अनिवार्य आवश्यकताओं का अनुलग्नक

सं०: टीईसी/एसडी/डीडी/टीसीपी-222/2.7/मई2021

ANNEXURES TO ERs

No.:TEC/SD/DD/TCP-222/2.7/May2021

अनिवार्य आवश्यकताओं में इंगित मानकों का विवरण

संस्करण-2.7

DETAILS OF STANDARDS SPECIFIED IN ESSENTIAL REQUIREMENTS

VERSION-2.7

भारतसरकार GOVERNMENT OF INDIA

दूरसंचारअभियांत्रिकीकेंद्र

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Annexure-A1: Safety Requirement for Communication Equipment

ParameterGroup: **SAFETY**

S. No.	Parameter Name	Standard	Limits/ Test Levels	Applicability/ Remarks
A1.1	IT Equipment Safety	IS 13252 part 1: 2010 Amd 2013 &Amd 2015 "Information Technology Equipment –Safety- Part 1: General Requirements" or equivalent IEC standard –EN/IEC 60950-1:2005+A1:2009+A2:2013 "Information Technology Equipment –Safety- Part 1: General Requirements OR EN/IEC 62368-1:2014	Compliance to clauses applicable to the EUT	Older version of standard shall be accepted if it was in force on the date of issue of report.
A1.2	Ingress Protection	IEC 60529	Compliance to clauses applicable to the EUT	As per offered product category

Annexure-A2: Safety Requirement for Battery in portable equipment

Parameter Group: **SAFETY**

S. No.	Parameter Name	Standard	Limits/ Test Levels	Applicability/ Remarks
A2.1	Battery Safety	IS 16046:2015 OR EN/IEC 62133:2012	Compliance to clauses applicable to the EUT	Applicable only if it is portable equipment and uses secondary cells and batteries containing alkaline or non-acid electrolyte. BIS certificate or test reports from BIS approved labs in respect of batteries shall be accepted and repeat testing of batteries is not required.

Annexure-A3: Safety Requirement for Radio Communication Equipment (Other than CPE)

Parameter Group: **SAFETY**

S. No.	Parameter Name	Standard	Limits/ Test Levels	Applicability/ Remarks
A3.1	IT Equipment Safety for Radio Products (Other than CPE)	EN/IEC 60215:2016	Compliance to clauses applicable to the EUT	Test reports as per IEC 60215: 1987 shall be acceptable only till March 31, 2020

Annexure-B: EMI/ EMC Requirement

(Additional details, referred clauses and Tables in TEC EMI EMC document TEC/SD/DD/EMC-221/05/OCT-16)

Parameter Group: EMC

S. No.	Parameter Name	Standard	Limits/ Test Levels	Applicability/ Remarks
B.1	Conducted emission - Class A	CISPR22 (2008)/ EN 55022 OR CISPR32 (2015)/EN 55032	**AC/ DC Power input/ output ports:** As per Table 7 of Annexure B1 for CISPR 22 and applicable Table(s) in CISPR 32. **Telecom Ports:** As per Table 8B of Annexure B1 and applicable Table(s) in CISPR 32.	Conducted Emission for Class A equipment as per applicable clauses/ ranges. Test reports as per CISPR 22 (2008)/ EN 55022 shall be acceptable only till 31.03.2020.

B.2	Radiated emission - Class A	CISPR22 (2008)/ EN 55022 OR CISPR32 (2015)/EN 55032	For CISPR 22: i. For 10 m measuring distance: As per Table 5a (Refer Annex B1) for frequency range up to 1 GHz. ii. For 3 m measuring distance: As per Table 5a1 (Refer Annex-B1) for frequency range up to 1 GHz. iii. For 3 m measuring distance: As per Table 5b (Refer Annex B1) frequency range beyond 1 GHz. For CISPR 32: Limits for Class A Radiated Emissions from applicable Tables of CISPR 32 for distances of 3m or 10m. Note: For 3m measuring distance, EUT size should be as such it fits in a cylindrical area of diameter 1m. For other equipment, measuring distance of 10m is applicable.	Radiated Emission for Class A equipment as per applicable clauses/ ranges. Test reports as per CISPR 22 (2008)/ EN 55022 shall be acceptable only till 31.03.2020.

S. No.	Parameter Name	Standard	Limits/ Test Levels	Applicability/ Remarks
B.3	Conducted emission - Class B	CISPR22 (2008)/ EN 55022 OR CISPR32 (2015)/EN 55032	AC/ DC Power input/ output ports: As per Table 6 of Annexure B1 for CISPR 22/EN 55022 Telecom Ports: As per Table 8A of Annexure B1 for CISPR 22/EN 55022 and applicable Table(s) in CISPR 32/EN 55032	Conducted Emission for Class B equipment as per applicable clauses/ ranges. Test reports as per CISPR 22 (2008)/ EN 55022 shall be acceptable only till 31.03.2020.

S. No.	Parameter Name	Standard	Limits/ Test Levels	Applicability/ Remarks
B.4	Radiated emission - Class B	CISPR22 (2008)/ EN 55022 OR CISPR32 (2015)/EN 55032	For CISPR 22: i. For 10 m measuring distance: As per Table 4a for frequency range up to 1 GHz. ii. For 3 m measuring distance: As per Table 4a1 for frequency range up to 1 GHz. iii. For 3 m measuring distance: As per Table 4b for frequency range beyond 1 GHz. For CISPR 32: Limits for Class B Radiated Emissions from applicable Tables of CISPR 32 for distances of 3m or 10m. Note: For 3m measuring distance, EUT size should be as such it fits in a cylindrical area of diameter 1m. For other equipment, measuring distance of 10m is applicable.	Radiated Emission for Class B equipment as per applicable clauses/ ranges. Test reports as per CISPR 22 (2008)/ EN 55022 shall be acceptable only till 31.03.2020.

S. No.	Parameter Name	Standard	Limits/ Test Levels	Applicability/ Remarks
B.5	Conducted and Radiated Emission - Electrical Appliances	CISPR14-1 (2016)		Conducted and Radiated Emission applicable to Electricity Meter
B.6	Immunity to Electrostatic Discharge	EN/IEC 61000-4-2(2008) Contact discharge	Level 2 {± 4 kV}, or higher voltage; Performance Criteria B	
B.7	Immunity to Electrostatic Discharge	EN/IEC 61000-4-2(2008) Air discharge	Level 3 {± 8 kV} or higher voltage; Performance Criteria B	
B.8	Immunity to Electrostatic Discharge- Level-4	EN/IEC 61000-4-2(2008) Contact Discharge	Level 4 {± 8 kV}; Performance Criteria B	Applicable to Electricity Meter
B.9	Immunity to Electrostatic Discharge- Level-4	EN/IEC 61000-4-2(2008) Air Discharge	Level 4 {± 15 kV}; Performance Criteria B	Applicable to Electricity Meter
B.10	Immunity to radiated RF	EN/IEC 61000-4-3(2010)	i. Test level 2 {Test field strength of 3 V/m} for 80 MHz to 1 GHz; Performance Criteria A. ii. Test level 3 {Test field strength of 10 V/m} for 800 MHz to 960 MHz & 1.4 to 6.0 GHz,; Performance Criteria A	Clauses applicable to Telecom Equipment or Telecom Terminal Equipment with voice interface.
B.11	Immunity to radiated RF	EN/IEC 61000-4-3(2010)	80 MHz to 6.0 GHz: Test level 2 {Test field strength of 3 V/m}: Performance Criteria A	Clauses applicable to Telecom Terminal Equipment without voice interface.

S. No.	Parameter Name	Standard	Limits/ Test Levels	Applicability/ Remarks
B.12	Immunity to fast transients (burst)	EN/IEC 61000-4-4(2012) AC/DC Power Lines	Test Level 2 (1.0 kV): Performance Criteria B	Not applicable for devices having in-built or replaceable battery
B.13	Immunity to fast transients (burst)	EN/IEC 61000-4-4(2012) Signal/Control/Data/Telecom Lines	Test level 2 (0.5kV): Performance Criteria B	Not applicable for mobile devices having only radio interface
B.14	Immunity to surges	EN/IEC 61000-4-5(2014) line to ground – power port	2kV: Performance Criteria B	Not applicable for devices having in-built or replaceable battery
B.15	Immunity to surges	EN/IEC 61000-4-5(2014) line to line – power port	1kV: Performance Criteria B	Not applicable for devices having in-built or replaceable battery
B.16	Immunity to surges	EN/IEC 61000-4-5(2014) Common mode – telecom ports	2kV: Performance Criteria C	Not applicable for mobile devices having only radio interface
B.17	Immunity to conducted disturbance induced by Radio frequency fields	EN/IEC 61000-4-6(2013): AC/DC lines & signal control /telecom lines.	Test level 2 {3 V r.m.s.}: Performance Criteria A 150 kHz to 80 MHz	Not applicable for mobile devices having only radio interface
B.18	Immunity to voltage dips & short interruption: Voltage dip corresponding to a reduction of supply voltage of 30% for 500ms (i.e. 70 % supply voltage for 500ms)	EN/IEC 61000-4-11(2004)	Performance criteria B	Applicable to AC power ports
B.19	Immunity to voltage dips & short interruption: Voltage dip corresponding to a reduction of supply voltage of 60% for 200ms; (i.e. 40% supply voltage for 200ms).	EN/IEC 61000-4-11(2004)	Performance criteria C	Applicable to AC power ports

S. No.	Parameter Name	Standard	Limits/ Test Levels	Applicability/ Remarks
B.20	Immunity to voltage dips & short interruption: Voltage interruption corresponding to a reduction of supply voltage of > 95% for 5s.	EN/IEC 61000-4-11(2004)	Performance criteria C	Applicable to AC power ports
B.21	Immunity to voltage dips & short interruption: Voltage interruption corresponding to a reduction of supply voltage of >95% for 10ms.	EN/IEC 61000-4-11(2004)	Performance criteria B	Applicable to AC power ports.
B.22	Immunity to voltage dips & short interruption: Voltage Interruption with 0% of supply for 10ms.	EN/IEC 61000-4-29	Performance criteria B	Applicable to DC power ports
B.23	Immunity to voltage dips & short interruption: Voltage Interruption with 0% of supply for 30ms, 100ms, 300ms and 1000ms.	EN/IEC 61000-4-29	Performance criteria C	Applicable to DC power ports
B.24	Immunity to voltage dips & short interruption: Voltage dip corresponding to 40% & 70% of supply for 10ms, 30 ms.	EN/IEC 61000-4-29	Performance criteria B	Applicable to DC power ports
B.25	Immunity to voltage dips & short interruption: Voltage dip corresponding to 40% & 70% of supply for 100ms, 300ms and 1000 ms.	EN/IEC 61000-4-29	Performance criteria C	Applicable to DC power ports

S. No.	Parameter Name	Standard	Limits/ Test Levels	Applicability/ Remarks
B.26	Immunity to voltage dips & short interruption: Voltage variations corresponding to 80% and 120% of supply for 100 ms to 10s as per Table 1c of IEC 61000-4-29	EN/IEC 61000-4-29	Performance criteria B	Applicable to DC power ports

Note: Minimum required information related to EMI/EMC parameters has been captured in Annex-B to facilitate the applicants. However, for further details/clarity in this regard, TEC document for EMI/EMC standard – TEC/SD/DD/EMC-221/05/OCT-16 may kindly be referred to.

Conducted and Radiated Emissions will be as per Class A for chasis based OLT equipment and Class B for residential OLT equipment

In case of any conflict, the TEC document for EMI/EMC standard shall prevail.

Note for IoT Devices

1. If Tracking Device come along with vehicle for testing then CISPR 25 / AIS 004-Part3 will be applicable.
2. Immunity to Surges - For Non- Rechargeable fixed battery operated device without any telecom or power port, this test is not applicable.
3. Conducted and Radiated Emission – If Smart Electricity Meter is to be tested along with communication module then CISPR 14-1 is applicable.
4. Immunity to Electrostatic Discharge: – Smart Electricity Meter

   For communication module limits as per standard IEC 61000-4-2 are applicable.

   If Smart Electricity Meter is to be tested along with communication module, then severity level should be 4 (As per standard of Smart electricity Meter IS 16444 which refer to IS 13779 & IS 15884) in both cases – Air and Contact Discharge.
5. Immunity to Radiated RF: – Smart Electricity Meter

   For communication module limits as per standard IEC 61000-4-3 are applicable.

   If Smart Electricity Meter is to be tested along with communication module, then severity level should be 4 and field strength is 10 V/m (As per standard of Smart electricity Meter IS 16444 which refer to IS 13779 & IS 15884).
6. Immunity to Fast Transients: – Smart Electricity Meter

   For communication module limits as per standard IEC 61000-4-4 (2012) are applicable.

   If Smart Electricity Meter is to be tested along with communication module, then severity level should be 3, ±4 kV (As per standard of Smart electricity Meter IS 16444 which refer to IS 13779 & IS 15884).
7. Immunity to Surges: – Smart Electricity Meter

   For communication module limits as per standard IEC 61000-4-5 (2014) are applicable.

   If Smart Electricity Meter is to be tested along with communication module, then ±5 kV and 5 Pulses each polarity at 60º, 240º only in differential mode.
8. General Safety Requirements: – Smart Electricity Meter

   For communication module standard IEC 60950/IS 13252 are applicable.

   If Smart Electricity Meter is to be tested along with communication module, then safety must be as per prevailing IS 16444.

Annexure- B1: Emission limits as per CISPR22

Parameter Group: EMC

The value of the limits from "CISPR 22 (2008)" at clause-6 [and reproduced below in tables 4(a), 4(b) & 5(a), 5(b)] shall be used for class B and class A equipment respectively. Further, the limits of table 5 may also be used for equipment in Telecommunication Centres.
Alternatively, the Limits as per Table 4 (a1) & 5 (a1) for measuring distance of 3m are also acceptable , as applicable , in place of Table 4 (a) & 5 (a) respectively.

a)Limits below 1 GHz

Table 4(a): Limits for unwanted radiated emission of "Class B" equipment at a measuring distance of 10m.

Frequency range	**Limits (quasi-peak)**
30-230 MHz	30 dB (μV/m)
230- 1000 MHz	37dB (μ V/m)
Note: 1) The lower limit shall apply at the transitionFrequency. *Note: 2) Additional provisions may be required for cases where interference occurs.*	

Table 5(a): Limits for unwanted radiated emission of "Class A" equipment (for Telecommunication Centres) at a measuring distance of 10m.

Frequency range	**Limits (quasi-peak)**
30-230 MHz	40 dB (μV/m)
230- 1000 MHz	47 dB (μV/m)
Note: 1) The lower limit shall apply at the transition Frequency. Note: 2) Additional provisions may be required forcases where interference occurs.	

***Note**:*

Limits are shown here for a measurement distance of 10m. However, measurements made using alternative test sites are also acceptable in accordance with CISPR 22 including clause No. 10.4.5.

Table 4(a1): Limits for unwanted radiated emission of "Class B" Equipment at a measuring distance of 3 m.

Frequency range	**limits (quasi – peak)**
30 – 230 MHz	40.5 dB (μV/m)
230 – 1000 MHz	47.5 dB (μV/m)
Notes: 1. The lower limits shall apply at transition frequency 2. Additional provisions may be required for cases where interference occurs.	

Table 5 (a1): Limits for unwanted radiated emission of "Class A" Equipment at a measuring distance of 3 m.

Frequency range	**limits (quasi – peak)**
30 – 230 MHz	50.5 dB (μV/m)
230 – 1000 MHz	57.5 dB (μV/m)
Notes: *1.The lower limits shall apply at transition frequency* *2. Additional provisions may be required for cases where interference occurs.*	

b) Limits above 1 GHz

The EUT shall meet the following limits when measured in accordance with the prescribed method and the conditional testing procedure as described.

Table 4(b): Limits for radiated disturbance of "Class B" Eqpt. at a measurement distance of 3 m.

Frequency range GHz	**Average limit** dB (μV/m)	**Peak limit** dB (μV/m)
1 to 3	50	70
3 to 6	54	74
NOTE: *The lower limit applies at the transition frequency.*		

Table 5(b): Limits for radiated disturbance of "Class A" Eqpt. at a measurement distance of 3 m.

Frequency range GHz	**Average limit** dB (μV/m)	**Peak limit** dB (μV/m)
1 to 3	56	76
3 to 6	60	80
NOTE :*The lower limit applies at the transition frequency.*		

Limits for conducted emission

For Class A equipment

Table 7: Limit of conducted emission (disturbance) at the main ports of Class A Telecom Equipment

Frequency range	**Limit (Quasi -Peak)**	**Limit (Average)**
0.15 – 0.5 MHz	79 dB (μV)	66 dB (μV)
0.5-30 MHz	73 dB (μV)	60 dB (μV)
Note: The lower limit shall apply at the transition Frequencies.		

Table 8(B): Limits for conducted common mode (asymmetric mode) emissions from telecommunication ports of Class A equipment (intended for use in telecommunication centers only).

Frequency rangeMHz	**Voltage limits dB (μV)**		**Current limits dB (μA)**	
	Quasi-peak	**Average**	**Quasi-peak**	**Average**
0.15 to 0.5	97 to 87	84 to 74	53 to 43	40 to 30
0.5 to 30	87	74	43	30
Note 1: The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz. *Note 2: The current and voltage disturbance limits are derived foruse with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω are telecommunication port under test (conversion factor is 20 log_{10}150/1= 44 dB).*				

For Class B equipment

Table 6: Limits of conducted emission (disturbance) at the mains ports of Class B Telecom Equipment

Frequency range	Limit (Quasi -Peak)	Limit (Average)
0.15 -0.5 MHz	66-56 dB (μV)	56-46 dB (μV)
0.5-5 MHz	56 dB (μV)	46 dB (μV)
5-30 MHz	60 dB (μV)	50 dB (μV)
Note: 1) The lower limit shall apply at the transition Frequencies. *Note: 2) The limits decreases linearly with logarithm of the Frequency in the range 0.15 MHz to 0.50 MHz.*		

Table 8(A): Limits for conducted common mode (asymmetric mode) emission from telecommunication ports for class B equipment.

Frequency rangeMHz	Voltage limits dB (μV)		Current limits dB (μA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 to 0.5	84 to 74	74 to 64	40 to 30	30 to 20
0.5 to 30	74	64	30	20
Note 1: The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz. *Note 2: The current and voltage disturbance limits are derived foruse with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω are telecommunication port under test (conversion factor is 20 $\log_{10}$150/1= 44 dB).*				

Conditional testing procedure for 1-6 GHz testing:

a. The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes.
b. If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.
c. If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz.
d. If the highest frequency of the internal sources of the EUT is between 500 MHz, and 1 GHz, the measurement shall only be made up to 5 GHz.
e. If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.

Class A and Class B equipment definition:

a. **Class B equipment:** "Class B" Telecom equipment is intended primarily for use in the domestic environment and may include:
    i. equipment with no fixed place of use; for example, portable equipment powered by built- in batteries;
    ii. Telecommunication terminal equipment powered by a telecommunication network;
    iii. Personal computers and auxiliary connected equipment.
b. **Class A equipment:** Class A Telecom equipment is a category of all other Telecom Equipments which satisfies class A Telecom Equipment limits but not the class B limits. Such equipment may cause Radio Interference in the domestic environment.

Annexure-C1: Frequency Band of Operation for Non-Cellular Radio Equipment

Parameter Group: Radio Conformance (RADCONF)

S. No.	Parameter Name	Standard	Limits/ Values	Applicability/ Remarks
C1.1	Frequency Band For MRTS	Latest NFAP issued by WPC.	300/400 MHz or 800 MHz	MRTS Equipment Testing procedure as per applicable ENxxx standard mentioned in Annexure C3
C1.2	Frequency for HF equipment	Latest NFAP issued by WPC	3 MHz to 30 MHz	HF Equipment Testing procedure as per applicable ENxxx standard mentioned in Annexure C3
C1.3	Frequency for UHF/ VHF equipment	Latest NFAP issued by WPC	30 MHz to 1000 MHz	VHF/UHF Equipment Testing procedure as per applicable ENxxx standard mentioned in Annexure C3
C1.4	Frequency for PTP Radio Interface	Latest NFAP issued by WPC.	6/ 7/ 13/ 15/ 18/ 23 GHz. Applicable for full or split outdoor unit.	Point to Point Microwave Fixed Radio Systems Testing procedure as per EN 302 217-2
C1.5	Frequency for PMP Radio Interface	Latest NFAP issued by WPC.	10.5/ 26/ 28 GHz. Applicable for full or split outdoor unit.	Point to Multi-Point Microwave Fixed Radio Systems Testing procedure as per EN 302 326-2
C1.6	Frequency of Operation - Satellite Equipment	Latest NFAP issued by WPC.	Lower C-band Receive Frequency 3.400-3.700 GHz Trans Frequency 6.425-6.725 GHz *Note- The equipment may operate in part of the bands or cover the full bands listed.*	Testing procedure as per Appendix-II, Test-2

C1.7	Frequency of Operation - Satellite Equipment	Latest NFAP issued by WPC.	Normal C-band Receive Frequency 3.700-4.200 GHz Trans Frequency 5.925-6.425 GHz *Note- The equipment may operate in part of the bands or cover the full bands listed.*	Testing procedure as per Appendix-II, Test-2
C1.8	Frequency of Operation - Satellite Equipment	Latest NFAP issued by WPC.	Extended C-band Receive Frequency 4.500-4.800 GHz Trans Frequency 6.725-7.025 GHz *Note- The equipment may operate in part of the bands or cover the full bands listed.*	Testing procedure as per Appendix-II, Test-2
C1.9	Frequency of Operation - Satellite Equipment	Latest NFAP issued by WPC.	Ku band Receive Frequency 10.7-11.7 GHz 12.2-12.75 GHz Trans Frequency 12.75-13.25 GHz 13.75-14.0 GHz 14.0-14.5 GHz *Note- The equipment may operate in part of the bands or cover the full bands listed.*	Testing procedure as per Appendix-II, Test-2

Note: Frequency of operation requirements is as per the latest NFAP issued by WPC and the requirements in NFAP supersede the requirements listed here.

Annexure-C2: Transmitted Power/ EIRP for Non-Cellular Radio Equipment

Parameter Group: Radio Conformance (RADCONF)

S. No.	Parameter Name	Standard	Limits/ Values	Applicability/ Remarks
C2.1	Max RF Power Output MRTS Base Stn	As per DoT/WPC license conditions	100 W	MRTS Base Stations Testing procedure as per applicable ENxxx standard mentioned Annexure C3
C2.2	Max RF Power Output MRTS Mobile Stn	As per DoT/WPC license conditions	30 W	MRTS Fixed Mobile Equipment Testing procedure as per applicable ENxxx standard mentioned Annexure C3
C2.3	Max RF Power Output for MRTS Handheld Stn	As per DoT/WPC license conditions	3 W	MRTS Handheld Equipment Testing procedure as per applicable ENxxx standard mentioned Annexure C3
C2.4	Max RF Power Output for MRTS Fixed Stn	As per DoT/WPC license conditions	30W	MRTS Fixed Equipment Testing procedure as per applicable ENxxx standard mentioned Annexure C3
C2.5	Max Transmit Power for HF Base Stn	As per DoT/WPC license conditions	As per DoT/WPC prescribed limit	HF Base Stations Testing procedure as per applicable ENxxx standard mentioned Annexure C3
C2.6	Max Transmit Power for HF HH Stn	As per DoT/WPC license conditions	As per DoT/WPC prescribed limit	HF Handheld Equipment Testing procedure as per applicable ENxxx standard mentioned Annexure C3
C2.7	Max Transmit Power for HF Mob Stn	As per DoT/WPC license conditions	As per DoT/WPC prescribed limit	HF Mobile Equipment Testing procedure as per applicable ENxxx standard mentioned Annexure C3
C2.8	Max Transmit Power for HF Fixed Stn	As per DoT/WPC license conditions	As per DoT/WPC prescribed limit	HF Fixed Equipment Testing procedure as per applicable

S. No.	Parameter Name	Standard	Limits/ Values	Applicability/ Remarks
				ENxxx standard mentioned Annexure C3
C2.9	Max Transmit Power for UHF/VHF Base Stn	As per DoT/WPC license conditions	As per DoT/WPC prescribed limit	VHF/UHF Base Station Testing procedure as per applicable ENxxx standard mentioned Annexure C3
C2.10	Max Transmit Power for UHF/VHF HH Stn	As per DoT/WPC license conditions	As per DoT/WPC prescribed limit	VHF/UHF Handheld Equipment Testing procedure as per applicable ENxxx standard mentioned Annexure C3
C2.11	Max Transmit Power for UHF/VHF Mob Stn	As per DoT/WPC license conditions	As per DoT/WPC prescribed limit	VHF/UHF Mobile Equipment Testing procedure as per applicable ENxxx standard mentioned Annexure C3
C2.12	Max Transmit Power for UHF/VHF Fixed Stn	As per DoT/WPC license conditions	As per DoT/WPC prescribed limit	VHF/UHF Fixed Equipment Testing procedure as per applicable ENxxx standard mentioned Annexure C3
C2.13	Transmit Power for PTP Radio interface	As per DoT/WPC license conditions	As per DoT/WPC prescribed limit	Point to Point Microwave Fixed Radio Systems Testing procedure as per EN 302 217-2 or Appendix-II, Test-3
C2.14	Transmit Power for PMP Radio Interface	As per DoT/WPC license conditions	As per DoT/WPC prescribed limit	Point to Multi-Point Microwave Fixed Radio Systems Testing procedure as per EN 302 326-2 or Appendix-II, Test-3
C2.15	Transmit Power - Satellite Equipment	As per DoT/WPC license conditions	As per DoT/WPC prescribed limit	Testing procedure as per Appendix-II, Test-2

Note: *EIRP requirements i.e. Limits/Values shall be as per the latest NFAP and GSRs issued by WPC, DoT and the requirements in NFAP and GSRs supersede the requirements listed here.*

Annexure-C3: Radio Conformance Requirement for Non-Cellular Radio Equipment

Parameter Group: Radio Conformance (RADCONF)

S. No.	Equipment Name	Parameter Name	Standard	Limits/ Values	Applicability/ Remarks
C3.1	MRTS Equipment	Conformance to standards for MRTS	ETSI EN 300 113	Compliance	Applicable for equipment meant for transmission of data and/or speech and having antenna connector
C3.2	MRTS Equipment	Conformance to standards for MRTS	ETSI EN 300 390	Compliance	Applicable for equipment meant for transmission of data and/or speech and having integral antenna
C3.3	MRTS Equipment	Conformance to standards for MRTS	ETSI EN 300 086	Compliance	Applicable for equipment meant for analogue speech and having internal or external RF connector
C3.4	MRTS Equipment	Conformance to standards for MRTS	ETSI EN 300 296	Compliance	Applicable for equipment meant for analogue speech and having integral antenna
C3.5	MRTS Equipment	Conformance to standards for MRTS	ETSI EN 300 219	Compliance	Applicable for equipment meant to transmit signals to initiate specific receiver response
C3.6	MRTS Equipment	Conformance to standards for MRTS	ETSI EN 300 341	Compliance	Applicable for equipment, using integral antenna, meant to transmit signals to initiate specific receiver response
C3.7	MRTS Equipment	Conformance to standards for MRTS	ETSI EN 301 166	Compliance	Applicable for equipment meant for transmission of data and/or speech and operating on narrow band channels (<10KHz) and having antenna connector
C3.8	MRTS Equipment	Conformance to standards for MRTS	ETSI EN 302 561	Compliance	Applicable for Terrestrial Trunked Radio (TETRA)

S. No.	Equipment Name	Parameter Name	Standard	Limits/ Values	Applicability/ Remarks
C3.9	VHF/UHF Equipment	Conformance to standards for Equipment used in VHF/UHF Radio Systems	ETSI EN 300 113	Compliance	Applicable for equipment meant for transmission of data and/or speech and having antenna connector
C3.10	VHF/UHF Equipment	Conformance to standards for Equipment used in VHF/UHF Radio Systems	ETSI EN 300 390	Compliance	Applicable for equipment meant for transmission of data and/or speech and having integral antenna
C3.11	VHF/UHF Equipment	Conformance to standards for Equipment used in VHF/UHF Radio Systems	ETSI EN 300 086	Compliance	Applicable for equipment meant for analog speech and having internal or external RF connector
C3.12	VHF/UHF Equipment	Conformance to standards for Equipment used in VHF/UHF Radio Systems	ETSI EN 300 296	Compliance	Applicable for equipment meant for analog speech and having integral antenna
C3.13	VHF/UHF Equipment	Conformance to standards for Equipment used in VHF/UHF Radio Systems	ETSI EN 300 219	Compliance	Applicable for equipment meant to transmit signals to initiate specific receiver response
C3.14	VHF/UHF Equipment	Conformance to standards for Equipment used in VHF/UHF Radio Systems	ETSI EN 300 341	Compliance	Applicable for equipment, using integral antenna, meant to transmit signals to initiate specific receiver response
C3.15	VHF/UHF Equipment	Conformance to standards for Equipment used in VHF/UHF Radio Systems	ETSI EN 300 783	Compliance	Applicable for commercial amateur radio equipment.
C3.16	VHF/UHF Equipment	Conformance to standards for Equipment used in VHF/UHF Radio Systems	ETSI EN 300 720	Compliance	Applicable for UHF On-board vessels communication systems.

S. No.	Equipment Name	Parameter Name	Standard	Limits/ Values	Applicability/ Remarks
C3.17	VHF/UHF Equipment	Conformance to standards for Equipment used in VHF/UHF Radio Systems	ETSI EN 301 925	Compliance	Applicable for Radiotelephone transmitters and receivers for maritime mobile service operating in VHF band
C3.18	VHF/UHF Equipment	Conformance to standards for Equipment used in VHF/UHF Radio Systems	ETSI EN 301 178	Compliance	Applicable for portable VHF radiotelephone equipment for the maritime mobile service (for non-GMDSS applications only)
C3.19	VHF/UHF Equipment	Conformance to standards for Equipment used in VHF/UHF Radio Systems	ETSI EN 300 698	Compliance	Applicable for Radio telephone transmitters and receivers for the maritime mobile service operating in the VHF bands used on inland waterway
C3.20	HF Equipment	HF Radio Systems	ETSI EN 300 433	Compliance	Applicable to Citizen band (CB) Radio equipment.
C3.21	HF Equipment	HF Radio Systems	ETSI EN 303 402	Compliance	Applicable to maritime mobile transmitters and receivers.
C3.22	HF Equipment	HF Radio Systems	ETSI EN 301 783	Compliance	Applicable to commercially available amateur radio equipment.
C3.23	PTP Microwave Fixed Radio Systems	PTP Fixed Digital Radio Conformance	ETSI EN 302 217-2	Compliance	Applicable for full or split outdoor unit of Point to Point Microwave Fixed Radio Systems
C3.24	PMP Microwave Fixed Radio Systems	PMP Fixed Digital Radio Conformance	ETSI EN 302 326-2	Compliance	Applicable for full or split outdoor unit of Point to Multi-Point Microwave Fixed Radio Systems
C3.25	VSAT	Conformance to standards for Satellite	Compliance to ETSI EN 301 443	Compliance	For C Band
C3.26	VSAT	Conformance to standards for Satellite	Compliance to ETSI EN 301 428	Compliance	For Ku Band

Note to Annexure -C:

1. “Frequency of operation” and “maximum transmitted power “shall be entered in BOM file as per guidelines of WPC/DOT.
2. Usage scenario of equipment shall be entered in BOM. Various Usage Scenarios for different types of equipment like MRTS equipment, VHF/UHF/HF Radio are listed in Annexure-C3 along-with the applicable EN standard. There may be multiple ENs applicable for a single usage scenario as per the applicability mentioned. For example - HF Radio intended for Maritime usage in Citizen Band will have to get conformance against both EN standard mentioned in Annexure C3.20 & Annexure C3.21.
3. Type of VHF/UHF/HF/MRTS equipment- Base station fixed mobile transportable equipment; handheld, base band processing equipment etc. shall be entered in BOM.

Annexure-D: Parameters for 2-wire PSTN Lines, Trunks lines and CPEs connected thereon (INT2W & CPE2W)

Parameter Group: 2-Wire Interface (INT2W) and CPEs connected on 2-Wire (CPE2W)

S. No.	Equipment Name	Parameter Name	Standard	Limits/ Values	Applicability/ Remarks
D.1	2-Wire CPEs and Interfaces	Longitudinal/ Transverse Conversion Loss	Q.552 Clause 2.2.2 & Figure 2 / TBR.21 Clause 4.4.3	As in Figure 2, Annexure-D4	**Refer Note 1**
D.2	2-Wire CPEs and Interfaces	Return Loss	Q.552 Clause 2.2.1.2 and Figure 1	As in Figure 1, Annexure-D4	
D.3	2-Wire CPEs and Interfaces	Over Voltage/ Over Current Protection	K.21	Compliance	Compliance of this test only if port is connected to external lines e.g. in case of xDSL lines.
D.4	2-Wire CPEs and Interfaces	Maximum Loop Current	ETSI EN 300 001	< 60 mA	
D.5	2-Wire CPEs and Interfaces	Idle State Current	ETSI EN 300 001	< 40 µA/ 130µA	Without/ with CLIP display
D.6	2-Wire CPEs and Interfaces	Insulation Test	ETSI EN 300 001	$\geq$ 5 MΩ	**Refer Note 1**
D.7	2-Wire CPEs and Interfaces	Resistance to Earth	TBR-21 Clause 4.4.4	$\geq$ 10 MΩ	
D.8	2-wire Trunk Line	DC Resistance	ETSI TBR-21 Clause 4.4.1	$\geq$ 1 MΩ	
D.9	2-wire Trunk Line	Minimum Current on MGW Trunk Line	ETSI EN 300 001	$\geq$ 60 µA	
D.10	Telephones/ Fax with Handset	Acoustic Shock Absorption	P.360 Clause 4.1	Compliance	
D.11	Audio Conferencing Equipment	Voice Conference Verification	Functional Test	Compliance	
D.12	Fax, Modem	Transmit Power for Fax Machine/ Modem	T.4 Clause 6	-3dBm to -15 dBm	
D.13	Fax	Receiver Sensitivity for FAX	T.4 Clause 7	> -43 dBm	
D.14	Modem	Receiver Signal for Modem	V.34 (para 6.6)	> -43 dBm ON < -48 dBm OFF	
D.15	2-wire line and trunk	Transmission of DTMF Signals	Q.23 Clause 6 and 7	Compliance	

D.16	2- Wire Trunk	Current on Junction/ Trunk Line in PABX		< 60 mA	

Note 1: This test is exempted provided an undertaking should be submitted by the supplier that 2-wire equipment is not intended to be connected to Earth. In case the 2- wire equipment is intended to be connected to Earth by any supplier then the test would be required

Annexure-D1: ISDN Layer-III Specifications Test

Parameter Group: ISDN Conformance (ISDNCONF)

S. No.	Equipment Name	Parameter Name	Standard	Limits/ Values	Applicability/ Remarks
D1.1	ISDN BRI and PRI	Layer III specification Messages for circuit-mode connection basic call control.	Q.931 Applicable to ISDN BRI and PRI	Compliance	
D1.2		ALERTING	Clause no. 3.1.1		
D1.3		CALL PROCEEDING	Clause no. 3.1.2		
D1.4		CONNECT	Clause no. 3.1.3		
D1.5		SETUP	Clause no. 3.1.14		
D1.6		SETUP ACKNOWLEDGE	Clause no. 3.1.15		
D1.7		DISCONNECT	Clause no. 3.1.5		
D1.8		RELEASE	Clause no. 3.1.9		
D1.9		D1.10 **RELEASE** COMPLETE	Clause no. 3.1.10		
D1.11		Bearer capability	Clause no. 4.5.5		
D1.12		Called party number	Clause no. 4.5.8		
D1.13		Calling party number	Clause no. 4.5.10		
D1.14		Channel identification	Clause no. 4.5.13		
D1.15		Normal call clearing	As per Table 6-5		
D1.16		Call clearing User Busy	As per Table 6-5		
D1.17		Call clearing Invalid number format or incomplete number	As per Table 6-5		
D1.18		Call clearing No answer	As per Table 6-5		

Annexure-D2: Parameters for Cordless Telephone

Parameter Group: Radio Conformance (RADCONF)

Note: Maximum Range shall be 100 m.

