Department of Telecommunications
Telecommunications Engineering Centre
(IoT division)

File No: 2-20/2023-IoT/TEC Dated: 27.03.2024

SUB : Minutes of MATCOF meeting held on 07.02.2024 for review of Essential Requirements (ERs) of Feedback Device, Tracking Device, Smart Electricity Meter and End point Device for Environmental monitoring -reg.

A MATCOF meeting was held on 07.02.2024, in virtual mode, for review of Essential Requirements (ERs) of Feedback Device, Tracking Device, Smart Electricity Meter and End point Device for Environmental monitoring. List of participants is available at **Annexure-A.**

2. Sh. R.S. Singh, DDG(IoT), welcomed all the participants and briefed about the need for reviewing ERs of Feedback Device, Tracking Device, Smart Electricity Meter and End point Device for Environmental monitoring. He also apprised participants that World Telecommunication Standardization Assembly (WTSA)-2024 would be hosted by India in October 2024 in Delhi.

3. Mr. Shekhar Singh, AD(IoT) presented the proposed additions and comments/inputs received from stakeholders. The ER wise discussions held during the meeting are summarized in tables available in **Annexure-B.** Details of test parameters added are mentioned in **Annexure-C**

4. Meeting ended with vote of thanks from DDG(IoT).

5. Any suggestion / comment may be sent on adet.iottec-dot@gov.in & ad.iot-tec@gov.in with copy to adg.iot-tec-dot@gov.in by 05.04.2024 in track-change mode only.

Encl: Copy of ERs with proposed modification in track-change mode.

Shekhar Singh
AD(IoT)

To :

All the officers of TEC, Stakeholders and participants

Annexure-A

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Annexure-B

Table-1 ER : Tracking Device TEC28732401				
S.No.	**Parameter inER (Existing / New proposed to be added)**	**Existing**	**Comment Received**	**Remark**
1.	Proposed Addition of 5G and NB-IoT Parameters as circulated with meeting Notice also given in the table Annexure-1	Not available in existing ER	**Sh. Parag Kulkarni, JohnDeere :** Standards mentioned for 5G interface as consistent with other ER's developed recently by IoT division.	Agreed to include 5G test parameters as given in the Annexure-C
2.	3.1.3	GNSS Compliance	**Sh. Parag Kulkarni, JohnDeere :** *There is a separate interface requirements added for GNSS compliance for Pet tracking below, So it would be duplication requirement in this Point.* ***JD India recommendations : Remove Clause 3.1.3***	Agreed to remove GNSS from points 1.1.4(Asset Tracking) , 2.1.3(Human Tracking) and 3.1.3(Pet Tracking since GNSS as separate interface has been added as per details available in Annexure-C
3.	3.1.9	IPV6 Parameters-IOT	**Sh. Parag Kulkarni, JohnDeere :** IPV6 RFC 2460 & RFC 8400 both are being adopted today by the industry. However not everyone has migrated to RFC 8400 so it is recommended to have IPV6 RFC 2460 or RFC 8400. **JD India recommendations :** Remove this clause 3.1.9 as it is same as 3.1.8	Agreed to remove Clause 3.1.9 removed as it is already available at 3.1.8.
4.	4.1.3	GNSS Compliance	**Sh. Parag Kulkarni, JohnDeere :** As per **Annexure to ER for Tracking Device** , this	Following suggestions received apart from the JohnDeere :

			Annexure recommends to test the GNSS of Tracking Device for GPS & NavIC (IRNSS). It refers to Test Setup I: To verify the frequency of operation of the EUT (as per applicability defined in standard ETSI EN 303 345-1) . ETSI EN 303 413 standard addressed on GPS frequencies. As a manufacturer to build confidence in meeting compliance requirements, it would be preferred to have a Standard that need to be met for NavIC all frequencies. We understand infrastructure for L1 band is yet to be developed, not all international manufacturers would have developed GNSS chipsets for S bands. **JD India recommendation :** In Annexure testing shall be mention testing for GPS or NavIC , instead of GPS and NavIC and provide a cooling period to manufacturers to design & Develop the chips that can read S & L1 band frequencies	1. If the device is to be installed in the vehicles mandated by MoRTH for installation of VTS then GNSS testing may be done as per IS16833/AIS140 otherwise it can be voluntary certification. 2. Due to the unavailability of testing facility of NaVIC related parameters, slow development of NaVIC supporting Chips, opacity in difference of testing between GPS & NaVIC and, very slow rate of adoption in the industry, the GNSS testing in all the variants of tracking device except VTS may be exempted for one year on the similar lines to the exemption given for Radio Broadcast Receiver vide TEC Notification No. 5-5/2021-TC/TEC. Accordingly following was concluded: The testing of GNSS parameters in VTS are to be done as per IS16833/AIS140 as already decided in earlier MATCOF. 3. Discussions to be done with TC division for exemption of GNSS testing in all the variants of tracking device except VTS for one year on the similar lines to the exemption given for Radio Broadcast

				Receiver vide TEC Notification No. 5-5/2021-TC/TEC dated 08.01.2024.

Table-2 ER : Feedback Devices TEC23232401				
S.No.	**Parameter in ER (Existing / New proposed to be added)**	**Existing**	**Comment Received**	**Remark**
1.	Proposed Addition of 5G and NB-IoT Parameters as circulated with meeting Notice also given in the table Annexure-1	Not available in existing ER	**Sh. Parag Kulkarni, JohnDeere :** Standards mentioned for 5G interface as consistent with other ER's developed recently by IOT division.	Agreed to include 5G test parameters as given in the Annexure-C
2.	1.1.3	GPS Compliance Compliance to GoI notification GSR no. 436(E).	**Sh. Parag Kulkarni, JohnDeere :** GSR 436 E These rules may be called the panic button and Global Positioning System facility in all mobile phone handsets Rules, 2016. In these rules these rules all Mobile phone handsets shall have panic button from January 1 , 2017 and GPS system from January 1 . 2028 . both of	Agreed to remove clause 1.1.3 as GNSS test parameters have been added as separate interface as per details available in Annexure-C

			these clause are not applicable to feedback devices. JD India recommendations - Remove GSR 436 E for GPS compliance instead mention ETSI EN 303 413 standard for GNSS	
3.	1.25	GNSS compliance	**Sh. Parag Kulkarni, JohnDeere :** As per **Annexure to ER for Tracking Device** , this Annexure recommends to test the GNSS of Tracking Device for GPS & NavIC (IRNSS). It refers to Test Setup I: To verify the frequency of operation of the EUT (as per applicability defined in standard ETSI EN 303 345-1) . ETSI EN 303 413 standard addressed on GPS frequencies. As a manufacturer to build confidence in meeting compliance requirements, it would be preferred to have a Standard that need to be met for NavIC all frequencies. We understand infrastructure for L1 band is yet to be developed, not all international manufacturers would have developed GNSS chipsets for S bands. **JD India recommendation :** In Annexure testing shall be mention testing for GPS or NavIC , instead of GPS and NavIC and provide a cooling period to manufacturers to design & Develop the chips that	"Same as point no.-4 of Table-1"

			can read S & L1 band frequencies	

Table-3 ER : End Point Device for Environmental Monitoring TEC23732401				
S.No.	**Parameter in ER (Existing / New proposed to be added)**	**Existing**	**Comment Received**	**Remark**
1.	Proposed Addition of 5G and NB-IoT Parameters as circulated with meeting Notice also given in the table Annexure-1	Not available in existing ER	**Sh. Parag Kulkarni, JohnDeere :** Standards mentioned for 5G interface as consistent with other ER's developed recently by IOT division.	Agreed to include 5G test parameters as given in the Annexure-C
2.	1.1.8	IPv6 as per RFC 2460	**Sh. Parag Kulkarni, JohnDeere :** **:** correct Parameter name to be 'IPV6 Parameter' instead of ' IPV6 as per 2460'	Agreed to correct the test parameter as " IPV6 Parameters"
3.	1.25	GNSS compliance	**Sh. Parag Kulkarni, JohnDeere :** As per Annexure to ER for Tracking Device , this Annexure recommends to test the GNSS of Tracking Device for GPS & NavIC (IRNSS). It refers to Test Setup I: To verify the frequency of operation of the EUT (as per applicability defined in standard	"Same as point no.-4 of Table-1"

			ETSI EN 303 345-1) . ETSI EN 303 413 standard addressed on GPS frequencies. As a manufacturer to build confidence in meeting compliance requirements, it would be preferred to have a Standard that need to be met for NavIC all frequencies. We understand infrastructure for L1 band is yet to be developed, not all international manufacturers would have developed GNSS chipsets for S bands. **JD India recommendation** : In Annexure testing shall be mention testing for GPS or NavIC , instead of GPS and NavIC and provide a cooling period to manufacturers to design & Develop the chips that can read S & L1 band frequencies.	

Table-4 ER : Smart Electricity Meter TEC28362401				
S.No.	**Parameter in ER (Existing / New proposed to be added)**	**Existing**	**Comment Received**	**Remark**
1.	---	-----	**Sh. Ivyjit Singh Madan, SINHAL UDYOG PRIVATE LIMITED** 1. Smart Meter are manufactured for various types/ratings ie Single Phase (5-30 A, 10-60A), Three Phase (10-60 A, 10-100 A), LTCT(-5A, 0.5s), HTCT(-/5 A, 0.5s), etc. In	Since this is not directly related with the test parameters, it is decided to send this

			total, we do have 6 variant including ratings. -Clarification Required Do we need to conduct ER including interface in all types/rating or we can do on each type like Single Phase, Three Phase, LTCT and HTCT or One type & range is sufficient since we have to test Communication interface of equipment(s) only. 2. Incorporation of RF Communication Interface. -Details needed: We need test list to be covered under RF Communication interface. Our Suggestion equipment under test as below. 1. Frequency of Operation of Interface 2. Unwanted emissions in the spurious 3. TX effective radiated power 4. TX Duty cycle 5. TX Occupied bandwidth / Carrier bandwidth 6. TX out of band emissions 7. TX Transient	issue separately to TC division for necessary clarification. RF Mesh parameters as available in Annexure-C have been dded in the ER.

			8. TX Adaptive power control	
2.	Proposed Addition of 5G and NB-IoT Parameters as circulated with meeting Notice also given in the table Annexure-1	Not available in existing ER		Agreed to include 5G test parameters as given in the Annexure-C

Annexure-C

I. Interface : 5G NR- FR1 and FR2 interworking with other Radios

S.No.	Parameter Name	Standard Name
1	Additional Spectrum emissions mask for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.2
2	Additional Spurious emissions for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.4.3
3	Adjacent channel leakage ratio for Inter- band EN-DC including FR2 2CCs	3GPP TS 38.521-3 Clause 6.5B.2.4.3
4	Adjacent channel leakage ratio for inter- band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.3
5	Adjacent channel selectivity for inter-band EN-DC within FR1 2CCs	3GPP TS 38.521-3 3GPP TS 38.521-3 Clause 7.5B.3
6	Adjacent channel selectivity for intra-band contiguous EN-DC 2CCs	3GPP TS 38.521-3 Clause 7.5B.1
7	General spurious emissions for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.3.3.1
8	General spurious emissions for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.5B.3.1.1
9	Inband blocking for inter-band EN-DC within FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.2.3
10	Inband blocking for intra-band contiguous EN-DC in FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.2.1
11	Minimum output power for EN-DC Inter- band including FR2	3GPP TS 38.521-3 Clause 6.3B.1.4
12	Minimum Output Power for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.3B.1.1
13	Minimum output power for intra-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.3B.1.3

S.No.	Parameter Name	Standard Name
14	Narrow band blocking for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.6B.4.3
15	Narrow band blocking for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.6B.4.1
16	Out-of-band blocking for inter-band EN-DC within FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.3.3
17	Out-of-band blocking for intra-band contiguous EN-DC in FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.3.1
18	Reference sensitivity for EN-DC within FR1 3CCs	3GPP TS 38.521-3 Clause 7.3B.2.3_1.1
19	Reference sensitivity for inter-band EN-DC including FR2	3GPP TS 38.521-3 Clause 7.3B.2.4
20	Reference sensitivity for inter-band EN-DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.3B.2.3
21	Reference sensitivity for intra-band contiguous EN-DC 2CCs	3GPP TS 38.521-3 Clause 7.3B.2.1
22	Spectrum emissions mask for inter- band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.1
23	Spectrum emissions mask for inter-band EN-DC including FR2 (2 CCs)	3GPP TS 38.521-3 Clause 6.5B.2.4.1
24	Spurious emission band UE co-existence for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.5B.3.1.2
25	Spurious emissions band UE co-existence for inter-band within FR1	3GPP TS 38.521-3 Clause 6.5B.3.3.2
26	Spurious Emissions for EN DC within FR1 3CCs	3GPP TS 38.521-3 Clause 7.9B.3 1.1
27	Spurious Emissions for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.9B.3
28	Spurious emissions for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.9B.1

S.No.	Parameter Name	Standard Name
29	Spurious Response for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.7B.3
30	Spurious Response for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.7B.1
31	UE Maximum Output Power for Inter-Band EN-DC including FR2 - EIRP and TR	3GPP TS 38.521-3 Clause 6.2B.1.4.1
32	UE Maximum Output Power for Inter-Band EN-DC including FR2 - Spherical Coverage	3GPP TS 38.521-3 Clause 6.2B.1.4.2
33	UE Maximum Output Power for Inter-Band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.2B.1.3
34	UE Maximum Output Power for Intra-Band	3GPP TS 38.521-3 Clause 6.2B.1.1
	Contiguous EN-DC	
35	Wideband Intermodulation for inter band EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.8B.2.3
36	Wideband Intermodulation for intra band contiguous EN DC in FR1	3GPP TS 38.521-3 Clause 7.8B.2.1

II. Interface : 5G NR (FR1)

S.No.	Parameter Name	Standard Name
1	Additional spectrum emission mask-Transmitter	3GPP TS 38.521-1 Clause 6.5.2.3
2	Additional spectrum emission mask for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.3
3	Additional spurious emissions	3GPP TS 38.521-1 Clause 6.5.3.3
4	Additional spurious emissions for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.3
5	Adjacent channel selectivity	3GPP TS 38.521-1 Clause 7.5
6	Adjacent channel selectivity for 2DL CA	3GPP TS 38.521-1 Clause 7.5A.1

S.No.	Parameter Name	Standard Name
7	Adjacent channel selectivity for UL-MIMO	3GPP TS 38.521-1 Clause 7.5D
8	General spurious emissions-Transmitter	3GPP TS 38.521-1 Clause 6.5.3.1
9	General spurious emissions for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.1
10	In-band Blocking for CA-2DL CA	3GPP TS 38.521-1 Clause 7.6A.2.1
11	Inband Blocking	3GPP TS 38.521-1 Clause 7.6.2
12	Inband blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.2
13	Minimum output power	3GPP TS 38.521-2 Clause 6.3.1
14	Narrow band blocking	3GPP TS 38.521-1 Clause 7.6.4
15	Narrow band blocking for CA-2DL CA	3GPP TS 38.521-1 Clause 7.6A.4.1
16	Narrow band blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.4
17	NR ACLR	3GPP TS 38.521-1 Clause 6.5.2.4.1
18	NR ACLR for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.4.1
19	Out-of-band blocking	3GPP TS 38.521-1 Clause 7.6.3
20	Out-of-band blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.3
21	Reference sensitivity power level	3GPP TS 38.521-1 Clause 7.3.2
22	Reference sensitivity power level for 2DL CA without exception	3GPP TS 38.521-1 Clause 7.3A.1
23	Reference sensitivity power level for UL-MIMO	3GPP TS 38.521-1 Clause 7.3D.2
24	Spectrum Emission Mask-5G NR FR1	3GPP TS 38.521-1 Clause 6.5.2.2
25	Spectrum emission Mask for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.2
26	Spurious emission for 2DL CA	3GPP TS 38.521-1 Clause 7.9A.1
27	Spurious emission for UE co-existence	3GPP TS 38.521-1 Clause 6.5.3.2
28	Spurious emission for UE co-existence for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.2
29	Spurious emissions-5G NR FR1	3GPP TS 38.521-1 Clause 7.9
30	Spurious response	3GPP TS 38.521-1 Clause 7.7

S.No.	Parameter Name	Standard Name
31	Spurious response for 2DL CA	3GPP TS 38.521-1 Clause 7.7A.1
32	Spurious response for UL-MIMO	3GPP TS 38.521-1 Clause 7.7D
33	UE Maximum Output Power	3GPP TS 38.521-1 Clause 6.2.1
34	UE maximum output power for UL-MIMO	3GPP TS 38.521-1 Clause 6.2D.1
35	UE maximum output power reduction for UL- MIMO	3GPP TS 38.521-1 Clause 6.2D.2
36	UTRA ACLR	3GPP TS 38.521-1 Clause 6.5.2.4.2
37	UTRA ACLR for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.4.2
38	Wide band Intermodulation	3GPP TS 38.521-1 Clause 7.8.2
39	Wide band Intermodulation for CA-2DL CA	3GPP TS 38.521-1 Clause 7.8A.2.1
40	Wide band Intermodulation for UL-MIMO	3GPP TS 38.521-1 Clause 7.8D.2

III. Interface : 5G NR (FR2)

S.No.	Parameter Name	Standard Name
1	Adjacent channel leakage ratio	3GPP TS 38.521-2 Clause 6.5.2.3
2	Minimum Output power-Transmitter	3GPP TS 38.521-1 Clause 6.3.1
3	Reference sensitivity power level	3GPP TS 38.521-1 Clause 7.3.2
4	Spectrum Emission Mask-5G NR FR2	3GPP TS 38.521-2 Clause 6.5.2.1
5	UE maximum output power-EIRP and TRP	3GPP TS 38.521-2 Clause 6.2.1.1
6	UE maximum output power-Spherical coverage	3GPP TS 38.521-2 Clause 6.2.1.2
7	UE maximum output power reduction	3GPP TS 38.521-2 Clause 6.2.2
8	UE maximum output power with additional requirements	3GPP TS 38.521-2 Clause 6.2.3

IV. Interface : NB-IoT

S.No.	Parameter Name	Standard Name
1	Frequency Stability-NB-IOT	3GPP TS 36.521-1 Clause 6.5.1F
2	Maximum output power-NB-IOT	3GPP TS 36.521-1 Clause 6.2.2F
3	Operating Frequency-NB-IOT-Device Equp. shall be capable of operating in at least one of the frequency bands as per the National Freq. Allocation plan	National Frequency Allocation Plan- 2018 Frequency Allocation Table (IND 16)
4	Power Control Absolute Power Tolerance-NB-IOT	3GPP TS 36.521-1 Clause 6.3.5F.1
5	Receiver Adjacent Channel Selectivity (ACS) - NB-IOT	3GPP TS 36.521-1 Clause 7.5F
6	Receiver In-band blocking-NB-IOT	3GPP TS 36.521-1 Clause 7.6.1F
7	Receiver Reference Sensitivity level-NB-IOT	3GPP TS 36.521-1 Clause 7.3F
8	Receiver spurious emission-NB-IOT	3GPP TS 36.521-1 Clause 7.9F
9	Spectrum emissions mask-NB-IOT	3GPP TS 36.521-1 Clause 6.6.2.1F
10	Spurious emissions-NB-IOT	3GPP TS 36.521-1 Clause 6.6.3F.1-6.6.3F.2

V. Interface : Geolocation Navigation Interface

S.No.	Parameter Name	Standard Name
1	GPS	As per Annexure to ER for Tracking Device
2	NavIC	As per Annexure to ER for Tracking Device

VI Interface : LPWAN - LoRa

S.No.	Parameter Name	Standard Name
1	Basic RF Requirements for LPWAN-LoRA	Annex- G5(5.4 to 5.18). ETSI EN 300 220-2 V3.2.1
2	EIRP LoRa	WPC GSR 564(E). Annex- G5(5.2).
3	Frequency of Operation for LoRa Int	Latest NFAP. Annex- G5(5.1)
4	Maximum Transmit Power LoRa	WPC GSR 564(E). Annex- G5(5.3).

VII Interface : RF Mesh

S.No.	Parameter Name	Standard Name
1	Basic RF Requirements for RF Mesh	Annex- G5(5.4 to 5.18). ETSI EN 300 220-2 V3.2.1
2	EIRP RF Mesh	WPC GSR 564(E). Annex- G5(5.2).
3	Frequency of Operation for RF Mesh Int	Latest NFAP. Annex- G5(5.1)
4	Maximum Transmit Power RF Mesh	WPC GSR 564(E). Annex- G5(5.3).

अनिवार्यआवश्यकताएं संख्या: TEC28732401

EssentialRequirements ERNo.: TEC28732401

TrackingDevice

MTCTEकेतहतजारी:
IssuedunderMTCTEby:

दूरसंचार अभियांत्रिकी केंद्र
भारत सरकार
खुर्शीद लाल भवन, जनपथ, नई दिल्ली - 110001, भारत

TelecommunicationEngineeringCentre
Government ofIndia
Khurshid LalBhawan,Janpath, NewDelhi-110001, INDIA

Essential Requirements for:

TrackingDevice

CertificationScheme:**SCS** Product Fee Group: **B**

This ER covers all types of Tracking Devices withCellular and non-cellular connectivity ~~.~~including 5G and NB-IoT~~as well as LPWANtechnologies.~~

Note:AnnexuresreferredtointhisERareAnnexuresasmentionedin"AnnexurestoERs"No.TEC/SD/DD/TCP-222/02/June19asupdated fromtime to time and available on MTCTE portal.

This product has the following variants:

1. Asset Tracking Device
2. Human Tracking Device
3. Pet Tracking Device
4. Standalone tracking device for Vehicle

1. Variant1:AssetTrackingDevice

1.1 ParametersLinkedwithProductVariant

S.No.	Parameter Name	Standard Name
1.1.1	Conducted and Radiated Emission-Class A-IoT	TEC EMI EMC Standard CISPR 22 or-32 EN55022 or-32. Annex-B. Refer Note for IoT
1.1.2	Conducted And Radiated Emission-Class B-IoT	TEC EMI EMC Standard CISPR 22 or-32 EN55022 or-32. Annex-B. Refer Note for IoT
1.1.3	Dual IPParameters	RFC 4213. Annex-P6
~~1.1.4~~	~~GNSS Compliance~~	~~Asper Annexure to ER for Tracking~~ Device
1.1.5	Immunity to Electrostatic Discharge (Level 2or Level 3)	TEC EMI EMC StandardEN/IEC:61000-4-2. Annex-B

Comment [SS1]: Added as a separate interface

1.1.6	Immunity to Radiated RF	TEC EMI EMC Standard EN/IEC:61000-4-3. Annex-B
1.1.7	IoT Dev - Non-0 IMEI or MEID or UniqueMAC	Annex-M
1.1.8	IPV4Parameters	RFC 791. Annex-P6
1.1.9	IPV6 Parameters-IOT	RFC 2460/8200. Annex-P7
1.1.10	IT Equipment Safety	IS 13252-1 or IEC:60950-1 or IEC 62368-1. Annex-A1

1.2 Interface1:BLEforIoT

S.No.	Parameter Name	Standard Name
1.2.1	Basic RF Requirements for BLE Interface	Annex G4 (4.4 to 4.15). ETSI EN 300 328V2.2.2.
1.2.2	EIRP for BLE Interface	WPC GSR 45(E). Annex-G4 (4.2)
1.2.3	Frequency of Operation for BLE Interface	Latest NFAP. Annex-G4(4.1)
1.2.4	Maximum Transmitted Power for BLE Int	WPC GSR 45(E). Annex-G4 (4.3)

1.3 Interface2:GSMorGPRSorEDGE

S.No.	Parameter Name	Standard Name
1.3.1	Int Parameters for GSM or GPRS or EDGE	3GPP TS 51 010-1 or EN 301 511. Annex-F10
1.3.2	Operating Frequency for GSM or GPRS orEDGE Int	NFAP. Annex-F

1.4 Interface3:LPWAN-LoRa

S.No.	Parameter Name	Standard Name
1.4.1	Basic RF Requirements for LPWAN-LoRA	Annex- G5(5.4 to 5.18). ETSI EN 300 220-2V3.2.1
1.4.2	EIRP LoRa	WPC GSR 564(E). Annex- G5(5.2).
1.4.3	Frequency of Operation for LoRa Int	Latest NFAP. Annex- G5(5.1)
1.4.4	Maximum Transmit Power LoRa	WPC GSR 564(E). Annex- G5(5.3).

1.5 Interface4:LTEorLTE-A

S.No.	Parameter Name	Standard Name
1.5.1	Int Parameters for LTE or LTE-A	3GPP TS 36.521-1 or EN 301 908-13. Annex-F12
1.5.2	Operating Frequency for LTE or LTE-A Int	NFAP. Annex-F

1.6 Interface5:WCDMAorHSPA

S.No.	Parameter Name	Standard Name
1.6.1	Operating Frequency for WCDMA or HSPAInt	NFAP. Annex-F
1.6.2	WCDMA or HSPA Int Parameters	3GPP TS 34.121-1 or EN 301 908-2. Annex-F11

1.7 Interface6:WiFi

S.No.	Parameter Name	Standard Name
1.7.1	2.4 GHz WiFi Radio Conformance	ETSI EN 300 328 or FCC CFR47 pt 15.247or FCC CFR47 pt 15.249. Annex-G3
1.7.2	5 GHz WiFiRadio Conformance	ETSI EN 301 893 and or ETSI EN 302 502orFCCCFR47pt15.407orFCCCFR47pt 15.249. Annex-G3
1.7.3	EIRP for Wifi Interface	Latest NFAP and GSRs issued by DoTWPC. Annex-G2
1.7.4	Frequency for WiFi equipments	DoT WPC GSR No. 45(E) 1048(E). Annex-G1

1.1 Interface 20 : 5G NR- FR1 and FR2 interworking with other Radios

S.No.	Parameter Name	Standard Name
1.21.1	Additional Spectrum emissions mask for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.2
1.21.2	Additional Spurious emissions for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.4.3
1.21.3	Adjacent channel leakage ratio for Inter- band EN-DC including FR2 2CCs	3GPP TS 38.521-3 Clause 6.5B.2.4.3

1.21.4	Adjacent channel leakage ratio for inter- band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.3
1.21.5	Adjacent channel selectivity for inter-band EN-DC within FR1 2CCs	3GPP TS 38.521-3 3GPP TS 38.521-3 Clause 7.5B.3
1.21.6	Adjacent channel selectivity for intra-band contiguous EN-DC 2CCs	3GPP TS 38.521-3 Clause 7.5B.1
1.21.7	General spurious emissions for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.3.3.1
1.21.8	General spurious emissions for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.5B.3.1.1
1.21.9	Inband blocking for inter-band EN-DC within FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.2.3
1.21.10	Inband blocking for intra-band contiguous EN-DC in FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.2.1
1.21.11	Minimum output power for EN-DC Inter- band including FR2	3GPP TS 38.521-3 Clause 6.3B.1.4
1.21.12	Minimum Output Power for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.3B.1.1
1.21.13	Minimum output power for intra-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.3B.1.3
1.21.14	Narrow band blocking for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.6B.4.3
1.21.15	Narrow band blocking for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.6B.4.1
1.21.16	Out-of-band blocking for inter-band EN-DC within FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.3.3
1.21.17	Out-of-band blocking for intra-band contiguous EN-DC in FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.3.1
1.21.18	Reference sensitivity for EN-DC within FR1 3CCs	3GPP TS 38.521-3 Clause 7.3B.2.3_1.1
1.21.19	Reference sensitivity for inter-band EN-DC including FR2	3GPP TS 38.521-3 Clause 7.3B.2.4
1.21.20	Reference sensitivity for inter-band EN-DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.3B.2.3
1.21.21	Reference sensitivity for intra-band contiguous EN-DC 2CCs	3GPP TS 38.521-3 Clause 7.3B.2.1

1.21.22	Spectrum emissions mask for inter- band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.1
1.21.23	Spectrum emissions mask for inter-band EN-DC including FR2 (2 CCs)	3GPP TS 38.521-3 Clause 6.5B.2.4.1
1.21.24	Spurious emission band UE co-existence for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.5B.3.1.2
1.21.25	Spurious emissions band UE co-existence for inter-band within FR1	3GPP TS 38.521-3 Clause 6.5B.3.3.2
1.21.26	Spurious Emissions for EN DC within FR1 3CCs	3GPP TS 38.521-3 Clause 7.9B.3 1.1
1.21.27	Spurious Emissions for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.9B.3
1.21.28	Spurious emissions for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.9B.1
1.21.29	Spurious Response for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.7B.3
1.21.30	Spurious Response for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.7B.1
1.21.31	UE Maximum Output Power for Inter-Band EN-DC including FR2 - EIRP and TR	3GPP TS 38.521-3 Clause 6.2B.1.4.1
1.21.32	UE Maximum Output Power for Inter-Band EN-DC including FR2 - Spherical Coverage	3GPP TS 38.521-3 Clause 6.2B.1.4.2
1.21.33	UE Maximum Output Power for Inter-Band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.2B.1.3
1.21.34	UE Maximum Output Power for Intra-Band	3GPP TS 38.521-3 Clause 6.2B.1.1
	Contiguous EN-DC	
1.21.35	Wideband Intermodulation for inter band EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.8B.2.3
1.21.36	Wideband Intermodulation for intra band contiguous EN DC in FR1	3GPP TS 38.521-3 Clause 7.8B.2.1

1.2 Interface 21 : 5G NR (FR1)

S.No.	Parameter Name	Standard Name
1.22.1	Additional spectrum emission mask- Transmitter	3GPP TS 38.521-1 Clause 6.5.2.3

1.22.2	Additional spectrum emission mask for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.3
1.22.3	Additional spurious emissions	3GPP TS 38.521-1 Clause 6.5.3.3
1.22.4	Additional spurious emissions for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.3
1.22.5	Adjacent channel selectivity	3GPP TS 38.521-1 Clause 7.5
1.22.6	Adjacent channel selectivity for 2DL CA	3GPP TS 38.521-1 Clause 7.5A.1
1.22.7	Adjacent channel selectivity for UL-MIMO	3GPP TS 38.521-1 Clause 7.5D
1.22.8	General spurious emissions-Transmitter	3GPP TS 38.521-1 Clause 6.5.3.1
1.22.9	General spurious emissions for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.1
1.22.10	In-band Blocking for CA-2DL CA	3GPP TS 38.521-1 Clause 7.6A.2.1
1.22.11	Inband Blocking	3GPP TS 38.521-1 Clause 7.6.2
1.22.12	Inband blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.2
1.22.13	Minimum output power	3GPP TS 38.521-2 Clause 6.3.1
1.22.14	Narrow band blocking	3GPP TS 38.521-1 Clause 7.6.4
1.22.15	Narrow band blocking for CA-2DL CA	3GPP TS 38.521-1 Clause 7.6A.4.1
1.22.16	Narrow band blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.4
1.22.17	NR ACLR	3GPP TS 38.521-1 Clause 6.5.2.4.1
1.22.18	NR ACLR for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.4.1
1.22.19	Out-of-band blocking	3GPP TS 38.521-1 Clause 7.6.3
1.22.20	Out-of-band blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.3
1.22.21	Reference sensitivity power level	3GPP TS 38.521-1 Clause 7.3.2
1.22.22	Reference sensitivity power level for 2DL CA without exception	3GPP TS 38.521-1 Clause 7.3A.1
1.22.23	Reference sensitivity power level for UL- MIMO	3GPP TS 38.521-1 Clause 7.3D.2
1.22.24	Spectrum Emission Mask-5G NR FR1	3GPP TS 38.521-1 Clause 6.5.2.2
1.22.25	Spectrum emission Mask for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.2
1.22.26	Spurious emission for 2DL CA	3GPP TS 38.521-1 Clause 7.9A.1
1.22.27	Spurious emission for UE co-existence	3GPP TS 38.521-1 Clause 6.5.3.2
1.22.28	Spurious emission for UE co-existence for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.2
1.22.29	Spurious emissions-5G NR FR1	3GPP TS 38.521-1 Clause 7.9
1.22.30	Spurious response	3GPP TS 38.521-1 Clause 7.7

1.22.31	Spurious response for 2DL CA	3GPP TS 38.521-1 Clause 7.7A.1
1.22.32	Spurious response for UL-MIMO	3GPP TS 38.521-1 Clause 7.7D
1.22.33	UE Maximum Output Power	3GPP TS 38.521-1 Clause 6.2.1
1.22.34	UE maximum output power for UL-MIMO	3GPP TS 38.521-1 Clause 6.2D.1
1.22.35	UE maximum output power reduction for UL-MIMO	3GPP TS 38.521-1 Clause 6.2D.2
1.22.36	UTRA ACLR	3GPP TS 38.521-1 Clause 6.5.2.4.2
1.22.37	UTRA ACLR for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.4.2
1.22.38	Wide band Intermodulation	3GPP TS 38.521-1 Clause 7.8.2
1.22.39	Wide band Intermodulation for CA-2DL CA	3GPP TS 38.521-1 Clause 7.8A.2.1
1.22.40	Wide band Intermodulation for UL-MIMO	3GPP TS 38.521-1 Clause 7.8D.2

1.3 Interface 22 : 5G NR (FR2)

S.No.	Parameter Name	Standard Name
1.23.1	Adjacent channel leakage ratio	3GPP TS 38.521-2 Clause 6.5.2.3
1.23.2	Minimum Output power-Transmitter	3GPP TS 38.521-1 Clause 6.3.1
1.23.3	Reference sensitivity power level	3GPP TS 38.521-1 Clause 7.3.2
1.23.4	Spectrum Emission Mask-5G NR FR2	3GPP TS 38.521-2 Clause 6.5.2.1
1.23.5	UE maximum output power-EIRP and TRP	3GPP TS 38.521-2 Clause 6.2.1.1
1.23.6	UE maximum output power-Spherical coverage	3GPP TS 38.521-2 Clause 6.2.1.2
1.23.7	UE maximum output power reduction	3GPP TS 38.521-2 Clause 6.2.2
1.23.8	UE maximum output power with additional requirements	3GPP TS 38.521-2 Clause 6.2.3

1.24. Interface 23 : NB-IoT

S.No.	Parameter Name	Standard Name
1.24.1	Frequency Stability-NB-IOT	3GPP TS 36.521-1 Clause 6.5.1F
1.24.2	Maximum output power-NB-IOT	3GPP TS 36.521-1 Clause 6.2.2F
1.24.3	Operating Frequency-NB-IOT-Device Equp. shall be capable of operating in at least one of the frequency bands as per the National Freq. Allocation plan	National Frequency Allocation Plan- 2018 Frequency Allocation Table (IND 16)
1.24.4	Power Control Absolute Power Tolerance-NB-IOT	3GPP TS 36.521-1 Clause 6.3.5F.1

1.24.5	Receiver Adjacent Channel Selectivity (ACS) - NB-IOT	3GPP TS 36.521-1 Clause 7.5F
1.24.6	Receiver In-band blocking-NB-IOT	3GPP TS 36.521-1 Clause 7.6.1F
1.24.7	Receiver Reference Sensitivity level-NB-IOT	3GPP TS 36.521-1 Clause 7.3F
1.24.8	Receiver spurious emission-NB-IOT	3GPP TS 36.521-1 Clause 7.9F
1.24.9	Spectrum emissions mask-NB-IOT	3GPP TS 36.521-1 Clause 6.6.2.1F
1.24.10	Spurious emissions-NB-IOT	3GPP TS 36.521-1 Clause 6.6.3F.1-6.6.3F.2

1.25 Interface 26 : Geolocation Navigation Interface

S.No.	Parameter Name	Standard Name
1.27.1	GPS	Annexure to ER for Tracking Device
1.27.2	NavIC	Annexure to ER for Tracking Device

2. Variant2:HumanTrackingDevice

2.1 ParametersLinkedwithProductVariant

S.No.	Parameter Name	Standard Name
2.1.1	Conducted And Radiated Emission - Class B	TEC EMI EMC Standard CISPR 22/32EN55022/32. Annex-B
2.1.2	Dual IPParameters	RFC 4213. Annex-P6
2.1.3	~~GNSS Compliance~~	~~Asper Annexure to ER for Tracking Device~~
2.1.4	Immunity to Electrostatic Discharge (Level 2or Level 3)	TEC EMI EMC StandardEN/IEC:61000-4-2. Annex-B

Comment [SS2]: Added as a separate interface

2.1.5	Immunity to Radiated RF	TEC EMI EMC Standard EN/IEC:61000-4-3. Annex-B
2.1.6	IoT Dev - Non-0 IMEI or MEID or UniqueMAC	Annex-M
2.1.7	IPV4Parameters	RFC 791. Annex-P6
2.1.8	IPV6 Parameters-IOT	RFC 24608200. Annex-P7
2.1.9	IT Equipment Safety	IS 13252-1 or IEC:60950-1 or IEC 62368-1. Annex-A1
2.1.10	SAR Value for IoT Devices	IEC 62209-1 / IEC 62209-2, Annex-M

2.2 Interface1:BLEforIoT

S.No.	Parameter Name	Standard Name
2.2.1	Basic RF Requirements for BLE Interface	Annex G4 (4.4 to 4.15). ETSI EN 300 328V2.2.2.
2.2.2	EIRP for BLE Interface	WPC GSR 45(E). Annex-G4 (4.2)
2.2.3	Frequency of Operation for BLE Interface	Latest NFAP. Annex-G4(4.1)
2.2.4	Maximum Transmitted Power for BLE Int	WPC GSR 45(E). Annex-G4 (4.3)

2.3 Interface2:GSMorGPRSorEDGE

S.No.	Parameter Name	Standard Name
2.3.1	Int Parameters for GSM or GPRS or EDGE	3GPP TS 51 010-1 or EN 301 511. Annex-F10
2.3.2	Operating Frequency for GSM or GPRS orEDGE Int	NFAP. Annex-F

2.4 Interface3:LPWAN-LoRa

S.No.	Parameter Name	Standard Name
2.4.1	Basic RF Requirements for LPWAN-LoRA	Annex- G5(5.4 to 5.18). ETSI EN 300 220-2V3.2.1
2.4.2	EIRP LoRa	WPC GSR 564(E). Annex- G5(5.2).
2.4.3	Frequency of Operation for LoRa Int	Latest NFAP. Annex- G5(5.1)
2.4.4	Maximum Transmit Power LoRa	WPC GSR 564(E). Annex- G5(5.3).

2.5 Interface4:LTEorLTE-A

S.No.	Parameter Name	Standard Name
2.5.1	Int Parameters for LTE or LTE-A	3GPP TS 36.521-1 or EN 301 908-13. Annex-F12
2.5.2	Operating Frequency for LTE or LTE-A Int	NFAP. Annex-F

2.6 Interface5:WCDMAorHSPA

S.No.	Parameter Name	Standard Name
2.6.1	Operating Frequency for WCDMA or HSPAInt	NFAP. Annex-F
2.6.2	WCDMA or HSPA Int Parameters	3GPP TS 34.121-1 or EN 301 908-2. Annex-F11

2.7 Interface6:WiFi

S.No.	Parameter Name	Standard Name
2.7.1	2.4 GHz WiFi Radio Conformance	ETSI EN 300 328 or FCC CFR47 pt 15.247or FCC CFR47 pt 15.249. Annex-G3
2.7.2	5 GHz WiFiRadio Conformance	ETSI EN 301 893 and or ETSI EN 302 502orFCCCFR47pt15.407orFCCCFR47pt 15.249. Annex-G3
2.7.3	EIRP for Wifi Interface	Latest NFAP and GSRs issued by DoTWPC. Annex-G2
2.7.4	Frequency for WiFi equipments	DoT WPC GSR No. 45(E) 1048(E). Annex-G1

1.4 Interface 20 : 5G NR- FR1 and FR2 interworking with other Radios

S.No.	Parameter Name	Standard Name
1.21.1	Additional Spectrum emissions mask for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.2
1.21.2	Additional Spurious emissions for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.4.3
1.21.3	Adjacent channel leakage ratio for Inter- band EN-DC including FR2 2CCs	3GPP TS 38.521-3 Clause 6.5B.2.4.3

1.21.4	Adjacent channel leakage ratio for inter- band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.3
1.21.5	Adjacent channel selectivity for inter-band EN-DC within FR1 2CCs	3GPP TS 38.521-3 3GPP TS 38.521-3 Clause 7.5B.3
1.21.6	Adjacent channel selectivity for intra-band contiguous EN-DC 2CCs	3GPP TS 38.521-3 Clause 7.5B.1
1.21.7	General spurious emissions for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.3.3.1
1.21.8	General spurious emissions for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.5B.3.1.1
1.21.9	Inband blocking for inter-band EN-DC within FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.2.3
1.21.10	Inband blocking for intra-band contiguous EN-DC in FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.2.1
1.21.11	Minimum output power for EN-DC Inter- band including FR2	3GPP TS 38.521-3 Clause 6.3B.1.4
1.21.12	Minimum Output Power for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.3B.1.1
1.21.13	Minimum output power for intra-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.3B.1.3
1.21.14	Narrow band blocking for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.6B.4.3
1.21.15	Narrow band blocking for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.6B.4.1
1.21.16	Out-of-band blocking for inter-band EN-DC within FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.3.3

1.21.17	Out-of-band blocking for intra-band contiguous EN-DC in FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.3.1
1.21.18	Reference sensitivity for EN-DC within FR1 3CCs	3GPP TS 38.521-3 Clause 7.3B.2.3_1.1
1.21.19	Reference sensitivity for inter-band EN-DC including FR2	3GPP TS 38.521-3 Clause 7.3B.2.4
1.21.20	Reference sensitivity for inter-band EN-DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.3B.2.3
1.21.21	Reference sensitivity for intra-band contiguous EN-DC 2CCs	3GPP TS 38.521-3 Clause 7.3B.2.1
1.21.22	Spectrum emissions mask for inter- band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.1
1.21.23	Spectrum emissions mask for inter-band EN-DC including FR2 (2 CCs)	3GPP TS 38.521-3 Clause 6.5B.2.4.1
1.21.24	Spurious emission band UE co-existence for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.5B.3.1.2
1.21.25	Spurious emissions band UE co-existence for inter-band within FR1	3GPP TS 38.521-3 Clause 6.5B.3.3.2
1.21.26	Spurious Emissions for EN DC within FR1 3CCs	3GPP TS 38.521-3 Clause 7.9B.3 1.1
1.21.27	Spurious Emissions for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.9B.3
1.21.28	Spurious emissions for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.9B.1
1.21.29	Spurious Response for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.7B.3
1.21.30	Spurious Response for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.7B.1
1.21.31	UE Maximum Output Power for Inter-Band EN-DC including FR2 - EIRP and TR	3GPP TS 38.521-3 Clause 6.2B.1.4.1
1.21.32	UE Maximum Output Power for Inter-Band EN-DC including FR2 - Spherical Coverage	3GPP TS 38.521-3 Clause 6.2B.1.4.2
1.21.33	UE Maximum Output Power for Inter-Band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.2B.1.3
1.21.34	UE Maximum Output Power for Intra-Band	3GPP TS 38.521-3 Clause 6.2B.1.1

	Contiguous EN-DC	
1.21.35	Wideband Intermodulation for inter band EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.8B.2.3
1.21.36	Wideband Intermodulation for intra band contiguous EN DC in FR1	3GPP TS 38.521-3 Clause 7.8B.2.1

1.5 Interface 21 : 5G NR (FR1)

S.No.	Parameter Name	Standard Name
1.22.1	Additional spectrum emission mask- Transmitter	3GPP TS 38.521-1 Clause 6.5.2.3
1.22.2	Additional spectrum emission mask for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.3
1.22.3	Additional spurious emissions	3GPP TS 38.521-1 Clause 6.5.3.3
1.22.4	Additional spurious emissions for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.3
1.22.5	Adjacent channel selectivity	3GPP TS 38.521-1 Clause 7.5
1.22.6	Adjacent channel selectivity for 2DL CA	3GPP TS 38.521-1 Clause 7.5A.1
1.22.7	Adjacent channel selectivity for UL-MIMO	3GPP TS 38.521-1 Clause 7.5D
1.22.8	General spurious emissions-Transmitter	3GPP TS 38.521-1 Clause 6.5.3.1
1.22.9	General spurious emissions for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.1
1.22.10	In-band Blocking for CA-2DL CA	3GPP TS 38.521-1 Clause 7.6A.2.1
1.22.11	Inband Blocking	3GPP TS 38.521-1 Clause 7.6.2
1.22.12	Inband blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.2
1.22.13	Minimum output power	3GPP TS 38.521-2 Clause 6.3.1
1.22.14	Narrow band blocking	3GPP TS 38.521-1 Clause 7.6.4
1.22.15	Narrow band blocking for CA-2DL CA	3GPP TS 38.521-1 Clause 7.6A.4.1
1.22.16	Narrow band blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.4
1.22.17	NR ACLR	3GPP TS 38.521-1 Clause 6.5.2.4.1
1.22.18	NR ACLR for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.4.1
1.22.19	Out-of-band blocking	3GPP TS 38.521-1 Clause 7.6.3
1.22.20	Out-of-band blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.3
1.22.21	Reference sensitivity power level	3GPP TS 38.521-1 Clause 7.3.2
1.22.22	Reference sensitivity power level for 2DL CA without exception	3GPP TS 38.521-1 Clause 7.3A.1

1.22.23	Reference sensitivity power level for UL- MIMO	3GPP TS 38.521-1 Clause 7.3D.2
1.22.24	Spectrum Emission Mask-5G NR FR1	3GPP TS 38.521-1 Clause 6.5.2.2
1.22.25	Spectrum emission Mask for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.2
1.22.26	Spurious emission for 2DL CA	3GPP TS 38.521-1 Clause 7.9A.1
1.22.27	Spurious emission for UE co-existence	3GPP TS 38.521-1 Clause 6.5.3.2
1.22.28	Spurious emission for UE co-existence for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.2
1.22.29	Spurious emissions-5G NR FR1	3GPP TS 38.521-1 Clause 7.9
1.22.30	Spurious response	3GPP TS 38.521-1 Clause 7.7
1.22.31	Spurious response for 2DL CA	3GPP TS 38.521-1 Clause 7.7A.1
1.22.32	Spurious response for UL-MIMO	3GPP TS 38.521-1 Clause 7.7D
1.22.33	UE Maximum Output Power	3GPP TS 38.521-1 Clause 6.2.1
1.22.34	UE maximum output power for UL-MIMO	3GPP TS 38.521-1 Clause 6.2D.1
1.22.35	UE maximum output power reduction for UL-MIMO	3GPP TS 38.521-1 Clause 6.2D.2
1.22.36	UTRA ACLR	3GPP TS 38.521-1 Clause 6.5.2.4.2
1.22.37	UTRA ACLR for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.4.2
1.22.38	Wide band Intermodulation	3GPP TS 38.521-1 Clause 7.8.2
1.22.39	Wide band Intermodulation for CA-2DL CA	3GPP TS 38.521-1 Clause 7.8A.2.1
1.22.40	Wide band Intermodulation for UL-MIMO	3GPP TS 38.521-1 Clause 7.8D.2

1.6 Interface 22 : 5G NR (FR2)

S.No.	Parameter Name	Standard Name
1.23.1	Adjacent channel leakage ratio	3GPP TS 38.521-2 Clause 6.5.2.3
1.23.2	Minimum Output power-Transmitter	3GPP TS 38.521-1 Clause 6.3.1
1.23.3	Reference sensitivity power level	3GPP TS 38.521-1 Clause 7.3.2
1.23.4	Spectrum Emission Mask-5G NR FR2	3GPP TS 38.521-2 Clause 6.5.2.1
1.23.5	UE maximum output power-EIRP and TRP	3GPP TS 38.521-2 Clause 6.2.1.1
1.23.6	UE maximum output power-Spherical coverage	3GPP TS 38.521-2 Clause 6.2.1.2
1.23.7	UE maximum output power reduction	3GPP TS 38.521-2 Clause 6.2.2

1.23.8	UE maximum output power with additional requirements	3GPP TS 38.521-2 Clause 6.2.3

1.25. Interface 23 : NB-IoT

S.No.	Parameter Name	Standard Name
1.24.1	Frequency Stability-NB-IOT	3GPP TS 36.521-1 Clause 6.5.1F
1.24.2	Maximum output power-NB-IOT	3GPP TS 36.521-1 Clause 6.2.2F
1.24.3	Operating Frequency-NB-IOT-Device Equp. shall be capable of operating in at least one of the frequency bands as per the National Freq. Allocation plan	National Frequency Allocation Plan- 2018 Frequency Allocation Table (IND 16)
1.24.4	Power Control Absolute Power Tolerance-NB-IOT	3GPP TS 36.521-1 Clause 6.3.5F.1
1.24.5	Receiver Adjacent Channel Selectivity (ACS) - NB-IOT	3GPP TS 36.521-1 Clause 7.5F
1.24.6	Receiver In-band blocking-NB-IOT	3GPP TS 36.521-1 Clause 7.6.1F
1.24.7	Receiver Reference Sensitivity level-NB-IOT	3GPP TS 36.521-1 Clause 7.3F
1.24.8	Receiver spurious emission-NB-IOT	3GPP TS 36.521-1 Clause 7.9F
1.24.9	Spectrum emissions mask-NB-IOT	3GPP TS 36.521-1 Clause 6.6.2.1F
1.24.10	Spurious emissions-NB-IOT	3GPP TS 36.521-1 Clause 6.6.3F.1-6.6.3F.2

1.26 Interface 26 : Geolocation Navigation Interface

S.No.	Parameter Name	Standard Name
1.27.1	GPS	Annexure to ER for Tracking Device
1.27.2	NavIC	Annexure to ER for Tracking Device

3. Variant3:PetTrackingDevice

3.1 ParametersLinkedwithProductVariant

S.No.	Parameter Name	Standard Name

3.1.1	Conducted And Radiated Emission - Class B	TEC EMI EMC Standard CISPR 22/32EN55022/32. Annex-B
3.1.2	Dual IPParameters	RFC 4213. Annex-P6
~~3.1.3~~	~~GNSS Compliance~~	~~Asper Annexure to ER for Tracking Device~~
3.1.4	Immunity to Electrostatic Discharge (Level 2or Level 3)	TEC EMI EMC StandardEN/IEC:61000-4-2. Annex-B
3.1.5	Immunity to Radiated RF	TEC EMI EMC Standard EN/IEC:61000-4-3. Annex-B
3.1.6	IoT Dev - Non-0 IMEI or MEID or UniqueMAC	Annex-M
3.1.7	IPV4Parameters	RFC 791. Annex-P6
3.1.8	IPV6 Parameters	RFC 2460 / 8200. Annex-P7
~~3.1.9~~	~~IPV6 Parameters IOT~~	~~RFC 24608200. Annex-P7~~
3.1.10	IT Equipment Safety	IS 13252-1 or IEC:60950-1 or IEC 62368-1. Annex-A1
3.1.11	SAR Value for IoT Devices	IEC 62209-1 / IEC 62209-2, Annex-M

3.2 Interface1:GSMorGPRSorEDGE

S.No.	Parameter Name	Standard Name
3.2.1	Int Parameters for GSM or GPRS or EDGE	3GPP TS 51 010-1 or EN 301 511. Annex-F10
3.2.2	Operating Frequency for GSM or GPRS orEDGE Int	NFAP. Annex-F

3.3 Interface2:LPWAN-LoRa

S.No.	Parameter Name	Standard Name
3.3.1	Basic RF Requirements for LPWAN-LoRA	Annex- G5(5.4 to 5.18). ETSI EN 300 220-2V3.2.1
3.3.2	EIRP LoRa	WPC GSR 564(E). Annex- G5(5.2).
3.3.3	Frequency of Operation for LoRa Int	Latest NFAP. Annex- G5(5.1)
3.3.4	Maximum Transmit Power LoRa	WPC GSR 564(E). Annex- G5(5.3).

