer table 52-7 for SR, 52-12 for LR & 52-16 for ER of IEEE 802.3ae	Refer table 86-6 for SR4 and 87-7 for LR4 of	Refer table 86-6 for SR10, 88-7 for LR4/ER4 of	IEEE 802.3au

				802.3z section-3		IEEE 802.3ba	IEEE 802.3ba	
Wavelength /Spectrum /Extinction Ratio				Refer 38.3.1 for SX and 38.4.1 for LX of IEEE 802.3z section-3	Refer table 52-7 for SR, 52-12 for LR & 52-16 for ER of IEEE 802.3ae	Refer table 86-6 for SR4 and 87-7 for LR4 of IEEE 802.3ba	Refer table 86-6 for SR10, 88-7 for LR4/ER4 of IEEE 802.3ba	IEEE 802.3au
Receiver Sensitivity				Refer 38.3.2 for SX and 38.4.2 for LX of IEEE 802.3z section-3	Refer table 52-9 for SR, 52-13 for LR & 52-17 for ER of IEEE 802.3ae	Refer table 86-8 for SR4 and 87-8 for LR4 of IEEE 802.3ba	Refer table 86-8 for SR10, 88-8 for LR4/ER4 of IEEE 802.3ba	IEEE 802.3au
Through put test	RFC 2544	RFC 2544	RFC 2544	RFC 2544	RFC 2544	RFC 2544	RFC 2544	RFC 2544
Addressing IPv4	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791
Addressing IPv6	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460

Table III. (B)

Applicable to→ Test Parameter↓	**64 Kbps**	**2 Mbps (E12)**	**8 Mbps (E22)**	**34 Mbps (E31)**	**45 Mbps (E32)**	**140 Mbps (E4)**	**STM-1 electrical**
Nominal Bit Rate with Tolerance	G.703	G.703	G.703	G.703	G.703	G.703	G.703
Pulse Shape	G.703	G.703	G.703	G.703	G.703	G.703	G.703
Operating Wavelength range							
Input Port Return loss	G.703	G.703	G.703	G.703	G.703	G.703	G.703
Output Jitter	G.703	G.823	G.823	G.823	G.824	G.823	G.825
Input Port Jitter Tolerance	G.823	G.823	G.823	G.823	G.824	G.823	G.825
DC Power					G.703		
Mean Launched power							
Reciever Senstivity							
Reciever Overload							
Addressing IPv4	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791
Addressing IPv6	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460

Table III (C)

Applicable to→ Test Parameter↓	**GPON**	**EPON**	**XGPON**	**XGSPON**	**WDMPON**	**NGPON2**	**WDM couplers**	**RF Video**
Optical power @ OLT	G.984.2	IEEE 802.3ah	G.987.2	G.9807.1	G.694.1	G.989.2		
Sensitivity @OLT	G.984.2	IEEE 802.3ah	G.987.2	G.9807.1	G.694.1	G.989.2		
Optical power @ ONT	G.984.2	IEEE 802.3ah	G.987.2	G.9807.1	G.694.1	G.989.2		
Sensitivity @ONT	G.984.2	IEEE 802.3ah	G.987.2	G.9807.1	G.694.1	G.989.2		
Wavelength Tx	G.984.2	IEEE 802.3ah	G.987.2	G.9807.1	G.694.1	G.989.2		
Wavelength Rx	G.984.2	IEEE 802.3ah	G.987.2	G.9807.1	G.694.1	G.989.2		
Protocol	Ethernet over GEM G.984.2		G.987.2 X-GEM	G.9807.1 X-GEM	**G.698.3**	G.989.2		
Line testing	IEEE 802.3ah	IEEE 802.3ah	IEEE 802.3ah	IEEE 802.3ah	IEEE 802.3ah	IEEE 802.3ah		
Through put test	G.984.1 RFC 2544	RFC 2544	G.987.1 RFC 2544	G.9807.1 RFC 2544	RFC 2544	G.989.2 RFC 2544		
RF video o/p Bandwidth								52+/- 870MHz
RF O/P level								14dBmV
RF O/P tilt								0dB
Addressing IPv4	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791
Addressing IPv6	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460

Table III (D)