S. No.	Parameter Name	Frequency	Power	Remarks
D2.1	Frequency band of Operation and Transmit Power – Base Unit only	1610, 1640, 1675, 1690 KHz	Transmit power < 500 mW	
D2.2	Frequency band of Operation and Transmit Power – Base and Remote Unit	26.375, 26.475, 26.575, 26.625, 46.675, 46.725, 46.775, 46.825, 46.830, 49.845, 49.860, 49.875 MHz.	Transmit power < 500 mW for Base Unit Transmit Power < 200 mW for Remote Unit	
D2.3	Frequency band of Operation and Transmit Power – Remote Unit only	150.360, 150.750, 150.850, 150.950 MHz.	Transmit power < 50 mW	
D2.4	Transmitted frequency by Base Unit	46.610, 46.630, 46.670, 46.710, 46.730, 46.770, 46.830, 46.870, 46.930, 46.970, 43.720, 43.740, 43.820, 43.840, 43.920, 43.960, 44.120, 44.160, 44.180, 44.200, 44.320, 44.360, 44.400, 44.460, 44.480 MHz	RF Power < 500 mW	
D2.5	Transmitted frequency by Handset	49.670, 49.845, 49.860, 49.770, 49.875, 49.830, 49.890, 49.930, 49.990, 49.970, 48.760, 48.840, 48.860, 48.920, 49.020, 49.080, 49.100, 49.160, 49.200, 49.240, 49.280, 49.360, 49.400, 49.460, 49.500 MHz	RF Power < 100 mW	
D2.6	Frequency of Operation	926-926.5 MHz	Very low power Cordless Phone	
D2.7	Frequency and Power for FHSS	2.4-2.4835 GHz	Power < 100 mW Power Spectral Density < 100 mW/100 KHz EIRP	
D2.8	D2.9 Frequency and Power for other modulation types	2.4-2.4835 GHz	Power < 100 mW Power Spectral Density < 10 mW/1 MHz EIRP	

S. No.	Parameter Name	Frequency	Power	Remarks
D2.10	Frequency and Power in 5 GHz band	5.150-5.350 and 5.725-5.875 GHz	Mean EIRP < 200 mW Power Spectral Density < 10 mW/1 MHz EIRP	
D2.11	Maximum Frequency Deviation	5 Khz		
D2.12	Transmitter narrowband spurious emission	30 MHz- 1 GHz	When operating: < -36dBm, When in stand-by: < -57 dBm.	
D2.13	Transmitter narrowband spurious emission	>1GHz-12.75GHz	When operating: < -30dBm, When in stand-by: < -47 dBm.	
D2.14	Transmitter narrowband spurious emission	>1.8GHz-1.9GHz and 5.15 GHz-5.3 GHz	When operating: < -47dBm, When in stand-by: < -47 dBm.	
D2.15	Transmitter wideband spurious emission	30 MHz-1GHz	When operating: < -86dBm/Hz, When in stand-by: < -107 dBm/Hz.	
D2.16	Transmitter wideband spurious emission	>1GHz-12.75GHz	When operating: < -80dBm/Hz, When in stand-by: < -97 dBm/Hz.	
D2.17	Transmitter wideband spurious emission	>1.8GHz-1.9GHz and 5.15 GHz-5.3 GHz	When operating: < -97dBm/Hz, When in stand-by: < -97 dBm/Hz.	
D2.18	Receiver narrowband spurious emission	30 MHz-1GHz	< -57 dBm	
D2.19	Receiver narrowband spurious emission	>1GHz-12.75GHz	< -47 dBm	
D2.20	Receiver wideband spurious emission	30 MHz-1GHz	< -107 dBm/Hz	
D2.21	Receiver wideband spurious emission	>1GHz-12.75GHz	< -97 dBm/Hz	

Annexure-D3: CCS#7 Conformance Parameters

Parameter Group: ISDN Conformance (ISDNCONF)

S. No.	Parameter Name	Individual Parameter Name	Standard	Test no.	Applicability/ Remarks
D3.1	CCS#7 MTP2 Parameters	Timer T2	ITU-T Q.781. Annex-D3	Test 1.2	Signaling Gateway and Media Gateway
D3.2	CCS#7 MTP2 Parameters	Timer T3	ITU-T Q.781. Annex-D3	Test 1.3	
D3.3	CCS#7 MTP2 Parameters	Timer T4 and T1	ITU-T Q.781. Annex-D3	Test 1.4	
D3.4	CCS#7 MTP2 Parameters	Normal Alignment	ITU-T Q.781. Annex-D3	Test 1.5	

S. No.	Parameter Name	Individual Parameter Name	Standard	Test no.	Applicability/ Remarks
D3.5	CCS#7 MTP2 Parameters	Emergency Alignment T4E	ITU-T Q.781. Annex-D3	Test 1.19	
D3.6	CCS#7 MTP3 Parameters	SignallingLinkset deactivation	ITU-T Q.782. Annex-D3	Test 1.2	
D3.7	CCS#7 MTP3 Parameters	SignallingLinkset activation	ITU-T Q.782. Annex-D3	Test 1.3	
D3.8	CCS#7 MTP3 Parameters	Message with Invalid DPC	ITU-T Q.782. Annex-D3	Test 2.2	
D3.9	CCS#7 MTP3 Parameters	Message with erroneous SI	ITU-T Q.782. Annex-D3	Test 2.3	
D3.10	CCS#7 MTP3 Parameters	Additional CBD	ITU-T Q.782. Annex-D3	Test 4.3	
D3.11	CCS#7 MTP3 Parameters	No acknowledgement to first CBD	ITU-T Q.782. Annex-D3	Test 4.4	
D3.12	CCS#7 MTP3 Parameters	Inhibition of available link	ITU-T Q.782. Annex-D3	Test7.1.1	
D3.13	CCS#7 MTP3 Parameters	Inhibition of unavailable link	ITU-T Q.782. Annex-D3	Test 7.1.2	
D3.14	CCS#7 MTP3 Parameters	Signaling Link test: After activation of a link	ITU-T Q.782. Annex-D3	Test 12.1	
D3.15	CCS#7 ISUP Parameters	Reset Received	ITU-T Q.784. Annex-D3	Test 1.2.1	Signaling Gateway
D3.16	CCS#7 ISUP Parameters	Reset Sent	ITU-T Q.784. Annex-D3	Test 1.2.2	
D3.17	CCS#7 ISUP Parameters	Circuit Group Reset Received	ITU-T Q.784. Annex-D3	Test 1.2.5	
D3.18	CCS#7 ISUP Parameters	Circuit Group Reset Sent	ITU-T Q.784. Annex-D3	Test 1.2.6	
D3.19	CCS#7 ISUP Parameters	CGB and CGU Received	ITU-T Q.784. Annex-D3	Test 1.3.1.1	
D3.20	CCS#7 ISUP Parameters	CGB and CGU Sent	ITU-T Q.784. Annex-D3	Test 1.3.1.2	

S. No.	Parameter Name	Individual Parameter Name	Standard	Test no.	Applicability/ Remarks
D3.21	CCS#7 ISUP Parameters	Circuit Blocking received	ITU-T Q.784. Annex-D3	Test 1.3.2.1	
D3.22	CCS#7 ISUP Parameters	Circuit Blocking sent	ITU-T Q.784. Annex-D3	Test 1.3.2.2	

Annexure-D4: Figures

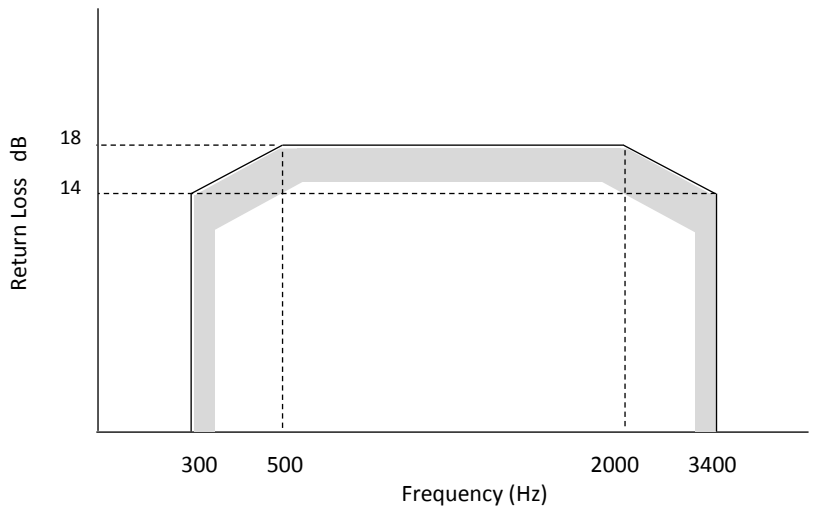


Fig. 1: Minimum Value of return Loss

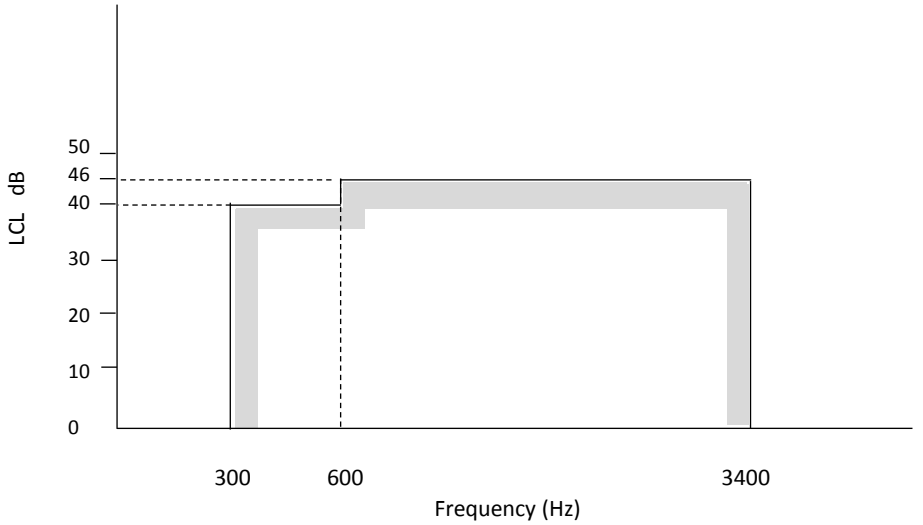


Fig. 2: Minimum Value of LCL

Annexure-F: Frequency of Operation for Cellular Wireless Interfaces and Equipment

Parameter Group: Cellular (CELLULAR)

S. No.	Technology	Parameter Name	Standard	Limits/ Values	Applicability/ Remarks	Test Procedure

F.1	CDMA2000	Frequency of Operation		Latest NFAP issued by WPC.		Appendix - II Test 36
F.2	2G/ GSM/ GPRS/ EDGE	Frequency of Operation		Latest NFAP issued by WPC.		Appendix - II Test 36
F.3	3G/ WCDMA/ HSPA	Frequency of Operation		Latest NFAP issued by WPC.		Appendix - II Test 36
F.4	4G/ LTE/ LTE-A	Frequency of Operation		Latest NFAP issued by WPC.		Appendix - II Test 36
F.5	BTS with MSR	BTS with MSR Operating Frequency		Latest NFAP issued by WPC.		Appendix - II Test 36
F.6	BTS with AAS	BTS with AAS Operating Frequency		Latest NFAP issued by WPC.		Appendix - II Test 36

Annexure-F1: Radio Conformance Test for Base Transceiver Station (BTS) and Compact Cellular Network (CCN) using 2G/ GSM/ GPRS/ EDGE Technology

Parameter Group: Cellular (CELLULAR)

S. No.	Parameter Name	Individual Parameter Name	Standard	Clause	Applicability/ Remarks
F1.1	GSM BTS Transmitter Parameters	Adjacent channel power	3GPP TS 51.021	Clause 6.5	
F1.2		Wideband noise and intra BSS intermodulation attenuation in multicarrier operation	3GPP TS 51.021	Clause 6.12	
F1.3		Spurious emissions from the transmitter antenna connector	3GPP TS 51.021	Clause 6.6	
F1.4		Mean transmitted RF carrier power	3GPP TS 51.021	Clause 6.3	
F1.5		Intermodulation attenuation	3GPP TS 51.021	Clause 6.7	
F1.6		Intra Base Station System intermodulation attenuation	3GPP TS 51.021	Clause 6.8	
F1.7		Radiated spurious emissions	3GPP TS 51.021	Clause 8	
F1.8	GSM BTS Receiver Parameters	Static Reference Sensitivity Level	3GPP TS 51.021	Clause 7.3	
F1.9		Reference interference level	3GPP TS 51.021	Clause 7.5	
F1.10		Blocking Characteristics	3GPP TS 51.021	Clause 7.6	
F1.11		Intermodulation characteristics	3GPP TS 51.021	Clause 7.7	
F1.12		AM suppression	3GPP TS 51.021	Clause 7.8	
F1.13		Spurious emissions from the receiver antenna connector	3GPP TS 51.021	Clause 7.9	

Annexure-F2: Radio Conformance Test for NodeB and Compact Cellular Network (CCN) using 3G/WCDMA/HSPA Technology

Parameter Group: Cellular (CELLULAR)

S. No.	Parameter Name	Individual Parameter Name	Standard	Clause	Applicability/ Remarks
F2.1	WCDMA NodeB Transmitter Parameters	Spectrum emission mask	3GPP TS 25.141	Clause 6.5.2.1	NodeB and CCN
F2.2		Adjacent Channel Leakage Power Ratio (ACLR)	3GPP TS 25.141	Clause 6.5.2.2	
F2.3		Spurious emissions	3GPP TS 25.141	Clause 6.5.3	
F2.4		Base station output power	3GPP TS 25.141	Clause 6.2	
F2.5		Transmitter intermodulation	3GPP TS 25.141	Clause 6.6	
F2.6	WCDMA NodeB Receiver Parameters	Spurious Emissions	3GPP TS 25.141	Clause 7.7	
F2.7		Blocking characteristics	3GPP TS 25.141	Clause 7.5	
F2.8		Intermodulation characteristics	3GPP TS 25.141	Clause 7.6	
F2.9		Adjacent Channel Selectivity (ACS)	3GPP TS 25.141	Clause 7.4	
F2.10		Reference sensitivity level	3GPP TS 25.141	Clause 7.2	
F2.11	WCDMA NodeB Home BTS AdjChl Op Power	Home base station output power for adjacent channel protection	3GPP TS 25.141	Clause 6.4.6	NodeB

Annexure-F3: Radio Conformance Test for eNodeB and Compact Cellular Network (CCN) using 4G/LTE/LTE-A Technology

Parameter Group: Cellular (CELLULAR)

S. No.	Parameter Name	Individual Parameter Name	Standard	Clause	Applicability/ Remarks
F3.1	LTE eNodeB Transmitter Parameters	Operating band unwanted emissions	3GPP TS 36.141	Clause 6.6.3	eNodeB and CCN
F3.2		Adjacent Channel Leakage Power Ratio (ACLR)	3GPP TS 36.141	Clause 6.6.2	
F3.3		Transmitter spurious emissions	3GPP TS 36.141	Clause 6.6.4	
F3.4		Base station output power	3GPP TS 36.141	Clause 6.2	
F3.5		Transmitter intermodulation	3GPP TS 36.141	Clause 6.7	
F3.6	LTE eNodeB Receiver Parameters	Receiver spurious emissions	3GPP TS 36.141	Clause 7.7	
F3.7		Blocking	3GPP TS 36.141	Clause 7.6	
F3.8		Receiver intermodulation	3GPP TS 36.141	Clause 7.8	
F3.9		Adjacent Channel Selectivity (ACS) and narrow-band blocking	3GPP TS 36.141	Clause 7.5	
F3.10		Reference sensitivity level	3GPP TS 36.141	Clause 7.2	
F3.11	LTE eNodeB Home BS Parameters	Home BS output power for adjacent UTRA channel protection : Applicable to Home base Station only	3GPP TS 36.141	Clause 6.2.6	eNodeB
F3.12		Home BS output power for adjacent E-UTRA channel protection: Applicable to Home base Station only	3GPP TS 36.141	Clause 6.2.7	
F3.13		Home BS output power for co-channel E-UTRA protection: Applicable to Home base Station only	3GPP TS 36.141	Clause 6.2.8	

Annexure-F4: Radio Conformance Test for Base Station (BS) using Multi Standard Radio (MSR) Technology

Parameter Group: Cellular (CELLULAR)

S. No.	Parameter Name	Individual Parameter Name	Standard	Clause	Applicability/ Remarks
F4.1	BS with MSR Transmitter Parameters	Base Station output power	3GPP TS 37.141	Clause 6.2	BS with MSR
F4.2		Transmitter spurious emissions	3GPP TS 37.141	Clause 6.6.1	
F4.3		Operating band unwanted emissions	3GPP TS 37.141	Clause 6.6.2	
F4.4		Adjacent Channel Leakage Power Ratio (ACLR)	3GPP TS 37.141	Clause 6.6.4	
F4.5		Transmitter intermodulation	3GPP TS 37.141	Clause 6.7	
F4.6	BS with MSR Receiver Parameters	Receiver spurious emissions	3GPP TS 37.141	Clause 7.6	
F4.7		In-band selectivity and blocking or In Band Blocking and Narrow band Blocking	3GPP TS 37.141	Clause 7.4	
F4.8		Out-of-band blocking	3GPP TS 37.141	Clause 7.5	
F4.9		Receiver intermodulation	3GPP TS 37.141	Clause 7.7	
F4.10		Reference sensitivity level	3GPP TS 37.141	Clause 7.2	

Annexure-F5: Radio Conformance Test for Base station (BS) using Active Antenna System (AAS)

Parameter Group: Cellular (CELLULAR)

S. No.	Parameter Name	Individual Parameter Name	Standard	Clause	Applicability/ Remarks
F5.1	BS with AAS Transmitter Parameters	Base Station output power	3GPP TS 37.145-1	Clause 6.2	BS with AAS
F5.2		Spurious emission	3GPP TS 37.145-1	Clause 6.6.6	
F5.3		Operating band unwanted emission	3GPP TS 37.145-1	Clause 6.6.5	
F5.4		Adjacent Channel Leakage Power Ratio	3GPP TS 37.145-1	Clause 6.6.3	
F5.5		Spectrum emission mask	3GPP TS 37.145-1	Clause 6.6.4	
F5.6		Transmitter intermodulation	3GPP TS 37.145-1	Clause 6.7	
F5.7	BS with AAS Receiver Parameters	Reference sensitivity level	3GPP TS 37.145-1	Clause 7.2	
F5.8		Adjacent channel selectivity and narrowband blocking or In Band Blocking and Narrow band Blocking	3GPP TS 37.145-1	Clause 7.4	
F5.9		Blocking or out-of-band blocking	3GPP TS 37.145-1	Clause 7.5	
F5.10		Receiver spurious emissions	3GPP TS 37.145-1	Clause 7.6	
F5.11		Receiver intermodulation	3GPP TS 37.145-1	Clause 7.7	

Annexure-F6: Radio Conformance Test for Cellular Wireless Repeaters using 2G/GSM Technology

Parameter Group: Cellular (CELLULAR)

S. No.	Parameter Name	Individual Parameter Name	Standard	Clause	Applicability/ Remarks
F6.1	GSM Repeater Station Parameters	Output Power	3GPP TS 45.005	Clause 4.1.2	
F6.2		Spurious emissions	3GPP TS 51.026	Clause 5	
F6.3		Frequency Error	3GPP TS 51.026	Clause 8	
F6.4		Intermodulation Attenuation	3GPP TS 51.026	Clause 6	
F6.5		Out of Band Gain	3GPP TS 51.026	Clause 7	

Annexure-F7: Radio Conformance Test for Cellular Wireless Repeaters using 3G/WCDMA ULTRA FDD Technology

Parameter Group: Cellular (CELLULAR)

S. No.	Parameter Name	Individual Parameter Name	Standard	Clause	Applicability/ Remarks
F7.1	WCDMA Repeater Station Parameters	Output Power	3GPP TS 25.143	Clause 6	
F7.2		Out of band emission	3GPP TS 25.143	Clause 9.1	
F7.3		Spurious emissions	3GPP TS 25.143	Clause 9.2	
F7.4		Input intermodulation	3GPP TS 25.143	Clause 11	
F7.5		Out of band gain	3GPP TS 25.143	Clause 8	
F7.6		Adjacent Channel Rejection Ratio	3GPP TS 25.143	Clause 13	
F7.8		Output intermodulation	3GPP TS 25.143	Clause 12	

Annexure-F8: Radio Conformance Test for Cellular Wireless Repeaters using 4G/LTE FDD Technology

Parameter Group: Cellular (CELLULAR)

S. No.	Parameter Name	Individual Parameter Name	Standard		Applicability /Remarks
F8.1	LTE Repeater Station Parameters	Output Power	3GPP TS 36.143 Clause 6		
F8.2		Operating band unwanted emissions	3GPP TS 36.143 Clause 9.1		
F8.3		Spurious emissions	3GPP TS 36.143 Clause 9.2		
F8.4		Input intermodulation	3GPP TS 36.143 Clause 11		
F8.5		Out of band gain	3GPP TS 36.143 Clause 8		
F8.6		Adjacent Channel Rejection Ratio	3GPP TS 36.143 Clause 13		
F8.7		Output intermodulation	3GPP TS 36.143 Clause 12		

Annexure-F9: Radio Conformance Test for Devices having Cellular Wireless Interface using CDMA2000 Technology

Parameter Group: Cellular (CELLULAR)

S. No.	Parameter Name	Individual Parameter Name	Standard		Applicability/Remarks
F9.1	CDMA Int Parameters	Transmitter Maximum output power	1x: S0011 Clause 4.4.5	EN 301 908-04 (CDMA) Clause 4.2.3	Test setup and test procedure along with the equipment required to conduct test must be included as available for Test 39 otherwise evaluation of applications of Labs for CAB/CB accreditation not possible.
F9.2		Transmitter Spectrum emissions mask	1x: S0011 Clause 4.5.1	EN 301 908-04 (CDMA) Clause 4.2.2	Same as above
F9.3		Transmitter spurious emissions in active mode (Conducted)	1x: S0011 Clause 4.5.1	EN 301 908-04 (CDMA) Clause 4.2.2	Same as above
F9.4		Receiver spurious emission in idle mode (Conducted)	1x: S0011 Clause 3.6	EN 301 908-04 (CDMA) Clause 4.2.5	Same as above
F9.5		Receiver Adjacent Channel Selectivity (ACS)		EN 301 908-04 (CDMA) Clause 4.2.8	Same as above
F9.6		Receiver In-band blocking		EN 301 908-04 (CDMA) Clause 4.2.6	Same as above
The following parameter "Frequency Stability" and "Power control Absolute Power Tolerance" shall be applicable for End Point Devices for Environmental Mentoring only.					
F9.7		Frequency Stability	1x: S0011 4.1	EN 301 908-04 (CDMA)	Compliance to given Standard Test setup and test procedure along with the equipment required to conduct test must be included as available for Test 39 otherwise evaluation of applications

					of Labs for CAB/CB accreditation not possible.
F9.8		Receiver Reference Sensitivity Level		EN 301 908-04 (CDMA)	Compliance to given Standard Test setup and test procedure along with the equipment required to conduct test must be included as available for Test 39 otherwise evaluation of applications of Labs for CAB/CB accreditation not possible.

Annexure-F10: Radio Conformance Test for Devices having Cellular Wireless Interface using GSM/ GPRS/ EDGE Technology

Parameter Group: Cellular (CELLULAR)

S. No.	Parameter Name	Individual Parameter Name	Standard		Applicability/Remarks
F10.1	GSM Int Parameters	Transmitter Maximum output power	3GPP TS 51 010-1 Clause 13.3	EN 301 511 (GSM) Clause 4.2.5	GSM Test setup and test procedure along with the equipment required to conduct test must be included as available for Test 39 otherwise evaluation of applications of Labs for CAB/CB accreditation not possible.
F10.2		Transmitter Maximum output power	3GPP TS 51 010-1 Clause 13.16.2	EN 301 511 (GSM) Clause 4.2.10	GPRS/ EDGE Same as above.
F10.3		Output RF Spectrum	3GPP TS 51 010-1 Clause 13.4	EN 301 511 (GSM) Clause 4.2.6	GSM Same as above.
F10.4		Output RF Spectrum	3GPP TS 51 010-1 Clause 13.16.3	EN 301 511 (GSM) Clause 4.2.11	GPRS/ EDGE Same as above.
F10.5		Spurious emissions (MS allocated a channel)	3GPP TS 51 010-1 Clause 12.1.1	EN 301 511 (GSM) Clause 4.2.12	GSM Same as above.
F10.6		Spurious emission (MS in idle mode)	3GPP TS 51 010-1 Clause 12.1.2	EN 301 511 (GSM) Clause 4.2.13	GSM Same as above.
F10.7		Frequency Error and phase error	3GPP TS 51 010-1 Clause 13.1	EN 301 511 (GSM) Clause 4.2.1	GSM Same as above.

S. No.	Parameter Name	Individual Parameter Name	Standard		Applicability/Remarks
F10.8		Frequency Error and phase error	GPRS:3GPP TS 51 010-1 Clause 13.16.1	EN 301 511 (GSM) Clause 4.2.4	GPRS/ EDGE Same as above.
F10.9		Reference sensitivity level (speech channels)	3GPP TS 51 010-1 Clause 14.2.1	EN 301 511 (GSM) Clause 4.2.42	GSM Same as above.
F10.10		Adjacent Channel Rejection (speech channels)	3GPP TS 51 010-1 Clause 14.5.1	EN 301 511 (GSM) Clause 4.2.38	GSM Same as above.
F10.11		Receiver blocking	3GPP TS 51 010-1 Clause 14.7.1	EN 301 511 (GSM) Clause 4.2.20	GSM Same as above.

Annexure-F11: Radio Conformance Test for Devices having Cellular Wireless Interface using WCDMA/ HSPA Technology

Parameter Group: Cellular (CELLULAR)

S. No.	Parameter Name	Individual Parameter Name	Standard		Applicability/Remarks
F11.1	WCDMA Int Parameters	Transmitter Maximum output power	3GPP TS 34.121-1 Clause 5.2	EN 301 908-2 (UMTS) Clause 4.2.2	Test setup and test procedure along with the equipment required to conduct test must be included as available for Test 39 otherwise evaluation of applications of Labs for CAB/CB accreditation not possible.
F11.2		Transmitter Spectrum emissions mask	3GPP TS 34.121-1 Clause 5.9	EN 301 908-2 (UMTS) Clause 4.2.3	Same as above

S. No.	Parameter Name	Individual Parameter Name	Standard		Applicability/Remarks
F11.3		Transmitter spurious emissions	3GPP TS 34.121-1 Clause 5.11	EN 301 908-2 (UMTS) Clause 4.2.4	Same as above
F11.4		Receiver spurious emission	3GPP TS 34.121-1 Clause 6.8	EN 301 908-2 (UMTS) Clause 4.2.10	Same as above
F11.5		Transmitter Minimum Output Power	3GPP TS 34.121-1 Clause 5.4.3	EN 301 908-2 (UMTS) Clause 4.2.5	Same as above
F11.6		Receiver Reference sensitivity level	3GPP TS 34.121-1 Clause 6.2	EN 301 908-2 (UMTS) Clause 4.2.13	Same as above
F11.7		Receiver Adjacent Channel Selectivity (ACS)	3GPP TS 34.121-1 Clause 6.4	EN 301 908-2 (UMTS) Clause 4.2.6	Same as above
F11.8		Receiver In-band blocking	3GPP TS 34.121-1 Clause 6.5.2.1	EN 301 908-2 (UMTS) Clause 4.2.7	Same as above
The following parameter "Frequency Stability" shall be applicable for End Point Devices for Environmental Mentoring only.					
F11.9		Frequency Stability	3GPP TS 34.121-1 5.3	EN 301 908-2 (UM3GPP TS)	Compliance to given Standard.

Annexure-F12: Radio Conformance Test for Devices having Cellular Wireless Interface using LTE/ LTE-A Technology

Parameter Group: Cellular (CELLULAR)

S. No.	Parameter Name	Individual Parameter Name	Standard		Applicability/Remarks
F12.1	LTE Int Parameters	Maximum output power	3GPP TS 36.521-1 Clause 6.2.2	EN 301 908-13 (LTE) Clause 4.2.2	Test setup and test procedure along with the equipment required to conduct test must be included as available for Test 39 otherwise evaluation of applications of Labs for CAB/CB accreditation not possible.
F12.2		Spectrum emissions mask	3GPP TS 36.521-1 Clause 6.6.2.1	EN 301 908-13 (LTE) Clause 4.2.3	Same as above
F12.3		Spurious emissions	3GPP TS 36.521-1 Clauses 6.6.3.1, 6.6.3.2, 6.6.3.3	EN 301 908-13 (LTE) Clause 4.2.4	Same as above
F12.4		Receiver spurious emission	3GPP TS 36.521-1 Clause 7.9	EN 301 908-13 (LTE) Clause 4.2.10	Same as above
F12.5		Receiver Reference Sensitivity level	3GPP TS 36.521-1 Clause 7.3	EN 301 908-13 (LTE) Clause 4.2.12	Same as above
F12.6		Receiver Adjacent Channel Selectivity (ACS)	3GPP TS 36.521-1 Clause 7.5	EN 301 908-13 (LTE) Clause 4.2.6	Same as above
F12.7		Receiver In-band blocking	3GPP TS 36.521-1 Clause 7.6.1	EN 301 908-13 (LTE) Clause 4.2.7	Same as above
The following parameter "Frequency Stability" and "Power control Absolute Power Tolerance" shall be applicable for End Point Devices for Environmental Mentoring only.					
F12.8		Frequency Stability	3GPP TS 36.521-1 6.5	EN 301 908-13 (LTE)	Compliance to given Standard.
F12.9		Power control Absolute Power Tolerance	3GPP TS 36.521-1 6.3.5.1	EN 301 908-13 (LTE)	Compliance to given Standard.

Annexure-G1: Parameters for Radio Interfaces for equipment operating in delicensed frequency bands

Parameter Group: Radio Conformance (RADCONF)

S. No.	Parameter Name	Standard/ Parameter	Limits/ Values	Applicability/Remarks
G1.1	Frequency for WiFi equipment	DoT WPC GSR No. 45(E), 1048(E)	**2.4 GHZ Band:** 2.4-2.4835 GHz as per WPC GSR 45(E) **5 GHz Band:** 5.150-5.250 GHz, 5.250-5.350 GHz, 5.470-5.725 GHz, 5.725-5.875 GHz as per WPC GSR 1048(E)	Wifi Interface Test procedure as per Appendix-II Test-1
G1.2	Frequency for PTP/ PMP Radio Interface	DoT WPC GSR No. 45(E), 1048(E)	**2.4 GHZ Band:** 2.4-2.4835 GHz as per WPC GSR 45(E) **5 GHz Band**: 5.150-5.350 GHz, 5.250-5.350 GHz, 5.470-5.725 GHz, 5.725-5.875 GHz as per WPC GSR 1048(E)	PTP/ PMP Wireless Access Equipment Test procedure as per Appendix-II Test-1

Annexure-G2: Parameters for Radio Interfaces for equipment operating in delicensed frequency bands

Parameter Group: Radio Conformance (RADCONF)

S. No.	Parameter Name	Standard/ Parameter	Limits/ Values	Remarks
G2.1	EIRP for all equipment operating in 2.4 GHz	Latest NFAP and GSRs issued by DoT WPC	$\leq$ 4 W for outdoor usage $\leq$ 200 mW for indoor usage Note: *EIRP requirements shall be as per the latest NFAP and GSRs issued by WPC, DoT and the requirements in NFAP and GSRs supersede the requirements listed here.*	Wifi Interface & PTP/PMP Wireless Access Equipment in 2.4 GHz Testing as per EN 300 328 or Appendix-II Test-1

S. No.	Parameter Name	Standard/ Parameter	Limits/ Values	Remarks
G2.2	EIRP for RLAN/ WLAN equipment operating in 5 GHz	Latest NFAP and GSRs issued by DoT WPC	As per WPC GSR 1048(E) Note: *EIRP requirements shall be as per the latest NFAP and GSRs issued by WPC and the requirements in NFAP and GSRs supersede the requirements listed here.*	Wifi Interface Testing as per EN 301893 or Appendix-II Test-1
G2.3	EIRP for PTP/ PMP fixed Radio systems operating in 5 GHz	Latest NFAP and GSRs issued by DoT WPC	As per WPC GSR 1048(E) Note: *EIRP requirements shall be as per the latest NFAP and GSRs issued by WPC and the requirements in NFAP and GSRs supersede the requirements listed here.*	PTP/PMP Wireless Access Equipment in 5 GHz Testing as per EN 302 502 or Appendix-II Test-1
G2.4	EIRP for Cordless Telephone	WPC GSR		Cordless Phone

Annexure-G3: Parameters for Radio Interfaces for equipment operating in delicensed frequency bands

Parameter Group: Radio Conformance (RADCONF)

S. No.	Parameter Name	Standard/ Parameter	Applicability/Limits/ Values	Remarks
G3.1	Radio Conformance for all WiFi equipment operating in 2.4 GHz	EN 300 328 or FCC CFR47 Part15.247 or FCC CFR47 Part 15.249		Wifi Interface & PTP/PMP Wireless Access Equipment in 2.4 GHz
G3.2	Radio Conformance for RLAN/WLAN WiFi equipment operating in 5 GHz	EN 301 893 or FCC CFR47 Part 15.407 or FCC CFR47 Part 15.249	FCC CFR47 15.407 for 5.150-5.350 GHz FCC CFR47 Part 15.249 for 5.725-5.875 GHz	Wifi Interface
G3.3	Radio Conformance for PTP/PMP Wireless Access Equipment operating in 5 GHz	EN 302 502 or FCC CFR47 Part 15.249	Except clauses 4.2.4, 4.2.6 and 4.2.8 of EN 302 502 in 5.825-5.875 GHz band) Conformance to FCC CFR47 Part 15.249 for 5.725-5.875 GHz	Wifi Interface & PTP/PMP Wireless Access Equipment in 5 GHz

Annexure-G4 Bluetooth Low Energy (BLE)/ ZigBee/6LowPAN working frequency band 2.400 to 2.4835 GHz

S. No.	Parameter Name	Standard/ Parameter	Applicability/Limits/ Values	Remarks
G4.1	Frequency of Operation of Interface	Latest NFAP Annexure-1	2.4 GHz to 2.4835 GHz (As per WPC GSR 45(E))	Test Setup No. 41
G4.2	EIRP for Interface	ETSI EN 300 328 V2.2.2 (2019-07)	≤ 4W (36 dBm) As per WPC GSR 45(E)	Test Setup No. 42 (Test as per ETSI EN 300 328 V2.2.2 (2019-07) clause 5.4.2.2)
G4.3	Maximum Transmit Power / RF Ouput Power of Interface	ETSI EN 300 328 V2.2.2 (2019-07)	≤ 1 W (30dBm) As per WPC GSR 45(E) (ETSI EN 300 328 V2.2.2 (2019-07) clause 4.3.1.2 or 4.3.2.2 may be referred)	Test Setup No. 42 (Test as per ETSI EN 300 328 V2.2.2 (2019-07)clause 5.4.2.2)
G4.4	Power Spectral Density	ETSI EN 300 328 V2.2.2 (2019-07)	As per ETSI EN 300 328 V2.2.2 (2019-07) clause 4.3.2.3 (*Only for non-FHSS equipment)*	(Test as per ETSI EN 300 328 V2.2.2 (2019-07)clause 5.4.3)
G4.5	Duty cycle, Tx-Sequence, Tx-gap	ETSI EN 300 328 V2.2.2 (2019-07)	As per ETSI EN 300 328 V2.2.2 (2019-07) clause 4.3.1.3 or 4.3.2.4 *(Only for non-Adaptive equipment)*	(Test as per ETSI EN 300 328 V2.2.2 (2019-07)clause 5.4.2)
G4.6	Accumulated Transmit time, Frequency Occupation & Hopping Sequence	ETSI EN 300 328 V2.2.2 (2019-07)	As per ETSI EN 300 328 V2.2.2 (2019-07) clause 4.3.1.4 *(Only for FHSS equipment)*	(Test as per ETSI EN 300 328 V2.2.2 (2019-07)clause 5.4.4)