3.4 Interface3:LTEorLTE-A

S.No.	Parameter Name	Standard Name

3.4.1	Int Parameters for LTE or LTE-A	3GPP TS 36.521-1 or EN 301 908-13. Annex-F12
3.4.2	Operating Frequency for LTE or LTE-A Int	NFAP. Annex-F

3.5 Interface4:WCDMAorHSPA

S.No.	Parameter Name	Standard Name
3.5.1	Operating Frequency for WCDMA or HSPAInt	NFAP. Annex-F
3.5.2	WCDMA or HSPA Int Parameters	3GPP TS 34.121-1 or EN 301 908-2. Annex-F11

1.7 Interface 20 : 5G NR- FR1 and FR2 interworking with other Radios

S.No.	Parameter Name	Standard Name
1.21.1	Additional Spectrum emissions mask for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.2
1.21.2	Additional Spurious emissions for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.4.3
1.21.3	Adjacent channel leakage ratio for Inter- band EN-DC including FR2 2CCs	3GPP TS 38.521-3 Clause 6.5B.2.4.3
1.21.4	Adjacent channel leakage ratio for inter- band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.3
1.21.5	Adjacent channel selectivity for inter-band EN-DC within FR1 2CCs	3GPP TS 38.521-3 3GPP TS 38.521-3 Clause 7.5B.3
1.21.6	Adjacent channel selectivity for intra-band contiguous EN-DC 2CCs	3GPP TS 38.521-3 Clause 7.5B.1
1.21.7	General spurious emissions for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.3.3.1
1.21.8	General spurious emissions for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.5B.3.1.1
1.21.9	Inband blocking for inter-band EN-DC within FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.2.3
1.21.10	Inband blocking for intra-band contiguous EN-DC in FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.2.1

1.21.11	Minimum output power for EN-DC Inter- band including FR2	3GPP TS 38.521-3 Clause 6.3B.1.4
1.21.12	Minimum Output Power for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.3B.1.1
1.21.13	Minimum output power for intra-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.3B.1.3
1.21.14	Narrow band blocking for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.6B.4.3
1.21.15	Narrow band blocking for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.6B.4.1
1.21.16	Out-of-band blocking for inter-band EN-DC within FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.3.3
1.21.17	Out-of-band blocking for intra-band contiguous EN-DC in FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.3.1
1.21.18	Reference sensitivity for EN-DC within FR1 3CCs	3GPP TS 38.521-3 Clause 7.3B.2.3 1.1
1.21.19	Reference sensitivity for inter-band EN-DC including FR2	3GPP TS 38.521-3 Clause 7.3B.2.4
1.21.20	Reference sensitivity for inter-band EN-DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.3B.2.3
1.21.21	Reference sensitivity for intra-band contiguous EN-DC 2CCs	3GPP TS 38.521-3 Clause 7.3B.2.1
1.21.22	Spectrum emissions mask for inter- band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.1
1.21.23	Spectrum emissions mask for inter-band EN-DC including FR2 (2 CCs)	3GPP TS 38.521-3 Clause 6.5B.2.4.1
1.21.24	Spurious emission band UE co-existence for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.5B.3.1.2
1.21.25	Spurious emissions band UE co-existence for inter-band within FR1	3GPP TS 38.521-3 Clause 6.5B.3.3.2
1.21.26	Spurious Emissions for EN DC within FR1 3CCs	3GPP TS 38.521-3 Clause 7.9B.3 1.1
1.21.27	Spurious Emissions for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.9B.3
1.21.28	Spurious emissions for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.9B.1

1.21.29	Spurious Response for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.7B.3
1.21.30	Spurious Response for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.7B.1
1.21.31	UE Maximum Output Power for Inter-Band EN-DC including FR2 - EIRP and TR	3GPP TS 38.521-3 Clause 6.2B.1.4.1
1.21.32	UE Maximum Output Power for Inter-Band EN-DC including FR2 - Spherical Coverage	3GPP TS 38.521-3 Clause 6.2B.1.4.2
1.21.33	UE Maximum Output Power for Inter-Band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.2B.1.3
1.21.34	UE Maximum Output Power for Intra-Band	3GPP TS 38.521-3 Clause 6.2B.1.1
	Contiguous EN-DC	
1.21.35	Wideband Intermodulation for inter band EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.8B.2.3
1.21.36	Wideband Intermodulation for intra band contiguous EN DC in FR1	3GPP TS 38.521-3 Clause 7.8B.2.1

1.8 Interface 21 : 5G NR (FR1)

S.No.	Parameter Name	Standard Name
1.22.1	Additional spectrum emission mask- Transmitter	3GPP TS 38.521-1 Clause 6.5.2.3
1.22.2	Additional spectrum emission mask for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.3
1.22.3	Additional spurious emissions	3GPP TS 38.521-1 Clause 6.5.3.3
1.22.4	Additional spurious emissions for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.3
1.22.5	Adjacent channel selectivity	3GPP TS 38.521-1 Clause 7.5
1.22.6	Adjacent channel selectivity for 2DL CA	3GPP TS 38.521-1 Clause 7.5A.1
1.22.7	Adjacent channel selectivity for UL-MIMO	3GPP TS 38.521-1 Clause 7.5D
1.22.8	General spurious emissions-Transmitter	3GPP TS 38.521-1 Clause 6.5.3.1
1.22.9	General spurious emissions for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.1
1.22.10	In-band Blocking for CA-2DL CA	3GPP TS 38.521-1 Clause 7.6A.2.1
1.22.11	Inband Blocking	3GPP TS 38.521-1 Clause 7.6.2
1.22.12	Inband blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.2
1.22.13	Minimum output power	3GPP TS 38.521-2 Clause 6.3.1
1.22.14	Narrow band blocking	3GPP TS 38.521-1 Clause 7.6.4

1.22.15	Narrow band blocking for CA-2DL CA	3GPP TS 38.521-1 Clause 7.6A.4.1
1.22.16	Narrow band blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.4
1.22.17	NR ACLR	3GPP TS 38.521-1 Clause 6.5.2.4.1
1.22.18	NR ACLR for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.4.1
1.22.19	Out-of-band blocking	3GPP TS 38.521-1 Clause 7.6.3
1.22.20	Out-of-band blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.3
1.22.21	Reference sensitivity power level	3GPP TS 38.521-1 Clause 7.3.2
1.22.22	Reference sensitivity power level for 2DL CA without exception	3GPP TS 38.521-1 Clause 7.3A.1
1.22.23	Reference sensitivity power level for UL- MIMO	3GPP TS 38.521-1 Clause 7.3D.2
1.22.24	Spectrum Emission Mask-5G NR FR1	3GPP TS 38.521-1 Clause 6.5.2.2
1.22.25	Spectrum emission Mask for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.2
1.22.26	Spurious emission for 2DL CA	3GPP TS 38.521-1 Clause 7.9A.1
1.22.27	Spurious emission for UE co-existence	3GPP TS 38.521-1 Clause 6.5.3.2
1.22.28	Spurious emission for UE co-existence for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.2
1.22.29	Spurious emissions-5G NR FR1	3GPP TS 38.521-1 Clause 7.9
1.22.30	Spurious response	3GPP TS 38.521-1 Clause 7.7
1.22.31	Spurious response for 2DL CA	3GPP TS 38.521-1 Clause 7.7A.1
1.22.32	Spurious response for UL-MIMO	3GPP TS 38.521-1 Clause 7.7D
1.22.33	UE Maximum Output Power	3GPP TS 38.521-1 Clause 6.2.1
1.22.34	UE maximum output power for UL-MIMO	3GPP TS 38.521-1 Clause 6.2D.1
1.22.35	UE maximum output power reduction for UL-MIMO	3GPP TS 38.521-1 Clause 6.2D.2
1.22.36	UTRA ACLR	3GPP TS 38.521-1 Clause 6.5.2.4.2
1.22.37	UTRA ACLR for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.4.2
1.22.38	Wide band Intermodulation	3GPP TS 38.521-1 Clause 7.8.2
1.22.39	Wide band Intermodulation for CA-2DL CA	3GPP TS 38.521-1 Clause 7.8A.2.1
1.22.40	Wide band Intermodulation for UL-MIMO	3GPP TS 38.521-1 Clause 7.8D.2

1.9 Interface 22 : 5G NR (FR2)

S.No.	Parameter Name	Standard Name
1.23.1	Adjacent channel leakage ratio	3GPP TS 38.521-2 Clause 6.5.2.3

1.23.2	Minimum Output power-Transmitter	3GPP TS 38.521-1 Clause 6.3.1
1.23.3	Reference sensitivity power level	3GPP TS 38.521-1 Clause 7.3.2
1.23.4	Spectrum Emission Mask-5G NR FR2	3GPP TS 38.521-2 Clause 6.5.2.1
1.23.5	UE maximum output power-EIRP and TRP	3GPP TS 38.521-2 Clause 6.2.1.1
1.23.6	UE maximum output power-Spherical coverage	3GPP TS 38.521-2 Clause 6.2.1.2
1.23.7	UE maximum output power reduction	3GPP TS 38.521-2 Clause 6.2.2
1.23.8	UE maximum output power with additional requirements	3GPP TS 38.521-2 Clause 6.2.3

1.26. Interface 23 : NB-IoT

S.No.	Parameter Name	Standard Name
1.24.1	Frequency Stability-NB-IOT	3GPP TS 36.521-1 Clause 6.5.1F
1.24.2	Maximum output power-NB-IOT	3GPP TS 36.521-1 Clause 6.2.2F
1.24.3	Operating Frequency-NB-IOT-Device Equp. shall be capable of operating in at least one of the frequency bands as per the National Freq. Allocation plan	National Frequency Allocation Plan- 2018 Frequency Allocation Table (IND 16)
1.24.4	Power Control Absolute Power Tolerance-NB-IOT	3GPP TS 36.521-1 Clause 6.3.5F.1
1.24.5	Receiver Adjacent Channel Selectivity (ACS) - NB-IOT	3GPP TS 36.521-1 Clause 7.5F
1.24.6	Receiver In-band blocking-NB-IOT	3GPP TS 36.521-1 Clause 7.6.1F
1.24.7	Receiver Reference Sensitivity level-NB-IOT	3GPP TS 36.521-1 Clause 7.3F
1.24.8	Receiver spurious emission-NB-IOT	3GPP TS 36.521-1 Clause 7.9F
1.24.9	Spectrum emissions mask-NB-IOT	3GPP TS 36.521-1 Clause 6.6.2.1F
1.24.10	Spurious emissions-NB-IOT	3GPP TS 36.521-1 Clause 6.6.3F.1-6.6.3F.2

1.27 Interface 26 : Geolocation Navigation Interface

S.No.	Parameter Name	Standard Name
1.27.1	GPS	Annexure to ER for Tracking Device
1.27.2	NavIC	Annexure to ER for Tracking Device

4. Variant4:StandalonetrackingdeviceforVehicle

4.1 ParametersLinkedwithProductVariant

S.No.	Parameter Name	Standard Name
4.1.1	Dual IPParameters	RFC 4213. Annex-P6
4.1.2	EMI EMC compliance	IS 16833
4.1.3	GNSS Compliance	~~Asper Annexure to ER for Tracking Device~~IS 16833
4.1.4	IoT Dev - Non-0 IMEI or MEID or UniqueMAC	Annex-M
4.1.5	IPV4Parameters	IS 16833~~RFC 791. Annex-P6~~
4.1.6	IPV6 Parameters	IS 16833~~RFC 2460 / 8200. Annex-P7~~
4.1.7	Safety compliance	IS 16833

4.2 Interface1:BLEforIoT

S.No.	Parameter Name	Standard Name
4.2.1	Basic RF Requirements for BLE Interface	Annex G4 (4.4 to 4.15). ETSI EN 300 328V2.2.2.
4.2.2	EIRP for BLE Interface	WPC GSR 45(E). Annex-G4 (4.2)
4.2.3	Frequency of Operation for BLE Interface	Latest NFAP. Annex-G4(4.1)
4.2.4	Maximum Transmitted Power for BLE Int	WPC GSR 45(E). Annex-G4 (4.3)

4.3 Interface2:GSMorGPRSorEDGE

S.No.	Parameter Name	Standard Name
4.3.1	Int Parameters for GSM or GPRS or EDGE	3GPP TS 51 010-1 or EN 301 511. Annex-F10
4.3.2	Operating Frequency for GSM or GPRS orEDGE Int	NFAP. Annex-F

4.4 Interface3:LPWAN-LoRa

S.No.	Parameter Name	Standard Name

4.4.1	Basic RF Requirements for LPWAN-LoRA	Annex- G5(5.4 to 5.18). ETSI EN 300 220-2V3.2.1
4.4.2	EIRP LoRa	WPC GSR 564(E). Annex- G5(5.2).
4.4.3	Frequency of Operation for LoRa Int	Latest NFAP. Annex- G5(5.1)
4.4.4	Maximum Transmit Power LoRa	WPC GSR 564(E). Annex- G5(5.3).

4.5 Interface4:LTEorLTE-A

S.No.	Parameter Name	Standard Name
4.5.1	Int Parameters for LTE or LTE-A	3GPP TS 36.521-1 or EN 301 908-13. Annex-F12
4.5.2	Operating Frequency for LTE or LTE-A Int	NFAP. Annex-F

4.6 Interface5:WCDMAorHSPA

S.No.	Parameter Name	Standard Name
4.6.1	Operating Frequency for WCDMA or HSPAInt	NFAP. Annex-F
4.6.2	WCDMA or HSPA Int Parameters	3GPP TS 34.121-1 or EN 301 908-2. Annex-F11

4.7 Interface6:WiFi

S.No.	Parameter Name	Standard Name
4.7.1	2.4 GHz WiFi Radio Conformance	ETSI EN 300 328 or FCC CFR47 pt 15.247or FCC CFR47 pt 15.249. Annex-G3
4.7.2	5 GHz WiFiRadio Conformance	ETSI EN 301 893 and or ETSI EN 302 502orFCCCFR47pt15.407orFCCCFR47pt 15.249. Annex-G3
4.7.3	EIRP for Wifi Interface	Latest NFAP and GSRs issued by DoTWPC. Annex-G2
4.7.4	Frequency for WiFi equipments	DoT WPC GSR No. 45(E) 1048(E). Annex-
		G1

1.10 Interface 20 : 5G NR- FR1 and FR2 interworking with other Radios

S.No.	Parameter Name	Standard Name
1.21.1	Additional Spectrum emissions mask for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.2
1.21.2	Additional Spurious emissions for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.4.3
1.21.3	Adjacent channel leakage ratio for Inter- band EN-DC including FR2 2CCs	3GPP TS 38.521-3 Clause 6.5B.2.4.3
1.21.4	Adjacent channel leakage ratio for inter- band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.3
1.21.5	Adjacent channel selectivity for inter-band EN-DC within FR1 2CCs	3GPP TS 38.521-3 3GPP TS 38.521-3 Clause 7.5B.3
1.21.6	Adjacent channel selectivity for intra-band contiguous EN-DC 2CCs	3GPP TS 38.521-3 Clause 7.5B.1
1.21.7	General spurious emissions for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.3.3.1
1.21.8	General spurious emissions for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.5B.3.1.1
1.21.9	Inband blocking for inter-band EN-DC within FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.2.3
1.21.10	Inband blocking for intra-band contiguous EN-DC in FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.2.1
1.21.11	Minimum output power for EN-DC Inter- band including FR2	3GPP TS 38.521-3 Clause 6.3B.1.4
1.21.12	Minimum Output Power for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.3B.1.1
1.21.13	Minimum output power for intra-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.3B.1.3
1.21.14	Narrow band blocking for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.6B.4.3
1.21.15	Narrow band blocking for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.6B.4.1
1.21.16	Out-of-band blocking for inter-band EN-DC within FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.3.3
1.21.17	Out-of-band blocking for intra-band contiguous EN-DC in FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.3.1

1.21.18	Reference sensitivity for EN-DC within FR1 3CCs	3GPP TS 38.521-3 Clause 7.3B.2.3_1.1
1.21.19	Reference sensitivity for inter-band EN-DC including FR2	3GPP TS 38.521-3 Clause 7.3B.2.4
1.21.20	Reference sensitivity for inter-band EN-DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.3B.2.3
1.21.21	Reference sensitivity for intra-band contiguous EN-DC 2CCs	3GPP TS 38.521-3 Clause 7.3B.2.1
1.21.22	Spectrum emissions mask for inter- band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.1
1.21.23	Spectrum emissions mask for inter-band EN-DC including FR2 (2 CCs)	3GPP TS 38.521-3 Clause 6.5B.2.4.1
1.21.24	Spurious emission band UE co-existence for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.5B.3.1.2
1.21.25	Spurious emissions band UE co-existence for inter-band within FR1	3GPP TS 38.521-3 Clause 6.5B.3.3.2
1.21.26	Spurious Emissions for EN DC within FR1 3CCs	3GPP TS 38.521-3 Clause 7.9B.3 1.1
1.21.27	Spurious Emissions for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.9B.3
1.21.28	Spurious emissions for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.9B.1
1.21.29	Spurious Response for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.7B.3
1.21.30	Spurious Response for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.7B.1
1.21.31	UE Maximum Output Power for Inter-Band EN-DC including FR2 - EIRP and TR	3GPP TS 38.521-3 Clause 6.2B.1.4.1
1.21.32	UE Maximum Output Power for Inter-Band EN-DC including FR2 - Spherical Coverage	3GPP TS 38.521-3 Clause 6.2B.1.4.2
1.21.33	UE Maximum Output Power for Inter-Band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.2B.1.3
1.21.34	UE Maximum Output Power for Intra-Band	3GPP TS 38.521-3 Clause 6.2B.1.1

	Contiguous EN-DC	
1.21.35	Wideband Intermodulation for inter band EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.8B.2.3
1.21.36	Wideband Intermodulation for intra band contiguous EN DC in FR1	3GPP TS 38.521-3 Clause 7.8B.2.1

1.11 Interface 21 : 5G NR (FR1)

S.No.	Parameter Name	Standard Name
1.22.1	Additional spectrum emission mask- Transmitter	3GPP TS 38.521-1 Clause 6.5.2.3
1.22.2	Additional spectrum emission mask for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.3
1.22.3	Additional spurious emissions	3GPP TS 38.521-1 Clause 6.5.3.3
1.22.4	Additional spurious emissions for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.3
1.22.5	Adjacent channel selectivity	3GPP TS 38.521-1 Clause 7.5
1.22.6	Adjacent channel selectivity for 2DL CA	3GPP TS 38.521-1 Clause 7.5A.1
1.22.7	Adjacent channel selectivity for UL-MIMO	3GPP TS 38.521-1 Clause 7.5D
1.22.8	General spurious emissions-Transmitter	3GPP TS 38.521-1 Clause 6.5.3.1
1.22.9	General spurious emissions for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.1
1.22.10	In-band Blocking for CA-2DL CA	3GPP TS 38.521-1 Clause 7.6A.2.1
1.22.11	Inband Blocking	3GPP TS 38.521-1 Clause 7.6.2
1.22.12	Inband blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.2
1.22.13	Minimum output power	3GPP TS 38.521-2 Clause 6.3.1
1.22.14	Narrow band blocking	3GPP TS 38.521-1 Clause 7.6.4
1.22.15	Narrow band blocking for CA-2DL CA	3GPP TS 38.521-1 Clause 7.6A.4.1
1.22.16	Narrow band blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.4
1.22.17	NR ACLR	3GPP TS 38.521-1 Clause 6.5.2.4.1
1.22.18	NR ACLR for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.4.1
1.22.19	Out-of-band blocking	3GPP TS 38.521-1 Clause 7.6.3
1.22.20	Out-of-band blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.3
1.22.21	Reference sensitivity power level	3GPP TS 38.521-1 Clause 7.3.2
1.22.22	Reference sensitivity power level for 2DL CA without exception	3GPP TS 38.521-1 Clause 7.3A.1

1.22.23	Reference sensitivity power level for UL- MIMO	3GPP TS 38.521-1 Clause 7.3D.2
1.22.24	Spectrum Emission Mask-5G NR FR1	3GPP TS 38.521-1 Clause 6.5.2.2
1.22.25	Spectrum emission Mask for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.2
1.22.26	Spurious emission for 2DL CA	3GPP TS 38.521-1 Clause 7.9A.1
1.22.27	Spurious emission for UE co-existence	3GPP TS 38.521-1 Clause 6.5.3.2
1.22.28	Spurious emission for UE co-existence for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.2
1.22.29	Spurious emissions-5G NR FR1	3GPP TS 38.521-1 Clause 7.9
1.22.30	Spurious response	3GPP TS 38.521-1 Clause 7.7
1.22.31	Spurious response for 2DL CA	3GPP TS 38.521-1 Clause 7.7A.1
1.22.32	Spurious response for UL-MIMO	3GPP TS 38.521-1 Clause 7.7D
1.22.33	UE Maximum Output Power	3GPP TS 38.521-1 Clause 6.2.1
1.22.34	UE maximum output power for UL-MIMO	3GPP TS 38.521-1 Clause 6.2D.1
1.22.35	UE maximum output power reduction for UL-MIMO	3GPP TS 38.521-1 Clause 6.2D.2
1.22.36	UTRA ACLR	3GPP TS 38.521-1 Clause 6.5.2.4.2
1.22.37	UTRA ACLR for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.4.2
1.22.38	Wide band Intermodulation	3GPP TS 38.521-1 Clause 7.8.2
1.22.39	Wide band Intermodulation for CA-2DL CA	3GPP TS 38.521-1 Clause 7.8A.2.1
1.22.40	Wide band Intermodulation for UL-MIMO	3GPP TS 38.521-1 Clause 7.8D.2

1.12 Interface 22 : 5G NR (FR2)

S.No.	Parameter Name	Standard Name
1.23.1	Adjacent channel leakage ratio	3GPP TS 38.521-2 Clause 6.5.2.3
1.23.2	Minimum Output power-Transmitter	3GPP TS 38.521-1 Clause 6.3.1
1.23.3	Reference sensitivity power level	3GPP TS 38.521-1 Clause 7.3.2
1.23.4	Spectrum Emission Mask-5G NR FR2	3GPP TS 38.521-2 Clause 6.5.2.1
1.23.5	UE maximum output power-EIRP and TRP	3GPP TS 38.521-2 Clause 6.2.1.1
1.23.6	UE maximum output power-Spherical coverage	3GPP TS 38.521-2 Clause 6.2.1.2
1.23.7	UE maximum output power reduction	3GPP TS 38.521-2 Clause 6.2.2

1.23.8	UE maximum output power with additional requirements	3GPP TS 38.521-2 Clause 6.2.3

1.27. Interface 23 : NB-IoT

S.No.	Parameter Name	Standard Name
1.24.1	Frequency Stability-NB-IOT	3GPP TS 36.521-1 Clause 6.5.1F
1.24.2	Maximum output power-NB-IOT	3GPP TS 36.521-1 Clause 6.2.2F
1.24.3	Operating Frequency-NB-IOT-Device Equp. shall be capable of operating in at least one of the frequency bands as per the National Freq. Allocation plan	National Frequency Allocation Plan- 2018 Frequency Allocation Table (IND 16)
1.24.4	Power Control Absolute Power Tolerance-NB-IOT	3GPP TS 36.521-1 Clause 6.3.5F.1
1.24.5	Receiver Adjacent Channel Selectivity (ACS) - NB-IOT	3GPP TS 36.521-1 Clause 7.5F
1.24.6	Receiver In-band blocking-NB-IOT	3GPP TS 36.521-1 Clause 7.6.1F
1.24.7	Receiver Reference Sensitivity level-NB-IOT	3GPP TS 36.521-1 Clause 7.3F
1.24.8	Receiver spurious emission-NB-IOT	3GPP TS 36.521-1 Clause 7.9F
1.24.9	Spectrum emissions mask-NB-IOT	3GPP TS 36.521-1 Clause 6.6.2.1F
1.24.10	Spurious emissions-NB-IOT	3GPP TS 36.521-1 Clause 6.6.3F.1-6.6.3F.2

अनिवार्यआवश्यकताएं

सं. TEC28362401

EssentialRequirements

ERNo.: TEC28362401

SmartElectricityMeter

MTCTEकेतहतजारी:

IssuedunderMTCTEby:

दूरसंचार अभियांत्रिकी केंद्र

भारत सरकार

खुर्शीद लाल भवन, जनपथ, नई दिल्ली - 110001, भारत

TelecommunicationEngineeringCentre

Government ofIndia

Khurshid LalBhawan,Janpath, NewDelhi-110001, INDIA

Essential Requirements for:

SmartElectricityMeter

CertificationScheme:**SCS** Product Fee Group: **B**

This ER covers Smart Electricity Meter/ Standalone communication module for Smart Electricity Meter working on wired or wireless (cellular/non cellular)communication technologies including 5G and NB-IoT ~~included.~~

Note:AnnexuresreferredtointhisERareAnnexuresasmentionedin"AnnexurestoERs"No.TEC/SD/DD/TCP-222/02/June19asupdated fromtime to time and available on MTCTE portal.

This product has the following variants:

1.Smart Electricity Meter

1. Variant1:SmartElectricityMeter

1.1 ParametersLinkedwithProductVariant

S.No.	Parameter Name	Standard Name
1.1.1	Conducted And Radiated Emission-ElectricalAppliances-IOT	CISPR14-1 (2016) or CISPR 32 2015 plus A1 2019Annex-B. (Refer Note for IoT)
1.1.2	Dual IPParameters	RFC 4213. Annex-P6
1.1.3	Immunity to AC Voltage Dips and ShortInterruptions-IOT	TEC EMI EMC Standard EN IEC 61000-4-11. Annex-B. (Refer Note for IoT)
1.1.4	Immunity to Electrostatic Discharge (Level 4or Level 2 or Level 3)-IOT	TEC EMI EMC Standard EN-IEC 61000-4-2 Annex-B. (Refer Note for IoT).
1.1.5	Immunity to Fast transients (Burst)-IOT	TEC EMI EMC Standard EN-IEC 61000-4-4. Annex-B. (Refer Note for IoT)
1.1.6	Immunity to Radiated RF-IOT	TEC EMI EMC Standard EN-IEC 61000-4-3. Annex-B. (Refer Note for IoT)
1.1.7	Immunity to RF Field Induced ConductedDisturbance-IOT	TEC EMI EMC Standard EN-IEC 61000-4-6. Annex-B. (Refer Note for IoT)

1.1.8	Immunity to Surges-IOT	TEC EMI EMC Standard EN-IEC 61000-4-5. Annex-B. (Refer Note for IoT)
1.1.9	IoT Dev-Non-0 IMEI or MEID or Unique MAC	Annex-M
1.1.10	IPV4Parameters	RFC 791. Annex-P6
1.1.11	IPV6 Parameters-IOT	RFC 24608200. Annex-P7
1.1.12	IT Equipment Safety-IOT	IS 13252-1 or IEC 60950-1 or IEC 62368-1. Annex-A1. (Refer Note for IoT)

1.2 Interface1:GSMorGPRSorEDGE

S.No.	Parameter Name	Standard Name
1.2.1	Int Parameters for GSM or GPRS or EDGE	3GPP TS 51 010-1 or EN 301 511. Annex-F10
1.2.2	Operating Frequency for GSM or GPRS orEDGE Int	NFAP. Annex-F

1.3 Interface2:LPWAN–LoRa

S.No.	Parameter Name	Standard Name
1.3.1	Basic RF Requirements for LPWAN-LoRA	Annex- G5(5.4 to 5.18). ETSI EN 300 220-2V3.2.1
1.3.2	EIRP LoRa	WPC GSR 564(E). Annex- G5(5.2).
1.3.3	Frequency of Operation for LoRaInt	Latest NFAP. Annex- G5(5.1)
1.3.4	Maximum Transmit Power LoRa	WPC GSR 564(E). Annex- G5(5.3).

1.4 Interface3:LTEorLTE-A

S.No.	Parameter Name	Standard Name
1.4.1	Int Parameters for LTE or LTE-A	3GPP TS 36.521-1 or EN 301 908-13. Annex-F12
1.4.2	Operating Frequency for LTE or LTE-A Int	NFAP. Annex-F

1.5 Interface4:WCDMAorHSPA

S.No.	Parameter Name	Standard Name
1.5.1	Operating Frequency for WCDMA or HSPAInt	NFAP. Annex-F

1.5.2	WCDMA or HSPA Int Parameters	3GPP TS 34.121-1 or EN 301 908-2. Annex-F11

1.6 Interface 5 : 6LoWPAN

S.No.	Parameter Name	Standard Name
1.6.1	Basic RF Requirements for 6LowPANInterface	Annex G4 (4.4 to 4.15). ETSI EN 300 328V2.2.2.
1.6.2	EIRP for 6LowPAN Interface	WPC GSR 45(E). Annex-G4(4.2)
1.6.3	Frequency of operation for 6LowPANInterface	Latest NFAP Annex-G4(4.1)
1.6.4	Maximum Transmitted Power for 6LowPANInt	WPC GSR 45(E). Annex-G4 (4.3)

1.1 Interface 20 : 5G NR- FR1 and FR2 interworking with other Radios

S.No.	Parameter Name	Standard Name
1.21.1	Additional Spectrum emissions mask for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.2
1.21.2	Additional Spurious emissions for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.4.3
1.21.3	Adjacent channel leakage ratio for Inter- band EN-DC including FR2 2CCs	3GPP TS 38.521-3 Clause 6.5B.2.4.3
1.21.4	Adjacent channel leakage ratio for inter- band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.3
1.21.5	Adjacent channel selectivity for inter-band EN-DC within FR1 2CCs	3GPP TS 38.521-3 3GPP TS 38.521-3 Clause 7.5B.3
1.21.6	Adjacent channel selectivity for intra-band contiguous EN-DC 2CCs	3GPP TS 38.521-3 Clause 7.5B.1
1.21.7	General spurious emissions for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.3.3.1
1.21.8	General spurious emissions for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.5B.3.1.1
1.21.9	Inband blocking for inter-band EN-DC within FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.2.3

1.21.10	Inband blocking for intra-band contiguous EN-DC in FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.2.1
1.21.11	Minimum output power for EN-DC Inter- band including FR2	3GPP TS 38.521-3 Clause 6.3B.1.4
1.21.12	Minimum Output Power for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.3B.1.1
1.21.13	Minimum output power for intra-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.3B.1.3
1.21.14	Narrow band blocking for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.6B.4.3
1.21.15	Narrow band blocking for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.6B.4.1
1.21.16	Out-of-band blocking for inter-band EN-DC within FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.3.3
1.21.17	Out-of-band blocking for intra-band contiguous EN-DC in FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.3.1
1.21.18	Reference sensitivity for EN-DC within FR1 3CCs	3GPP TS 38.521-3 Clause 7.3B.2.3 1.1
1.21.19	Reference sensitivity for inter-band EN-DC including FR2	3GPP TS 38.521-3 Clause 7.3B.2.4
1.21.20	Reference sensitivity for inter-band EN-DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.3B.2.3
1.21.21	Reference sensitivity for intra-band contiguous EN-DC 2CCs	3GPP TS 38.521-3 Clause 7.3B.2.1
1.21.22	Spectrum emissions mask for inter- band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.1
1.21.23	Spectrum emissions mask for inter-band EN-DC including FR2 (2 CCs)	3GPP TS 38.521-3 Clause 6.5B.2.4.1
1.21.24	Spurious emission band UE co-existence for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.5B.3.1.2
1.21.25	Spurious emissions band UE co-existence for inter-band within FR1	3GPP TS 38.521-3 Clause 6.5B.3.3.2
1.21.26	Spurious Emissions for EN DC within FR1 3CCs	3GPP TS 38.521-3 Clause 7.9B.3 1.1
1.21.27	Spurious Emissions for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.9B.3

1.21.28	Spurious emissions for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.9B.1
1.21.29	Spurious Response for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.7B.3
1.21.30	Spurious Response for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.7B.1
1.21.31	UE Maximum Output Power for Inter-Band EN-DC including FR2 - EIRP and TR	3GPP TS 38.521-3 Clause 6.2B.1.4.1
1.21.32	UE Maximum Output Power for Inter-Band EN-DC including FR2 - Spherical Coverage	3GPP TS 38.521-3 Clause 6.2B.1.4.2
1.21.33	UE Maximum Output Power for Inter-Band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.2B.1.3
1.21.34	UE Maximum Output Power for Intra-Band	3GPP TS 38.521-3 Clause 6.2B.1.1
	Contiguous EN-DC	
1.21.35	Wideband Intermodulation for inter band EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.8B.2.3
1.21.36	Wideband Intermodulation for intra band contiguous EN DC in FR1	3GPP TS 38.521-3 Clause 7.8B.2.1

1.2 Interface 21 : 5G NR (FR1)

S.No.	Parameter Name	Standard Name
1.22.1	Additional spectrum emission mask- Transmitter	3GPP TS 38.521-1 Clause 6.5.2.3
1.22.2	Additional spectrum emission mask for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.3
1.22.3	Additional spurious emissions	3GPP TS 38.521-1 Clause 6.5.3.3
1.22.4	Additional spurious emissions for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.3
1.22.5	Adjacent channel selectivity	3GPP TS 38.521-1 Clause 7.5
1.22.6	Adjacent channel selectivity for 2DL CA	3GPP TS 38.521-1 Clause 7.5A.1
1.22.7	Adjacent channel selectivity for UL-MIMO	3GPP TS 38.521-1 Clause 7.5D
1.22.8	General spurious emissions-Transmitter	3GPP TS 38.521-1 Clause 6.5.3.1
1.22.9	General spurious emissions for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.1
1.22.10	In-band Blocking for CA-2DL CA	3GPP TS 38.521-1 Clause 7.6A.2.1
1.22.11	Inband Blocking	3GPP TS 38.521-1 Clause 7.6.2
1.22.12	Inband blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.2

1.22.13	Minimum output power	3GPP TS 38.521-2 Clause 6.3.1
1.22.14	Narrow band blocking	3GPP TS 38.521-1 Clause 7.6.4
1.22.15	Narrow band blocking for CA-2DL CA	3GPP TS 38.521-1 Clause 7.6A.4.1
1.22.16	Narrow band blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.4
1.22.17	NR ACLR	3GPP TS 38.521-1 Clause 6.5.2.4.1
1.22.18	NR ACLR for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.4.1
1.22.19	Out-of-band blocking	3GPP TS 38.521-1 Clause 7.6.3
1.22.20	Out-of-band blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.3
1.22.21	Reference sensitivity power level	3GPP TS 38.521-1 Clause 7.3.2
1.22.22	Reference sensitivity power level for 2DL CA without exception	3GPP TS 38.521-1 Clause 7.3A.1
1.22.23	Reference sensitivity power level for UL- MIMO	3GPP TS 38.521-1 Clause 7.3D.2
1.22.24	Spectrum Emission Mask-5G NR FR1	3GPP TS 38.521-1 Clause 6.5.2.2
1.22.25	Spectrum emission Mask for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.2
1.22.26	Spurious emission for 2DL CA	3GPP TS 38.521-1 Clause 7.9A.1
1.22.27	Spurious emission for UE co-existence	3GPP TS 38.521-1 Clause 6.5.3.2
1.22.28	Spurious emission for UE co-existence for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.2
1.22.29	Spurious emissions-5G NR FR1	3GPP TS 38.521-1 Clause 7.9
1.22.30	Spurious response	3GPP TS 38.521-1 Clause 7.7
1.22.31	Spurious response for 2DL CA	3GPP TS 38.521-1 Clause 7.7A.1
1.22.32	Spurious response for UL-MIMO	3GPP TS 38.521-1 Clause 7.7D
1.22.33	UE Maximum Output Power	3GPP TS 38.521-1 Clause 6.2.1
1.22.34	UE maximum output power for UL-MIMO	3GPP TS 38.521-1 Clause 6.2D.1
1.22.35	UE maximum output power reduction for UL-MIMO	3GPP TS 38.521-1 Clause 6.2D.2
1.22.36	UTRA ACLR	3GPP TS 38.521-1 Clause 6.5.2.4.2
1.22.37	UTRA ACLR for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.4.2
1.22.38	Wide band Intermodulation	3GPP TS 38.521-1 Clause 7.8.2
1.22.39	Wide band Intermodulation for CA-2DL CA	3GPP TS 38.521-1 Clause 7.8A.2.1
1.22.40	Wide band Intermodulation for UL-MIMO	3GPP TS 38.521-1 Clause 7.8D.2

1.3 Interface 22 : 5G NR (FR2)

S.No.	Parameter Name	Standard Name
1.23.1	Adjacent channel leakage ratio	3GPP TS 38.521-2 Clause 6.5.2.3
1.23.2	Minimum Output power-Transmitter	3GPP TS 38.521-1 Clause 6.3.1
1.23.3	Reference sensitivity power level	3GPP TS 38.521-1 Clause 7.3.2
1.23.4	Spectrum Emission Mask-5G NR FR2	3GPP TS 38.521-2 Clause 6.5.2.1
1.23.5	UE maximum output power-EIRP and TRP	3GPP TS 38.521-2 Clause 6.2.1.1
1.23.6	UE maximum output power-Spherical coverage	3GPP TS 38.521-2 Clause 6.2.1.2
1.23.7	UE maximum output power reduction	3GPP TS 38.521-2 Clause 6.2.2

1.23.8	UE maximum output power with additional requirements	3GPP TS 38.521-2 Clause 6.2.3

1.24. Interface 23 : NB-IoT

S.No.	Parameter Name	Standard Name
1.24.1	Frequency Stability-NB-IOT	3GPP TS 36.521-1 Clause 6.5.1F
1.24.2	Maximum output power-NB-IOT	3GPP TS 36.521-1 Clause 6.2.2F
1.24.3	Operating Frequency-NB-IOT-Device Equp. shall be capable of operating in at least one of the frequency bands as per the National Freq. Allocation plan	National Frequency Allocation Plan- 2018 Frequency Allocation Table (IND 16)
1.24.4	Power Control Absolute Power Tolerance-NB-IOT	3GPP TS 36.521-1 Clause 6.3.5F.1
1.24.5	Receiver Adjacent Channel Selectivity (ACS) - NB-IOT	3GPP TS 36.521-1 Clause 7.5F
1.24.6	Receiver In-band blocking-NB-IOT	3GPP TS 36.521-1 Clause 7.6.1F
1.24.7	Receiver Reference Sensitivity level-NB-IOT	3GPP TS 36.521-1 Clause 7.3F
1.24.8	Receiver spurious emission-NB-IOT	3GPP TS 36.521-1 Clause 7.9F
1.24.9	Spectrum emissions mask-NB-IOT	3GPP TS 36.521-1 Clause 6.6.2.1F
1.24.10	Spurious emissions-NB-IOT	3GPP TS 36.521-1 Clause 6.6.3F.1-6.6.3F.2

अनिवार्यआवश्यकताएं संख्या: TEC23732401

EssentialRequirements ERNo.: TEC23732401

EndPointDeviceforEnvironmentalMonitoring

MTCTEकेतहतजारी:
IssuedunderMTCTEby:

दूरसंचार अभियांत्रिकी केंद्र
भारत सरकार
खुर्शीद लाल भवन, जनपथ, नई दिल्ली - 110001, भारत

TelecommunicationEngineeringCentre
Government ofIndia
Khurshid LalBhawan,Janpath, NewDelhi-110001, INDIA

Essential Requirements for:

End Point Device for Environmental

MonitoringCertificationScheme:**SCS** ProductFeeGroup:**B**

This ER covers all types of End Point Devices for Environmental Monitoringwith Cellular/non cellular Connectivity including~~.~~ 5G and NB-IoT ~~included~~

Note:AnnexuresreferredtointhisERareAnnexuresasmentionedin"AnnexurestoERs"No.TEC/SD/DD/TCP-222/02/June19asupdated fromtime to time and available on MTCTE portal.

This product has the following variants:

1.End Point Device for Environmental Monitoring

1. Variant1:EndPointDeviceforEnvironmentalMonitoring

1.1 ParametersLinkedwithProductVariant

S.No.	Parameter Name	Standard Name
1.1.1	Conducted And Radiated Emission - Class B	TEC EMI EMC Standard CISPR 22/32EN55022/32. Annex-B
1.1.2	Immunity to AC Voltage Dips and ShortInterruptions	TEC EMI EMC Standard EN/IEC:61000-4-11. Annex-B
1.1.3	Immunity to Electrostatic Discharge	TEC EMI EMC StandardEN/IEC:61000-4-2. Annex-B
1.1.4	Immunity to Fast Transients (Burst)	TEC EMI EMC Standard EN/IEC:61000-4-4. Annex-B
1.1.5	Immunity to Radiated RF	TEC EMI EMC Standard EN/IEC:61000-4-3. Annex-B
1.1.6	Immunity to RF Field Induced ConductedDisturbance	TEC EMI EMC Standard EN/IEC:61000-4-6. Annex-B
1.1.7	Immunity to Surges	TEC EMI EMC StandardEN/IEC:61000-4-5.

		Annex-B
	IPV4Parameters	RFC 791. Annex-P6 (if applicable)
1.1.8	IPv6 ~~as per RFC 2460~~	RFC 2460 / RFC 8200 . Annex-P7
1.1.9	Dual IPParameters~~IPv6 Dual Stack as per RFC 4213~~	RFC 4213clause 2.1 and 2.2. Annex-P6 (if applicable)
1.1.10	IT Equipment Safety	IS 13252-1 or IEC:60950-1 or IEC 62368-1. Annex-A1

1.2 Interface1:CDMA

S.No.	Parameter Name	Standard Name
1.2.1	CDMA Int Parameters	1xS0011 or EN 301 908-04 CDMA. Annex-F9
1.2.2	Operating Frequency for CDMA Int	NFAP. Annex-F

1.3 Interface2:GSMorGPRSorEDGE

S.No.	Parameter Name	Standard Name
1.3.1	Int Parameters for GSM or GPRS or EDGE	3GPP TS 51 010-1 or EN 301 511. Annex-F10
1.3.2	Operating Frequency for GSM or GPRS orEDGE Int	NFAP. Annex-F

1.4 Interface3:LTEorLTE-A

S.No.	Parameter Name	Standard Name
1.4.1	Int Parameters for LTE or LTE-A	3GPP TS 36.521-1 or EN 301 908-13. Annex-F12
1.4.2	Operating Frequency for LTE or LTE-A Int	NFAP. Annex-F

1.5 Interface4:WCDMAorHSPA

S.No.	Parameter Name	Standard Name
1.5.1	Operating Frequency for WCDMA or HSPAInt	NFAP. Annex-F
1.5.2	WCDMA or HSPA Int Parameters	3GPP TS 34.121-1 or EN 301 908-2. Annex-F11

1.6. Interface 5 : Geolocation Navigation Interface

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S.No.	Parameter Name	Standard Name
1.6.1	GPS	Annexure to ER for Tracking Device
1.6.2	NavIC	Annexure to ER for Tracking Device

1.7. Interface 6 : BLE for IoT

S.No.	Parameter Name	Standard Name
1.7.1	Basic RF Requirements for BLE Interface	Annex G4 (4.4 to 4.15). ETSI EN 300 328 V2.2.2.
1.7.2	EIRP for BLE Interface	WPC GSR 45(E). Annex-G4 (4.2)
1.7.3	Frequency of Operation for BLE Interface	Latest NFAP. Annex-G4(4.1)
1.7.4	Maximum Transmitted Power for BLE Int	WPC GSR 45(E). Annex-G4 (4.3)

1.8. Interface 7 : NFC for IoT

S.No.	Parameter Name	Standard Name
1.8.1	Basic RF Requirements for NFC - Int	Annex- G6 (6.2 to 6.13). ETSI EN 300 330 V2.1.1
1.8.2	Frequency of Operation for NFC Int	Latest NFAP. Annex-G6(6.1)

1.9. Interface 8 : WiFi

S.No.	Parameter Name	Standard Name
1.9.1	2.4 GHz WiFi Radio Conformance	ETSI EN 300 328 or FCC CFR47 pt 15.247 or FCC CFR47 pt 15.249. Annex-G3
1.9.2	5 GHz WiFi Radio Conformance	ETSI EN 301 893 and or ETSI EN 302 502 or FCC CFR47 pt 15.407 or FCC CFR47 pt 15.249. Annex-G3
1.9.3	EIRP for Wifi Interface	Latest NFAP and GSRs issued by DoT WPC. Annex-G2
1.9.4	Frequency for WiFi equipments	DoT WPC GSR No. 45(E) 1048(E). Annex- G1

1.1 Interface19:ZigBee

S.No.	Parameter Name	Standard Name
1.20.1	Basic RF Requirements for ZigBee Interface	Annex G4 (4.4 to 4.15). ETSI EN 300 328V2.2.2.

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1.20.2	EIRP for ZigBee Interface	WPC GSR 45(E). Annex-G4 (4.2)
1.20.3	Frequency of Operation for ZigBee Interface	Latest NFAP. Annex-G4(4.1)
1.20.4	Maximum Transmitted Power for ZigBee Int	WPC GSR 45(E). Annex-G4 (4.3)

1.1 Interface 3 : LPWAN - LoRa

S.No.	Parameter Name	Standard Name
2.4.1	Basic RF Requirements for LPWAN-LoRA	Annex- G5(5.4 to 5.18). ETSI EN 300 220-2 V3.2.1
2.4.2	EIRP LoRa	WPC GSR 564(E). Annex- G5(5.2).
2.4.3	Frequency of Operation for LoRa Int	Latest NFAP. Annex- G5(5.1)
2.4.4	Maximum Transmit Power LoRa	WPC GSR 564(E). Annex- G5(5.3).

1.10. Interface 20 : 5G NR- FR1 and FR2 interworking with other Radios

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S.No.	Parameter Name	Standard Name
1.21.1	Additional Spectrum emissions mask for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.2
1.21.2	Additional Spurious emissions for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.4.3
1.21.3	Adjacent channel leakage ratio for Inter- band EN-DC including FR2 2CCs	3GPP TS 38.521-3 Clause 6.5B.2.4.3
1.21.4	Adjacent channel leakage ratio for inter- band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.3
1.21.5	Adjacent channel selectivity for inter-band EN-DC within FR1 2CCs	3GPP TS 38.521-3 3GPP TS 38.521-3 Clause 7.5B.3
1.21.6	Adjacent channel selectivity for intra-band contiguous EN-DC 2CCs	3GPP TS 38.521-3 Clause 7.5B.1
1.21.7	General spurious emissions for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.3.3.1
1.21.8	General spurious emissions for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.5B.3.1.1

1.21.9	Inband blocking for inter-band EN-DC within FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.2.3
1.21.10	Inband blocking for intra-band contiguous EN-DC in FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.2.1
1.21.11	Minimum output power for EN-DC Inter- band including FR2	3GPP TS 38.521-3 Clause 6.3B.1.4
1.21.12	Minimum Output Power for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.3B.1.1
1.21.13	Minimum output power for intra-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.3B.1.3
1.21.14	Narrow band blocking for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.6B.4.3
1.21.15	Narrow band blocking for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.6B.4.1
1.21.16	Out-of-band blocking for inter-band EN-DC within FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.3.3
1.21.17	Out-of-band blocking for intra-band contiguous EN-DC in FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.3.1
1.21.18	Reference sensitivity for EN-DC within FR1 3CCs	3GPP TS 38.521-3 Clause 7.3B.2.3_1.1
1.21.19	Reference sensitivity for inter-band EN-DC including FR2	3GPP TS 38.521-3 Clause 7.3B.2.4
1.21.20	Reference sensitivity for inter-band EN-DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.3B.2.3
1.21.21	Reference sensitivity for intra-band contiguous EN-DC 2CCs	3GPP TS 38.521-3 Clause 7.3B.2.1
1.21.22	Spectrum emissions mask for inter- band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.1
1.21.23	Spectrum emissions mask for inter-band EN-DC including FR2 (2 CCs)	3GPP TS 38.521-3 Clause 6.5B.2.4.1
1.21.24	Spurious emission band UE co-existence for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.5B.3.1.2
1.21.25	Spurious emissions band UE co-existence for inter-band within FR1	3GPP TS 38.521-3 Clause 6.5B.3.3.2
1.21.26	Spurious Emissions for EN DC within FR1 3CCs	3GPP TS 38.521-3 Clause 7.9B.3 1.1

1.21.27	Spurious Emissions for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.9B.3
1.21.28	Spurious emissions for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.9B.1
1.21.29	Spurious Response for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.7B.3
1.21.30	Spurious Response for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.7B.1
1.21.31	UE Maximum Output Power for Inter-Band EN-DC including FR2 - EIRP and TR	3GPP TS 38.521-3 Clause 6.2B.1.4.1
1.21.32	UE Maximum Output Power for Inter-Band EN-DC including FR2 - Spherical Coverage	3GPP TS 38.521-3 Clause 6.2B.1.4.2
1.21.33	UE Maximum Output Power for Inter-Band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.2B.1.3
1.21.34	UE Maximum Output Power for Intra-Band	3GPP TS 38.521-3 Clause 6.2B.1.1
	Contiguous EN-DC	
1.21.35	Wideband Intermodulation for inter band EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.8B.2.3
1.21.36	Wideband Intermodulation for intra band contiguous EN DC in FR1	3GPP TS 38.521-3 Clause 7.8B.2.1

1.11. Interface 21 : 5G NR (FR1)

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S.No.	Parameter Name	Standard Name
1.22.1	Additional spectrum emission mask- Transmitter	3GPP TS 38.521-1 Clause 6.5.2.3
1.22.2	Additional spectrum emission mask for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.3
1.22.3	Additional spurious emissions	3GPP TS 38.521-1 Clause 6.5.3.3
1.22.4	Additional spurious emissions for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.3
1.22.5	Adjacent channel selectivity	3GPP TS 38.521-1 Clause 7.5
1.22.6	Adjacent channel selectivity for 2DL CA	3GPP TS 38.521-1 Clause 7.5A.1
1.22.7	Adjacent channel selectivity for UL-MIMO	3GPP TS 38.521-1 Clause 7.5D
1.22.8	General spurious emissions-Transmitter	3GPP TS 38.521-1 Clause 6.5.3.1
1.22.9	General spurious emissions for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.1
1.22.10	In-band Blocking for CA-2DL CA	3GPP TS 38.521-1 Clause 7.6A.2.1

1.22.11	Inband Blocking	3GPP TS 38.521-1 Clause 7.6.2
1.22.12	Inband blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.2
1.22.13	Minimum output power	3GPP TS 38.521-2 Clause 6.3.1
1.22.14	Narrow band blocking	3GPP TS 38.521-1 Clause 7.6.4
1.22.15	Narrow band blocking for CA-2DL CA	3GPP TS 38.521-1 Clause 7.6A.4.1
1.22.16	Narrow band blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.4
1.22.17	NR ACLR	3GPP TS 38.521-1 Clause 6.5.2.4.1
1.22.18	NR ACLR for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.4.1
1.22.19	Out-of-band blocking	3GPP TS 38.521-1 Clause 7.6.3
1.22.20	Out-of-band blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.3
1.22.21	Reference sensitivity power level	3GPP TS 38.521-1 Clause 7.3.2
1.22.22	Reference sensitivity power level for 2DL CA without exception	3GPP TS 38.521-1 Clause 7.3A.1
1.22.23	Reference sensitivity power level for UL- MIMO	3GPP TS 38.521-1 Clause 7.3D.2
1.22.24	Spectrum Emission Mask-5G NR FR1	3GPP TS 38.521-1 Clause 6.5.2.2
1.22.25	Spectrum emission Mask for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.2
1.22.26	Spurious emission for 2DL CA	3GPP TS 38.521-1 Clause 7.9A.1
1.22.27	Spurious emission for UE co-existence	3GPP TS 38.521-1 Clause 6.5.3.2
1.22.28	Spurious emission for UE co-existence for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.2
1.22.29	Spurious emissions-5G NR FR1	3GPP TS 38.521-1 Clause 7.9
1.22.30	Spurious response	3GPP TS 38.521-1 Clause 7.7
1.22.31	Spurious response for 2DL CA	3GPP TS 38.521-1 Clause 7.7A.1
1.22.32	Spurious response for UL-MIMO	3GPP TS 38.521-1 Clause 7.7D
1.22.33	UE Maximum Output Power	3GPP TS 38.521-1 Clause 6.2.1
1.22.34	UE maximum output power for UL-MIMO	3GPP TS 38.521-1 Clause 6.2D.1
1.22.35	UE maximum output power reduction for UL-MIMO	3GPP TS 38.521-1 Clause 6.2D.2
1.22.36	UTRA ACLR	3GPP TS 38.521-1 Clause 6.5.2.4.2
1.22.37	UTRA ACLR for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.4.2
1.22.38	Wide band Intermodulation	3GPP TS 38.521-1 Clause 7.8.2
1.22.39	Wide band Intermodulation for CA-2DL CA	3GPP TS 38.521-1 Clause 7.8A.2.1

1.22.40	Wide band Intermodulation for UL-MIMO	3GPP TS 38.521-1 Clause 7.8D.2

1.12. Interface 22 : 5G NR (FR2)

S.No.	Parameter Name	Standard Name
1.23.1	Adjacent channel leakage ratio	3GPP TS 38.521-2 Clause 6.5.2.3
1.23.2	Minimum Output power-Transmitter	3GPP TS 38.521-1 Clause 6.3.1
1.23.3	Reference sensitivity power level	3GPP TS 38.521-1 Clause 7.3.2
1.23.4	Spectrum Emission Mask-5G NR FR2	3GPP TS 38.521-2 Clause 6.5.2.1
1.23.5	UE maximum output power-EIRP and TRP	3GPP TS 38.521-2 Clause 6.2.1.1
1.23.6	UE maximum output power-Spherical coverage	3GPP TS 38.521-2 Clause 6.2.1.2
1.23.7	UE maximum output power reduction	3GPP TS 38.521-2 Clause 6.2.2
1.23.8	UE maximum output power with additional requirements	3GPP TS 38.521-2 Clause 6.2.3

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1.24. Interface 23 : NB-IoT

S.No.	Parameter Name	Standard Name
1.24.1	Frequency Stability-NB-IOT	3GPP TS 36.521-1 Clause 6.5.1F
1.24.2	Maximum output power-NB-IOT	3GPP TS 36.521-1 Clause 6.2.2F
1.24.3	Operating Frequency-NB-IOT-Device Equp. shall be capable of operating in at least one of the frequency bands as per the National Freq. Allocation plan	National Frequency Allocation Plan- 2018 Frequency Allocation Table (IND 16)
1.24.4	Power Control Absolute Power Tolerance-NB-IOT	3GPP TS 36.521-1 Clause 6.3.5F.1
1.24.5	Receiver Adjacent Channel Selectivity (ACS) - NB-IOT	3GPP TS 36.521-1 Clause 7.5F
1.24.6	Receiver In-band blocking-NB-IOT	3GPP TS 36.521-1 Clause 7.6.1F
1.24.7	Receiver Reference Sensitivity level-NB-IOT	3GPP TS 36.521-1 Clause 7.3F
1.24.8	Receiver spurious emission-NB-IOT	3GPP TS 36.521-1 Clause 7.9F
1.24.9	Spectrum emissions mask-NB-IOT	3GPP TS 36.521-1 Clause 6.6.2.1F
1.24.10	Spurious emissions-NB-IOT	3GPP TS 36.521-1 Clause 6.6.3F.1-6.6.3F.2

अनिवार्यआवश्यकताएं संख्या: TEC23232401

EssentialRequirements ERNo.: TEC23232401

FeedbackDevice

MTCTEकेतहतजारी:
IssuedunderMTCTEby:

दूरसंचार अभियांत्रिकी केंद्र
भारत सरकार
खुर्शीद लाल भवन, जनपथ, नई दिल्ली - 110001, भारत

TelecommunicationEngineeringCentre
Government ofIndia
Khurshid LalBhawan,Janpath, NewDelhi-110001, INDIA

Essential Requirements for:

FeedbackDevice

CertificationScheme:**SCS** Product Fee Group: **B**

This ER covers all types of IoT Feedback Devices with Cellular / non-cellularLPWAN Connectivity~~.~~including 5G and NB-IoT~~included~~

Note:AnnexuresreferredtointhisERareAnnexuresasmentionedin"AnnexurestoERs"No.TEC/SD/DD/TCP-222/02/June19asupdated fromtime to time and available on MTCTE portal.