Product → Interfaces ↓	2 Wires (POTS)	WI-FI (single band)	WI-FI (dual band)	USB	G.fast	G.hn
Longitudinal/ Transverse Conversion Loss/ (Impedance Unbalance about earth)	**Q.552 (Cl** 2.1.2)					
Return loss	**Q.552 (Cl** 2.1.1.2)					
Over voltage/over current protection	**K.21**					
Max loop current	ETSI EN 300 001(<60mA)					
Idle state current	ETSI EN 300 001(<60mA)					
Insulation test	ETSI EN 300 001(<60mA)					
Compliance		Certificate for Conformance to IEEE 802.11a/b/g/n/ac				
Frequency of operation		NFAP	NFAP			
EIRP		NFAP	NFAP			
Compliance certificate		For 2.4Ghz: ETSI EN 300 328 For 5Ghz: ETSI EN 301 893				
PSD						G.9964
Profile					106Mhz	G.9960

					G.9700	(Cl 6)
PPPoE					RFC 2516	
PVC					Support	
VPI/VCI					Support	
Loop resistance					EN 300 001	
Insulation resistance					>= 5 Mega ohms	
Impulse noise protection					Better than 2	
Through put test					500Mbp @100m @ 0.5mm copper	
Addressing IPv4	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791
Addressing IPv6	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460

Table III (E)

Product → Interfaces ↓	ADSL	ADSL Lite (G.lite)	ADSL (G.dmt)	ADSL over POTS	ADSL over ISDN	RE-ADSL2	ADSL2	Splitterless ADSL2	ADSL2+	ADSL2+M	VDSL	VDSL2	VDSL2 (Vectoring)	VDSL2 Annex Q V Plus/35b
standard	ANSI T1.413-Issue 2	ITU G.992.2	ITU G.992.1	ITU G.992.1 Annex A	ITU G.992.1 Annex B	ITU G.992.3 Annex L	ITU G.992.3	ITU G.992.4	ITU G.992.5	ITU G.992.5 Annex M	ITU G.993.1 & ETSI TS 101 270-1 V1.2.1	ITU G.993.2	ITU G.993.5	ITU G.993.2 Amendment 1 (11/15)
Downstream rate	8.0 Mbit/s	1.5 Mbit/s	8.0 Mbit/s	8.0 Mbit/s	8.0 Mbit/s	5.0 Mbit/s	13.0 Mbit/s	1.5 Mbit/s	24.0 Mbit/s	24.0 Mbit/s	55 Mbit/s	125 Mbit/s (998ADE17)	125 Mbit/s (998ADE17)	300 Mbit/s (998ADE35)
Upstream rate	1.0 Mbit/s	0.5 Mbit/s	1.1 Mbit/s	1.1 Mbit/s	1.5 Mbit/s	0.8 Mbit/s	1.1 Mbit/s	0.5 Mbit/s	1.2 Mbit/s	2.6 Mbit/s	3 Mbit/s	60 Mbit/s	60 Mbit/s	60 Mbit/s
PSD		ITU G.992.2 annexII	G.992.1(anne- A)	G.992.1(anne- A)	G.992.1(anne- A)		G.992.3		G.992.5		G.993.1 (cl 6.2)	G.993.2 (cl 7.2) – Annex A,B&C	G.993.2 (cl 7.2) – Annex A,B&C	G.993.2 (cl 7.2) – Annex A,B&C
Transmitted power at xTU-C		ITU G.992.2 (cl 7.10.1)		20.4 dBm	19.9 dBm	18.8 dBm	20.4 dBm		20.4 dBm	19.3 dBm	11.5 dBm	14.5 dBm	14.5 dBm	17.0 dBm
Transmitted power at ATU-C With splitter									+20.4 dBm					
Transmitted power at xTU-R With splitter				12.5 dBm	13.3 dBm	12.5 dBm	12.5 dBm		+12.5 dBm	12.5 dBm		14.5 dBm	14.5 dBm	14.5 dBm

Transmitted power at ATU-C With ISDN									19.9 dBm					
Transmitted power at ATU-R With ISDN									13.8 dBm					
Line port impedence									135 ohm		135 ohm	135 ohm		
Longitudinal balance									G.992.5 (cl A.4.3.3.1)		55dB(lower frequency) 43dB(higher frequency)	G.993.2(cl 7.4)	G.993.2(cl 7.4)	G.993.2(cl 7.4)
Insertion loss									G.992.3 (cl E.4.3.3.1)					
Return Loss									14 dB		G.993.1(cl 6.5)			
Profile												G.993.2(cl 7.2)	G.993.2(cl 7.2)	35b
PPPoE	RFC 2516	RFC 2516	RFC 2516	RFC 2516	RFC 2516	RFC 2516	RFC 2516	RFC 2516	RFC 2516	RFC 2516	RFC 2516	RFC 2516	RFC 2516	RFC 2516
PVC	Support	Support	Support	Support	Support	Support	Support	Support	Support	Support	Support	Support	Support	Support
VPI/VCI	Support	Support	Support	Support	Support	Support	Support	Support	Support	Support	Support	Support	Support	Support
Loop resistance	EN 300 001	EN 300 001	EN 300 001	EN 300 001	EN 300 001	EN 300 001	EN 300 001	EN 300 001	EN 300 001	EN 300 001	EN 300 001	EN 300 001	EN 300 001	EN 300 001