S. No.	Parameter Name	Standard/ Parameter	Applicability/Limits/ Values	Remarks
G4.7	Hopping Frequency Separation	ETSI EN 300 328 V2.2.2 (2019-07)	As per ETSI EN 300 328 V2.2.2 (2019-07) clause 4.3.1.5 *(Only for FHSS equipment)*	(Test as per ETSI EN 300 328 V2.2.2 (2019-07) clause 5.4.5)
G4.8	Medium Utilization (MU) factor	ETSI EN 300 328 V2.2.2 (2019-07)	As per ETSI EN 300 328 V2.2.2 (2019-07) clause 4.3.1.6 or 4.3.2.5 *(Only for non-Adaptive equipment)*	(Test as per ETSI EN 300 328 V2.2.2 (2019-07)clause 5.4.2)
G4.9	Adaptivity	ETSI EN 300 328 V2.2.2 (2019-07)	As per ETSI EN 300 328 V2.2.2 (2019-07) clause 4.3.1.7 or 4.3.2.6 *(Only for Adaptive equipment)*	(Test as per ETSI EN 300 328 V2.2.2 (2019-07)clause 5.4.6)
G4.10	Occupied Channel Bandwidth	ETSI EN 300 328 V2.2.2 (2019-07)	As per ETSI EN 300 328 V2.2.2 (2019-07) clause 4.3.1.8 or 4.3.2.7	(Test as per ETSI EN 300 328 V2.2.2 (2019-07)clause 5.4.7)
G4.11	Transmitter unwanted emission in the OOB domain	ETSI EN 300 328 V2.2.2 (2019-07)	As per ETSI EN 300 328 V2.2.2 (2019-07) clause 4.3.1.9 or 4.3.2.8	(Test as per ETSI EN 300 328 V2.2.2 (2019-07)clause 5.4.8)
G4.12	Transmitter unwanted emissions in the spurious domain	ETSI EN 300 328 V2.2.2 (2019-07)	As per ETSI EN 300 328 V2.2.2 (2019-07) clause 4.3.1.10 or 4.3.2.9	(Test as per ETSI EN 300 328 V2.2.2 (2019-07)clause 5.4.9)
G4.13	Receiver spurious emissions	ETSI EN 300 328 V2.2.2 (2019-07)	As per ETSI EN 300 328 V2.2.2 (2019-07) clause 4.3.1.11 or 4.3.2.10	(Test as per ETSI EN 300 328 V2.2.2 (2019-07)clause 5.4.10)
G4.14	Receiver Blocking	ETSI EN 300 328 V2.2.2 (2019-07)	As per ETSI EN 300 328 V2.2.2 (2019-07) clause 4.3.1.12 or 4.3.2.11	(Test as per ETSI EN 300 328 V2.2.2 (2019-07)clause 5.4.11.2)

S. No.	Parameter Name	Standard/ Parameter	Applicability/Limits/ Values	Remarks
G4.15	Geo-location capability	ETSI EN 300 328 V2.2.2 (2019-07)	As per ETSI EN 300 328 V2.2.2 (2019-07) clause 4.3.1.13 or 4.3.2.12 *(Only for equipment with geo-location capability)*	

Annexure-G5 LoRa/ SigFox/ RFID / RF Mesh working in frequency band 865 MHz to 867 MHz

S. No.	Parameter Name	Standard/ Parameter	Applicability/Limits/ Values	Remarks
G5.1	Frequency of Operation of Interface	Latest NFAP Annexure-1	865 MHz to 867 MHz (As per WPC GSR 564(E))	
G5.2	EIRP for Interface	ETSI EN 300 220-2 V3.2.1 (2018-06)	< 4 W As per WPC GSR 564 (E)	Test as per ETSI EN 300 220-1 V3.1.1 clause 5.2.2
G5.3	Maximum Transmit Power	ETSI EN 300 220-2 V3.2.1 (2018-06)	< 1 W As per WPC GSR 564 (E)	Test as per ETSI EN 300 220-1 V3.1.1 clause 5.2.2
G5.4	Unwanted emissions in the spurious domain	ETSI EN 300 220-2 V3.2.1 (2018-06)	As per ETSI EN 300 220-2 V3.2.1 clause 4.2.2	Test as per ETSI EN 300 220-1 V3.1.1 clause 5.9.3
G5.5	TX effective radiated power	ETSI EN 300 220-2 V3.2.1 (2018-06)	As per ETSI EN 300 220-2 V3.2.1 clause 4.3.1	Test as per ETSI EN 300 220-1 V3.1.1 clause 5.2.2

S. No.	Parameter Name	Standard/ Parameter	Applicability/Limits/ Values	Remarks
G5.6	TX Maximum e.r.p spectral density	ETSI EN 300 220-2 V3.2.1 (2018-06)	As per ETSI EN 300 220-2 V3.2.1 clause 4.3.2 *(Applies to EUT using annex B bands I, L. Applies to EUT using DSSS or wideband techniques other than FHSS modulation, using annex C band X.)*	Test as per ETSI EN 300 220-1 V3.1.1 clause 5.3.2
G5.7	TX Duty cycle	ETSI EN 300 220-2 V3.2.1 (2018-06)	As per ETSI EN 300 220-2 V3.2.1 clause 4.3.3 *(Not applicable to EUT with polite spectrum access where permitted in annex B, table B.1 or annex C, table C.1 or any NRI.)*	Test as per ETSI EN 300 220-1 V3.1.1 clause 5.5.2
G5.8	TX Occupied bandwidth / Carrier bandwidth	ETSI EN 300 220-2 V3.2.1 (2018-06)	200 KHz (As per GSR 564 (E)) (Ref : ETSI EN 300 220-2 V3.2.1 clause 4.3.4)	Test as per ETSI EN 300 220-1 V3.1.1 clause 5.6.3
G5.9	TX out of band emissions	ETSI EN 300 220-2 V3.2.1 (2018-06)	As per ETSI EN 300 220-2 V3.2.1 clause 4.3.5 (*Applies to EUT with OCW > 25 kHz.)*	Test as per ETSI EN 300 220-1 V3.1.1 clause 5.8.3
G5.10	TX Transient	ETSI EN 300 220-2 V3.2.1 (2018-06)	As per ETSI EN 300 220-2 V3.2.1 clause 4.3.6	Test as per ETSI EN 300 220-1 V3.1.1 clause 5.10.3
G5.11	TX Adjacent channel power	ETSI EN 300 220-2 V3.2.1 (2018-06)	As per ETSI EN 300 220-2 V3.2.1 clause 4.3.7 *(Applies to EUT with OCW ≤ 25 kHz)*	Test as per ETSI EN 300 220-1 V3.1.1 clause 5.11.3
G5.12	TX behaviour under low voltage conditions	ETSI EN 300 220-2 V3.2.1 (2018-06)	As per ETSI EN 300 220-2 V3.2.1 clause 4.3.8 *(Applies to battery powered EUT.)*	Test as per ETSI EN 300 220-1 V3.1.1 clause 5.12.3
G5.13	TX Adaptive power control	ETSI EN 300 220-2 V3.2.1 (2018-06)	As per ETSI EN 300 220-2 V3.2.1 clause 4.3.9 (*Applies to EUT with adaptive power control using annex C band AA*.)	Test as per ETSI EN 300 220-1 V3.1.1 clause 5.13.3

S. No.	Parameter Name	Standard/ Parameter	Applicability/Limits/ Values	Remarks
G5.14	TX FHSS	ETSI EN 300 220-2 V3.2.1 (2018-06)	As per ETSI EN 300 220-2 V3.2.1 clause 4.3.10 *(Applies to FHSS EUT)*	Declaration to be made by Manufacturer as per ETSI EN 300 220-2 V3.1.1 clause 4.3.10.3
G5.15	TX Short term behaviour	ETSI EN 300 220-2 V3.2.1 (2018-06)	As per ETSI EN 300 220-2 V3.2.1 clause 4.3.11 (*Applies to EUT using annex C bands Y, Z, AA, AB, AC, AD*)	Test as per ETSI EN 300 220-1 clause 5.5.2
G5.16	RX sensitivity	ETSI EN 300 220-2 V3.2.1 (2018-06)	As per ETSI EN 300 220-2 V3.2.1 clause 4.4.1 *(Applies to EUT with polite spectrum access.)*	Test as per ETSI EN 300 220-1 clause 5.14.3
G5.17	Clear channel assessment threshold	ETSI EN 300 220-2 V3.2.1 (2018-06)	As per ETSI EN 300 220-2 V3.2.1 clause 4.5.2 *(Applies to EUT with polite spectrum access.)*	Test as per ETSI EN 300 220-1 V3.1.1 clause 5.21.2.3
G5.18	Polite spectrum access timing parameters	ETSI EN 300 220-2 V3.2.1 (2018-06)	As per ETSI EN 300 220-2 V3.2.1 clause 4.5.3 *(Applies to EUT with polite spectrum access.)*	Test as per ETSI EN 300 220-1 V3.1.1 clause 5.21.3.2
G5.19	RX Blocking	ETSI EN 300 220-2 V3.2.1 (2018-06)	As per ETSI EN 300 220-2 V3.2.1 clause 4.4.2	Test as per ETSI EN 300 220-1 V3.1.1 clause 5.18.6
G5.20	Adaptive Frequency Agility	ETSI EN 300 220-2 V3.2.1 (2018-06)	As per ETSI EN 300 220-2 V3.2.1 clause 4.5.4 *(Applies to EUT with AFA.)*	Test as per ETSI EN 300 220-1 V3.1.1 clause 5.21.4

Annexure-G6 RFID/ NFC working in frequency bands 50KHz to 200KHz or 13.553 MHz to 13.567MHz

S. No.	Parameter Name	Standard/ Parameter	Applicability/Limits/ Values	Remarks
G6.1	Frequency of Operation of Interface	Latest NFAP Annexure-1	50KHz to 200KHz (As per WPC GSR 90 (E)) And / OR 13.553 MHz to 13.567MHz (As per WPC GSR 884(E))	Test as per ETSI EN 300 330 V2.1.1 (2017-02) clause 6.2.2.
G6.2	Permitted range of operating frequencies	Latest NFAP Annexure-1	50KHz to 200KHz And / OR 13.553 MHz to 13.567MHz	As per ETSI EN 300 330 V2.1.1 (2017-02) clause 4.3.1, the permitted range of operating frequencies used by the EUT shall be declared by the manufacturer.
G6.3	Modulation bandwidth	ETSI EN 300 330 V2.1.1 (2017-02)	As per ETSI EN 300 330 V2.1.1 (2017-02) clause 4.3.3	Test as per ETSI EN 300 330 V2.1.1 (2017-02) clause 6.2.3.
G6.4	Transmitter H-field requirements	ETSI EN 300 330 V2.1.1 (2017-02)	50KHz to 200KHz (As per WPC GSR 90 (E)) OR 13.553 MHz to 13.567MHz (As per WPC GSR 884(E)) (Ref: ETSI EN 300 330 V2.1.1 (2017-02) clause 4.3.4)	Test as per ETSI EN 300 330 V2.1.1 (2017-02) clause 6.2.4.
G6.5	Transmitter RF carrier current	ETSI EN 300 330 V2.1.1 (2017-02)	As per ETSI EN 300 330 V2.1.1 (2017-02) clause 4.3.5 *(Only for equipment under class 3 in clause 6.1.2)*	Test as per ETSI EN 300 330 V2.1.1 (2017-02) clause 6.2.5.

S. No.	Parameter Name	Standard/ Parameter	Applicability/Limits/ Values	Remarks
G6.6	Transmitter radiated E-field	ETSI EN 300 330 V2.1.1 (2017-02)	As per ETSI EN 300 330 V2.1.1 (2017-02) clause 4.3.6 *(Only for equipment under class 3 in clause 6.1.2)*	Test as per ETSI EN 300 330 V2.1.1 (2017-02) clause 6.2.6.
G6.7	Transmitter conducted spurious emissions	ETSI EN 300 330 V2.1.1 (2017-02)	As per ETSI EN 300 330 V2.1.1 (2017-02) clause 4.3.7 *(Only for equipment under class 3 in clause 6.1.2)*	Test as per ETSI EN 300 330 V2.1.1 (2017-02) clause 6.2.7.
G6.8	Transmitter radiated spurious domain emission limits < 30 MHz	ETSI EN 300 330 V2.1.1 (2017-02)	As per ETSI EN 300 330 V2.1.1 (2017-02) clause 4.3.8	Test as per ETSI EN 300 330 V2.1.1 (2017-02) clause 6.2.8.
G6.9	Transmitter radiated spurious domain emission limits > 30 MHz (NA)	ETSI EN 300 330 V2.1.1 (2017-02)	As per ETSI EN 300 330 V2.1.1 (2017-02) clause 4.3.9 (*For equipment under class 1, 2 and 4 in clause 6.1.2)*	Test as per ETSI EN 300 330 V2.1.1 (2017-02) clause 6.2.9
G6.10	Transmitter Frequency stability	ETSI EN 300 330 V2.1.1 (2017-02)	As per ETSI EN 300 330 V2.1.1 (2017-02) clause 4.3.10 *(Only for channelized systems)*	Test as per ETSI EN 300 330 V2.1.1 (2017-02) clause 6.2.10
G6.11	Receiver spurious emissions	ETSI EN 300 330 V2.1.1 (2017-02)	As per ETSI EN 300 330 V2.1.1 (2017-02) clause 4.4.2 *(Does only apply to receivers which a not co-located with transmitters)*	Test as per ETSI EN 300 330 V2.1.1 (2017-02) clause 6.3.1
G6.12	Adjacent channel selectivity	ETSI EN 300 330 V2.1.1 (2017-02)	As per ETSI EN 300 330 V2.1.1 (2017-02) clause 4.4.3 *(Only for channelized systems in clause 4.4.1)*	Test as per ETSI EN 300 330 V2.1.1 (2017-02) clause 6.3.2

S. No.	Parameter Name	Standard/ Parameter	Applicability/Limits/ Values	Remarks
G6.13	Receiver blocking or desensitization	ETSI EN 300 330 V2.1.1 (2017-02)	As per ETSI EN 300 330 V2.1.1 (2017-02) clause 4.4.4 *(Not for tagging systems in clause 4.4.1)*	Test as per ETSI EN 300 330 V2.1.1 (2017-02) clause 6.3.3

Annexure-H: Ethernet Interface Parameters

Parameter Group: Ethernet Interface (INTETH)

S. No.	Interface Name	Parameter Name	Standard	Limits/ Values	Applicability/ Remarks
H.1	Gigabit Ethernet Electrical or 10 100 1000 Base T Ethernet	Link Speed and Auto Negotiation GE	IEEE 802.3		Appendix-II, Test4
H.2	Fast Ethernet Electrical or 10/100 Base T Ethernet	Link Speed and Auto Negotiation for GE	IEEE 802.3		Appendix-II, Test4
H.3	Gigabit Ethernet Optical	Average Launch power for 1 GE Opt	IEEE 802.3z Cl. 38		
H.4	Gigabit Ethernet Optical	Wavelength for 1 GE Opt	IEEE 802.3z Cl. 38		
H.5	Gigabit Ethernet Optical	Receiver Sensitivity 1 GE Opt	IEEE 802.3z Cl. 38		
H.6	10 Gigabit Ethernet Optical	Wavelength for 10GE Int	IEEE 802.3ae Cl. 52		
H.7	10 Gigabit Ethernet Optical	Receiver Sensitivity for 10GE Int	IEEE 802.3ae Cl. 52		
H.8	10 Gigabit Ethernet Optical	Average Launch power for 10 GE Opt	IEEE 802.3ae Cl. 52		
H.9	40 Gigabit Ethernet Optical	Average Launch power for 40 GE Opt	IEEE 802.3ba Cl. 86, 87		

S. No.	Interface Name	Parameter Name	Standard	Limits/ Values	Applicability/ Remarks
H.10	40 Gigabit Ethernet Optical	Wavelength for 40 GE Opt	IEEE 802.3ba Cl. 86, 87		
H.11	40 Gigabit Ethernet Optical	Receiver Sensitivity 40 GE Opt	IEEE 802.3ba Cl. 86, 87		
H.12	100 Gigabit Ethernet Optical	Average Launch power for 100 GE Opt	IEEE 802.3ba Cl. 86, 88		
H.13	100 Gigabit Ethernet Optical	Wavelength for 100 GE Opt	IEEE 802.3ba Cl. 86, 88		
H.14	100 Gigabit Ethernet Optical	Receiver Sensitivity 100 GE Opt	IEEE 802.3ba Cl. 86, 88		
H.15	Fast Ethernet Optical	Average Launch power for FE Opt	IEEE 802.3u		
H.16	Fast Ethernet Optical	Wavelength for FE Opt	IEEE 802.3u		
H.17	Fast Ethernet Optical	Receiver Sensitivity for FE Opt	IEEE 802.3u		

Annexure-I: PDH Interface Parameters

Parameter Group: PDH Interface (INTPDH)

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/ Values	Applicability/ Remarks
I.1	2Mbps-E1	Input Jitter Tolerance for 2 MBPS Int	G.823 , ETSI TBR-4	Fig 13,Clause No.-7.1.2	
I.2	2Mbps-E1	Input Return Loss for 2 MBPS Int	G.703 , ETSI TBR-4 Cl. 9.3.1	51 to 102 (KHz)-12dB 102 to 2048(KHz)-18dB 2048 to 3072(KHZ)-14dB	
I.3	2Mbps-E1	Nominal Bit Rate with Tolerance 2 MBPS Int	G.703 , ETSI TBR-4 Cl. 9.2.3	2048Kbps	
I.4	2Mbps-E1	Output Jitter for 2 MBPS Int	G.823 , ETSI TBR-4	20 to 100 kHz - 1.5(UIpp) 18 k to 100kHz-0.2(UIpp)	
I.5	2Mbps-E1	Pulse Mask for 2 MBPS Int	G.703, ETSI TBR-4	Figure 11-1,clause-11.2	
I.6	ISDN PRI	Input Jitter Tolerance for PRI	G.823, I.431, ETSI TBR-4		
I.7	ISDN PRI	Input Return Loss for PRI	G.703, Cl. 11.3, ETSI TBR-4 Cl. 9.3.1		
I.8	ISDN PRI	Bit Rate Tolerance PRI	G.703, Cl. 11.1, ETSI TBR-4 Cl. 9.2.3		
I.9	ISDN PRI	Output Jitter for PRI	G.823, I.431, ETSI TBR-4		
I.10	ISDN PRI	Pulse Mask for PRI	G.703, Cl. 11.2, ETSI TBR-4 Cl. 9.2.1		
I.11	8Mbps-E2	Input Jitter Tolerance for 8 MBPS Int	G.823	Fig 14 , clause 7.1.3	

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/ Values	Applicability/ Remarks
I.12	8Mbps-E2	Input Return Loss for 8 MBPS Int	G.703	211 to 422(KHz)-12dB 422 to 8448(KHz)-18dB 8448 to 12 672(KHZ)-14dB	
I.13	8Mbps-E2	Nominal Bit Rate with Tolerance 8 MBPS Int	G.703	8448 kbit/s	
I.14	8Mbps-E2	Output Jitter for 8 MBPS Int	G.823	20 to 400 kHz - 1.5(UIpp) 3 k to 400 kHz-0.2(UIpp)	
I.15	8Mbps-E2	Pulse Mask for 8 MBPS Int	G.703	Figure 12-1,clause-12.2	
I.16	34Mbps-E3I	Input Jitter Tolerance for 34 MBPS Int	G.823	Fig 15 clause-7.1.4	
I.17	34Mbps-E3I	Input Return Loss for 34 MBPS Int	G.703	860 to 1720(KHz)-12dB 1720 to 34 368(KHz)-18dB 34 368 to 51 550 (KHZ)-14dB	
I.18	34Mbps-E3I	N Nominal Bit Rate with Tolerance 34 MBPS Int	G.703	34 368 kbit/s	
I.19	34Mbps-E3I	Output Jitter for 34 MBPS Int	G.823	100 to 800 kHz - 1.5(UIpp) 10 k to 800 kHz-0.15(UIpp)	
I.20	34Mbps-E3I	Pulse Mask for 34 MBPS Int	G.703	Figure 13-1,clause-13.2	
I.21	64 Kbps	Input Jitter Tolerance for 64 KBPS Int	G.823	Figure 12, clause-7.1.1	

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/ Values	Applicability/ Remarks
I.22	64 Kbps	Input Return Loss for 64 KBPS Int	G.703	4 to 13(KHz)-12dB 13 to 256(KHz)-18dB 256 to 384(KHz)-14dB	
I.23	64 Kbps	Nominal Bit Rate with Tolerance 64 KBPS Int	G.703	64 kbit/s	
I.24	64 Kbps	Output Jitter for 64 KBPS Int	G.823	20 to 20 k -0.25(UIpp) 3 k to 20 kHz-0.05(UIpp)	
I.25	64 Kbps	Pulse Mask for 64 KBPS Int	G.703	Figure 6-5,clause-6.2.1.2	
I.26	N X 64 Kbps	Input Jitter Tolerance for NX64 KBPS Int	G.823, ETSI TBR-4 Cl. 9.3.3	Figure 12, clause-7.1.1	
I.27	N X 64 Kbps	Input Return Loss for NX64 KBPS Int	G.703	4 to 13(KHz)-12dB 13 to 256(KHz)-18dB 256 to 384(KHz)-14dB	
I.28	N X 64 Kbps	Nominal Bit Rate with Tolerance NX64 KBPS Int	G.703	64 kbit/s	
I.29	N X 64 Kbps	Output Jitter for NX64 KBPS Int	G.823, I.431, ETSI TBR-4 Cl. 9.2.4	20 to 20 k -0.25(UIpp) 3 k to 20 kHz-0.05(UIpp)	
I.30	N X 64 Kbps	Pulse Mask for NX64 KBPS Int	G.703	Figure 6-5,clause-6.2.1.2	
I.31	45Mbps	Input Jitter Tolerance for 45 MBPS Int	G.824	Fig-9, clause—7.2.4	
I.32	45Mbps	~~No~~ DC power	G.703	44 736 kbit/s	
I.33	45Mbps	Nominal Bit Rate with Tolerance 45 MBPS Int	G.824	10 to 400 kHz-5.0(UIpp)	

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/ Values	Applicability/ Remarks
				30 to 400 kHz- 0.1(UIpp)	
I.34	45Mbps	Output Jitter for 45 MBPS Int	G.703	Fig 10-1 clause 10	
I.35	45Mbps	Pulse Mask for 45 MBPS Int	G.823	Table 19 ,clause-7.1.5	
I.36	140Mbps-E4	Input Jitter Tolerance for 140 MBPS Int	G.703, ETSI TBR-4 Cl. 9.3.1	≥15 dB over frequency range 7 MHz to 210 MHz	
I.37	140Mbps-E4	Input Return Loss for 140 MBPS Int	G.703, ETSI TBR-4 Cl. 9.2.3	139264 kbit/s	
I.38	140Mbps-E4	Nominal Bit Rate with Tolerance 140 MBPS Int	G.823	200 to 3.5 MHz - 1.5(UIpp) 10 k to 3.5 MHz - 0.0755 (UIpp)	
I.39	140Mbps-E4	Output Jitter for 140 MBPS Int	G.703, ETSI TBR-4 Cl. 9.2.1	Fig 14.1,14.2 clause-14.2	
I.40	140Mbps-E4	Pulse Mask for 140 MBPS Int	G.703		
I.41	10 MBPS	Min Peak Voltage for 10 MHz Int	G.703		
I.42	10 MBPS	Max Peak Voltage for 10 MHz Int	G.823 , ETSI TBR-4	Fig 13,Clause No.-7.1.2	

Annexure-J1: xDSL Interface Parameters

Parameter Group: DSL Interface (INTDSL)

S. No.	Interface Name	Parameter Name	Standard	Clause	Remarks
J1.1	ADSLx	Insulation Test for 2 wire Int	ETSI EN 300 001 Cl. 2.2		
J1.2	ADSLx	Loop resistance for ADSLx	ETSI EN 300 001 Table 2.3		
J1.3	ADSLx	PSD for ADSL Int	G.992.3 Annexure A, B, I, J, G992.5		
J1.4	ADSLx	Bit Rate for ADSL Int	ANSI.T1.413-2		
J1.5	ADSLx	Insulation Test for ADSL Int			
J1.6	ADSLx	Impulse Noise Protection for ADSL Int	G.992.3 Appendix V		
J1.7	ADSLx	Transmitted Power At ATU-C for ADSLxInt	G.992.3 Annexure-P		
J1.8	ADSLx	Line Port impedance for ADSLxInt			
J1.9	VDSLx	Insulation Test for 2 wire Int	ETSI EN 300 001		
J1.10	VDSLx	Loop resistance for VDSLx	ETSI EN 300 001		
J1.11	VDSLx	Profiles for VDSLx	G.993.2 Cl. 7.2		
J1.12	VDSLx	Return Loss for VDSLx	G.993.1 Cl. 6.5		
J1.13	VDSLx	PSD for VDSLxInt	G.993.1 Cl. 6.2/ G.993.2 Cl. 7.2		
J1.14	VDSLx	Line Port impedance for VDSLxInt			
J1.15	VDSLx	Transmitted Power At ATU-C for VDSLxInt			
J1.16	VDSLx	Bit Rate for VDSLxInt	G.993.1/ G993.2		
J1.17	G.FAST	PPPoE for G.FAST Int	RFC 2516 Functional Test		Annex-P11
J1.18	G.FAST	PVC Support for G.FAST Int			
J1.19	G.FAST	VPI-VCI Support for G.FAST Int			
J1.20	G.FAST	Loop Resistance for G.FAST IntSLx	ETSI EN 300 001		
J1.21	G.FAST	Insulation Test for G.FAST Int			
J1.22	G.FAST	Impulse Noise Protection for G.FAST Int			
J1.23	G.FAST	Throughput Test for G.FAST Int			
J1.24	G.FAST	Profiles for G.FAST Int	G.9700		
J1.25	G.HN	Profiles for G.HN Int	G.9960		

S. No.	Interface Name	Parameter Name	Standard	Clause	Remarks
J1.26	G.HN	PSD for G.HN	G.9964		
J1.27	SHDSL	PSD for SHDSL Int	G.991.2		
J1.28	SHDSL	Return Loss for SHDSL	G.991.2		
J1.29	SHDSL	Transmitted Power for SHDSL Int	G.991.2		
J1.30	SHDSL	Impedance Unbalance About Earth for SHDSL Int	G.991.2		
J1.31	SHDSL	Insulation Resistance for SHDSL int	G.991.2		
J1.32	SHDSL	Throughput for SHDSL Interface	G.991.2		
J1.33	SHDSL	LCL for SHDSL Interface	G.991.2		

Annexure-J2: PON Interface Parameters

Parameter Group: PON Interface (INTPON)

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/Values	Remarks
J2.1	GPON	Operating Wavelength Trans for GPON Int	G.984.2 Cl. 8.2.5.1	DS 1480-1500nm	
J2.2	GPON	Operating Wavelength Recv for GPON Int	G.984.2 Cl. 8.2.5.2	"US 1260-1360nm (Class B/B+) or 1290-1330nm (Class C/C+/D)	
J2.3	GPON	Opt Output Power for GPON Int at OLT	G.984.2	0 to +4dBm (A) +5.0 to +9.0 dBm (B) +1.5 to +5.0 dBm (B+) +3.0 to +7.0 dBm (C/C+) +6.0 to +10.0 dBm (D) A,B,B+,C,C+ and 'D' are classes of optical link budget for PON Measured at 1490nm at OLT 's PON port i.e. Rx or D/L mode. Refer following Tables of ITU-T G.984.2: (1) Table 2c & Table 2f1 for Class A, Class B, Class C (2) Table A.1 for Class B+ (3) Table V.1 for Class C+, (4) Table V.2 for Class D	
J2.4	GPON	Opt Output Power for GPON Int at ONT	G.984.2	-3.0 to +2.0dBm (A) -2.0 to +3.0 dBm (B) +0.5 to +5.0 dBm (B+) +2.0 to +7.0 dBm (C) +0.5 to +5.0 dBm (C+) +0.5 to +5.0 dBm (D) A,B,B+,C,C+ and 'D' are classes of optical link budget for PON Measured at 1490nm at OLT 's PON port i.e. Rx or D/L mode. Refer following Tables of ITU-T G.984.2: (1) Table 2c & Table 2f1 for Class A, Class B, Class C (2) Table A.1 for Class B+ (3) Table V.1 for Class C+, (4) Table V.2 for Class D	

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/Values	Remarks
J2.5	GPON	Receiver Sensitivity for GPON Int at OLT	G.984.2	-24dBm(minimum) (A) -28 dBm(minimum) (B/B+) -29 dBm(minimum) (C) -32 dBm(minimum) (C+) -35 dBm(minimum) (D) A,B,B+,C,C+ and 'D' are classes of optical link budget for PON Measured at 1490nm at OLT 's PON port i.e. Rx or D/L mode. Refer following Tables of ITU-T G.984.2: (1) Table 2c & Table 2f1 for Class A, Class B, Class C (2) Table A.1 for Class B+ (3) Table V.1 for Class C+, (4) Table V.2 for Class D	
J2.6	GPON	Receiver Sensitivity for GPON Int at ONT	G.984.2	-21dBm(minimum) (A) -21 dBm(minimum) (B) -27 dBm(minimum) (B+) -28 dBm(minimum) (C) -30 dBm(minimum) (C+) -30 dBm(minimum) (D) A,B,B+,C,C+ and 'D' are classes of optical link budget for PON Measured at 1490nm at OLT 's PON port i.e. Rx or D/L mode. Refer following Tables of ITU-T G.984.2: (1) Table 2c & Table 2f1 for Class A, Class B, Class C (2) Table A.1 for Class B+ (3) Table V.1 for Class C+, (4) Table V.2 for Class D	
J2.7	GPON	Throughput for GPON Int	G.984.1, RFC 2544		

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/Values	Remarks
J2.8	GPON	Protocol Test for GPON Int	EthOGEM/ G.984.2	PICS Test as per Annexure V & VI of ITU-T G.983.1 with respect to GPON parameter and their reference values	
J2.9	GPON	Line Test for GPON Int	IEEE 802.3ah		
J2.10	EPON	Operating Wavelength Trans for EPON Int	IEEE 802.3ah	US 1260-1360 nm Refer TEC GR on EPON(2019)	
J2.11	EPON	Operating Wavelength Recv for EPON Int	IEEE 802.3ah	DS 1480 -1500 nm Refer TEC GR on EPON(2019)	
J2.12	EPON	Opt Output Power for EPON Int at OLT	IEEE 802.3ah	+2 dbm to +7dbm Refer TEC GR on EPON(2019)	
J2.13	EPON	Opt Output Power for EPON Int at ONT	IEEE 802.3ah	-1 dbm to +4dbm Refer TEC GR on EPON(2019)	
J2.14	EPON	Receiver Sensitivity for EPON Int at OLT	IEEE 802.3ah	-27dbm(minimum)(for 1000Base-PX20-D) - 30dbm(minimum)(1000Base-PX20E-D) Refer TEC GR on EPON(2019)	
J2.15	EPON	Receiver Sensitivity for EPON Int at ONT	IEEE 802.3ah	-24dbm(minimum)(for 1000Base-PX20-U) - 27dbm(minimum)(1000Base-PX20E-U) Refer TEC GR on EPON(2019)	
J2.16	EPON	Throughput for EPON Int	RFC2544		
J2.17	EPON	Line Test for EPON Int	IEEE 802.3ah		
J2.18	XGPON	Operating Wavelength Trans for XGPON Int	G.987.2	DS 1575 – 1580 nm	
J2.19	XGPON	Operating Wavelength Recv for XGPON Int	G.987.2	US 1260 – 1280 nm	
J2.20	XGPON	Opt Output Power XGPON Int at OLT	G.987.2	+2.0 to +6.0 dBm (N1) +4.0 to +8.0 dBm (N2a) +10.0 to +12.5 dBm (N2b)	

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/Values	Remarks
				+6.0 to +10.0 dBm (E1) +8.0 to +12.0 dBm (E2a) +14.5.0 to +16.5 dBm (E2b) N1, N2, E1 and E2 are classes of optical path loss. Refer following Table 9.3 of ITU-T G.987.2	
J2.21	XGPON	Opt Output Power XGPON Int at ONT	G.987.2	+2.0 to +7.0 dBm (N1,N2,E1, E2) Refer following Table 9.4 of ITU-T G.987.2	
J2.22	XGPON	Receiver Sensitivity XGPON Int at OLT	G.987.2	-27.5dBm for (N1) -29.5dBm for (N2) -31.5dBm for (E1) -33.5dBm for (E2) Refer following Table 9.4 of ITU-T G.987.2	
J2.23	XGPON	Receiver Sensitivity XGPON Int at ONT	G.987.2	-28.0dBm for (N1) -28.0dBm for (N2a) -21.5dBm for (N2b) -28.0dBm for (E1) -28.0dBm for (E2a) -21.5dBm for (E2b) Refer following Table 9.3 of ITU-T G.987.2	
J2.24	XGPON	Throughput for XGPON Int	G.987.1, RFC2544		
J2.25	XGPON	Protocol test for XGPON Int	G.987.2, XGEM	PICS Test as per Annexure V & VI of ITU-T G.987.1 with respect to XGPON parameter and their reference values	
J2.26	XGPON	Line test for XGPON Int	IEEE 802.3ah		
J2.27	XGSPON	Operating Wavelength Trans XGSPON Int	G.9807.1	"DS i. 1 575 – 1 580 nm (Basic wavelength) ii. 1 480 to 1 500 nm (optional wavelength)	

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/Values	Remarks
				XGS-PON systems come with two operating wavelength options Basic wavelength set: consists of XG-PON wavelength reuse, in which case the system has to accommodate both XGS-PON ONUs and legacy XG-PON ONUs Optional wavelength set: consists of G-PON wavelength reuse, for the operators having no legacy Gigabit PON in the deployment area Refer ITU-T G.9807.1"	
J2.28	XGSPON	Operating Wavelength Recv XGSPON Int	G.9807.1	"US i. 1 260 – 1 280 nm (Basic wavelength) ii. 1 300 to 1 320 nm (optional wavelength) XGS-PON systems come with two operating wavelength options Basic wavelength set: consists of XG-PON wavelength reuse, in which case the system has to accommodate both XGS-PON ONUs and legacy XG-PON ONUs Optional wavelength set: consists of G-PON wavelength reuse, for the operators having no legacy Gigabit PON in the deployment area Refer ITU-T G.9807.1"	
J2.29	XGSPON	Opt Output Power XGSPON Int at OLT	G.9807.1	+2.0 to +5.0 dBm (N1) +4.0 to +7.0 dBm (N2) +6.0 to +9.0 dBm (E1) N1, N2 and E1 are classes of optical link	

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/Values	Remarks
				budget for PON. Refer Table B.9.3 of standard ITU-T G.9807.1	
J2.30	XGSPON	Opt Output Power XGSPON Int at ONT	G.9807.1	+4.0 to +9.0 dBm (N1,N2,E1) Refer Table B.9.4 of standard ITU-T G.9807.1	
J2.31	XGSPON	Receiver Sensitivity XGSPON Int at OLT	G.9807.1	-26.0 dBm (N1) -28.0 dBm (N2) -30.0 dBm (E1) Refer Table B.9.4 of standard ITU-T G.9807.1	
J2.32	XGSPON	Receiver Sensitivity XGSPON Int at ONT	G.9807.1	-28dBm (N1, N2 and E1) Refer Table B.9.3 of standard ITU-T G.9807.1	
J2.33	XGSPON	Throughput for XGSPON Int	G.9807.1, RFC2544		
J2.34	XGSPON	Protocol Test for XGSPON Int	G.9807.1, XGEM	PICS Test as per Annexure V & VI of ITU-T G.983.1 with respect to XGPON parameter and their reference values	
J2.35	XGSPON	Line Test for XGSPON Int	IEEE 802.3ah		
J2.36	WDMPON	Operating Wavelength Trans WDMPON Int	G.694.1 (G.989.2/p2p WDM)	US 1530nm-1560nm C-Band Refer TEC GR on WDM-PON(2017)	These are proprietary implementation
J2.37	WDMPON	Operating Wavelength Recv WDMPON Int	G.694.1 (G.989.2/p2p WDM)	DS 1530nm-1560nm C-Band Refer TEC GR on WDM-PON(2017)	These are proprietary implementation
J2.38	WDMPON	Opt Output Power WDMPON Int at OLT	G.694.1 (G.989.2/p2p WDM)	+2.0 to +7.0 dBm Refer TEC GR on WDM-PON(2017)	These are proprietary implementation