This product has the following variants:

1.Feedback Device

1. Variant1:FeedbackDevice

1.1 ParametersLinkedwithProductVariant

S.No.	Parameter Name	Standard Name
1.1.1	Conducted And Radiated Emission - Class B	TEC EMI EMC Standard CISPR 22/32EN55022/32. Annex-B
1.1.2	Dual IPParameters	RFC 4213. Annex-P6 (if applicable)
~~1.1.3~~	~~GPS Compliance~~	~~Compliance to GoI notification GSR no.436(E).~~
1.1.4	Immunity to AC Voltage Dips and ShortInterruptions	TEC EMI EMC Standard EN/IEC:61000-4-11. Annex-B
1.1.5	Immunity to DC Voltage Dips and ShortInterruptions	EN/IEC:61000-4-29. Annex-B
1.1.6	Immunity to Electrostatic Discharge	TEC EMI EMC StandardEN/IEC:61000-4-2. Annex-B
1.1.7	Immunity to Fast Transients (Burst)	TEC EMI EMC StandardEN/IEC:61000-4-4. Annex-B

Comment [SS1]: To be deleted and added as separate interface

1.1.8	Immunity to Radiated RF	TEC EMI EMC Standard EN/IEC:61000-4-3. Annex-B
1.1.9	Immunity to RF Field Induced ConductedDisturbance	TEC EMI EMC StandardEN/IEC:61000-4-6. Annex-B
1.1.10	Immunity to Surges	TEC EMI EMC StandardEN/IEC:61000-4-5. Annex-B
1.1.11	IoT Dev - Non-0 IMEI or MEID or UniqueMAC	Annex-M~~(if applicable)~~
1.1.12	IPV4Parameters	RFC 791. Annex-P6 (if applicable)
1.1.13	IPV6 Parameters	RFC 2460 / 8200. Annex-P7 (if applicable)
1.1.14	IT Equipment Safety	IS 13252-1 or IEC:60950-1 or IEC 62368-1. Annex-A1

1.2 Interface1:CDMA

S.No.	Parameter Name	Standard Name
1.2.1	CDMA Int Parameters	1xS0011 or EN 301 908-04 CDMA. Annex-F9
1.2.2	Operating Frequency for CDMA Int	NFAP. Annex-F

1.3 Interface2:GSMorGPRSorEDGE

S.No.	Parameter Name	Standard Name
1.3.1	Int Parameters for GSM or GPRS or EDGE	3GPP TS 51 010-1 or EN 301 511. Annex-F10
1.3.2	Operating Frequency for GSM or GPRS orEDGE Int	NFAP. Annex-F

1.4 Interface3:LPWAN-LoRa

S.No.	Parameter Name	Standard Name
1.4.1	Basic RF Requirements for LPWAN-LoRA	Annex- G5(5.4 to 5.18). ETSI EN 300 220-2V3.2.1
1.4.2	EIRP LoRa	WPC GSR 564(E). Annex- G5(5.2).
1.4.3	Frequency of Operation for LoRaInt	Latest NFAP. Annex- G5(5.1)
1.4.4	Maximum Transmit Power LoRa	WPC GSR 564(E). Annex- G5(5.3).

1.5 Interface4:LTEorLTE-A

S.No.	Parameter Name	Standard Name
1.5.1	Int Parameters for LTE or LTE-A	3GPP TS 36.521-1 or EN 301 908-13. Annex-F12
1.5.2	Operating Frequency for LTE or LTE-A Int	NFAP. Annex-F

1.6 Interface5:WCDMAorHSPA

S.No.	Parameter Name	Standard Name
1.6.1	Operating Frequency for WCDMA or HSPAInt	NFAP. Annex-F
1.6.2	WCDMA or HSPA Int Parameters	3GPP TS 34.121-1 or EN 301 908-2. Annex-F11

1.7 Interface 6 : 5G NR- FR1 and FR2 interworking with other Radios

S.No.	Parameter Name	Standard Name
1.7.1	Additional Spectrum emissions mask for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.2
1.7.2	Additional Spurious emissions for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.4.3
1.7.3	Adjacent channel leakage ratio for Inter- band EN-DC including FR2 2CCs	3GPP TS 38.521-3 Clause 6.5B.2.4.3
1.7.4	Adjacent channel leakage ratio for inter- band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.3
1.7.5	Adjacent channel selectivity for inter-band EN-DC within FR1 2CCs	3GPP TS 38.521-3 3GPP TS 38.521-3 Clause 7.5B.3
1.7.6	Adjacent channel selectivity for intra-band contiguous EN-DC 2CCs	3GPP TS 38.521-3 Clause 7.5B.1
1.7.7	General spurious emissions for inter-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.3.3.1
1.7.8	General spurious emissions for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.5B.3.1.1
1.7.9	Inband blocking for inter-band EN-DC within FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.2.3

1.7.10	Inband blocking for intra-band contiguous EN-DC in FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.2.1
1.7.11	Minimum output power for EN-DC Inter- band including FR2	3GPP TS 38.521-3 Clause 6.3B.1.4
1.7.12	Minimum Output Power for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.3B.1.1
1.7.13	Minimum output power for intra-band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.3B.1.3
1.7.14	Narrow band blocking for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.6B.4.3
1.7.15	Narrow band blocking for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.6B.4.1
1.7.16	Out-of-band blocking for inter-band EN-DC within FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.3.3
1.7.17	Out-of-band blocking for intra-band contiguous EN-DC in FR1-2CCs	3GPP TS 38.521-3 Clause 7.6B.3.1
1.7.18	Reference sensitivity for EN-DC within FR1 3CCs	3GPP TS 38.521-3 Clause 7.3B.2.3_1.1
1.7.19	Reference sensitivity for inter-band EN-DC including FR2	3GPP TS 38.521-3 Clause 7.3B.2.4
1.7.20	Reference sensitivity for inter-band EN-DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.3B.2.3
1.7.21	Reference sensitivity for intra-band contiguous EN-DC 2CCs	3GPP TS 38.521-3 Clause 7.3B.2.1
1.7.22	Spectrum emissions mask for inter- band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.5B.2.3.1
1.7.23	Spectrum emissions mask for inter-band EN-DC including FR2 (2 CCs)	3GPP TS 38.521-3 Clause 6.5B.2.4.1
1.7.24	Spurious emission band UE co-existence for intra-band contiguous EN-DC	3GPP TS 38.521-3 Clause 6.5B.3.1.2
1.7.25	Spurious emissions band UE co-existence for inter-band within FR1	3GPP TS 38.521-3 Clause 6.5B.3.3.2
1.7.26	Spurious Emissions for EN DC within FR1 3CCs	3GPP TS 38.521-3 Clause 7.9B.3 1.1

1.7.27	Spurious Emissions for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.9B.3
1.7.28	Spurious emissions for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.9B.1
1.7.29	Spurious Response for inter band EN DC within FR1 2CCs	3GPP TS 38.521-3 Clause 7.7B.3
1.7.30	Spurious Response for intra band contiguous EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.7B.1
1.7.31	UE Maximum Output Power for Inter-Band EN-DC including FR2 - EIRP and TR	3GPP TS 38.521-3 Clause 6.2B.1.4.1
1.7.32	UE Maximum Output Power for Inter-Band EN-DC including FR2 - Spherical Coverage	3GPP TS 38.521-3 Clause 6.2B.1.4.2
1.7.33	UE Maximum Output Power for Inter-Band EN-DC within FR1	3GPP TS 38.521-3 Clause 6.2B.1.3
1.7.34	UE Maximum Output Power for Intra-Band	3GPP TS 38.521-3 Clause 6.2B.1.1
	Contiguous EN-DC	
1.7.35	Wideband Intermodulation for inter band EN DC in FR1 2CCs	3GPP TS 38.521-3 Clause 7.8B.2.3
1.7.36	Wideband Intermodulation for intra band contiguous EN DC in FR1	3GPP TS 38.521-3 Clause 7.8B.2.1

1.8 Interface 7 : 5G NR (FR1)

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S.No.	Parameter Name	Standard Name
1.8.1	Additional spectrum emission mask- Transmitter	3GPP TS 38.521-1 Clause 6.5.2.3
1.8.2	Additional spectrum emission mask for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.3
1.8.3	Additional spurious emissions	3GPP TS 38.521-1 Clause 6.5.3.3
1.8.4	Additional spurious emissions for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.3
1.8.5	Adjacent channel selectivity	3GPP TS 38.521-1 Clause 7.5
1.8.6	Adjacent channel selectivity for 2DL CA	3GPP TS 38.521-1 Clause 7.5A.1
1.8.7	Adjacent channel selectivity for UL-MIMO	3GPP TS 38.521-1 Clause 7.5D
1.8.8	General spurious emissions-Transmitter	3GPP TS 38.521-1 Clause 6.5.3.1
1.8.9	General spurious emissions for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.1

1.8.10	In-band Blocking for CA-2DL CA	3GPP TS 38.521-1 Clause 7.6A.2.1
1.8.11	Inband Blocking	3GPP TS 38.521-1 Clause 7.6.2
1.8.12	Inband blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.2
1.8.13	Minimum output power	3GPP TS 38.521-2 Clause 6.3.1
1.8.14	Narrow band blocking	3GPP TS 38.521-1 Clause 7.6.4
1.8.15	Narrow band blocking for CA-2DL CA	3GPP TS 38.521-1 Clause 7.6A.4.1
1.8.16	Narrow band blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.4
1.8.17	NR ACLR	3GPP TS 38.521-1 Clause 6.5.2.4.1
1.8.18	NR ACLR for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.4.1
1.8.19	Out-of-band blocking	3GPP TS 38.521-1 Clause 7.6.3
1.8.20	Out-of-band blocking for UL-MIMO	3GPP TS 38.521-1 Clause 7.6D.3
1.8.21	Reference sensitivity power level	3GPP TS 38.521-1 Clause 7.3.2
1.8.22	Reference sensitivity power level for 2DL CA without exception	3GPP TS 38.521-1 Clause 7.3A.1
1.8.23	Reference sensitivity power level for UL- MIMO	3GPP TS 38.521-1 Clause 7.3D.2
1.8.24	Spectrum Emission Mask-5G NR FR1	3GPP TS 38.521-1 Clause 6.5.2.2
1.8.25	Spectrum emission Mask for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.2
1.8.26	Spurious emission for 2DL CA	3GPP TS 38.521-1 Clause 7.9A.1
1.8.27	Spurious emission for UE co-existence	3GPP TS 38.521-1 Clause 6.5.3.2
1.8.28	Spurious emission for UE co-existence for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.3.2
1.8.29	Spurious emissions-5G NR FR1	3GPP TS 38.521-1 Clause 7.9
1.8.30	Spurious response	3GPP TS 38.521-1 Clause 7.7
1.8.31	Spurious response for 2DL CA	3GPP TS 38.521-1 Clause 7.7A.1
1.8.32	Spurious response for UL-MIMO	3GPP TS 38.521-1 Clause 7.7D
1.8.33	UE Maximum Output Power	3GPP TS 38.521-1 Clause 6.2.1
1.8.34	UE maximum output power for UL-MIMO	3GPP TS 38.521-1 Clause 6.2D.1
1.8.35	UE maximum output power reduction for UL-MIMO	3GPP TS 38.521-1 Clause 6.2D.2
1.8.36	UTRA ACLR	3GPP TS 38.521-1 Clause 6.5.2.4.2
1.8.37	UTRA ACLR for UL MIMO	3GPP TS 38.521-1 Clause 6.5D.2.4.2
1.8.38	Wide band Intermodulation	3GPP TS 38.521-1 Clause 7.8.2

1.8.39	Wide band Intermodulation for CA-2DL CA	3GPP TS 38.521-1 Clause 7.8A.2.1
1.8.40	Wide band Intermodulation for UL-MIMO	3GPP TS 38.521-1 Clause 7.8D.2

1.9 Interface 8 : 5G NR (FR2)

S.No.	Parameter Name	Standard Name
1.9.1	Adjacent channel leakage ratio	3GPP TS 38.521-2 Clause 6.5.2.3
1.9.2	Minimum Output power-Transmitter	3GPP TS 38.521-1 Clause 6.3.1
1.9.3	Reference sensitivity power level	3GPP TS 38.521-1 Clause 7.3.2
1.9.4	Spectrum Emission Mask-5G NR FR2	3GPP TS 38.521-2 Clause 6.5.2.1
1.9.5	UE maximum output power-EIRP and TRP	3GPP TS 38.521-2 Clause 6.2.1.1
1.9.6	UE maximum output power-Spherical coverage	3GPP TS 38.521-2 Clause 6.2.1.2
1.9.7	UE maximum output power reduction	3GPP TS 38.521-2 Clause 6.2.2
1.9.8	UE maximum output power with additional requirements	3GPP TS 38.521-2 Clause 6.2.3

1.10. Interface 9 : NB-IoT

S.No.	Parameter Name	Standard Name
1.10.1	Frequency Stability-NB-IOT	3GPP TS 36.521-1 Clause 6.5.1F
1.10.2	Maximum output power-NB-IOT	3GPP TS 36.521-1 Clause 6.2.2F
1.10.3	Operating Frequency-NB-IOT-Device Equp. shall be capable of operating in at least one of the frequency bands as per the National Freq. Allocation plan	National Frequency Allocation Plan- 2018 Frequency Allocation Table (IND 16)
1.10.4	Power Control Absolute Power Tolerance-NB-IOT	3GPP TS 36.521-1 Clause 6.3.5F.1
1.10.5	Receiver Adjacent Channel Selectivity (ACS) - NB-IOT	3GPP TS 36.521-1 Clause 7.5F
1.10.6	Receiver In-band blocking-NB-IOT	3GPP TS 36.521-1 Clause 7.6.1F
1.10.7	Receiver Reference Sensitivity level-NB-IOT	3GPP TS 36.521-1 Clause 7.3F
1.10.8	Receiver spurious emission-NB-IOT	3GPP TS 36.521-1 Clause 7.9F
1.10.9	Spectrum emissions mask-NB-IOT	3GPP TS 36.521-1 Clause 6.6.2.1F

1.10.10	Spurious emissions-NB-IOT	3GPP TS 36.521-1 Clause 6.6.3F.1-6.6.3F.2

1.11. Interface 10 : Geolocation Navigation Interface

S.No.	Parameter Name	Standard Name
1.11.1	GPS	Annexure to ER for Tracking Device
1.11.2	NavIC	Annexure to ER for Tracking Device

अनिवार्यआवश्यकताओंकाअनुलग्नक
सं०:टीईसी/एसडी/डीडी/टीसीपी-222/2.10/अगस्त2021

ANNEXURESTOERs

No.:TEC/SD/DD/TCP-222/2.9/August2021

अनिवार्यआवश्यकताओंमेंइंगित मानकोंकाविवरण

संस्करण-2.10

DETAILSOFSTANDARDSSPECIFIEDINESSENTIALREQUIREMENTS

VERSION-2.10

भारतसरकारGOVERNMENTOFINDIA
दूरसंचारअनुभवानुकीकेंद्र

खुर्शीद् लालभवन, जनपथ,नईददल्ली -110001, भारत**TELECOMMUNICATION ENGINEERING**

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IMPORTANTNOTICE

1. ***The RFC documents of IETF are subject to periodic revision. Hence, wherever RFCs are mentioned in theERs/ Annexures to ERs, the offered product shall meet either the referred RFC or its latest/ later version.Wherever, a feature of the RFC is mentioned, product shall comply with the part of the RFC specifying thefeature.***
2. ***Similarly,thisappliestootherstandardsofIEC,EN,CISPR,ETSI,ITU,IEEE,TECetc.***

DISCLAIMER

1. ***TheAnnexuresandAppendicesinthisdocumentarebeingreviewedandtheupdatedversionshallbeuploadedon MTCTE Portalwww.mtcte.tec.gov.infromtimetotime.***
2. ***Feedback for corrections, if any, may be sent on email to help.mtcte.tec@gov.in with copy tosanjai.kumar67@gov.in***

Annexure-A1:SafetyRequirementforCommunicationEquipment

ParameterGroup:**SAFETY**

S.No.	ParameterName	Standard	Limits/TestLevels	Applicability/Remarks
A1.1	ITEquipment Safety	IS13252 part1: 2010Amd 2013 &Amd 2015 "InformationTechnology Equipment –Safety-Part 1: General Requirements" orequivalent IEC standard – EN/IEC60950-1:2005+A1:2009+A2:2013 "Information TechnologyEquipment–Safety-Part1:GeneralRequirements OR EN/IEC62368-1:2014	Compliancetoclausesapplicab letotheEUT	Older version of standard shall beacceptedifitwasinforceonthedateofissueof report.
A1.2	IngressProtection	IEC60529	Compliancetoclausesapplicab letotheEUT	Asperofferedproductcategory

Annexure-A2:SafetyRequirementforBattery inportableequipment

Parameter Group:**SAFETY**

S.No.	ParameterName	Standard	Limits/TestLevels	Applicability/Remarks
A2.1	BatterySafety	IS16046:2015 OREN/IEC62133:2012	Compliancetoclausesapplicab letotheEUT	Applicable only if it is portable equipmentand uses secondary cells and batteriescontainingalkalineornon-acidelectrolyte.BIS certificate or test reports from BISapproved labs in respect of batteries shallbe accepted and repeat testing of batteriesisnot required.

Annexure-A3: Safety Requirement for Radio Communication Equipment (Other than CPE)Parameter Group:**SAFETY**

S.No.	ParameterName	Standard	Limits/TestLevels	Applicability/Remarks
A3.1	ITEquipmentSafetyforRadio Products (Otherthan CPE)	EN/IEC60215:2016	Compliancetoclausesapplicab letotheEUT	Test reports as per IEC 60215: 1987 shallbeacceptableonlytill March 31, 2020

Annexure-B:EMI/EMCRequirement

(Additionaldetails,referredclausesandTablesinTECEMIEMCdocumentTEC/SD/DD/EMC-221/05/OCT-16)

ParameterGroup:EMC

S.No.	ParameterName	Standard	Limits/TestLevels	Applicability/Remarks
B.1	Conducted emission - ClassA	CISPR22 (2008)/ EN 55022OR CISPR32(2015)/EN55032	**AC/ DC Power input/ outputports:** AsperTable7ofAnnexureB1for CISPR 22 OR ~~and~~ applicableTable(s)in CISPR32. **TelecomPorts:** As per Table 8B of AnnexureB1 and applicable Table(s) inCISPR32.	Conducted Emission for Class Aequipmentasperapplicableclauses/ranges. TestreportsasperCISPR22(2008)/EN 55022 shall be acceptable onlytill 31.03.2020.

S.No.	ParameterName	Standard	Limits/TestLevels	Applicability/Remarks
B.2	Radiatedemission -ClassA	CISPR22 (2008)/ EN 55022OR CISPR32(2015)/EN55032	ForCISPR22: i. For10mmeasuringdistance : As per Table 5a (Refer AnnexB1) for frequency range up to 1GHz. ii. For 3 m measuringdistance: As per Table 5a1 (Refer Annex-B1) for frequency range up to 1GHz. iii. For 3 m measuringdistance: As per Table 5b (Refer AnnexB1) frequency range beyond 1GHz. ForCISPR32: Limits for Class A RadiatedEmissions from applicableTables of CISPR 32 fordistancesof 3m or10m. Note: For 3m measuring distance,EUTsizeshouldbeassuchitfits in a cylindrical area ofdiameter1m. For1o2ther equipment, measuringdistanceof10m isapplicable.	Radiated Emission for Class Aequipmentasperapplicableclauses/ranges. TestreportsasperCISPR22(2008)/EN 55022 shall be acceptable onlytill 31.03.2020.
Annexuret	oERs –2.10/ August2021			

S.No.	ParameterName	Standard	Limits/TestLevels	Applicability/Remarks
B.3	Conducted emission - ClassB	CISPR22 (2008)/ EN 55022OR CISPR32(2015)/EN55032	AC/ DC Power input/ outputports: AsperTable6ofAnnexureB1forCISPR 22/EN 55022 OR applicableTable(s)in CISPR32/EN55032 TelecomPorts: As per Table 8A of AnnexureB1forCISPR22/EN55022OR ~~and~~applicableTable(s)in CISPR32/EN55032	Conducted Emission for Class Bequipmentasperapplicableclauses/ranges. TestreportsasperCISPR22(2008)/EN 55022 shall be acceptable onlytill 31.03.2020.

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S.No.	ParameterName	Standard	Limits/TestLevels	Applicability/Remarks
B.4	Radiatedemission -ClassB	CISPR22 (2008)/ EN 55022OR CISPR32(2015)/EN55032	ForCISPR22: i. For10mmeasuringdistance : As per Table 4a for frequencyrangeup to 1 GHz. ii. For3mmeasuringdistance : As per Table 4a1 for frequencyrangeup to 1 GHz. iii. For3mmeasuringdistance : As per Table 4b for frequencyrangebeyond1 GHz. ForCISPR32: LimitsforClassBRadiatedEmissions from applicableTables of CISPR 32 fordistancesof 3m or10m. Note: For 3m measuring distance,EUTsizeshouldbeassuchitfits in a cylindrical area ofdiameter1m. Forotherequipment,measuringdistanceof10m isapplicable.	Radiated Emission for Class Bequipmentasperapplicableclauses/ranges. TestreportsasperCISPR22(2008)/EN 55022 shall be acceptable onlytill 31.03.2020.

S.No.	ParameterName	Standard	Limits/TestLevels	Applicability/Remarks
B.5	ConductedandRadiatedEmission - ElectricalAppliances	CISPR14-1(2016) or CISPR 32:2015+A1 2019	As per applicable standard	CISPR 14-1:2020 is applicable for Energy meter without any wireless communication feature. Equivalent standard of CISPR-14-1 is IS 6873(Part 2/ Sec1) IS/CISPR 32:2015+A1 2019 is applicable for Energy meter with wireless communication feature. ~~Conducted and Radiated Emissionapplicableto ElectricityMeter~~ Refer clause 12.8.6 of IS 14697:2021
B.6	ImmunitytoElectrostaticDischarge	EN/IEC61000-4-2(2008) Contactdischarge	Level 2 {± 4 kV}, or highervoltage;PerformanceCriteriaB	
B.7	ImmunitytoElectrostaticDischarge	EN/IEC61000-4-2(2008) Airdischarge	Level 3 {± 8 kV} or highervoltage; PerformanceCriteriaB	
B.8	ImmunitytoElectrostaticDischarge- Level-4	EN/IEC61000-4-2(2008) ContactDischarge	Level 4 {± 8 kV};PerformanceCriteriaB	Applicableto Smart ElectricityMeter
B.9	ImmunitytoElectrostaticDischarge- Level-4	EN/IEC61000-4-2(2008) AirDischarge	Level 4 {± 15 kV};PerformanceCriteriaB	Applicableto Smart ElectricityMeter
B.10	ImmunitytoradiatedRF	EN/IEC61000-4-3(2010) or EN/IEC61000-4-3(2020)	i. Test level 2 {Test fieldstrength of 3 V/m} for80 MHz to 1 GHz;PerformanceCriteriaA. ii. Test level 3 {Test fieldstrength of 10 V/m} for800MHzto960MHz& 1.4 to 6.0 GHz,;PerformanceCriteriaA	Clauses applicable to TelecomEquipmentorTelecomTerminalEquipmentwithvoiceinterface. Refer EN/IEC61000-4-3(2020)

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B.11	ImmunitytoradiatedRF	EN/IEC61000-4-3(2010) or EN/IEC61000-4-3(2020)	80MHz to 6.0 GHz: Test level 2 {Test field strengthof 3 V/m}: Performance CriteriaA	Clauses applicable to TelecomTerminal Equipment without voiceinterface.

S.No.	ParameterName	Standard	Limits/TestLevels	Applicability/Remarks
B.12	Immunitytofasttransients(burst)	EN/IEC61000-4-4(2012) AC/DCPowerLines	Test Level 2 (1.0 kV):PerformanceCriteriaB	Not applicable for devices having in-builtor replaceable battery
B.13	Immunitytofasttransients(burst)	EN/IEC61000-4-4(2012) Signal/Control/Data/TelecomLines	Test level 2 (0.5kV):PerformanceCriteriaB	Notapplicableformobiledeviceshavingonlyradio interface
B.14	Immunityto surges	EN/IEC61000-4-5(2014) lineto ground–power port	2kV:PerformanceCriteriaB	Not applicable for devices having in-builtor replaceable battery
B.15	Immunityto surges	EN/IEC61000-4-5(2014) linetoline –powerport	1kV:PerformanceCriteriaB	Notapplicable for deviceshavingin-builtorreplaceablebattery
B.16	Immunityto surges	EN/IEC61000-4-5(2014) Common mode – telecomports	2kV:PerformanceCriteriaC	Notapplicableformobiledeviceshavingonlyradio interface
B.17	Immunitytoconducteddisturbance induced byRadiofrequencyfields	EN/IEC61000-4-6(2013): AC/DC lines & signalcontrol/telecomlines.	Testlevel2{3Vr.m.s.}:PerformanceCriteria A 150kHz to 80 MHz	Notapplicableformobiledeviceshavingonlyradio interface
B.18	Immunity to voltage dips &short interruption: Voltagedip corresponding to areduction of supply voltageof30%for500ms(i.e.70%supplyvoltagefor 500ms)	EN/IEC61000-4-11(2004) or EN/IEC61000-4-11(2020)	PerformancecriteriaB	ApplicabletoACpower ports
B.19	Immunity to voltage dips &short interruption: Voltagedip corresponding to areductionofsupplyvoltage of60%for200ms;(i.e.40%supplyvoltagefor200ms).	EN/IEC61000-4-11(2004) or EN/IEC61000-4-11(2020)	PerformancecriteriaC	ApplicabletoACpower ports

S.No.	ParameterName	Standard	Limits/TestLevels	Applicability/Remarks
B.20	Immunitytovoltagedips&short interruption: Voltageinterruptioncorresponding to a reduction of supplyvoltageof>95%for5s.	EN/IEC61000-4-11(2004) or EN/IEC61000-4-11(2020)	PerformancecriteriaC	ApplicabletoACpower ports
B.21	Immunitytovoltagedips&short interruption: Voltageinterruption correspondingto a reduction ofsupply voltageof >95% for10ms.	EN/IEC61000-4-11(2004) or EN/IEC61000-4-11(2020)	PerformancecriteriaB	ApplicabletoACpower ports.
B.22	Immunitytovoltagedips&short interruption: VoltageInterruptionwith0% of supplyfor10ms.	EN/IEC61000-4-29	PerformancecriteriaB	Applicableto DCpower ports
B.23	Immunitytovoltagedips&short interruption: VoltageInterruption with 0% ofsupplyfor30ms, 100ms, 300msand 1000ms.	EN/IEC61000-4-29	PerformancecriteriaC	Applicableto DCpower ports
B.24	Immunity to voltage dips &short interruption: Voltagedip corresponding to 40% &70%ofsupplyfor10ms,30 ms.	EN/IEC61000-4-29	PerformancecriteriaB	Applicableto DCpower ports
B.25	Immunity to voltage dips &short interruption: Voltagedip corresponding to 40% &70%ofsupplyfor100ms, 300msand 1000 ms.	EN/IEC61000-4-29	PerformancecriteriaC	Applicableto DCpower ports

S.No.	ParameterName	Standard	Limits/TestLevels	Applicability/Remarks
B.26	Immunitytovoltagedips&short interruption: Voltagevariations corresponding to80%and 120% of supply for 100 ms to 10s as perTable1cofIEC61000-4-29	EN/IEC61000-4-29	PerformancecriteriaB	Applicableto DCpower 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 maykindlybereferred to.

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

equipmentIncase ofany conflict, theTECdocument forEMI/EMC standard shall prevail.

NoteforIoTDevices

1. ~~If TrackingDevicecomealongwithvehicle fortestingthen CISPR25 /AIS 004 Part3 willbe applicable.~~Tracking device- (i)As per TC division letter no. ID – 6-6/2021-TC/TEC(Pt 1) dated 12.05.2022it has been clarified that tracking device which are integral part of Completely Build Units (CBUs) i.e. complete vehicles whether comes fitted with imported vehicle or imported /sourced locally for fitment in locally manufactured vehicles, shall not be covered under MTCTE. Genuine Service parts sourced locally or imported as replacement for fitment in CBUs are also not covered under MTCTE. Tracking Device if sold separate and standalone unit (i.e. neither as an integralpartof vehicle nor as a genuine service part for replacement in CBUs) will be covered under MTCTE.

(ii) In case of Vehicle tracking device, Testing of EMI/ EMC/Safety/ GNSS(Global Navigation Satellite System) are to done as per IS 16833 standards and test report from designated lab* is pre-requisite before going for testing of interfaces and other parameters in as mentioned in the ER.

(iii) For conducted and radiated emission refer B.1 to B.4 as per applicability.

~~1.~~

2. Immunityto Surges -For Non-Rechargeablefixedbatteryoperated device withoutanytelecom or powerport, thistest isnot applicable.

3. Conducted and Radiated Emission – Refer B.5. If Smart Electricity Meter is to be tested along with wireless communication module then IS 16444 Part 1:2015 & IS 16444 Part 2:2017 which refers to CISPR 32 (2015)+A1:2019 (Class B).is applicable. CISPR 14-1:2020 is applicable for Energy meter without wireless communication feature.

Note: IS 16444 Part 1 refers to IEC 62052-11 (Cl 9.3.14), which further refers to CISPR 32.

IS 16444 Part 2 refers to IS 14697 (Cl 12.8.6), which further refers to IS 6873 Part 7. IS 6873 Part 7 is nothing but CISPR 32

.

~~3.~~4. Immunityto Electrostatic Discharge:–Smart ElectricityMeter

ForcommunicationmodulelimitsasperstandardIEC61000-4-2areapplicable.Refer B.8 and B.9.Performance criteria B of the communication module as per TEC EMC standard.

If Smart Electricity Meter is to be tested along with communication module, then severity level and performance criteria should be asperIS 16444 Part 2:2017{whichrefer toIS14697:2021 (Cl 10.1 & 12.8)} andIS 16444 Part 1:2015 {which refers to IS 15884:2010 (Cl 4.5 & 5.5)}

~~4.~~5. ImmunitytoRadiated RF: – Smart ElectricityMeter

ForcommunicationmodulelimitsasperstandardIEC61000-4-3areapplicable. Refer B.11. Performance criteria B of the communication module as per TEC EMC standard.

If Smart Electricity Meter is to be tested along with communication module, then severity level and performance criteria should beasperIS 16444 Part 2:2017{whichrefer toIS14697:2021 (Cl 10.1 & 12.8)} andIS 16444 Part 1:2015 {which refers to IS 15884:2010 (Cl 4.5 & 5.5)}.Test according to IS 14700 (Part 4/ sec 3):2008*or EN/IEC 61000-4-3*

~~5.~~6. ImmunitytoFastTransients: –SmartElectricityMeter

ForcommunicationmodulelimitsasperstandardIEC61000-4-4(2012)areapplicable. Performance criteria B of the communication module as per TEC EMC standard.

If Smart Electricity Meter is to be tested along with communication module, then severity level and performance criteria should beasperIS 16444 Part 2:2017{whichrefer toIS14697:2021 (Cl 10.1 & 12.8)} andIS 16444 Part 1:2015 {which refers to IS 15884:2010 (Cl 4.5 & 5.5)}.Test according to IS 14700 (Part 4/ sec 4):2008*or EN/IEC 61000-4-4.*

~~6.~~7. ImmunitytoSurges: – Smart ElectricityMeter

ForcommunicationmodulelimitsasperstandardIEC61000-4-5(2014)areapplicable. Performance criteria B of the communication module as per TEC EMC standard.

If Smart Electricity Meter is to be tested along with communication module, then severity level and performance criteria should be asperIS 16444 Part 1:2015{whichrefer toIS

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15884:2010 (Cl 4.5 & 5.5)} and IS 16444 Part 1:2015 { which refers IS 14697:2021 (Cl 10.1 & 12.8)}.Test according to*EN/IEC 61000-4-5 or IS 14700 (Part 4/Sec5)*

~~7.~~8. GeneralSafetyRequirements:– SmartElectricityMeter

Forcommunicationmodulestandard IEC60950/IS13252areapplicable.

If Smart ElectricityMeter isto betested alongwithcommunicationmodule, thensafetymustbeasper prevailingIS 16444 Part 1:2015 and IS 16444 Part-2:2017~~.~~

9.Immunity to AC Voltage Dips and Short Interruptions – Smart Electricity Meter

As per annexure B, B.18, B19, B20 and B21.Please refer TEC EMC standard section 9.6.2.

10. Immunityto Conducteddisturbance induced by Radiofrequencyfields- Refer B.17 for Smart Electricity Meter, PerformanceCriteria B as per TEC EMC standard.

~~**Decision from MTCTE :**~~11. The test parameters of Smart Electricity Meter mentioned in the TEC ER against which BIS test report as well as certificate are already available need not to be testedagain in TEC

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Annexure- B1: Emission limits as per CISPR22Parameter

Group:EMC

Thevalueofthelimitsfrom"CISPR22(2008)"atclause-6[andreproducedbelowintables4(a),4(b)&5(a),5(b)]shallbeusedforclassBandclassAequipmentrespectively.Further, thelimits of table5 mayalso be usedfor equipment in Telecommunication Centres.
Alternatively,theLimitsasperTable4(a1)&5(a1)formeasuringdistanceof3marealsoacceptable,asapplicable,inplaceofTable4(a)&5(a)respectively.

a) Limitsbelow1GHz

Table4(a):Limitsforunwantedradiatedemissionof "ClassB"equipmentatameasuringdistanceof10m.

Frequencyrange	**Limits(quasi-peak)**
30-230MHz	30dB(µV/m)
230-1000 MHz	37dB(µV/m)
Note:1)Thelowerlimit shall applyat the transitionFrequency. *Note:2)Additional provisions mayberequired forcases whereinterferenceoccurs.*	

Table5(a):Limitsforunwantedradiatedemissionof"ClassA"equipment(forTelecommunication Centres)ata measuringdistanceof10m.

Frequencyrange	**Limits(quasi-peak)**
30-230MHz	40dB(µV/m)
230-1000 MHz	47dB(µV/m)
Note:1) Thelower limit shallapplyatthetransition Frequency. Note:2)Additionalprovisionsmaybe required forcaseswhereinterference occurs.	

***Note**:*

Limitsareshownhereforameasurementdistanceof10m.However, measurementsmadeusingalternativetestsitesarealsoacceptableinaccordancewithCISPR 22 includingclause No. 10.4.5.

Table4(a1):Limitsforunwantedradiatedemissionof"ClassB"Equipmentatameasuringdistanceof3m.

Frequencyrange	**limits(quasi –peak)**
30– 230 MHz	40.5dB(μV/m)
230– 1000 MHz	47.5dB(μV/m)
Notes: 1. Thelowerlimits shall applyat transition frequency 2. Additional provisionsmayberequired for caseswhereinterferenceoccurs.	

Table5(a1):Limitsfor unwantedradiatedemissionof"ClassA"Equipmentatameasuringdistanceof3m.

Frequencyrange	**limits(quasi –peak)**
30– 230 MHz	50.5dB(μV/m)
230– 1000 MHz	57.5dB(μV/m)
Notes: *1. Thelowerlimitsshallapplyattransitionfrequency* *2. Additionalprovisionsmayberequiredforcases whereinterferenceoccurs.*	

b)Limitsabove1GHz

TheEUTshallmeetthefollowinglimitswhenmeasured inaccordance withtheprescribed methodandtheconditional testingprocedureasdescribed.

Table4(b):Limitsforradiateddisturbanceof"ClassB"Eqpt.atameasurementdistanceof3m.

Frequencyrange GHz	**Averagelimit** dB(μV/m)	**Peaklimit** dB(μV/m)
1 to 3	50	70
3 to 6	54	74
NOTE:*Thelowerlimitapplies atthetransitionfrequency.*		

Table5(b):Limitsforradiateddisturbanceof"ClassA"Eqpt.atameasurementdistanceof3m.

Frequencyrange GHz	**Averagelimit** dB(μV/m)	**Peaklimit** dB(μV/m)
1 to 3	56	76
3 to 6	60	80
NOTE:*Thelowerlimitappliesatthetransitionfrequency.*		

Limitsforconductedemission

ForClassAequipment

Table7:Limitofconductedemission (disturbance)atthe mainportsofClassATelecomEquipment

Frequencyrange	Limit(Quasi-Peak)	Limit(Average)
0.15– 0.5 MHz	79dB(μV)	66dB(μV)
0.5-30MHz	73dB(μV)	60dB(μV)
Note:Thelowerlimit shallapplyat thetransitionFrequencies.		

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

FrequencyrangeMHz	Voltage limits dB (μV)Quasi-peak	Average	Current limits dB (μA)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 0.5MHz.

Note2:Thecurrentandvoltagedisturbancelimitsarederivedforusewith animpedancestabilization network(ISN)whichpresentsacommonmode(asymmetricmode)impedanceof 150Ωaretelecommunicationportundertest(conversion factoris 20 log_{10}150/1=44dB).

ForClassBequipment

Table6:Limitsofconductedemission(disturbance)atthe mainsportsofClassBTelecomEquipment

Frequencyrange	Limit(Quasi-Peak)	Limit(Average)
0.15-0.5 MHz	66-56dB(μV)	56-46dB(μV)
0.5-5MHz	56dB(μV)	46dB(μV)
5-30MHz	60dB(μV)	50dB(μV)
Note:1)Thelower limit shallapply atthe transition Frequencies. *Note:2)Thelimits decreaseslinearly with logarithm of theFrequencyin therange0.15 MHzto 0.50MHz.*		

Table8(A):Limitsforconductedcommon mode(asymmetricmode)emissionfromtelecommunicationportsforclassBequipment.

FrequencyrangeMHz	Voltage limits dB (μV)Quasi-peak	Average	Current limits dB (μA)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:Thelimits decreaselinearly with thelogarithm of the frequencyintherange0.15 MHz to 0.5MHz. *Note2:Thecurrentandvoltagedisturbancelimitsarederivedforusewith animpedancestabilization network(ISN)whichpresentsacommonmode(asymmetricmode)impedanceof 150Ωaretelecommunicationportundertest(conversion factoris 20 $\log_{10}$150/1=44dB).*				

Conditionaltestingprocedurefor1-6GHztesting:

a. Thehighestinternal sourceof anEUTis defined as thehighestfrequencygeneratedor usedwithinthe EUTor onwhichtheEUToperates ortunes.
b. If the highest frequencyofthe internalsources oftheEUT is lessthan 108 MHz,the measurement shallonlybemadeup to 1GHz.
c. If the highest frequencyofthe internal sources of the EUT is between108MHz and 500MHz, the measurement shallonlybemadeupto 2 GHz.
d. If the highestfrequencyofthe internalsources of the EUTis between500MHz, and1 GHz,the measurementshall onlybemadeup to5 GHz.
e. IfthehighestfrequencyoftheinternalsourcesoftheEUTisabove1GHz,themeasurementshallbemadeupto5timesthehighestfrequencyor6GHz,whichever is less.

ClassAand ClassBequipment definition:

a. **ClassB equipment:**"ClassB"Telecomequipment is intendedprimarilyforuse inthedomesticenvironmentand mayinclude:
    i. equipmentwith no fixedplaceof use; forexample, portable equipment powered bybuilt-inbatteries;
    ii. Telecommunicationterminalequipmentpoweredbyatelecommunicationnetwork;
    iii. Personalcomputersand auxiliaryconnected equipment.
b. **ClassAequipment:**ClassATelecomequipmentisacategoryofallotherTelecomEquipmentswhichsatisfiesclassATelecomEquipmentlimitsbutnot the class Blimits.Such equipmentmaycause RadioInterferenceinthe domesticenvironment.

Annexure-C1: Frequency Band of Operation for Non-Cellular Radio EquipmentParameter Group: Radio Conformance(RADCONF)

S.No.	ParameterName	Standard	Limits/Values	Applicability/Remarks
C1.1	FrequencyBandForMRTS	LatestNFAP issued byWPC.	300/400MHz or 800 MHz	MRTS EquipmentTestingprocedureasper applicable ENxxx standardmentionedinAnnexureC3
C1.2	Frequencyfor HFequipment	LatestNFAP issued byWPC	3MHz to 30 MHz	HFEquipment Testing procedure as perapplicableENxxxstandard mentionedin AnnexureC3
C1.3	Frequency for UHF/ VHFequipment	LatestNFAP issued byWPC	30MHz to 1000 MHz	VHF/UHF EquipmentTesting procedure as perapplicableENxxxstandard mentionedin AnnexureC3
C1.4	FrequencyforPTPRadioInterface	LatestNFAP issued byWPC.	6/ 7/ 13/ 15/ 18/ 23 GHz.Applicableforfullorsplitoutdoor unit.	PointtoPointMicrowaveFixedRadioSystems Testing procedure as per EN 302217-2
C1.5	Frequency for PMP RadioInterface	LatestNFAP issued byWPC.	10.5/26/ 28 GHz. Applicableforfullorsplitoutdoor unit.	PointtoMulti-PointMicrowaveFixedRadio Systems Testing procedure as per EN 302326-2
C1.6	Frequency of Operation - SatelliteEquipment	LatestNFAP issued byWPC.	Lower C-bandReceive Frequency3.400-3.700GHz Trans Frequency6.425-6.725GHz *Note-Theequipmentmay operateinpartofthebandsorcoverthefullbands listed.*	TestingprocedureasperAppendix -II,Test-2

C1.7	Frequency of Operation - SatelliteEquipment	LatestNFAP issued byWPC.	Normal C-bandReceive Frequency3.700-4.200GHz Trans Frequency5.925-6.425GHz *Note- The equipment mayoperateinpartofthebandsor coverthefullbandslisted.*	TestingprocedureasperAppendix -II,Test-2
C1.8	Frequency of Operation - SatelliteEquipment	LatestNFAP issued byWPC.	Extended C-bandReceive Frequency4.500-4.800GHz Trans Frequency6.725-7.025GHz *Note- The equipment mayoperateinpartofthebandsor coverthefullbandslisted.*	TestingprocedureasperAppendix -II,Test-2
C1.9	Frequency of Operation - SatelliteEquipment	LatestNFAP issued byWPC.	Kuband Receive Frequency10.7-11.7GHz 12.2-12.75GHz Trans Frequency12.75-13.25GHz 13.75-14.0GHz 14.0-14.5GHz *Note- The equipment mayoperateinpartofthebandsorcoverthe fullbands listed.*	TestingprocedureasperAppendix -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 listedhere.

Annexure-C2: Transmitted Power/ EIRP for Non-Cellular Radio EquipmentParameter Group: Radio Conformance(RADCONF)

S.No.	ParameterName	Standard	Limits/Values	Applicability/Remarks
C2.1	Max RFPowerOutputMRTSBaseStn	As per DoT/WPClicenseconditions	100 W	MRTS Base StationsTesting procedure as perapplicableENxxxstandard mentionedAnnexureC3
C2.2	Max RFPower OutputMRTS MobileStn	As per DoT/WPClicenseconditions	30 W	MRTS Fixed Mobile EquipmentTesting procedure as perapplicableENxxxstandard mentionedAnnexureC3
C2.3	MaxRFPowerOutputforMRTSHandheldStn	As per DoT/WPClicenseconditions	3 W	MRTSHandheldEquipmentTesting procedure as perapplicableENxxxstandard mentionedAnnexureC3
C2.4	Max RFPower OutputforMRTS FixedStn	As per DoT/WPClicenseconditions	30W	MRTS Fixed EquipmentTesting procedure as perapplicableENxxxstandard mentionedAnnexureC3
C2.5	MaxTransmitPowerfor HFBaseStn	As per DoT/WPClicenseconditions	As per DoT/WPCprescribedlimit	HF Base StationsTestingprocedureasper applicable ENxxx standardmentionedAnnexureC3
C2.6	Max TransmitPowerforHFHHStn	As per DoT/WPClicenseconditions	As per DoT/WPCprescribedlimit	HF Handheld EquipmentTesting procedure as perapplicableENxxxstandard mentionedAnnexureC3
C2.7	Max TransmitPowerforHFMobStn	As per DoT/WPClicenseconditions	As per DoT/WPCprescribedlimit	HF Mobile EquipmentTesting procedure as perapplicableENxxxstandard mentionedAnnexureC3
C2.8	Max TransmitPowerfor HFFixedStn	As per DoT/WPClicenseconditions	As per DoT/WPCprescribedlimit	HF Fixed Equipment Testingprocedureas perapplicable ENxxxstandardmentioned

S.No.	ParameterName	Standard	Limits/Values	Applicability/Remarks
				AnnexureC3
C2.9	MaxTransmitPowerforUHF/VHFBaseStn	As per DoT/WPClicenseconditions	As per DoT/WPCprescribedlimit	VHF/UHF Base StationTesting procedure as perapplicableENxxxstandard mentionedAnnexureC3
C2.10	MaxTransmitPowerfor UHF/VHFHHStn	As per DoT/WPClicenseconditions	As per DoT/WPCprescribedlimit	VHF/UHF Handheld EquipmentTesting procedure as perapplicableENxxxstandard mentionedAnnexureC3
C2.11	MaxTransmitPowerfor UHF/VHFMobStn	As per DoT/WPClicenseconditions	As per DoT/WPCprescribedlimit	VHF/UHF Mobile EquipmentTesting procedure as perapplicableENxxxstandard mentionedAnnexureC3
C2.12	Max Transmit Power for UHF/VHF FixedStn	As per DoT/WPClicenseconditions	As per DoT/WPCprescribedlimit	VHF/UHFFixedEquipmentTesting procedure as perapplicableENxxxstandard mentionedAnnexureC3
C2.13	TransmitPowerforPTPRadiointerface	As per DoT/WPClicenseconditions	As per DoT/WPCprescribedlimit	PointtoPointMicrowaveFixedRadioSystems TestingprocedureasperEN302217-2orAppendix-II, Test-3
C2.14	TransmitPowerforPMPRadio Interface	As per DoT/WPClicenseconditions	As per DoT/WPCprescribedlimit	PointtoMulti-PointMicrowaveFixedRadio Systems TestingprocedureasperEN302326-2orAppendix-II, Test-3
C2.15	TransmitPower-SatelliteEquipment	As per DoT/WPClicenseconditions	As per DoT/WPCprescribedlimit	TestingprocedureasperAppendix-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 therequirementslistedhere.

Annexure-C3: Radio Conformance Requirement for Non-Cellular Radio EquipmentParameter Group: Radio Conformance(RADCONF)

S.No.	EquipmentName	ParameterName	Standard	Limits/Values	Applicability/Remarks
C3.1	MRTS Equipment	ConformancetostandardsforMRTS	ETSIEN 300 113	Compliance	Applicable for equipment meant fortransmissionofdataand/orspeechandhavingantenna connector
C3.2	MRTS Equipment	ConformancetostandardsforMRTS	ETSIEN 300 390	Compliance	Applicable for equipment meant fortransmissionofdataand/orspeechandhavingintegral antenna
C3.3	MRTS Equipment	ConformancetostandardsforMRTS	ETSIEN 300 086	Compliance	Applicable for equipment meant foranalogue speech and having internal orexternalRFconnector
C3.4	MRTS Equipment	ConformancetostandardsforMRTS	ETSIEN 300 296	Compliance	Applicable for equipment meant foranaloguespeechandhavingintegralantenna
C3.5	MRTS Equipment	ConformancetostandardsforMRTS	ETSIEN 300 219	Compliance	Applicable for equipment meant totransmit signals to initiate specificreceiverresponse
C3.6	MRTS Equipment	ConformancetostandardsforMRTS	ETSIEN 300 341	Compliance	Applicable for equipment, usingintegral antenna, meant to transmitsignals to initiate specific receiverresponse
C3.7	MRTS Equipment	ConformancetostandardsforMRTS	ETSIEN 301 166	Compliance	Applicable for equipment meant fortransmissionofdataand/orspeechandoperating on narrow band channels(<10KHz)and having antennaconnector
C3.8	MRTS Equipment	Conformance to standardsforMRTS	ETSIEN 302 561	Compliance	ApplicableforTerrestrialTrunkedRadio(TETRA)

S.No.	EquipmentName	ParameterName	Standard	Limits/Values	Applicability/Remarks
C3.9	VHF/UHF Equipment	Conformancetostandardsfor Equipment used inVHF/UHFRadioSystems	ETSIEN 300 113	Compliance	Applicable for equipment meant fortransmissionofdataand/orspeechandhavingantenna connector
C3.10	VHF/UHF Equipment	Conformancetostandardsfor Equipment used inVHF/UHFRadioSystems	ETSIEN 300 390	Compliance	Applicable for equipment meant fortransmissionofdataand/orspeechandhavingintegral antenna
C3.11	VHF/UHF Equipment	Conformancetostandardsfor Equipment used inVHF/UHFRadioSystems	ETSIEN 300 086	Compliance	Applicable for equipment meant foranalogspeechandhavinginternalorexternalRFconnector
C3.12	VHF/UHF Equipment	Conformancetostandardsfor Equipment used inVHF/UHFRadioSystems	ETSIEN 300 296	Compliance	Applicableforequipmentmeantforanalog speech and having integralantenna
C3.13	VHF/UHF Equipment	Conformance to standardsfor Equipment used inVHF/UHFRadioSystems	ETSIEN 300 219	Compliance	Applicable for equipment meant totransmit signals to initiate specificreceiverresponse
C3.14	VHF/UHF Equipment	Conformancetostandardsfor Equipment used inVHF/UHFRadioSystems	ETSIEN 300 341	Compliance	Applicableforequipment, usingintegral antenna, meant to transmitsignals to initiate specific receiverresponse
C3.15	VHF/UHF Equipment	ConformancetostandardsforEquipment used in VHF/UHFRadioSystems	ETSIEN 300 783	Compliance	Applicableforcommercialamateurradio equipment.
C3.16	VHF/UHF Equipment	Conformancetostandardsfor Equipment used inVHF/UHFRadioSystems	ETSIEN 300 720	Compliance	ApplicableforUHFOn-boardvesselscommunicationsystems.