Insulation resistance	>= 5 Mega ohms	>= 5 Mega ohms	>= 5 Mega ohms	>= 5 Mega ohms	>= 5 Mega ohms	>= 5 Mega ohms	>= 5 Mega ohms	>= 5 Mega ohms	>= 5 Mega ohms	>= 5 Mega ohms	>= 5 Mega ohms	>= 5 Mega ohms	>= 5 Mega ohms	>= 5 Mega ohms
Impulse noise protection	Better than 2	Better than 2	Better than 2	Better than 2	Better than 2	Better than 2	Better than 2	Better than 2	Better than 2	Better than 2	Better than 2	Better than 2	Better than 2	Better than 2
Addressing IPv4	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791	RFC 791
Addressing IPv6	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460	RFC 2460

Note: Wherever RFC are referred, only 'shall' clauses given in the RFCs should be tested against the parameter referred in this ER.

Table IV: List of Test Parameters Applicable, its International Standards and expected result/limit

Applicable to→ Test Parameter↓	**Standard**	**GPON-OLT**	**GPON-ONU**	**GPON-ONT**	**Remarks**
Dual stack(IPv6 compliance)	RFC 8200 (IPv6) , RFC 791 (IPv4)		Y	Y	Dual stack IP Addresses should be supported.
user name and password based authentication	ITU-T G.984.3 section 9.2.2 ITU-T G.984.3 section 12		Y	Y	PPPoE session authentication should be present.
Support of 802.1x authenticator functionality (MAC based)	IEEE 802.1x		Y		Security based on IEEE 802.1x shall be supported.
MAC address limitation per-ONT	IEEE 802.3		Y	Y	The data stream is received from only the number of streams specified.
DOS prevention, SSH v1/2 for CLI	ITU-T G.984.3 section V.2, SSH v2 RFC 4251		Y		The denied Traffic streams should not pass through the OLT
Maximum bandwidth limiting	ITU-T-REC-G.984.3-200803 Section 7.5	Y			The bandwidth is receieved as per applied limits.
Minimum guaranteed bandwidth	ITU-T-REC-G.984.3-200803 Section 7.5	Y			The bandwidth is receieved Is 512kbps
Min. two classes of classification	ITU-T-REC-G.984.3-200803 Section 7.5	Y			T-CONT1 to T-CONT2 shall be supported
Switch fabric in OLT shall be able to handle full wired speed throughputs.	G.984.1 IEEE 802.3(testing procedure)	Y			Downstream rate: 0 to 2.48832 Gbit/s Upstream rate: 0 to 1.24416 Gbit/s
MAC learning shall be supported at OLT	G.984.1 IEEE 802.3(testing procedure)	Y			
Port-id-based VLAN shall be supported at OLT	G.984.1 IEEE 802.1Q(testing procedure)	Y			
VLAN stacking towards the network at the OLT shall be supported	G.984.1 IEEE 802.1Q(testing procedure)	Y			
The operator shall be able to enable/disable MAC address learning function and configure the MAC learning aging time.	G.984.1 IEEE 802.3(testing procedure)	Y			The OLT learns the MAC address and removes it after MAC aging time

IETF RFC 2544 conformance/performance shall be tested for end-to-end Ethernet service. • Throughput • Latency • Frameloss	RFC 2544	Y			Supported RFC 2544 Test at 1GbE/10GB port

Note: Wherever RFC are referred, only 'shall' clauses given in the RFCs should be tested against the parameter referred in this ER.

4.0 Security and authentication Requirements

As and when prescribed by DoT

Note: As security requirement has not been finalized yet, it is not possible to anticipate the features required to comply the security requirement and therefore this document can be at best treated as interim document till the security requirement is finalized. Accordingly, more features may be added in the ER.