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/Values	Remarks
J2.39	WDMPON	Opt Output Power WDMPON Int at ONT	G.694.1 (G.989.2/p2p WDM)	-2.0 to +2.0 dBm Refer TEC GR on WDM-PON(2017)	These are proprietary implementation
J2.40	WDMPON	Receiver Sensitivity WDMPON Int at OLT	G.694.1 (G.989.2/p2p WDM)	-24.0 dBm Refer TEC GR on WDM-PON(2017)	These are proprietary implementation
J2.41	WDMPON	Receiver Sensitivity WDMPON Int at ONT	G.694.1 (G.989.2/p2p WDM)	-17.0 dBm Refer TEC GR on WDM-PON(2017)	These are proprietary implementation
J2.42	WDMPON	Throughput for WDMPON Int	RFC2544		These are proprietary implementation
J2.43	WDMPON	Protocol test for WDMPON Int	G.694.1 (G.989.2/p2p WDM)	PICS Test as per Annexure V & VI of ITU-T G.983.1 with respect to NGPON2 parameter and their reference values	These are proprietary implementation
J2.44	WDMPON	Line Test for WDMPON Int	IEEE 802.3ah		These are proprietary implementation
J2.45	NGNPON2	Operating Wavelength Trans NGPON2Int	G.989.2	DS 1596 -1603 nm Refer ITU-T G.989.2	
J2.46	NGNPON2	Operating Wavelength Recv NGPON2Int	G.989.2	US For TWDM PON 1524-1544nm for Wideband 1528-1540nm for Reduced band 1532-1540nm for Narrow band For PtP WDM PON 1524-1625nm for Expanded Spectrum 1603-1625nm for Shared spectrum Refer ITU-T G.989.2	

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/Values	Remarks
J2.47	NGNPON2	Opt Output Power NGPON2Int at OLT	G.989.2	For 2.48832 Gbit/s downstream Direction 0.0 to +4.0 dBm (N1) +2.0 to +6.0 dBm (N2) +4.0 to +8.0 dBm (E1) +6.0 to +10.0 dBm (E2) For 9.95328 Gbit/s downstream Direction +3.0 to +7.0 dBm (N1) +5.0 to +9.0 dBm (N2) +7.0 to +11.0 dBm (E1) +9.0 to +11.0 dBm (E2) N1, N2, E1 and E2 are classes of optical link budget for PON Refer following Table 11.4 & Table 11.5 of ITU-T G.989.2	
J2.48	NGNPON2	Opt Output Power NGPON2Int at ONT	G.989.2	For 2.48832 Gbit/s upstream Direction Type A link +4.0 to +9.0 dBm (N1,N2, E1, E2) Type B link 0 to +5.0 dBm (N1, N2, E1, E2) For 9.95328 Gbit/s upstream Direction Type A link +4.0 to +9.0 dBm (N1) +4.0 to +9.0 dBm (N2) +4.0 to +9.0 dBm (E1) NA (E2) Type B link +2.0 to +7.0 dBm (N1) +2.0 to +7.0 dBm (N2) +2.0 to +7.0 dBm (E1) +4.0 to +9.0 dBm (E2	

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/Values	Remarks
				Type A link values assume an unamplified OLT receiver Type B link values assume an amplified OLT receiver with the amplifier at the S/R-CG reference point Refer following Table 11.6 & Table 11.7 of ITU-T G.989.2	
J2.49	NGNPON2	Receiver Sensitivity NGPON2Int at OLT	G.989.2	For 2.48832 Gbit/s Type A link - 26.0 dBm (N1) -28.0 dBm (N2) -30.5 dBm (E1) -32.5 dBm(E2) Type B link -30.0 dBm (N1) -32.0 dBm (N2) -34.5 dBm (E1) -36.5 dBm (E2) For 9.95328 Gbit/s Type A link - 26.0 dBm (N1) -28.0 dBm (N2) -30.5 dBm (E1) Type B link - 28.0 dBm (N1) -30.0 dBm (N2) -32.5 dBm (E1) -32.5 dBm (E2) Refer following Table 11.6 & Table 11.7 of ITU-T G.989.2	
J2.50	NGNPON2	Receiver Sensitivity NGPON2Int at ONT	G.989.2	For 2.48832 Gbit/s - 30.0 dBm (N1,N2, E1, E2)	

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/Values	Remarks
				For 9.95328 Gbit/s - 28.0 dBm (N1,N2, E1, E2) Refer following Table 11.4 & Table 11.5 of ITU-T G.989.2	
J2.51	NGNPON2	Throughput for NGPON2Int	G.989.2		
J2.52	NGNPON2	Protocol Test for NGPON2Int	G.989.2, RFC2544	PICS Test as per Annexure V & VI of ITU-T G.983.1 with respect to NGPON2 parameter and their reference values	
J2.53	NGNPON2	Line Test for NGPON2Int	IEEE 802.3ah		
J2.54	RF Video	RF Video Output Bandwidth, Level and Tilt-Values		52-870 MHz, 14 dBmV, 0 dB	

Annexure-J3: PON Conformance Parameters

Parameter Group: PON Conformance (CONFPON)

S. No.	Parameter Name	Standard	Remarks
J3.1	DOS Prevention, SSH v1-2 for CLI in PON	ITU-T G.984.3 section V.2, SSH v2 RFC 4251.	The denied Traffic streams should not pass through the OLT.
J3.2	Frameloss of PON	RFC 2544.	Support a BER of better than or equal to 10-10 at the MAC service interface (or the frame loss ratio equivalent)
J3.3	Latency of PON	RFC 2544.	<1.5 ms one way for 20Km of distance. refer Table I.1/G.984.1
J3.4	MAC Address Learning and Aging Control OLT	G.984.1. (For GPON OLT), IEEE 802.3ah (FOR EPON OLT), G.987.2 (FOR XGPON OLT), G.9807.1 (FOR XGSPON OLT), G.694.1 (FOR WDMPON OLT), G.989.2 (FOR NGPON2 OLT) & IEEE 802.1Q (Testing Procedure)	Yes/No
J3.5	MAC Address Limitation in PON	IEEE 802.3.	The data stream is received from only the number of streams specified.
J3.6	MAC Based 802.1x Authentication in PON	IEEE 802.1x.	Authentication based on IEEE 802.1x shall be supported.
J3.7	MAC Learning Support at OLT	G.984.1.	Yes/No
J3.8	Maximum Bandwidth Limiting in PON	G.984.3 Section 7.5 (For GPON OLT), IEEE 802.3ah (FOR EPON OLT), G.987.2 (FOR XGPON OLT), G.9807.1 (FOR XGSPON OLT), G.694.1 (FOR WDMPON OLT), G.989.2 (FOR NGPON2 OLT)	max. 1Gbps (GPON)

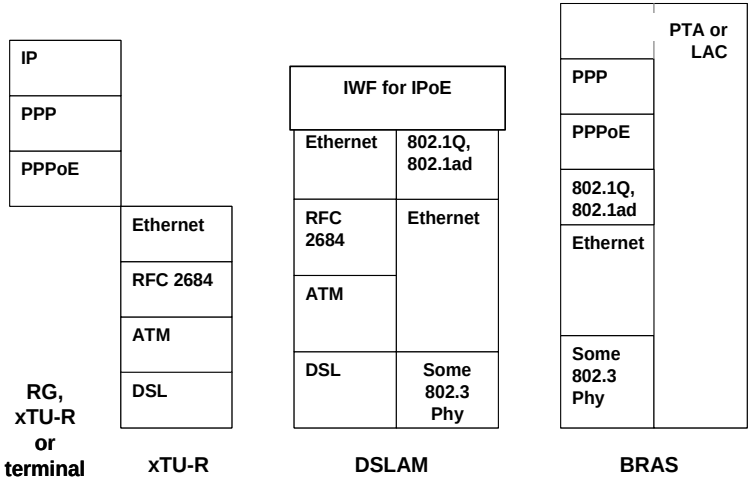
S. No.	Parameter Name	Standard	Remarks
J3.9	Minimum Guaranteed Bandwidth in PON	G.984.3 Section 7.5. (For GPON OLT), IEEE 802.3ah (FOR EPON OLT), G.987.2 (FOR XGPON OLT), G.9807.1 (FOR XGSPON OLT), G.694.1 (FOR WDMPON OLT), G.989.2 (FOR NGPON2 OLT)	minimum 512Kbps
J3.10	Minimum two classes of Classification in PON	G.984.3 Section 7.5. (For GPON OLT), IEEE 802.3ah (FOR EPON OLT), G.987.2 (FOR XGPON OLT), G.9807.1 (FOR XGSPON OLT), G.694.1 (FOR WDMPON OLT), G.989.2 (FOR NGPON2 OLT)	support of all TCONT-1, 2 ,3, 4 types.
J3.11	Password Based Authentication in PON	ITU-T G.984.3 section 9.2.2, 12.	Password based authentication should be supported.
J3.12	Port-id Based VLAN Support at OLT	G.984.1 (For GPON OLT), IEEE 802.3ah (FOR EPON OLT), G.987.2 (FOR XGPON OLT), G.9807.1 (FOR XGSPON OLT), G.694.1 (FOR WDMPON OLT), G.989.2 (FOR NGPON2 OLT) & IEEE 802.1Q (Testing Procedure)	Yes/No Provision of creating multiple port-id based multiple VLAN shall exist.
J3.13	Switch Fabric Throughput Capability OLT	G.984.1 (For GPON OLT), IEEE 802.3ah (FOR EPON OLT), G.987.2 (FOR XGPON OLT), G.9807.1 (FOR XGSPON OLT), G.694.1 (FOR WDMPON OLT), G.989.2 (FOR NGPON2 OLT)	Demonstrate support for full wired speed throughput by testing traffic through one randomly chosen port of switch fabric then using this value coroborate with data sheet provided by chipset vendor.
J3.14	Throughput of PON	RFC 2544.	a) Nominal bit rate*. When the OLT and the end office are in their normal operating state (accuracy of 1 x10-11)

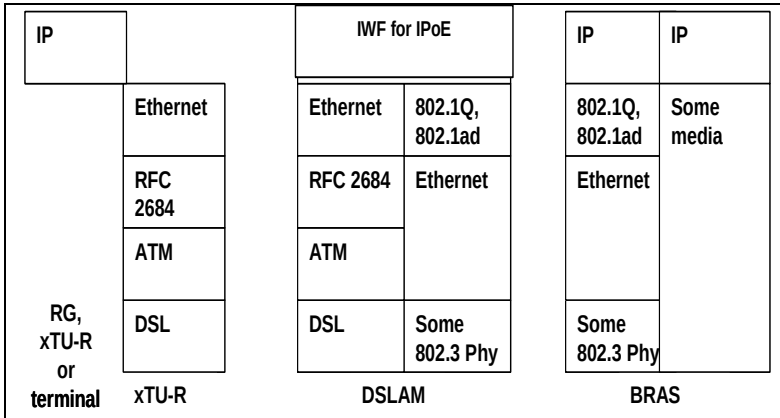
S. No.	Parameter Name	Standard	Remarks
			b) Nominal bit rate*. When the end office is in its free-running mode (accuracy of 4.6 x10-6) c)Nominal bit rate*. When the OLT is in its free-running mode (accuracy of 3.2 x10-5)
J3.15	VLAN Stacking to Network Support at OLT	G.984.1, (For GPON OLT), IEEE 802.3ah (FOR EPON OLT), G.987.2 (FOR XGPON OLT), G.9807.1 (FOR XGSPON OLT), G.694.1 (FOR WDMPON OLT), G.989.2 (FOR NGPON2 OLT) & IEEE 802.1Q(testing procedure).	Yes/No To test the double tagging support between ONT and OLT.

*Nominal bit rate for different technology is defined in respective Standard i.e. 1)GPON-G.984.2/cl8.2.1, (2)XGPON- G.987.2/Cl 9.2.1,(3) NGPON2-G.989.2/Cl 11.1.1,(4) XGSPON- G.9807.1/Cl B.9.2.1, (5) EPON-IEEE 802.3ah

Annexure J4 – DSLAM Functional Test

Applicable to→ **Test Parameter↓**	**Standard**	**IP-DSLAM**	**IP-DSLAM** **With splitter**	**Remarks**
POTS SPLITTERS The broad specifications for splitter shall be: a. 600-ohm impedance b. ETSI harmonized impedance splitter (ETSI TR 101 728).			Y	
VLAN Aggregation: The DSLAM shall terminate PVCs on DSL line and aggregate them over a single or multiple Customer-VLANs, Service-VLANs as well as a combination of them, at the uplink interface. It shall also implement 802.1p priority on the Ethernet flows.	IEEE 802.1p	Y	Y	To check if more than 1 vlan can be passed over the same port in DSLAM
Protocol *Support* DSLAM shall support DHCP based IP access with DHCP relay and DHCP option 82 for direct IP over Ethernet based access for video/gaming and other entertainment services.	RFC 2131 RFC 3046	Y	Y	

<u>PPPoE</u> over ATM (U-interface): Figure 1 depicts the end-to-end protocol stacks associated with PPPoE access method  Figure 1-		Y	Y	To check PPPoE session is established on the ADSL or VDSL system. Methodology is mentioned in DSL forum technical report TR-045. **Annexure-E: group 3.3_test 1 & Test 2 may be carried out to cater this clause.** It is tested through protocol simulator.
***IPoE* <u>over ATM (U-interface):</u>** Figure 2 depicts the end-to-end protocol stacks associated with IPoE access method.		Y	Y	To check if IPOE is established on the ADSL or VDSL system. Methodology is mentioned in DSL forum technical report TR-045. **Annexure-E: group 3.3_test 1 & Test 2 may be carried out to cater this clause.** It is tested through protocol simulator.

 Figure 2				
Ethernet Scalability **1.** The device shall provide a means to limit the number of MAC addresses learned on any given port. **2.** The device shall support placing all subscriber traffic into a single or multiple VLANs on an uplink.		Y	Y	1. Limit the port on DSLAM to 1 mac and send two mac traffic only one mac traffic which is defined will run. 2. Check more than 1 vlan can pass through the port
Video application protocol support • IGMP Proxy • IGMPv2/v3 snooping Further- 1. IGMP proxy shall handle multicast and control where the packets has to be replicated (in terms of specific customer VLANs or ports).	RFC 2236 RFC3376	Y	Y	Capability to be demonstrated as describes in clause. Enable IGMP proxy and snooping and check if multicast channel is learnt once the channel is joint

2. In upstream direction, IGMP proxy function shall forward IGMP messages from subscriber to multicast VLAN. 3. In downstream direction, multicast streams shall be multiplexed in to subscriber's connection based on 'Join' messages received.				
Filtering : The DSLAM shall allow the following filters to be defined: • List of acceptable MAC destination addresses applicable to frames received at the upstream direction on bridged ports. • When attached to a bridged port, any frame received with a destination MAC not specified in the list shall be discarded. The DSLAM shall be capable of filtering L2 traffic configurable per Port/PVC/Service basis at least for the following parameters- **a. Source IP and MAC Address per port, per PVC, per VLAN** **b. Destination IP and MAC Address per port, per PVC, per VLAN.**		Y	Y	Capability to be demonstrated as describes in clause. Set the MAC address to be allowed per port, send traffic of that mac and see it is going through. Send traffic of other mac and see that traffic is not going
Broadcast Handling: As far as Ethernet broadcast traffic is concerned, all downstream broadcast traffic shall be discarded with the exception cases called for by DHCP Relay Agent, PPPoE Intermediate Agent, and IGMP Snooping/ IGMP Snooping and Proxy functions.		Y	Y	Capability to be demonstrated as describes in clause.
Protection from ARP spoofing attacks • ***Source MAC Flooding*** • ***Broadcast control***		Y	Y	1. To check if DSLAM can block certain MAC. 2. To check if broadcast mac can be controlled

• ***L2 Peer to Peer ("hair-pin") Forwarding*** • ***Source MAC Spoofing***				3. Communication on same vlan can be done or blocked. 4. To check if mac is learnt on the DSLAM

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

Annexure-K: SDH Interface Parameters

Parameter Group: PDH Interface (INTPDH)

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/ Values	Applicability/ Remarks
K.1	STM-1 Electrical	Input Jitter Tolerance STM-1 Electrical	G.825	Table 4, Fig-1 clause-6.1.2.1	
K.2	STM-1 Electrical	Input Return Loss for STM-1 Electrical	G.703	≥15 dB over frequency range 8 MHz to 240 MHz	
K.3	STM-1 Electrical	Nominal Bit Rate with Tolerance STM-1 Electrical Int	G.703	155520 Kbps	
K.4	STM-1 Electrical	Output Jitter for STM-1 Electrical Int	G.825	500 to 1.3 MHz -1.5(UIpp) 65 k to 1.3 MHz-0.075 (UIpp)	
K.5	STM-1 Electrical	Pulse Mask for STM-1 Electrical Int	G.703	Fig 17-1 & 17-2 clause-17.4	
K.6	STM-1 Optical	Input Jitter Tolerance for STM-1 Opt	G.825	Fig. 1 ,clause-6.1.2.1	
K.7	STM-1 Optical	Mean Launched Power for STM-1 Opt Int	G.957	I-1,S-1.1, S-1.2: -8(max)& -15(min)(dBm)	

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/ Values	Applicability/ Remarks
				L-1.1,L-1.2, L-1.3: 0 (max)& -5(min)(dBm)	
K.8	STM-1 Optical	Nominal Bit Rate with Tolerance STM-1 Opt Int	G.957	155 520 Kbps	
K.9	STM-1 Optical	Operating Wavelength Range for STM-1 Opt Int	G.957	I-1: 1260a)-1360 S-1.1: 1261a)- 1360 S-1.2: 1430-1576, 1430-1580 L-1.1: 1260a)-1360, 1263a)- 1360 L-1.2: 1480-1580 L-1.3: 1534-1566/1523-1577, 1480-1580 (nm)	
K.10	STM-1 Optical	Output Jitter for STM-1 Opt Int	G.783	0.5k to 1.3 MHz -0.30(UI) 65 k to 1.3MHz – 0.10 (UI) (1UI=6.43ns)	
K.11	STM-1 Optical	Receiver Overload for STM-1 Opt Int	G.957	I-1,S-1.1, S-1.2: -8dBm L-1.1,L-1.2, L-1.3: -10 dBm	
K.12	STM-1 Optical	Receiver Sensitivity for STM-1 Opt Int	G.957	I-1: -23dBm S-1.1, S-2.1: -28dBm L-1.1, L-1.2, L-1.3: -34 dBm	
K.13	STM-4 Optical	Input Jitter Tolerance for STM-4 Opt	G.825	Fig. 3, clause-6.1.2.2	

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/ Values	Applicability/ Remarks
K.14	STM-4 Optical	Mean Launched Power for STM-4 Opt Int	G.957, G.691	I-4,S-4.1,S-4.2: -8 (max)& -15(min)(dBm) L-4.1,L-4.2,L-4.3: +2(max)& -3(min)(dBm)	
K.15	STM-4 Optical	Nominal Bit Rate with Tolerance STM-4 Opt Int	G.957	622 080Kbps	
K.16	STM-4 Optical	Operating Wavelength Rangefor STM-4 Opt Int	G.957	I-4: 1260a)-1360 S-4.1: 1293-1334/1274-1356 S-4.2: 1430-1580 L-4.1: 1300- 1325/1296-1330,1280-1335 L-4.2: 1480-1580 L-4.3: 1480-1580 (nm)	
K.17	STM-4 Optical	Output Jitter for STM-4 Opt Int	G.783	1k to 5 MHz -0 .30(UI) 250 k to 5 MHz – 0.10 (UI) (1UI=1.61ns)	
K.18	STM-4 Optical	Receiver Overload for STM-4 Opt Int	G.957	I-4,S-4.1,S-4.1, L-4.1,L-4.2, L-4.3: -8dBm	
K.19	STM-4 Optical	Receiver Sensitivity for STM-4 Opt Int	G.957	I-4:-23dBm S-4.1,S-4.1, L-4.1,L-4.2, L-4.3: -28dBm	

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/ Values	Applicability/ Remarks
K.20	STM-16 Optical	Input Jitter Tolerance for STM-16 Opt	G.825	Fig. 4, clause-6.1.2.3	
K.21	STM-16 Optical	Mean Launched Power for STM-16 Opt Int	G.957	I-16: -3&-10(dBm) S-16.1, S-16.2: 0(max)& -5(min)(dBm) L-16.1, L-16.2,L-16.3 :+3(max)& -2(min)(dBm)	
K.22	STM-16 Optical	Nominal Bit Rate with Tolerance STM-16 Opt Int	G.957	2 488 320 kbps	
K.23	STM-16 Optical	Operating Wavelength Range for STM-16 Opt Int	G.957	I-16: 1266a)-1360 S-16.1: 1260a)-1360 S-16.2: 1430-1580 L-16.1: 1280-1335 L-16.2: 1500-1580 L-16.3: 1500-1580 (nm)	
K.24	STM-16 Optical	Output Jitter for STM-16 Opt Int	G.783	5k to 20 MHz -0.30(UI) 1000 k to 20 MHz – 0.10 (UI) (1UI=0.40ns)	
K.25	STM-16 Optical	Receiver Overload for STM-16 Opt Int	G.957	I-16:-3dBm S-16.1,S-16.1:0dBm L-16.1,L-16.2,L-16.3: -9dBm	

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/ Values	Applicability/ Remarks
K.26	STM-16 Optical	Receiver Sensitivity for STM-16 Opt Int	G.957	I-16,S-16.1,S-16.1: -18dBm L-16.1, L-16.2, L-16.3 : -27dBm	
K.27	STM-64 Optical	Input Jitter Tolerance for STM-64 Opt	G.825	Fig. 5, clause-6.1.2.4	
K.28	STM-64 Optical	Mean Launched Power for STM-64 Opt Int	G.691	L -64.2a: +2(max)&-2(min) L -64.2b: 13(max)&10(min) L -64.2c: +2(max)&-2(min) L -64.3: 13(max)&10(min)	
K.29	STM-64 Optical	Nominal Bit Rate with Tolerance STM-64 Opt Int	G.707	9 953 280 Kbps	
K.30	STM-64 Optical	Operating Wavelength Range for STM-64 Opt Int	G.691	1530-1565nm	
K.31	STM-64 Optical	Output Jitter for STM-64 Opt Int	G.783	20k to 80 MHz -0.30(UI) 4000 k to 80 MHz – 0.10 (UI) (1UI=0.10ns))	
K.32	STM-64 Optical	Receiver Overload for STM-64 Opt Int	G.691	L -64.2a:-9 dBm L -64.2b:-3 dBm L -64.2c:-9 dBm L -64.3: -3dBm	
K.33	STM-64 Optical	Receiver Sensitivity for STM-64 Opt Int	G.691	L -64.2a:-26dBm L -64.2b:-14dBm L -64.2c:-26dBm L -64.3: -13dBm	
K.34	STM-256 Optical	Input Jitter Tolerance for STM-256 Opt	G.825	Table 8 Fig 6 Amd.1	

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/ Values	Applicability/ Remarks
K.35	STM-256 Optical	Mean Launched Power for STM-256 Opt Int	G.693	Table 4 & 6	
K.36	STM-256 Optical	Nominal Bit Rate with Tolerance STM-256 Opt Int	G.693	NRZ 40G	
K.37	STM-256 Optical	Operating Wavelength Rangefor STM-256 Opt Int	G.693	Table 4 & 6	
K.38	STM-256 Optical	Output Jitter for STM-256 Opt Int	G.783	FFS to FFS -FFS 16000 k to 320 MHz – 0.10 (UI) (1UI=0.025ns)	
K.39	STM-256 Optical	Receiver Overload for STM-256 Opt Int	G.693	Table 4 & 6	
K.40	STM-256 Optical	Receiver Sensitivity for STM-256 Opt Int	G.825	Table 4, Fig-1 clause-6.1.2.1	

Annexure-L: OTN Interface Parameters

Parameter Group: OTN Interface (INTOTN)

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/ Values	Applicability/ Remarks
L.1	OTU-1	Central Frequency for OTU-1	G.959.1, G.693	192.1 + 0.2 m THz, m = 0 to 15 THz	
L.2	OTU-1	Input Jitter Tolerance for OTU-1	G.8251	Fig 7.1-1 Page 8	
L.3	OTU-1	Mean total InputPower for OTU-1	G.959.1, G.693		As different application codes based on the fibre, no of channels, span distance/attenuation etc have different values, so the respective tables may be referred for the value.

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/ Values	Applicability/ Remarks
L.4	OTU-1	Mean total Output Power for OTU-1	G.959.1, G.693		As different application codes based on the fibre, no of channels, span distance/attenuation etc have different values, so the respective tables may be referred for the value.
L.5	OTU-1	Minimum Receiver Overload for OTU-1	G.959.1, G.693		
L.6	OTU-1	Nominal Bit Rate with Tolerance OTU-1	G.709	255/238 ∗2 488 320kbit/s±20 ppm	
L.7	OTU-1	Output Jitter for OTU-1	G.8251	5K to 20 M**:**1.5(UIpp) 1M to 20 M:0.15 (UIpp)	
L.8	OTU-1	Receiver Sensitivity for OTU-1	G.959.1	-22dBm	
L.9	OTU-2	Central Frequency for OTU-2	G.959.1, G.693	192.1 + 0.2 m, m = 0 to 15 THz	
L.10	OTU-2	Input Jitter Tolerance for OTU-2	G.8251	Fig 7.1-1	
L.11	OTU-2	Mean total Input Power for OTU-2	G.959.1, G.693		As different application codes based on the fibre, no of channels, span distance/attenuation etc have different values, so the respective tables may be referred for the value.
L.12	OTU-2	Mean total Output	G.959.1, G.693		As different application codes based on the fibre, no of channels, span distance/attenuation etc have different

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/ Values	Applicability/ Remarks
		Power for OTU-2			values, so the respective tables may be referred for the value.
L.13	OTU-2	Minimum Receiver Overload for OTU-2	G.959.1, G.693	-1dBm	
L.14	OTU-2	Nominal Bit Rate with Tolerance OTU-2	G.709	255/237 × 9 953 280kbit/s□55/237	
L.15	OTU-2	Output Jitter for OTU-2	G.8251 Cl. 5	20K to 80 M **:**1.5(UIpp) 4M to 20 M:0.15 (UIpp)	
L.16	OTU-2	Receiver Sensitivity for OTU-2	G.959.1 Cl. 7, 8, G.693 Cl. 6, 7		As different application codes based on the fibre, no of channels, span distance/attenuation etc have different values, so the respective tables may be referred for the value.
L.17	OTU-3	Central Frequency for OTU-3	G.959.1 G.693	192.1 THz	
L.18	OTU-3	~~Maximum~~ Mean total Input Power for OTU-3	G.959.1, G.693		As different application codes based on the fibre, no of channels, span distance/attenuation etc have different values, so the respective tables may be referred for the value.
L.19	OTU-3	~~Minimum~~ Mean total Output Power for OTU-3	G.959.1, G.693		As different application codes based on the fibre, no of channels, span distance/attenuation etc have different values, so the respective tables may be referred for the value.

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/ Values	Applicability/ Remarks
L.20	OTU-3	Minimum Receiver Overload for OTU-3	G.959.1, G.693	+3dBm	
L.21	OTU-3	Nominal Bit Rate with Tolerance OTU-3	G.709	255/236 ∗ 39 813 120 kbit/s ± 20 ppm	
L.22	OTU-3	Receiver Sensitivity for OTU-3	G.959.1, G.693		As different application codes based on the fibre, no of channels, span distance/attenuation etc have different values, so the respective tables may be referred for the value.
L.23	OTU-4	Central Frequency for OTU-4int	G.959.1, G.695.1	229.0 + 0.8 m, m = 0 to 3(THz)	
L.24	OTU-4	Maximum Mean total input Power for OTU-4int	G.959.1, G.695	Table 8-5, 8-6 G.959.1/Table 8-23 G.695	
L.25	OTU-4	Mean Total Output Power for OTU-4int	G.959.1, G.695	Table 8-5, 8-6 G.959.1/Table 8-23 G.695	
L.26	OTU-4	Minimum receiver overload for OUT-4 int	G.959.1, G.695		

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/ Values	Applicability/ Remarks
L.27	OTU-4	Nominal Bit Rate with Tolerance OTU-4	G.709	255/227 ∗ 99 532 800 kbit/s ±20 ppm	
L.28	OTU-4	Receiver Sensitivity for OTU-4	G.959.1, G.695	Table 8-5, 8-6 G.959.1/Table 8-23 G.695	

Annexure-M: Mobile Handset and Tablet Test Parameters

Parameter Group: Mobile Functional (MOBFUNC)

S. No.	Applicability	Parameter Name	Standard	Test Procedure
M.1	Mobile Handset and Tablet	Mobile device - Non-Zero IMEI/MEID/ESN	GSMA official document IMEI Allocation & Approval Process	Appendix-II, Test-30
M.2	Mobile Handset – Feature Phone	Mobile Emergency Support - Panic Button	G.S.R. No. 436 (E) dated 22-04-2016, 3GPP TS 22.101 for GSM/ UMTS/ LTE, 3GPP2 C.S0023 for CDMA.	Appendix-II, Test-31
M.3	Mobile Handset – Smart Phone	Mobile Emergency Support - Panic Button	G.S.R. No. 436 (E) dated 22-04-2016, 3GPP TS 22.101 for GSM/ UMTS/ LTE, 3GPP2 C.S0023 for CDMA.	Appendix-II, Test-32
M.4	Mobile Handset – Smart Phone	Mobile Emergency Support - GPS Location	G.S.R. No. 1441 (E) dated 23-11-2017.	Appendix-II, Test-33
M.5	Mobile Handset	Mobile Emergency Support - Call on 112	DoT 16-04/2015-AS-III/NP/67/120 dt 4.5.16, 3GPP2 C.S0023 for CDMA 2000, 3GPP TS 22.101 and TS 24.008 for GSM/ UMTS/ LTE.	Appendix-II, Test-34
M.6	Mobile Handset	Mobile Device Indian Language Support	IS 16333 (Part 3).	Appendix-II, Test-37
M.7	Mobile Handset	SAR Display for Mobile Handset	TEC/GR/SAR/001/01.MAR.09 or IEC Standard 62209-1	Appendix-II, Test-35
M.8	Mobile Handset	SAR Value for Mobile Handset	IEC 62209-1:2005 TEC/GR/SAR/001/01.MAR.09	62209-1: 2005 or later version
M.9	IoT Devices	IoT Dev - Non-0 IMEI or MEID or Unique MAC	GSMA official document IMEI Allocation & Approval Process (for IMEI / MEID)	Device manufacturer shall mention the suitable procedure for testing IMEI/ MEID/ MAC address/ any other unique ID by connecting device to

				smart phone/ tablet/ PC and without using any specialised test equipment
M.10	(i) SAR values for IoT devices expected to be worn on the body.	Parameters given in section 4.2.1, table-4 of STANDARD No.: TEC 13016:2020	STANDARD No.: TEC 13016:2020 , Section 4.2.1 Table -4	As per STANDARD No.: TEC 13016:2020
	(ii) SAR values for IoT devices expected to be worn on the body near the head.	Parameters given in section 4.2.1, table-5 of STANDARD No.: TEC 13016:2020	STANDARD No.: TEC 13016:2020 , Section 4.2.1 Table -5	As per STANDARD No.: TEC 13016:2020
	(iii) SAR values for IoT devices expected to be used in close proximity of 20 cm or less to the body	Parameters given in section 4.2.1, table-6 of STANDARD No.: TEC 13016:2020	STANDARD No.: TEC 13016:2020 , Section 4.2.1 Table -6	As per STANDARD No.: TEC 13016:2020

Annexure-P1: IP Conformance Parameters – SIP and SIPI – RFC 3261 and Q.1912.5

Parameter Group: IP Conformance

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P1.1	SIP Parameters Set-A	SIP Header : Message Body Type	RFC 3261	Clause 7.4.1	SIP Terminal, PABX
P1.2	SIP Parameters Set-A	Generating SIP request (To, R-URI, From, Call-ID, CSeq, Max-Forwards, Via)	RFC 3261	Clause 8.1.1, 8.1.1.2 to 8.1.1.7	SIP Terminal, PABX
P1.3	SIP Parameters Set-A	SIP Dialog and Transaction	RFC 3261	Clause 12, 12.1.1, 12.1.2	SIP Terminal, PABX
P1.4	SIP Parameters Set-A	SIP Terminating a Session with a BYE request.	RFC 3261	Clause 15	SIP Terminal, PABX
P1.5	SIP Parameters Set-A	SIP Creating the initial invite	RFC 3261	Clause 13.2.1	SIP Terminal, PABX
P1.6	SIP Parameters Set-A	User Authentication	RFC 3261	Clause 21	SIP Terminal, PABX
P1.7	SIP Parameters Set-B	SIP - Call Flow	RFC 3261	Clause 4	LMGW
P1.8	SIP Parameters Set-B	SIP Header : Message Body Type	RFC 3261	Clause 7.4.1	LMGW
P1.9	SIP Parameters Set-B	Generating SIP request (To, R-URI, From, Call-ID, CSeq, Max-Forwards, Via)	RFC 3261	Clause 8.1.1, 8.1.1.2 to 8.1.1.7	LMGW
P1.10	SIP Parameters Set-B	SIP Dialog and Transaction	RFC 3261	Clause 12, 12.1.1, 12.1.2	LMGW
P1.11	SIP Parameters Set-B	SIP Terminating a Session with a BYE request.	RFC 3261	Clause 15	LMGW

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P1.12	SIP Parameters Set-B	SIP Creating the initial invite	RFC 3261	Clause 13.2.1	LMGW
P1.13	SIP Parameters Set-B	User Authentication	RFC 3261	Clause 21	LMGW
P1.14	SIP Parameters Set-C	SIP - Max Forwards (Not for SIPS URI)	RFC 3261	Clause 8.1.1.6	SBC
P1.15	SIP Parameters Set-C	SIP - Message Body length (Not for SIPS URI)	RFC 3261	Clause 7.4.2	SBC
P1.16	SIP Parameters Set-C	SIP - Responses (Not for SIPS URI)	RFC 3261	Clause 7.2	SBC
P1.17	SIP Parameters Set-D	SIP - Max Forwards (Not for SIPS URI)	RFC 3261	Clause 8.1.1.6	SOFT SWITCH
P1.18	SIP Parameters Set-D	SIP - Message Body length (Not for SIPS URI)	RFC 3261	Clause 7.4.2	SOFT SWITCH
P1.19	SIP Parameters Set-D	SIP - Responses (Not for SIPS URI)	RFC 3261	Clause 7.2	SOFT SWITCH
P1.20	SIP Parameters Set-D	SIP - Cancelling a Request	RFC 3261	Clause 9	SOFT SWITCH
P1.21	SIP Parameters Set-D	SIP - Client Behaviour (Not for SIPS URI)	RFC 3261	Clause 9.1	SOFT SWITCH
P1.22	SIPI Parameters	SIPI - Conventions for representation of ISUP PDU	Q 1912.5	Clause 5.1	SOFT SWITCH
P1.23	SIPI Parameters	SIPI - Conventions for representation of SIP/SDP information	Q 1912.5	Clause 5.2	SOFT SWITCH

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P1.24	SIPI Parameters	SIPI - IAM parameters	Q 1912.5	Clause 6.1.3	SOFT SWITCH
P1.25	SIPI Parameters	SIPI - INVITE received with an SDP offer	Q 1912.5	Clause 6.1.2	SOFT SWITCH
P1.26	SIPI Parameters	SIPI - INVITE received without an SDP offer	Q 1912.5	Clause 6.1.1	SOFT SWITCH
P1.27	SIPI Parameters	SIPI - ISUP encapsulation – detailed procedures	Q 1912.5	Clause 5.4	SOFT SWITCH
P1.28	SIPI Parameters	SIPI - Sending of Initial Address Message (IAM)	Q 1912.5	Clause 6.1	SOFT SWITCH

Annexure-P2: IP Conformance Parameters – RTP – RFC 3550

Parameter Group: IP Conformance (CONFIP)

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P2.1	RTP Parameters Set-A	RTP: Sender report RTCP packet version	RFC 3550	Clause 6.4.1	SIP Terminal, PABX
P2.2	RTP Parameters Set-A	RTP: Sequence number	RFC 3550	Clause 5.1	SIP Terminal, PABX
P2.3	RTP Parameters Set-A	RTP: Version and Port	RFC 3550	Clause 5.1	SIP Terminal, PABX
P2.4	RTP Parameters Set-A	RTP: Payload Type	RFC 3550	Clause 5.1	SIP Terminal, PABX
P2.5	RTP Parameters Set-A	RTP: SSRC Identification	RFC 3550	Clause 5.1	SIP Terminal, PABX
P2.6	RTP Parameters Set-B	RTP: Sender report RTCP packet version	RFC 3550	Clause 6.4.1	LMGW, MGW
P2.7	RTP Parameters Set-B	RTP: Sequence number	RFC 3550	Clause 5.1	LMGW, MGW
P2.8	RTP Parameters Set-B	RTP: Version and Port	RFC 3550	Clause 5.1	LMGW, MGW
P2.9	RTP Parameters Set-B	RTP: Payload Type	RFC 3550	Clause 5.1	LMGW, MGW
P2.10	RTP Parameters Set-C	RTP: Byte Order, Alignment, and Time Format	RFC 3550	Clause 4	Session Border Controller
P2.11	RTP Parameters Set-C	RTP: Simple Multicast Audio Conference	RFC 3550	Clause 2.1	Session Border Controller

Annexure-P3: IP Conformance Parameters – RTCP – RFC 3551

Parameter Group: IP Conformance (CONFIP)

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P3.1	RTCP Parameters Set-A	RTCP: Port Assignment	RFC 3551	Clause 8	SIP Terminal
P3.2	RTCP Parameters Set-A	RTCP: Registering Additional Encodings	RFC 3551	Clause 3	SIP Terminal
P3.3	RTCP Parameters Set-A	RTCP: GSM-EFR	RFC 3551	Clause 4.5.9	SIP Terminal
P3.4	RTCP Parameters Set-A	RTCP: Guidelines 1 for sample-based audio encodings	RFC 3551	Clause 4.3	SIP Terminal
P3.5	RTCP Parameters Set-A	RTCP: Guidelines 2 for sample-based audio encodings	RFC 3551	Clause 4.4	SIP Terminal
P3.6	RTCP Parameters Set-B	RTCP: Port Assignment	RFC 3551	Clause 8	Session Border Controller
P3.7	RTCP Parameters Set-B	RTCP: Registering Additional Encodings	RFC 3551	Clause 3	Session Border Controller

Annexure-P4: IP Conformance Parameters – TCP – RFC 793

Parameter Group: IP Conformance (CONFIP)

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P4.1	TCP Parameters	Header Format and Sequence Numbers	RFC 793	Clause 3.1, 3.3 Clause 1.4, 2.3, 3.1, Test terminology as per clause 3.2	MGW, SIP Terminal, PABX SBC

Annexure-P5: IP Conformance Parameters – UDP – RFC 768 and MGCP – H.248

Parameter Group: IP Conformance (CONFIP)

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P5.1	UDP Parameters	UDP Format	RFC 768		MGW, LMGW, SBC, Soft Switch, PABX
P5.2	UDP Parameters	User Terminology	RFC 768		MGW, LMGW, SBC, Soft Switch, PABX
P5.3	UDP Parameters	Sequence numbers	RFC 768		MGW, LMGW, SBC, Soft Switch, PABX
P5.4	MGCP Parameters	Connection Model	H.248	Clauses 6.1 & 6.2	MGW, LMGW, Soft Switch

Annexure-P6: IP Conformance Parameters – IPV4 and Dual Stack – RFC 791 and RFC 4213

Parameter Group: IP Conformance (CONFIP) (For IoT devices / gateways:- IPv4 / Dual IP parameters will be tested if feature is available.)