S.No.	EquipmentName	ParameterName	Standard	Limits/Values	Applicability/Remarks
C3.17	VHF/UHF Equipment	Conformancetostandardsfor Equipment used inVHF/UHFRadioSystems	ETSIEN 301 925	Compliance	Applicable for Radiotelephonetransmitters and receivers for maritimemobileserviceoperatingin VHFband
C3.18	VHF/UHF Equipment	Conformancetostandardsfor Equipment used inVHF/UHFRadioSystems	ETSIEN301178	Compliance	Applicable for portable VHFradiotelephone equipment for themaritimemobileservice(fornon-GMDSSapplicationsonly)
C3.19	VHF/UHF Equipment	Conformancetostandardsfor Equipment used inVHF/UHFRadioSystems	ETSIEN 300 698	Compliance	Applicable for Radio telephonetransmitters and receivers for themaritimemobileserviceoperatingin the VHF bands used on inlandwaterway
C3.20	HFEquipment	HFRadioSystems	ETSIEN 300 433	Compliance	ApplicabletoCitizenband(CB)Radioequipment.
C3.21	HFEquipment	HFRadioSystems	ETSIEN 303 402	Compliance	Applicable to maritime mobiletransmittersandreceivers.
C3.22	HFEquipment	HFRadioSystems	ETSIEN 301 783	Compliance	Applicabletocommerciallyavailableamateurradioequipment.
C3.23	PTPMicrowaveFixed Radio Systems	PTPFixedDigitalRadioConformance	ETSIEN302 217-2	Compliance	Applicable for full or split outdoorunitofPointtoPointMicrowave FixedRadioSystems
C3.24	PMP MicrowaveFixedRadio Systems	PMP Fixed Digital RadioConformance	ETSIEN 302326-2	Compliance	Applicable for full or split outdoorunit of Point to Multi-PointMicrowaveFixedRadioSystems
C3.25	VSAT	Conformancetostandards forSatellite	CompliancetoETSI EN301 443	Compliance	ForCBand
C3.26	VSAT	Conformancetostandards forSatellite	CompliancetoETSI EN301 428	Compliance	ForKuBand

NotetoAnnexure -C:

1. “Frequencyofoperation”and“maximumtransmittedpower“shallbeenteredinBOMfile asperguidelinesofWPC/DOT.
2. UsagescenarioofequipmentshallbeenteredinBOM.VariousUsageScenariosfordifferenttypesofequipmentlikeMRTSequipment,VHF/UHF/HF Radio are listed in Annexure-C3 along-with the applicable EN standard. There may be multiple ENs applicable for a single usagescenarioas per the applicability mentioned.Forexample - HF Radio intended forMaritime usage in Citizen Bandwill have toget conformanceagainstboth EN standardmentioned in AnnexureC3.20 &AnnexureC3.21.
3. Type of VHF/UHF/HF/MRTS equipment- Base station fixed mobile transportable equipment; handheld, base band processing equipment etc. shall beenteredinBOM.

Annexure-D: Parameters for 2-wire PSTN Lines, Trunks lines and CPEs connected thereon (INT2W & CPE2W)Parameter Group: 2-WireInterface (INT2W)and CPEsconnected on2-Wire(CPE2W)

S.No.	EquipmentName	ParameterName	Standard	Limits/Values	Applicability/ Remarks
D.1	2-WireCPEsand Interfaces	Longitudinal/Transverse ConversionLoss	Q.552Clause2.2.2& Figure 2/ TBR.21Clause4.4.3	Asin Figure2, Annexure-D4	**ReferNote1**
D.2	2-WireCPEsand Interfaces	ReturnLoss	Q.552Clause2.2.1.2 and Figure1	Asin Figure1, Annexure-D4	
D.3	2-WireCPEsand Interfaces	OverVoltage/OverCurrentProtection	K.21	Compliance	Compliance ofthistestonlyifport isconnected toexternallines e.g.incaseofxDSL lines.
D.4	2-WireCPEsand Interfaces	MaximumLoopCurrent	ETSIEN 300 001	<60 mA	
D.5	2-WireCPEsand Interfaces	IdleStateCurrent	ETSIEN 300 001	<40 µA/ 130µA	Without/with CLIPdisplay
D.6	2-WireCPEsand Interfaces	InsulationTest	ETSIEN 300 001	≥5MΩ	**ReferNote1**
D.7	2-WireCPEsand Interfaces	ResistancetoEarth	TBR-21Clause4.4.4	≥10MΩ	
D.8	2-wireTrunkLine	DCResistance	ETSITBR-21 Clause 4.4.1	≥1MΩ	
D.9	2-wireTrunkLine	MinimumCurrentonMGW TrunkLine	ETSIEN 300 001	≥60 µA	
D.10	Telephones/FaxwithHandset	AcousticShock Absorption	P.360Clause4.1	Compliance	
D.11	AudioConferencing Equipment	VoiceConference Verification	FunctionalTest	Compliance	
D.12	Fax,Modem	TransmitPowerforFax Machine/Modem	T.4Clause 6	-3dBmto-15 dBm	
D.13	Fax	ReceiverSensitivityforFAX	T.4Clause 7	>-43dBm	
D.14	Modem	ReceiverSignalforModem	V.34(para6.6)	>-43 dBm ON <-48 dBm OFF	
D.15	2-wirelineandtrunk	TransmissionofDTMF Signals	Q.23Clause6 and 7	Compliance	
D.16	2-WireTrunk	Currenton Junction/Trunk		<60 mA	

		LineinPABX			

Note1: This test is exempted providedan undertakingshould besubmitted bythesupplier that 2-wireequipment is not intendedto beconnectedto Earth. In casethe 2-wire equipmentisintended tobeconnectedto Earthbyanysupplierthen thetest wouldberequired

Annexure-D1: ISDN Layer-III Specifications

TestParameterGroup:ISDNConformance(ISDNCONF)

S.No.	Equipment Name	ParameterName	Standard	Limits/ Values	Applicability/Remarks
D1.1	ISDNBRIandPRI	LayerIIIspecificationMessagesfor circuit-modeconnectionbasiccallcontrol.	Q.931 Applicable to ISDN BRIand PRI		
D1.2		ALERTING	Clauseno. 3.1.1		
D1.3		CALLPROCEEDING	Clauseno. 3.1.2	Compliance	
D1.4		CONNECT	Clauseno. 3.1.3		
D1.5		SETUP	Clauseno. 3.1.14		
D1.6		SETUPACKNOWLEDGE	Clauseno. 3.1.15		
D1.7		DISCONNECT	Clauseno. 3.1.5		
D1.8		RELEASE	Clauseno. 3.1.9		
D1.9		D1.10**RELEASE** COMPLETE	Clauseno. 3.1.10		
D1.11		Bearer capability	Clauseno. 4.5.5		
D1.12		Called partynumber	Clauseno. 4.5.8		
D1.13		Callingpartynumber	Clauseno. 4.5.10		
D1.14		Channelidentification	Clauseno. 4.5.13		
D1.15		Normalcallclearing	AsperTable 6-5		
D1.16		CallclearingUserBusy	AsperTable 6-5		
D1.17		CallclearingInvalidnumberformat orincompletenumber	AsperTable 6-5		
D1.18		CallclearingNoanswer	AsperTable 6-5		

Annexure-D2: Parameters for Cordless TelephoneParameter Group:

Radio Conformance (RADCONF)Note:MaximumRangeshall be100 m.

S.No.	ParameterName	Frequency	Power	Remarks
D2.1	FrequencybandofOperationandTransmitPower–BaseUnitonly	1610,1640, 1675, 1690 KHz	Transmitpower <500 mW	
D2.2	Frequency band of Operation andTransmitPower–BaseandRemoteUnit	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.	Transmitpower<500mWforBaseUnit Transmit Power < 200 mW forRemoteUnit	
D2.3	Frequencyband ofOperation and TransmitPower– RemoteUnit only	150.360, 150.750, 150.850, 150.950MHz.	Transmitpower <50 mW	
D2.4	TransmittedfrequencybyBaseUnit	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, 44.480MHz	RFPower <500 mW	
D2.5	TransmittedfrequencybyHandset	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, 49.500MHz	RFPower <100 mW	
D2.6	Frequencyof Operation	926-926.5MHz	Verylow power Cordless Phone	
D2.7	FrequencyandPower for FHSS	2.4-2.4835GHz	Power<100mW PowerSpectralDensity<100mW/100KHz EIRP	
D2.8	D2.9Frequency and Power for othermodulationtypes	2.4-2.4835GHz	Power<100mW Power Spectral Density < 10 mW/1MHzEIRP	

S.No.	ParameterName	Frequency	Power	Remarks
D2.10	Frequencyand Powerin5GHzband	5.150-5.350and 5.725-5.875 GHz	MeanEIRP<200mW Power Spectral Density < 10 mW/1MHzEIRP	
D2.11	MaximumFrequencyDeviation	5Khz		
D2.12	Transmitternarrowband spuriousemission	30MHz-1 GHz	Whenoperating: <-36dBm, Wheninstand-by:<-57dBm.	
D2.13	Transmitternarrowband spuriousemission	>1GHz-12.75GHz	When operating: < -30dBm,Wheninstand-by:<-47dBm.	
D2.14	Transmitternarrowband spuriousemission	>1.8GHz-1.9GHzand 5.15GHz-5.3GHz	When operating: < -47dBm,Wheninstand-by:<-47dBm.	
D2.15	Transmitterwidebandspuriousemission	30MHz-1GHz	Whenoperating: <-86dBm/Hz, Wheninstand-by:<-107 dBm/Hz.	
D2.16	Transmitterwidebandspuriousemission	>1GHz-12.75GHz	When operating: < -80dBm/Hz,Wheninstand-by:<-97dBm/Hz.	
D2.17	Transmitterwidebandspuriousemission	>1.8GHz-1.9GHzand 5.15GHz-5.3GHz	Whenoperating: <-97dBm/Hz, Wheninstand-by:<-97dBm/Hz.	
D2.18	Receivernarrowbandspuriousemission	30MHz-1GHz	<-57dBm	
D2.19	Receivernarrowbandspuriousemission	>1GHz-12.75GHz	<-47dBm	
D2.20	Receiverwidebandspuriousemission	30MHz-1GHz	<-107dBm/Hz	
D2.21	Receiverwidebandspuriousemission	>1GHz-12.75GHz	<-97dBm/Hz	

Annexure-D3: CCS#7 Conformance

ParametersParameterGroup:ISDNConformance(ISDNCONF)

S.No.	ParameterName	IndividualParameterName	Standard	Testno.	Applicability/Remarks
D3.1	CCS#7MTP2Parameters	TimerT2	ITU-TQ.781. Annex-D3	Test1.2	SignalingGatewayandMediaGateway
D3.2	CCS#7MTP2Parameters	TimerT3	ITU-TQ.781. Annex-D3	Test1.3	
D3.3	CCS#7MTP2Parameters	TimerT4 andT1	ITU-TQ.781. Annex-D3	Test1.4	
D3.4	CCS#7MTP2Parameters	NormalAlignment	ITU-TQ.781. Annex-D3	Test1.5	

S.No.	ParameterName	IndividualParameterName	Standard	Testno.	Applicability/ Remarks
D3.5	CCS#7MTP2Parameters	EmergencyAlignmentT4E	ITU-TQ.781. Annex-D3	Test1.19	
D3.6	CCS#7MTP3Parameters	SignallingLinkset deactivation	ITU-TQ.782. Annex-D3	Test1.2	
D3.7	CCS#7MTP3Parameters	SignallingLinksetactivation	ITU-TQ.782. Annex-D3	Test1.3	
D3.8	CCS#7MTP3Parameters	MessagewithInvalidDPC	ITU-TQ.782. Annex-D3	Test2.2	
D3.9	CCS#7MTP3Parameters	Messagewith erroneousSI	ITU-TQ.782. Annex-D3	Test2.3	
D3.10	CCS#7MTP3Parameters	AdditionalCBD	ITU-TQ.782. Annex-D3	Test4.3	
D3.11	CCS#7MTP3Parameters	Noacknowledgementtofirst CBD	ITU-TQ.782. Annex-D3	Test4.4	
D3.12	CCS#7MTP3Parameters	Inhibitionofavailablelink	ITU-TQ.782. Annex-D3	Test7.1.1	
D3.13	CCS#7MTP3Parameters	Inhibitionofunavailable link	ITU-TQ.782. Annex-D3	Test7.1.2	
D3.14	CCS#7MTP3Parameters	SignalingLinktest:After activationofalink	ITU-TQ.782. Annex-D3	Test12.1	
D3.15	CCS#7ISUPParameters	ResetReceived	ITU-TQ.784. Annex-D3	Test1.2.1	SignalingGateway
D3.16	CCS#7ISUPParameters	ResetSent	ITU-TQ.784. Annex-D3	Test1.2.2	
D3.17	CCS#7ISUPParameters	CircuitGroupResetReceived	ITU-TQ.784. Annex-D3	Test1.2.5	
D3.18	CCS#7ISUPParameters	CircuitGroupResetSent	ITU-TQ.784. Annex-D3	Test1.2.6	
D3.19	CCS#7ISUPParameters	CGBand CGUReceived	ITU-TQ.784. Annex-D3	Test1.3.1.1	
D3.20	CCS#7ISUPParameters	CGBand CGUSent	ITU-TQ.784. Annex-D3	Test1.3.1.2	
D3.21	CCS#7ISUPParameters	CircuitBlockingreceived	ITU-TQ.784.	Test1.3.2.1	

S.No.	ParameterName	IndividualParameterName	Standard	Testno.	Applicability/ Remarks
			Annex-D3		
D3.22	CCS#7ISUPParameters	CircuitBlockingsent	ITU-TQ.784. Annex-D3	Test1.3.2.2	

Annexure-D4:Figures

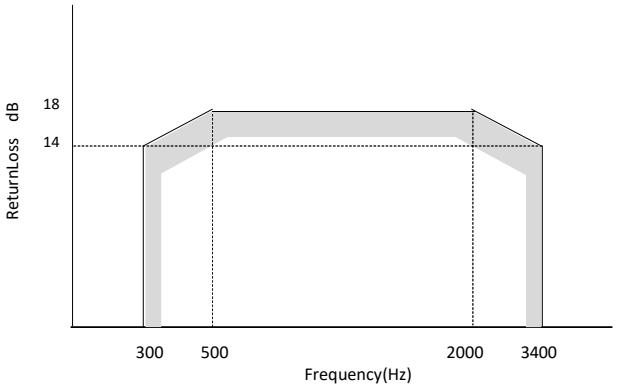


Fig.1:MinimumValueofreturnLoss

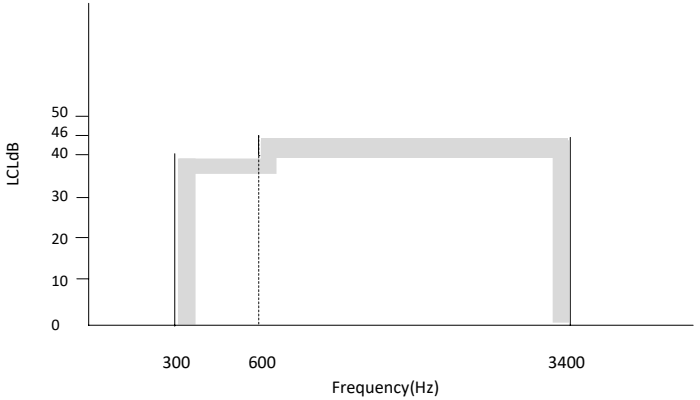


Fig.2:MinimumValueofLCL

Annexure-F: Frequency of Operation for Cellular Wireless Interfaces and EquipmentParameter Group: Cellular (CELLULAR)

S.No.	Technology	ParameterName	Standard	Limits/Values	Applicability/Remarks	TestProcedure
F.1	CDMA2000	Frequencyof Operation		LatestNFAPissued		Appendix-II

				byWPC.		Test36
F.2	2G/GSM/ GPRS/ EDGE	Frequencyof Operation		LatestNFAPissued byWPC.		Appendix-II Test36
F.3	3G/WCDMA/ HSPA	FrequencyofOperation		LatestNFAPissued byWPC.		Appendix-II Test36
F.4	4G/LTE/ LTE-A	Frequencyof Operation		LatestNFAPissued byWPC.		Appendix-II Test36
F.5	BTSwith MSR	BTSwithMSROperating Frequency		LatestNFAPissued byWPC.		Appendix-II Test36
F.6	BTSwithAAS	BTSwithAASOperating Frequency		LatestNFAPissued byWPC.		Appendix-II Test36

Annexure-F1: Radio Conformance Test for Base Transceiver Station (BTS) and Compact Cellular Network (CCN)using2G/ GSM/ GPRS/EDGE Technology

ParameterGroup:Cellular(CELLULAR)

S.No.	ParameterName	IndividualParameterName	Standard	Clause	Applicability/Remarks
F1.1	GSMBTS TransmitterParameters	Adjacentchannelpower	3GPP TS 51.021	Clause6.5	
F1.2		WidebandnoiseandintraBSSintermodulation attenuation inmulticarrieroperation	3GPP TS 51.021	Clause6.12	
F1.3		Spurious emissions from thetransmitterantennaconnector	3GPP TS 51.021	Clause6.6	
F1.4		Meantransmitted RFcarrierpower	3GPP TS 51.021	Clause6.3	
F1.5		Intermodulationattenuation	3GPP TS 51.021	Clause6.7	
F1.6		Intra Base Station Systemintermodulationattenuation	3GPP TS 51.021	Clause6.8	
F1.7		Radiatedspuriousemissions	3GPP TS 51.021	Clause8	
F1.8	GSMBTSReceiverParameters	StaticReferenceSensitivityLevel	3GPP TS 51.021	Clause7.3	
F1.9		Referenceinterferencelevel	3GPP TS 51.021	Clause7.5	
F1.10		BlockingCharacteristics	3GPP TS 51.021	Clause7.6	
F1.11		Intermodulationcharacteristics	3GPP TS 51.021	Clause7.7	
F1.12		AMsuppression	3GPP TS 51.021	Clause7.8	
F1.13		Spurious emissions from the receiverantennaconnector	3GPP TS 51.021	Clause7.9	

Annexure-F2:RadioConformanceTestforNodeBandCompactCellularNetwork(CCN)using3G/WCDMA/HSPA Technology

ParameterGroup:Cellular(CELLULAR)

S.No.	ParameterName	IndividualParameterName	Standard	Clause	Applicability/Remarks
F2.1	WCDMA NodeBTransmitterParameters	Spectrumemissionmask	3GPP TS 25.141	Clause6.5.2.1	NodeBandCCN
F2.2		Adjacent Channel Leakage Power Ratio(ACLR)	3GPP TS 25.141	Clause6.5.2.2	
F2.3		Spuriousemissions	3GPP TS 25.141	Clause6.5.3	
F2.4		Basestationoutputpower	3GPP TS 25.141	Clause6.2	
F2.5		Transmitterintermodulation	3GPP TS 25.141	Clause6.6	
F2.6	WCDMA NodeBReceiverParameters	SpuriousEmissions	3GPP TS 25.141	Clause7.7	
F2.7		Blockingcharacteristics	3GPP TS 25.141	Clause7.5	
F2.8		Intermodulationcharacteristics	3GPP TS 25.141	Clause7.6	
F2.9		AdjacentChannelSelectivity(ACS)	3GPP TS 25.141	Clause7.4	
F2.10		Referencesensitivitylevel	3GPP TS 25.141	Clause7.2	
F2.11	WCDMA NodeBHomeBTSAdjChlOpPower	Homebasestationoutputpowerforadjacentchannel protection	3GPP TS 25.141	Clause6.4.6	NodeB

Annexure-F3:RadioConformanceTestforeNodeBandCompactCellularNetwork(CCN)using4G/LTE/LTE-ATechnology

ParameterGroup:Cellular(CELLULAR)

S.No.	ParameterName	IndividualParameterName	Standard	Clause	Applicability/ Remarks
F3.1	LTEeNodeBTransmitterParameters	Operatingbandunwantedemissions	3GPP TS 36.141	Clause 6.6.3	eNodeBand CCN
F3.2		AdjacentChannel LeakagePowerRatio(ACLR)	3GPP TS 36.141	Clause 6.6.2	
F3.3		Transmitterspuriousemissions	3GPP TS 36.141	Clause 6.6.4	
F3.4		Basestationoutputpower	3GPP TS 36.141	Clause 6.2	
F3.5		Transmitterintermodulation	3GPP TS 36.141	Clause 6.7	
F3.6	LTE eNodeBReceiverParameters	Receiverspuriousemissions	3GPP TS 36.141	Clause 7.7	
F3.7		Blocking	3GPP TS 36.141	Clause 7.6	
F3.8		Receiverintermodulation	3GPP TS 36.141	Clause 7.8	
F3.9		AdjacentChannel Selectivity(ACS) andnarrow-band blocking	3GPP TS 36.141	Clause 7.5	
F3.10		Referencesensitivitylevel	3GPP TS 36.141	Clause 7.2	
F3.11	LTEeNodeBHomeBSParameters	HomeBSoutputpowerforadjacentUTRAchannel protection: Applicableto HomebaseStationonly	3GPP TS 36.141	Clause 6.2.6	eNodeB
F3.12		HomeBS outputpowerforadjacent E-UTRAchannel protection:Applicable toHomebaseStation only	3GPP TS 36.141	Clause 6.2.7	
F3.13		HomeBS outputpowerforco-channel E-UTRA protection:Applicable toHomebaseStation only	3GPP TS 36.141	Clause 6.2.8	

Annexure-F4:RadioConformanceTestforBaseStation(BS)usingMultiStandardRadio(MSR)Technology

ParameterGroup:Cellular(CELLULAR)

S.No.	Parameter Name	IndividualParameterName	Standard	Clause	Applicability/ Remarks
F4.1	BSwith MSR Transmitter Parameters	BaseStation outputpower	3GPP TS 37.141	Clause6.2	BSwithMSR
F4.2		Transmitterspuriousemissions	3GPP TS 37.141	Clause6.6.1	
F4.3		Operatingbandunwanted emissions	3GPP TS 37.141	Clause6.6.2	
F4.4		AdjacentChannel LeakagePower Ratio(ACLR)	3GPP TS 37.141	Clause6.6.4	
F4.5		Transmitterintermodulation	3GPP TS 37.141	Clause6.7	
F4.6	BSwith MSR Receiver Parameters	Receiverspuriousemissions	3GPP TS 37.141	Clause7.6	
F4.7		In-bandselectivityandblockingor In Band Blockingand Narrow bandBlocking	3GPP TS 37.141	Clause7.4	
F4.8		Out-of-bandblocking	3GPP TS 37.141	Clause7.5	
F4.9		Receiverintermodulation	3GPP TS 37.141	Clause7.7	
F4.10		Referencesensitivitylevel	3GPP TS 37.141	Clause7.2	

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

S.No.	ParameterName	IndividualParameterName	Standard	Clause	Applicability/ Remarks
F5.1	BSwithAASTransmitterParameters	BaseStation outputpower	3GPP TS 37.145-1	Clause6.2	BSwithAAS
F5.2		Spuriousemission	3GPP TS 37.145-1	Clause6.6.6	
F5.3		Operatingbandunwantedemission	3GPP TS 37.145-1	Clause6.6.5	
F5.4		AdjacentChannel LeakagePower Ratio	3GPP TS 37.145-1	Clause6.6.3	
F5.5		Spectrumemissionmask	3GPP TS 37.145-1	Clause6.6.4	
F5.6		Transmitterintermodulation	3GPP TS 37.145-1	Clause6.7	
F5.7	BSwithAASReceiverParameters	Referencesensitivitylevel	3GPP TS 37.145-1	Clause7.2	
F5.8		Adjacentchannelselectivityand narrowband blocking or In BandBlockingandNarrowbandBlocking	3GPP TS 37.145-1	Clause7.4	
F5.9		Blockingorout-of-bandblocking	3GPP TS 37.145-1	Clause7.5	
F5.10		Receiverspuriousemissions	3GPP TS 37.145-1	Clause7.6	
F5.11		Receiverintermodulation	3GPP TS 37.145-1	Clause7.7	

Annexure-F6:RadioConformanceTestforCellularWirelessRepeatersusing2G/GSMTechnology

ParameterGroup:Cellular(CELLULAR)

S.No.	ParameterName	IndividualParameterName	Standard	Clause	Applicability/Remarks
F6.1	GSMRepeaterStationParameters	OutputPower	3GPP TS 45.005	Clause4.1.2	
F6.2		Spuriousemissions	3GPP TS 51.026	Clause5	
F6.3		FrequencyError	3GPP TS 51.026	Clause8	
F6.4		IntermodulationAttenuation	3GPP TS 51.026	Clause6	
F6.5		OutofBandGain	3GPP TS 51.026	Clause7	

Annexure-F7: Radio Conformance Test for Cellular Wireless Repeaters using 3G/WCDMA ULTRA FDD TechnologyParameter Group: Cellular (CELLULAR)

S.No.	ParameterName	IndividualParameterName	Standard	Clause	Applicability/Remarks
F7.1	WCDMA Repeater StationParameters	OutputPower	3GPP TS 25.143	Clause6	
F7.2		Outofbandemission	3GPP TS 25.143	Clause9.1	
F7.3		Spuriousemissions	3GPP TS 25.143	Clause9.2	
F7.4		Inputintermodulation	3GPP TS 25.143	Clause11	
F7.5		Outofbandgain	3GPP TS 25.143	Clause8	
F7.6		AdjacentChannelRejectionRatio	3GPP TS 25.143	Clause13	
F7.8		Outputintermodulation	3GPP TS 25.143	Clause12	

Annexure-F8:RadioConformanceTestforCellularWirelessRepeatersusing4G/LTEFDDTechnology

ParameterGroup:Cellular(CELLULAR)

S.No.	ParameterName	IndividualParameterName	Standard		Applicability /Remarks
F8.1	LTE RepeaterStationParameters	OutputPower	3GPP TS 36.143 Clause6		
F8.2		Operatingbandunwantedemissions	3GPP TS 36.143 Clause 9.1		
F8.3		Spuriousemissions	3GPP TS 36.143 Clause 9.2		
F8.4		Inputintermodulation	3GPP TS 36.143 Clause 11		
F8.5		Outofbandgain	3GPP TS 36.143 Clause8		
F8.6		AdjacentChannelRejectionRatio	3GPP TS 36.143 Clause 13		
F8.7		Outputintermodulation	3GPP TS 36.143 Clause 12		

Annexure-F9:RadioConformanceTestforDeviceshavingCellularWirelessInterfaceusingCDMA2000Technology

ParameterGroup:Cellular(CELLULAR)

S.No.	Parameter Name	IndividualParameterName	Standard		Applicability/Remarks
F9.1	CDMAInt Parameters	TransmitterMaximumoutputpower	1x:S0011Clause4.4.5	EN301 908-04 (CDMA)Clause4.2.3	Test setup and testprocedure along with theequipment required toconduct test must beincluded as available forTest 39 otherwiseevaluationofapplications of Labs forCAB/CB accreditationnotpossible.
F9.2		TransmitterSpectrumemissions mask	1x:S0011 Clause4.5.1	EN301908-04 (CDMA)Clause4.2.2	Sameasabove
F9.3		Transmitterspuriousemissionsin activemode(Conducted)	1x:S0011 Clause4.5.1	EN301908-04 (CDMA)Clause4.2.2	Sameasabove
F9.4		Receiverspurious emissionin idle mode(Conducted)	1x:S0011 Clause3.6	EN301908-04 (CDMA)Clause4.2.5	Sameasabove
F9.5		ReceiverAdjacentChannelSelectivit y (ACS)		EN301908-04 (CDMA)Clause4.2.8	Sameasabove
F9.6		Receiver In-bandblocking		EN301 908-04 (CDMA)Clause4.2.6	Sameasabove
Thefollowingparameter"FrequencyStability"and"PowercontrolAbsolutePowerTolerance"shallbeapplicableforEndPointDevicesforEnvironmental Mentoring only.					
F9.7		FrequencyStability	1x:S00114.1	EN301908-04 (CDMA)	Compliancetogiven Standard Testsetupandtest procedurealongwith the equipmentrequiredto conducttestmustbe includedasavailablefor Test39otherwise evaluationofapplications

					ofLabsforCAB/CB accreditationnotpossible.
F9.8		ReceiverReferenceSensitivity Level		EN301908-04 (CDMA)	Compliancetogiven Standard Testsetupandtest procedurealongwith the equipmentrequiredto conducttestmustbe includedasavailablefor Test39otherwise evaluationofapplications ofLabsforCAB/CB accreditationnotpossible.

Annexure-F10: Radio Conformance Test for Devices having Cellular Wireless Interface using GSM/ GPRS/ EDGE TechnologyParameter Group: Cellular (CELLULAR)

S.No.	ParameterName	IndividualParameterName	Standard		Applicability/Remarks
F10.1	GSMInt Parameters	TransmitterMaximumoutputpower	3GPP TS 51 010-1 Clause13.3	EN301 511 (GSM)Clause 4.2.5	GSM Testsetupandtest procedurealongwith theequipmentrequired toconducttest mustbe includedasavailablefor Test39otherwise evaluationof applicationsof Labsfor CAB/CBaccreditation notpossible.
F10.2		TransmitterMaximumoutputpower	3GPP TS 51 010-1 Clause13.16.2	EN301 511 (GSM)Clause 4.2.10	GPRS/EDGE Sameasabove.
F10.3		OutputRFSpectrum	3GPP TS 51 010-1 Clause13.4	EN301 511 (GSM)Clause 4.2.6	GSM Sameasabove.
F10.4		OutputRFSpectrum	3GPP TS 51 010-1 Clause13.16.3	EN301 511 (GSM)Clause 4.2.11	GPRS/EDGE Sameasabove.
F10.5		Spuriousemissions(MSallocateda channel)	3GPP TS 51 010-1 Clause12.1.1	EN301 511 (GSM)Clause 4.2.12	GSM Sameasabove.
F10.6		Spuriousemission(MS inidlemode)	3GPP TS 51 010-1 Clause12.1.2	EN301 511 (GSM)Clause 4.2.13	GSM Sameasabove.
F10.7		FrequencyErrorandphaseerror	3GPP TS 51 010-1 Clause13.1	EN301 511 (GSM)Clause 4.2.1	GSM Sameasabove.

S.No.	ParameterName	IndividualParameterName	Standard		Applicability/Remarks
F10.8		FrequencyErrorandphaseerror	GPRS:3GPPTS51 010-1Clause13.16.1	EN301 511 (GSM)Clause 4.2.4	GPRS/EDGE Sameasabove.
F10.9		Referencesensitivitylevel (speech channels)	3GPP TS 51 010-1 Clause14.2.1	EN301 511 (GSM)Clause 4.2.42	GSM Sameasabove.
F10.10		AdjacentChannelRejection(speech channels)	3GPP TS 51 010-1 Clause14.5.1	EN301 511 (GSM) Clause4.2.38	GSM Sameasabove.
F10.11		Receiverblocking	3GPP TS 51 010-1 Clause14.7.1	EN301 511 (GSM)Clause 4.2.20	GSM Sameasabove.

Annexure-F11: Radio Conformance Test for Devices having Cellular Wireless Interface using WCDMA/ HSPA TechnologyParameter Group: Cellular (CELLULAR)

S.No.	ParameterName	IndividualParameterName	Standard		Applicability/Remarks
F11.1	WCDMAInt Parameters	TransmitterMaximumoutputpower	3GPP TS 34.121-1 Clause5.2	EN301908-2 (UMTS)Clause 4.2.2	Testsetupandtest procedurealongwith theequipmentrequired toconducttest mustbe includedasavailable forTest 39otherwise evaluationof applicationsof Labsfor CAB/CBaccreditation notpossible.
F11.2		TransmitterSpectrumemissionsmask	3GPP TS 34.121-1 Clause5.9	EN301908-2 (UMTS)Clause 4.2.3	Sameasabove
F11.3		Transmitterspuriousemissions	3GPP TS 34.121-1	EN301908-2 (UMTS)Clause	Sameasabove

S.No.	ParameterName	IndividualParameterName	Standard		Applicability/Remarks
			Clause5.11	4.2.4	
F11.4		Receiverspuriousemission	3GPP TS 34.121-1 Clause6.8	EN301908-2 (UMTS) Clause4.2.10	Sameasabove
F11.5		TransmitterMinimumOutputPower	3GPP TS 34.121-1 Clause5.4.3	EN301908-2 (UMTS) Clause4.2.5	Sameasabove
F11.6		ReceiverReferencesensitivitylevel	3GPP TS 34.121-1 Clause6.2	EN301908-2 (UMTS) Clause4.2.13	Sameasabove
F11.7		Receiver Adjacent Channel Selectivity(ACS)	3GPP TS 34.121-1 Clause6.4	EN301908-2 (UMTS) Clause4.2.6	Sameasabove
F11.8		Receiver In-bandblocking	3GPP TS 34.121-1 Clause6.5.2.1	EN301908-2 (UMTS) Clause4.2.7	Sameasabove
Thefollowingparameter"FrequencyStability"shallbeapplicableforEndPointDevicesforEnvironmentalMentoringonly.					
F11.9		FrequencyStability	3GPP TS 34.121-15.3	EN301908-2 (UM3GPPTS)	Compliancetogiven Standard.

Annexure-F12: Radio Conformance Test for Devices having Cellular Wireless Interface using LTE/ LTE-A TechnologyParameter Group: Cellular (CELLULAR)

S.No.	Parameter Name	IndividualParameterName	Standard		Applicability/Remarks
F12.1	LTEIntParameters	Maximumoutputpower	3GPP TS 36.521-1 Clause6.2.2	EN301908-13(LTE) Clause4.2.2	Test setup and test procedurealong with the equipmentrequired to conduct test mustbe included as available forTest 39 otherwise evaluationof applications of Labs forCAB/CBaccreditationnot possible.
F12.2		Spectrumemissionsmask	3GPP TS 36.521-1 Clause6.6.2.1	EN301908-13(LTE) Clause4.2.3	Sameasabove
F12.3		Spuriousemissions	3GPP TS 36.521-1 Clauses6.6.3.1,6.6.3.2, 6.6.3.3	EN301908-13(LTE) Clause4.2.4	Sameasabove
F12.4		Receiverspuriousemission	3GPP TS 36.521-1 Clause7.9	EN301908-13(LTE) Clause4.2.10	Sameasabove
F12.5		ReceiverReference Sensitivitylevel	3GPP TS 36.521-1 Clause7.3	EN301908-13(LTE) Clause4.2.12	Sameasabove
F12.6		ReceiverAdjacentChannelSelectivity (ACS)	3GPP TS 36.521-1 Clause7.5	EN301908-13(LTE) Clause4.2.6	Sameasabove
F12.7		Receiver In-bandblocking	3GPP TS 36.521-1 Clause7.6.1	EN301908-13(LTE) Clause4.2.7	Sameasabove
Thefollowingparameter"FrequencyStability"and"PowercontrolAbsolutePowerTolerance"shallbeapplicableforEndPoint DevicesforEnvironmentalMentoringonly.					
F12.8		FrequencyStability	3GPP TS 36.521-1 6.5	EN301908-13(LTE)	Compliancetogiven Standard.
F12.9		PowercontrolAbsolute PowerTolerance	3GPP TS 36.521-1 6.3.5.1	EN301908-13(LTE)	Compliancetogiven Standard.

Annexure-G1: Parameters for Radio Interfaces for equipment operating in delicensed frequency bandsParameter Group: RadioConformance(RADCONF)

S.No.	ParameterName	Standard/ Parameter	Limits/Values	Applicability/Remarks
G1.1	Frequencyfor WiFi equipment	DoT WPCGSR No.45(E),1048(E)	**2.4GHZBand:** 2.4-2.4835 GHz as per WPCGSR45(E) **5GHzBand:** 5.150-5.250GHz, 5.250-5.350GHz, 5.470-5.725 GHz, 5.725-5.875 GHz as perWPCGSR 1048(E)	WifiInterface Testprocedureasper Appendix-IITest-1
G1.2	FrequencyforPTP/PMPRadioInterface	DoT WPCGSR No.45(E),1048(E)	**2.4GHZBand:** 2.4-2.4835 GHz as per WPCGSR45(E) **5GHz Band**: 5.150-5.350GHz, 5.250-5.350GHz, 5.470-5.725 GHz, 5.725-5.875 GHz as perWPCGSR 1048(E)	PTP/ PMP Wireless Access EquipmentTestprocedureasper Appendix-IITest-1

Annexure-G2: Parameters for Radio Interfaces for equipment operating in delicensed frequency bandsParameter Group: Radio Conformance(RADCONF)

S.No.	ParameterName	Standard/Parameter	Limits/Values	Remarks
G2.1	EIRPforallequipmentoperating in 2.4 GHz	Latest NFAP and GSRsissued byDoTWPC	≤4 W foroutdoorusage ≤200mWforindoorusageNote: *EIRP requirements shall be as per the latest NFAP andGSRsissuedbyWPC,DoTandtherequirementsinNFAPandGSRs supersedetherequirementslistedhere.*	Wifi Interface & PTP/PMPWireless Access Equipment in 2.4GHz TestingasperEN300328orAppendix-IITest-1
G2.2	EIRPforRLAN/WLAN equipmentoperatingin5	LatestNFAPand GSRs issued byDoT WPC	Maximum conducted output power andAntennaGainasper limitsmentionedin **WPC**	WifiInterface Testingas per EN301893 or

S.No.	ParameterName	Standard/Parameter	Limits/Values	Remarks
	GHz		**GSR 1048(E)** based on type of equipment, itsoperational/deploymentcharacteristicsandspecific condition related to Antenna Gain fordifferentfrequencybands i.e.**5.150-5.250GHz,5.250-5.350GHzand5.470-5.725GHzand5.725-5.875GHz**. **EIRPlimit=**Maximumconductedoutputpower+ AntennaGain Note: *EIRP requirements shall be as per the latest NFAP andGSRsissuedbyWPCandtherequirementsinNFAPandGSRssuperseded therequirementslisted here.*	Appendix-IITest-1
G2.3	EIRP for PTP/ PMP fixedRadiosystemsoperatingin5GHz	Latest NFAP and GSRsissued byDoTWPC	MaximumconductedoutputpowerandAntenna Gain as per limits mentioned in **WPCGSR 1048(E)** based on type of equipment, itsoperational/deploymentcharacteristicsandspecific condition related to Antenna Gain fordifferentfrequencybands i.e.**5.150-5.250GHz,5.250-5.350GHzand5.470-5.725GHzand5.725-5.875GHz**. **EIRPlimit=**Maximumconductedoutputpower+ AntennaGain Note: *EIRP requirements shall be as per the latest NFAP andGSRsissuedbyWPCandtherequirementsinNFAPandGSRssuperseded therequirementslisted here.*	PTP/PMP Wireless AccessEquipmentin 5 GHz Testing as per EN 302 502 orAppendix-IITest-1
G2.4	EIRPforCordlessTelephone	WPCGSR		CordlessPhone

Annexure-G3: Parameters for Radio Interfaces for equipment operating in delicensed frequency bandsParameter Group: Radio Conformance(RADCONF)

S.No.	ParameterName	Standard/Parameter	Applicability/Limits/Values	Remarks
G3.1	Radio Conformance for all WiFiequipmentoperatingin2.4 GHz	EN300 328 or FCCCFR47Part 15.247or FCCCFR47Part 15.249	**Referin EN 300 328:-** **Clause 4.2** -Applicable category of equipmenton basis of FHSSandnonFHSS **Clause 4.3 and sub clauses**– Conformancetestsaspercategoryinclause4.2withlimitsin sub clauses **Clause5**– Testmethods	Wifi Interface & PTP/PMPWireless Access Equipment in 2.4GHz
G3.2	Radio Conformance forRLAN/WLAN WiFi equipmentoperatingin 5 GHz	EN301 893 or FCC CFR47 Part15.409 or FCC CFR47 Part15.249	TestrequirementsandlimitsforasperEN301 893 forfrequencybands i.e.**5.150-5.250GHz,5.250-5.350GHzand5.470-5.725GHzand5.725-5.875GHz*** TestrequirementsandlimitsasperFCCCFR47 15.409 for**5.150-5.250GHz,5.250-5.350GHzand5.470-5.725GHz** Testrequirementsandlimitsasper FCCCFR47Part15.249**for5.725-5.875 GHz**	WifiInterface
G3.3	Radio Conformance for PTP/PMPWireless Access Equipmentoperatingin 5 GHz	EN302 502 or FCC CFR47 Part15.249	Exceptclauses4.2.4, 4.2.6 and4.2.8 ofEN 302502in**5.725-5.875GHz band)** Testrequirementsandlimitsasper FCCCFR47Part15.249**for5.725-5.875 GHz**	Wifi Interface & PTP/PMPWireless Access Equipment in 5GHz

***Note–StandardETSIEN301893doesn't directlyrefertofrequencyband5.725-5.875GHzbutthesamemaybereferredforlimitsforconformance testing for5.725-5.875 GHzbandas well.**

Annexure-G4BluetoothLowEnergy(BLE)/ZigBee/6LowPANworkingfrequencyband2.400to2.4835GHz

S. No.	ParameterName	Standard/Parameter	Applicability/Limits/Values	Remarks
G4.1	FrequencyofOperationofInterface	LatestNFAP Annexure-1	2.4 GHzto2.4835 GHz (Asper WPCGSR 45(E))	TestSetupNo.41
G4.2	EIRPforInterface	ETSIEN300328V2.2.2 (2019-07)	≤ 4W (36 dBm) AsperWPCGSR 45(E)	TestSetupNo.42 (Test as per ETSI EN 300328V2.2.2(2019-07)clause 5.4.2.2)
G4.3	Maximum Transmit Power / RFOuput Power of Interface	ETSIEN300328V2.2.2 (2019-07)	≤ 1W(30dBm) AsperWPCGSR 45(E) (ETSIEN300328V2.2.2(2019-07)clause 4.3.1.2or4.3.2.2maybereferred)	TestSetupNo.42 (Test as per ETSI EN 300328V2.2.2(2019-07)clause 5.4.2.2)
G4.4	PowerSpectralDensity	ETSIEN300328V2.2.2 (2019-07)	AsperETSI EN300328 V2.2.2(2019-07)clause4.3.2.3 (*Onlyfornon-FHSSequipment)*	(TestasperETSI EN300328V2.2.2 (2019-07)clause5.4.3)
G4.5	Dutycycle,Tx-Sequence,Tx-gap	ETSIEN300328V2.2.2 (2019-07)	AsperETSI EN300328 V2.2.2(2019-07)clause4.3.1.3or4.3.2.4 *(Onlyfornon-Adaptiveequipment)*	(TestasperETSI EN300328V2.2.2 (2019-07)clause5.4.2)
G4.6	Accumulated Transmit time,FrequencyOccupation&HoppingSequence	ETSIEN300328V2.2.2 (2019-07)	AsperETSI EN300328 V2.2.2(2019-07)clause4.3.1.4 *(OnlyforFHSSequipment)*	(TestasperETSI EN300328V2.2.2 (2019-07)clause5.4.4)

S. No.	ParameterName	Standard/ Parameter	Applicability/Limits/Values	Remarks
G4.7	HoppingFrequencySeparation	ETSIEN300328V2.2.2 (2019-07)	AsperETSI EN300328 V2.2.2(2019-07)clause4.3.1.5 *(OnlyforFHSSequipment)*	(TestasperETSI EN300328V2.2.2(2019-07)clause 5.4.5)
G4.8	MediumUtilization(MU)factor	ETSI EN 300 328V2.2.2 (2019-07)	AsperETSI EN300328 V2.2.2(2019-07)clause4.3.1.6 or4.3.2.5 *(Onlyfornon-Adaptiveequipment)*	(TestasperETSI EN300328V2.2.2 (2019-07)clause5.4.2)
G4.9	Adaptivity	ETSIEN300328V2.2.2 (2019-07)	AsperETSI EN300328 V2.2.2(2019-07)clause4.3.1.7or4.3.2.6 *(OnlyforAdaptiveequipment)*	(TestasperETSI EN300328V2.2.2 (2019-07)clause5.4.6)
G4.10	OccupiedChannelBandwidth	ETSIEN300328V2.2.2 (2019-07)	AsperETSI EN300328 V2.2.2(2019-07)clause4.3.1.8or4.3.2.7	(TestasperETSI EN300328V2.2.2 (2019-07)clause5.4.7)
G4.11	TransmitterunwantedemissionintheOOBdomain	ETSIEN300328V2.2.2 (2019-07)	AsperETSI EN300328 V2.2.2(2019-07)clause4.3.1.9or4.3.2.8	(TestasperETSI EN300328V2.2.2 (2019-07)clause5.4.8)
G4.12	Transmitter unwanted emissions inthespuriousdomain	ETSIEN300328V2.2.2 (2019-07)	AsperETSI EN300328 V2.2.2(2019-07)clause4.3.1.10or 4.3.2.9	(TestasperETSI EN300328V2.2.2 (2019-07)clause5.4.9)
G4.13	Receiverspuriousemissions	ETSIEN300328V2.2.2 (2019-07)	AsperETSI EN300328 V2.2.2(2019-07)clause4.3.1.11or 4.3.2.10	(TestasperETSI EN300328V2.2.2 (2019-07)clause5.4.10)
G4.14	ReceiverBlocking	ETSIEN300328V2.2.2 (2019-07)	AsperETSI EN300328 V2.2.2(2019-07)clause4.3.1.12or 4.3.2.11	(TestasperETSI EN300328V2.2.2 (2019-07)clause5.4.11.2)

S. No.	ParameterName	Standard/ Parameter	Applicability/Limits/Values	Remarks
G4.15	Geo-locationcapability	ETSIEN300328V2.2.2 (2019-07)	AsperETSI EN300328 V2.2.2(2019-07)clause4.3.1.13or 4.3.2.12 *(Only for equipment with geo-locationcapability)*	

Annexure-G5LoRa/SigFox/RFID/RFMeshworkinginfrequencyband865MHzto867MHz

S. No.	ParameterName	Standard/Par ameter	Applicability/Limits/Values	Remarks
G5.1	Frequency of Operation ofInterface	LatestNFAP Annexure-1	865MHzto867MHz (Asper WPCGSR564(E))	
G5.2	EIRPforInterface	ETSIEN300220-2 V3.2.1(2018-06)	<4W AsperWPCGSR564(E)	Test as per ETSI EN300220-1V3.1.1clause5.2.2
G5.3	MaximumTransmitPower	ETSIEN300220-2 V3.2.1(2018-06)	<1W AsperWPCGSR564(E)	Test as per ETSI EN300220-1V3.1.1clause5.2.2
G5.4	Unwanted emissions in the spuriousdomain	ETSIEN300220-2 V3.2.1(2018-06)	AsperETSIEN300220-2 V3.2.1clause4.2.2	Test as per ETSI EN300220-1V3.1.1clause5.9.3
G5.5	TXeffectiveradiatedpower	ETSIEN300220-2 V3.2.1(2018-06)	AsperETSIEN300220-2 V3.2.1clause4.3.1	Test as per ETSI EN300220-1V3.1.1clause5.2.2

S. No.	ParameterName	Standard/ Parameter	Applicability/Limits/Values	Remarks
G5.6	TXMaximume.r.pspectraldensity	ETSIEN300220-2 V3.2.1(2018-06)	AsperETSIEN300220-2 V3.2.1clause4.3.2 *(Applies to EUT using annex B bands I, L. AppliestoEUTusingDSSSor widebandtechniquesother thanFHSSmodulation,usingannex CbandX.)*	Test as per ETSI EN300220-1V3.1.1clause5.3.2
G5.7	TXDutycycle	ETSIEN300220-2 V3.2.1(2018-06)	AsperETSIEN300220-2 V3.2.1clause4.3.3 *(Not applicable to EUT with polite spectrumaccess wherepermittedinannex B,tableB.1or annexC,tableC.1or anyNRI.)*	Test as per ETSI EN300220-1V3.1.1clause5.5.2
G5.8	TX Occupied bandwidth / Carrierbandwidth	ETSIEN300220-2 V3.2.1(2018-06)	200KHz (AsperGSR564(E)) (Ref:ETSIEN300220-2 V3.2.1clause4.3.4)	Test as per ETSI EN300220-1V3.1.1clause5.6.3
G5.9	TXoutof bandemissions	ETSIEN300220-2 V3.2.1(2018-06)	AsperETSIEN300220-2 V3.2.1clause4.3.5 (*Applies toEUTwithOCW> 25kHz.)*	Test as per ETSI EN300220-1V3.1.1clause5.8.3
G5.10	TXTransient	ETSIEN300220-2 V3.2.1(2018-06)	AsperETSIEN300220-2V3.2.1clause4.3.6	Test as per ETSI EN300220-1V3.1.1clause5.10.3
G5.11	TXAdjacentchannelpower	ETSIEN300220-2 V3.2.1(2018-06)	AsperETSIEN300220-2V3.2.1clause4.3.7 *(Applies to EUTwith OCW≤ 25kHz)*	Test as per ETSI EN300220-1V3.1.1clause5.11.3
G5.12	TX behaviour under low voltageconditions	ETSIEN300220-2 V3.2.1(2018-06)	AsperETSIEN300220-2V3.2.1clause4.3.8 *(Applies tobatterypoweredEUT.)*	Test as per ETSI EN300220-1V3.1.1clause5.12.3
G5.13	TXAdaptivepowercontrol	ETSIEN300220-2 V3.2.1(2018-06)	AsperETSIEN300220-2V3.2.1clause4.3.9 (*Applies to EUT with adaptive power control usingannex CbandAA.*)	Test as per ETSI EN300220-1V3.1.1clause5.13.3

S. No.	ParameterName	Standard/ Parameter	Applicability/Limits/Values	Remarks
G5.14	TXFHSS	ETSIEN300220-2 V3.2.1(2018-06)	AsperETSIEN300220-2V3.2.1clause4.3.10 *(AppliestoFHSSEUT)*	Declaration to be made byManufactureras per ETSIEN 300220-2V3.1.1 clause4.3.10.3
G5.15	TXShorttermbehaviour	ETSIEN300220-2 V3.2.1(2018-06)	AsperETSIEN300220-2V3.2.1clause4.3.11 (*Applies to EUT using annex C bands Y, Z, AA, AB,AC, AD*)	Test as per ETSI EN300220-1 clause5.5.2
G5.16	RXsensitivity	ETSIEN300220-2 V3.2.1(2018-06)	AsperETSIEN300220-2V3.2.1clause4.4.1 *(Applies to EUTwith politespectrumaccess.)*	TestasperETSIEN300220-1 clause5.14.3
G5.17	Clearchannelassessmentthreshold	ETSIEN300220-2 V3.2.1(2018-06)	AsperETSIEN300220-2V3.2.1clause4.5.2 *(Applies to EUTwith politespectrumaccess.)*	TestasperETSIEN300220-1 V3.1.1clause 5.21.2.3
G5.18	Polite spectrum access timingparameters	ETSIEN300220-2 V3.2.1(2018-06)	AsperETSIEN300220-2V3.2.1clause4.5.3 *(Applies to EUTwith politespectrumaccess.)*	TestasperETSIEN300220-1 V3.1.1clause 5.21.3.2
G5.19	RX Blocking	ETSIEN300220-2 V3.2.1(2018-06)	AsperETSIEN300220-2V3.2.1clause4.4.2	Test as per ETSI EN300220-1V3.1.1clause5.18.6
G5.20	AdaptiveFrequencyAgility	ETSIEN300220-2 V3.2.1(2018-06)	AsperETSIEN300220-2V3.2.1clause 4.5.4 *(Applies to EUTwith AFA.)*	Test as per ETSI EN300220-1V3.1.1clause5.21.4

Annexure-G6 RFID/ NFCworkinginfrequencybands50KHzto200KHzor13.553 MHzto13.567MHz

S. No.	ParameterName	Standard/Parameter	Applicability/Limits/Values	Remarks
G6.1	Frequency of Operation ofInterface	Latest NFAPAnnexure-1	50KHzto200KHz (Asper WPCGSR90(E)) And/OR 13.553MHzto13.567MHz(Asper WPCGSR884(E))	Test as per ETSI EN 300 330V2.1.1(2017-02)clause6.2.2.
G6.2	Permittedrangeofoperatingfrequencies	Latest NFAPAnnexure-1	50KHzto200KHz And/OR 13.553MHzto13.567MHz	AsperETSIEN300330V2.1.1 (2017-02) clause 4.3.1, thepermitted range of operatingfrequencies used by the EUTshallbedeclared bythe manufacturer.
G6.3	Modulationbandwidth	ETSIEN300330 V2.1.1(2017-02)	AsperETSIEN300330V2.1.1(2017-02)clause 4.3.3	Test as per ETSI EN 300 330V2.1.1(2017-02)clause6.2.3.
G6.4	TransmitterH-fieldrequirements	ETSIEN300330 V2.1.1(2017-02)	50KHzto200KHz (Asper WPCGSR90(E)) OR 13.553MHzto13.567MHz(AsperWPCGSR884(E)) (Ref:ETSIEN300330V2.1.1(2017-02)clause 4.3.4)	Test as per ETSI EN 300 330V2.1.1(2017-02)clause6.2.4.
G6.5	TransmitterRFcarriercurrent	ETSIEN300330 V2.1.1(2017-02)	AsperETSIEN300330V2.1.1(2017-02)clause 4.3.5 *(Onlyforequipmentunderclass 3inclause 6.1.2)*	Test as per ETSI EN 300 330V2.1.1(2017-02)clause6.2.5.