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P6.1	IPV4 Parameters Set-A	Model of operation	RFC 791	Clause 2.2	MGW, SGW, PABX, ONU, ONT
P6.2	IPV4 Parameters Set-A	Internet Header Format	RFC 791	Clause 3.1	MGW, SGW, PABX, ONU, ONT, **IoT Gateway, Feedback device, Smart Electricity meter, Tracking device, Smart camera, Smart Watch**
P6.3	IPV4 Parameters Set-A	Addressing	RFC 791	Clause 3.2	MGW, SGW, PABX, ONU, ONT
P6.4	IPV4 Parameters Set-B	Model of operation	RFC 791	Clause 2.2	SBC
P6.5	IPV4 Parameters Set-B	Gateways	RFC 791	Clause 2.4	SBC, **IoT Gateway**
P6.6	IPV4 Parameters Set-B	Interfaces	RFC 791	Clause 3.3	SBC
P6.7	IPV4 Parameters Set-C	Function Description	RFC 791	Clause 2.3	SOFT SWITCH, **IoT Gateway, Feedback device, Smart Electricity meter, Tracking device, Smart camera, Smart Watch**
P6.8	IPV4 Parameters Set-C	Gateways	RFC 791	Clause 2.4	SOFT SWITCH
P6.9	IPV4 Parameters Set-C	Interfaces	RFC 791	Clause 3.3	SOFT SWITCH

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P6.10	Dual IP layer operation: Address	Dual IP layer operation: Address Configuration	RFC 4213	Clause 2.1	WiFi Access Point, WiFi CPE, DSL NT Modem, ONU, ONT, SBC, IP Terminal, , **IoT Gateway, Feedback device, Smart Electricity meter, Tracking device, Smart camera, Smart Watch** Product should demostrate support to all IPv6 services through respective RFCs and clause numbers. All Product variants should comply to either native IPv6 or Dual Stack test for PON devices.
P6.11	Dual IP layer operation: DNS	Dual IP layer operation: DNS	RFC 4213	Clause 2.2	SBC, IP Terminal, PON ONT Product should demostrate support to all IPv6 services through respective RFCs and clause numbers. All Product variants should comply to either native IPv6 or Dual Stack test for PON devices.
P6.12	Dual IP layer operation: Tunnelling	Dual IP layer operation: Tunnelling	RFC 4213	Clause 3	WiFi Access Point, WiFi CPE, DSL NT Modem, ONU, ONT, OLT, MGW, LMGW, PABX, SBC, Mobile Device, ONU, ONT,

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
					CCNProduct should demostrate support to all IPv6 services through respective RFCs and clause numbers. All Product variants should comply to either native IPv6 or Dual Stack test for PON devices.
P6.13	Dual IP layer operation: Tunnelling	Dual IP layer operation: Tunnelling	RFC 4213	Clause 3.2.1	**IoT Gateway, Feedback device, Smart Electricity meter, Tracking device, Smart camera, Smart Watch**
P6.14	Dual IP layer operation: Decapsulation	Dual IP layer operation: Decapsulation	RFC 4213	Clause 3.6	**IoT Gateway, Feedback device, Smart Electricity meter, Tracking device, Smart camera, Smart Watch**
P6.15	Dual IP layer operation: Link Local Address	Dual IP layer operation: Link Local Address	RFC 4213	Clause 3.7	**IoT Gateway, Feedback device, Smart Electricity meter, Tracking device, Smart camera, Smart Watch**

Annexure-P7: IPv6 Conformance Parameters

Parameter Group: IP Conformance (CONFIP) (For IoT devices / gateways:- IPv6 parameters will be tested if feature is available.)

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P7.1	IPV6 Header Parameters	Header: Version Field	RFC 2460 / RFC 8200	Clause 3	SIP Terminal, SBC, Mobile Device, ONU, ONT, CCN, **IoT Gateway, Feedback device, Smart Electricity meter, Tracking device, Smart camera, Smart Watch**
P7.2	IPV6 Header Parameters	Header: Traffic Class	RFC 2460 / RFC 8200	Clause 3	SIP Terminal, SBC, Mobile Device, ONU, ONT, CCN, **IoT Gateway, Feedback device, Smart Electricity meter, Tracking device, Smart camera, Smart Watch**
P7.3	IPV6 Header Parameters	Header: Flow Label	RFC 2460 / RFC 8200	Clause 3	SIP Terminal, SBC, Mobile Device, ONU, ONT, CCN, **IoT Gateway, Feedback device, Smart Electricity meter, Tracking device, Smart camera, Smart Watch**
P7.4	IPV6 Header Parameters	Header: Payload Length	RFC 2460 / RFC 8200	Clause 3	SIP Terminal, SBC, Mobile Device, ONU, ONT, CCN, **IoT Gateway,**

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
					Feedback device, Smart Electricity meter, Tracking device, Smart camera, Smart Watch
P7.5	IPV6 Header Parameters	Header: No next header after IPv6 Header	RFC 2460 / RFC 8200	Clause 3	SIP Terminal, SBC, Mobile Device, ONU, ONT, CCN, **IoT Gateway, Feedback device, Smart Electricity meter, Tracking device, Smart camera, Smart Watch**
P7.6	IPV6 Header Parameters	Header: Hop Limit	RFC 2460 / RFC 8200	Clause 3	SIP Terminal, SBC, Mobile Device, ONU, ONT, CCN, **IoT Gateway, Feedback device, Smart Electricity meter, Tracking device, Smart camera, Smart Watch**
P7.7	IPV6 Header Parameters	Header: Source and Destination Address	RFC 2460 / RFC 8200	Clause 3	SIP Terminal, SBC, Mobile Device, ONU, ONT, CCN, **IoT Gateway, Feedback device, Smart Electricity meter, Tracking device, Smart camera, Smart Watch**

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P7.8	IPV6 Extn. Header Parameters	IPv6 Extension Header Order	RFC 2460 / RFC 8200	Clause 4.1	Mobile Device, ONU, ONT, CCN, **IoT Gateway, Feedback device, Smart Electricity meter, Tracking device, Smart camera, Smart Watch**
P7.9	IPV6 Extn. Header Parameters	IPv6 Extension Header Options	RFC 2460 / RFC 8200	Clause 4.2	Mobile Device, ONU, ONT, CCN
P7.10	IPV6 Extn. Header Parameters	IPv6 Extension Header Hop by Hop Options	RFC 2460 / RFC 8200	Clause 4.3	Mobile Device, ONU, ONT, CCN
P7.11	IPV6 Extn. Header Parameters	IPv6 Extension Header Routing	RFC 2460 / RFC 8200	Clause 4.4	Mobile Device, ONU, ONT, CCN, **IoT Gateway, Feedback device, Smart Electricity meter, Tracking device, Smart camera, Smart Watch**
P7.12	IPV6 Extn. Header Parameters	IPV6 Extn. Header Fragment Header	RFC 8200	Clause 4.5	**IoT Gateway, Feedback device, Smart Electricity meter, Tracking device, Smart camera, Smart Watch**
P7.13	IPV6 Packet Size Issues parameter	IPV6 Packet Size Issues	RFC 8200	Clause 5	**IoT Gateway**

Annexure-P8: IP Conformance Parameters – DTMF – RFC 4733

Parameter Group: IP Conformance (CONFIP)

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P8.1	DTMF Parameters Set-A	RTP payload format for named telephones events	RFC 4733	Clause 2	MGW,LMGW
P8.2	DTMF Parameters Set-A	Use of RTP header fields	RFC 4733	Clause 2.2	MGW,LMGW
P8.3	DTMF Parameters Set-A	Payload Format	RFC 4733	Clause 2.3	MGW,LMGW
P8.4	DTMF Parameters Set-B	DTMF: Applications	RFC 4733	Clause 3.1	Soft Switch
P8.5	DTMF Parameters Set-B	DTMF: Congestion Consideration	RFC 4733	Clause 3.3	Soft Switch
P8.6	DTMF Parameters Set-B	DTMF: Events	RFC 4733	Clause 3.2	Soft Switch
P8.7	DTMF Parameters Set-B	DTMF: Payload Format	RFC 4733	Clause 2.3	Soft Switch

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P8.8	DTMF Parameters Set-B	DTMF: RTP payload format for named telephones events	RFC 4733	Clause 2	Soft Switch
P8.9	DTMF Parameters Set-B	DTMF: Specification of Events codes for DTMF events	RFC 4733	Clause 3	Soft Switch
P8.10	DTMF Parameters Set-B	DTMF: Use of RTP header fields	RFC 4733	Clause 2.2	Soft Switch
P8.11	DTMF Parameters Set-C	DTMF: Duration negotiation	RFC 4733	Clause 2.3.5	PABX
P8.12	DTMF Parameters Set-C	DTMF: Negotiation of Payload	RFC 4733	Clause 2.5.1.1	PABX
P8.13	DTMF Parameters Set-C	DTMF: Transmission of Event Packet	RFC 4733	Clause 2.5.1.2	PABX
P8.14	DTMF Parameters Set-C	DTMF: Verification of sequence no. and time stamp	RFC 4733	Clause 2.2.1	PABX

Annexure-P9: IP Conformance Parameters – SCTP – RFC 4960

Parameter Group: IP Conformance (CONFIP)

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P9.1	SCTP Parameters Set-A	SCTP packet Format	RFC 4960	Clause 3	MGW, LMGW, SGW
P9.2	SCTP Parameters Set-A	SCTP common header field descriptions	RFC 4960	Clause 3.1	MGW, LMGW, SGW
P9.3	SCTP Parameters Set-A	Chunk field descriptions	RFC 4960	Clause 3.2	MGW, LMGW, SGW
P9.4	SCTP Parameters Set-A	Optional/variable-length parameters format	RFC 4960	Clause 3.2.1	MGW, LMGW, SGW
P9.5	SCTP Parameters Set-A	Reporting of unrecognized parameters	RFC 4960	Clause 3.2.2	MGW, LMGW, SGW
P9.6	SCTP Parameters Set-A	SCTP association state diagram	RFC 4960	Clause 4	MGW, LMGW, SGW
P9.7	SCTP Parameters Set-B	User Data Fragmentation	RFC 4960	Clause 1.5.3	SBC, Soft Switch
P9.8	SCTP Parameters Set-B	Path Management	RFC 4960	Clause 1.5.7	SBC, Soft Switch
P9.9	SCTP Parameters Set-B	Transmission of DATA Chunks	RFC 4960	Clause 6.1	SBC, Soft Switch
P9.10	SCTP Parameters Set-B	Path Failure Detection	RFC 4960	Clause 8.2	SBC, Soft Switch

Annexure-P10: IP Conformance Parameters – M3UA – RFC 4960 and Signalling over IP – RFC 2719

Parameter Group: IP Conformance (CONFIP)

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P10.1	M3UA Parameters	Procedures to Support the M3UA-User	RFC 3332	Clause 4.1	Soft Switch, SGW
P10.2	M3UA Parameters	Establishment of Association and Traffic Between SGs and ASPs	RFC 3332	Clause 5.1	Soft Switch, SGW
P10.3	M3UA Parameters	M3UA Port Number	RFC 3332	Clause 7.2	Soft Switch, SGW
P10.4	M3UA Protocol Extensions Parameter	M3UA Protocol Extensions	RFC 3332	Clause 7.3	Soft Switch, SGW
P10.5	Signalling Protocol Over IP	Gateway Component Functions	RFC2719	Clause 2.1	SGW
P10.6	Signalling Protocol Over IP	SS7 Interworking for Connection Control	RFC2719	Clause 2.2	SGW
P10.7	Signalling Protocol Over IP	ISDN Interworking for Connection Control	RFC2719	Clause 2.3	SGW
P10.8	Signalling Protocol Over IP	Architecture for Database Access	RFC2719	Clause 2.4	SGW
P10.9	Signalling Protocol Over IP	SG to SG	RFC2719	Clause 3.5	SGW

Annexure-P11: IP Conformance Parameters – Functional Tests for IP

Parameter Group: IP Conformance (CONFIP)

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P11.1	IPV4 Parameters Set-D	IPV4 Functional Tests	RFC 791	Appendix-II, Test-5	LAN Switch, Router
P11.2	SNMPv2 Parameters	SNMPv2 Functional Tests	RFC 3416	Appendix-II, Test-38	LAN Switch, Router
P11.3	SNMPv3 Parameters	SNMPv3 Functional Tests	RFC 3410	Appendix-II, Test-39	LAN Switch, Router
P11.4	SNMPv2 or Qx Protocol Parameters	SNMPv2 or Qx Protocol functional test		Appendix-II, Test-6	LAN Switch, Router
P11.5	SNMPv3 or Qx Protocol Parameters	SNMPv3 or Qx Protocol functional test		Appendix-II, Test-7	LAN Switch, Router
P11.6	Dynamic Routing	Dynamic Routing Functional Tests		Appendix-II, Test-8	Router, L3 switch
P11.7	Static Routing	Static Routing Functional Tests		Appendix-II, Test-9	Router, L3 switch
P11.8	TCP Parameters	TCP Functional Tests	RFC 793	Appendix-II, Test-10	Router
P11.9	Mac Learning & Pkt Fwdg	Mac Learning and Packet Forwarding		Appendix-II, Test-11	LAN Switch

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P11.10	Spanning Tree Protocol Test	Spanning Tree Protocol Root Bridge Election Functional Test	IEEE 802.1d	Appendix-II, Test-12	LAN Switch
P11.11	Spanning Tree Protocol Test	Spanning Tree Protocol Port Blocking Functional Test	IEEE 802.1d	Appendix-II, Test-13	LAN Switch
P11.12	OSPFv2	OSPFv2	RFC2328	Appendix-I, Table-1	Router
P11.13	OSPFv3 for IPv6	OSPFV3	RFC2740	Appendix-I, Table-2	Router
P11.14	IPV6 Complete Suite	RFC 2460 or 8200	RFC2460/8200	Appendix-I, Table-3	Router, Security System
P11.15	IPV6 Complete Suite	RFC 4861	RFC4862	Appendix-I, Table-4	Router, Security System
P11.16	IPV6 Complete Suite	RFC 4862	RFC4862	Appendix-I, Table-5	Router, Security System
P11.17	IPV6 Complete Suite	RFC 1981	RFC1981	Appendix-I, Table-6	Router, Security System
P11.18	IPV6 Complete Suite	RFC 4443	RFC4443	Appendix-I, Table-7	Router, Security System
P11.19	BGP for IPv6	BGP for IPV6	RFC2545	Appendix-I, Table-8	MPLS, BNG/BRAS Router
P11.20	BGP4		RFC4271	Appendix-I, Table-9	MPLS, BNG/BRAS Router
P11.21	MBGP		RFC4760	Appendix-I, Table-10	MPLS, BNG/BRAS Router

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P11.22	LDP		RFC5036	Appendix-I, Table-11	MPLS Router
P11.23	IPSec Functional Test	IPSec Functional Test		Appendix-II, Test-16	IP Security System
P11.24	NAT Functional Test	NAT Functional Test		Appendix-II, Test-17, 18	IP Security System
P11.25	Policy Functional Test	Policy Functional Test		Appendix-II, Test-19	IP Security System
P11.26	IDS Functional Test	IDS Functional Test		Appendix-II, Test-20, 21	IP Security System
P11.27	IPS Functional Test	IPS Functional Test		Appendix-II, Test-22, 23	IP Security System
P11.28	UTM URL, Content & Anti-Virus Filtering Functional Test	UTM URL, Content & Anti-Virus Filtering Functional Test		Appendix-II, Test-24, 25, 26	IP Security System
P11.29	Profile for frequency synchronisation	Profile for frequency synchronisation		Appendix-II, Test-27	PTP GM
P11.30	Profile for time and phase synchronisation with full timing support	Profile for time and phase synchronisation with full timing support		Appendix-II, Test-28	PTP GM

S. No.	Parameter Name	Individual Parameter Name	IETF RFC	Clause/ Section	Applicability/ Remarks
P11.31	Profile for time and phase synchronisation with partial timing support	Profile for time and phase synchronisation with partial timing support		Appendix-II, Test-29	PTP GM
P11.32	PPPoE	PPPoE Functional Test	RFC2516	Appendix-II, Test-14	PON, Router
P11.33	Radius	Radius Functional Test	RFC2865	Appendix-II, Test-15	Router
P11.34	MPLS-TP Requirement	MPLS-TP Requirement	RFC 5654	Clause 2	MPLS TP CEN Switch (Conformance testing)
P11.35	Ethernet PWE and Service Identification	Ethernet PWE and Service Identification	RFC 4448	Clause 4	MPLS TP CEN Switch (Conformance testing)
P11.36	TDM PWE and Service Identification	TDM PWE and Service Identification	RFC 3916	Clause 4 & Clause 7.1	MPLS TP CEN Switch (Conformance testing)
P11.37					
P11.38					

ANNXEURE Q: Optical Fibre (Single Mode) Tests

I. ITU-T G.652.D Optical Fibre – (Variant 1)

SN	Parameter Name	Individual Parameter Name	Standard	Limits/ Values
1	**Geometrical Characteristics**	Mode Field Diameter at 1310 nm	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-45	9.2 ± 0.4 µm
2		Cladding Diameter	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	125 ± 0.7 µm
3		Cladding Non-circularity	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	≤ 0.8 %
4		Core Clad concentricity error	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	≤ 0.5 µm
5		Coating diameter	IEC 60793-2-50 and IEC 60793-1-21	242 ± 5 µm (uncolor); 252 ± 10µm (color)
6		Coating /Cladding concentricity	IEC 60793-2-50 and IEC 60793-1-21	≤ 12 µm
7	**Transmission Characteristics** (Attenuation of uncabled fibre)	At 1310 nm	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.34 dB/km
8		At 1550 nm	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.20 dB/km
9		At 1490 nm	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.24 dB/km
10		At 1270 nm	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.40 dB/km
11		At 1625 nm	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.23 dB/km
12		Water peak attenuation at 1380 to 1390 nm	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.34 dB/km
13		Sudden irregularity in attenuation	Telcordia GR-20-CORE,2013 and IEC 60793-1-40	≤ 0.1 dB

14	**Transmission Characteristics** (Chromatic Dispersion)	At 1550nm	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 18.0 ps/nm.Km
15		At 1625nm	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 22.0 ps/nm.Km
16		In 1285-1330nm band	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 3.5 ps/nm.Km
17		In 1270-1340nm band	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 5.3 ps/nm.Km
18		Zero Dispersion slope	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 0.092 ps/(nm^2 Km)
19		Zero Dispersion wavelength range	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	1300 - 1324nm
20	**Transmission Characteristics** (Polarization mode dispersion)	Uncabled Fiber	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-48	≤ 0.15 ps/√km
21		Link design value for un-cabled fibre	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-48	≤ 0.06 ps/√km
22	**Transmission Characteristics** (Cutoff wavelength)	Cable cut-off wavelength	ITU-T G.652 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-44	1260nm Max
23	**Transmission Characteristics** (Fibre Macro bend loss)	Change in attenuation when fiber is coiled with 100 turns on 60 ±1.0 mm diameter mandrel	ITU-T G.652 ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47	≤ 0.05 dB at 1550 nm ≤ 0.1 dB at 1625 nm
24		Change in attenuation when fiber is coiled with 1 turn around 32 ± 0.5 mm diameter mandrel	ITU-T G.652 ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47	≤ 0.5 dB at 1550 nm ≤ 1.0 dB at 1625 nm
25		Change in attenuation when fiber is coiled with 100 turns on 50 ±0.5 mm diameter mandrel	ITU-T G.652 ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47	≤ 0.05 dB at 1310 nm
26	**Mechanical Characteristics**	Proof test for minimum strain level	ITU-T G.652, G.650.1 and IEC 60793-2-50, 60793-1-30	1%

27		Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged	IEC 60793-2-50, 60793-1-32	1.0 ≤ N ≤ 8.9 N (Peak) 1.0 ≤ N ≤ 5.0 N (Average)
28		Dynamic Tensile Strength Un aged)	IEC 60793-2-50 and IEC 60793-1-31	≥ 550 KPSI (3.80Gpa)
29		Dynamic Tensile Strength Aged (Damp heat aged)	IEC 60793-2-50 and IEC 60793-1-31	≥ 440 KPSI (3.00Gpa)
30		Dynamic Fatigue (Unaged and Damp heat aged)	IEC 60793-2-50 and IEC 60793-1-33	≥ 20
31		Fiber Curl	IEC 60793-2-50, 60793-1-34	≥ 4 Meter radius of curvature
32	**Environmental Characteristics of Fiber for both color and uncolor fibres**	Temperature Cycle Test: Temperature Dependence of Attenuation: Induced Attenuation at 1550 nm and 1625 nm at -60°C to +85°C	IEC 60793-2-50 and IEC 60793-1-52	≤ 0.05 dB/Km
33		Temperature-Humidity Cycle Test: Induced attenuation at 1550 nm and 1625 nm at -10C TO +85°C and 95% relative humidity	EIA/TIA 455-73	≤ 0.05 dB/Km
34		Water Immersion Test: Induced attenuation at 1550 nm and 1625 nm due to water immersion at 23 ± 2°C	IEC 60793-2-50 and IEC 60793-1-53	≤ 0.05dB/Km
35		Accelerated Aging (Dry Heat) Test: Induced attenuation at 1550 nm and 1625 nm due to Temperature aging at 85 ± 2° C	IEC 60793-2-50 and IEC 60793-1-51	≤ 0.05 dB/Km
36		Retention of Coating Color: Coated fibre aged for 30 days at 85℃ temperature with 95% Humidity and then 20 days in 85℃ dry heat	IEC 60793-2-50 and IEC 60793-1-51	No change in colour of coated fibre

37		High Temperature and High Humidity (Damp Heat) Test: Induced attenuation at 1550 nm & 1625 nm at 85℃ temperature and 85% Relative Humidity for 30 days	IEC 60793-2-50 and IEC 60793-1-50	≤ 0.05 dB/Km
38		Cable Material Compatibility test for fibre : Fibre to be aged with filling compound for 30 days at 85℃ temperature and 85% Relative Humidity	Telcordia GR-20-CORE,2013; Draft IEC 60794-1-219	• Aged coating strip force: 1.0 ≤ F ≤ 8.9 N (Peak) 1.0 ≤ F ≤ 5.0 N (Average) • Visual Inspection under 5X magnification: No fibre coatings cracking, splitting, or delamination. • For coloured fibres, colour to be identifiable and no colour transfers to the filling compound. • MEK Rub Test as mentioned below in test no 39.
39	**Colour qualification for color fibres**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219	To be tested by using socked (solvent) tissue paper for ten strokes unidirectional on 10cm length of the fiber. No color trace shall be observed on tissue paper after testing.
40	**Material Properties :**	Fiber Materials: The substances of which the fibres are made	RoHS 3 (EU 2015/863)	Fibre material to be RoHS complied.

N.B.: Latest issue of above mentioned Standards may be referred.

II. ITU-T G.655 Optical Fibre (Variant 2)

SN	Parameter Name	Individual Parameter Name	Standard	Limits/ Values
1	**Geometrical Characteristics**	Mode Field Diameter at 1550 nm	ITU-T G.655 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-45	9.6 ± 0.4 µm
2		Cladding Diameter	ITU-T G.655 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	125 ± 0.7 µm
3		Cladding Non-circularity	ITU-T G.655 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	≤ 0.8 %
4		Core Clad concentricity error	ITU-T G.655 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	≤ 0.5 µm
5		Coating diameter	IEC 60793-2-50 and IEC 60793-1-21	242 ± 5 µm (uncolor); 252 ± 10 µm (color)
6		Coating /Cladding concentricity	IEC 60793-2-50 and IEC 60793-1-21	≤ 12 µm
7	**Transmission Characteristics** (Attenuation of uncabled fibre)	At 1550 nm	ITU-T G.655 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.21 dB/km
8		At 1625 nm	ITU-T G.655 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.23 dB/km
9		Sudden irregularity in attenuation	Telcordia GR-20-CORE,2013 and IEC 60793-1-40	≤ 0.1 dB
10	**Transmission Characteristics** (Chromatic Dispersion)	At 1530 to 1565 nm	ITU-T G.655, G.650.1 and IEC 60793-2-50, 60793-1-42	Min value of Dmin - 1.0 ps/nm.Km Max value of Dmax - 10.0 ps/nm.Km Dmax – Dmin: ≤5.0 ps/nm.km
11		At 1565 to 1625nm	ITU-T G.655, G.650.1 and IEC 60793-2-50, 60793-1-42	Min value of Dmin - 4.0 ps/nm.Km Max value of Dmax - 14.0 ps/nm.Km
12		Dispersion slope at 1550 nm	ITU-T G.655, G.650.1 and IEC 60793-2-50, 60793-1-42	≤ 0.09 ps/(nm^2 Km)

13	**Transmission Characteristics** (Polarization mode dispersion)	Uncabled Fiber	ITU-T G.655 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-48	≤ 0.15 ps/√km
14		Link design value for un-cabled fibre	ITU-T G.655 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-48	≤ 0.1 ps/√km
15	**Transmission Characteristics** (Cutoff Wavelength)	Cable cut off wavelength	ITU-T G.655 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-44	1450 nm Max
16	**Transmission Characteristics** (Fibre Macro bend loss)	Change in attenuation when fiber is coiled with 100 turns on 60 ±1.0 mm diameter mandrel	ITU-T G.655 ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47	≤ 0.05 dB at 1550 nm ≤ 0.1 dB at 1625 nm
17		Change in attenuation when fiber is coiled with 1 turn around 32 ± 0.5 mm diameter mandrel	ITU-T G.655 ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47	≤ 0.5 dB at 1550 nm ≤ 0.5 dB at 1625 nm
18	**Mechanical Characteristics**	Proof test for minimum strain level	ITU-T G.655, G.650.1 and IEC 60793-2-50, 60793-1-30	1%
19		Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32	1.0 ≤ F ≤ 8.9 N (Peak) 1.0 ≤ F ≤ 5.0 N (Average)
20		Dynamic Tensile Strength (Un aged)	IEC 60793-2-50 and IEC 60793-1-31	≥ 550 KPSI (3.80Gpa)
21		Dynamic Tensile Strength Aged (Damp heat aged)	IEC 60793-2-50 and IEC 60793-1-31	≥ 440 KPSI (3.00Gpa)
22		Dynamic Fatigue (Unaged and Damp heat aged)	IEC 60793-2-50 and IEC 60793-1-33	≥ 20
23		Fiber Curl	IEC 60793-2-50, 60793-1-34	≥ 4 Meter radius of curvature
24	**Environmental Characteristics of Fiber (for both color and uncolor fibres)**	Temperature Cycle Test: Temperature Dependence of Attenuation : Induced Attenuation at 1550 nm and 1625 nm at -60°C to +85°C	IEC 60793-2-50 and IEC 60793-1-52	≤ 0.05 dB/Km

25		Temperature-Humidity Cycle Test: Induced attenuation at 1550 nm and 1625 nm at -10° C TO +85° C and 95% relative humidity	EIA/TIA 455-73	≤ 0.05 dB/Km
26		Water Immersion Test: Induced attenuation at 1550 nm and 1625 nm due to water immersion at 23 ± 2°C	IEC 60793-2-50 and IEC 60793-1-53	≤ 0.05dB/Km
27		Accelerated Aging (Dry Heat) Test: Induced attenuation at 1550 nm and 1625 nm due to Temperature aging at 85 ± 2° C	IEC 60793-2-50 and IEC 60793-1-51	≤ 0.05 dB/Km
28		Retention of Coating Color: Coated fibre aged for 30 days at 85℃ temperature with 95% Humidity and then 20 days in 85℃ dry heat	IEC 60793-2-50 and IEC 60793-1-51	No change in colour of coated fibre
29		High Temperature and High Humidity (Damp Heat) Test: Induced attenuation at 1550 nm & 1625 nm at 85℃ temperature and 85% Relative Humidity for 30 days	IEC 60793-2-50 and IEC 60793-1-50	≤ 0.05 dB/Km
30		Cable Material Compatibility test for fibre : Fibre to be aged with filling compound for 30 days at 85℃ temperature and 85% Relative Humidity	Telcordia GR-20-CORE,2013; Draft IEC 60794-1-219	• Aged coating strip force: 1.0 ≤ F ≤ 8.9 N (Peak) 1.0 ≤ F ≤ 5.0 N (Average) • Visual Inspection under 5X magnification: No fibre coatings cracking, splitting, or delamination. • For coloured fibres, colour to be identifiable and no colour transfers to the filling compound.

				• MEK Rub Test as mentioned below in test no 31.
31	**Colour qualification**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219	To be tested by using socked (solvent) tissue paper for ten strokes unidirectional on 10cm length of the fiber. No color trace shall be observed on tissue paper after testing.
32	**Material Properties :**	Fiber Materials: The substances of which the fibres are made	RoHS 3 (EU 2015/863)	Fibre material to be RoHS complied.

N.B.: Latest issue of above mentioned Standards may be referred.

III. ITU-T G.656 Optical Fibre (Variant 3)

SN	Parameter Name	Individual Parameter Name	Standard	Limits/ Values
1	**Geometrical Characteristics**	Mode Field Diameter at 1550 nm	ITU-T G.656 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-45	9.2 ± 0.4 µm
2		Cladding Diameter	ITU-T G.656 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	125 ± 0.7 µm
3		Cladding Non-circularity	ITU-T G.656 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	≤ 1 %
4		Core Clad concentricity error	ITU-T G.656 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	≤ 0.5 µm
5		Coating diameter	IEC 60793-2-50 and IEC 60793-1-21	242 ± 5 µm (uncolor); 252 ± 10µm (color)
6		Coating /Cladding concentricity	IEC 60793-2-50 and IEC 60793-1-21	≤ 12 µm
7	**Transmission Characteristics** (Attenuation of uncabled fibre)	At 1460	ITU-T G.656, G.650.1 and IEC 60793-2-50, 60793-1-40	≤ 0.26 dB/km
8		At 1550 nm	ITU-T G.656, G.650.1 and IEC 60793-2-50, 60793-1-40	≤ 0.21 dB/km
9		At 1625 nm	ITU-T G.656, G.650.1 and IEC 60793-2-50, 60793-1-40	≤ 0.24 dB/km
10		At 1383 nm	ITU-T G.656, G.650.1 and IEC 60793-2-50, 60793-1-40	≤ 0.4 dB/km
11		Sudden irregularity in attenuation	Telcordia GR-20-CORE,2013	≤ 0.05 dB
12	**Transmission Characteristics**	At 1460 to 1550 nm	ITU-T G.656, G.650.1 and IEC 60793-2-50, 60793-1-42	1.0- 9.28 ps/nm.Km

13	(Chromatic Dispersion)	At 1550 to 1625 nm	ITU-T G.656, G.650.1 and IEC 60793-2-50, 60793-1-42	3.6 – 14.0 ps/nm.Km
14		Dispersion slope at 1550 nm	ITU-T G.656, G.650.1 and IEC 60793-2-50, 60793-1-42	≤ 0.07 ps/(nm^2 Km)
15	**Transmission Characteristics** (Polarization mode dispersion)	Uncabled Fiber	ITU-T G.656 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-48	≤ 0.15 ps/√km
16		Link design value for un-cabled fibre	ITU-T G.655 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-48	≤ 0.2 ps/√km
17	**Transmission Characteristics** (Cut off wavelength)	Cable cutoff wavelength	ITU-T G.656 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-44	1450 nm Max
18	**Transmission Characteristics** (Fibre Macro bend loss)	Change in attenuation when fiber is coiled with 100 turns on 60 ±1.0 mm diameter mandrel	ITU-T G.656 ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47	≤ 0.05 dB at 1550 nm ≤ 0.1 dB at 1625 nm
19		Change in attenuation when fiber is coiled with 1 turn around 32 ± 0.5 mm diameter mandrel	ITU-T G.656 ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47	≤ 0.5 dB at 1550 nm ≤ 0.5 dB at 1625 nm
20	**Mechanical Characteristics**	Proof test for minimum strain level	ITU-T G.656, G.650.1 and IEC 60793-2-50, 60793-1-30	1%
21		Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32	1.0 ≤ F ≤ 8.9 N (Peak) 1.0 ≤ F ≤ 5.0 N (Average)
22		Dynamic Tensile Strength (Un aged)	IEC 60793-2-50 and IEC 60793-1-31	≥ 550 KPSI (3.80Gpa)
23		Dynamic Tensile Strength Aged (Damp heat aged)	IEC 60793-2-50 and IEC 60793-1-31	≥ 440 KPSI (3.00Gpa)
24		Dynamic Fatigue Unaged and Damp heat aged	IEC 60793-2-50 and IEC 60793-1-33	≥ 20
25		Fiber Curl	IEC 60793-2-50, 60793-1-34	≥ 4 Meter radius of curvature

26	**Environmental Characteristics of Fiber for both color and uncolor fibres**	Temperature Cycle Test: Temperature Dependence of Attenuation : Induced Attenuation at 1550 nm and 1625 nm at -60°C to +85°C	IEC 60793-2-50 and IEC 60793-1-52	≤ 0.05 dB/Km
27		Temperature-Humidity Cycle Test: Induced attenuation at 1550 nm and 1625 nm at -10°C to +85°C and 95% relative humidity	EIA/TIA 455-73	≤ 0.05 dB/Km
28		Water Immersion Test: Induced attenuation at 1550 nm and 1625 nm due to water immersion at 23 ± 2°C	IEC 60793-2-50 and IEC 60793-1-53	≤ 0.05dB/Km
29		Accelerated Aging (Dry Heat) Test: Induced attenuation at 1550 nm and 1625 nm due to Temperature aging at 85 ± 2° C	IEC 60793-2-50 and IEC 60793-1-51	≤ 0.05 dB/Km
30		Retention of Coating Color: Coated fibre aged for 30 days at 85°C temperature with 95% Humidity and then 20 days in 85°C dry heat	IEC 60793-2-50 and IEC 60793-1-51	No change in colour of coated fibre
31		High Temperature and High Humidity (Damp Heat) Test: Induced attenuation at 1550 nm & 1625 nm at 85°C temperature and 85% Relative Humidity for 30 days	IEC 60793-2-50 and IEC 60793-1-50	≤ 0.05 dB/Km
32		Cable Material Compatibility test for fibre : Fibre to be aged with filling compound for 30 days at 85°C temperature and 85% Relative Humidity	Telcordia GR-20-CORE,2013; Draft IEC 60794-1-219	• Aged coating strip force: 1.0 ≤ F ≤ 8.9 N (Peak) 1.0 ≤ F ≤ 5.0 N (Average) • Visual Inspection under 5X magnification:

				No fibre coatings cracking, splitting, or delamination. • For coloured fibres, colour to be identifiable and no colour transfers to the filling compound. • MEK Rub Test as mentioned below in test no 33.
33	**Colour qualification**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219	To be tested by using socked (solvent) tissue paper for ten strokes unidirectional on 10cm length of the fiber. No color trace shall be observed on tissue paper after testing.
34	**Material Properties :**	Fiber Materials: The substances of which the fibres are made	RoHS 3 (EU 2015/863)	Fibre material to be RoHS complied.