S. No.	ParameterName	Standard/Parameter	Applicability/Limits/Values	Remarks
G6.6	TransmitterradiatedE-field	ETSIEN300330 V2.1.1(2017-02)	AsperETSIEN300330V2.1.1(2017-02)clause 4.3.6 *(Onlyforequipmentunderclass 3 inclause6.1.2)*	Test as per ETSI EN 300 330V2.1.1(2017-02)clause6.2.6.
G6.7	Transmitter conducted spuriousemissions	ETSIEN300330 V2.1.1(2017-02)	AsperETSIEN300330V2.1.1(2017-02)clause 4.3.7 *(Onlyforequipmentunderclass 3 inclause6.1.2)*	Test as per ETSI EN 300 330V2.1.1(2017-02)clause6.2.7.
G6.8	Transmitter radiated spurious domainemissionlimits<30MHz	ETSIEN300330 V2.1.1(2017-02)	AsperETSIEN300330V2.1.1(2017-02)clause 4.3.8	Test as per ETSI EN 300 330V2.1.1(2017-02)clause6.2.8.
G6.9	Transmitter radiated spurious domainemissionlimits>30MHz(NA)	ETSIEN300330 V2.1.1(2017-02)	AsperETSIEN300330V2.1.1(2017-02)clause 4.3.9 (*For equipment under class 1, 2 and 4 in clause6.1.2)*	Test as per ETSI EN 300 330V2.1.1(2017-02)clause6.2.9
G6.10	TransmitterFrequencystability	ETSIEN300330 V2.1.1(2017-02)	AsperETSIEN300330V2.1.1(2017-02)clause 4.3.10 *(Onlyforchannelizedsystems)*	Test as per ETSI EN 300 330V2.1.1(2017-02)clause6.2.10
G6.11	Receiverspuriousemissions	ETSIEN300330 V2.1.1(2017-02)	AsperETSIEN300330V2.1.1(2017-02)clause 4.4.2 *(Does only apply to receivers which a not co-locatedwith transmitters)*	Test as per ETSI EN 300 330V2.1.1(2017-02)clause6.3.1
G6.12	Adjacentchannelselectivity	ETSIEN300330 V2.1.1(2017-02)	AsperETSIEN300330V2.1.1(2017-02)clause 4.4.3 *(Onlyforchannelizedsystemsinclause4.4.1)*	Test as per ETSI EN 300 330V2.1.1(2017-02)clause6.3.2

S. No.	ParameterName	Standard/Parameter	Applicability/Limits/Values	Remarks
G6.13	Receiverblockingordesensitization	ETSIEN300330 V2.1.1(2017-02)	AsperETSIEN300330V2.1.1(2017-02)clause 4.4.4 *(Notfortaggingsystemsinclause4.4.1)*	Test as per ETSI EN 300 330V2.1.1(2017-02)clause6.3.3

Annexure-H: Ethernet Interface

ParametersParameterGroup:EthernetInterface(INTETH)

S. No.	InterfaceName	ParameterName	Standard	Limits/Values	Applicability/Remarks
H.1	Gigabit EthernetElectricalor101001000BaseTEthernet	LinkSpeedandAutoNegotiationGE	IEEE802.3		Appendix-II,Test4
H.2	FastEthernetElectricalor 10/100 Base TEthernet	LinkSpeedandAutoNegotiationforGE	IEEE802.3		Appendix-II,Test4
H.3	GigabitEthernetOptical	AverageLaunchpowerfor1GEOpt	clause 38.3.1 TransmitteropticalspecificationsofIEEE 802.32008Sec-3,ShortHaul	Maxshallbelesserofclass 1 safety limit as defby 38.7.2 or avgreceivepower(max)defbytable38-4 Min=-9.5dBm	
			clause38.4.1 Transmitteropticalspecifications ofIEEE802.32008 Section-3,LongHaul	Max=-3dBmMin=-11.5	
H.4	GigabitEthernetOptical	Wavelengthfor1GEOpt	IEEE802.3zCL.38,Short Haul	770–860nm	
			IEEE802.3zCL.38,Long Haul	1270–1335nm	
H.5	GigabitEthernetOptical	ReceiverSensitivity1GEOpt	clause 38.3.2 Receiveropticalspecifications ofIEEE802.32008 Section-3,shorthaul	-17dBm	
			38.4.2,longhaul	-19dBm	
H.6	10GigabitEthernetOptical	Wavelengthfor10GEInt	IEEE802.3aeCl52,Short Haul	840-860nm	
			IEEE802.3aeCl52,Long Haul	1260–1355nm	

S. No.	InterfaceName	ParameterName	Standard	Limits/Values	Applicability/Remarks
H.7	10GigabitEthernetOptical	ReceiverSensitivityfor10GEInt	table52-9forSR,52-13forLR and 52-17 for ER ofIEEE802.3ae specifications,SR	-11.1dBm	
			LR	-12.6dBm	
H.8	10GigabitEthernetOptical	AverageLaunchpowerfor10GEOpt	table 52-7 for SR, 52-12 forLR and 52-16 for ER ofIEEE802.3aespecifications,Short Haul	Max shall be lesser ofclass1safetylimitasdefby 52.10.2 or the avgreceive power(max) defby table52-9 Min=-7.3dBm	
			LongHaul	Max=0.5dBm Min=-8.2dBm	
H.9	40GigabitEthernetOptical	AverageLaunchpowerfor40GEOpt	Table86-6forSR4 and87-7 for LR4 of IEEE 802.3baspecifications, SR4	Max= 2.4dBmMin=-7.6dBm	
			IEEE802.3baLR4	Max=2.3dBmMin =-7dBm	
H.10	40GigabitEthernetOptical	Wavelengthfor40GEOpt	IEEE802.3ba,SR4	840– 860nm	
			IEEE802.3ba,LR4	1264.5to1277.5 1284.5to1297.5 1304.5to1317.5 1324.5to1337.5	
H.11	40GigabitEthernetOptical	ReceiverSensitivity40GEOpt	Table86-8forSR4 and87-8 for LR4 of IEEE 802.3baspecifications, SR4	-5.4dBm	
			LR4	-11.5dBm	
H.12	100GigabitEthernetOptical	Average Launch power for100 GEOpt	Table86-6forSR10, 88-7forLR4/ER4ofIEEE802.3ba	Max= 2.4dBmMin=-7.6dBm	

S. No.	InterfaceName	ParameterName	Standard	Limits/Values	Applicability/Remarks
			specifications,SR4		
			LR4	Max = 4.5 dBmMin=-4.3dBm	
H.13	100GigabitEthernetOptical	Wavelengthfor100GEOpt	IEEE802.3ba,SR10	840– 860nm	
			LR4	1294.53to1296.59nm 1299.02to1301.09nm 1303.54to1305.63nm 1308.09to1310.19nm	
H.14	100GigabitEthernetOptical	ReceiverSensitivity100GEOpt	Table86-8forSR100,88-8 for LR4/ER4 ofIEEE802.3ba specifications,SR4	-5.4dBm	
			LR4	-8.6dBm	
H.15	FastEthernetOptical	Average Launch power forFEOpt	IEEE802.3u		
H.16	FastEthernetOptical	WavelengthforFEOpt	IEEE802.3u		
H.17	FastEthernetOptical	ReceiverSensitivityforFEOpt	IEEE802.3u		

Annexure-I: PDH Interface

ParametersParameterGroup:PDHInterface(INTPDH)

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Applicability/Remarks
I.1	2Mbps-E1	InputJitterTolerancefor2MBPS Int	G.823, ETSITBR-4	Fig13,ClauseNo.-7.1.2	
I.2	2Mbps-E1	InputReturnLoss for2MBPS Int	G.703,ETSITBR-4Cl. 9.3.1	51to 102(KHz)-12dB 102to 2048(KHz)-18dB 2048to3072(KHZ)-14dB	
I.3	2Mbps-E1	NominalBitRatewithTolerance2MBPS Int	G.703, ETSITBR-4 Cl. 9.2.3	2048Kbps	
I.4	2Mbps-E1	OutputJitterfor2MBPSInt	G.823, ETSITBR-4	20 to100 kHz-1.5(UIpp) 18 k to 100kHz-0.2(UIpp)	
I.5	2Mbps-E1	PulseMaskfor2MBPSInt	G.703,ETSITBR-4	Figure11-1,clause-11.2	
I.6	ISDNPRI	InputJitterTolerancefor PRI	G.823, I.431,ETSI TBR-4		
I.7	ISDNPRI	InputReturnLossforPRI	G.703, Cl. 11.3,ETSITBR-4 Cl. 9.3.1		
I.8	ISDNPRI	BitRateTolerancePRI	G.703, Cl. 11.1,ETSITBR-4 Cl. 9.2.3		
I.9	ISDNPRI	OutputJitter forPRI	G.823, I.431,ETSI TBR-4		
I.10	ISDNPRI	Pulse Mask forPRI	G.703, Cl. 11.2,ETSITBR-4 Cl. 9.2.1		
I.11	8Mbps-E2	InputJitterTolerancefor8MBPS Int	G.823	Fig14,clause7.1.3	

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Applicability/Remarks
I.12	8Mbps-E2	InputReturnLoss for8MBPS Int	G.703	211to422(KHz)-12dB 422to8448(KHz)-18dB 8448to12672(KHZ)-14dB	
I.13	8Mbps-E2	NominalBitRatewith Tolerance8MBPS Int	G.703	8448kbit/s	
I.14	8Mbps-E2	OutputJitterfor8MBPSInt	G.823	20 to400 kHz-1.5(UIpp) 3 k to 400 kHz-0.2(UIpp)	
I.15	8Mbps-E2	PulseMaskfor8MBPSInt	G.703	Figure12-1,clause-12.2	
I.16	34Mbps-E3I	InputJitterTolerancefor34MBPS Int	G.823	Fig15clause-7.1.4	
I.17	34Mbps-E3I	InputReturnLoss for34MBPS Int	G.703	860to1720(KHz)-12dB 1720to 34368(KHz)-18dB 34 368 to 51 550(KHZ)-14dB	
I.18	34Mbps-E3I	NNominalBitRatewithTolerance34 MBPSInt	G.703	34368 kbit/s	
I.19	34Mbps-E3I	OutputJitterfor34MBPSInt	G.823	100 to800 kHz-1.5(UIpp) 10 k to 800 kHz-0.15(UIpp)	
I.20	34Mbps-E3I	PulseMaskfor34MBPS Int	G.703	Figure13-1,clause-13.2	
I.21	64Kbps	InputJitterTolerancefor64KBPS Int	G.823	Figure12, clause-7.1.1	

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Applicability/Remarks
I.22	64Kbps	InputReturnLossfor64 KBPSInt	G.703	4to13(KHz)-12dB 13to256(KHz)-18dB 256to384(KHz)-14dB	
I.23	64Kbps	NominalBitRatewithTolerance64 KBPSInt	G.703	64kbit/s	
I.24	64Kbps	OutputJitterfor64KBPS Int	G.823	20to20k -0.25(UIpp) 3 k to 20 kHz-0.05(UIpp)	
I.25	64Kbps	PulseMaskfor64KBPSInt	G.703	Figure6-5,clause-6.2.1.2	
I.26	NX64 Kbps	InputJitterToleranceforNX64KBPS Int	G.823,ETSITBR-4 Cl. 9.3.3	Figure12, clause-7.1.1	
I.27	NX64 Kbps	InputReturnLoss forNX64KBPS Int	G.703	4to13(KHz)-12dB 13to256(KHz)-18dB 256to384(KHz)-14dB	
I.28	NX64 Kbps	NominalBitRatewithToleranceNX64 KBPSInt	G.703	64kbit/s	
I.29	NX64 Kbps	OutputJitterforNX64KBPSInt	G.823, I.431,ETSITBR-4Cl.9.2.4	20to20k -0.25(UIpp) 3 k to 20 kHz-0.05(UIpp)	
I.30	NX64 Kbps	PulseMaskforNX64KBPS Int	G.703	Figure6-5,clause-6.2.1.2	
I.31	45Mbps	InputJitterTolerancefor45MBPS Int	G.824	Fig-9,clause—7.2.4	
I.32	45Mbps	~~No~~DCpower	G.703	44736 kbit/s	
I.33	45Mbps	NominalBitRatewithTolerance45MBPSInt	G.824	10 to 400 kHz-5.0(UIpp) 30 to 400kHz-	

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Applicability/Remarks
				0.1(UIpp)	
I.34	45Mbps	OutputJitterfor45MBPSInt	G.703	Fig10-1clause10	
I.35	45Mbps	PulseMaskfor45MBPS Int	G.823	Table19,clause-7.1.5	
I.36	140Mbps-E4	InputJitterTolerancefor140MBPS Int	G.703,ETSITBR-4Cl. 9.3.1	≥15 dBoverfrequency range7MHzto210MHz	
I.37	140Mbps-E4	InputReturnLoss for140MBPS Int	G.703,ETSITBR-4 Cl. 9.2.3	139264kbit/s	
I.38	140Mbps-E4	NominalBitRatewithTolerance140MBPSInt	G.823	200to 3.5 MHz-1.5(UIpp) 10k to3.5 MHz-0.0755(UIpp)	
I.39	140Mbps-E4	OutputJitterfor140MBPS Int	G.703,ETSITBR-4 Cl. 9.2.1	Fig14.1,14.2clause-14.2	
I.40	140Mbps-E4	PulseMaskfor140MBPSInt	G.703		
I.41	10MBPS	MinPeakVoltagefor10 MHzInt	G.703		
I.42	10MBPS	MaxPeakVoltage for10MHzInt	G.823, ETSITBR-4	Fig13,ClauseNo.-7.1.2	

Annexure-J1: xDSL Interface

ParametersParameterGroup:DSLInterface(INTDSL)

S.No.	InterfaceName	ParameterName	Standard	Clause	Remarks
J1.1	ADSLx	InsulationTestfor2wireInt	ETSIEN 300 001 Cl. 2.2		
J1.2	ADSLx	LoopresistanceforADSLx	ETSIEN 300 001Table2.3		
J1.3	ADSLx	PSDforADSLInt	G.992.3AnnexureA,B,I,J, G992.5		
J1.4	ADSLx	BitRateforADSLInt	ANSI.T1.413-2		
J1.5	ADSLx	InsulationTestforADSLInt			
J1.6	ADSLx	ImpulseNoiseProtectionforADSLInt	G.992.3AppendixV		
J1.7	ADSLx	TransmittedPowerAtATU-Cfor ADSLxInt	G.992.3Annexure-P		
J1.8	ADSLx	LinePortimpedancefor ADSLxInt			
J1.9	VDSLx	InsulationTestfor2wireInt	ETSIEN 300 001		
J1.10	VDSLx	LoopresistanceforVDSLx	ETSIEN300001		
J1.11	VDSLx	ProfilesforVDSLx	G.993.2Cl. 7.2		
J1.12	VDSLx	ReturnLossforVDSLx	G.993.1Cl. 6.5		
J1.13	VDSLx	PSDforVDSLxInt	G.993.1Cl. 6.2/ G.993.2 Cl. 7.2		
J1.14	VDSLx	LinePortimpedancefor VDSLxInt			
J1.15	VDSLx	TransmittedPowerAtATU-Cfor VDSLxInt			
J1.16	VDSLx	BitRateforVDSLxInt	G.993.1/G993.2		
J1.17	G.FAST	PPPoEforG.FAST Int	RFC2516FunctionalTest		Annex-P11
J1.18	G.FAST	PVCSupportforG.FAST Int			
J1.19	G.FAST	VPI-VCISupportforG.FASTInt			
J1.20	G.FAST	LoopResistanceforG.FASTIntSLx	ETSIEN 300 001		
J1.21	G.FAST	InsulationTestforG.FASTInt			
J1.22	G.FAST	ImpulseNoiseProtectionforG.FASTInt			
J1.23	G.FAST	ThroughputTestforG.FAST Int			
J1.24	G.FAST	ProfilesforG.FAST Int	G.9700		
J1.25	G.HN	ProfilesforG.HNInt	G.9960		

S.No.	InterfaceName	ParameterName	Standard	Clause	Remarks
J1.26	G.HN	PSDforG.HN	G.9964		
J1.27	SHDSL	PSDforSHDSLInt	G.991.2		
J1.28	SHDSL	Return LossforSHDSL	G.991.2		
J1.29	SHDSL	TransmittedPowerforSHDSLInt	G.991.2		
J1.30	SHDSL	ImpedanceUnbalanceAboutEarthfor SHDSLInt	G.991.2		
J1.31	SHDSL	InsulationResistancefor SHDSLint	G.991.2		
J1.32	SHDSL	Throughput forSHDSLInterface	G.991.2		
J1.33	SHDSL	LCLforSHDSLInterface	G.991.2		

Annexure-J2: PON Interface

ParametersParameterGroup:PONInterface(INTPON)

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Remarks
J2.1	GPON	OperatingWavelength TransforGPONInt	G.984.2Cl. 8.2.5.1	DS1480-1500nm	
J2.2	GPON	OperatingWavelength RecvforGPONInt	G.984.2Cl. 8.2.5.2	"US1260-1360nm(ClassB/B+)or 1290-1330nm(ClassC/C+/D)	
J2.3	GPON	OptOutputPowerforGPON IntatOLT	G.984.2	0to +4dBm(A) +5.0to +9.0dBm(B) +1.5to +5.0dBm(B+) +3.0to +7.0dBm(C/C+) +6.0to +10.0 dBm(D) A,B,B+,C,C+ and 'D' are classes ofoptical linkbudget for PON Measuredat1490nmatOLT's PONport i.e. Rx or D/L mode. Refer followingTables of ITU-T G.984.2: (1) Table 2c &Table2f1for ClassA, ClassB, ClassC (2)Table A.1 for Class B+(3)Table V.1forClassC+, (4)TableV.2forClass D	
J2.4	GPON	OptOutputPowerforGPON Intat ONT	G.984.2	-3.0 to+2.0dBm(A) -2.0to +3.0 dBm(B) +0.5to +5.0dBm(B+) +2.0to +7.0dBm(C) +0.5to +5.0dBm(C+) +0.5to +5.0dBm(D) A,B,B+,C,C+ and 'D' are classes ofoptical linkbudget for PON Measuredat1490nmatOLT's PONport i.e. Rx or D/L mode. Refer followingTables of ITU-T G.984.2: (1) Table 2c &Table2f1for ClassA, ClassB, ClassC (2)Table A.1 for Class B+(3)Table V.1forClassC+, (4)TableV.2forClass D	

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Remarks
J2.5	GPON	ReceiverSensitivityforGPON Intat OLT	G.984.2	-24dBm(minimum)(A) -28dBm(minimum)(B/B+) -29dBm(minimum)(C) -32dBm(minimum)(C+) -35 dBm(minimum) (D)A,B,B+,C,C+ and 'D' are classes ofoptical link budget for PONMeasuredat1490nmatOLT'sPONport i.e. Rx or D/L mode. ReferfollowingTablesofITU-TG.984.2: (1)Table2c&Table2f1 forClassA,Class B, Class C (2) Table A.1 forClassB+(3) TableV.1forClassC+, (4)Table V.2forClassD	
J2.6	GPON	ReceiverSensitivityforGPON Int atONT	G.984.2	-21dBm(minimum)(A) -21dBm(minimum)(B) -27dBm(minimum)(B+) -28dBm(minimum)(C) -30dBm(minimum)(C+) -30 dBm(minimum) (D)A,B,B+,C,C+ and 'D' are classes ofoptical link budget for PONMeasuredat1490nmatOLT'sPONport i.e. Rx or D/L mode. ReferfollowingTablesofITU-TG.984.2: (1)Table2c&Table2f1 forClassA,Class B, Class C (2) Table A.1 forClassB+(3) TableV.1forClassC+, (4)Table V.2forClassD	
J2.7	GPON	ProtocolTestforGPON Int	EthOGEM/G.984.2	PICSTestasperAnnexureV &VIofITU-TG.983.1withrespecttoGPON parameterandtheir referencevalues	

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Remarks
J2.8	EPON	Operating WavelengthTransforEPONInt	IEEE802.3ah	DS1480-1500 nm ReferTECGRon EPON(2019)	
J2.9	EPON	Operating WavelengthRecvforEPONInt	IEEE802.3ah	US1260-1360 nm ReferTECGRon EPON(2019)	
J2.10	EPON	OptOutputPowerfor EPONInt atOLT	IEEE802.3ah	+2dbm to+7dbm ReferTECGRonEPON(2019)	
J2.11	EPON	OptOutputPowerfor EPONInt atONT	IEEE802.3ah	-1dbm to+4dbm ReferTECGRonEPON(2019)	
J2.12	EPON	ReceiverSensitivityforEPON Intat OLT	IEEE802.3ah	-27dbm(minimum)(for 1000Base-PX20-D) - 30dbm(minimum)(1000Base-PX20E-D) ReferTECGRonEPON(2019)	
J2.13	EPON	ReceiverSensitivityforEPON Intat ONT	IEEE802.3ah	-24dbm(minimum)(for 1000Base-PX20-U) - 27dbm(minimum)(1000Base-PX20E-U) ReferTECGRonEPON(2019)	
J2.14	XGPON	OperatingWavelength TransforXGPONInt	G.987.2	DS1575– 1580 nm	
J2.15	XGPON	OperatingWavelength RecvforXGPON Int	G.987.2	US1260– 1280 nm	
J2.16	XGPON	OptOutputPowerXGPONIntat OLT	G.987.2	+2.0 to +6.0dBm(N1) +4.0to+8.0dBm(N2a) +10.0to +12.5 dBm(N2b) +6.0to+10.0dBm(E1) +8.0to+12.0 dBm(E2a) +14.5.0to +16.5 dBm(E2b) N1, N2, E1 and E2 are classes of opticalpathloss. ReferfollowingTable9.3 of ITU-TG.987.2	

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Remarks
J2.17	XGPON	OptOutputPowerXGPONIntat ONT	G.987.2	+2.0 to +7.0dBm(N1,N2,E1, E2) Refer following Table 9.4of ITU-TG.987.2	
J2.18	XGPON	Receiver SensitivityXGPONIntatOLT	G.987.2	-27.5dBmfor (N1) -29.5dBmfor (N2) -31.5dBmfor(E1) -33.5dBmfor(E2) Refer following Table 9.4of ITU-TG.987.2	
J2.19	XGPON	Receiver SensitivityXGPONIntatONT	G.987.2	-28.0dBmfor (N1) -28.0dBmfor (N2a) -21.5dBmfor(N2b) -28.0dBmfor(E1) -28.0dBmfor(E2a) -21.5dBmfor(E2b) Refer following Table 9.3of ITU-TG.987.2	
J2.20	XGPON	Protocol test for XGPONInt	G.987.2,XGEM	PICS Test as per Annexure V & VI ofITU-TG.987.1 withrespect to XGPONparameterandtheirreferencevalues	
J2.21	XGSPON	Operating WavelengthTransXGSPONInt	G.9807.1	"DSi.1575–1580nm(Basicwavelength) ii. 1 480 to 1 500 nm (optionalwavelength) XGS-PON systems come with twooperatingwavelength options Basic wavelength set: consists of XG-PON wavelength reuse, in which casethe system has to accommodate bothXGS-PON ONUs and legacy XG-PONONUs Optional wavelength set: consists ofG-PONwavelengthreuse,forthe	

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Remarks
				operatorshavingnolegacyGigabitPONin thedeploymentarea ReferITU-TG.9807.1"	
J2.22	XGSPON	Operating WavelengthRecvXGSPON Int	G.9807.1	"USi.1260–1280nm(Basicwavelength) ii.1300to1320nm(optionalwavelength) XGS-PON systems come with twooperatingwavelength options Basic wavelength set: consists of XG-PON wavelength reuse, in which casethe system has to accommodate bothXGS-PON ONUs and legacy XG-PONONUs Optional wavelength set: consists ofG-PON wavelength reuse, for theoperators having no legacy GigabitPONin thedeploymentarea ReferITU-TG.9807.1"	
J2.23	XGSPON	Opt Output PowerXGSPONIntatOLT	G.9807.1	+2.0 to +5.0dBm(N1) +4.0to+7.0dBm(N2) +6.0to+9.0dBm(E1) N1, N2 and E1 are classes of optical linkbudget for PON. Refer Table B.9.3 of standard ITU-TG.9807.1	
J2.24	XGSPON	Opt Output PowerXGSPONIntatONT	G.9807.1	+4.0 to +9.0dBm(N1,N2,E1) Refer Table B.9.4 of standard ITU-TG.9807.1	
J2.25	XGSPON	Receiver SensitivityXGSPONIntatOLT	G.9807.1	-26.0dBm(N1) -28.0dBm(N2) -30.0 dBm(E1)	

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Remarks
				ReferTable B.9.4ofstandard ITU-T G.9807.1	
J2.26	XGSPON	Receiver SensitivityXGSPONIntatONT	G.9807.1	-28dBm(N1, N2 and E1) Refer Table B.9.3 of standard ITU-TG.9807.1	
J2.27	XGSPON	ProtocolTestforXGSPONInt	G.9807.1,XGEM	PICS Test as per Annexure V & VI ofITU-T G.983.1 with respect toXGPONparameterandtheirreference values	
J2.28	WDMPON	Operating WavelengthTransWDMPONInt	G.694.1(G.989.2/ p2p WDM)	US 1530nm-1560nm C-BandReferTECGRonWDM-PON(2017)	These areproprietary implementation
J2.29	WDMPON	Operating WavelengthRecvWDMPONInt	G.694.1(G.989.2/ p2pWDM)	DS 1530nm-1560nm C-BandReferTECGRonWDM-PON(2017)	These areproprietaryimplementation
J2.30	WDMPON	OptOutputPowerWDMPONIntatOLT	G.694.1(G.989.2/ p2pWDM)	+2.0 to+7.0dBm ReferTECGR on WDM-PON(2017)	These areproprietaryimplementation
J2.31	WDMPON	Opt Output PowerWDMPONIntatONT	G.694.1(G.989.2/ p2pWDM)	-2.0 to +2.0 dBm ReferTECGR on WDM-PON(2017)	These areproprietaryimplementation
J2.32	WDMPON	Receiver SensitivityWDMPONIntatOLT	G.694.1(G.989.2/ p2pWDM)	-24.0 dBm ReferTECGR on WDM-PON(2017)	These areproprietaryimplementation
J2.33	WDMPON	Receiver SensitivityWDMPONIntatONT	G.694.1(G.989.2/ p2pWDM)	-17.0 dBm ReferTECGR on WDM-PON(2017)	These areproprietaryimplementation
J2.34	WDMPON	ThroughputforWDMPON	RFC2544		Theseare

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Remarks
		Int			proprietary implementation
J2.35	WDMPON	Protocol test forWDMPON Int	G.694.1(G.989.2/ p2pWDM)	PICS Test as per Annexure V & VI ofITU-T G.983.1 with respect to NGPON2parameterandtheirreference values	These areproprietaryimplementation
J2.36	NGNPON2	Operating WavelengthTransNGPON2Int	G.989.2	DS1596 -1603 nmReferITU-TG.989.2	
J2.37	NGNPON2	Operating WavelengthRecvNGPON2Int	G.989.2	US ForTWDM PON 1524-1544nm for Wideband1528-1540nm for Reduced band1532-1540nm for Narrow bandFor PtPWDM PON 1524-1625nm for Expanded Spectrum1603-1625nm for Shared spectrumReferITU-TG.989.2	
J2.38	NGNPON2	Opt Output PowerNGPON2IntatOLT	G.989.2	For 2.48832 Gbit/s downstreamDirection 0.0 to+4.0dBm(N1) +2.0to+6.0dBm(N2) +4.0to+8.0dBm(E1) +6.0to+10.0dBm(E2) For 9.95328 Gbit/s downstreamDirection +3.0to+7.0dBm(N1) +5.0to+9.0dBm(N2) +7.0to+11.0 dBm(E1) +9.0to+11.0 dBm(E2) N1, N2, E1 and E2 are classes of opticallinkbudgetfor PON Refer following Table 11.4 & Table 11.5ofITU-TG.989.2	

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Remarks
J2.39	NGNPON2	Opt Output PowerNGPON2IntatONT	G.989.2	For 2.48832 Gbit/s upstreamDirection TypeA link +4.0 to +9.0dBm(N1,N2, E1, E2) TypeB link 0to +5.0 dBm(N1, N2, E1, E2) For 9.95328 Gbit/s upstreamDirection TypeA link +4.0to+9.0dBm(N1) +4.0to+9.0dBm(N2) +4.0 to +9.0dBm (E1)NA(E2) TypeB link +2.0to+7.0dBm(N1) +2.0to+7.0dBm(N2) +2.0to+7.0dBm(E1) +4.0to+9.0dBm(E2 Type A link values assume anunamplifiedOLT receiver Type B link values assume an amplifiedOLT receiver with the amplifier at theS/R-CGreference point Refer following Table 11.6 & Table 11.7oflTU-TG.989.2	
J2.40	NGNPON2	Receiver SensitivityNGPON2IntatOLT	G.989.2	For 2.48832 Gbit/sTypeA link -26.0dBm(N1) -28.0dBm(N2) -30.5 dBm(E1) -32.5dBm(E2) TypeB link -30.0dBm(N1) -32.0dBm(N2)	

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Remarks
				-34.5dBm(E1) -36.5 dBm(E2) For 9.95328 Gbit/sTypeA link -26.0dBm(N1) -28.0dBm(N2) -30.5 dBm(E1) TypeB link -28.0dBm(N1) -30.0dBm(N2) -32.5 dBm(E1) -32.5 dBm(E2) Refer following Table 11.6 & Table 11.7ofITU-TG.989.2	
J2.41	NGNPON2	Receiver SensitivityNGPON2IntatONT	G.989.2	For2.48832Gbit/s -30.0 dBm(N1,N2, E1,E2) For9.95328Gbit/s -28.0dBm(N1,N2,E1, E2) Refer following Table 11.4 & Table 11.5ofITU-TG.989.2	
J2.42	NGNPON2	ProtocolTestforNGPON2Int	G.989.2,RFC2544	PICSTestasperAnnexureV &VIofITU-T G.983.1 with respect toNGPON2parameterandtheir referencevalues	
J2.43	RFVideo	RFVideo Output Bandwidth, Level and Tilt-Values		52-870MHz, 14dBmV,0dB	

Annexure-J3: PON Conformance

ParametersParameterGroup:PONConformance(CONFPON)

S.No.	ParameterName	Standard	Remarks
J3.1	DOSPrevention,SSH v1-2forCLIinPON	ITU-TG.984.3sectionV.2, SSHv2RFC4251.	Thedenied Trafficstreams shouldnotpassthroughtheOLT.
J3.2	FramelossofPON	RFC2544.	Support a BER of betterthan or equal to 10-10 atthe MAC service interface(orthe frameloss ratio equivalent)
J3.3	Latencyof PON	RFC2544.	<1.5 msonewayfor 20Kmofdistance.referTable I.1/G.984.1
J3.4	MACAddressLearningandAgingControlOLT	G.984.1. (For GPON OLT), IEEE 802.3ah (FOREPON OLT), G.987.2 (FOR XGPON OLT),G.9807.1 (FOR XGSPON OLT), G.694.1 (FORWDMPONOLT),G.989.2(FORNGPON2OLT) &IEEE802.1Q(TestingProcedure)	Yes/No
J3.5	MACAddressLimitationinPON	IEEE802.3.	The data stream isreceivedfromonlythe numberofstreamsspecifi ed.
J3.6	MACBased802.1xAuthenticationinPON	IEEE802.1x.	AuthenticationbasedonIEEE802 .1xshall besupported.
J3.7	MAC LearningSupportatOLT	G.984.1.	Yes/No
J3.8	MaximumBandwidthLimitinginPON	G.984.3 Section 7.5(For GPON OLT), IEEE802.3ah (FOR EPON OLT), G.987.2 (FORXGPONOLT),G.9807.1(FORXGSPONOLT), G.694.1(FORWDMPONOLT),G.989.2(FORNGPON2OLT)	max.1Gbps (GPON)
J3.9	MinimumGuaranteedBandwidthinPON	G.984.3Section7.5.(ForGPONOLT), IEEE	minimum 512Kbps

S.No.	ParameterName	Standard	Remarks
		802.3ah (FOR EPON OLT), G.987.2 (FORXGPONOLT),G.9807.1(FORXGSPONOLT), G.694.1(FORWDMPONOLT),G.989.2(FORNGPON2OLT)	
J3.10	Minimum two classes of Classification inPON	G.984.3 Section 7.5. (For GPON OLT), IEEE802.3ah (FOR EPON OLT), G.987.2 (FORXGPONOLT),G.9807.1(FORXGSPONOLT), G.694.1(FORWDMPONOLT),G.989.2(FORNGPON2OLT)	supportofall TCONT-1,2 ,3,4types.
J3.11	PasswordBasedAuthenticationinPON	ITU-TG.984.3section9.2.2,12.	Password basedauthentication shouldbesupported.
J3.12	Port-idBasedVLANSupportatOLT	G.984.1 (For GPON OLT), IEEE 802.3ah (FOREPON OLT), G.987.2 (FOR XGPON OLT),G.9807.1 (FOR XGSPON OLT), G.694.1 (FORWDMPONOLT),G.989.2(FORNGPON2OLT) &IEEE802.1Q(TestingProcedure)	Yes/No Provisionof creating multiple port-idbasedmultipleVLANshall exist.
J3.13	SwitchFabricThroughputCapabilityOLT	G.984.1(For GPON OLT), IEEE 802.3ah (FOREPON OLT), G.987.2 (FOR XGPON OLT),G.9807.1 (FOR XGSPON OLT), G.694.1 (FORWDMPONOLT),G.989.2(FORNGPON2OLT)	Demonstrate support forfull wired speedthroughput by testingtraffic through onerandomly chosen port ofswitch fabric then usingthisvaluecoroboratewithdata sheet provided by chipsetvendor.
J3.14	Max ThroughputofPON	RFC2544.	a) Nominal bit rate*.WhentheOLTandtheend office are in theirnormal operating state(accuracyof1 x10-11) b) Nominalbitrate*.

S.No.	ParameterName	Standard	Remarks
			Whentheendofficeisinits free-running mode(accuracyof 4.6x10-6) c)Nominal bit rate*. Whenthe OLT is in its free-runningmode(accuracyof3.2 x10-5)
J3.15	VLANStackingtoNetworkSupportatOLT	G.984.1, (For GPON OLT), IEEE 802.3ah (FOREPON OLT), G.987.2 (FOR XGPON OLT),G.9807.1 (FOR XGSPON OLT), G.694.1 (FORWDMPONOLT),G.989.2(FORNGPON2OLT) &IEEE802.1Q(testingprocedure).	Yes/No To test thedouble tagging supportbetweenONTandOLT.

*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/Cl11.1.1,(4)XGSPON-G.9807.1/Cl B.9.2.1, (5)EPON-IEEE802.3ah

AnnexureJ4–DSLAMFunctionalTest

Applicableto→ **TestParameter↓**	**Standard**	**IP-DSLAM**	**IP-DSLAM** **Withsplitter**	**Remarks**
POTSSPLITTERS Thebroad specifications forsplittershall be: a. 600-ohmimpedance b. ETSIharmonizedimpedancesplitter(ETSITR101728).			Y	
VLANAggregation: The DSLAM shall terminate PVCs on DSL line andaggregate them over a single or multiple Customer-VLANs, Service-VLANs as well as a combination ofthem, at the uplink interface. It shall also implement802.1ppriorityon the Ethernet flows.	IEEE802.1p	Y	Y	TocheckifmorethanI vlancanbepassedoverthesame port in DSLAM
Protocol*Support* DSLAMshallsupportDHCPbasedIPaccesswithDHCP relayandDHCPoption82fordirectIPoverEthernet basedaccessforvideo/gamingandotherentertainment services.	RFC 2131 RFC 3046	Y	Y	
PPPoEover ATM (U-interface): Figure 1 depicts the end-to-endprotocolstacksassociatedwithPPPoEaccessmethod		Y	Y	TocheckPPPoEsessionisestablishedontheADSLorVDSLsystem.MethodologyismentionedinDSLforumtechnicalreportTR-045.**Annexure-E:group3.3_test1&Test2**

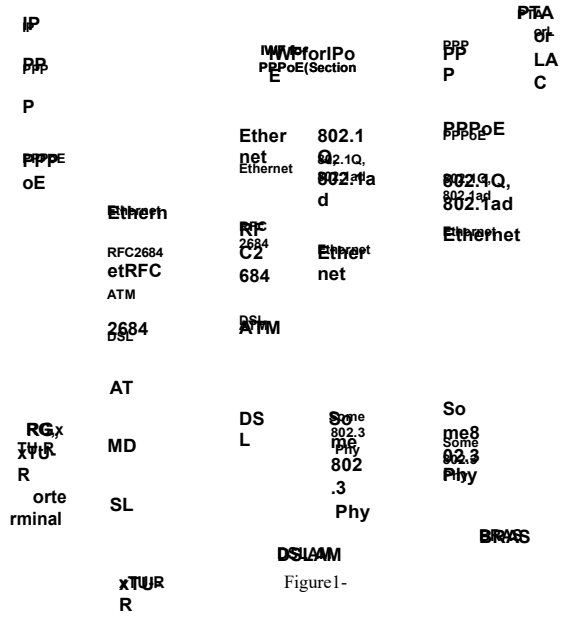
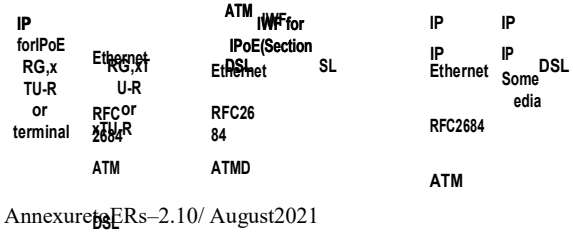


Figure1-

*IPoE*overATM(U-interface):Figure2depictstheend-to-endprotocolstacksassociatedwithIPoEaccessmethod.



maybecarriedouttocaterthisclause. Itistestedthrough protocol simulator.

Y	Y	To check if IPOE is established on the ADSL orVDSLsystem.MethodologyismentionedinDSL forum technical report TR-045. **Annexure-E:group3.3_test1&Test2maybecarried outtocaterthisclause.**Itistestedthroughprotocolsimulator.	

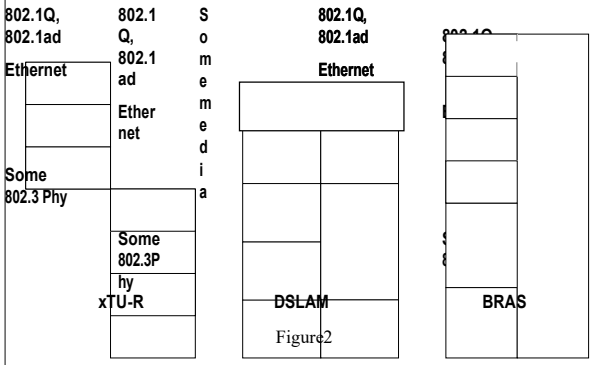

802.1Q,
802.1ad
Ethernet
Some
802.3 Phy
802.1
Q,
802.1
ad
Ether
net
Some
802.3P
hy
xTU-R
S
o
m
e
m
e
d
i
a
802.1Q,
802.1ad
Ethernet
DSLAM
BRAS

Figure2

EthernetScalability 1. The device shall provide a means to limit thenumberofMACaddresseslearnedonanygivenport. 2. Thedeviceshallsupportplacingallsubscribertrafficintoasingleormultiple VLANsonanuplink.		Y	Y	1. Limit the port on DSLAM to 1 mac and sendtwomactrafficonlyone mactrafficwhichisdefinedwill run. 2. Checkmorethan1vlancanpassthroughtheport
Videoapplicationprotocolsupport • IGMPProxy • IGMPv2/v3 snoopingFurther- 1. IGMPproxyshallhandlemulticastandcontrolwhere the packetshastobereplicated(intermsof specificcustomerVLANs or ports). 2. Inupstreamdirection,IGMPproxyfunctionshallforwardIGMPmessagesfroms ubscribertomulticastVLAN. 3. Indownstreamdirection,multicaststreamsshallbemultiplexed in to subscriber's connection based on 'Join'messagesreceived.	RFC2 236 RFC3376	Y	Y	Capabilitytobedemonstratedasdescribesinclause. Enable IGMP proxy and snooping and check ifmulticast channel is learnt once the channel isjoint
Filtering:TheDSLAMshallallowthefollowingfilterstobe defined: • List of acceptable MAC destination addresses applicabletoframesreceivedattheupstreamdirectiononbridged ports. • Whenattachedtoabridgedport,anyframereceived		Y	Y	Capabilitytobedemonstratedasdescribesinclause. Set the MAC address to be allowed per port, sendtrafficofthatmacandseeitisgoingthrough. Sendtrafficofothermacandseethattrafficis

with a destination MAC not specified in the list shall bediscarded. The DSLAM shall be capable of filteringL2trafficconfigurable per Port/PVC/Service basis at least for thefollowingparameters- **a. SourceIPandMACAddressperport,perPVC, perVLAN** **b. Destination IP and MAC Address perport,per PVC, perVLAN.**				not going
BroadcastHandling:AsfarasEthernetbroadcasttrafficisconcerned,alldownstreambroadcasttrafficshall be discarded with the exception cases called for byDHCPRelayAgent,PPPoEIntermediateAgent,andIGMPSnooping/IGMPSnoopingandProxyfunctions.		Y	Y	Capabilitytobedemonstratedasdescribesinclause.
ProtectionfromARPspoofingattacks • ***SourceMACFlooding*** • ***Broadcastcontrol*** • ***L2PeertoPeer("hair-pin")Forwarding*** • ***SourceMAC Spoofing***		Y	Y	1. Tocheckif DSLAMcanblockcertainMAC. 2. Tocheckifbroadcast maccanbecontrolled 3. Communicationonsamevlancanbedoneorblocked. 4. TocheckifmacislearntontheDSLAM

Note: WhereverRFCare referred, only'shall'clausesgiven intheRFCsshould betestedagainst theparameterreferredinthisER.

Annexure-K: SDH Interface

ParametersParameterGroup:PDHInterface(INTPDH)

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Applicability/Remarks
K.1	STM-1Electrical	InputJitterToleranceSTM-1 Electrical	G.825	Table4,Fig-1clause-6.1.2.1	
K.2	STM-1Electrical	InputReturn LossforSTM-1 Electrical	G.703	≥15 dBoverfrequencyrange8 MHzto 240 MHz	
K.3	STM-1Electrical	NominalBitRatewith ToleranceSTM-1Electrical Int	G.703	155520Kbps	
K.4	STM-1Electrical	Output Jitter for STM-1ElectricalInt	G.825	500to1.3MHz -1.5(UIpp) 65kto 1.3MHz-0.075(UIpp)	
K.5	STM-1Electrical	PulseMask forSTM-1 ElectricalInt	G.703	Fig17-1&17-2 clause-17.4	
K.6	STM-1Optical	InputJitterTolerancefor STM-1Opt	G.825	Fig.1,clause-6.1.2.1	
K.7	STM-1Optical	MeanLaunchedPowerforSTM-1OptInt	G.957	I-1,S-1.1,S-1.2: -8(max)&-15(min)(dBm) L-1.1,L-1.2,L-1.3:0(max)&-5(min)(dBm)	
K.8	STM-1Optical	NominalBitRatewith ToleranceSTM-1OptInt	G.957	155520 Kbps	
K.9	STM-1Optical	OperatingWavelengthRangeforSTM-1 OptInt	G.957	I-1:1260a)-1360 S-1.1:1261a)-1360 S-1.2:1430-1576,1430-1580 L-1.1:1260a)-1360,1263a)-1360L-1.2:1480-1580 L-1.3:1534-1566/1523-1577,	

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Applicability/Remarks
				1480-1580(nm)	
K.10	STM-1Optical	OutputJitterforSTM-1Opt Int	G.783	0.5kto1.3MHz-0.30(UI) 65 k to 1.3MHz– 0.10 (UI)(1UI=6.43ns)	
K.11	STM-1Optical	Receiver Overload for STM-1OptInt	G.957	I-1,S-1.1,S-1.2:-8dBm L-1.1,L-1.2,L-1.3:-10dBm	
K.12	STM-1Optical	Receiver Sensitivity for STM-1OptInt	G.957	I-1:-23dBm S-1.1,S-2.1:-28dBm L-1.1,L-1.2, L-1.3:-34dBm	
K.13	STM-4Optical	InputJitterTolerancefor STM-4Opt	G.825	Fig.3, clause-6.1.2.2	
K.14	STM-4Optical	MeanLaunchedPowerforSTM-4OptInt	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-4Optical	NominalBitRatewith ToleranceSTM-4OptInt	G.957	622 080Kbps	
K.16	STM-4Optical	OperatingWavelengthRangeforSTM-4OptInt	G.957	I-4:1260a)-1360 S-4.1:1293-1334/1274-1356 S-4.2:1430-1580	

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Applicability/Remarks
				L-4.1:1300-1325/1296-1330,1280-1335 L-4.2:1480-1580 L-4.3:1480-1580(nm)	
K.17	STM-4Optical	OutputJitterforSTM-4Opt Int	G.783	1kto5MHz -0.30(UI) 250kto5MHz–0.10(UI)(1UI=1.61ns)	
K.18	STM-4Optical	Receiver Overload for STM-4OptInt	G.957	I-4,S-4.1,S-4.1, L-4.1,L-4.2,L-4.3:-8dBm	
K.19	STM-4Optical	Receiver Sensitivity for STM-4OptInt	G.957	I-4:-23dBm S-4.1,S-4.1,L-4.1,L-4.2,L-4.3: -28dBm	
K.20	STM-16Optical	InputJitterTolerancefor STM-16Opt	G.825	Fig.4, clause-6.1.2.3	
K.21	STM-16Optical	MeanLaunchedPowerforSTM-16OptInt	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-16Optical	NominalBitRatewith ToleranceSTM-16 OptInt	G.957	2 488 320 kbps	
K.23	STM-16Optical	OperatingWavelengthRangeforSTM-16 OptInt	G.957	I-16:1266a)-1360 S-16.1:1260a)-1360	

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Applicability/Remarks
				S-16.2:1430-1580 L-16.1:1280-1335 L-16.2:1500-1580 L-16.3:1500-1580(nm)	
K.24	STM-16Optical	Output Jitter for STM-16 OptInt	G.783	5kto20MHz -0.30(UI) 1000kto20MHz–0.10(UI)(1UI=0.40ns)	
K.25	STM-16Optical	Receiver Overload for STM-16OptInt	G.957	I-16:-3dBm S-16.1,S-16.1:0dBmL-16.1,L-16.2,L-16.3: -9dBm	
K.26	STM-16Optical	Receiver Sensitivity for STM-16OptInt	G.957	I-16,S-16.1,S-16.1:-18dBm L-16.1,L-16.2, L-16.3:-27dBm	
K.27	STM-64Optical	InputJitterTolerancefor STM-64Opt	G.825	Fig.5, clause-6.1.2.4	
K.28	STM-64Optical	MeanLaunchedPowerforSTM-64OptInt	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-64Optical	NominalBitRatewith ToleranceSTM-64 OptInt	G.707	9953 280 Kbps	
K.30	STM-64Optical	OperatingWavelengthRangeforSTM-64 OptInt	G.691	1530-1565nm	
K.31	STM-64Optical	OutputJitterforSTM-64Opt Int	G.783	20kto80MHz -0.30(UI)	

S.No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Applicability/Remarks
				4000k to80 MHz – 0.10(UI) (1UI=0.10ns))	
K.32	STM-64Optical	Receiver Overload for STM-64OptInt	G.691	L-64.2a:-9 dBm L-64.2b:-3dBm L-64.2c:-9 dBm L-64.3:-3dBm	
K.33	STM-64Optical	Receiver Sensitivity for STM-64OptInt	G.691	L -64.2a:-26dBmL - 64.2b:-14dBmL- 64.2c:-26dBm L-64.3:-13dBm	
K.34	STM-256Optical	InputJitterTolerancefor STM-256Opt	G.825	Table8 Fig6 Amd.1	
K.35	STM-256Optical	Mean LaunchedPowerfor STM-256Opt Int	G.693	Table4 &6	
K.36	STM-256Optical	NominalBit Ratewith ToleranceSTM-256Opt Int	G.693	NRZ40G	
K.37	STM-256Optical	OperatingWavelengthRangefor STM-256Opt Int	G.693	Table4 &6	
K.38	STM-256Optical	Output Jitter for STM-256 OptInt	G.783	FFStoFFS-FFS 16000kto320MHz–0.10(UI)(1UI=0.025ns)	
K.39	STM-256Optical	ReceiverOverloadforSTM-256 OptInt	G.693	Table4 &6	
K.40	STM-256Optical	ReceiverSensitivityfor STM-256Opt Int	G.825	Table4,Fig-1clause-6.1.2.1	

Annexure-L: OTN Interface

ParametersParameterGroup:OTNInterface(INTOTN)

S. No.	Interface Name	Parameter Name	Standard/ Parameter	Limits/Values	Applicability/Remarks
L.1	OTU-1	CentralFrequency forOTU-1	G.959.1,G.693	192.1 + 0.2 m THz,m= 0 to 15 THz	
L.2	OTU-1	InputJitter Tolerancefor OTU-1	G.8251	Fig7.1-1Page8	
L.3	OTU-1	Mean totalInputPowerforOTU-1	G.959.1,G.693		Asdifferentapplicationcodesbasedonthefibre,noofchannels,spandistance/attenuationetchavedifferent values,sotherespectivetablesmaybereferred forthevalue.
L.4	OTU-1	MeantotalOutput Power forOTU-1	G.959.1,G.693		Asdifferentapplicationcodesbasedonthefibre,noofchannels,spandistance/attenuationetchavedifferent values,sotherespectivetablesmaybereferred forthevalue.
L.5	OTU-1	MinimumReceiverOverload forOTU-1	G.959.1,G.693		
L.6	OTU-1	NominalBit Ratewith Tolerance OTU-1	G.709	255/238∗2488320kbit/s±20ppm	
L.7	OTU-1	OutputJitterforOTU-1	G.8251	5Kto 20M:1.5(UIpp) 1Mto20M:0.15(UIpp)	

S. No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Applicability/Remarks
L.8	OTU-1	ReceiverSensitivity forOTU-1	G.959.1	-22dBm	
L.9	OTU-2	Central Frequencyfor OTU-2	G.959.1,G.693	192.1 +0.2 m, m= 0 to 15 THz	
L.10	OTU-2	InputJitter Tolerancefor OTU-2	G.8251	Fig7.1-1	
L.11	OTU-2	MeantotalInputPowerfor OTU-2	G.959.1,G.693		Asdifferentapplicationcodesbasedonthefibre,noofchannels, span distance/attenuation etc have differentvalues,so therespectivetablesmaybereferredfor the value.
L.12	OTU-2	MeantotalOutputPowerfor OTU-2	G.959.1,G.693		Asdifferentapplicationcodesbasedonthefibre,noofchannels, span distance/attenuation etc have differentvalues,so therespectivetablesmaybereferredfor the value.
L.13	OTU-2	MinimumReceiverOverload forOTU-2	G.959.1,G.693	-1dBm	
L.14	OTU-2	NominalBit RatewithTolerance OTU-2	G.709	255/237 × 9 953 280kbit/s□55/237	
L.15	OTU-2	OutputJitterforOTU-2	G.8251Cl. 5	20Kto80M**:**1.5(UIpp) 4Mto20M:0.15(UIpp)	
L.16	OTU-2	Receiver Sensitivity	G.959.1Cl. 7, 8,		Asdifferentapplicationcodes basedonthefibre,noof channels,spandistance/attenuationetchavedifferent

S. No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Applicability/Remarks
		forOTU-2	G.693Cl. 6, 7		values,so therespectivetables maybereferredfor the value.
L.17	OTU-3	CentralFrequency forOTU-3	G.959.1G.693	192.1THz	
L.18	OTU-3	~~Maximum~~Mean totalInput Power forOTU-3	G.959.1,G.693		Asdifferentapplicationcodesbasedonthefibre,noofchannels, span distance/attenuation etc have differentvalues, so the respective tables may be referred for thevalue.
L.19	OTU-3	~~Minimum~~MeantotalOutput Powerfor OTU-3	G.959.1,G.693		Asdifferentapplicationcodesbasedonthefibre,noofchannels, span distance/attenuation etc have differentvalues, so the respective tables may be referred for thevalue.
L.20	OTU-3	MinimumReceiver OverloadforOTU-3	G.959.1,G.693	+3dBm	
L.21	OTU-3	NominalBit RatewithTolerance OTU-3	G.709	255/236∗39813120 kbit/s± 20 ppm	
L.22	OTU-3	ReceiverSensitivityforOTU-3	G.959.1,G.693		Asdifferentapplicationcodesbasedonthefibre,noofchannels, span distance/attenuation etc have differentvalues,so therespectivetablesmaybereferredfor the value.
L.23	OTU-4	CentralFrequencyforOTU-4int	G.959.1,G.695.1	229.0 +0.8 m, m= 0 to 3(THz)	

S. No.	InterfaceName	ParameterName	Standard/Parameter	Limits/Values	Applicability/Remarks
L.24	OTU-4	MaximumMeantotalinputPowerfor OTU-4int	G.959.1,G.695	Table8-5,8-6G.959.1/Table 8-23G.695	
L.25	OTU-4	MeanTotalOutputPowerfor OTU-4int	G.959.1,G.695	Table8-5,8-6G.959.1/Table 8-23G.695	
L.26	OTU-4	MinimumreceiveroverloadforOUT-4 int	G.959.1,G.695		
L.27	OTU-4	NominalBit Ratewith Tolerance OTU-4	G.709	255/227*99532800 kbit/s ±20 ppm	
L.28	OTU-4	ReceiverSensitivity forOTU-4	G.959.1,G.695	Table8-5,8-6G.959.1/Table 8-23G.695	

Annexure-M:MobileHandsetandTabletTestParametersParameter

Group:MobileFunctional(MOBFUNC)

S.No.	Applicability	ParameterName	Standard	TestProcedure
M.1	MobileHandsetandTablet	Mobile device - Non-ZeroIMEI/MEID/ESN	GSMAofficialdocument IMEIAllocation&ApprovalProcess	Appendix-II,Test-30
M.2	MobileHandset–FeaturePhone	Mobile Emergency Support - PanicButton	G.S.R.No.436 (E)dated 22-04-2016, 3GPP TS22.101 forGSM/ UMTS/LTE, 3GPP2C.S0023forCDMA.	Appendix-II,Test-31
M.3	MobileHandset–SmartPhone	Mobile Emergency Support - PanicButton	G.S.R. No. 436 (E) dated 22-04-2016,3GPP TS 22.101 for GSM/ UMTS/ LTE,3GPP2C.S0023 forCDMA.	Appendix-II,Test-32
M.4	MobileHandset–SmartPhone	Mobile Emergency Support - GPSLocation	G.S.R.No.1441 (E)dated23-11-2017.	Appendix-II,Test-33
M.5	MobileHandset	MobileEmergencySupport-Callon 112	DoT 16-04/2015-AS-III/NP/67/120 dt4.5.16,3GPP2 C.S0023 forCDMA 2000,3GPPTS 22.101 and TS 24.008 forGSM/UMTS/ LTE.	Appendix-II,Test-34
M.6	MobileHandset	MobileDeviceIndianLanguageSupport	IS16333(Part3).	Appendix-II,Test-37
M.7	MobileHandset	SARDisplayforMobileHandset	TEC/GR/SAR/001/01.MAR.09orIEC Standard62209-1	Appendix-II, Test-35
M.8	MobileHandset	SARValueforMobileHandset	IEC 62209-1:2005TEC/GR/SAR/001/01.MAR.09	62209-1:2005 or laterversion
M.9	IoTDevices	IoTDev- Non-0 IMEIorMEIDorUniqueMAC	GSMAofficialdocument IMEIAllocation&ApprovalProcess(for IMEI/ MEID)	Device manufacturershall mention thesuitable procedurefor testing IMEI/MEID/MAC address/ any otheruniqueID byconnectingdeviceto

				smart phone/ tablet/PCandwithoutusinganyspecialised testequipment
M.10	(i)SARvaluesfor IoTdevicesexpected to be worn onthebody.	Parameters given in section 4.2.1, table-4ofSTANDARDNo.:TEC13016:2020	STANDARDNo.:TEC13016:2020, Section4.2.1Table -4	As per STANDARDNo.:TEC13016:2020
	(ii)SARvaluesforIoTdevicesexpected to be worn onthebodynearthehead.	Parameters given in section 4.2.1, table-5ofSTANDARDNo.:TEC13016:2020	STANDARDNo.:TEC13016:2020, Section4.2.1Table -5	As per STANDARDNo.:TEC13016:2020
	(iii) SAR valuesfor IoTdevices expected to be usedin close proximity of 20 cmorless tothe body	Parameters given in section 4.2.1, table-6ofSTANDARDNo.:TEC13016:2020	STANDARDNo.:TEC13016:2020, Section4.2.1Table -6	As per STANDARDNo.:TEC13016:2020

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

IPConformance

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
P1.1	SIPParametersSet-A	SIPHeader:Message BodyType	RFC3261	Clause7.4.1	SIPTerminal,PABX
P1.2	SIPParametersSet-A	GeneratingSIPrequest (To, R-URI, From, Call-ID,CSeq,Max-Forwards,Via)	RFC3261	Clause8.1.1, 8.1.1.2 to 8.1.1.7	SIPTerminal,PABX
P1.3	SIPParametersSet-A	SIPDialogandTransaction	RFC3261	Clause12, 12.1.1, 12.1.2	SIPTerminal,PABX
P1.4	SIPParametersSet-A	SIPTerminatingaSessionwithaBYErequest.	RFC3261	Clause15	SIPTerminal,PABX
P1.5	SIPParametersSet-A	SIPCreatingtheinitialinvite	RFC3261	Clause13.2.1	SIPTerminal,PABX
P1.6	SIPParametersSet-A	UserAuthentication	RFC3261	Clause21	SIPTerminal,PABX
P1.7	SIPParametersSet-B	SIP-CallFlow	RFC3261	Clause4	LMGW
P1.8	SIPParametersSet-B	SIPHeader:Message BodyType	RFC3261	Clause7.4.1	LMGW
P1.9	SIPParametersSet-B	Generating SIP request (To, R-URI, From, Call-ID, CSeq, Max-Forwards,Via)	RFC3261	Clause8.1.1, 8.1.1.2 to 8.1.1.7	LMGW
P1.10	SIPParametersSet-B	SIPDialogandTransaction	RFC3261	Clause12, 12.1.1, 12.1.2	LMGW
P1.11	SIPParametersSet-B	SIP Terminating a Session with aBYErequest.	RFC3261	Clause15	LMGW

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
P1.12	SIPParametersSet-B	SIPCreatingtheinitialinvite	RFC3261	Clause13.2.1	LMGW
P1.13	SIPParametersSet-B	UserAuthentication	RFC3261	Clause21	LMGW
P1.14	SIPParametersSet-C	SIP-MaxForwards(NotforSIPSURI)	RFC3261	Clause8.1.1.6	SBC
P1.15	SIPParametersSet-C	SIP-MessageBodylength(NotforSIPS URI)	RFC3261	Clause7.4.2	SBC
P1.16	SIPParametersSet-C	SIP-Responses(NotforSIPSURI)	RFC3261	Clause7.2	SBC
P1.17	SIPParametersSet-D	SIP-MaxForwards(NotforSIPSURI)	RFC3261	Clause8.1.1.6	SOFTSWITCH
P1.18	SIPParametersSet-D	SIP-MessageBodylength(NotforSIPS URI)	RFC3261	Clause7.4.2	SOFTSWITCH
P1.19	SIPParametersSet-D	SIP-Responses(NotforSIPSURI)	RFC3261	Clause7.2	SOFTSWITCH
P1.20	SIPParametersSet-D	SIP -CancellingaRequest	RFC3261	Clause9	SOFTSWITCH
P1.21	SIPParametersSet-D	SIP-ClientBehaviour(NotforSIPSURI)	RFC3261	Clause9.1	SOFTSWITCH
P1.22	SIPIParameters	SIPI - Conventions forrepresentationofISUPPDU	Q1912.5	Clause5.1	SOFTSWITCH
P1.23	SIPIParameters	SIPI - Conventions forrepresentationofSIP/SDPinform ation	Q1912.5	Clause5.2	SOFTSWITCH

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
P1.24	SIPIParameters	SIPI- IAMparameters	Q1912.5	Clause6.1.3	SOFTSWITCH
P1.25	SIPIParameters	SIPI-INVITEreceivedwithanSDPoffer	Q1912.5	Clause6.1.2	SOFTSWITCH
P1.26	SIPIParameters	SIPI-INVITEreceivedwithoutanSDP offer	Q1912.5	Clause6.1.1	SOFTSWITCH
P1.27	SIPIParameters	SIPI - ISUP encapsulation – detailedprocedures	Q1912.5	Clause5.4	SOFTSWITCH
P1.28	SIPIParameters	SIPI-SendingofInitialAddressMessage(IAM)	Q1912.5	Clause6.1	SOFTSWITCH

Annexure-P2:IPConformance Parameters –RTP–RFC3550

ParameterGroup:IPConformance(CONFIP)

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
P2.1	RTPParametersSet-A	RTP:SenderreportRTCPpacketversion	RFC3550	Clause6.4.1	SIPTerminal,PABX
P2.2	RTPParametersSet-A	RTP:Sequencenumber	RFC3550	Clause5.1	SIPTerminal,PABX
P2.3	RTPParametersSet-A	RTP:VersionandPort	RFC3550	Clause5.1	SIPTerminal,PABX
P2.4	RTPParametersSet-A	RTP:PayloadType	RFC3550	Clause5.1	SIPTerminal,PABX
P2.5	RTPParametersSet-A	RTP:SSRCIdentification	RFC3550	Clause5.1	SIPTerminal,PABX
P2.6	RTPParametersSet-B	RTP:SenderreportRTCPpacketversion	RFC3550	Clause6.4.1	LMGW,MGW
P2.7	RTPParametersSet-B	RTP:Sequencenumber	RFC3550	Clause5.1	LMGW,MGW
P2.8	RTPParametersSet-B	RTP:VersionandPort	RFC3550	Clause5.1	LMGW,MGW
P2.9	RTPParametersSet-B	RTP:PayloadType	RFC3550	Clause5.1	LMGW,MGW
P2.10	RTPParametersSet-C	RTP:ByteOrder,Alignment,andTimeFormat	RFC3550	Clause4	SessionBorderController
P2.11	RTPParametersSet-C	RTP: Simple Multicast AudioConference	RFC3550	Clause2.1	SessionBorderController

Annexure-P3:IPConformance Parameters–RTCP–RFC3551

ParameterGroup:IPConformance(CONFIP)

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
P3.1	RTCPParametersSet-A	RTCP:PortAssignment	RFC3551	Clause8	SIPTerminal
P3.2	RTCPParametersSet-A	RTCP: Registering AdditionalEncodings	RFC3551	Clause3	SIPTerminal
P3.3	RTCPParametersSet-A	RTCP:GSM-EFR	RFC3551	Clause4.5.9	SIPTerminal
P3.4	RTCPParametersSet-A	RTCP: Guidelines 1 for sample-basedaudio encodings	RFC3551	Clause4.3	SIPTerminal
P3.5	RTCPParametersSet-A	RTCP: Guidelines 2 for sample-basedaudio encodings	RFC3551	Clause4.4	SIPTerminal
P3.6	RTCPParametersSet-B	RTCP:PortAssignment	RFC3551	Clause8	SessionBorderController
P3.7	RTCPParametersSet-B	RTCP: Registering AdditionalEncodings	RFC3551	Clause3	SessionBorderController

Annexure-P4:IPConformance Parameters–TCP–RFC793

ParameterGroup:IPConformance(CONFIP)

S.No.	ParameterName	IndividualParameterName	IETFR FC	Clause/Section	Applicability/Remarks
P4.1	TCPParameters	HeaderFormatandSequenceNumbers	RFC793	Clause3.1, 3.3 Clause1.4, 2.3, 3.1, Test terminologyasperclause3.2	MGW,SIPTerminal,PABX SBC

Annexure-P5:IPConformance Parameters– UDP– RFC768andMGCP–H.248

ParameterGroup:IPConformance(CONFIP)

S.No.	ParameterName	IndividualParameterName	IETFR FC	Clause/Section	Applicability/Remarks
P5.1	UDPParameters	UDPFormat	RFC768		MGW,LMGW,SBC,Soft Switch,PABX
P5.2	UDPParameters	UserTerminology	RFC768		MGW,LMGW,SBC,Soft Switch,PABX
P5.3	UDPParameters	Sequencenumbers	RFC768		MGW,LMGW,SBC,Soft Switch,PABX
P5.4	MGCPParameters	ConnectionModel	H.248	Clauses6.1& 6.2	MGW,LMGW,Soft Switch

Annexure-P6:IPConformanceParameters –IPV4and DualStack –RFC791andRFC4213

Parameter Group: IP Conformance (CONFIP)(For IoT devices / gateways:- IPv4 / DualIP parameterswill betestedif featureis available.)

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
P6.1	IPV4ParametersSet-A	Modelofoperation	RFC791	Clause2.2	MGW,SGW,PABX
P6.2	IPV4ParametersSet-A	InternetHeaderFormat	RFC791	Clause3.1	MGW,SGW,PABX,**IoT Gateway, Feedback device, SmartElectricity meter, Tracking device,Smart camera, Smart Watch**
P6.3	IPV4ParametersSet-A	Addressing	RFC791	Clause3.2	MGW,SGW,PABX
P6.4	IPV4ParametersSet-B	Modelofoperation	RFC791	Clause2.2	SBC
P6.5	IPV4ParametersSet-B	Gateways	RFC791	Clause2.4	SBC,**IoTGateway**
P6.6	IPV4ParametersSet-B	Interfaces	RFC791	Clause3.3	SBC
P6.7	IPV4ParametersSet-C	FunctionDescription	RFC791	Clause2.3	SOFT SWITCH, ~~**IoT Gateway,Feedbackdevice,SmartElectricitymeter,Tracking device, Smartcamera, SmartWatch**~~
P6.8	IPV4ParametersSet-C	Gateways	RFC791	Clause2.4	SOFTSWITCH
P6.9	IPV4ParametersSet-C	Interfaces	RFC791	Clause3.3	SOFTSWITCH
P6.10	DualIPlayeroperation:	DualIPlayeroperation:Address	RFC4213	Clause2.1	WiFiAccessPoint, WiFiCPE, DSLNT Modem, ONU,ONT,

Comment [SS1]: There is no must test case for this test. TO be dicussed with TS division

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
	Address	Configuration			SBC, IP Terminal, , **IoT Gateway,Feedbackdevice,SmartElectricitymeter,Tracking device, Smartcamera, SmartWatch** Productshoulddemostratesupportto all IPv6 services throughrespective RFCs andclausenumbers. All Product variants shouldcomply to either native IPv6 orDualStacktestforPONdevices.
P6.11	DualIPlayeroperation:DNS	DualIPlayeroperation:DNS	RFC4213	Clause2.2	SBC, IPTerminal,PON ONT Productshoulddemostratesupportto all IPv6 services throughrespective RFCs andclausenumbers. All Product variants shouldcomply to either native IPv6 orDualStacktestforPONdevices.
P6.12	DualIPlayeroperation:Tunnelling	DualIPlayeroperation: Tunnelling	RFC4213	Clause3	WiFi Access Point, WiFi CPE,DSL NT Modem, ONU, ONT,OLT,MGW,LMGW,PABX, SBC,MobileDevice,ONU,ONT, CCNProduct should demostratesupporttoallIPv6 services

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
					throughrespectiveRFCsandclausenumbers. All Product variants shouldcomply to either native IPv6 orDualStacktestforPONdevices.
P6.13	Dual IP layer operation:Tunnelling	DualIPlayeroperation:Tunnelling	RFC4213	Clause3.2.1	**IoT Gateway, ~~Feedback device,Smart Electricity meter,Trackingdevice, Smart camera, SmartWatch~~**
P6.14	Dual IP layer operation:Decapsulation	Dual IP layer operation:Decapsulation	RFC4213	Clause3.6	**IoT Gateway, ~~Feedback device,Smart Electricity meter,Trackingdevice, Smart camera, SmartWatch~~**
P6.15	Dual IP layer operation:LinkLocalAddress	Dual IP layer operation:Link LocalAddress	RFC4213	Clause3.7	**IoT Gateway, ~~Feedback device,Smart Electricity meter,Trackingdevice, Smart camera, SmartWatch~~**
P6.16	Dual IP Layer Operation RFC4213 - StaticTunnelMTU	Dual IP Layer Operation RFC 4213 - StaticTunnelMTU	RFC4213	ClauseNo.3.2.1	
P6.17	Dual IP Layer Operation RFC4213 - Decapsulation	Dual IP Layer Operation RFC 4213 - Decapsulation	RFC4213	ClauseNo.3.6	
P6.18	Dual IP Layer Operation RFC4213-Link-LocalAddresses	Dual IP Layer Operation RFC 4213 -Link-Local Addresses	RFC4213	ClauseNo.3.7	

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S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
P6.19	Dual IP Layer Operation RFC4213 - Neighbor Discoveryover Tunnels	Dual IP Layer Operation RFC 4213 - NeighborDiscoveryover Tunnels	RFC4213	ClauseNo.3.8	
P6.20	Dual IP Layer Operation RFC4213- SecurityConsiderations	Dual IP Layer Operation RFC 4213 - SecurityConsiderations	RFC4213	ClauseNo.5	

Annexure-P7:IPv6ConformanceParameters

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

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
P7.1	IPV6HeaderParameters	Header:Version Field	RFC2460/ RFC8200	Clause3	SIP Terminal, SBC,MobileDevice,ONU,ONT,OLT,CCN, **IoT Gateway, Feedbackdevice, Smart Electricitymeter,Tracking device,Smart camera, SmartWatch**
P7.2	IPV6HeaderParameters	Header:TrafficClass	RFC2460/ RFC8200	Clause3	SIP Terminal, SBC,MobileDevice,ONU,ONT,OLT,CCN, **IoT Gateway,Feedback device,SmartElectricity**

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
					meter, Tracking device,Smart camera, SmartWatch
P7.3	IPV6HeaderParameters	Header:Flow Label	RFC2460/ RFC8200	Clause3	SIP Terminal, SBC,MobileDevice,ONU,ONT,OLT,CCN, **IoT Gateway, Feedbackdevice, Smart Electricitymeter,Tracking device,Smart camera, SmartWatch**
P7.4	IPV6HeaderParameters	Header:PayloadLength	RFC2460/ RFC8200	Clause3	SIP Terminal, SBC,MobileDevice,ONU,ONT,OLT,CCN, **IoT Gateway, Feedbackdevice, Smart Electricitymeter,Tracking device,Smart camera, SmartWatch**
P7.5	IPV6HeaderParameters	Header:NonextheaderafterIPv6Header	RFC2460/ RFC8200	Clause3	SIP Terminal, SBC,MobileDevice,ONU,ONT,OLT,CCN, **IoT Gateway,Feedback device, Smart Electricitymeter,Trackingdevice,**

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
					Smartcamera,SmartWatch
P7.6	IPV6HeaderParameters	Header:Hop Limit	RFC2460/ RFC8200	Clause3	SIP Terminal, SBC,MobileDevice,ONU,ONT,OLT,CCN, **IoT Gateway, Feedbackdevice, Smart Electricitymeter,Tracking device,Smart camera, SmartWatch**
P7.7	IPV6HeaderParameters	Header: Source andDestinationAddress	RFC2460/ RFC8200	Clause3	SIP Terminal, SBC,MobileDevice,ONU,ONT,OLT,CCN, **IoT Gateway, Feedbackdevice, Smart Electricitymeter,Tracking device,Smart camera, SmartWatch**
P7.8	IPV6Extn.HeaderParameters	IPv6ExtensionHeaderOrder	RFC2460/ RFC8200	Clause4.1	MobileDevice,ONU,ONT,OLT,CCN, **IoT Gateway, Feedbackdevice, Smart Electricitymeter,Tracking device,Smart camera, SmartWatch**

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
P7.9	IPV6Extn.HeaderParameters	IPv6ExtensionHeader Options	RFC2460/ RFC8200	Clause4.2	MobileDevice,ONU,ONT,O LT, CCN
P7.10	IPV6Extn.HeaderParameters	IPv6 Extension Header Hop byHopOptions	RFC2460/ RFC8200	Clause4.3	MobileDevice,ONU,ONT,O LT, CCN
P7.11	IPV6Extn.HeaderParameters	IPv6ExtensionHeaderRouting	RFC2460/ RFC8200	Clause4.4	MobileDevice,ONU,ONT,O LT,CCN, **IoT Gateway, Feedbackdevice, Smart Electricitymeter,Tracking device,Smart camera, SmartWatch**
P7.12	IPV6Extn.HeaderParameters	IPV6 Extn. HeaderFragmentHeader	RFC8200	Clause4.5	**IoT Gateway, Feedbackdevice, Smart Electricitymeter,Tracking device,Smart camera, SmartWatch**
P7.13	IPV6 Packet Size Issuesparameter	IPV6PacketSizeIssues	RFC8200	Clause5	**IoTGateway**
P7.14	IPV6ExtensionHeaderOrder	IPV6ExtensionHeaderOrder	RFC2460/ RFC8200 ClauseNo. 4.1 RFC4213	Clause No. 4, 5Annexure-P7	

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
P7.15	IPV6Options	IPV6Options	RFC2460/ RFC8200	Clause No. 4.2Annexure-P7	
P7.16	IPV6RoutingHeader	IPV6RoutingHeader	RFC2460/ RFC8200	Clause No. 4.4Annexure-P7	
P7.17	IPV6FragmentHeader	IPV6FragmentHeader	RFC2460/ RFC8200	Clause No. 4.5Annexure-P7	
P7.18	IPV6DestinationOptionsHeader	IPV6DestinationOptionsHeader	RFC2460/ RFC8200	Clause No. 4.6Annexure-P7	
P7.19	IPV6No NextHeader	IPV6No NextHeader	RFC2460/ RFC8200	Clause No. 4.7Annexure-P7	
P7.20	IPV6PacketSizeIssues	IPV6PacketSizeIssues	RFC2460/ RFC8200	Clause No. 5Annexure-P7	
P7.21	IPV6Upper-LayerChecksums	IPV6Upper-LayerChecksums	RFC2460/ RFC8200	Clause No. 8.1Annexure-P7	
P7.22	IPV6RespondingtoPacketsCarryingRoutingHeaders	IPV6RespondingtoPacketsCarryingRoutingHeaders	RFC2460/ RFC8200	Clause No. 8.4Annexure-P7	

Annexure-P8: IP Conformance Parameters – DTMF – RFC 4733Parameter Group: IPConformance(CONFIP)

S.No.	ParameterName	IndividualParameterName	IETFR FC	Clause/ Section	Applicability/Remarks
P8.1	DTMFParametersSet-A	RTPpayloadformatfornamedtelephonese vents	RFC4733	Clause2	MGW,LMGW
P8.2	DTMFParametersSet-A	UseofRTP headerfields	RFC4733	Clause2.2	MGW,LMGW
P8.3	DTMFParametersSet-A	PayloadFormat	RFC4733	Clause2.3	MGW,LMGW
P8.4	DTMFParameters Set-B	DTMF:Applications	RFC4733	Clause3.1	SoftSwitch
P8.5	DTMFParameters Set-B	DTMF: CongestionConsideration	RFC4733	Clause3.3	SoftSwitch
P8.6	DTMFParameters Set-B	DTMF:Events	RFC4733	Clause3.2	SoftSwitch
P8.7	DTMFParameters Set-B	DTMF:PayloadFormat	RFC4733	Clause2.3	SoftSwitch

S.No.	ParameterName	IndividualParameterName	IETFR FC	Clause/ Section	Applicability/Remarks
P8.8	DTMFParameters Set-B	DTMF:RTPpayloadformatfornamedtelephonesevents	RFC4733	Clause2	SoftSwitch
P8.9	DTMFParameters Set-B	DTMF: Specification of Eventscodesfor DTMF events	RFC4733	Clause3	SoftSwitch
P8.10	DTMFParameters Set-B	DTMF: Use of RTP headerfields	RFC4733	Clause2.2	SoftSwitch
P8.11	DTMFParametersSet-C	DTMF:Durationnegotiation	RFC4733	Clause2.3.5	PABX
P8.12	DTMFParametersSet-C	DTMF:NegotiationofPayload	RFC4733	Clause2.5.1.1	PABX
P8.13	DTMFParametersSet-C	DTMF:TransmissionofEventPacket	RFC4733	Clause2.5.1.2	PABX
P8.14	DTMFParametersSet-C	DTMF: Verification ofsequenceno.andtimestamp	RFC4733	Clause2.2.1	PABX

Annexure-P9:IPConformanceParameters –SCTP–RFC4960

ParameterGroup:IPConformance(CONFIP)

S.No.	ParameterName	IndividualParameterName	IETFR FC	Clause/Se ction	Applicability/Remarks
P9.1	SCTPParametersSet-A	SCTPpacketFormat	RFC4960	Clause3	MGW, LMGW,SGW
P9.2	SCTPParametersSet-A	SCTP common header fielddescriptions	RFC4960	Clause3.1	MGW, LMGW,SGW
P9.3	SCTPParametersSet-A	Chunkfielddescriptions	RFC4960	Clause3.2	MGW, LMGW,SGW
P9.4	SCTPParametersSet-A	Optional/variable-lengthparametersformat	RFC4960	Clause3.2.1	MGW, LMGW,SGW
P9.5	SCTPParametersSet-A	Reporting of unrecognizedparameters	RFC4960	Clause3.2.2	MGW, LMGW,SGW
P9.6	SCTPParametersSet-A	SCTPassociationstatediagram	RFC4960	Clause4	MGW, LMGW,SGW
P9.7	SCTPParametersSet-B	UserDataFragmentation	RFC4960	Clause1.5.3	SBC,SoftSwitch
P9.8	SCTPParametersSet-B	PathManagement	RFC4960	Clause1.5.7	SBC,SoftSwitch
P9.9	SCTPParametersSet-B	TransmissionofDATA Chunks	RFC4960	Clause6.1	SBC,SoftSwitch
P9.10	SCTPParametersSet-B	PathFailureDetection	RFC4960	Clause8.2	SBC,SoftSwitch

Annexure-P10:IPConformance Parameters–M3UA–RFC4960andSignallingoverIP–RFC2719

ParameterGroup:IPConformance(CONFIP)

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
P10.1	M3UAParameters	Procedures to Support the M3UA-User	RFC3332	Clause4.1	SoftSwitch, SGW
P10.2	M3UAParameters	Establishment of Association andTrafficBetweenSGs andASPs	RFC3332	Clause5.1	SoftSwitch, SGW
P10.3	M3UAParameters	M3UAPort Number	RFC3332	Clause7.2	SoftSwitch, SGW
P10.4	M3UA ProtocolExtensionsParameter	M3UAProtocolExtensions	RFC3332	Clause7.3	SoftSwitch, SGW
P10.5	SignallingProtocolOverIP	GatewayComponentFunctions	RFC2719	Clause2.1	SGW
P10.6	SignallingProtocolOverIP	SS7InterworkingforConnectionControl	RFC2719	Clause2.2	SGW
P10.7	SignallingProtocolOverIP	ISDNInterworkingforConnectionControl	RFC2719	Clause2.3	SGW
P10.8	SignallingProtocolOverIP	ArchitectureforDatabaseAccess	RFC2719	Clause2.4	SGW
P10.9	SignallingProtocolOverIP	SGto SG	RFC2719	Clause3.5	SGW

Annexure-P11: IP Conformance Parameters – Functional Tests for IPParameter Group: IPConformance(CONFIP)

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
P11.1	IPV4ParametersSet-D	IPV4FunctionalTests	RFC791	Appendix-II,Test-5	LANSwitch,Router
P11.2	SNMPv2Parameters	SNMPv2FunctionalTests	RFC3416	Appendix-II, Test-38	LANSwitch,Router
P11.3	SNMPv3Parameters	SNMPv3FunctionalTests	RFC3410	Appendix-II, Test-39	LANSwitch,Router
P11.4	SNMPv2 or Qx ProtocolParameters	SNMPv2 or Qx Protocolfunctionaltest		Appendix-II,Test-6	LANSwitch,Router
P11.5	SNMPv3 or Qx ProtocolParameters	SNMPv3 or Qx Protocolfunctionaltest		Appendix-II,Test-7	LANSwitch,Router
P11.6	DynamicRouting	DynamicRoutingFunctionalTests		Appendix-II,Test-8	Router,L3switch
P11.7	StaticRouting	StaticRoutingFunctionalTests		Appendix-II,Test-9	Router,L3switch
P11.8	TCPParameters	TCPFunctionalTests	RFC793	Appendix-II, Test-10	Router
P11.9	MacLearning&Pkt Fwdg	Mac Learning and PacketForwarding		Appendix-II, Test-11	LANSwitch

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
P11.10	SpanningTreeProtocolTest	Spanning Tree Protocol RootBridge Election FunctionalTest	IEEE802.1d	Appendix-II, Test-12	LANSwitch
P11.11	SpanningTreeProtocolTest	Spanning Tree Protocol PortBlockingFunctional Test	IEEE802.1d	Appendix-II, Test-13	LANSwitch
P11.12	OSPFv2	OSPFv2	RFC2328	Appendix-I,Table-1	Router
P11.13	OSPFv3forIPv6	OSPFV3	RFC2740	Appendix-I,Table-2	Router
P11.14	IPV6CompleteSuite	RFC2460 or8200	RFC2460/8200	Appendix-I,Table-3	Router,SecuritySystem
P11.15	IPV6CompleteSuite	RFC4861	RFC4862	Appendix-I,Table-4	Router,SecuritySystem
P11.16	IPV6CompleteSuite	RFC4862	RFC4862	Appendix-I,Table-5	Router,SecuritySystem
P11.17	IPV6CompleteSuite	RFC1981	RFC1981	Appendix-I,Table-6	Router,SecuritySystem
P11.18	IPV6CompleteSuite	RFC4443	RFC4443	Appendix-I,Table-7	Router,SecuritySystem
P11.19	BGPforIPv6	BGPforIPV6	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
P11.22	LDP		RFC5036	Appendix-I,Table-	MPLSRouter

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
				11	
P11.23	IPSecFunctionalTest	IPSecFunctionalTest		Appendix-II, Test-16	IPSecuritySystem
P11.24	NATFunctionalTest	NATFunctionalTest		Appendix-II, Test-17, 18	IPSecuritySystem
P11.25	PolicyFunctional Test	PolicyFunctional Test		Appendix-II, Test-19	IPSecuritySystem
P11.26	IDSFunctionalTest	IDSFunctionalTest		Appendix-II, Test-20, 21	IPSecuritySystem
P11.27	IPSFunctionalTest	IPSFunctionalTest		Appendix-II, Test-22, 23	IPSecuritySystem
P11.28	UTM URL, Content & Anti-Virus Filtering FunctionalTest	UTM URL, Content & Anti-VirusFilteringFunctionalTest		Appendix-II, Test-24, 25, 26	IPSecuritySystem
P11.29	Profile for frequencysynchronisation	Profile for frequencysynchronisation		Appendix-II, Test-27	PTPGM
P11.30	Profilefortimeandphasesynchronisation with fulltimingsupport	Profilefortimeandphasesynchronisation with fulltimingsupport		Appendix-II, Test-28	PTPGM
P11.31	Profile for time and phasesynchronisationwithpartial	Profile for time and phasesynchronisationwithpartial		Appendix-II, Test-29	PTPGM

S.No.	ParameterName	IndividualParameterName	IETFRFC	Clause/Section	Applicability/Remarks
	timingsupport	timingsupport			
P11.32	PPPoE	PPPoEFunctionalTest	RFC2516	Appendix-II, Test-14	PON,Router
P11.33	Radius	RadiusFunctionalTest	RFC2865	Appendix-II, Test-15	Router
P11.34	MPLS-TPRequirement	MPLS-TPRequirement	RFC5654	Clause2	MPLS TP CEN Switch(Conformancetesting)
P11.35	EthernetPWEandServiceIdentification	EthernetPWEandServiceIdentification	RFC4448	Clause4	MPLSTPCENSwitch (Conformancetesting)
P11.36	TDMPWEandServiceIdentification	TDMPWEandServiceIdentification	RFC3916	Clause4&Clause7.1	MPLSTPCENSwitch (Conformancetesting)
P11.37					
P11.38					

ANNXEUREQ:OpticalFibre(SingleMode)Tests

I. ITU-TG.652.DOptical Fibre– (Variant1)

SN	ParameterName	IndividualParameterName	Standard	Limits/Values
1	**GeometricalCharacteristics**	ModeFieldDiameterat1310nm	ITU-TG.652 and ITU-TG.650.1; IEC60793-2-50and IEC 60793-1-45	9.2 ±0.4 µm
2		CladdingDiameter	ITU-TG.652 and ITU-TG.650.1; IEC60793-2-50and IEC 60793-1-20	125 ±0.7 µm
3		CladdingNon-circularity	ITU-TG.652 and ITU-TG.650.1; IEC60793-2-50and IEC 60793-1-20	≤ 0.8 %
4		CoreCladconcentricityerror	ITU-TG.652 and ITU-TG.650.1; IEC60793-2-50and IEC 60793-1-20	≤ 0.5 µm
5		Coatingdiameter	IEC60793-2-50and IEC 60793-1-21	242±5 µm(uncolor); 252± 10µm(color)
6		Coating/Claddingconcentricity	IEC60793-2-50and IEC 60793-1-21	≤ 12 µm
7	**TransmissionCharacteristics**(Attenuation ofuncabledfibre)	At1310 nm	ITU-TG.652 and ITU-TG.650.1; IEC60793-2-50and IEC 60793-1-40	≤0.34dB/km
8		At1550 nm	ITU-TG.652 and ITU-TG.650.1; IEC60793-2-50and IEC 60793-1-40	≤0.20dB/km
9		At1490 nm	ITU-TG.652and ITU-T G.650.1; IEC60793-2-50and IEC 60793-1-40	≤0.24dB/km
10		At1270 nm	ITU-TG.652 and ITU-TG.650.1; IEC60793-2-50and IEC 60793-1-40	≤0.40dB/km
11		At1625 nm	ITU-TG.652 and ITU-TG.650.1; IEC60793-2-50and IEC 60793-1-40	≤0.23dB/km
12		Waterpeak attenuation at1380 to 1390 nm	ITU-TG.652 and ITU-TG.650.1; IEC60793-2-50and IEC 60793-1-40	≤0.34dB/km
13		Suddenirregularityin attenuation	TelcordiaGR-20-CORE,2013andIEC60793-1-40	≤ 0.1 dB

14	**TransmissionCharacteristics**(Chromatic Dispersion)	At1550nm	ITU-TG.652 and ITU-TG.650.1; IEC60793-2-50and IEC 60793-1-42	≤ 18.0 ps/nm.Km
15		At1625nm	ITU-TG.652 and ITU-TG.650.1; IEC60793-2-50and IEC 60793-1-42	≤ 22.0 ps/nm.Km
16		In1285-1330nmband	ITU-TG.652and ITU-T G.650.1; IEC60793-2-50and IEC 60793-1-42	≤ 3.5 ps/nm.Km
17		In1270-1340nmband	ITU-TG.652 and ITU-TG.650.1; IEC60793-2-50and IEC 60793-1-42	≤ 5.3 ps/nm.Km
18		ZeroDispersionslope	ITU-TG.652 and ITU-TG.650.1; IEC60793-2-50and IEC 60793-1-42	≤ 0.092 ps/(nm^2Km)
19		ZeroDispersionwavelengthrange	ITU-TG.652 and ITU-TG.650.1; IEC60793-2-50and IEC 60793-1-42	1300 -1324nm
20	**TransmissionCharacteristics**(Polarizationmode dispersion)	UncabledFiber	ITU-TG.652andITU-TG.650.1;IEC60793-2-50andIEC60793-1-48	≤ 0.15 ps/√km
21		Linkdesignvalueforun-cabled fibre	ITU-TG.652 and ITU-TG.650.1; IEC60793-2-50and IEC 60793-1-48	≤ 0.06 ps/√km
22	**TransmissionCharacteristics**(Cutoff wavelength)	Cablecut-offwavelength	ITU-TG.652andITU-T G.650.1;IEC60793-2-50andIEC60793-1-44	1260nmMax
23	**TransmissionCharacteristics**(Fibre Macrobendloss)	Changeinattenuationwhenfiberiscoiledwith 100 turnson 60 ±1.0 mmdiametermandrel	ITU-TG.652,ITU-TG.650.1,IEC60793-2-50andIEC60793-1-47	≤0.05 dBat 1550 nm ≤0.1 dBat 1625 nm
24		Changeinattenuationwhenfiberiscoiled with 1 turnaround 32 ± 0.5mm diametermandrel	ITU-TG.652,ITU-TG.650.1,IEC60793-2-50andIEC60793-1-47	≤0.5 dBat 1550 nm ≤1.0 dBat 1625 nm
25		Change in attenuationwhen fiberiscoiledwith100turnson50±0.5 mmdiametermandrel	ITU-TG.652,ITU-TG.650.1,IEC60793-2-50andIEC60793-1-47	≤0.05 dBat 1310 nm
26	**MechanicalCharacteristics**	Prooftestforminimumstrainlevel	ITU-TG.652,G.650.1and IEC 60793-2-50,60793-1-30	1%

27		Peak Stripability force to removeprimary coating of the fiber(Unaged,Wateraged,Dampheat aged	IEC60793-2-50,60793-1-32	1.0≤ N≤8.9 N (Peak) 1.0≤N≤ 5.0N(Average)
28		DynamicTensileStrengthUnaged)	IEC60793-2-50and IEC 60793-1-31	≥ 550 KPSI(3.80Gpa)
29		DynamicTensileStrength Aged(Dampheataged)	IEC60793-2-50and IEC60793-1-31	≥ 440 KPSI(3.00Gpa)
30		DynamicFatigue (Unaged andDampheat aged)	IEC60793-2-50and IEC 60793-1-33	≥ 20
31		FiberCurl	IEC60793-2-50,60793-1-34	≥4Meterradiusof curvature
32	**EnvironmentalCharacteristicsof Fiber forboth color anduncolorfibres**	Temperature Cycle Test:Temperature Dependence ofAttenuation:InducedAttenuationat1550nm and 1625 nm at -60°C to +85°C	IEC60793-2-50and IEC 60793-1-52	≤0.05dB/Km
33		Temperature-Humidity Cycle Test:Inducedattenuationat1550nmand 1625 nmat -10C TO +85°C and95%relative humidity	EIA/TIA455-73	≤0.05dB/Km
34		Water Immersion Test: Inducedattenuationat 1550nm and 1625 nmduetowaterimmersionat23±2°C	IEC60793-2-50and IEC 60793-1-53	≤0.05dB/Km
35		AcceleratedAging(DryHeat)Test:Inducedattenuationat1550nmand 1625 nm due to Temperature agingat85 ± 2° C	IEC60793-2-50and IEC 60793-1-51	≤0.05dB/Km
36		RetentionofCoatingColor:Coated fibre aged for 30 days at85°Ctemperaturewith95% Humidityandthen20days in85°Cdryheat	IEC60793-2-50and IEC 60793-1-51	Nochangeincolourofcoatedfibre

37		High Temperature and HighHumidity (Damp Heat) Test:Induced attenuation at 1550 nm &1625nmat85°Ctemperatureand 85%Relative Humidityfor30 days	IEC60793-2-50and IEC 60793-1-50	≤0.05dB/Km
38		Cable Material Compatibility testfor fibre : Fibre to be aged withfilling compound for 30 days at85°Ctemperatureand85%RelativeHumidity	TelcordiaGR-20-CORE,2013;DraftIEC60794-1-219	• Agedcoatingstripforce: 1.0≤ F≤ 8.9 N(Peak) 1.0≤F≤ 5.0N(Average) • VisualInspectionunder5Xmagnification: Nofibrecoatingscracking,splitting,or delamination. • For coloured fibres, colour to beidentifiableandnocolourtransferstothefilling compound. • MEK Rub Test as mentionedbelowin test no 39.
39	**Colourqualification forcolorfibres**	MEKRUBTest(MethylEthylKetone)	DraftIEC60794-1-219	Tobetestedbyusingsocked(solvent)tissue paper for ten strokesunidirectional on 10cm length of thefiber.Nocolortraceshallbeobserved ontissuepaperaftertesting.
40	**Material Properties:**	FiberMaterials:Thesubstancesof whichthefibresaremade	RoHS3 (EU2015/863)	Fibrematerial tobeRoHScomplied.

N.B.:Latestissueofabovementioned Standardsmaybereferred.

II. ITU-TG.655OpticalFibre(Variant2)

SN	ParameterName	IndividualParameterName	Standard	Limits/Values
1	**GeometricalCharacteristics**	ModeFieldDiameterat1550nm	ITU-TG.655and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-45	9.6 ±0.4 µm
2		CladdingDiameter	ITU-TG.655and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-20	125 ±0.7 µm
3		CladdingNon-circularity	ITU-TG.655and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-20	≤ 0.8 %
4		CoreCladconcentricityerror	ITU-TG.655and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-20	≤ 0.5 µm
5		Coatingdiameter	IEC60793-2-50and IEC 60793-1-21	242±5 µm(uncolor); 252± 10µm (color)
6		Coating/Claddingconcentricity	IEC60793-2-50and IEC 60793-1-21	≤ 12 µm
7	**TransmissionCharacteristics**(Attenuation ofuncabledfibre)	At1550 nm	ITU-TG.655andITU-TG.650.1;IEC 60793-2-50and IEC60793-1-40	≤0.21dB/km
8		At1625 nm	ITU-TG.655and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-40	≤0.23dB/km
9		Suddenirregularityin attenuation	TelcordiaGR-20-CORE,2013and IEC60793-1-40	≤ 0.1 dB
10	**TransmissionCharacteristics**(Chromatic Dispersion)	At 1530to 1565 nm	ITU-T G.655, G.650.1 andIEC60793-2-50,60793-1-42	Min value of Dmin - 1.0 ps/nm.KmMax value ofDmax-10.0ps/nm.Km Dmax–Dmin:≤5.0ps/nm.km
11		At 1565to 1625nm	ITU-T G.655, G.650.1 andIEC60793-2-50,60793-1-42	Min value of Dmin - 4.0 ps/nm.KmMax value ofDmax-14.0ps/nm.Km
12		Dispersionslopeat1550nm	ITU-T G.655, G.650.1 andIEC60793-2-50,60793-1-42	≤ 0.09 ps/(nm^{2}Km)

13	**TransmissionCharacteristics**(Polarizationmode dispersion)	UncabledFiber	ITU-TG.655and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-48	≤ 0.15 ps/√km
14		Linkdesignvalueforun-cabledfibre	ITU-TG.655andITU-TG.650.1;IEC60793-2-50andIEC 60793-1-48	≤ 0.1 ps/√km
15	**TransmissionCharacteristics**(Cutoff Wavelength)	Cablecutoffwavelength	ITU-TG.655andITU-TG.650.1;IEC60793-2-50andIEC 60793-1-44	1450nm Max
16	**TransmissionCharacteristics**(Fibre Macrobendloss)	Changeinattenuationwhenfiberiscoiledwith 100 turnson 60 ±1.0 mmdiametermandrel	ITU-TG.655,ITU-TG.650.1,IEC60793-2-50andIEC60793-1-47	≤0.05 dBat 1550 nm ≤0.1 dBat 1625 nm
17		Changeinattenuationwhenfiberiscoiled with 1 turn around 32 ± 0.5mm diametermandrel	ITU-TG.655,ITU-TG.650.1,IEC60793-2-50andIEC60793-1-47	≤0.5 dBat 1550 nm ≤0.5 dBat 1625 nm
18	**MechanicalCharacteristics**	Prooftestforminimumstrainlevel	ITU-TG.655,G.650.1 and IEC60793-2-50,60793-1-30	1%
19		Peak Stripability force to removeprimarycoatingof the fiber (Unaged,Wateraged,Dampheataged)	IEC60793-2-50,60793-1-32	1.0≤ F≤ 8.9 N(Peak) 1.0≤F≤ 5.0N(Average)
20		DynamicTensileStrength (Unaged)	IEC60793-2-50and IEC 60793-1-31	≥ 550 KPSI(3.80Gpa)
21		DynamicTensileStrength Aged(Dampheataged)	IEC60793-2-50and IEC60793-1-31	≥ 440 KPSI(3.00Gpa)
22		DynamicFatigue (Unaged andDampheat aged)	IEC60793-2-50and IEC 60793-1-33	≥ 20
23		FiberCurl	IEC60793-2-50,60793-1-34	≥4Meterradiusof curvature
24	**EnvironmentalCharacteristicsof Fiber (forboth color anduncolorfibres)**	Temperature Cycle Test:Temperature Dependence ofAttenuation:InducedAttenuation at1550nmand1625nmat-60°Cto +85°C	IEC60793-2-50and IEC 60793-1-52	≤0.05dB/Km

25		Temperature-Humidity Cycle Test:Induced attenuation at 1550 nm and1625nm at -10°C TO +85° C and 95%relative humidity	EIA/TIA455-73	≤0.05dB/Km
26		Water Immersion Test: Inducedattenuation at 1550 nm and 1625nmduetowaterimmersionat23± 2°C	IEC60793-2-50and IEC 60793-1-53	≤0.05dB/Km
27		AcceleratedAging(DryHeat)Test:Inducedattenuationat1550nmand 1625 nm due to Temperature agingat85 ± 2° C	IEC60793-2-50and IEC 60793-1-51	≤0.05dB/Km
28		RetentionofCoatingColor:Coated fibre aged for 30 days at85°C temperature with 95%Humidityandthen20days in85°C dryheat	IEC60793-2-50and IEC 60793-1-51	Nochangeincolourofcoatedfibre
29		High Temperature and HighHumidity (Damp Heat) Test:Induced attenuation at 1550 nm &1625 nmat 85°C temperature and85%RelativeHumidityfor30days	IEC60793-2-50and IEC 60793-1-50	≤0.05dB/Km
30		Cable Material Compatibility testfor fibre : Fibre to be aged withfilling compound for 30 days at85°Ctemperatureand85%RelativeHumidity	TelcordiaGR-20-CORE,2013;DraftIEC60794-1-219	• Agedcoatingstripforce: 1.0≤ F≤ 8.9 N(Peak) 1.0≤F≤ 5.0N(Average) • VisualInspectionunder5Xmagnification: Nofibrecoatingscracking,splitting,or delamination. • For coloured fibres, colour to beidentifiable and no colourtransferstothefillingcompound. • MEKRubTest asmentioned

				belowin testno 31.
31	**Colourqualification**	MEKRUBTest(MethylEthylKetone)	DraftIEC60794-1-219	To be tested by using socked(solvent) tissue paper for ten strokesunidirectionalon10cmlengthofthefiber.No color traceshall be observedontissuepaperaftertesting.
32	**MaterialProperties:**	FiberMaterials: Thesubstancesofwhichthefibresaremade	RoHS3 (EU2015/863)	Fibrematerial tobeRoHScomplied.

N.B.:Latestissueofabovementioned Standardsmaybereferred.

III. ITU-TG.656OpticalFibre(Variant3)

SN	ParameterName	IndividualParameterName	Standard	Limits/Values
1	**GeometricalCharacteristics**	ModeFieldDiameterat1550nm	ITU-TG.656 andITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-45	9.2 ±0.4 µm
2		CladdingDiameter	ITU-TG.656 andITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-20	125 ±0.7 µm
3		CladdingNon-circularity	ITU-TG.656andITU-TG.650.1;IEC60793-2-50and IEC60793-1-20	≤ 1 %
4		CoreCladconcentricityerror	ITU-TG.656andITU-TG.650.1;IEC60793-2-50and IEC60793-1-20	≤ 0.5 µm
5		Coatingdiameter	IEC60793-2-50and IEC60793-1-21	242±5 µm(uncolor); 252± 10µm(color)
6		Coating/Claddingconcentricity	IEC60793-2-50and IEC60793-1-21	≤ 12 µm
7	**TransmissionCharacteristics**(Attenuation ofuncabledfibre)	At1460	ITU-TG.656,G.650.1 and IEC60793-2-50,60793-1-40	≤0.26dB/km
8		At1550 nm	ITU-TG.656,G.650.1 and IEC60793-2-50,60793-1-40	≤0.21dB/km
9		At1625 nm	ITU-TG.656,G.650.1 and IEC60793-2-50,60793-1-40	≤0.24dB/km
10		At1383 nm	ITU-T G.656, G.650.1 andIEC60793-2-50,60793-1-40	≤0.4dB/km
11		Suddenirregularityin attenuation	TelcordiaGR-20-CORE,2013	≤ 0.05 dB
12	**Transmission Characteristics**	At 1460to 1550 nm	ITU-TG.656,G.650.1 and IEC60793-2-50,60793-1-42	1.0-9.28 ps/nm.Km

13	(ChromaticDispersion)	At 1550to 1625 nm	ITU-TG.656,G.650.1and IEC60793-2-50,60793-1-42	3.6 – 14.0ps/nm.Km
14		Dispersionslopeat1550nm	ITU-TG.656,G.650.1 and IEC60793-2-50,60793-1-42	≤ 0.07 ps/(nm^{2}Km)
15	**TransmissionCharacteristics**(Polarizationmodedispersion)	UncabledFiber	ITU-TG.656andITU-TG.650.1;IEC60793-2-50and IEC60793-1-48	≤ 0.15 ps/√km
16		Linkdesignvalueforun-cabledfibre	ITU-TG.655andITU-TG.650.1;IEC60793-2-50and IEC60793-1-48	≤ 0.2 ps/√km
17	**TransmissionCharacteristics**(Cut off wavelength)	Cablecutoffwavelength	ITU-TG.656andITU-TG.650.1; IEC 60793-2-50 andIEC60793-1-44	1450nm Max
18	**TransmissionCharacteristics**(Fibre Macrobendloss)	Changeinattenuationwhenfiberiscoiled with 100 turns on60 ±1.0mm diametermandrel	ITU-T G.656 ,ITU-T G.650.1,IEC60793-2-50andIEC60793-1-47	≤0.05 dBat 1550 nm ≤0.1 dBat 1625 nm
19		Changeinattenuationwhenfiberiscoiled with 1 turn around 32 ± 0.5mm diametermandrel	ITU-T G.656 ,ITU-T G.650.1,IEC60793-2-50andIEC60793-1-47	≤0.5 dBat 1550 nm ≤0.5 dBat 1625 nm
20	**MechanicalCharacteristics**	Prooftest forminimum strain level	ITU-TG.656,G.650.1 and IEC60793-2-50,60793-1-30	1%
21		Peak Stripability force to removeprimary coating of the fiber(Unaged,Wateraged,Dampheat aged)	IEC60793-2-50,60793-1-32	1.0≤ F≤ 8.9 N(Peak) 1.0≤F≤ 5.0N(Average)
22		DynamicTensileStrength (Unaged)	IEC60793-2-50and IEC60793-1-31	≥ 550 KPSI(3.80Gpa)
23		DynamicTensileStrength Aged(Dampheataged)	IEC60793-2-50andIEC 60793-1-31	≥ 440 KPSI(3.00Gpa)
24		DynamicFatigue Unagedand Dampheataged	IEC60793-2-50and IEC60793-1-33	≥ 20
25		FiberCurl	IEC60793-2-50,60793-1-34	≥4Meterradiusof curvature

26	**EnvironmentalCharacteristicsof Fiber forboth color anduncolorfibres**	Temperature Cycle Test:Temperature Dependence ofAttenuation:InducedAttenuationat1550 nmand 1625nm at-60°C to +85°C	IEC60793-2-50and IEC60793-1-52	≤0.05dB/Km
27		Temperature-Humidity CycleTest:Inducedattenuationat1550nmand 1625 nm at-10°C to +85°C and 95%relativehumidity	EIA/TIA455-73	≤0.05dB/Km
28		Water Immersion Test: Inducedattenuation at 1550 nm and 1625nmduetowaterimmersionat23 ± 2°C	IEC60793-2-50and IEC60793-1-53	≤0.05dB/Km
29		Accelerated Aging (Dry Heat)Test:Inducedattenuationat1550nm and 1625 nm dueto Temperatureagingat 85±2°C	IEC60793-2-50and IEC60793-1-51	≤0.05dB/Km
30		Retention of Coating Color:Coatedfibreagedfor30daysat85°C temperature with 95%Humidityand then20 daysin 85°Cdryheat	IEC60793-2-50and IEC60793-1-51	Nochangeincolourofcoatedfibre
31		High Temperature and HighHumidity (Damp Heat) Test:Induced attenuation at 1550 nm &1625nmat85°Ctemperatureand 85%RelativeHumidityfor30days	IEC60793-2-50and IEC60793-1-50	≤0.05dB/Km
32		CableMaterialCompatibilitytestfor fibre : Fibre to be aged withfilling compound for 30 days at85°C temperature and 85%RelativeHumidity	Telcordia GR-20-CORE,2013;DraftIEC60794-1-219	• Agedcoatingstripforce: 1.0≤ F≤ 8.9 N(Peak) 1.0≤F≤ 5.0N(Average) • VisualInspectionunder5Xmagnification: Nofibrecoatingscracking,splitting,or

				delamination. • For coloured fibres, colour to beidentifiableandnocolourtransferstothefillingcompound. • MEKRubTestasmentionedbelowintest no 33.
33	**Colourqualification**	MEKRUBTest(MethylEthylKetone)	DraftIEC60794-1-219	Tobetestedbyusingsocked(solvent)tissuepaper for ten strokes unidirectional on 10cmlength of the fiber. No color trace shall beobservedontissue paper aftertesting.
34	**MaterialProperties:**	FiberMaterials: Thesubstancesofwhichthefibresaremade	RoHS3 (EU2015/863)	Fibrematerial to beRoHScomplied.