N.B.: Latest issue of above mentioned Standards may be referred.

IV. ITU-T G.657.A1 Optical Fibre (Variant 4)

SN	Parameter Name	Individual Parameter Name	Standard	Limits/ Values
1	**Geometrical Characteristics**	Mode Field Diameter at 1310 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-45	(8.8-9.2) ± 0.4 µm
2		Cladding Diameter	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	125 ± 0.7 µm
3		Cladding Non-circularity	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	≤ 0.8 %
4		Core Clad concentricity error	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	≤ 0.5 µm
5		Coating diameter a) 250µm fibre b) 200µm fibre	IEC 60793-2-50 and IEC 60793-1-21	 242 ± 5 µm (uncolor); 252 ± 10 µm (color) 180-210 µm (uncolor); 180-220µm (color)
6		Coating /Cladding concentricity a) 250µm fibre b) 200µm fibre	IEC 60793-2-50 and IEC 60793-1-21	 ≤ 12 µm ≤ 10 µm
7	**Transmission Characteristics** (Attenuation of uncabled fibre)	At 1310 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.34 dB/km
8		At 1550 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.20 dB/km

9		At 1490 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.24 dB/km
10		At 1270 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.40 dB/km
11		At 1625 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.23 dB/km
12		Water peak attenuation at 1380 to 1390 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.34 dB/km
13		Sudden irregularity in attenuation	Telcordia GR-20-CORE,2013 and IEC 60793-1-40	≤ 0.1 dB
14	**Transmission Characteristics** (Chromatic Dispersion)	At 1550nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 18.0 ps/nm.Km
15		At 1625nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 22.0 ps/nm.Km
16		In 1285-1330nm band	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 3.5 ps/nm.Km
17		In 1270-1340nm band	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 5.3 ps/nm.Km
18		Zero Dispersion slope	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 0.092 ps/(nm^2 Km)
19		Zero Dispersion wavelength range	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	1300 - 1324nm

20	**Transmission Characteristics** (Polarization mode dispersion)	Un-cabled Fiber	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-48	≤ 0.15 ps/√km
21		Link design value for un-cabled fibre	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-48	≤ 0.06 ps/√km
22	**Transmission Characteristics** (Cut-off wavelength)	Fiber cut off wavelength for fibre used in Patch cords & Pig-tails (2m sample)	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-44	1260nm Max
23		Cable cut off wavelength	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-44	1260nm Max
24	**Transmission Characteristics** (Fibre Macro bend loss)	Change in attenuation when fibre is coiled with 10 turns on 15 mm radius mandrel	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-47	≤ 0.25 dB at 1550 nm ≤ 1.0 dB at 1625 nm
25		Change in attenuation when fibre is coiled with 1 turn on 10 mm radius mandrel	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-47	≤ 0.75 dB at 1550 nm ≤ 1.5 dB at 1625 nm
26	**Mechanical Characteristics**	Proof test for minimum strain level	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-30	1%
27		Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged) a) 250 μm fibre b) 200μm fibre	IEC 60793-2-50, 60793-1-32	1.0 ≤ F ≤ 8.9 N (Peak) 1.0 ≤ F ≤ 5.0 N (Average) 0.4 ≤ F ≤ 8.9 N (Peak) 0.4 ≤ F ≤ 5.0 N (Average)
28		Dynamic Tensile Strength (Un aged)	IEC 60793-2-50 and IEC 60793-1-31	≥ 550 KPSI (3.80Gpa)
29		Dynamic Tensile Strength Aged (Damp heat aged)	IEC 60793-2-50 and IEC 60793-1-31	≥ 440 KPSI (3.00Gpa)

30		Dynamic Fatigue (Unaged and Damp heat aged)	IEC 60793-2-50 and IEC 60793-1-33	≥ 20
31		Fiber Curl	IEC 60793-2-50, 60793-1-34	≥ 4 Meter radius of curvature
32	**Environmental Characteristics of Fiber for both color and uncolor fibres**	Temperature Cycle Test: Temperature Dependence of Attenuation : Induced Attenuation at 1550 nm and 1625 nm at -60°C to +85°C	IEC 60793-2-50 and IEC 60793-1-52	≤ 0.05 dB/Km
33		Temperature-Humidity Cycle Test: Induced attenuation at 1550 nm and 1625 nm at -10° C TO +85° C and 95% relative humidity	EIA/TIA 455-73	≤ 0.05 dB/Km
34		Water Immersion Test: Induced attenuation at 1550 nm and 1625 nm due to water immersion at 23 ± 2°C	IEC 60793-2-50 and IEC 60793-1-53	≤ 0.05dB/Km
35		Accelerated Aging (Dry Heat) Test: Induced attenuation at 1550 nm and 1625 nm due to Temperature aging at 85 ± 2° C	IEC 60793-2-50 and IEC 60793-1-51	≤ 0.05 dB/Km
36		Retention of Coating Color: Coated fibre aged for 30 days at 85℃ temperature with 95% Humidity and then 20 days in 85℃ dry heat	IEC 60793-2-50 and IEC 60793-1-51	No change in colour of coated fibre
37		High Temperature and High Humidity (Damp Heat) Test: Induced attenuation at 1550 nm & 1625 nm at 85℃ temperature and	IEC 60793-2-50 and IEC 60793-1-50	≤ 0.05 dB/Km

		85% Relative Humidity for 30 days		
38		Cable Material Compatibility test for fibre : Fibre to be aged with filling compound for 30 days at 85℃ temperature and 85% Relative Humidity	Telcordia GR-20-CORE,2013; Draft IEC 60794-1-219	• Aged coating strip force: $1.0 \leq F \leq 8.9$ N (Peak) $1.0 \leq F \leq 5.0$ N (Average) • Visual Inspection under 5X magnification: No fibre coatings cracking, splitting, or delamination. • For coloured fibres, colour to be identifiable and no colour transfers to the filling compound. • MEK Rub Test as mentioned below in test no 39.
39	**Colour qualification**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219	To be tested by using socked (solvent) tissue paper for ten strokes unidirectional on 10cm length of the fiber. No color trace shall be observed on tissue paper after testing.
40	**Material Properties :**	Fiber Materials: The substances of which the fibres are made	RoHS 3 (EU 2015/863)	Fibre material to be RoHS complied.

N.B.: Latest issue of above mentioned Standards may be referred.

V. ITU-T G.657.A2 Optical Fibre (Variant 5)

SN	Parameter Name	Individual Parameter Name	Standard	Limits/ Values
1	**Geometrical Characteristics**	Mode Field Diameter at 1310 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-45	**(8.6 to 9.2) ± 0.4 µm**
2		Cladding Diameter	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	125 ± 0.7 µm
3		Cladding Non-circularity	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	≤ 0.8 %
4		Core Clad concentricity error	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	≤ 0.5 µm
5		Coating diameter a) 250µm fibre b) 200µm fibre	IEC 60793-2-50 and IEC 60793-1-21	242 ± 5 µm (uncolor); 252 ± 10 µm (color) 180-210 µm (uncolor); 180-220µm (color)
6		Coating /Cladding concentricity a) 250µm fibre b) 200µm fibre	IEC 60793-2-50 and IEC 60793-1-21	≤ 12 µm ≤ 10 µm
7	**Transmission Characteristics** (Attenuation of uncabled fibre)	At 1310 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.35 dB/km
8		At 1550 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.21 dB/km
9		At 1490 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.24 dB/km

10		At 1270 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.40 dB/km
11		At 1625 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.23 dB/km
12		Water peak attenuation at 1380 to 1390 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.35 dB/km
13		Sudden irregularity in attenuation	Telcordia GR-20-CORE,2013 and IEC 60793-1-40	≤ 0.1 dB
14	**Transmission Characteristics** (Chromatic Dispersion)	At 1550nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 18.0 ps/nm.Km
15		At 1625nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 22.0 ps/nm.Km
16		In 1285-1330nm band	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 3.5 ps/nm.Km
17		In 1270-1340nm band	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 5.3 ps/nm.Km
18		Zero Dispersion slope	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 0.092 ps/(nm^2 Km)
19		Zero Dispersion wavelength range	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	1300 - 1324nm
20	**Transmission Characteristics**	Uncabled Fiber	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-48	≤ 0.2 ps/√km

21	(Polarization mode dispersion)	Link design value for un-cabled fibre	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-48	≤ 0.06 ps/√km
22	**Transmission Characteristics** (Cut off wavelength)	Fiber cut off wavelength for fibre used in Patch cords & Pig-tails (2m sample)	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-44	1260nm Max
23		Cable cut-off wavelength	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-44	1260nm Max
24	**Transmission Characteristics** (Fibre Macro bend loss)	Change in attenuation when fibre is coiled with 10 turns on 15 mm radius mandrel	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-47	≤ 0.03 dB at 1550 nm ≤ 0.1 dB at 1625 nm
25		Change in attenuation when fibre is coiled with 1 turn on 10 mm radius mandrel	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-47	≤ 0.1 dB at 1550 nm ≤ 0.2 dB at 1625 nm
26		Change in attenuation when fibre is coiled with 1 turn on 7.5 mm radius mandrel	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-47	≤ 0.5 dB at 1550 nm ≤ 1.0 dB at 1625 nm
27	**Mechanical Characteristics**	Proof test for minimum strain level	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-30	1%
28		Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged) a) 250 μm fibre b) 200μm fibre	IEC 60793-2-50, 60793-1-32	1.0 ≤ F ≤ 8.9 N (Peak) 1.0 ≤ F ≤ 5.0 N (Average) 0.4 ≤ F ≤ 8.9 N (Peak) 0.4 ≤ F ≤ 5.0 N (Average)
29		Dynamic Tensile Strength (Un aged)	IEC 60793-2-50 and IEC 60793-1-31	≥ 550 KPSI (3.80Gpa)
30		Dynamic Tensile Strength Aged (Damp heat aged)	IEC 60793-2-50 and IEC 60793-1-31	≥ 440 KPSI (3.00Gpa)

31		Dynamic Fatigue Unaged and Damp heat aged	IEC 60793-2-50 and IEC 60793-1-33	≥ 20
32		Fiber Curl	IEC 60793-2-50, 60793-1-34	≥ 4 Meter radius of curvature
33	**Environmental Characteristics of Fiber for both color and uncolor fibres**	Temperature Cycle Test: Temperature Dependence of Attenuation : Induced Attenuation at 1550 nm and 1625 nm at -60°C to +85°C	IEC 60793-2-50 and IEC 60793-1-52	≤ 0.05 dB/Km
34		Temperature-Humidity Cycle Test: Induced attenuation at 1550 nm and 1625 nm at -10° C TO +85° C and 95% relative humidity	EIA/TIA 455-73	≤ 0.05 dB/Km
35		Water Immersion Test: Induced attenuation at 1550 nm and 1625 nm due to water immersion at 23±2°C	IEC 60793-2-50 and IEC 60793-1-53	≤ 0.05dB/Km
36		Accelerated Aging (Dry Heat) Test: Induced attenuation at 1550 nm and 1625 nm due to Temperature aging at 85±2° C	IEC 60793-2-50 and IEC 60793-1-51	≤ 0.05 dB/Km
37		Retention of Coating Color: Coated fibre aged for 30 days at 85℃ temperature with 95% Humidity and then 20 days in 85℃ dry heat	IEC 60793-2-50 and IEC 60793-1-51	No change in colour of coated fibre
38		High Temperature and High Humidity (Damp Heat) Test: Induced attenuation at 1550 nm & 1625 nm at 85℃ temperature and	IEC 60793-2-50 and IEC 60793-1-50	≤ 0.05 dB/Km

		85% Relative Humidity for 30 days		
39		Cable Material Compatibility test for fibre : Fibre to be aged with filling compound for 30 days at 85℃ temperature and 85% Relative Humidity	Telcordia GR-20-CORE,2013; Draft IEC 60794-1-219	• Aged coating strip force: $1.0 \leq F \leq 8.9$ N (Peak) $1.0 \leq F \leq 5.0$ N (Average) • Visual Inspection under 5X magnification: No fibre coatings cracking, splitting, or delamination. • For coloured fibres, colour to be identifiable and no colour transfers to the filling compound. • MEK Rub Test as mentioned below in test no 40.
40	**Colour qualification**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219	To be tested by using socked (solvent) tissue paper for ten strokes unidirectional on 10cm length of the fiber. No color trace shall be observed on tissue paper after testing.
41	**Material Properties :**	Fiber Materials: The substances of which the fibres are made	RoHS 3 (EU 2015/863)	Fibre material to be RoHS complied.

N.B.: Latest issue of above mentioned Standards may be referred.

VI. G.657.B3 Optical Fibre (Variant 6)

SN	Parameter Name	Individual Parameter Name	Standard	Limits/ Values
1	**Geometrical Characteristics**	Mode Field Diameter at 1310 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-45	8.6 ± 0.4 µm
2		Cladding Diameter	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	125 ± 0.7 µm
3		Cladding Non-circularity	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	≤ 0.8 %
4		Core Clad concentricity error	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	≤ 0.5 µm
5		Coating diameter	IEC 60793-2-50 and IEC 60793-1-21	242 ± 7 µm (uncolor); 252 ± 10 µm (color)
6		Coating /Cladding concentricity	IEC 60793-2-50 and IEC 60793-1-21	≤ 12 µm
7	**Transmission Characteristics** (Attenuation of uncabled fibre)	At 1310 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.35 dB/km
8		At 1550 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.22 dB/km
9		At 1490 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.24 dB/km
10		At 1270 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.40 dB/km
11		At 1625 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.24 dB/km
12		Water peak attenuation at 1380 to 1390 nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.35 dB/km
13		Sudden irregularity in attenuation	Telcordia GR-20-CORE,2013 and IEC 60793-1-40	≤ 0.1 dB
14	**Transmission Characteristics**	At 1550nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 18.0 ps/nm.Km

15	(Chromatic Dispersion)	At 1625nm	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 22.0 ps/nm.Km
16		In 1285-1330nm band	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 3.5 ps/nm.Km
17		In 1270-1340nm band	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 5.3 ps/nm.Km
18		Zero Dispersion slope	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	≤ 0.092 ps/(nm^2 Km)
19		Zero Dispersion wavelength range	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-42	1300 – 1350 nm
20	**Transmission Characteristics** (Polarization mode dispersion)	Uncabled Fiber	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-48	≤ 0.2 ps/√km
21		Link design value for un-cabled fibre	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-48	≤ 0.06 ps/√km
22	**Transmission Characteristics** (Cut-off wavelength)	Fiber cut off wavelength for fibre used in Patch cords & Pig-tails	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-44	1260nm Max
23		Cable cutoff wavelength	ITU-T G.657 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-44	1260nm Max
24	**Transmission Characteristics** (Fibre Macro bend loss)	Change in attenuation when fibre is coiled with 1 turn on 10 mm radius mandrel	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-47	≤ 0.03 dB at 1550 nm ≤ 0.1 dB at 1625 nm
25		Change in attenuation when fibre is coiled with 1 turn on 7.5 mm radius mandrel	ITU-T G.657, G.650.1	≤ 0.08 dB at 1550 nm ≤ 0.25 dB at 1625 nm
26		Change in attenuation when fibre is coiled with 1 turn on 5 mm radius mandrel	IEC 60793-2-50, 60793-1-47	≤ 0.15 dB at 1550 nm ≤ 0.45 dB at 1625 nm
27	**Mechanical Characteristics**	Proof test for minimum strain level	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-30	1%
28		Peak Stripability force to remove primary coating of the fiber	IEC 60793-2-50, 60793-1-32	1.0 ≤ F ≤ 8.9 N (Peak) 1.0 ≤ F ≤ 5.0 N (Average)

		(Unaged, Water aged, Damp heat aged)		
29		Dynamic Tensile Strength (Un aged)	IEC 60793-2-50 and IEC 60793-1-31	≥ 550 KPSI (3.80Gpa)
30		Dynamic Tensile Strength Aged (Damp heat aged)	IEC 60793-2-50 and IEC 60793-1-31	≥ 440 KPSI (3.00Gpa)
31		Dynamic Fatigue (Unaged and Damp heat aged)	IEC 60793-2-50 and IEC 60793-1-33	≥ 20
32		Fiber Curl	IEC 60793-2-50, 60793-1-34	≥ 4 Meter radius of curvature
33	**Environmental Characteristics of Fiber for both color and uncolor fibres**	Temperature Cycle Test: Temperature Dependence of Attenuation : Induced Attenuation at 1550 nm and 1625 nm at -60°C to +85°C	IEC 60793-2-50 and IEC 60793-1-52	≤ 0.05 dB/Km
34		Temperature-Humidity Cycle Test: Induced attenuation at 1550 nm and 1625 nm at -10° C TO +85° C and 95% relative humidity	EIA/TIA 455-73	≤ 0.05 dB/Km
35		Water Immersion Test: Induced attenuation at 1550 nm and 1625 nm due to water immersion at 23 ± 2°C	IEC 60793-2-50 and IEC 60793-1-53	≤ 0.05dB/Km
36		Accelerated Aging (Dry Heat) Test: Induced attenuation at 1550 nm and 1625 nm due to Temperature aging at 85 ± 2° C	IEC 60793-2-50 and IEC 60793-1-51	≤ 0.05 dB/Km
37		Retention of Coating Color: Coated fibre aged for 30 days at 85℃ temperature with 95% Humidity and then 20 days in 85℃ dry heat	IEC 60793-2-50 and IEC 60793-1-51	No change in colour of coated fibre

38		High Temperature and High Humidity (Damp Heat) Test: Induced attenuation at 1550 nm & 1625 nm at 85℃ temperature and 85% Relative Humidity for 30 days	IEC 60793-2-50 and IEC 60793-1-50	≤ 0.05 dB/Km
39		Cable Material Compatibility test for fibre : Fibre to be aged with filling compound for 30 days at 85℃ temperature and 85% Relative Humidity	Telcordia GR-20-CORE,2013; Draft IEC 60794-1-219	• Aged coating strip force: 1.0 ≤ F ≤ 8.9 N (Peak) 1.0 ≤ F ≤ 5.0 N (Average) • Visual Inspection under 5X magnification: No fibre coatings cracking, splitting, or delamination. • For coloured fibres, colour to be identifiable and no colour transfers to the filling compound. • MEK Rub Test as mentioned below in test no 40.
40	**Colour qualification**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219	To be tested by using socked (solvent) tissue paper for ten strokes unidirectional on 10cm length of the fiber. No color trace shall be observed on tissue paper after testing.
41	**Material Properties :**	Fiber Materials: The substances of which the fibres are made	RoHS 3 (EU 2015/863)	Fibre material to be RoHS complied.

N.B.: Latest issue of above mentioned Standards may be referred.

VII. G.654.D Optical Fibre (Variant 7)

SN	Parameter Name	Individual Parameter Name	Standard	Limits/ Values
1	**Geometrical Characteristics**	Mode Field Diameter at 1550 nm	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-45	(11.5 to 15.0) ± 0.7 µm
2		Cladding Diameter	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	125 ± 1 µm
3		Cladding Non-circularity	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	≤ 2.0 %
4		Core Clad concentricity error	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	≤ 0.8 µm
5		Coating diameter	IEC 60793-2-50 and IEC 60793-1-21	242 ± 5 µm (uncolor); 252 ± 10 µm (color)
6		Coating /Cladding concentricity	IEC 60793-2-50 and IEC 60793-1-21	≤ 12 µm
7	**Transmission Characteristics** (Attenuation of uncabled fibre)	At 1550 nm	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-40	≤ 0.20 dB/km
8		At 1625nm	IEC 60793-2-50 and IEC 60793-1-40	≤ 0.40 dB/km
9		Sudden irregularity in attenuation	Telcordia GR-20-CORE,2013 and IEC 60793-1-40	≤ 0.1 dB
10	**Transmission Characteristics** (Chromatic Dispersion)	At 1550 nm	ITU-T G.654, G.650.1 and IEC 60793-2-50, 60793-1-42	Maximum 23 ps/nm.Km
11		Dispersion slope at 1550 nm	ITU-T G.654, G.650.1 and IEC 60793-2-50, 60793-1-42	≤ 0.070 ps/(nm^2 Km)
12	**Transmission Characteristics** (Polarization mode dispersion)	Uncabled Fiber	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-48	≤ 0.20 ps/√km
13		Link design value for un-cabled fibre	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-48	≤ 0.20 ps/√km

14	**Transmission Characteristics** (Cut-off wavelength)	Cable cut-off wavelength	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-44	1530 nm Max
15	**Transmission Characteristic** (Fibre Macro bend loss)	Change in attenuation when fiber is coiled with 100 turns on 60 ±1.0 mm diameter mandrel	ITU-T G.654 ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47	≤ 2.0 dB at 1625 nm
16	**Mechanical Characteristics**	Proof test for minimum strain level	ITU-T G.654, G.650.1 and IEC 60793-2-50, 60793-1-30	Minimum 0.69 GPa
17		Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32	1.0 ≤ F ≤ 8.9 N (Peak) 1.0 ≤ F ≤ 5.0 N (Average)
18		Dynamic Tensile Strength (Un aged)	IEC 60793-2-50 and IEC 60793-1-31	≥ 550 KPSI (3.80Gpa)
19		Dynamic Tensile Strength Aged (Damp heat aged)	IEC 60793-2-50 and IEC 60793-1-31	≥ 440 KPSI (3.00Gpa)
20		Dynamic Fatigue (Unaged and Damp heat aged)	IEC 60793-2-50 and IEC 60793-1-33	≥ 20
21		Fiber Curl	IEC 60793-2-50, 60793-1-34	≥ 4 Meter radius of curvature
22	**Environmental Characteristics of Fiber for both color and uncolor fibres**	Temperature Cycle Test: Temperature Dependence of Attenuation : Induced Attenuation at 1550 nm and 1625 nm at -60°C to +85°C	IEC 60793-2-50 and IEC 60793-1-52	≤ 0.05 dB/Km
23		Temperature-Humidity Cycle Test: Induced attenuation at 1550 nm and 1625 nm at -10° C TO +85° C and 95% relative humidity	EIA/TIA 455-73	≤ 0.05 dB/Km
24		Water Immersion Test: Induced attenuation at 1550 nm and 1625	IEC 60793-2-50 and IEC 60793-1-53	≤ 0.05dB/Km

		nm due to water immersion at 23 ± 2°C		
25		Accelerated Aging (Dry Heat) Test: Induced attenuation at 1550 nm and 1625 nm due to Temperature aging at 85 ± 2° C	IEC 60793-2-50 and IEC 60793-1-51	≤ 0.05 dB/Km
26		Retention of Coating Color: Coated fibre aged for 30 days at 85℃ temperature with 95% Humidity and then 20 days in 85℃ dry heat	IEC 60793-2-50 and IEC 60793-1-51	No change in colour of coated fibre
27		High Temperature and High Humidity (Damp Heat) Test: Induced attenuation at 1550 nm & 1625 nm at 85℃ temperature and 85% Relative Humidity for 30 days	IEC 60793-2-50 and IEC 60793-1-50	≤ 0.05 dB/Km
28		Cable Material Compatibility test for fibre : Fibre to be aged with filling compound for 30 days at 85℃ temperature and 85% Relative Humidity	Telcordia GR-20-CORE,2013; Draft IEC 60794-1-219	• Aged coating strip force: 1.0 ≤ F ≤ 8.9 N (Peak) 1.0 ≤ F ≤ 5.0 N (Average) • Visual Inspection under 5X magnification: No fibre coatings cracking, splitting, or delamination. • For coloured fibres, colour to be identifiable and no colour transfers to the filling compound.

				• MEK Rub Test as mentioned below in test no 29.
29	**Colour qualification**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219	To be tested by using socked (solvent) tissue paper for ten strokes unidirectional on 10cm length of the fiber. No color trace shall be observed on tissue paper after testing.
30	**Material Properties :**	Fiber Materials: The substances of which the fibres are made	RoHS 3 (EU 2015/863)	Fibre material to be RoHS complied.

N.B.: Latest issue of above mentioned Standards may be referred.

VIII. ITU-T G.654.E Optical Fibre (Variant 8)

SN	Parameter Name	Individual Parameter Name	Standard	Limits/ Values
1	**Geometrical Characteristics**	Mode Field Diameter at 1550 nm	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-45	(11.5 to 12.5) ± 0.7 µm
2		Cladding Diameter	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	125 ± 1 µm
3		Cladding Non-circularity	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	≤ 2.0 %
4		Core Clad concentricity error	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-20	≤ 0.8 µm
5		Coating diameter	IEC 60793-2-50 and IEC 60793-1-21	242 ± 5 µm (uncolor); 252 ± 10 µm (color)
6		Coating /Cladding concentricity	IEC 60793-2-50 and IEC 60793-1-21	≤ 12 µm
7	**Transmission Characteristics** (Attenuation of uncabled fibre)	At 1550 nm	ITU-T G.654, G.650.1 and IEC 60793-2-50, 60793-1-40	≤ 0.23 dB/km
8		At 1530nm - 1612nm	ITU-T G.654, G.650.1 and IEC 60793-2-50, 60793-1-40	≤ 0.25 dB/km
9		At 1612nm - 1625nm	ITU-T G.654, G.650.1 and IEC 60793-2-50, 60793-1-40	≤ 0.35 dB/km
10		Sudden irregularity in attenuation	Telcordia GR-20-CORE, 2013, IEC 60793-1-40	≤ 0.1 dB
11	**Transmission Characteristics** (Chromatic Dispersion)	At 1550 nm	ITU-T G.654, G.650.1 and IEC 60793-2-50, 60793-1-42	17 - 23 ps/nm.Km
12		Dispersion slope at 1550 nm	ITU-T G.654, G.650.1 and IEC 60793-2-50, 60793-1-42	0.050 - 0.070 ps/(nm^2 Km)
13	**Transmission Characteristics**	Uncabled Fiber	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-48	≤ 0.20 ps/√km
14		Link design value for un-cabled fibre	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-48	≤ 0.20 ps/√km

	(Polarization mode dispersion)			
15	**Transmission Characteristics** (Cut-off wavelength)	Cable cutoff wavelength	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50 and IEC 60793-1-44	1530 nm Max
16	**Transmission Characteristics** (Fibre Macro bend loss)	Change in attenuation when fiber is coiled with 100 turns on 60 ±1.0 mm diameter mandrel	ITU-T G.654 ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47	≤ 0.1 dB at 1625 nm
17	**Mechanical Characteristics**	Proof test for minimum strain level	ITU-T G.654, G.650.1 and IEC 60793-2-50, 60793-1-30	Minimum 0.69 GPa
18		Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged	IEC 60793-2-50, 60793-1-32	1.0 ≤ F ≤ 8.9 N (Peak) 1.0 ≤ F ≤ 5.0 N (Average)
19		Dynamic Tensile Strength (Un aged)	IEC 60793-2-50 and IEC 60793-1-31	≥ 550 KPSI (3.80Gpa)
20		Dynamic Tensile Strength Aged (Damp heat aged)	IEC 60793-2-50 and IEC 60793-1-31	≥ 440 KPSI (3.00Gpa)
21		Dynamic Fatigue (Unaged and Damp heat aged)	IEC 60793-2-50 and IEC 60793-1-33	≥ 20
22		Fiber Curl	IEC 60793-2-50, 60793-1-34	≥ 4 Meter radius of curvature
23	**Environmental Characteristics of Fiber for both color and uncolor fibres**	Temperature Cycle Test: Temperature Dependence of Attenuation : Induced Attenuation at 1550 nm and 1625 nm at -60°C to +85°C	IEC 60793-2-50 and IEC 60793-1-52	≤ 0.05 dB/Km
24		Temperature-Humidity Cycle Test: Induced attenuation at 1550 nm and	EIA/TIA 455-73	≤ 0.05 dB/Km

		1625 nm at -10° C TO +85° C and 95% relative humidity		
25		Water Immersion Test: Induced attenuation at 1550 nm and 1625 nm due to water immersion at 23 ± 2°C	IEC 60793-2-50 and IEC 60793-1-53	≤ 0.05dB/Km
26		Accelerated Aging (Dry Heat) Test: Induced attenuation at 1550 nm and 1625 nm due to Temperature aging at 85 ± 2° C	IEC 60793-2-50 and IEC 60793-1-51	≤ 0.05 dB/Km
27		Retention of Coating Color: Coated fibre aged for 30 days at 85℃ temperature with 95% Humidity and then 20 days in 85℃ dry heat	IEC 60793-2-50 and IEC 60793-1-51	No change in colour of coated fibre
28		High Temperature and High Humidity (Damp Heat) Test: Induced attenuation at 1550 nm & 1625 nm at 85℃ temperature and 85% Relative Humidity for 30 days	IEC 60793-2-50 and IEC 60793-1-50	≤ 0.05 dB/Km
29		Cable Material Compatibility test for fibre : Fibre to be aged with filling compound for 30 days at 85℃ temperature and 85% Relative Humidity	Telcordia GR-20-CORE,2013; Draft IEC 60794-1-219	• Aged coating strip force: $1.0 \leq F \leq 8.9$ N (Peak) $1.0 \leq F \leq 5.0$ N (Average) • Visual Inspection under 5X magnification: No fibre coatings cracking, splitting, or delamination. • For coloured fibres, colour to be identifiable and no colour transfers to the filling compound.

				• MEK Rub Test as mentioned below in test no 30.
30	**Colour qualification**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219	To be tested by using socked (solvent) tissue paper for ten strokes unidirectional on 10cm length of the fiber. No color trace shall be observed on tissue paper after testing.
31	**Material Properties :**	Fiber Materials: The substances of which the fibres are made	RoHS 3 (EU 2015/863)	Fibre material to be RoHS complied.

N.B.: Latest issue of above mentioned Standards may be referred.

Appendix-I

IP Conformance Test Cases for RFCs

The Appendix-I consist of 11 tables, from Table -1 to Table - 11

Table-1: OSPFv2 as per RFC 2328

Parameter Group: IP Conformance (CONFIP)

RFC Section	RFC Clause	Remarks
9.2	First, a Hello Packet may be received from a neighbour claiming to be itself the Backup Designated Router. Alternatively, a Hello packet may be received from a neighbour claiming to be itself the Designated Router, and indicating that there is no Backup Designated Router. In either case there must be bidirectional communication with the neighbour, i.e., the router must also appear in the neighbour's Hello Packet. This event signals an end to the Waiting state.	
13(5b)	In some cases (e.g., the state of the receiving interface is DR and the LSA was received from a router other than the Backup DR) the LSA will be flooded back out the receiving interface	
13.5	Circumstances:- LSA is more recent than database copy, but was not flooded back out receiving interface. Backup:- Delayed acknowledgment sent if advertisement received from Designated Router, otherwise do nothing. All other States:- Delayed acknowledgment sent.	
13(5a)	If there is already a database copy, and if the database copy was received via flooding and installed less than MinLSArrival seconds ago, discard the new LSA (without acknowledging it) and examine the next LSA (if any) listed in the Link State Update packet.	
8.1 & 8.2	The OSPF packet header is verified. The fields specified in the header must match those configured for the receiving interface. If they do not, the packet should be discarded	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtain confirmation from Helpdesk before submitting application.

Table-2: OSPFv3 as per RFC 2740

Parameter Group: IP Conformance (CONFIP)

RFC Section	RFC Clause	Remarks
3.1.3	The Interface ID that the neighbour advertises in its Hello Packets must be recorded in the neighbour structure. The router will include the neighbour's Interface ID in the router's router-LSA when either a) advertising a point-to-point link to the neighbour or b) advertising a link to a network where the neighbour has become Designated Router.	
A.3.2	All routers connected to a common link must agree on certain parameters (HelloInterval and RouterDeadInterval). These parameters are included in Hello packets, so that differences can inhibit the forming of neighbour relationships. The Hello packet also contains fields used in Designated Router election (Designated Router ID and Backup Designated Router ID), and fields used to detect bi-directionality (the Router IDs of all neighbours whose Hellos have been recently received).	
3.2.2	The receiving router must be an area border router, and the Router ID specified in the packet (the source router) must be the other end of a configured virtual link. The receiving interface must also attach to the virtual link's configured Transit area. If all of these checks succeed, the packet is accepted and is from now on associated with the virtual link (and the backbone area).	
3.2.2	The fields specified in the header must match those configured for the receiving interface. If they do not, the packet should be discarded	
3.4.3.1	Consider the router-LSA that router RT3 would originate for Area 1 in Figure 1. Only a single interface must be described, namely that which connects to the transit network N3. It assumes that RT4 has been elected Designated Router of Network N3	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtain confirmation from Helpdesk before submitting application.

Table-3: IPV6 as per RFC 2460

Parameter Group: IP Conformance (CONFIP)

RFC Section	RFC Clause	Remarks
4.1	IPv6 nodes must accept and attempt to process extension headers in any order and occurring any number of times in the same packet,	
4.2	The Option Type identifiers are internally encoded such that their highest-order two bits specify the action that must be taken if the processing IPv6 node does not recognize the Option Type: 11 - discard the packet and, only if the packet's Destination Address was not a multicast address, send an ICMP Parameter Problem, Code 2, message to the packet's Source Address, pointing to the unrecognized Option Type.	
4.2	The Option Type identifiers are internally encoded such that their highest-order two bits specify the action that must be taken if the processing IPv6 node does not recognize the Option Type: 01 - discard the packet.	
4.2	The Option Type identifiers are internally encoded such that their highest-order two bits specify the action that must be taken if the processing IPv6 node does not recognize the Option Type: 10 - discard the packet and, regardless of whether or not the packet's Destination Address was a multicast address, send an ICMP Parameter Problem, Code 2, message to the packet's Source Address, pointing to the unrecognized Option Type.	
4.4	If Segments Left is zero, the node must ignore the Routing header and proceed to process the next header in the packet, whose type is identified by the Next Header field in the Routing header.	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtain confirmation from Helpdesk before submitting application.