N.B.:Latestissueofabovementioned Standardsmaybereferred.

IV. ITU-TG.657.A1Optical Fibre(Variant4)

SN	ParameterName	IndividualParameterName	Standard	Limits/Values
1	**GeometricalCharacteristics**	ModeFieldDiameterat1310nm	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-45	(8.8-9.2)± 0.4µm
2		CladdingDiameter	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-20	125 ±0.7 µm
3		CladdingNon-circularity	ITU-TG.657and ITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-20	≤ 0.8 %
4		CoreCladconcentricityerror	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-20	≤ 0.5 µm
5		Coatingdiameter a) 250µm fibre b) 200µm fibre	IEC60793-2-50andIEC60793-1-21	242±5 µm(uncolor); 252± 10µm (color) 180-210µm(uncolor);180-220µm(color)
6		Coating/Claddingconcentricity a) 250µmfibre b) 200µmfibre	IEC60793-2-50andIEC60793-1-21	≤ 12 µm ≤ 10 µm
7	**TransmissionCharacteristics**(Attenuation ofuncabledfibre)	At1310 nm	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-40	≤0.34dB/km
8		At1550 nm	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-40	≤0.20dB/km

9		At1490 nm	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-40	≤0.24dB/km
10		At1270 nm	ITU-TG.657 andITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-40	≤0.40dB/km
11		At1625 nm	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-40	≤0.23dB/km
12		Water peak attenuation at 1380 to1390 nm	ITU-TG.657 andITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-40	≤0.34dB/km
13		Suddenirregularityin attenuation	Telcordia GR-20-CORE,2013andIEC 60793-1-40	≤ 0.1 dB
14	**TransmissionCharacteristics**(Chromatic Dispersion)	At1550nm	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-42	≤ 18.0 ps/nm.Km
15		At1625nm	ITU-TG.657 andITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-42	≤ 22.0 ps/nm.Km
16		In1285-1330nmband	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-42	≤ 3.5 ps/nm.Km
17		In1270-1340nmband	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-42	≤ 5.3 ps/nm.Km
18		ZeroDispersionslope	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-42	≤ 0.092 ps/(nm^2Km)
19		ZeroDispersionwavelengthrange	ITU-TG.657 andITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-42	1300 -1324nm
20	**Transmission**	Un-cabledFiber	ITU-TG.657 andITU-T	≤ 0.15 ps/√km

	Characteristics(Polarizationmodedispersion)		G.650.1; IEC 60793-2-50and IEC60793-1-48	
21		Linkdesignvalueforun-cabledfibre	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-48	≤ 0.06 ps/√km
22	**TransmissionCharacteristics**(Cut-offwavelength)	FibercutoffwavelengthforfibreusedinPatch cords&Pig-tails (2msample)	ITU-TG.657 andITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-44	1260nmMax
23		Cablecutoffwavelength	ITU-TG.657andITU-TG.650.1; IEC 60793-2-50 andIEC60793-1-44	1260nmMax
24	**TransmissionCharacteristics**(Fibre Macrobendloss)	Changeinattenuationwhenfibreiscoiled with 10turns on 15 mm radiusmandrel	ITU-T G.657, G.650.1 andIEC60793-2-50,60793-1-47	≤0.25 dBat 1550 nm ≤1.0 dBat 1625 nm
25		Changeinattenuationwhenfibreiscoiled with 1 turn on 10mm radiusmandrel	ITU-T G.657, G.650.1 andIEC60793-2-50,60793-1-47	≤0.75 dBat 1550 nm ≤1.5 dBat 1625 nm
26	**MechanicalCharacteristics**	Prooftest forminimum strain level	ITU-TG.657,G.650.1 and IEC60793-2-50,60793-1-30	1%
27		Peak Stripability force to removeprimary coating of the fiber(Unaged,Wateraged,Dampheataged) a) 250 µmfibre b) 200µmfibre	IEC60793-2-50,60793-1-32	1.0≤ F≤ 8.9 N(Peak) 1.0≤F≤ 5.0N (Average) 0.4≤ F≤ 8.9 N(Peak) 0.4≤F≤ 5.0N(Average)
28		DynamicTensileStrength (Unaged)	IEC60793-2-50and IEC 60793-1-31	≥ 550 KPSI(3.80Gpa)
29		DynamicTensileStrength Aged(Dampheat aged)	IEC60793-2-50andIEC 60793-1-31	≥ 440 KPSI(3.00Gpa)
30		DynamicFatigue (Unaged andDampheat aged)	IEC60793-2-50and IEC 60793-1-33	≥ 20

31		FiberCurl	IEC60793-2-50,60793-1-34	≥4Meterradiusof curvature
32	**EnvironmentalCharacteristicsof Fiber forboth color anduncolorfibres**	Temperature Cycle Test:Temperature Dependence ofAttenuation:InducedAttenuationat 1550 nm and 1625 nm at -60°Cto +85°C	IEC60793-2-50andIEC60793-1-52	≤0.05dB/Km
33		Temperature-Humidity CycleTest:Inducedattenuationat1550nmand 1625 nm at-10° CTO +85° C and 95%relativehumidity	EIA/TIA455-73	≤0.05dB/Km
34		Water Immersion Test: Inducedattenuation at 1550 nm and 1625nmduetowaterimmersionat23 ± 2°C	IEC60793-2-50andIEC60793-1-53	≤0.05dB/Km
35		Accelerated Aging (Dry Heat)Test:Inducedattenuationat1550nm and 1625 nm due toTemperatureagingat 85± 2°C	IEC60793-2-50andIEC60793-1-51	≤0.05dB/Km
36		Retention of Coating Color:Coatedfibreagedfor30daysat85°C temperature with 95%Humidityand then20 daysin 85°Cdryheat	IEC60793-2-50andIEC60793-1-51	Nochangeincolourofcoatedfibre
37		High Temperature and HighHumidity (Damp Heat) Test:Induced attenuation at 1550 nm &1625nmat85°Ctemperatureand85%Relative Humidityfor30 days	IEC60793-2-50andIEC60793-1-50	≤0.05dB/Km

38		CableMaterialCompatibilitytestfor fibre : Fibre to be aged withfilling compound for 30 days at85°C temperature and 85%Relative Humidity	Telcordia GR-20-CORE,2013; DraftIEC60794-1-219	• Agedcoatingstripforce: 1.0≤ F≤ 8.9 N(Peak) 1.0≤F≤ 5.0N(Average) • VisualInspectionunder5Xmagnification:No fibre coatingscracking, splitting, ordelamination. • For coloured fibres, colour to beidentifiableandnocolourtransferstothefillingcompound. • MEKRubTestasmentionedbelowintestno 39.
39	**Colourqualification**	MEKRUBTest(MethylEthylKetone)	DraftIEC60794-1-219	Tobetestedbyusingsocked(solvent)tissuepaper for ten strokes unidirectional on 10cmlengthofthefiber.Nocolor traceshallbe observedontissuepaperaftertesting.
40	**MaterialProperties:**	FiberMaterials: Thesubstancesofwhichthefibresaremade	RoHS3 (EU2015/863)	Fibrematerial tobeRoHScomplied.

N.B.:Latestissueofabovementioned Standardsmaybereferred.

V. ITU-TG.657.A2Optical Fibre(Variant5)

SN	ParameterName	IndividualParameterName	Standard	Limits/Values
1	**GeometricalCharacteristics**	ModeFieldDiameterat1310nm	ITU-TG.657andITU-TG.650.1; IEC 60793-2-50 andIEC60793-1-45	**(8.6 to 9.2)± 0.4 µm**
2		CladdingDiameter	ITU-TG.657 andITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-20	125 ±0.7 µm
3		CladdingNon-circularity	ITU-TG.657 andITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-20	≤ 0.8 %
4		CoreCladconcentricityerror	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-20	≤ 0.5 µm
5		Coatingdiameter a) 250µmfibre b) 200µmfibre	IEC60793-2-50andIEC60793-1-21	242 ± 5 µm (uncolor); 252 ± 10 µm (color)180-210µm(uncolor);180-220µm(color)
6		Coating/Claddingconcentricity a) 250µmfibre b) 200µmfibre	IEC60793-2-50andIEC60793-1-21	≤ 12 µm ≤ 10 µm
7	**TransmissionCharacteristics**(Attenuation ofuncabledfibre)	At1310 nm	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-40	≤0.35dB/km
8		At1550 nm	ITU-TG.657 andITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-40	≤0.21dB/km
9		At1490 nm	ITU-TG.657 andITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-40	≤0.24dB/km
10		At1270 nm	ITU-TG.657 andITU-T	≤0.40dB/km

			G.650.1;IEC60793-2-50and IEC60793-1-40	
11		At1625 nm	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-40	≤0.23dB/km
12		Water peak attenuation at 1380 to1390 nm	ITU-TG.657 andITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-40	≤0.35dB/km
13		Suddenirregularityin attenuation	Telcordia GR-20-CORE,2013andIEC 60793-1-40	≤ 0.1 dB
14	**TransmissionCharacteristics**(Chromatic Dispersion)	At1550nm	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-42	≤ 18.0 ps/nm.Km
15		At1625nm	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-42	≤22.0 ps/nm.Km
16		In1285-1330nmband	ITU-TG.657 andITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-42	≤ 3.5 ps/nm.Km
17		In1270-1340nmband	ITU-TG.657 andITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-42	≤ 5.3 ps/nm.Km
18		ZeroDispersionslope	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-42	≤ 0.092 ps/(nm^{2}Km)
19		ZeroDispersionwavelengthrange	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-42	1300 -1324nm
20	**TransmissionCharacteristics**(Polarizationmode dispersion)	UncabledFiber	ITU-TG.657andITU-TG.650.1;IEC60793-2-50and IEC60793-1-48	≤ 0.2 ps/√km
21		Linkdesignvalueforun-cabled fibre	ITU-TG.657 andITU-T G.650.1;IEC60793-2-50and	≤ 0.06 ps/√km

			IEC60793-1-48	
22	**TransmissionCharacteristics**(Cut offwavelength)	FibercutoffwavelengthforfibreusedinPatch cords&Pig-tails (2msample)	ITU-TG.657 andITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-44	1260nmMax
23		Cablecut-offwavelength	ITU-TG.657 andITU-T G.650.1; IEC 60793-2-50 andIEC60793-1-44	1260nmMax
24	**TransmissionCharacteristics**(Fibre Macrobendloss)	Changein attenuationwhenfibre is coiled with 10 turns on 15 mmradiusmandrel	ITU-T G.657, G.650.1 andIEC60793-2-50,60793-1-47	≤0.03 dBat 1550nm ≤0.1 dBat 1625 nm
25		Changeinattenuationwhenfibre iscoiledwith1turnon10mmradiusmandrel	ITU-T G.657, G.650.1 andIEC60793-2-50,60793-1-47	≤0.1 dBat 1550 nm ≤0.2 dBat 1625 nm
26		Changeinattenuationwhenfibreiscoiled with 1turn on 7.5 mm radiusmandrel	ITU-T G.657, G.650.1 andIEC60793-2-50,60793-1-47	≤0.5 dBat 1550 nm ≤1.0 dBat 1625 nm
27	**MechanicalCharacteristics**	Prooftest forminimum strain level	ITU-TG.657,G.650.1 and IEC60793-2-50,60793-1-30	1%
28		Peak Stripability force to removeprimary coating of the fiber(Unaged,Wateraged,Dampheataged) a) 250 µmfibre b) 200µmfibre	IEC60793-2-50,60793-1-32	1.0≤ F≤ 8.9 N(Peak) 1.0≤F≤ 5.0N(Average) 0.4≤ F≤ 8.9 N(Peak) 0.4≤F≤ 5.0N(Average)
29		DynamicTensileStrength (Unaged)	IEC60793-2-50and IEC 60793-1-31	≥ 550 KPSI(3.80Gpa)
30		DynamicTensileStrength Aged(Dampheataged)	IEC60793-2-50andIEC 60793-1-31	≥ 440 KPSI(3.00Gpa)
31		DynamicFatigue Unagedand Dampheataged	IEC60793-2-50and IEC 60793-1-33	≥ 20

32		FiberCurl	IEC60793-2-50,60793-1-34	≥4Meterradiusof curvature
33	**EnvironmentalCharacteristicsof Fiber forboth color anduncolorfibres**	Temperature Cycle Test:Temperature Dependence ofAttenuation:InducedAttenuationat 1550 nm and 1625 nm at -60°Cto +85°C	IEC60793-2-50andIEC60793-1-52	≤0.05dB/Km
34		Temperature-Humidity CycleTest:Inducedattenuationat1550nmand 1625 nm at-10°C TO +85° C and 95%relativehumidity	EIA/TIA455-73	≤0.05dB/Km
35		Water Immersion Test: Inducedattenuation at 1550 nm and 1625nmdue to waterimmersion at 23±2°C	IEC60793-2-50andIEC60793-1-53	≤0.05dB/Km
36		Accelerated Aging (Dry Heat)Test:Inducedattenuationat1550nm and 1625 nm due toTemperatureagingat 85±2°C	IEC60793-2-50andIEC60793-1-51	≤0.05dB/Km
37		Retention of Coating Color:Coatedfibreagedfor30daysat85°C temperature with 95%Humidityand then20 daysin 85°Cdryheat	IEC60793-2-50andIEC60793-1-51	Nochangeincolourofcoatedfibre
38		High Temperature and HighHumidity (Damp Heat) Test:Induced attenuation at 1550 nm &1625nmat85°Ctemperatureand 85%RelativeHumidityfor30days	IEC60793-2-50andIEC60793-1-50	≤0.05dB/Km

39		CableMaterialCompatibilitytestfor fibre : Fibre to be aged withfilling compound for 30 days at85°C temperature and 85%Relative Humidity	Telcordia GR-20-CORE,2013; DraftIEC60794-1-219	• Agedcoatingstripforce: 1.0≤ F≤ 8.9 N(Peak) 1.0≤F≤ 5.0N(Average) • VisualInspectionunder5Xmagnification:No fibre coatingscracking, splitting, ordelamination. • For coloured fibres, colour to beidentifiableandnocolourtransferstothefillingcompound. • MEKRubTestasmentionedbelowintestno 40.
40	**Colourqualification**	MEKRUBTest(MethylEthylKetone)	DraftIEC60794-1-219	Tobetestedbyusingsocked(solvent)tissuepaper for ten strokes unidirectional on 10cmlengthofthefiber.Nocolor traceshallbe observedontissuepaperaftertesting.
41	**MaterialProperties:**	FiberMaterials: Thesubstancesofwhichthefibresaremade	RoHS3 (EU2015/863)	Fibrematerial tobeRoHScomplied.

N.B.:Latestissueofabovementioned Standardsmaybereferred.

VI. G.657.B3OpticalFibre(Variant6)

SN	ParameterName	IndividualParameterName	Standard	Limits/Values
1	**GeometricalCharacteristics**	ModeFieldDiameterat1310nm	ITU-TG.657andITU-TG.650.1;IEC60793-2-50andIEC 60793-1-45	8.6 ±0.4 µm
2		CladdingDiameter	ITU-TG.657and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-20	125 ±0.7 µm
3		CladdingNon-circularity	ITU-TG.657and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-20	≤ 0.8 %
4		CoreCladconcentricityerror	ITU-TG.657and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-20	≤ 0.5 µm
5		Coatingdiameter	IEC60793-2-50and IEC 60793-1-21	242±7 µm(uncolor); 252± 10µm (color)
6		Coating/Claddingconcentricity	IEC60793-2-50and IEC 60793-1-21	≤ 12 µm
7	**TransmissionCharacteristics**(Attenuation ofuncabledfibre)	At1310 nm	ITU-TG.657and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-40	≤0.35dB/km
8		At1550 nm	ITU-TG.657and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-40	≤0.22dB/km
9		At1490 nm	ITU-TG.657and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-40	≤0.24dB/km
10		At1270 nm	ITU-TG.657and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-40	≤0.40dB/km
11		At1625 nm	ITU-TG.657and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-40	≤0.24dB/km
12		Waterpeak attenuationat 1380 to 1390 nm	ITU-TG.657and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-40	≤0.35dB/km
13		Suddenirregularityinattenuation	TelcordiaGR-20-CORE,2013andIEC60793-1-40	≤ 0.1 dB
14	**Transmission Characteristics**	At1550nm	ITU-TG.657and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-42	≤ 18.0 ps/nm.Km

15	(ChromaticDispersion)	At1625nm	ITU-TG.657and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-42	≤ 22.0 ps/nm.Km
16		In1285-1330nmband	ITU-TG.657and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-42	≤ 3.5 ps/nm.Km
17		In1270-1340nm band	ITU-TG.657and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-42	≤ 5.3 ps/nm.Km
18		ZeroDispersionslope	ITU-TG.657and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-42	≤ 0.092 ps/(nm^{2}Km)
19		ZeroDispersionwavelength range	ITU-TG.657and ITU-TG.650.1;IEC 60793-2-50and IEC60793-1-42	1300 – 1350 nm
20	**TransmissionCharacteristics**(Polarizationmode dispersion)	UncabledFiber	ITU-TG.657and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-48	≤ 0.2 ps/√km
21		Linkdesignvalueforun-cabledfibre	ITU-TG.657andITU-TG.650.1;IEC60793-2-50andIEC 60793-1-48	≤ 0.06 ps/√km
22	**TransmissionCharacteristics**(Cut-offwavelength)	Fiber cut off wavelength forfibreusedinPatchcords&Pig-tails	ITU-TG.657andITU-TG.650.1;IEC60793-2-50andIEC 60793-1-44	1260nmMax
23		Cablecutoffwavelength	ITU-TG.657and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-44	1260nmMax
24	**TransmissionCharacteristics**(Fibre Macrobendloss)	Change in attenuation whenfibreiscoiledwith1turnon10 mmradiusmandrel	ITU-T G.657, G.650.1 andIEC60793-2-50,60793-1-47	≤0.03 dBat 1550 nm ≤0.1 dBat 1625 nm
25		Change in attenuationwhenfibreiscoiledwith1turnon7.5 mmradiusmandrel	ITU-TG.657,G.650.1	≤0.08 dBat 1550 nm ≤0.25 dBat 1625 nm
26		Change in attenuationwhenfibreiscoiledwith1turno n5 mmradiusmandrel	IEC60793-2-50,60793-1-47	≤0.15 dBat 1550 nm ≤0.45 dBat 1625 nm
27	**MechanicalCharacteristics**	Prooftest forminimum strain level	ITU-TG.657,G.650.1 and IEC60793-2-50,60793-1-30	1%
28		PeakStripabilityforcetoremoveprimarycoatingof the fiber (Unaged,Wateraged, Damp	IEC60793-2-50,60793-1-32	1.0≤ F≤ 8.9 N(Peak) 1.0≤F≤ 5.0N(Average)

		heataged)		
29		DynamicTensileStrength (Unaged)	IEC60793-2-50and IEC 60793-1-31	≥ 550 KPSI(3.80Gpa)
30		DynamicTensileStrength Aged(Dampheataged)	IEC60793-2-50and IEC60793-1-31	≥ 440 KPSI(3.00Gpa)
31		DynamicFatigue (Unaged andDampheat aged)	IEC60793-2-50and IEC 60793-1-33	≥ 20
32		FiberCurl	IEC60793-2-50,60793-1-34	≥4Meterradiusof curvature
33	**EnvironmentalCharacteristicsof Fiber forboth color anduncolorfibres**	Temperature Cycle Test:TemperatureDependenceofAttenuation:InducedAttenuationat 1550nm and 1625nm at -60°C to +85°C	IEC60793-2-50and IEC60793-1-52	≤0.05dB/Km
34		Temperature-Humidity CycleTest:Induced attenuation at1550nmand1625nmat-10°C TO +85° C and 95% relativehumidity	EIA/TIA455-73	≤0.05dB/Km
35		Water Immersion Test: Inducedattenuation at 1550 nm and 1625nmduetowaterimmersionat23 ± 2°C	IEC60793-2-50and IEC 60793-1-53	≤0.05dB/Km
36		AcceleratedAging(DryHeat)Test: Induced attenuation at1550 nm and 1625 nm dueto Temperatureagingat 85±2°C	IEC60793-2-50and IEC 60793-1-51	≤0.05dB/Km
37		Retention of Coating Color:Coatedfibreagedfor30daysat85°Ctemperaturewith95% Humidityandthen20daysin85°Cdryheat	IEC60793-2-50and IEC 60793-1-51	Nochangeincolourofcoatedfibre
38		HighTemperatureandHigh Humidity(Damp Heat) Test:	IEC60793-2-50and IEC 60793-1-50	≤0.05dB/Km

		Induced attenuation at 1550 nm&1625nmat85°Ctemperatureand 85%Relative Humidityfor 30days		
39		Cable Material Compatibilitytestforfibre: Fibretobeagedwith filling compound for 30days at 85°C temperature and85%Relative Humidity	Telcordia GR-20-CORE,2013;DraftIEC60794-1-219	• Agedcoatingstripforce: 1.0≤ F≤ 8.9 N(Peak) 1.0≤F≤ 5.0N(Average) • VisualInspectionunder5Xmagnification: Nofibrecoatingscracking,splitting,or delamination. • For coloured fibres, colour to beidentifiableandnocolourtransferstothefilling compound. • MEK Rub Test as mentionedbelowin test no 40.
40	**Colourqualification**	MEKRUBTest(MethylEthylKetone)	DraftIEC60794-1-219	Tobetestedbyusingsocked(solvent)tissue paper for ten strokesunidirectionalon10cm lengthof the fiber.Nocolortraceshallbeobservedontissue paperafter testing.
41	**MaterialProperties:**	FiberMaterials: Thesubstancesofwhichthefibresarema de	RoHS3 (EU2015/863)	Fibrematerial tobeRoHScomplied.

N.B.:Latestissueofabovementioned Standardsmaybereferred.

VII. G.654.DOpticalFibre(Variant7)

SN	ParameterName	IndividualParameterName	Standard	Limits/Values
1	**GeometricalCharacteristics**	ModeFieldDiameterat1550 nm	ITU-TG.654 and ITU-TG.650.1; IEC60793-2-50andIEC60793-1-45	(11.5to15.0) ± 0.7 µm
2		CladdingDiameter	ITU-TG.654 and ITU-TG.650.1; IEC60793-2-50andIEC60793-1-20	125 ±1 µm
3		CladdingNon-circularity	ITU-TG.654 and ITU-TG.650.1; IEC60793-2-50andIEC60793-1-20	≤ 2.0 %
4		CoreCladconcentricityerror	ITU-TG.654 and ITU-TG.650.1; IEC60793-2-50andIEC60793-1-20	≤ 0.8 µm
5		Coatingdiameter	IEC60793-2-50and IEC 60793-1-21	242±5 µm(uncolor); 252± 10µm (color)
6		Coating/Claddingconcentricity	IEC60793-2-50and IEC 60793-1-21	≤12 µm
7	**TransmissionCharacteristics**(Attenuation ofuncabledfibre)	At1550 nm	ITU-TG.654and ITU-TG.650.1; IEC60793-2-50andIEC60793-1-40	≤0.20dB/km
8		At1625nm	IEC60793-2-50and IEC 60793-1-40	≤0.40dB/km
9		Suddenirregularityin attenuation	TelcordiaGR-20-CORE,2013and IEC60793-1-40	≤ 0.1 dB
10	**TransmissionCharacteristics**(Chromatic Dispersion)	At1550 nm	ITU-TG.654,G.650.1 and IEC60793-2-50, 60793-1-42	Maximum23 ps/nm.Km
11		Dispersionslopeat1550nm	ITU-TG.654,G.650.1 and IEC60793-2-50, 60793-1-42	≤ 0.070 ps/(nm^{2}Km)
12	**TransmissionCharacteristics**(Polarization modedispersion)	UncabledFiber	ITU-TG.654 and ITU-TG.650.1; IEC60793-2-50andIEC60793-1-48	≤ 0.20 ps/√km
13		Linkdesignvalueforun-cabledfibre	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50andIEC 60793-1-48	≤ 0.20 ps/√km
14	**TransmissionCharacteristics** (Cut-off	Cablecut-offwavelength	ITU-T G.654 and ITU-T G.650.1; IEC 60793-2-50andIEC 60793-1-44	1530nm Max

	wavelength)			
15	**TransmissionCharacteristic**(FibreMacro bendloss)	Change in attenuation whenfiberiscoiledwith100turnson60±1.0 mm diametermandrel	ITU-TG.654,ITU-TG.650.1,IEC60793-2-50andIEC 60793-1-47	≤2.0 dBat 1625 nm
16	**MechanicalCharacteristics**	Prooftest forminimum strain level	ITU-TG.654,G.650.1 and IEC60793-2-50, 60793-1-30	Minimum0.69 GPa
17		PeakStripabilityforcetoremoveprimarycoatingof the fiber (Unaged,Wateraged,Dampheataged)	IEC60793-2-50,60793-1-32	1.0≤ F≤ 8.9 N(Peak) 1.0≤F≤ 5.0N(Average)
18		DynamicTensileStrength (Unaged)	IEC60793-2-50and IEC 60793-1-31	≥ 550 KPSI(3.80Gpa)
19		DynamicTensileStrength Aged(Dampheataged)	IEC60793-2-50and IEC60793-1-31	≥ 440 KPSI(3.00Gpa)
20		DynamicFatigue (Unaged andDampheat aged)	IEC60793-2-50and IEC 60793-1-33	≥ 20
21		FiberCurl	IEC60793-2-50,60793-1-34	≥4Meterradiusof curvature
22	**EnvironmentalCharacteristicsof Fiber forboth color anduncolorfibres**	Temperature Cycle Test:TemperatureDependenceofAttenuation:InducedAttenuationat 1550nm and 1625nm at -60°C to +85°C	IEC60793-2-50and IEC 60793-1-52	≤0.05dB/Km
23		Temperature-Humidity CycleTest:Induced attenuation at1550nmand1625nmat-10°C TO +85° C and 95% relativehumidity	EIA/TIA455-73	≤0.05dB/Km
24		Water Immersion Test: Inducedattenuation at 1550 nm and 1625nmduetowaterimmersionat23 ± 2°C	IEC60793-2-50and IEC 60793-1-53	≤0.05dB/Km

25		Accelerated Aging (Dry Heat)Test: Induced attenuation at1550 nm and 1625 nm due toTemperatureagingat85±2°C	IEC60793-2-50and IEC 60793-1-51	≤0.05dB/Km
26		Retention of Coating Color:Coatedfibreagedfor30daysat85°C temperature with 95%Humidity and then 20 days in85°Cdryheat	IEC60793-2-50and IEC 60793-1-51	Nochangeincolourofcoatedfibre
27		High Temperature and HighHumidity (Damp Heat) Test:Induced attenuation at 1550 nm&1625nmat85°Ctemperatureand 85% Relative Humidity for30days	IEC60793-2-50and IEC 60793-1-50	≤0.05dB/Km
28		Cable Material Compatibilitytestforfibre: Fibretobeagedwith filling compound for 30days at 85°C temperature and85%Relative Humidity	Telcordia GR-20-CORE,2013;DraftIEC60794-1-219	• Agedcoatingstripforce: 1.0≤ F≤ 8.9 N(Peak) 1.0≤F≤ 5.0N(Average) • VisualInspectionunder5Xmagnification: No fibre coatingscracking,splitting,or delamination. • For coloured fibres, colourto be identifiable and nocolour transfers to thefillingcompound. • MEK Rub Test asmentionedbelowintest

				no 29.
29	**Colourqualification**	MEKRUBTest(MethylEthylKetone)	DraftIEC60794-1-219	Tobetestedbyusingsocked(solvent) tissue paper for tenstrokes unidirectional on10cmlengthofthefiber. No color trace shall be observedontissuepaperaftertesting.
30	**MaterialProperties:**	FiberMaterials: Thesubstancesofwhichthefibresarema de	RoHS3 (EU2015/863)	Fibre material to be RoHScomplied.

N.B.:Latestissueofabovementioned Standardsmaybereferred.

VIII. ITU-TG.654.EOpticalFibre (Variant8)

SN	ParameterName	IndividualParameterName	Standard	Limits/Values
1	**GeometricalCharacteristics**	ModeFieldDiameterat1550nm	ITU-TG.654and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-45	(11.5to12.5) ± 0.7 µm
2		CladdingDiameter	ITU-TG.654and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-20	125 ±1 µm
3		CladdingNon-circularity	ITU-TG.654andITU-TG.650.1; IEC 60793-2-50and IEC60793-1-20	≤ 2.0 %
4		CoreCladconcentricityerror	ITU-TG.654and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-20	≤ 0.8 µm
5		Coatingdiameter	IEC60793-2-50and IEC 60793-1-21	242±5 µm(uncolor); 252± 10µm (color)
6		Coating/Claddingconcentricity	IEC60793-2-50and IEC 60793-1-21	≤ 12 µm
7	**TransmissionCharacteristics**(Attenuation ofuncabledfibre)	At1550 nm	ITU-TG.654,G.650.1andIEC60793-2-50,60793-1-40	≤0.23dB/km
8		At 1530nm -1612nm	ITU-TG.654,G.650.1and IEC 60793-2-50,60793-1-40	≤0.25dB/km
9		At 1612nm -1625nm	ITU-TG.654,G.650.1and IEC 60793-2-50,60793-1-40	≤0.35dB/km
10		Suddenirregularityin attenuation	TelcordiaGR-20-CORE,2013, IEC 60793-1-40	≤ 0.1 dB
11	**TransmissionCharacteristics**(Chromatic Dispersion)	At1550 nm	ITU-TG.654,G.650.1and IEC 60793-2-50,60793-1-42	17-23 ps/nm.Km
12		Dispersionslopeat1550nm	ITU-TG.654,G.650.1and IEC 60793-2-50,60793-1-42	0.050 - 0.070 ps/(nm^{2}Km)
13	**TransmissionCharacteristics**(Polarizationmode	UncabledFiber	ITU-TG.654and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-48	≤ 0.20 ps/√km
14		Linkdesignvalueforun-cabled fibre	ITU-TG.654and ITU-TG.650.1; IEC 60793-2-50and IEC60793-1-48	≤ 0.20 ps/√km

	dispersion)			
15	**TransmissionCharacteristics**(Cut-off wavelength)	Cablecutoffwavelength	ITU-TG.654andITU-TG.650.1;IEC60793-2-50andIEC 60793-1-44	1530nm Max
16	**TransmissionCharacteristics**(FibreMacro bendloss)	Change in attenuation when fiber iscoiledwith100turnson60±1.0mmdiametermandrel	ITU-TG.654,ITU-TG.650.1,IEC60793-2-50andIEC60793-1-47	≤0.1 dBat 1625 nm
17	**MechanicalCharacteristics**	Prooftestforminimumstrainlevel	ITU-TG.654,G.650.1 and IEC60793-2-50,60793-1-30	Minimum0.69 GPa
18		Peak Stripability force to removeprimary coating of the fiber(Unaged,Wateraged,Dampheataged	IEC60793-2-50,60793-1-32	1.0≤ F≤ 8.9 N(Peak) 1.0≤F≤ 5.0N(Average)
19		DynamicTensileStrength (Unaged)	IEC60793-2-50and IEC 60793-1-31	≥ 550 KPSI(3.80Gpa)
20		DynamicTensileStrength Aged(Dampheataged)	IEC60793-2-50and IEC60793-1-31	≥ 440 KPSI(3.00Gpa)
21		DynamicFatigue (Unaged andDampheat aged)	IEC60793-2-50and IEC 60793-1-33	≥ 20
22		FiberCurl	IEC60793-2-50,60793-1-34	≥4Meterradiusof curvature
23	**EnvironmentalCharacteristicsof Fiber forboth color anduncolorfibres**	Temperature Cycle Test:Temperature Dependence ofAttenuation:InducedAttenuationat1550nm and 1625 nm at -60°C to +85°C	IEC60793-2-50and IEC 60793-1-52	≤0.05dB/Km
24		Temperature-Humidity Cycle Test:Inducedattenuationat1550nmand 1625nm at -10°C TO +85° Cand	EIA/TIA455-73	≤0.05dB/Km

		95%relative humidity		
25		WaterImmersionTest:Inducedattenuation at 1550 nm and 1625 nmdueto waterimmersion at23± 2°C	IEC60793-2-50and IEC 60793-1-53	≤0.05dB/Km
26		AcceleratedAging(DryHeat)Test:Induced attenuation at 1550 nm and1625 nm due to Temperature agingat85 ± 2° C	IEC60793-2-50and IEC 60793-1-51	≤0.05dB/Km
27		RetentionofCoatingColor:Coated fibre aged for 30 days at85°C temperature with 95%Humidityandthen20days in85°C dryheat	IEC60793-2-50and IEC 60793-1-51	Nochangeincolourofcoatedfibre
28		High Temperature and HighHumidity (Damp Heat) Test:Induced attenuation at 1550 nm &1625 nmat 85°C temperature and85%RelativeHumidityfor30days	IEC60793-2-50and IEC 60793-1-50	≤0.05dB/Km
29		CableMaterialCompatibilitytestforfibre : Fibre to be aged with fillingcompound for 30 days at 85°Ctemperature and 85% RelativeHumidity	Telcordia GR-20-CORE,2013;DraftIEC60794-1-219	• Agedcoatingstripforce: 1.0≤ F≤ 8.9 N(Peak) 1.0≤F≤ 5.0N(Average) • VisualInspectionunder5Xmagnification: Nofibrecoatingscracking,splitting,or delamination. • For coloured fibres, colour to beidentifiable and no colourtransfersto thefillingcompound. • MEKRub Testas mentioned

				belowin testno 30.
30	**Colourqualification**	MEKRUBTest(MethylEthylKetone)	DraftIEC60794-1-219	To be tested by using socked(solvent) tissue paper for tenstrokes unidirectional on 10cmlengthofthefiber.Nocolortrace shallbeobservedontissuepaperaftertesting.
31	**MaterialProperties:**	FiberMaterials: Thesubstancesofwhichthefibresaremade	RoHS3 (EU2015/863)	Fibre material to be RoHScomplied.

N.B.:Latestissueofabovementioned Standardsmaybereferred.

Appendix-I

IPConformanceTestCasesforRFCs

TheAppendix-Iconsist ofl1tables,fromTable-1to Table-11

Table-162:OSPFv2as perRFC2328

ParameterGroup:IPConformance(CONFIP)

RFC Section	RFCClause	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, andindicating that there is no Backup Designated Router.In either case there must be bidirectional communicationwith the neighbour, i.e., the router must also appear in the neighbour's Hello Packet. This event signals an end totheWaitingstate.	
13(5b)	Insomecases(e.g.,thestateofthereceivinginterfaceisDRandtheLSAwasreceivedfromarouterotherthantheBackup DR) theLSAwillbeflooded back outthe receivinginterface	
13.5	Circumstances:- LSA is more recent than database copy, but wasnotflooded back out receiving interface.Backup:- Delayed acknowledgment sent if advertisement received from Designated Router, otherwise do nothing.Allother 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 thanMinLSArrival seconds ago, discard the new LSA (without acknowledging it) and examine the next LSA (if any)listedin theLink StateUpdate packet.	
8.1 &8.2	TheOSPFpacketheaderisverified.Thefieldsspecifiedintheheadermustmatchthoseconfiguredforthereceivinginterface.If theydo not, thepacket 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 obtainconfirmation fromHelpdesk beforesubmitting application.

Table-2:OSPFv3as perRFC2740

ParameterGroup:IPConformance(CONFIP)

RFC Section	RFCClause	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 DesignatedRouter.	
A.3.2	Allroutersconnectedtoacommonlinkmustagreeoncertainparameters(HelloIntervalandRouterDeadInterval). These parameters are included in Hello packets, so that differences can inhibit the formingof neighbour relationships. The Hello packet also contains fields used in Designated Router election (DesignatedRouter ID and Backup Designated Router ID), and fields used to detect bi-directionality (the Router IDs of allneighbourswhoseHellos havebeen recentlyreceived).	
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'sconfigured Transit area. If all of these checks succeed, the packet is accepted and is from now on associated withthevirtual link (and the backbonearea).	
3.2.2	Thefieldsspecifiedintheheadermustmatchthoseconfiguredforthereceivinginterface.Iftheydonot,thepacketshould 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 bedescribed,namelythatwhichconnectstothetransitnetworkN3.ItassumesthatRT4hasbeenelectedDesignatedRouter of NetworkN3	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtainconfirmation fromHelpdesk beforesubmitting application.

Table-164:IPV6asperRFC2460

ParameterGroup:IPConformance(CONFIP)

RFC Section	RFCClause	Remarks
4.1	IPv6nodesmustacceptandattempttoprocessextensionheadersinanyorderandoccurringanynumberoftimesin thesamepacket,	
4.2	TheOptionTypeidentifiersareinternallyencodedsuchthattheirhighest-ordertwobitsspecifytheactionthatmustbetaken if theprocessingIPv6nodedoes not recognizethe OptionType: 11 - discard the packet and, only if the packet's Destination Address was not a multicast address, send anICMP Parameter Problem, Code 2, message to the packet's Source Address, pointing to the unrecognizedOptionType.	
4.2	TheOptionTypeidentifiersareinternallyencodedsuchthattheirhighest-ordertwobitsspecifytheactionthatmustbetaken if theprocessingIPv6nodedoesnot recognizethe OptionType: 01-discard thepacket.	
4.2	TheOptionTypeidentifiersareinternallyencodedsuchthattheirhighest-ordertwobitsspecifytheactionthatmustbetaken if theprocessingIPv6nodedoes not recognizethe OptionType: 10 - discard the packet and, regardless of whether or not the packet's Destination Address was a multicastaddress, send an ICMP Parameter Problem, Code 2, message to the packet's Source Address, pointing to theunrecognizedOption Type.	
4.4	IfSegmentsLeftiszero,thenodemustignoretheRoutingheaderandproceedtoprocessthenextheaderinthepacket,whosetypeis identified bythe Next Header field in theRoutingheader.	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtainconfirmation fromHelpdesk beforesubmitting application.

Table-165:IPV6asperRFC4861

ParameterGroup:IPConformance(CONFIP)

RFC Section	RFCClause	Remarks
6.1.1	ArouterMUSTsilentlydiscardanyreceivedRouter Solicitationmessagesthatdonotsatisfy allofthefollowingvaliditychecks: -TheIPHopLimitfieldhasavalueof255,i.e.,thepacketcouldnotpossiblyhavebeenforwardedbyarouter.	
6.1.2	AnodeMUSTsilentlydiscardanyreceivedRouterAdvertisementmessagesthatdonotsatisfyallofthefollowingvaliditychecks: -TheIPHopLimitfieldhasavalueof255,i.e.,thepacketcouldnotpossiblyhavebeenforwardedbyarouter.	
6.2.2	ArouterMUSTNOT sendRouterAdvertisementsout anyinterfacethat isnot anadvertisinginterface.	
7.1.1	AnodeMUSTsilentlydiscardanyreceivedNeighbourSolicitationmessagesthatdonotsatisfyallofthefollowingvaliditychecks: -TheIPHopLimitfieldhasavalueof255,i.e.,thepacketcouldnotpossiblyhavebeenforwardedbyarouter.	
7.1.2	nodeMUSTsilentlydiscardanyreceivedNeighbourAdvertisementmessagesthatdonotsatisfyallofthefollowingvaliditychecks: -TheIPHopLimitfieldhasavalueof255,i.e.,thepacketcouldnotpossiblyhavebeenforwardedbyarouter.	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtainconfirmation fromHelpdesk beforesubmitting application.

Table-166:IPV6asperRFC4862

ParameterGroup:IPConformance(CONFIP)

RFC Section	RFCClause	Remarks
5.4.2	In order to improve the robustness of the Duplicate Address Detectionalgorithm, an interface MUST receive andprocessdatagramssenttotheall-nodesmulticastaddressorsolicited-nodemulticastaddressofthetentativeaddress during the delay period.This does notnecessarily conflict with the requirement that joining the multicastgroupbedelayed.	
5.4	DuplicateAddressDetectionMUSTNOTbeperformedonanycastaddresses(notethatanycastaddressescannotsyntacticallybedistinguished from unicast addresses).	
7.1.1	AnodeMUSTsilentlydiscardanyreceivedNeighbourSolicitationmessagesthatdonotsatisfyallofthefollowingvaliditychecks: -TheIPHopLimitfieldhasavalueof255,i.e.,thepacketcouldnotpossiblyhavebeenforwardedbyarouter.	
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-incompatiblechanges mayuse different Codevalues.	
7.1.2	AnodeMUSTsilentlydiscardanyreceivedNeighbourAdvertisementmessagesthatdonotsatisfyallofthefollowingvaliditychecks: -TheIPHopLimitfieldhasavalueof255,i.e.,thepacketcouldnotpossiblyhavebeenforwardedbyarouter.	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtainconfirmation fromHelpdesk beforesubmitting application.

Table-167:IPV6asperRFC1981

ParameterGroup:IPConformance(CONFIP)

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

Table-168:IPV6asperRFC4443

ParameterGroup:IPConformance(CONFIP)

RFC Section	RFCClause	Remarks
2.2	(a)Ifthemessage isaresponse toamessage senttoone ofthenode'sunicastaddresses,theSourceAddressofthereplyMUST bethat sameaddress.	
	If the messageis aresponse toamessagesent toanyotheraddress,suchas - amulticast group address, - ananycast address implemented bythe node, or - aunicast address that does not belongto thenode; theSourceAddress ofthe ICMPv6 packetMUST beaunicast addressbelongingto thenode	
2.4	If anICMPv6informationalmessage ofunknown typeisreceived,itMUSTbesilentlydiscarded.	
2.4	AnICMPv6errormessageMUSTNOTbeoriginatedasa resultofreceivingthefollowing: (e.3)Apacketdestinedtoan IPv6multicastaddress.	
2.4	AnICMPv6errormessageMUSTNOTbeoriginatedasa resultofreceivingthefollowing: (e.6) A packet whose source address does not uniquely identify asingle node -- e.g., the IPv6 UnspecifiedAddress, an IPv6multicast address, or an address known by the ICMP messageoriginator to be an IPv6anycastaddress.	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtainconfirmation fromHelpdesk beforesubmitting application.

Table-8:BGPforIPV6as perRFC 2545

ParameterGroup:IPConformance(CONFIP)

RFCSection	RFCClause	Remarks
3	The link-local address shall be included in the Next Hop field if and only if the BGP speaker shares a commonsubnet with the entity identified by theglobalIPv6addresscarried in theNetwork Address ofNext Hop fieldand the peer the route is being advertised to In all other cases a BGP speaker shall advertise to its peer in theNetwork Address field only the global IPv6 address of the next hop (the value of the Length of Network AddressofNext Hop field shall beset to 16)	
3	The link-local address shall be included in the Next Hop field if and only if the BGP speaker shares a commonsubnet with the entity identified by the global IPv6 address carried in theNetwork Address of Next Hop fieldand the peer the route is being advertised to In all other cases a BGP speaker shall advertise to its peer in theNetwork Address field only the global IPv6 address of the next hop (the value of the Length of Network AddressofNext Hop field shall beset to 16)	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtainconfirmation fromHelpdesk beforesubmitting application.

Table-9:BGP4forIPV4asperRFC4271

ParameterGroup:IPConformance(CONFIP)

RFCSection	RFCClause	Remarks
9.2	WhenaBGPspeakerreceivesanUPDATEmessagefromaninternalpeer,thereceivingBGPspeakerSHALLNOTre-distributethe routinginformation containedin that UPDATE messagetoother internal peers	
6.1	iftheLengthfieldofthemessageheaderislessthan19orgreaterthan4096,thentheErrorSubcodeMUSTbesetto BadMessageLength.TheDatafield MUST containthe erroneousLengthfield.	
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 DatafieldMUST contain the attribute(type, length, andvalue)	
6.1	If the Marker field of the message header is not as expected, then a synchronization error has occurred and theError Subcode MUST be set to Connection Not Synchronized, if the Length field of an OPEN message is lessthantheminimum length of the OPEN message	
6.8	UponreceiptofanOPENmessage,the localsystemMUSTexamineallofits connectionsthatareintheOpenConfirmstate	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtainconfirmation fromHelpdesk beforesubmitting application.

Table-10:MBGPas per RFC4760

ParameterGroup:IPConformance(CONFIP)

RFCSection	RFCClause	Remarks
7	If a BGP speaker receives froma neighbour an Update message thatcontains the MP_REACH_NLRI orMP_UNREACH_NLRI attribute, and the speaker determines that the attribute is incorrect, the speaker MUSTdelete all the BGP routes received from that neighbour whose AFI/SAFI is the same as the one carried in theincorrectMP_REACH_NLRIor MP_UNREACH_NLRIattribute	
7	If a BGP speaker receives froma neighbour an Update message thatcontains the MP_REACH_NLRI orMP_UNREACH_NLRI attribute, and the speaker determines that the attribute is incorrect, the speaker MUSTdelete all the BGP routes received from that neighbour whose AFI/SAFI is the same as the one carried in theincorrectMP_REACH_NLRIor MP_UNREACH_NLRIattribute	
7	If a BGP speaker receives fromaneighbour an Update message thatcontains the MP_REACH_NLRI orMP_UNREACH_NLRI attribute, and the speaker determines that the attribute is incorrect, the speaker MUSTdelete all the BGP routes received from that neighbour whose AFI/SAFI is the same as the one carried in theincorrectMP_REACH_NLRIor MP_UNREACH_NLRIattribute	

Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtainconfirmation fromHelpdesk beforesubmitting application.

Table-11: LDP as per RFC

5036ParameterGroup:IPConformance(CONFIP)

RFCSection	RFCClause	Remarks
2.2.2	AnLDPIdentifierisasix-octetquantityusedtoidentifyanLSRlabelspace.ThefirstfouroctetsidentifytheLSRand must bea globallyuniquevalue, such asa32-bit router Idassigned to the LSR.	
2.5.2	An LSRMUSTadvertisethesametransportaddressinallHellosthatadvertisethesamelabelspace	
2.5.6	AfteranLDPsessionhasbeenestablished,anLSRmustarrangethatitspeerreceiveanLDPPDUfromitatleasteveryKeepAlive timeperiod to ensurethepeer restarts thesessionKeepAlive Timer	
2.7	Whenthenexthopfor aprefixchanges,theLSRmustretrieve thelabeladvertisedbythenew next hopfromtheLIBfor usein forwarding.	
2.8.1	TheLabelRequestmessageMUSTincludeaHopCountTLV.	

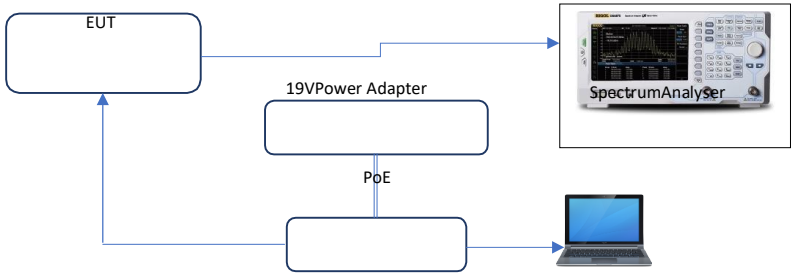
Note: Wherever a particular IP test is implemented in a product through a RFC different from what is mentioned in ER, please obtainconfirmation fromHelpdesk beforesubmitting application.

Appendix-II

TestSetup andTest Procedures

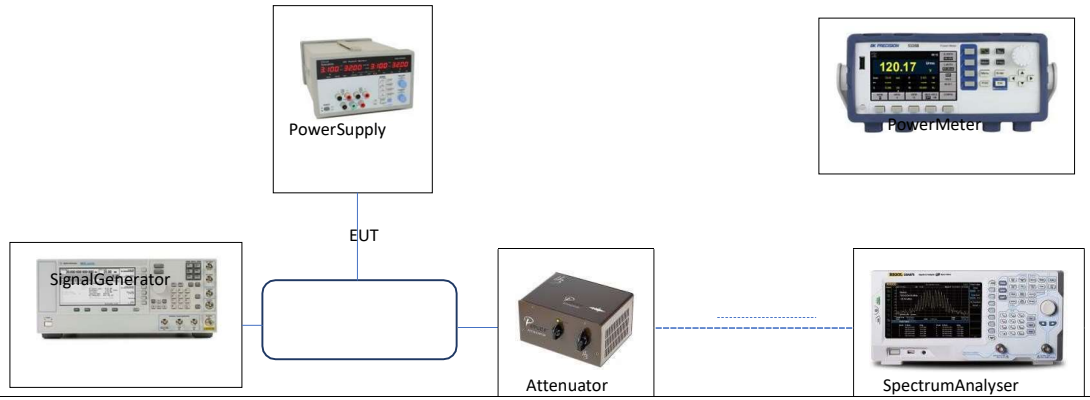
TheAppendix consistof37testsfromTest1 toTest37

TestNo.1

ParameterName	FrequencyandEIRP forWi-FiandPointtoPoint/Point toMultipointRadioInterface
TestDetails	Frequencyof OperationandPeakPowerMeasurementTestSetup
Testinstruments required	SpectrumAnalyzer
TestSetup	
TestProcedure	1. Makethesetup asshown above. 2. ConfiguretheSpectrum Analyserfor a) CenterFrequencyasrequired. b) SPANof 20MHz c) RBWof3KHz 3. ConfigureEUTindifferentmodesofoperation. 4. MeasurepeakpowershowninSpectrumanalyser.
ExpectedResults	1.Recordpeakpowerand attachtrace

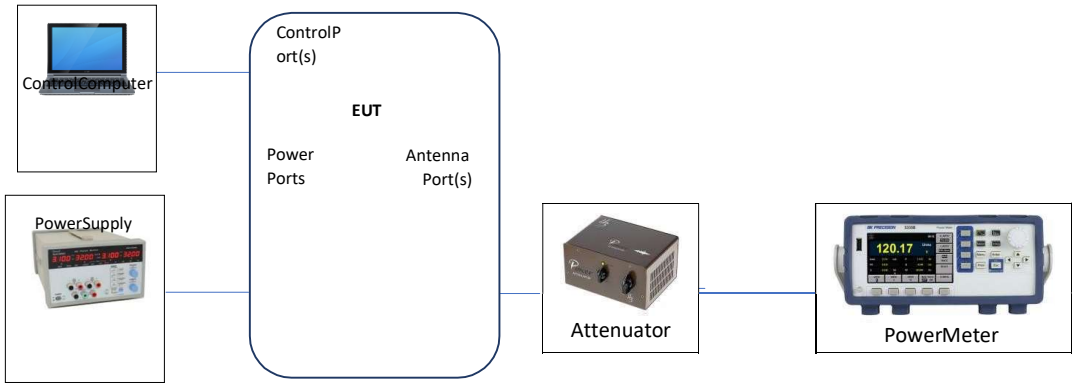
Note:This isa representativesetup andmaybeadapted asper therequirement oftesting forthe equipment.

TestNo.1

ParameterName	Frequencyof Operation andTransmitPowerfor SatelliteEquipment
TestDetails	TypicalsetupofFrequencyofOperation&TransmitPowermeasurementforSatelliteSystemEquipment
Test instrumentsrequired	Signal GeneratorSpectrum AnalyserAttenuator Power MeterPowerSuppl y
TestSetup	
TestProcedure	1. FormeasurementofTransmitPower,PowerMeteristobeconnectedtothe EquipmentUnderTest(EUT). 2. Formeasurementof FrequencyofOperation, SpectrumAnalyser(withDCblockifrequired)istobe connectedto theEUT.
ExpectedResults	3.Recordpeakpower andattachtrace

Note:This isa representativesetup andmaybeadaptedas perthe requirementof testingfor theequipment.