Table-4: IPV6 as per RFC 4861

Parameter Group: IP Conformance (CONFIP)

RFC Section	RFC Clause	Remarks
6.1.1	A router MUST silently discard any received Router Solicitation messages that do not satisfy all of the following validity checks: - The IP Hop Limit field has a value of 255, i.e., the packet could not possibly have been forwarded by a router.	
6.1.2	A node MUST silently discard any received Router Advertisementmessages that do not satisfy all of the following validity checks: - The IP Hop Limit field has a value of 255, i.e., the packetcould not possibly have been forwarded by a router.	
6.2.2	A router MUST NOT send Router Advertisements out any interface that is not an advertising interface.	
7.1.1	A node MUST silently discard any received Neighbour Solicitation messages that do not satisfy all of the following validity checks: - The IP Hop Limit field has a value of 255, i.e., the packet could not possibly have been forwarded by a router.	
7.1.2	node MUST silently discard any received Neighbour Advertisementmessages that do not satisfy all of the following validity checks: - The IP Hop Limit field has a value of 255, i.e., the packetcould not possibly have been forwarded by a router.	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtain confirmation from Helpdesk before submitting application.

Table-5: IPV6 as per RFC 4862

Parameter Group: IP Conformance (CONFIP)

RFC Section	RFC Clause	Remarks
5.4.2	In order to improve the robustness of the Duplicate Address Detectionalgorithm, an interface MUST receive and process datagrams sent tothe all-nodes multicast address or solicited-node multicast addressof the tentative address during the delay period. This does notnecessarily conflict with the requirement that joining the multicast group be delayed.	
5.4	Duplicate Address Detection MUST NOT be performed on anycastaddresses (note that anycast addresses cannot syntactically bedistinguished from unicast addresses).	
7.1.1	A node MUST silently discard any received Neighbour Solicitationmessages that do not satisfy all of the following validity checks: - The IP Hop Limit field has a value of 255, i.e., the packet could not possibly have been forwarded by a router.	
7.1.1	The contents of the Reserved field, and of any unrecognized options,MUST be ignored. Future, backward-compatible changes to the protocol may specify the contents of the Reserved field or add new options;backward-incompatible changes may use different Code values.	
7.1.2	A node MUST silently discard any received Neighbour Advertisementmessages that do not satisfy all of the following validity checks: - The IP Hop Limit field has a value of 255, i.e., the packet could not possibly have been forwarded by a router.	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtain confirmation from Helpdesk before submitting application.

Table-6: IPV6 as per RFC 1981

Parameter Group: IP Conformance (CONFIP)

RFC Section	RFC Clause	Remarks
4	A node may receive a Packet Too Big message reporting anext-hop MTU that is less than the IPv6 minimum link MTU. In thatcase, the node is not required to reduce the size of subsequentpackets sent on the path to less than the IPv6 minimum link MTU,	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtain confirmation from Helpdesk before submitting application.

Table-7: IPV6 as per RFC 4443

Parameter Group: IP Conformance (CONFIP)

RFC Section	RFC Clause	Remarks
2.2	(a) If the message is a response to a message sent to one of thenode's unicast addresses, the Source Address of the reply MUST bethat same address.	
	If the message is a response to a message sent to any otheraddress, such as - a multicast group address, - an anycast address implemented by the node, or - a unicast address that does not belong to the node; the Source Address of the ICMPv6 packet MUST be a unicast address belonging to the node	
2.4	If an ICMPv6 informational message of unknown type is received,it MUST be silently discarded.	
2.4	An ICMPv6 error message MUST NOT be originated as a result ofreceiving the following: (e.3) A packet destined to an IPv6 multicast address.	
2.4	An ICMPv6 error message MUST NOT be originated as a result ofreceiving the following: (e.6) A packet whose source address does not uniquely identify asingle node -- e.g., the IPv6 Unspecified Address, an IPv6multicast address, or an address known by the ICMP messageoriginator to be an IPv6 anycast address.	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtain confirmation from Helpdesk before submitting application.

Table-8: BGP for IPV6 as per RFC 2545

Parameter Group: IP Conformance (CONFIP)

RFC Section	RFC Clause	Remarks
3	The link-local address shall be included in the Next Hop field if and only if the BGP speaker shares a common subnet with the entity identified by the global IPv6 address carried in the Network Address of Next Hop field and the peer the route is being advertised to In all other cases a BGP speaker shall advertise to its peer in the Network Address field only the global IPv6 address of the next hop (the value of the Length of Network Address of Next Hop field shall be set to 16)	
3	The link-local address shall be included in the Next Hop field if and only if the BGP speaker shares a common subnet with the entity identified by the global IPv6 address carried in the Network Address of Next Hop field and the peer the route is being advertised to In all other cases a BGP speaker shall advertise to its peer in the Network Address field only the global IPv6 address of the next hop (the value of the Length of Network Address of Next Hop field shall be set to 16)	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtain confirmation from Helpdesk before submitting application.

Table-9: BGP4 for IPV4 as per RFC 4271

Parameter Group: IP Conformance (CONFIP)

RFC Section	RFC Clause	Remarks
9.2	When a BGP speaker receives an UPDATE message from an internal peer, the receiving BGP speaker SHALL NOT re-distribute the routing information contained in that UPDATE message to other internal peers	
6.1	if the Length field of the message header is less than 19 or greater than 4096,then the Error Subcode MUST be set to Bad Message Length. The Data field MUST contain the erroneous Length field.	
6.3	If an optional attribute is recognized, then the value of this attribute MUST be checked. If an error is detected, the attribute MUST be discarded, and the Error Subcode MUST be set to Optional Attribute Error. The Data field MUST contain the attribute (type, length, and value)	
6.1	If the Marker field of the message header is not as expected, then a synchronization error has occurred and the Error Subcode MUST be set to Connection Not Synchronized, if the Length field of an OPEN message is less than the minimum length of the OPEN message	
6.8	Upon receipt of an OPEN message, the local system MUST examine all of its connections that are in the OpenConfirm state	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtain confirmation from Helpdesk before submitting application.

Table-10: MBGP as per RFC 4760

Parameter Group: IP Conformance (CONFIP)

RFC Section	RFC Clause	Remarks
7	If a BGP speaker receives from a neighbour an Update message that contains the MP_REACH_NLRI or MP_UNREACH_NLRI attribute, and the speaker determines that the attribute is incorrect, the speaker MUST delete all the BGP routes received from that neighbour whose AFI/SAFI is the same as the one carried in the incorrect MP_REACH_NLRI or MP_UNREACH_NLRI attribute	
7	If a BGP speaker receives from a neighbour an Update message that contains the MP_REACH_NLRI or MP_UNREACH_NLRI attribute, and the speaker determines that the attribute is incorrect, the speaker MUST delete all the BGP routes received from that neighbour whose AFI/SAFI is the same as the one carried in the incorrect MP_REACH_NLRI or MP_UNREACH_NLRI attribute	
7	If a BGP speaker receives from a neighbour an Update message that contains the MP_REACH_NLRI or MP_UNREACH_NLRI attribute, and the speaker determines that the attribute is incorrect, the speaker MUST delete all the BGP routes received from that neighbour whose AFI/SAFI is the same as the one carried in the incorrect MP_REACH_NLRI or MP_UNREACH_NLRI attribute	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtain confirmation from Helpdesk before submitting application.

Table-11: LDP as per RFC 5036

Parameter Group: IP Conformance (CONFIP)

RFC Section	RFC Clause	Remarks
2.2.2	An LDP Identifier is a six-octet quantity used to identify an LSR label space. The first four octets identify the LSR and must be a globally unique value, such as a 32-bit router Id assigned to the LSR.	
2.5.2	An LSR MUST advertise the same transport address in all Hellos that advertise the same label space	
2.5.6	After an LDP session has been established, an LSR must arrange that its peer receive an LDP PDU from it at least every KeepAlive timeperiod to ensure the peer restarts the session KeepAlive Timer	
2.7	When the next hop for a prefix changes, the LSR must retrieve the label advertised by the new next hop from the LIB for use in forwarding.	
2.8.1	The Label Request message MUST include a Hop Count TLV.	

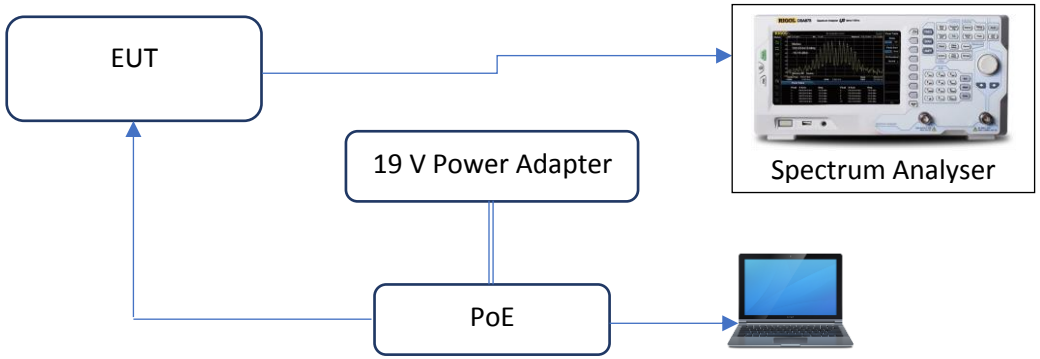
Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtain confirmation from Helpdesk before submitting application.

Appendix-II

Test Setup and Test Procedures

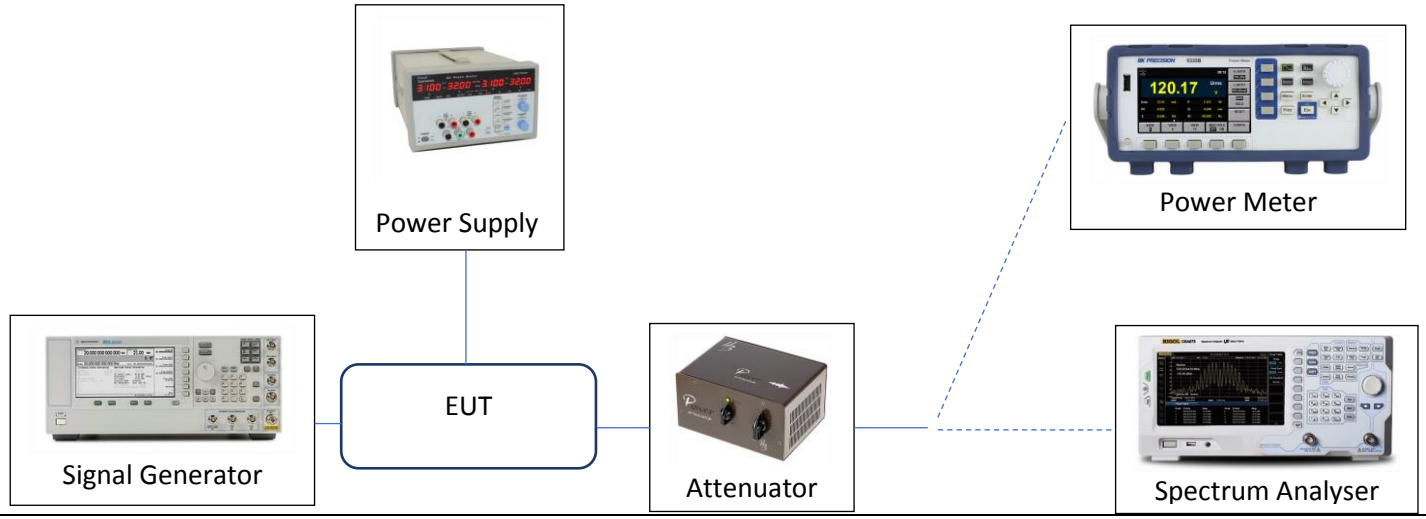
The Appendix consist of 37 tests from Test 1 to Test 37

Test No.1

Parameter Name	Frequency and EIRP for Wi-Fi and Point to Point/ Point to Multipoint Radio Interface
Test Details	Frequency of Operation and Peak Power Measurement Test Setup
Test instruments required	Spectrum Analyzer
Test Setup	
Test Procedure	1. Make the setup as shown above. 2. Configure the Spectrum Analyser for a) Center Frequency as required. b) SPAN of 20MHz c) RBW of 3KHz 3. Configure EUT in different modes of operation. 4. Measure peak power shown in Spectrum analyser.
Expected Results	1. Record peak power and attach trace

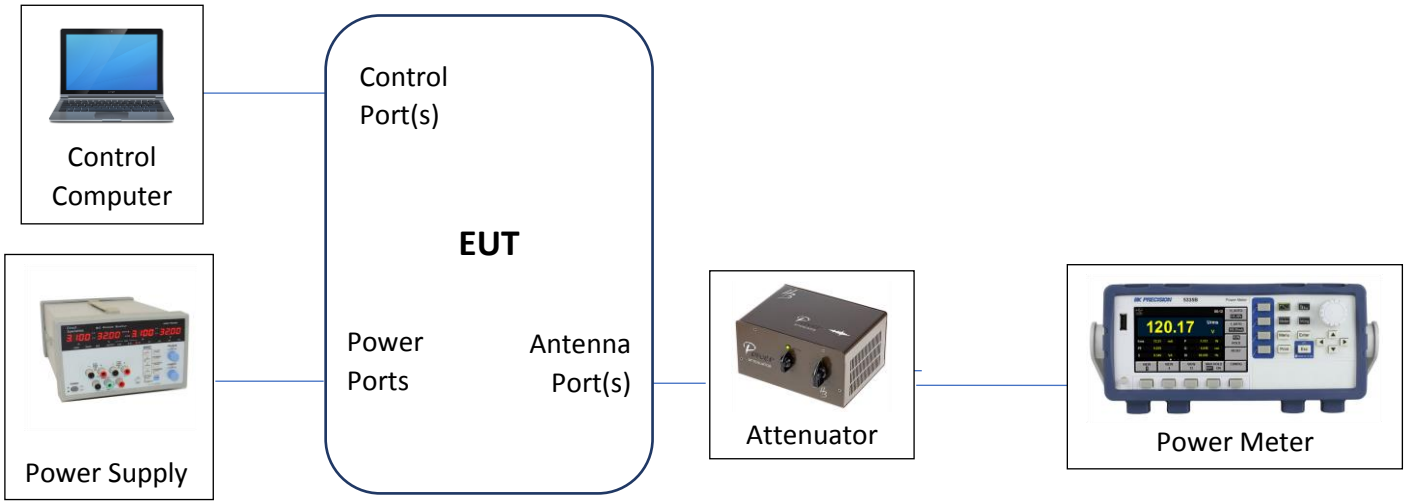
Note: This is a representative setup and may be adapted as per the requirement of testing for the equipment.

Test No.2

Parameter Name	Frequency of Operation and Transmit Power for Satellite Equipment
Test Details	Typical setup of Frequency of Operation & Transmit Power measurement for Satellite System Equipment
Test instruments required	Signal Generator Spectrum Analyser Attenuator Power Meter Power Supply
Test Setup	
Test Procedure	1. For measurement of Transmit Power, Power Meter is to be connected to the Equipment Under Test(EUT). 2. For measurement of Frequency of Operation, Spectrum Analyser (with DC block if required) is to be connected to the EUT.
Expected Results	3. Record peak power and attach trace

Note: This is a representative setup and may be adapted as per the requirement of testing for the equipment.

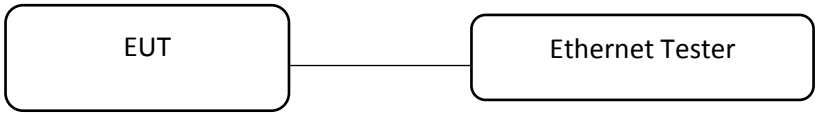
Test No.3

Parameter Name	Transmit power for PTP/ PMP Radio Interface
Test Details	Typical setup of Transmit power Measurement
Test instruments required	Power Meter Power Supply Attenuator
Test Setup	
Test Procedure	1. For measurement of Transmit Power, Power Meter is to be connected to the Equipment Under Test (EUT).
Expected Results	2. Record peak power and attach trace

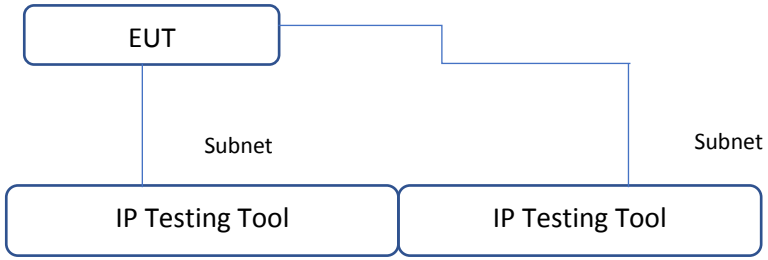
Note: This is a representative setup and may be adapted as per the requirement of testing for the equipment.

Test No.4

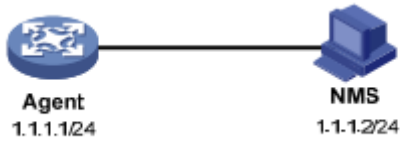
Parameter Name	Link Speed and Auto-negotiation FE, Link Speed and Auto-negotiation GE

Test Details	Test for Ethernet Link Speed (100/1000) and Auto-negotiation
Test instruments required	Ethernet Tester supporting 100/1000 mbps link
Test Setup	
Test Procedure	1. Connect the Ethernet Tester to the applicable/ supported Ethernet interface of the EUTas shown above. 2. Configure the EUT to use auto-negotiation on its selected Ethernet port. 3. Configure the Ethernet Tester to run at 100 mbps speed and see if it is able to connect to the EUT. The Ethernet link between the Ethernet Tester and EUT should be active and report 100mbps link speed (if link speed 100 mbps is supported by the EUT). 4. Configure the Ethernet Tester to run at 1000 mbps speed and see if it is able to connect to the EUT. The Ethernet link between the Ethernet Tester and EUT should be active and report 1000mbps link speed. (if link speed 1000 mbps is supported by the EUT).
Expected Results	1. The Ethernet link between the Ethernet Tester and EUT should be active and report 100 or 1000 mbps link speed as per the link speed supported by the EUT

Test No.5

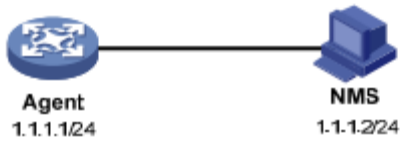
Parameter Name	IPV4 Functional Tests
Test instruments required	IP Testing Tool
Test Setup	
Test Procedure	1. Connect the IP Testing Tool to the Ethernet interface of the router as shown above. 2. Configure the IP interfaces of the EUT and IP Testing Tool for back-to-back communication from/ to IP Testing Tool. 3. Configure static/ dynamic routing on the EUT to reach local LAN subnets from the IP Testing Tool. 4. Perform IPv4 ping test from IP Testing Tool to IP Testing Tool and verify that it is successful and that there is no packet drop. 5. Perform file transfer test from IP Testing Tool to IP Testing Tool and verify that it is successful.
Expected Results	1. IPv4 Ping test should be successful with zero packet loss. 2. File transfer test should be successful. 3. Enclose screenshots and IP Testing Tool traces of the IPV4 communication.

Test No.6

Parameter Name	SNMPv2 or Qx Protocol Functional Tests
Test Details	Test for management: SNMPv2, or Qx (check TRAP, GET and SET operations)
Test instruments required	1. PC/Laptop – 1 Numbers (SNMP or Qx Manager) 2. Switch – 1 Numbers
Test Setup	
Test Procedure	**For SNMP,** 1.) Configure the EUT to run SNMP agent and NMS (PC) to run SNMP manager application by using correct parameters. 2.) Testing of TRAP message: The NMS uses SNMPv2 to manage the SNMP agent, and the agent automatically sends notifications to report events to the NMS. Configure the SNMP agent to send traps to the manager. Use a wrong community name to get the value of a MIB node on the agent. You can see an authentication failure trap on the SNMP manager. 3.) Test "SetRequest" operation: SNMP Testing node (SNMP manager) sends SNMPv2c "SetRequest" to set SysName to "EUT1". Verify the SysName value on the EUT. It should match the value "EUT1" set using 'SetRequest' function from the SNMP manger. 4.) Test SNMP GET Operation (single Object): Testing node (SNMP Manager) sends SNMPv2c "GetRequest" scalar object to get sysName.0 1.3.6.1.2.1.1.5.0 in system group in MIB II, to Agent. The agent should respond with "SysName value as "EUT1" as set in the previous step, verifying that the EUT support SNMP GET function. **For Qx,** 1) Configure the EUT to run Qx agent and NMS (PC) to run Qx manager application by using correct parameters.

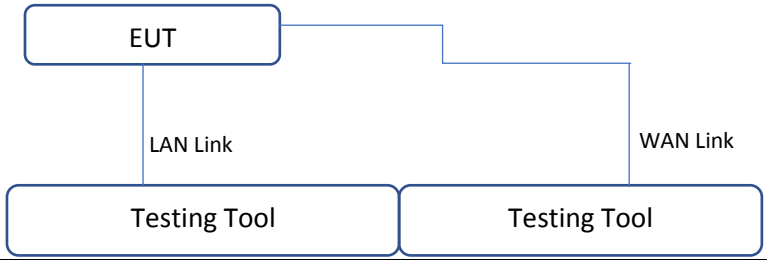
	2) Testing of TRAP message: The NMS uses Qx to manage the Qx agent, and the agent automatically sends notifications to report events to the NMS. Configure the Qx agent to send traps to the manager. 3) Test "Write" operation: Qx Testing node (Qx manager) sends Qx"Write" to set Name to "EUT1". Verify the Name value on the EUT. It should match the value "EUT1" set using 'Write function from the Qx manger. 4) Test "Read" Operation (single Object): Testing node (Qx Manager) sends "Read" scalar object to get Name on Agent. The agent should respond with Name value as "EUT1" as set in the previous step, verifying that the EUT support Qx Read function.
Expected Results	1.) TRAP should be sent by EUT (Agent) to Testing Node (SNMP or Qx Manager). 2.) Set Request operation should be able to set SysName object in agent (EUT), or Write operation should be able to set Name in Qx agent (EUT), 3.) GetRequest operation should be able to get SysName Object from agent(EUT) Read operation should be able to get Name Object from Qx agent(EUT) Attach screenshots for above successful operations.

Test No.7

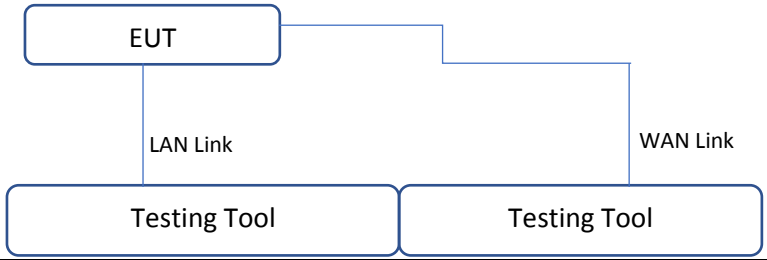
Parameter Name	SNMPv3 or Qx Protocol Functional Tests
Test Details	Test for SNMPv3 or Qx management
Test instruments required	1. PC/Laptop – 1 Numbers (SNMP/Qx Manager) 2. Switch – 1 Numbers
Test Setup	
Test Procedure	**For SNMP** • Configure the agent on EUT and SNMP manager on PC/NMS to use SNMPv3 with security level setting to Auth.Priv. Set Authentication to SHA and Privacy (encryption) to DES. • The NMS uses SNMPv3 to monitor and manage the agent • The agent automatically sends notifications to report events to the NMS. • The NMS and the agent perform authentication when they establish an SNMP session. The authentication algorithm is SHA and the authentication key is xxxxxx. The NMS and the agent also encrypt the SNMP packets between them by using the DES algorithm and encryption key yyyyyy **For Qx** • Configure the agent on EUT and Qx manager on PC/NMS to use Qx with security level setting to AuthPriv. Set SSH between EUT and NMS to enable authentication and encryption. • The NMS uses Qx to monitor and manage the agent • The agent automatically sends notifications to report events to the NMS. • The NMS and the agent perform authentication when they establish an Qx session based on SSH. The NMS and the agent encrypt the packets by using SSH
Expected Results	• Use correct authentication credentials to access the agent. - Attach traces for successful encrypted authentication with correct credentials

	• Use incorrect authentication credentials to access the agent - Attach traces for failed authentication with incorrect credentials

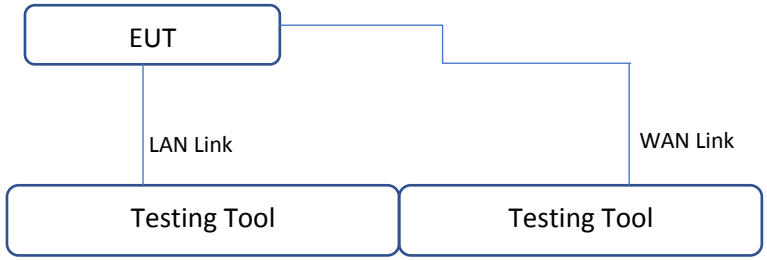
Test No.8

Parameter Name	Dynamic Routing Functional Tests
Test Details	Test for Dynamic Routing Table entry
Test instruments required	IP Testing Tool
Test Setup	
Test Procedure	1. Connect the interface as the case may be, as shown in the setup diagram 2. Connect the Testing Tool to the Ethernet interface of the EUT as shown above. 3. Configure the IP interfaces of the EUT and Testing Tool for back-to-back communication between two ports of Testing Tool. 4. Verify that no static or dynamic routing table entry exists on the EUT and that ping to the WAN port of Testing Tool is not working through LAN Port of Testing Tool. 5. Configure Dynamic Routing (OSPFv2) on the EUT to reach each subnet from other subnet using dynamic routing. Static routing should NOT be used in this case. 6. Perform back-to-back ping test from Testing Tool through EUT and verify that it is successful and that there is no packet drop. 7. Verify the existence of dynamic routing table entry of remote LAN subnet on the EUT using dynamic routing.
Expected Results	1. There should be routing table entry of the remote LAN subnet on the EUT using dynamic routing protocol (OSPF). 2. The ping test should be successful to the remote LAN subnet IP address.

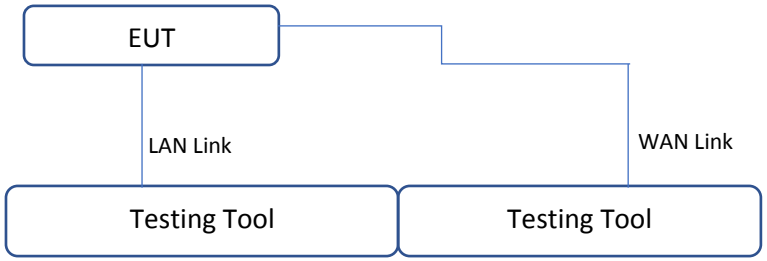
Test No.9

Parameter Name	Static Routing Functional Tests
Test Details	Test for Static Routing Table entry
Test instruments required	Testing Tool
Test Setup	
Test Procedure	1. Connect the interface as the case may be, as shown in the setup diagram 2. Connect the Testing Tool to the Ethernet interface of the EUT as shown above. 3. Configure the IP interfaces of the EUT and Testing Tool for back-to-back communication between two ports of Testing Tool. 4. Verify that no static or dynamic routing table entry exists on the EUT and that ping to the WAN port of Testing Tool is not working through LAN Port of Testing Tool. 5. Configure static routing on the EUT to reach each subnet from other subnet. 6. Perform ping test from back-to-back ping test from Testing Tool through EUT and verify that it is successful and that there is no packet drop. 7. Verify the existence of routing table entry of remote LAN subnet on the EUT using static routing.
Expected Results	1. There should be routing table entry of the remote LAN subnet on the EUT using static route. 2. The ping test should be successful to the remote LAN subnet IP address.

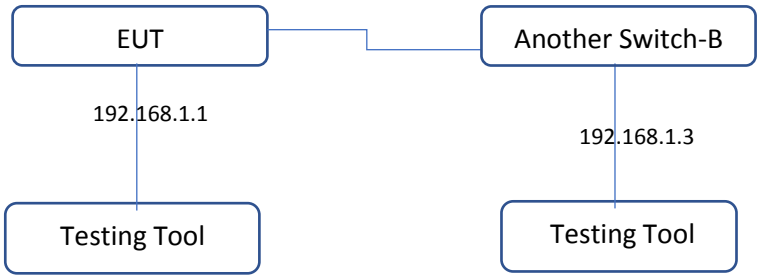
Test No.10

Parameter Name	TCP Functional Tests
Test Details	Test for TCP protocol
Test instruments required	IP Testing Tool
Test Setup	
Test Procedure	1. Connect the Testing Tool to the Ethernet interface of the router as shown above. 2. Configure the Testing Tool and the EUT for back-to-back communication between two ports of Testing Tool. 3. Configure static/ dynamic routing on the EUT to reach each subnet from other subnet. 4. Install/ ensure availability of FTP server and FTP client on Testing Tool for performing file transfer test. 5. Perform file transfer test between the two ports of Testing Tool and verify that it is successful through EUT as per the above-mentioned setup. 6. The EUT must also support TELNET functionality. Configure the EUT to support telnet on its local IP address. 7. Connect to the EUT using telnet from Testing Tool to verify that telnet connection is established and EUT can be configured remotely using telnet sessions. 8. Capture packets at various stages to verify functionality of Sequence Numbers and TCP Header Formats.
Expected Results	1. File transfer test should be successful. 2. Telnet connection to EUT from Testing Tool should be successful. 3. Enclose screenshots and Testing Tool traces of the communication, and indicate various Headers and Sequence Numbers.

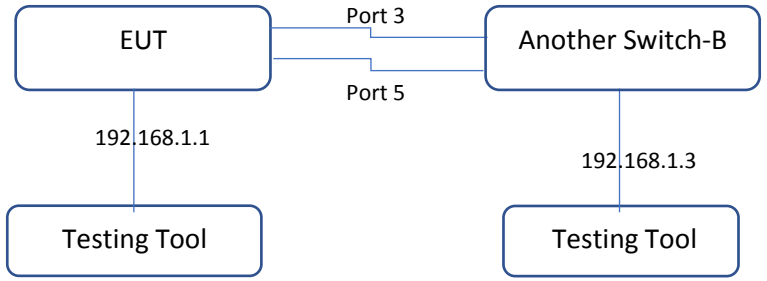
Test No.11

Parameter Name	Mac Learning and Packet Forwarding Tests
Test Details	Mac Learning and Packet Forwarding
Test instruments required	IP Testing Tool
Test Setup	
Test Procedure	1. Connect Interface-A of Testing Tool with EUT and ping EUT. 2. Ensure MAC address of Interface-A of Testing Tool is visible in EUT's MAC address table and Interface-B MAC address is not visible. (e.g. show mac-add). 3. Connect Interface-B of Testing Tool to EUT and ping Testing Tool through Interface-A. Ping should be successful. 4. Check EUT's MAC address table. MAC address of Interface-B of Testing Tool should be visible in table.
Expected Results	1. Ping from Interface-B to Interface-A should be successful, showing successful packet forwarding. 2. MAC address should be visible on EUT's MAC table. 3. Enclose screenshot for successful test.

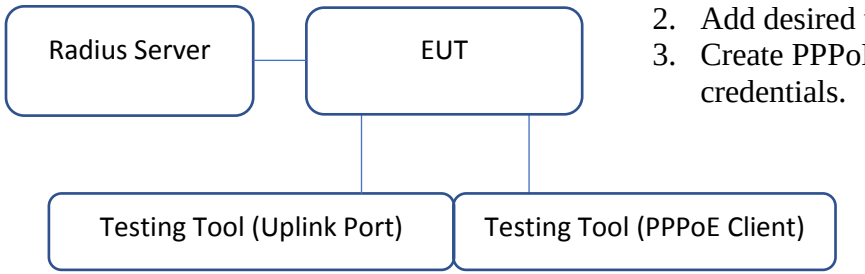
Test No.12

Parameter Name	Spanning Tree Protocol Root Bridge Election Functional Test
Test Details	Test for Spanning tree protocol (STP) – Root Bridge Election
Test instruments required	IP Testing Tool Another Switch
Test Setup	
Test Procedure	1. Enable STP (802.1d) at both EUT and other switch, keeping priority value the same. 2. Verify from C-BPDU from Testing Tool that it contains information about bridge id (Priority/ MAC Address). 3. Depending on computed bridge id, Verify from C-BPDU messages that EUT either becomes the Root Bridge, or allows the other switch to become Root Bridge.
Expected Results	1. The switch, which has the lowest root bridge ID, will be elected as the root bridge. 2. Attach screenshot and Testing Tool traces as artefacts.

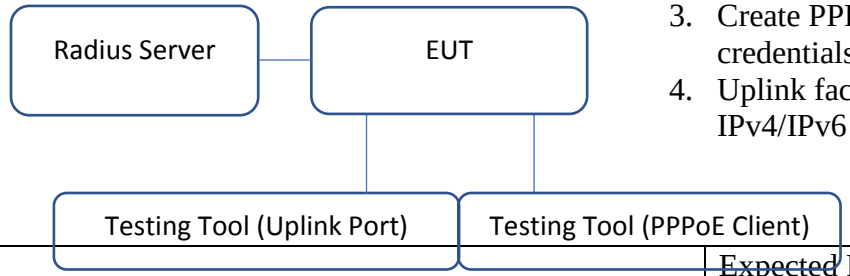
Test No.13

Parameter Name	Spanning Tree Protocol Port Blocking Functional Test
Test Details	Test for Spanning tree protocol (STP) – Port Blocking
Test instruments required	Testing Tool Another Switch
Test Setup	
Test Procedure	1. Create setup as in test STP-1 2. Create Switch-B as root bridge 3. Connect additional ports of EUT and switch-B to create one more link
Expected Results	3. STP should automatically block port 5 4. Evidence: Print status of port 3 and 5 from EUT

Test No.14

Parameter Name	PPPoE as per RFC 2516
Test Details	
Test instruments required	Test tool for emulating PPPoE Client and uplink port Linus Server with Radius Tool
Pre-Test Setup And Test Setup	 1. Setup free radius server on the Linux machine 2. Add desired user credentials in user file on the radius server. 3. Create PPPoE emulation on the test tool with the same user credentials.
Test Steps	1. Start the PPPoE client emulation from test tool. 2. Verify that PADI was received on the box by using CLI 3. Check that authentication was successful by using CLI 4. Issue show PPPoE statistics again to see that DUT has sent PADO, received PADR and send PADS packet by using CLI. (Note: since subscriber bring up happens very fast you might be able to see all the packet count in step 2 itself.) 5. Check on DUT to see that subscriber has come up by executing CLIs 6. Stop the PPPoE client emulation from test tool. 7. Check that PADT message was received on the DUT using CLI 8. Check that subscriber entry has been cleared from the DUT using CLI
Expected Results	1. For Step 2, CLI output contains correct PADI packet count. 2. For Step 3, Authentication is granted. 3. For Step 4, CLI output contains correct PADO, PADR and PADS packet count. 4. For Step 5, CLI contains correct subscriber count and state. 5. For Step 6, PADT is received on the DUT after PPPoE client emulation is stopped in the test tool. 6. For Step 8, CLI output returns subscriber count as 0

Test No.15

Parameter Name	Radius
Test instruments required	Test tool for emulating PPPoE Client and uplink port Linus Server with Radius Tool
Pre-Test Setup And Test Setup	 1. Setup free radius server on the Linux machine 2. Add desired user credentials in user file on the radius server. 3. Create PPPoE emulation on the test tool with the same user credentials. 4. Uplink facing port on the DUT configured with appropriate IPv4/IPv6 addressed and ARP/NDP resolved on the test tool.

Test Steps	Expected Results
1. Start the PPPoE client emulation from test tool. 2. Verify that PADI was received on the box by using CLI 3. Check that authentication request was received on the DUT by using CLI 4. Check that Access-Accept was received on the DUT by using CLI 5. Stop the PPPoE client emulation from test tool. 6. Check that PADT message was received on the DUT using CLI 7. Check that subscriber entry has been cleared from the DUT using CLI 8. Create a mismatch between user credentials in PPPoE client emulation and free radius user file. 9. Start the PPPoE client emulation from test tool. 10. Verify that access-reject has been received on the DUT using CLI 11. Check that no subscriber comes up if Access-reject has been received from the radius server using CLI	• • CLI output contains correct PADI packet count. • Authentication is granted. • Accept counter increments correctly in the CLI output. • • PADT is received on the DUT after PPPoE client emulation is stopped in the test tool. • CLI output contains Active subscriber count as 0 • • • Reject counter increments correctly in the CLI output • CLI output contains Active subscriber count as 0

Test No.16

Parameter Name	Ping traffic through Policy based IPSec Tunnel

Test instruments required	Peer Device Two Linux machines
Pre-Test Setup And Test Setup	 1. Configure IKE and IPsec under Security configuration options on both DUT and PEER devices. 2. To route the required traffic through the tunnel, add the configured VPN under the required policy on both DUT and PEER devices 3. If DUT needs to be act as Initiator, then configure establish tunnel immediately only at the DUT side 4. If DUT needs to be act as responder, then configure establish tunnel immediately only at the PEER side
Test Case Steps	1. Send ping traffic from Linux1 to Linux2 or Linux2 to Linux1 2. Verify fields under security IPsec /IKE CLI
Expected Results	1. If Establish tunnel immediately is configured: a. As soon as configuration gets committed verify P1 and P2 SA is up on both the devices. b. role (initiator or responder) should be proper under ike cli based on the configuration on both the devices c. There should not be any ping packet drop d. packet statistics under ipsec cli should match with actual sent traffic. e. configured Policy through which tunnel is formed should be visible in ipsec sa cli 2. If Establish tunnel on-traffic is configured (default configuration if nothing is configured) a. There will be one ping packet drop and packet statistics should match accordingly under ipsec cli b. P1 and P2 SA should be up on both the devices c. role (initiator or responder) should be proper under ike cli based on traffic d. configured Policy through which tunnel is formed should be visible in ipsec sa cli

Test No.17

Parameter Name	Test Source NAT with PAT with multiple source ip addresses.
Test instruments required	One Linux client with hping2 tool installed

	One linux machines
Pre-Test Setup And Test Setup	 1. Install hping2 on Linux Client to initiate traffic from multiple source addresses 2. On Linux server, add route for nat-pool address used in nat configuration on DUT 3. Configure source nat pool on DUT with single IP address 4. Configure source nat rule-set on DUT with 'from' and 'to' and also match condition like 'source-address' and 'destination-address' Note:PAT is enabled by default
Test Case Steps	1. Start sending traffic with hping2 tool from Linux client with first IP to Linux server IP address 2. Again, Initiate hping2 by incrementing the source IP in 'source-ip' field
Expected Results	1. For Step 1, verify that cli output of flow session shows nat-translation. Test considered pass if the source address is natted with the address from the pool specified. 2. Also, check source nat-translation hit count is incrementing in cli output 3. For step 2, Verify that port address translation is seen in cli output of security flow session

Test No.18

Parameter Name	Test Source NAT NAT64 related feature
Test instruments required	One Linux client One linux server
Pre-Test Setup And Test Setup	 1. To configure NAT64, you need to have a pool of single IPs which will be the IPv4 address of the server. 2. We need a destination NAT configuration to translate the IPv6 address into IPv4 address in the destination field of the incoming packet. 3. The destination address is IPv4, but the source address is IPv6. Thus, we must apply the source NAT in order to change the IPv6 address to IPv4 in the source field of the packet.
Test Case Steps	1. Initiate traffic from Linux client 2. Verify nat translation has worked by checking flow session on DUT
Expected Results	1. Check how the sessions are being established:

Test No.19

Parameter Name	Verify Source Address any, destination specific, application any action = deny
Test instruments required	One Linux client One linux server
Pre-Test Setup And Test Setup	 1. Configure IPs on the eth interfaces of both the linux machines.
Test Case Steps	1. Configure security zones and add interfaces to it. 2. (Ex: Configure a security zone "trust" and add the interface connected to one of the linux machines to it. Configure another security zone "untrust" and add router's other interface to it.) 3. Create address book entries to specify the source and destination address. 4. Create a policy (say p1) from zone trust to zone untrust and vice-versa, with source address any name, destination address as address book name, application any. 5. Set a deny condition for the policy. 6. (For ex: set security policies from-zone trust to-zone untrust policy p1 then deny) 7. Commit the configuration. 8. Send traffic from H0 to H1.
Expected Results	1. Traffic should not be allowed due to the deny policy.

Test No.20

Parameter Name	Verify the packet capture of the attack logs
Test instruments required	2 Linux server, syslog, ftp client and server
Pre-Test Setup And Test Setup	 1. IDP license is installed 2. IDP security package is installed 3. Configure IDP with FTP:USER: ROOT attack and attack to fw policy 4. Configure the packet-log server and the port details 5. Enable 5 packets to capture pre and post the attack.
Test Case Steps	1. Start the packet-log server to capture the packets 2. Start the FTP server 3. Start FTP traffic with user as root
Expected Results	1. IDP attack table should not have the attack detected 2. The packet log tool should have the attack details and the pre and post attack packet captured 3. IDP attack log should be generated and the packet log id should be matching with the packet log attack details

Test No.21

Parameter Name	Check the attack detection over https session
Test instruments required	2 Linux as server client, openssl, curl.
Pre-Test Setup And Test Setup	 1. IDP license is installed 2. IDP security package is installed 3. Configure a ssl proxy profile and attach to the fw policy 4. Configure an IDP with custom http attack and attach to the same IDP policy
Test Case Steps	1. Start the openssl server. 2. Send the https traffic using curl from client
Expected Results	1. IDP attack table should have the custom http attack detected

Test No.22

Parameter Name	Close Client and Server Action for TCP in IPS Rule Base
Test instruments required	2 Linux servers
Pre-Test Setup And Test Setup	 1. IDP license is installed 2. IDP security package is installed 3. Configure an http attack with close client and server as action
Test Case Steps	1. Start the tcp dump on both client and server. 2. Send the http attack traffic.
Expected Results	1. http attack should be detected 2. client and server should have received RST packet to close the tcp connection 3. IDP attack log should have the action as close-client-and-server as action

Test No.23

Parameter Name	Close Client Action for UDP in IPS Rule Base
Test instruments required	2 Linux servers
Pre-Test Setup And Test Setup	 1. IDP license is installed 2. IDP security package is installed 3. Configure a dns attack with close client as action
Test Case Steps	1. Start the tcp dump on client. 2. Send the dns attack traffic from client.
Expected Results	1. DNS attack should be detected. 2. Server should not receive the packet. 3. IDP attack log should have the action as DROP as action.

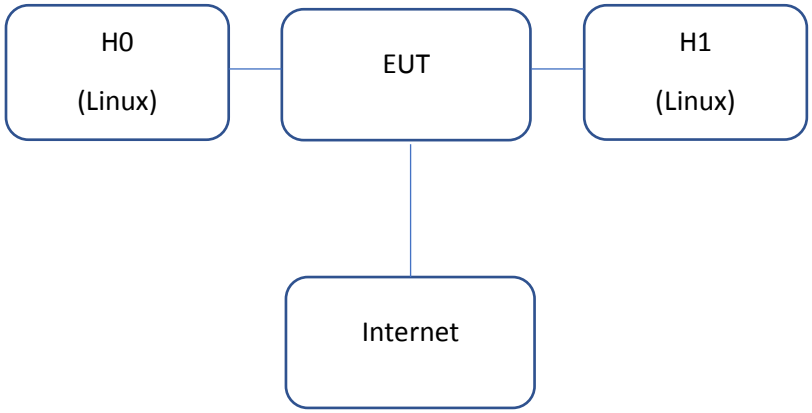
Test No.24

Parameter Name	http with block-extension-list
Test instruments required	2 Linux servers
Pre-Test Setup And Test Setup	 1. Configure UTM custom objects for file extension list such as vbs, pl, tst 2. Configure the UTM content filtering feature profile with the block-extension for those file extension list 3. Configure notifications options as message and content for the message 4. Attach the profile to the fw policy. 5. Configure the security logging
Test Case Steps	1. Start the HTTP server and have the files with different extension 2. From client get vbs, pl, txt and html files using curl
Expected Results	1. Other than html file all are blocked 2. In the utm content filtering statistics, the extension blocked counter should increment accordingly 3. Verify the content filtering blocked message in the syslog

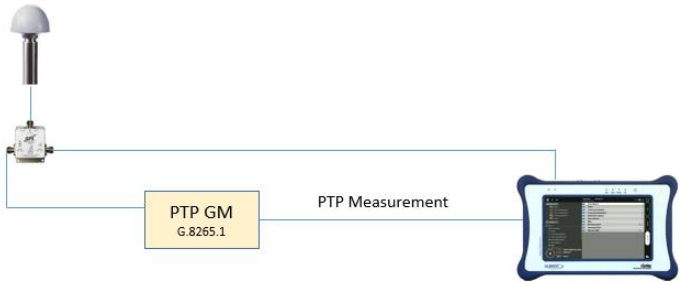
Test No.25

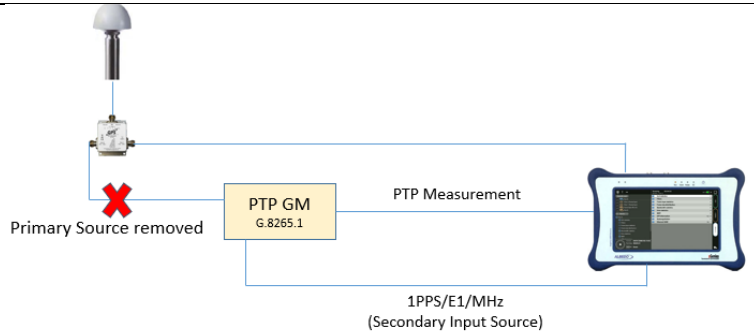
Parameter Name	File extension blocking
Test instruments required	2 Linux servers
Pre-Test Setup And Test Setup	 1. Configure UTM custom objects for filename extension list for com and exe 2. Configure the UTM content filtering feature profile with the block-extension for those filename extension list 3. Configure content filtering UTM policy for ftp upload and download 4. Configure notifications options as message and content for the message 5. Attach the profile to the fw policy. 6. Configure the security logging
Test Case Steps	1. Start the FTP server and have the files with different extension 2. From client, do ftp and get exe and com extension files 3. From client do ftp and put exe and com extension files
Expected Results	1. GET and PUT of exe and com files are blocked with proper error message 2. In the utm content filtering statistics, the Base on extension list counter should increment accordingly 3. Verify the content filtering blocked message in the syslog

Test No.26

Parameter Name	Test with Infected file for ALL Protocol
Test instruments required	2 Linux servers
Pre-Test Setup And Test Setup	 1. DUT should have internet access through one of the revenue interfaces 2. Sophos license should be installed 3. Sophos av is configured and the pattern is up to date 4. Configure Sophos anti-virus profile for http, ftp up/down, smtp, pop and imap 5. Attach the profile to the utm policy 6. Attach the utm policy to the fw policy
Test Case Steps	1. Send the following traffic with the virus file attached (HTTP GET/POST, FTP GET/PUT, SMTP, IMAP and POP3)
Expected Results	1. The virus file should be blocked with the proper error message 2. The virus file should be detected and the threat-found incremented in the anti-virus statistics 3. Verify the av virus detected message in the syslog

Test No.27

Parameter Name	Profile for frequency synchronisation
Test Details	Support for PTP frequency profile: G.8265.1 & monitor 1) PTP messages exchanged between Master & Slave 2) Protocol statistics of GM for e.g. GM IP, GM Identity, GM clock class & value etc. 3) GM locking with auxiliary interfaces and observe relevant protocol statistics.
Test instruments required	Synch tester Splitter GPS Antenna Connecting Cables Laptop
Test Setup 1 Test Setup 2	Setup 1: Follow Test procedure instructions 4 to 7  Setup 2: Follow Test procedure instruction 8



Test Procedure

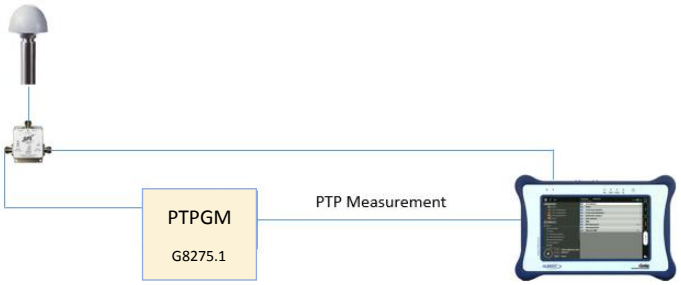
1. Connect GNSS signal to PTP GM and Tester. Wait for sufficient (approx. 1-2 hours) time so that GM and Tester are locked to UTC.
2. Now, configure PTP GM as per the settings mentioned below:

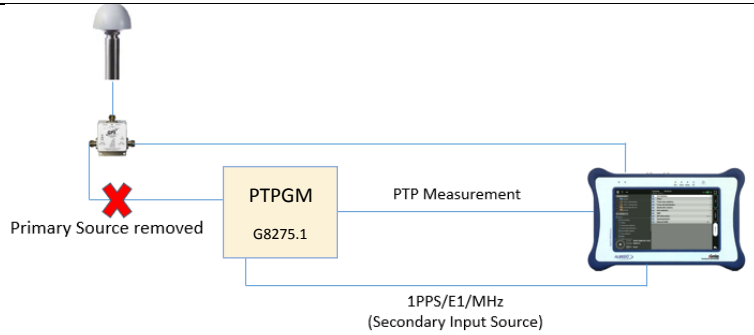
	ITU-T G.8265.1
frame	{udp}
addressing-mode	{unicast}
one-step	{enable|disable}
path-delay-mechanism	{e2e|disable}
domain	<4..23>
priority1	-
priority2	-
localpriority	<1..255>
class	<80..110>
BMCA	"Static BMCA"
sync-interval	<0.125 msg/s..128 msg/s>
delay-request-interval	<0.125 msg/s..128 msg/s>
announce-tx-interval	<0.125 msg/s..8 msg/s>

3. After configuring PTP GM with correct Frequency profile setting (**through CLI & GUI**). Configure the Sync Tester with same parameters & connect the Tester to the configured PTP port on GM.
4. **Verify:** if PTP GM has ping option & able to ping Tester's IP. Also verify if VLAN tagging is possible on PTP messages.
5. **Verify:** If GM is sharing all the relevant protocol information to the Tester for e.g.
   i) GM IP
   ii) GM Identity

	iii) GM Priority iv) GM Clock class & value v) GM Clock Source 6. **Verify:** Message Exchange between Master & Slave i.e. i) Sync ii) Follow-up iii) Delay Request iv) Delay Response etc. 7. Now, remove the GPS antenna cable from the PTP GM and see if the **Clock class** in the tester changes to a different value (Locked mode clock class to Holdover clock class). **8.** Configure Primary input clock in PTP GM as GNSS and set a secondary input clock as well (for e.g. 1PPS, E1, MHz). Sync Tester can be used to give secondary input to the GM. Now remove the primary input clock from the GM and **verify that GM automatically switches to secondary input source.**
Expected Results	1. Verify GM configuration through GUI & CLI. 2. Verify Test procedure - Steps 4 to 8. Results should match the configured value as per ITU-T Standard. 3. Attach screenshots.

Test No.28

Parameter Name	Profile for time and phase synchronisation with full timing support
Test Details	Support for PTP phaseprofile: G8275.1 1) PTP messages exchanged between Master & Slave 2) Protocol statistics of GM for e.g. GM MAC, GM Identity, GM clock class & value etc. 3) GM locking with auxiliary interfaces and observe relevant protocol statistics.
Test instruments required	Synch tester (e.g. xGenius) Splitter GPS Antenna Connecting Cables Laptop
Test Setup 1 Test Setup 2	Setup 1: Follow Test procedure instructions 4 to 7  Setup 2: Follow Test procedure instruction 8



Test Procedure

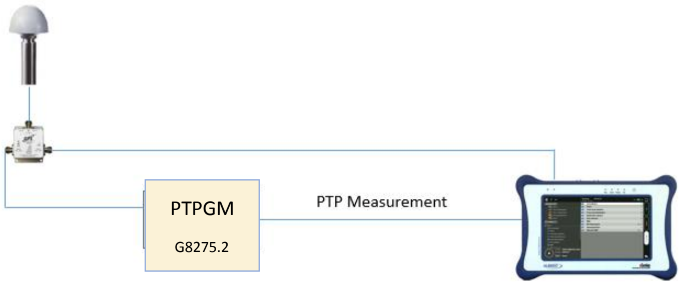
1. Connect GNSS signal to PTP GM and Tester. Wait for sufficient (approx. 1-2 hours) time so that GM and Tester are locked to UTC.
2. Now, configure PTP GM as per the settings mentioned below:

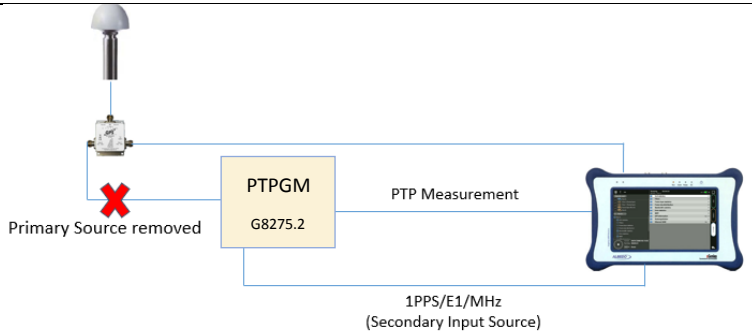
	ITU-T G.8275.1
frame	{ethernet}
addressing-mode	{multicast}
one-step	{enable|disable}
path-delay-mechanism	{e2e}
domain	<24..43>
priority1	<128>
priority2	<0..255>
localpriority	<1..255>
class	{6|7|140|150|160|248|255}
BMCA	"Alternate BMCA"
sync-interval	<16 msg/s>
delay-request-interval	<16 msg/s>
announce-tx-interval	<8 msg/s>

3. After configuring PTP GM with correct Phase profile (full on-path) setting **(through CLI & GUI).** Configure the Sync Tester with same parameters & connect the Tester to the configured PTP port on GM.
4. **Verify:** if VLAN tagging is possible on the PTP messages.
5. **Verify:** If GM is sharing all the relevant protocol information to the Tester for e.g.
   i) GM MAC
   ii) GM Identity

	iii) GM Priority iv) GM Clock class & value v) GM Clock Source 6. **Verify**: Message Exchange between Master & Slave i.e. i) Sync ii) Follow-up iii) Delay Request iv) Delay Response etc. 7. Now, remove the GPS antenna cable from the PTP GM and see if the Clock class in the tester changes to a different value (Locked mode clock class to Holdover clock class). 8. Configure Primary input clock in PTP GM as GNSS and set a secondary input clock as well (for e.g. 1PPS, E1, MHz). Sync Tester can be used to give secondary input to the GM. Now remove the primary input clock from the GM and **verify that GM automatically switches to secondary input source.**
Expected Results	1. Verify GM configuration through GUI (Graphic User Interface) &CLI (Command Line Interface). 2. Verify Test procedure - Steps 4 to 8. Results should match the configured value as per ITU-T Standard. 3. Attach Screenshot.

Test No.29

Parameter Name	Profile for time and phase synchronisation with partial timing support
Test Details	Support for PTP phase profile: G.8275.2 1) PTP messages exchanged between Master & Slave 2) Protocol statistics of GM for e.g. GM IP, GM Identity, GM clock class & value etc. 3) GM locking with auxiliary interfaces and observe relevant protocol statistics.
Test instruments required	Synch tester (e.g. xGenius) Splitter GPS Antenna Connecting Cables Laptop
Test Setup 1 Test Setup 2	Setup 1: Follow Test procedure instructions 4 to 7  Setup 2: Follow Test procedure instruction 8



Test Procedure

1. Connect GNSS signal to PTP GM and Tester. Wait for sufficient (approx. 1-2 hours) time so that GM and Tester are locked to UTC.
2. Now, configure PTP GM as per the settings mentioned below:

	ITU-T G.8275.2
frame	{udp}
addressing-mode	{unicast}
one-step	{enable|disable}
path-delay-mechanism	{e2e|disable}
domain	<44..63>
priority1	<128>
priority2	<0..255>
localpriority	<1..255>
class	{6|7|140|150|160|248|255}
BMCA	"Alternate BMCA"
sync-interval	<1 msg/s..128 msg/s>
delay-request-interval	<1 msg/s..128 msg/s>
announce-tx-interval	<1 msg/s..8 msg/s>

3. After configuring PTP GM with correct Phase profile (partial on-path) setting (**through CLI & GUI**). Configure the Sync Tester with same parameters & connect the Tester to the configured PTP port on GM.
4. **Verify:** if PTP GM has ping option & able to ping Tester's IP. Also verify if VLAN tagging is possible on the PTP messages.
5. **Verify:** If GM is sharing all the relevant protocol information to the Tester for e.g.
   i) GM IP
   ii) GM Identity

	iii) GM Priority iv) GM Clock class & value v) GM Clock Source 6. **Verify:** Message Exchange between Master & Slave i.e. i) Sync ii) Follow-up iii) Delay Request iv) Delay Response etc. 7. Now, remove the GPS antenna cable from the PTP GM and verify if the **Clock class** in the tester changes to a different value (Locked mode clock class to Holdover clock class). 8. Configure Primary input clock in PTP GM as GNSS and set a secondary input clock as well (for e.g. 1PPS, E1, MHz). Sync Tester can be used to give secondary input to the GM. Now remove the primary input clock from the GM and **verify that GM automatically switches to secondary input source.**
Expected Results	1. Verify GM configuration through GUI & CLI. 2. Verify Test procedure - Steps 4 to 8. Results should match the configured value as per ITU-T Standard. 3. Attach screenshots.

Test No.30

Parameter Name	Mobile device - Non-Zero IMEI/MEID/ESN
Test Details	Test for Identification of Equipment Identity for mobile device for GSM/ UMTS/ LTE/ CDMA
Test instruments required	None
Test Setup	Powered on EUT
Test Procedure	1. Press *#06# to display IMEI / MEID / ESN. 2. Copy down the displayed IMEI/ MEID/ ESN.
Expected Results	1. Check that the displayed IMEI / MEID / ESN is not all zeroes/ null.

Test No.31

Parameter Name	Mobile Emergency Support - Panic button
Test Details	Test for functioning of Panic button in Feature phone
Test instruments required	None
Test Setup	1. Power on EUT. 2. If the device has a keypad lock, invoke it to lock the key pad.
Test Procedure 1	1. Press Numeric Key "5" on the feature phone keypad for more than 10 seconds. 2. If a call is not invoked, repeat step 1 with numeric key "9". 3. Disconnect the call if invoked. 4. Remove keypad lock. 5. Repeat step 1, 2 and 3.
Test Procedure 2	1. Switch on the mobile screen. If there is a screen protector (wallpaper), invoke it. If there is a screen lock, invoke it to lock the screen. 2. Switch off screen display. 3. Press panic (red) button for more than 3 seconds 4. Disconnect the call if invoked.
Expected Results	1. Check that emergency call is invoked in both cases by actions in step 2 and 5. 2. Wallpaper ON + Screen Lock ON + Screen Off + Long press panic (red) button once => Emergency call

Test No.32

Parameter Name	Mobile Emergency Support - Panic button
Test Details	Test for functioning of Panic button in Smart phone
Test instruments required	None
Test Setup	Powered on EUT.
Test Procedure 1	1. Switch on the mobile so that the screen is lit. If there is a screen protector (wallpaper), invoke it. If there is a screen lock, invoke it to lock the screen. 2. Switch off screen display. 3. Short Press power-on button thrice in quick succession. 4. Disconnect the call if invoked. 5. With screen protector and screen lock invoked and screen display switched on, repeat step 3 and 4.
Test Procedure 2	1. Switch on the mobile screen. If there is a screen protector (wallpaper), remove it. If there is a screen lock, invoke it to lock the screen. 2. Check if a Soft emergency call button is visible even in screen lock mode. 3. Invoke emergency call by touching it. 4. Disconnect the call if invoked.
Test Procedure 3	1. Switch on the mobile screen. If there is a screen protector (wallpaper), invoke it. If there is a screen lock, invoke it to lock the screen. 2. Switch off screen display. 3. Press panic (red) button for more than 3 seconds 4. Disconnect the call if invoked.
Expected Results	1. Wallpaper ON + Screen Lock ON + Screen Off + Short press power on button thrice => Emergency call 2. Wallpaper ON + Screen Lock ON + Screen Lit + Short press power on button thrice => Emergency call 3. Wallpaper Off + Screen Lock ON + Screen Lit + Softemergency call button touch => Emergency call 4. Wallpaper ON + Screen Lock ON + Screen Off + Long press panic (red) button once => Emergency call

Test No.33

Parameter Name	Mobile Emergency Support - GPS Location
Test Details	Test for facility of identifying the location through satellite-based GPS in smart phone handsets.
Test instruments required	None
Test Setup	Powered on EUT.
Test Procedure	1. Switch on the mobile and deactivate SIM(s). 2. Go to settings through appropriate menu. 3. Locate settings for “Location” and turn the “Location” Off and On. 4. Use any suitable App to display current location of mobile.
Expected Results	1. Verify that Mobile phone is able to display location using satellite-based GPS, when SIM(s) are deactivated.

Test No.34

Parameter Name	Mobile Emergency Support – Call on 112
Test Details	Test for facility to dial 112 with Keypad lock, without SIM or without registration on PLMN.
Test instruments required	None
Test Setup	Powered on EUT. Test SIM without subscription.
Test Procedure 1	1. Switch on the mobile screen. If there is a screen protector (wallpaper), remove it. If there is a screen lock, invoke it to lock the screen. 2. Check if either keypad, or an icon/ link to display the keypad is visible. In case of later, click icon/ link to display keyboard. 3. Invoke emergency call by dialing 112. 4. Disconnect the call if invoked.
Test Procedure 2	1. Remove SIM from mobile. Switch on the mobile. If there is a screen protector (wallpaper), remove it. If there is a screen lock, invoke it to lock the screen. 2. Repeat steps 2, 3 and 4 of Procedure 1.
Test Procedure 3	1. Insert test SIM and switch ON mobile. 2. Verify that mobile is trying to be registered to some available PLMN. 3. Repeat procedure 2 with test SIM.
Expected Results	1. It is possible to dial the emergency number 112 even if the key pad is locked, as verified through Procedure 1. 2. It is possible to dial the emergency number 112 without SIM, as verified through Procedure 2. 3. The mobile phone, which has not successfully registered shall nevertheless be able to make emergency call attempts on an available PLMN, as verified through Procedure 3.

Test No.35

Parameter name	Display of SAR Value
Test Details	Test for Display of SAR Value
Test Instruments required	None
Test Setup	Powered on EUT
Test Procedure	Press *#07# to get SAR Value.
Expected Result	Check that SAR Value is less than 1.6 W/Kg.

Test No.36

Parameter name	Operating Frequency
Test Details	Test for checking of Operating Frequency

Test Instruments required	Base Station Emulator, Signal generator, spectrum analyser, required software
Test Setup	Powered on EUT
Test Procedure	1. Check that the frequency of operation as per its data sheet/ information given by the vendor is as per the Applicable National Frequency Allocation Plan 2. If the step 1 above is okay, then - a. Put the Device Under Test (DUT) in Airplane or Switch Off mode. b. Configure Base Station Emulator for required frequency and technology. c. Switch on the DUT and initiate a call. d. Check that the DUT is connected to the Base Station Emulator and that the call goes through. e. Carry out steps a-d for all the technology – frequency combinations supported by the DUT as per its data sheet/ information given by the vendor.
Expected Results	The call should go through in step 2.d for all the technology – frequency combinations supported by the DUT as per its data sheet/ information given by the vendor.

Test No.37

Parameter name	Indian Language Support for Mobile Phones
Test Details	1. Test for checking Message input capability 2. Test for checking Message Readability
Test Instruments/ Documents required	1. Standard Font for English and 22 Indian Languages (Both in Soft Copy and Printed Copy) 2. Computer/ Laptop with Data Card/ Dongle and in-built SMS Application
Test Setup	Powered on EUT with an active SIM Card
Test Procedure 1	i) Input all the characters of English language one by one and check that the displayed character matches with the character typed on keypad. ii) Repeat above step i) for Hindi. iii) Repeat above step i) for any other (at-least one) Indian Language as declared by the manufacturer.
Test Procedure 2	i) Input all the characters of English language to make a text in a computer/ Laptop and using Data Card/ Dongle through SMS Application send it to the DUT. ii) Read and compare the text character by character to see that the sent message and the received message are the same. iii) Repeat above step for Hindi and all (twenty-one) other Indian languages.
Expected Results for Message input capability	The DUT should have in-built capability for inputting of the following languages: a) English b) Hindi and c) Any other (at-least one) Indian Language
Expected Results for Message Readability	The DUT should have the capability to display all the languages as follows: a) English b) Hindi and c) All (twenty-one) other Indian Languages

Test No.38

Parameter Name	SNMPv2 Functional Tests
Test Details	Test for management: SNMPv2 (check TRAP, GET and SET operations)
Test instruments required	SNMP Test Tool (SNMP Manager)
Test Setup	
Test Procedure	1. Configure the EUT to run SNMP agent and SNMP Test Tool (NMS) to run SNMP manager application by using correct parameters. 2. Testing of TRAP message: The NMS uses SNMPv2 to manage the SNMP agent, and the agent automatically sends notifications to report events to the NMS. 3. Configure the SNMP agent to send traps to the manager. 4. Use a wrong community name to get the value of a MIB node on the agent. You can see an authentication failure trap on the SNMP manager. 5. Test "SetRequest" operation: SNMP Testing node (SNMP manager) sends SNMPv2c "SetRequest" to set SysName to "EUT1". Verify the SysName value on the EUT. It should match the value "EUT1" set using 'SetRequest' function from the SNMP manger. 6. Test SNMP GET Operation (single Object): Testing node (SNMP Manager) sends SNMPv2c "GetRequest" scalar object to get sysName.0 1.3.6.1.2.1.1.5.0 in system group in MIB II, to Agent. The agent should respond with "SysName value as "EUT1" as set in the previous step, verifying that the EUT support SNMP GET function.
Expected Results	1. TRAP should be sent by EUT (Agent) to Testing Node (SNMP Manager). 2. SetRequest operation should be able to set SysName object in agent (EUT) 3. GetRequest operation should be able to get SysName Object from agent (EUT) 4. Attach screenshots for above successful operations.

Test No.39

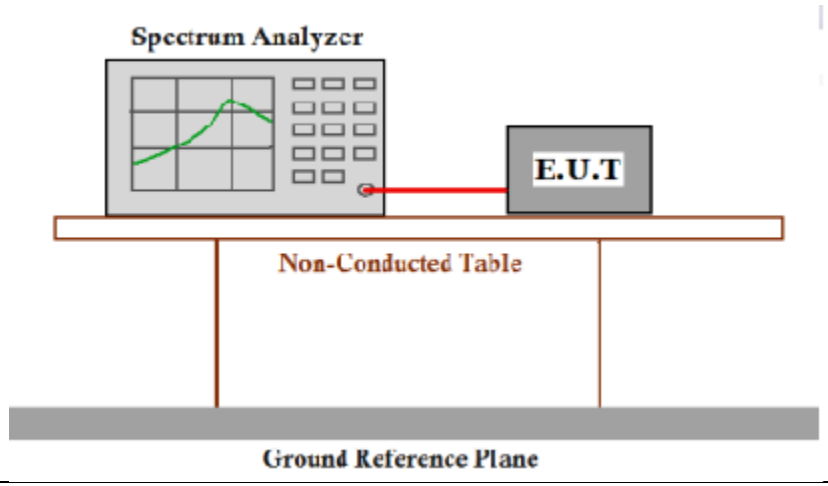
Parameter Name	SNMPv3 Functional Tests
Test Details	Test for SNMPv3 management
Test instruments required	SNMP Test Tool (SNMP Manager)
Test Setup	
Test Procedure	1. Configure the agent on EUT and SNMP manager on SNMP Test Tool to use SNMPv3 with security level setting to AuthPriv. Set Authentication to SHA and Privacy (encryption) to DES. 2. The NMS uses SNMPv3 to monitor and manage the agent 3. The agent automatically sends notifications to report events to the NMS. 4. The NMS and the agent perform authentication when they establish an SNMP session. The authentication algorithm is SHA and the authentication key is xxxxxx. The NMS and the agent also encrypt the SNMP packets between them by using the DES algorithm and encryption key yyyyyy
Expected Results	1. Use correct authentication credentials to access the agent. 2. Attach traces for successful encrypted authentication with correct credentials 3. Use incorrect authentication credentials to access the agent 4. Attach traces for failed authentication with incorrect credentials

Test No.40

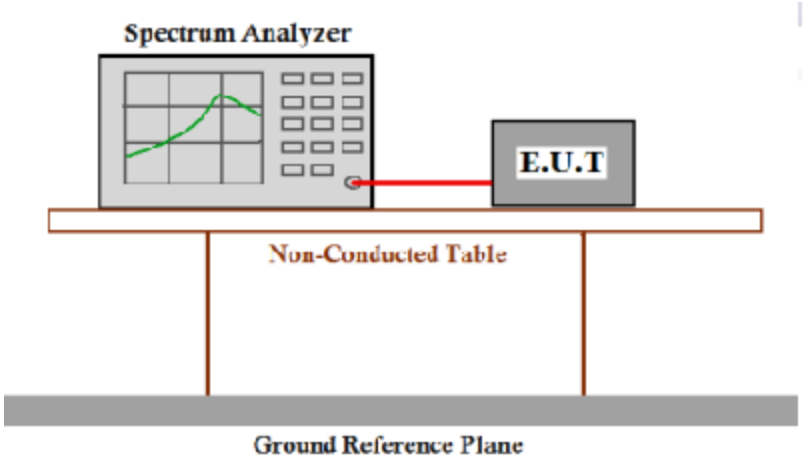
Parameter Name	Support for priority for emergency calls
Test Details	As per Department of Telecom No. 16-04/ 2015-AS-III/NP/67/120 dated 4th May 2016
Standard	3GPP TS 23.067 Enhanced Multi-Level Precedence and Pre-emption service (eMLPP): Stage 2
Test Procedure	1. The call to emergency number is given priority. 2. The emergency numbers are accessible irrespective of balance/ limit. 3. The numbers are routed through other operator, if the signal of the operator, to which the Subscriber is subscribed, is low or unavailable. 4. The numbers are diallable with or without SIM (subject to implementation)
Expected Results	Compliance

Test No. 41

Parameter name	Frequency of operation for BLE interface
Test details	Band edge limitations (Ref Standard : -)
Test instruments required	Spectrum analyzer Power Supply

Test setup	
Test Procedure	1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer or power meter. 2. Set instrument center frequency to the frequency of the emission to be measured (must be within 2MHz of the authorized band edge). 3. Set span to 2MHz, 4. RBW=100kHz, VBW≥3×RBW 5. Detector=peak 6. Sweep time =auto, 7. Trace mode=max hold. 8. Allow sweep to continue until the trace stabilizes(required measurement time may increase for low duty cycle applications) 9. Measure the power of the peaks outside the band.
Expected results	2400MHz - 2483.5MHz

Test No. 42

Parameter name	EIRP of BLE interface, Maximum Transmitted power for BLE interface, RF Output Power
Test details	Peak power measurement
Test instruments required	Spectrum analyzer Power Supply
Test setup	

Test Procedure	1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable (Cable loss =1.0dB) from the antenna port to the spectrum. 2. Set the RBW≥DTS bandwidth 3. Set the VBW ≥ 3 x RBW 4. Set the span ≥ 3 x RBW. 5. Detector = peak. 6. Sweep time = auto couple. 7. Trace mode = max hold. 8. Use peak marker function to determine the peak amplitude level. 9. Report the worse case 10. To calculate the EIRP, add the Antenna gain to Measured power.
Expected results	As per WPC GSR 45(E)