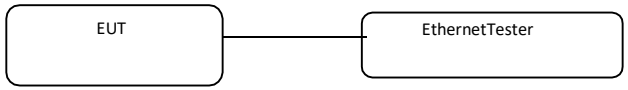
TestNo.1

ParameterName	TransmitpowerforPTP/ PMPRadioInterface
TestDetails	TypicalsetupofTransmitpowerMeasurement
Test instrumentsrequired	PowerMeter Power SupplyAttenuator
TestSetup	
TestProcedure	1.FormeasurementofTransmit Power,PowerMeter istobeconnected tothe Equipment UnderTest(EUT).
ExpectedResults	2.Recordpeakpowerand attachtrace

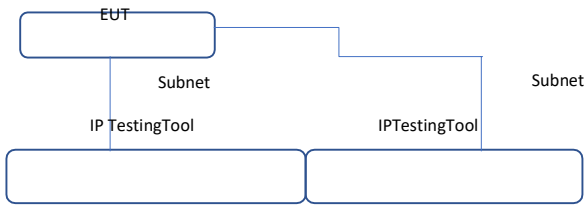
Note:This is a representativesetup and maybeadapted as per therequirement of testing fortheequipment.

TestNo.4

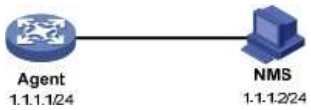
ParameterName	LinkSpeedandAuto-negotiationFE, LinkSpeedandAuto-negotiationGE

TestDetails	TestforEthernetLinkSpeed(100/1000) andAuto-negotiation
Testinstrumentsrequired	EthernetTester supporting100/1000 mbpslink
TestSetup	
TestProcedure	1. ConnecttheEthernetTesterto theapplicable/supportedEthernetinterfaceoftheEUTasshownabove. 2. ConfiguretheEUTtouseauto-negotiation onitsselectedEthernetport. 3. Configure the Ethernet Tester to run at 100 mbps speed and see if it is able to connect to the EUT. TheEthernetlinkbetweentheEthernet TesterandEUTshould beactiveandreport 100mbpslinkspeed(iflinkspeed 100 mbps is supported bytheEUT). 4. Configurethe EthernetTester torun at 1000mbpsspeedand seeifit isableto connectto theEUT.The EthernetlinkbetweentheEthernet TesterandEUTshould beactiveandreport 1000mbpslinkspeed.(iflinkspeed 1000 mbps is supported bytheEUT).
ExpectedResults	1.TheEthernet link betweenthe Ethernet TesterandEUTshouldbeactiveandreport 100 or1000 mbps link speed as per thelink speed supported bytheEUT

TestNo.1

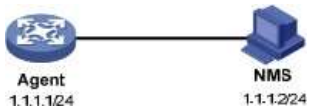
ParameterName	IPV4FunctionalTests
Testinstrumentsrequired	IPTestingTool
TestSetup	
TestProcedure	1. Connectthe IPTestingTooltotheEthernetinterfaceoftherouterasshownabove. 2. Configurethe IPinterfacesoftheEUT andIPTestingToolforback-to-backcommunicationfrom/toIPTestingTool. 3. Configurestatic/dynamicroutingonthe EUTto reachlocalLANsubnetsfromthe IPTestingTool. 4. PerformIPv4pingtestfromIPTestingTooltoIPTestingTool andverifythatitissuccessfulandthatthereisnopacket drop. 5. PerformfiletransfertestfromIPTestingTooltoIPTestingToolandverifythatitissuccessful.
ExpectedResults	1. IPv4Pingtestshould besuccessfulwith zeropacketloss. 2. Filetransfertestshouldbesuccessful. 3. Enclosescreenshotsand IPTestingTooltracesof theIPV4communication.

TestNo.1

ParameterName	SNMPv2orQx ProtocolFunctionalTests
TestDetails	Testformanagement:SNMPv2,orQx(check TRAP,GETandSEToperations)
Testinstrumentsrequired	1. PC/Laptop–1Numbers (SNMP orQxManager) 2. Switch– 1 Numbers
TestSetup	
TestProcedure	**ForSNMP,** 1.)ConfiguretheEUTto runSNMP agentand NMS (PC)torun SNMPmanagerapplication byusingcorrectparameters. 2.)TestingofTRAPmessage: TheNMSuses SNMPv2tomanagethe SNMPagent,and the agentautomaticallysends notifications to report events to the NMS. ConfiguretheSNMPagentto sendtrapstothemanager. Useawrongcommunitynameto get thevalue of aMIBnodeon theagent. You can seeanauthenticationfailuretrap on theSNMP manager. 3.) Test "SetRequest" operation:SNMP Testing node (SNMP manager) sends SNMPv2c "SetRequest" to setSysName to "EUT1". Verify the SysName value on the EUT. It should match the value "EUT1" set using'SetRequest'function from theSNMP 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. Theagent should respond with "SysName value as "EUT1" as set in the previous step, verifying that the EUTsupport SNMP GETfunction. **ForQx,** 1) ConfiguretheEUTtorun Qxagent andNMS(PC)torun Qxmanagerapplicationbyusingcorrectparameters. 2) TestingofTRAPmessage: TheNMSuses QxtomanagetheQxagent, andtheagent automaticallysends

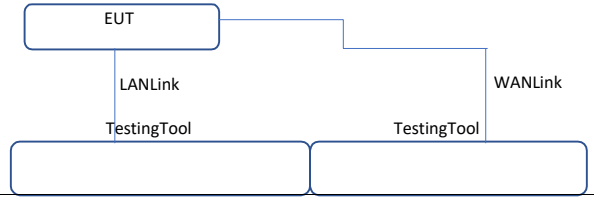
	notificationstoreporteventstotheNMS. ConfiguretheQxagenttosendtrapstothe manager. 3) Test “Write” operation:Qx Testing node (Qx manager) sends Qx“Write” to set Name to “EUT1”. Verifythe Name value on the EUT. It should match the value “EUT1” set using ‘Write function from the Qxmanger. 4) Test“Read” Operation (single Object): Testing node (Qx Manager) sends “Read” scalar object to getName on Agent. The agent should respond with Name value as “EUT1” as set in the previous step,verifyingthat the EUT supportQxRead function.
ExpectedResults	1.)TRAPshould besent byEUT(Agent)toTestingNode(SNMPorQxManager). 2.)SetRequest operation shouldbe abletoset SysNameobject in agent(EUT), orWriteoperation shouldbeableto setNamein Qxagent (EUT), 3.)GetRequestoperationshouldbeabletogetSysNameObjectfromagent(EUT)ReadoperationshouldbeabletogetN ameObjectfromQxagent(EUT) Attachscreenshotsforabovesuccessfuloperations.

TestNo.7

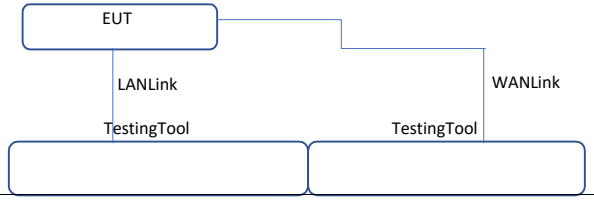
ParameterName	SNMPv3orQx ProtocolFunctionalTests
TestDetails	TestforSNMPv3 orQx management
Testinstrumentsrequired	1. PC/Laptop–1Numbers(SNMP/Qx Manager) 2. Switch– 1 Numbers
TestSetup	
TestProcedure	**ForSNMP** • ConfiguretheagentonEUTandSNMP manager onPC/NMStouseSNMPv3 withsecuritylevelsettingtoAuth.Priv. Set Authentication to SHAand Privacy(encryption)to DES. • TheNMS usesSNMPv3 tomonitorand managetheagent • Theagentautomaticallysendsnotificationsto reporteventsto theNMS. • TheNMS andthe agentperform authenticationwhen theyestablish anSNMPsession. Theauthenticationalgorithm is SHA and the authentication key is xxxxxx. The NMS and the agent also encrypt the SNMPpacketsbetween them byusingthe DESalgorithmand encryption keyyyyyyy **ForQx** • Configuretheagenton EUTand Qxmanager on PC/NMSto useQxwithsecuritylevelsettingtoAuthPriv.SetSSHbetween EUT andNMS toenableauthentication andencryption. • TheNMSusesQxtomonitorandmanagethe agent • Theagentautomaticallysendsnotificationsto reporteventsto theNMS. • The NMS and the agent perform authentication when they establish an Qx session based on SSH. TheNMS and the agentencrypt thepacketsbyusingSSH
ExpectedResults	• Usecorrectauthenticationcredentialstoaccesstheagent. - Attachtracesforsuccessfulencrypted authenticationwithcorrectcredentials

	• Useincorrectauthenticationcredentialstoaccesstheagent - Attachtracesforfailedauthenticationwithincorrectcredentials

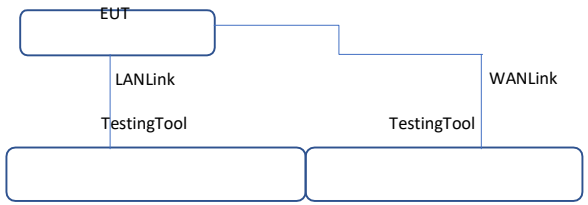
TestNo.1

ParameterName	DynamicRoutingFunctionalTests
TestDetails	Test forDynamicRoutingTableentry
Testinstrumentsrequired	IPTestingTool
TestSetup	
TestProcedure	1. Connecttheinterface as thecasemaybe,as shownin thesetup diagram 2. ConnecttheTestingTooltotheEthernetinterface oftheEUTasshownabove. 3. Configure the IP interfaces of the EUT and Testing Tool for back-to-back communication between two portsofTestingTool. 4. Verifythat no staticor dynamicroutingtableentryexists on the EUTand that pingto theWANport ofTestingTool is not workingthroughLAN Port ofTestingTool. 5. ConfigureDynamicRouting(OSPFv2)ontheEUT toreacheach subnetfromother subnetusingdynamicrouting.Static routingshould NOT beusedin this case. 6. Performback-to-backpingtest fromTestingTooltheroughEUTandverifythatitis successfulandthatthereisno packet drop. 7. Verifythe existenceof dynamic routingtableentryof remote LAN subnetontheEUT usingdynamicrouting.
ExpectedResults	1. Thereshould beroutingtableentryof theremote LAN subnet on theEUTusingdynamicroutingprotocol(OSPF). 2. ThepingtestshouldbesuccessfulTo theremote LANsubnetIPaddress.

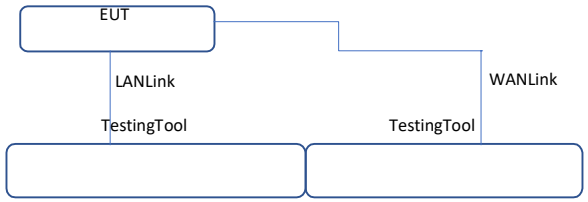
TestNo.1

ParameterName	StaticRoutingFunctionalTests
TestDetails	TestforStatic RoutingTable entry
Testinstrumentsrequired	TestingTool
TestSetup	
TestProcedure	1. Connecttheinterface as thecasemaybe,as shownin thesetup diagram 2. ConnecttheTestingTooltotheEthernetinterface oftheEUTasshownabove. 3. Configure the IP interfaces of the EUT and Testing Tool for back-to-back communication between two portsofTestingTool. 4. Verifythat no staticor dynamicroutingtableentryexists on the EUTand that pingto theWANport ofTestingTool is not workingthroughLAN Port ofTestingTool. 5. Configurestaticroutingon theEUTto reacheachsubnet fromothersubnet. 6. Performpingtestfrom back-to-backpingtest fromTestingToolthroughEUTand verifythatit issuccessfulandthat thereis no packet drop. 7. Verifytheexistenceof routingtableentryof remoteLANsubnet on theEUT usingstatic routing.
ExpectedResults	1. Thereshould beroutingtable entryoftheremoteLAN subneton theEUT usingstatic route. 2. ThepingtestshouldbesuccessfultotheremoteLANsubnetIPaddress.

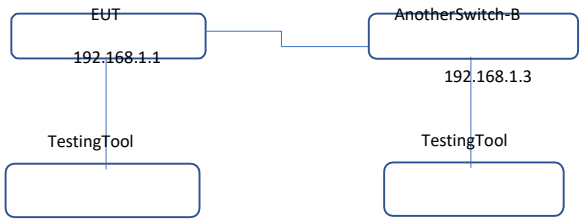
TestNo.18

ParameterName	TCPFunctionalTests
TestDetails	TestforTCPprotocol
Testinstrumentsrequired	IPTestingTool
TestSetup	
TestProcedure	1. ConnecttheTestingTooltotheEthernetinterface oftherouter asshownabove. 2. Configurethe TestingTool and theEUTforback-to-back communication betweentwo ports ofTestingTool. 3. Configurestatic/dynamicroutingonthe EUTtoreacheach subnetfromothersubnet. 4. Install/ensureavailabilityof FTPserverandFTPclient onTestingToolforperformingfiletransfer test. 5. Performfiletransfer testbetween thetwo portsofTestingTool andverifythatitis successfulthrough EUTaspertheabove-mentionedsetup. 6. TheEUTmustalsosupportTELNETfunctionality.ConfiguretheEUTto supporttelnetonitslocalIPaddress. 7. Connectto theEUT usingtelnet fromTestingToolto verifythattelnet connectionis establishedand EUTcanbeconfigured remotelyusingtelnet sessions. 8. Capturepackets atvarious stagestoverifyfunctionalityofSequenceNumbersand TCP HeaderFormats.
ExpectedResults	1. Filetransfertestshouldbesuccessful. 2. TelnetconnectiontoEUTfromTestingToolshouldbesuccessful. 3. Enclose screenshots and Testing Tool traces of the communication, and indicate various Headers andSequenceNumbers.

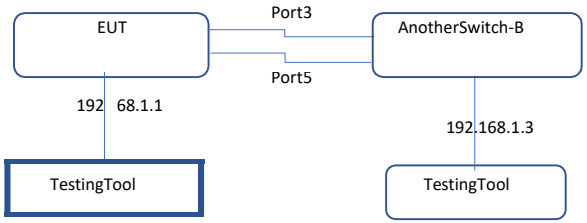
TestNo.18

ParameterName	MacLearningandPacketForwardingTests
TestDetails	MacLearningandPacketForwarding
Testinstrumentsrequired	IPTestingTool
TestSetup	
TestProcedure	1. Connect Interface-AofTestingToolwithEUTandpingEUT. 2. Ensure MAC address of Interface-A of Testing Tool is visible in EUT's MAC address table and Interface-BMACaddress is not visible. (e.g. showmac-add). 3. Connect Interface-B of Testing Tool to EUT and ping Testing Tool through Interface-A. Ping should besuccessful. 4. CheckEUT'sMACaddresstable.MAC addressof Interface-BofTestingToolshouldbevisibleintable.
ExpectedResults	1. Pingfrom Interface-BtoInterface-Ashouldbesuccessful,showingsuccessfulpacketforwarding. 2. MACaddressshouldbe visibleonEUT'sMACtable. 3. Enclosescreenshotforsuccessfultest.

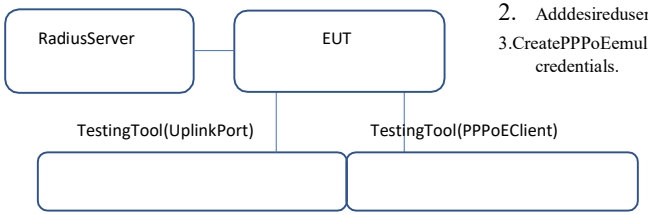
TestNo.18

ParameterName	SpanningTreeProtocolRootBridgeElectionFunctional Test
TestDetails	TestforSpanningtreeprotocol (STP)–Root BridgeElection
Testinstrumentsrequired	IPTestingTool AnotherSwitch
TestSetup	
TestProcedure	1. EnableSTP (802.1d)at both EUT andotherswitch, keepingpriorityvaluethe same. 2. Verifyfrom C-BPDUfromTestingToolthat itcontains informationabout bridgeid(Priority/MACAddress). 3. Dependingoncomputedbridgeid,VerifyfromC-BPDUmessages thatEUTeitherbecomes theRootBridge, orallowstheotherswitchtobecomeRoot Bridge.
ExpectedResults	1. Theswitch,whichhas thelowestrootbridge ID,willbeelectedas therootbridge. 2. AttachscreenshotandTestingTooltracesasartefacts.

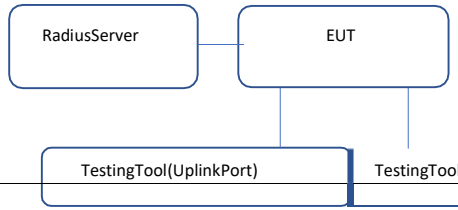
TestNo.18

ParameterName	SpanningTreeProtocolPortBlockingFunctionalTest
TestDetails	TestforSpanningtree protocol (STP)– Port Blocking
Testinstrumentsrequired	TestingTool AnotherSwitch
TestSetup	
TestProcedure	1. Createsetup asintest STP-1 2. CreateSwitch-Basrootbridge 3. Connectadditional portsof EUTand switch-Btocreateonemorelink
ExpectedResults	3. STPshould automaticallyblock port5 4. Evidence:Printstatusof port3and 5fromEUT

TestNo.19

ParameterName	PPPoEasperRFC2516
TestDetails	
Test instrumentsrequired	TesttoolforemulatingPPPoEClient anduplinkport LinusServerwithRadiusTool
Pre-TestSetupAnd TestSetup	 1. SetupfreeradiusserverontheLinux machine 2. Adddesiredusercredentialsinuserfileontheradiusserver. 3.CreatePPPoEemulation onthetest toolwiththesame user credentials.
TestSteps	1. StartthePPPoEclientemulationfromtesttool. 2. Verifythat PADIwasreceived on the boxbyusingCLI 3. Checkthatauthenticationwas successfulbyusingCLI 4. Issue show PPPoE statistics again to see that DUT has sent PADO, received PADR and send PADS packet by usingCLI.(Note:sincesubscriber bringuphappens veryfastyou mightbe able toseeall thepacketcountinstep2itself.) 5. Checkon DUTto seethat subscriberhascomeupbyexecutingCLIs 6. StopthePPPoEclientemulationfromtesttool. 7. CheckthatPADT message wasreceived ontheDUT usingCLI 8. Checkthatsubscriber entryhasbeencleared fromthe DUTusingCLI
ExpectedResults	1. ForStep2, CLIoutput contains correct PADIpacket count. 2. ForStep3,Authenticationisgranted. 3. ForStep4, CLIoutput containscorrectPADO,PADRand PADSpacketcount. 4. ForStep5,CLIcontainscorrectsubscribercountand state. 5. ForStep6, PADTisreceived ontheDUT afterPPPoEclient emulationisstopped inthetest tool. 6. ForStep8,CLIoutput returnssubscribercountas0

TestNo.19

ParameterName	Radius
Test instrumentsrequired	TesttoolforemulatingPPPoEClient anduplinkport LinusServerwithRadiusTool
Pre-TestSetupAnd TestSetup	 1. SetupfreeradiusserverontheLinux machine 2. Adddesiredusercredentialsinuserfileontheradiusserver. 3. CreatePPPoEemulationonthetesttoolwiththesameuser credentials. 4. Uplink facing port on the DUT configured with appropriateIPv4/IPv6addressedand ARP/NDPresolvedonthetesttool.

TestSteps	Expected Results
1. StartthePPPoEclientemulationfromtesttool. 2. Verifythat PADIwasreceived on the boxbyusingCLI 3. Checkthat authenticationrequestwasreceivedonthe DUT byusingCLI 4. Checkthat Access-Accept was receivedon theDUT byusingCLI 5. StopthePPPoEclientemulationfromtesttool. 6. CheckthatPADT message wasreceived ontheDUT usingCLI 7. Checkthatsubscriber entryhasbeencleared fromthe DUTusingCLI 8. Createamismatchbetweenusercredentialsin PPPoEclientemulationandfreeradius user file. 9. StartthePPPoEclientemulationfromtesttool. 10. Verifythat access-rejecthasbeen received ontheDUT usingCLI 11. Checkthatnosubscribercomesupif Access-rejecthasbeenreceivedfromtheradius server usingCLI	• • CLIoutput contains correctPADIpacket count. • Authenticationisgranted. • Acceptcounterincrements correctlyin theCLIoutput. • • PADT is received on the DUT after PPPoE client emulationisstopped in the test tool. • CLIoutputcontains Activesubscribercount as0 • • • Reject counter incrementscorrectlyin theCLIoutput • CLIoutputcontains Activesubscribercount as0

TestNo.16

ParameterName	PingtrafficthroughPolicybasedIPSecTunnel

Test instrumentsrequired	PeerDevice TwoLinux machines
Pre-TestSetupAnd TestSetup	 1. ConfigureIKE and IPsec underSecurityconfigurationoptionsonbothDUTandPEERdevices. 2. Toroutetherequiredtrafficthroughthe tunnel,add theconfiguredVPNunder therequired policyon bothDUTandPEERdevices 3. If DUTneeds tobeact asInitiator,then configure establish tunnelimmediatelyonlyattheDUTside 4. If DUT needsto beactasresponder,then configureestablishtunnel immediatelyonlyat thePEER side
TestCaseSteps	1. Sendpingtrafficfrom Linux1toLinux2orLinux2to Linux1 2. Verifyfields under securityIPsec/IKECLI
ExpectedResults	1. If Establishtunnelimmediatelyisconfigured: a. Assoonas configurationgetscommitted verifyP1 andP2 SAisup onboththedevices. b. role(initiatororresponder)should beproper underikeclibasedon theconfiguration onboth thedevices c. Thereshould not be anypingpacket drop d. packetstatisticsunderipsecclishouldmatchwithactualsenttraffic. e. configuredPolicythroughwhich tunnelis formed should bevisible inipsecsacli 2. IfEstablishtunnelon-trafficisconfigured(defaultconfigurationifnothingisconfigured) a. Therewill beonepingpacket dropandpacket statistics should matchaccordinglyunder ipseccli b. P1and P2SA shouldbe upon boththedevices c. role(initiator orresponder) should beproper underikecli basedon traffic d. configuredPolicythroughwhich tunnelis formed should bevisiblein ipsecsa cli

TestNo.17

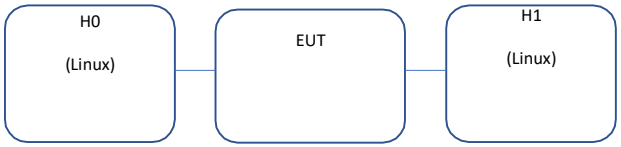
ParameterName	TestSourceNATwithPATwithmultiplesourceipaddresses.
Test instrumentsrequired	OneLinuxclientwithhping2toolinstalled

	Onelinuxmachines
Pre-TestSetupAnd TestSetup	 1. Installhping2on LinuxClienttoinitiatetraffic frommultiplesourceaddresses 2. OnLinuxserver, addroutefornat-pooladdress usedinnatconfigurationonDUT 3. ConfiguresourcenatpoolonDUTwithsingle IPaddress 4. Configuresourcenatrule-setonDUTwith‘from’and‘to’and alsomatchconditionlike‘source-address’and‘destination-address’ Note:PATis enabled bydefault
TestCaseSteps	1. Startsendingtrafficwith hping2toolfromLinux clientwithfirst IPto Linux serverIP address 2. Again, Initiatehping2byincrementingthesource IPin‘source-ip’ field
ExpectedResults	1. ForStep1,verifythatclioutput offlowsessionshows nat-translation.Testconsidered passifthesourceaddressisnattedwith theaddressfrom thepool specified. 2. Also,check sourcenat-translation hitcount isincrementingincli output 3. Forstep 2, Verifythat port address translationis seen in cli output of securityflow session

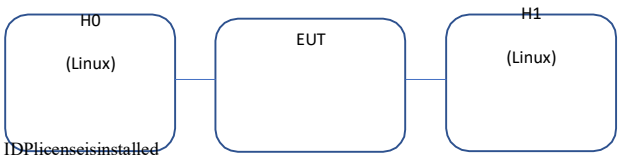
TestNo.19

ParameterName	TestSourceNATNAT64relatedfeature
Test instrumentsrequired	OneLinuxclient Onelinux server
Pre-TestSetupAnd TestSetup	 1. Toconfigure NAT64,youneedtohaveapoolof singleIPswhichwillbetheIPv4addressoftheserver. 2. We need a destination NAT configuration to translate the IPv6 address into IPv4 address in the destination field oftheincomingpacket. 3. ThedestinationaddressisIPv4,butthesourceaddressisIPv6.Thus,wemustapplythe sourceNATin orderto changetheIPv6addresstoIPv4inthesourcefieldofthepacket.
TestCaseSteps	1. Initiatetrafficfrom Linux client 2. Verifynat translation hasworked bycheckingflow sessionon DUT
ExpectedResults	1.Checkhow thesessions arebeingestablished:

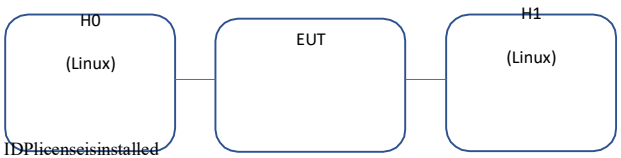
TestNo.19

ParameterName	VerifySourceAddressany, destination specific,application anyaction=deny
Test instrumentsrequired	OneLinuxclient Onelinux server
Pre-TestSetupAnd TestSetup	 1.Configure IPsontheethinterfacesofboththe linuxmachines.
TestCaseSteps	1. Configuresecurityzonesand addinterfaces toit. 2. (Ex:Configure a security zone "trust" and add the interface connected to one of the linux machines to it.Configureanothersecurityzone"untrust" and add router'sotherinterfaceto it.) 3. Createaddressbookentriestospecifythesource anddestinationaddress. 4. Create a policy (say p1) from zone trust to zone untrust and vice-versa, with source address any name, destinationaddressasaddress bookname, application any. 5. Seta denyconditionforthepolicy. 6. (For ex: set securitypolicies from-zonetrustto-zoneuntrust policyp1 thendeny) 7. Committheconfiguration. 8. Sendtraffic fromH0toH1.
ExpectedResults	1. Trafficshould notbe allowedduetothedenypolicy.

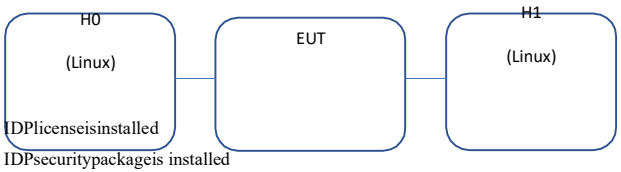
TestNo.19

ParameterName	Verifythepacketcaptureoftheattack logs
Test instrumentsrequired	2 Linux server,syslog,ftpclientandserver
Pre-TestSetupAnd TestSetup	 1. IDPlicenseisinstalled 2. IDPsecuritypackageis installed 3. Configure IDPwithFTP:USER: ROOTattackandattack tofwpolicy 4. Configurethepacket-logserver andtheportdetails 5. Enable5packetstocapturepreandposttheattack.
TestCaseSteps	1. Startthepacket-logserver tocapturethepackets 2. StarttheFTPserver 3. StartFTPtraffic withuserasroot
ExpectedResults	1. IDPattacktableshouldnothavetheattackdetected 2. Thepacketlogtool shouldhavetheattack detailsandthepreandpostattackpacket captured 3. IDPattacklogshouldbegeneratedandthe packetlogidshouldbe matchingwith thepacketlogattackdetails

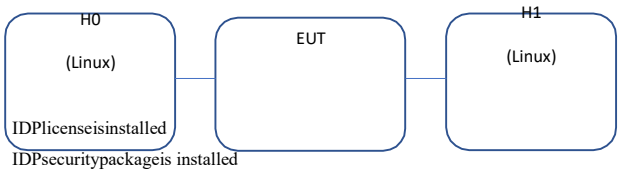
TestNo.19

ParameterName	Checktheattackdetectionoverhttps session
Test instrumentsrequired	2 Linuxasserverclient, openssl,curl.
Pre-TestSetupAnd TestSetup	 1. IDPlicenseisinstalled 2. IDPsecuritypackageis installed 3. Configureassl proxyprofile and attach to thefwpolicy 4. ConfigureanIDPwithcustomhttpattackandattachtothesameIDPpolicy
TestCaseSteps	1. Starttheopensslserver. 2. Sendthehttpstraffic usingcurlfromclient
ExpectedResults	1.IDPattacktableshouldhavethecustomhttpattackdetected

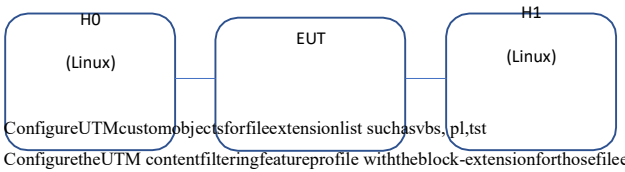
TestNo.19

ParameterName	CloseClientandServer ActionforTCPin IPSRuleBase
Test instrumentsrequired	2Linuxservers
Pre-TestSetupAnd TestSetup	 1. IDPlicenseisinstalled 2. IDPsecuritypackageis installed 3. Configureanhttpattackwithcloseclientandserverasaction
TestCaseSteps	1. Startthetcpdump onboth clientand server. 2. Sendthehttpattacktraffic.
ExpectedResults	1. httpattackshouldbe detected 2. clientandservershouldhavereceived RSTpackettoclosethetcp connection 3. IDP attack logshouldhavetheactionasclose-client-and-server asaction

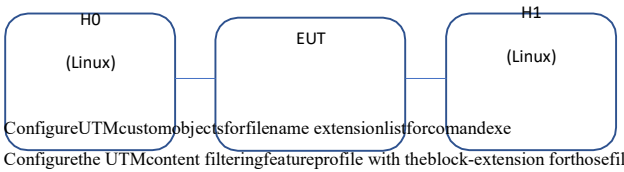
TestNo.19

ParameterName	CloseClientActionforUDPinIPSRuleBase
Test instrumentsrequired	2Linuxservers
Pre-TestSetupAnd TestSetup	 1. IDPlicenseisinstalled 2. IDPsecuritypackageis installed 3. Configureadnsattackwithcloseclientasaction
TestCaseSteps	1. Startthetcp dumponclient. 2. Sendthednsattacktrafficfromclient.
ExpectedResults	1. DNSattackshouldbedetected. 2. Servershouldnotreceive thepacket. 3. IDP attacklogshouldhavetheactionasDROPasaction.

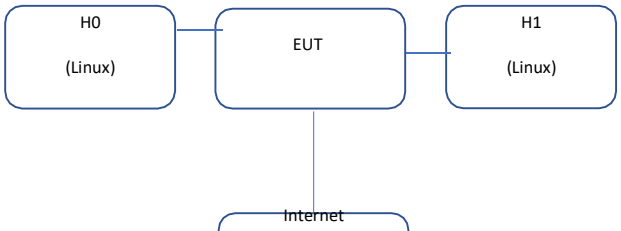
TestNo.20

ParameterName	httpwithblock-extension-list
Test instrumentsrequired	2Linuxservers
Pre-TestSetupAnd TestSetup	 1. ConfigureUTMcustomobjectsforfileextensionlist suchasvbs,pl,tst 2. ConfiguretheUTM contentfilteringfeatureprofile withtheblock-extensionforthosefileextensionlist 3. Configurenotificationsoptionsas messageandcontent forthemessage 4. Attachtheprofiletothe fwpolicy. 5. Configurethesecuritylogging
TestCaseSteps	1. StarttheHTTPserver andhavethefileswithdifferent extension 2. Fromclientget vbs,pl, txtand htmlfiles usingcurl
ExpectedResults	1. Otherthanhtmlfileallareblocked 2. Intheutm contentfilteringstatistics, theextension blockedcountershouldincrementaccordingly 3. Verifythecontent filteringblocked messagein thesyslog

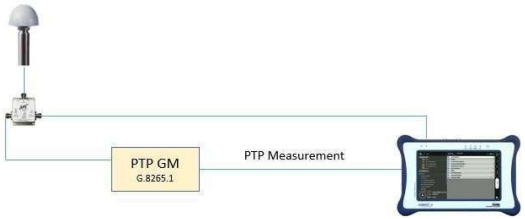
TestNo.20

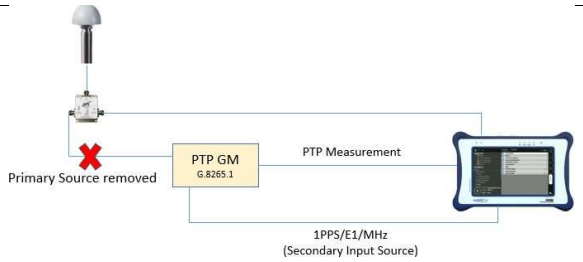
ParameterName	Fileextensionblocking
Test instrumentsrequired	2Linuxservers
Pre-TestSetupAnd TestSetup	 1. ConfigureUTMcustomobjectsforfilename extensionlistforcomandexe 2. Configurethe UTMcontent filteringfeatureprofile with theblock-extension forthosefilenameextension list 3. Configurecontent filteringUTM policyforftp upload and download 4. Configurenotifications optionsas messageand content forthemessage 5. Attachtheprofiletothe fwpolicy. 6. Configurethesecuritylogging
TestCaseSteps	1. StarttheFTPserverandhavethefileswithdifferent extension 2. Fromclient,do ftpandget exeand comextensionfiles 3. Fromclient doftp and putexeandcomextensionfiles
ExpectedResults	1. GETandPUT ofexeandcomfiles areblocked withproper errormessage 2. Intheutmcontent filteringstatistics,theBaseonextensionlistcountershouldincrementaccordingly 3. Verifythecontent filteringblockedmessagein thesyslog

TestNo.20

ParameterName	TestwithInfectedfileforALLProtocol
Test instrumentsrequired	2Linuxservers
Pre-TestSetupAnd TestSetup	 1. DUTshouldhaveinternetaccess throughoneoftherevenueinterfaces 2. Sophoslicenseshouldbeinstalled 3. Sophosavis configuredandthe patternisup todate 4. ConfigureSophos anti-virusprofileforhttp,ftp up/down, smtp,pop and imap 5. Attachtheprofile totheutmpolicy 6. Attach the utm policytothe fw policy
TestCaseSteps	1.Sendthefollowingtrafficwith thevirusfileattached (HTTPGET/POST,FTPGET/PUT,SMTP,IMAPandPOP3)
ExpectedResults	1. Thevirus fileshould beblockedwith thepropererrormessage 2. Thevirusfileshouldbedetected and thethreat-foundincremented intheanti-virusstatistics 3. Verifytheavvirus detected messagein thesyslog

TestNo.20

ParameterName	Profileforfrequencysynchronisation
TestDetails	SupportforPTP frequencyprofile: G.8265.1&monitor 1) PTPmessagesexchangedbetweenMaster &Slave 2) ProtocolstatisticsofGMfore.g.GMIP,GMIdentity, GMclockclass&valueetc. 3) GMlockingwith auxiliaryinterfaces andobserverelevant protocolstatistics.
Test instrumentsrequired	Synchtester Splitter GPS Antenna Connecting CablesLaptop
TestSetup1 TestSetup 2	Setup1:Follow Testprocedureinstructions4 to7  Setup2:FollowTestprocedureinstruction8

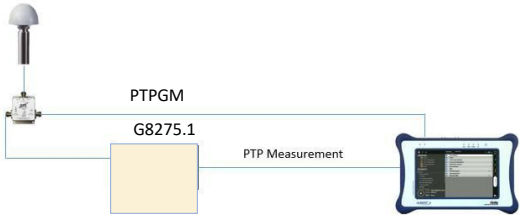
<table>
<tr><td></td><td> 
</td></tr>
<tr><td>TestProcedure</td><td>1. Connect GNSS signal to PTP GM and Tester. Wait for sufficient (approx. 1-2 hours) time so that GM and Tester arelockedto UTC.
2. Now,configurePTP GMasper thesettings mentionedbelow:

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. AfterconfiguringPTPGMwithcorrectFrequencyprofilesetting(through CLI&GUI).ConfiguretheSyncTesterwithsame parameters& connect theTesterto theconfigured PTP portonGM.
4. Verify:ifPTP GMhaspingoption&abletopingTester’s IP.AlsoverifyifVLANtaggingispossibleonPTPmessages.
5. Verify:IfGMissharingalltherelevantprotocolinformationtotheTester fore.g.
i) GMIP
ii) GMIdentity</td></tr>
</table>

	iii) GM Priority iv) GMClock class &value v) GMClockSource 6. **Verify:**MessageExchangebetweenMaster&Slavei.e. i) Sync ii) Follow-up iii) DelayRequest iv) DelayResponseetc. 7. Now,removetheGPS antennacablefrom thePTPGM andseeifthe**Clockclass** in thetester changesto adifferentvalue(Locked mode clock class to Holdoverclockclass). 8. ConfigurePrimaryinputclock inPTP GMas GNSSand seta secondaryinputclock aswell (fore.g.1PPS,E1, MHz).SyncTester can beusedto give secondaryinputto theGM. Nowremovethe primaryinputclock from theGMand **verifythatGMautomaticallyswitchestosecondaryinputsource.**
ExpectedResults	1. VerifyGM configurationthroughGUI&CLI. 2. VerifyTest procedure-Steps 4 to8. Results should matchthe configured valueas perITU-T Standard. 3. Attachscreenshots.

TestNo.28

ParameterName	Profilefortime andphasesynchronisationwithfull timingsupport
TestDetails	SupportforPTP phaseprofile:G8275.1 1) PTPmessagesexchangedbetweenMaster &Slave 2) ProtocolstatisticsofGMfore.g.GMMAC,GMIdentity,GMclock class &value etc. 3) GMlockingwithauxiliaryinterfacesandobserverelevantprotocolstatistics.
Test instrumentsrequired	Synchtester(e.g.xGenius) Splitter GPS Antenna Connecting CablesLaptop
TestSetup1 TestSetup2	Setup1:Follow Testprocedureinstructions4 to7  Setup2: FollowTestprocedureinstruction8

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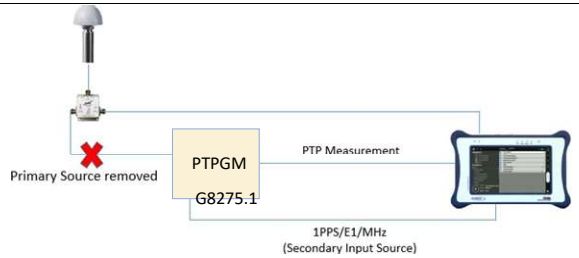
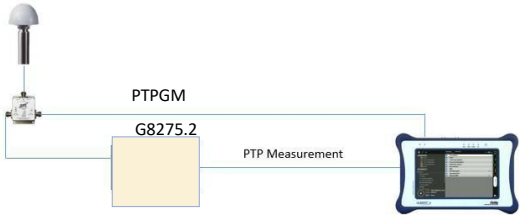
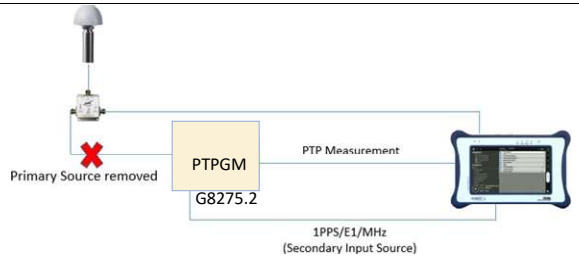
<tr><td></td><td> 
</td></tr>
<tr><td>TestProcedure</td><td>1. Connect GNSS signal to PTP GM and Tester. Wait for sufficient (approx. 1-2 hours) time so that GM and Tester arelockedto UTC.
2. Now,configurePTP GMasper thesettings mentionedbelow:

<table>
<tr><td></td><td>ITU-T G.8275.1</td></tr>
<tr><td>frame</td><td>{ethernet}</td></tr>
<tr><td>addressing-mode</td><td>{multicast}</td></tr>
<tr><td>one-step</td><td>{enable|disable}</td></tr>
<tr><td>path-delay-mechanism</td><td>{e2e}</td></tr>
<tr><td>domain</td><td><24..43></td></tr>
<tr><td>priority1</td><td><128></td></tr>
<tr><td>priority2</td><td><0..255></td></tr>
<tr><td>localpriority</td><td><1..255></td></tr>
<tr><td>class</td><td>{6|7|140|150|160|248|255}</td></tr>
<tr><td>BMCA</td><td>“Alternate BMCA”</td></tr>
<tr><td>sync-interval</td><td><16 msg/s></td></tr>
<tr><td>delay-request-interval</td><td><16 msg/s></td></tr>
<tr><td>announce-tx-interval</td><td><8 msg/s></td></tr>
</table>
3. After configuring PTP GM with correct Phase profile (full on-path) setting (through CLI & GUI). Configure theSyncTester with sameparameters&connect theTestertotheconfiguredPTP porton GM.
4. Verify:ifVLANtaggingispossible onthePTPmessages.
5. Verify:IfGMissharingalltherelevantprotocolinformationtotheTester fore.g.
i) GMMAC
ii) GMIdentity</td></tr>
</table>

	iii) GM Priority iv) GMClock class &value v) GMClockSource 6. **Verify**:MessageExchangebetweenMaster&Slavei.e. i) Sync ii) Follow-up iii) DelayRequest iv) DelayResponseetc. 7. Now,removetheGPS antennacablefrom thePTP GMand seeif theClock classin thetester changesto adifferentvalue(Locked mode clock class to Holdoverclockclass). 8. ConfigurePrimaryinput clockin PTPGM asGNSS andseta secondaryinput clockas well(for e.g.1PPS, E1,MHz).SyncTester can beusedto give secondaryinputto theGM. Nowremovethe primaryinputclock from theGMand **verifythatGMautomaticallyswitchestosecondaryinputsource.**
ExpectedResults	1. VerifyGMconfiguration throughGUI(GraphicUserInterface)&CLI(Command LineInterface). 2. VerifyTest procedure-Steps 4 to8. Results should matchthe configured valueas perITU-T Standard. 3. AttachScreenshot.

TestNo.29

ParameterName	Profilefortimeandphasesynchronisationwithpartialtimingsupport
TestDetails	SupportforPTPphaseprofile:G.8275.2 1) PTPmessagesexchangedbetweenMaster &Slave 2) ProtocolstatisticsofGMfore.g.GMIP,GMIdentity, GMclockclass&valueetc. 3) GMlockingwithauxiliaryinterfacesandobserve relevantprotocolstatistics.
Test instrumentsrequired	Synchtester(e.g.xGenius) Splitter GPS Antenna Connecting CablesLaptop
TestSetup1 TestSetup2	Setup1:Follow Testprocedureinstructions4 to7  Setup2:FollowTestprocedureinstruction8

<table>
<tr><td></td><td> 
</td></tr>
<tr><td>TestProcedure</td><td>1. Connect GNSS signal to PTP GM and Tester. Wait for sufficient (approx. 1-2 hours) time so that GM and Testerarelockedto UTC.
2. Now,configurePTP GMasper thesettings mentionedbelow:

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 theSyncTester with sameparameters &connect theTestertotheconfiguredPTP port onGM.
4. Verify:ifPTP GMhaspingoption&ableto pingTester’s IP.AlsoverifyifVLANtaggingispossibleonthePTPmessages.
5. Verify:IfGMissharingalltherelevantprotocolinformationtotheTester fore.g.
i) GMIP
ii) GMIdentity</td></tr>
</table>

	iii) GM Priority iv) GMClock class &value v) GMClockSource 6. **Verify:**MessageExchangebetweenMaster&Slavei.e. i) Sync ii) Follow-up iii) DelayRequest iv) DelayResponseetc. 7. Now,remove theGPSantennacablefrom the PTP GMand verifyif the**Clockclass**in thetesterchanges to adifferentvalue (Lockedmode clock class toHoldover clockclass). 8. Configure Primary input clock in PTP GM as GNSS and set a secondary input clock as well (for e.g. 1PPS, E1, MHz).SyncTester can beusedto give secondaryinputto theGM. Nowremovethe primaryinputclock from theGMand **verifythatGMautomaticallyswitchestosecondaryinputsource.**
ExpectedResults	1. VerifyGM configurationthroughGUI&CLI. 2. VerifyTest procedure-Steps 4 to8. Results should matchthe configured valueas perITU-T Standard. 3. Attachscreenshots.

TestNo.21

ParameterName	Mobiledevice-Non-Zero IMEI/MEID/ESN
TestDetails	Testfor Identificationof Equipment IdentityformobiledeviceforGSM/UMTS/LTE/CDMA
Test instrumentsrequired	None
TestSetup	PoweredonEUT
TestProcedure	1. Press*#06# to displayIMEI/ MEID/ ESN. 2. CopydownthedisplayedIMEI/MEID/ESN.
ExpectedResults	1.Checkthatthe displayedIMEI/MEID/ ESNis notallzeroes/ null.

TestNo.21

ParameterName	MobileEmergencySupport-Panic button
TestDetails	Testforfunctioningof Panicbutton in Featurephone
Test instrumentsrequired	None
TestSetup	1. PoweronEUT. 2. If the devicehas a keypadlock, invokeitto lock thekeypad.
TestProcedure1	1. PressNumeric Key“5”onthe featurephonekeypad formorethan 10seconds. 2. If acallisnotinvoked, repeatstep1withnumerickey“9”. 3. Disconnect thecallifinvoked. 4. Removekeypadlock. 5. Repeatstep1,2and 3.
TestProcedure2	1. Switchonthemobilescreen.Ifthereisascreenprotector(wallpaper),invokeit.Ifthereisascreenlock,invokeitto lock the screen. 2. Switchoffscreendisplay. 3. Presspanic(red)button formorethan 3 seconds 4. Disconnectthecallifinvoked.
ExpectedResults	1. Checkthat emergencycallis invoked inboth cases byactions in step2 and 5. 2. WallpaperON+ScreenLockON+ScreenOff +Longpresspanic (red) buttononce=>Emergencycall

TestNo.21

ParameterName	MobileEmergencySupport-Panic button
TestDetails	TestforfunctioningofPanic button inSmart phone
Test instrumentsrequired	None
TestSetup	PoweredonEUT.
TestProcedure1	1. Switchonthemobile sothatthescreen islit.Ifthereisascreenprotector (wallpaper),invokeit.If thereisascreenlock, invoke it tolock thescreen. 2. Switchoff screendisplay. 3. ShortPresspower-on buttonthriceinquick succession. 4. Disconnectthecallifinvoked. 5. Withscreenprotector and screenlockinvoked andscreendisplayswitched on,repeatstep 3and4.
TestProcedure2	1. Switchonthemobilescreen.Ifthereisascreenprotector(wallpaper),removeit.Ifthereisascreen lock,invokeitto lock the screen. 2. CheckifaSoftemergencycall buttonisvisibleeveninscreen lockmode. 3. Invokeemergencycall bytouchingit. 4. Disconnectthecallifinvoked.
TestProcedure3	1. Switch on the mobile screen. If there is a screen protector (wallpaper), invoke it. If there is a screen lock, invokeitto lock the screen. 2. Switchoffscreendisplay. 3. Presspanic (red)button formorethan 3 seconds 4. Disconnectthecallifinvoked.
ExpectedResults	1. WallpaperON+ScreenLockON+ScreenOff + Shortpress poweronbuttonthrice=>Emergencycall 2. WallpaperON+ScreenLockON+ScreenLit+ Shortpresspoweron buttonthrice=>Emergencycall 3. WallpaperOff+ScreenLock ON+ScreenLit+ Softemergencycallbuttontouch=>Emergencycall 4. WallpaperON+ScreenLockON+ScreenOff+Longpress panic (red)buttononce=>Emergencycall

TestNo.21

ParameterName	MobileEmergencySupport-GPSLocation
TestDetails	Testforfacilityofidentifyingthelocation throughsatellite-basedGPS insmartphonehandsets.
Test instrumentsrequired	None
TestSetup	PoweredonEUT.
TestProcedure	1. Switchonthemobile anddeactivateSIM(s). 2. Gotosettingsthroughappropriatemenu. 3. Locatesettingsfor“Location”andturnthe“Location”OffandOn. 4. UseanysuitableApp todisplaycurrentlocation ofmobile.
ExpectedResults	1.Verifythat Mobilephoneis ableto displaylocation usingsatellite-basedGPS, when SIM(s)aredeactivated.

TestNo.21

ParameterName	MobileEmergencySupport– Call on 112
TestDetails	Testforfacilitytodial112with Keypadlock,without SIMor withoutregistrationon PLMN.
Test instrumentsrequired	None
TestSetup	PoweredonEUT. TestSIMwithoutsubscription.
TestProcedure1	1. Switch on the mobile screen. If there is a screen protector (wallpaper), remove it. If there is a screen lock, invokeitto lock the screen. 2. Checkifeither keypad,oran icon/linkto displaythekeypad isvisible. In caseoflater, clickicon/link todisplaykeyboard. 3. Invokeemergencycall bydialing112. 4. Disconnectthecall ifinvoked.
TestProcedure2	1. RemoveSIMfrommobile.Switchonthemobile.If thereisascreenprotector(wallpaper),removeit.Ifthereisascreen lock, invokeit to lock thescreen. 2. Repeatsteps2, 3and 4of Procedure1.
TestProcedure3	1. InserttestSIMandswitchONmobile. 2. Verifythatmobileis tryingtoberegistered tosomeavailablePLMN. 3. Repeatprocedure2withtestSIM.
ExpectedResults	1. Itis possibleto dialtheemergencynumber 112even if thekeypad is locked, asverifiedthrough Procedure1. 2. Itispossibletodial theemergencynumber 112withoutSIM,asverifiedthroughProcedure2. 3. Themobilephone,whichhasnotsuccessfullyregistered shallneverthelessbeable tomakeemergencycallattemptson an availablePLMN, asverified throughProcedure3.

TestNo.21

Parametername	Displayof SARValue
TestDetails	TestforDisplayof SARValue
Test Instrumentsrequired	None
TestSetup	PoweredonEUT
TestProcedure	Press*#07#togetSARValue.
ExpectedResult	CheckthatSARValue is lessthan 1.6W/Kg.

TestNo.36

Parametername	OperatingFrequency
TestDetails	Testforcheckingof OperatingFrequency
TestInstrumentsrequired	BaseStationEmulator,Signal generator,spectrumanalyser,requiredsoftware
TestSetup	PoweredonEUT
TestProcedure	1. Checkthat thefrequencyofoperation asper itsdata sheet/informationgivenbythevendorisas per theApplicableNationalFrequencyAllocation Plan 2. If thestep1aboveisokay,then - a. PuttheDeviceUnder Test (DUT)in AirplaneorSwitch Offmode. b. ConfigureBaseStation Emulatorforrequiredfrequencyandtechnology. c. Switchon theDUT and initiateacall. d. CheckthattheDUTis connectedtothe BaseStationEmulatorandthat the callgoesthrough.

	e.Carry out steps a-d for all the technology – frequency combinations supported by the DUT as per its datasheet/information givenbythe vendor.
ExpectedResults	The call should go through in step 2.d for all the technology – frequency combinations supported by the DUT as per itsdatasheet/ informationgiven bythe vendor.

TestNo.21

Parametername	IndianLanguageSupportforMobilePhones
TestDetails	1. TestforcheckingMessageinput capability 2. TestforcheckingMessageReadability
TestInstruments/ Documentsrequired	1. StandardFontforEnglishand22Indian Languages(BothinSoftCopyandPrintedCopy) 2. Computer/LaptopwithDataCard/Dongle andin-builtSMSApplication
TestSetup	PoweredonEUT withan activeSIMCard
TestProcedure1	i) Input all the characters of English language one by one and check that the displayed character matches with thecharactertyped on keypad. ii) Repeatabovestep i)for Hindi. iii) Repeatabovestepi) for anyother (at-leastone) IndianLanguage asdeclared bythemanufacturer.
TestProcedure2	i) Inputallthe charactersof Englishlanguagetomakeatextinacomputer/LaptopandusingDataCard/ DonglethroughSMS Application send it to theDUT. ii) Read and compare the text character by character to see that the sent message and the received message are thesame. iii) RepeatabovestepforHindiand all(twenty-one) otherIndianlanguages.
Expected Resultsfor Message inputcapability	TheDUT should havein-built capabilityfor inputtingof thefollowinglanguages: a) English b) Hindi and c) Anyother(at-leastone)IndianLanguage
Expected Resultsfor MessageReadability	TheDUT should havethe capabilitytodisplayall thelanguages asfollows: a) English b) Hindi and c) All(twenty-one)otherIndianLanguages

TestNo.22

ParameterName	SNMPv2FunctionalTests
TestDetails	Testformanagement:SNMPv2(check TRAP,GETandSEToperations)
Testinstrumentsrequired	SNMPTestTool(SNMPManager)
TestSetup	
TestProcedure	1. Configure the EUT to run SNMP agent and SNMP Test Tool (NMS) to run SNMP manager application byusingcorrect parameters. 2. TestingofTRAP message:TheNMSuses SNMPv2to managethe SNMPagent, andthe agent automaticallysendsnotifications to report events to the NMS. 3. ConfiguretheSNMPagentto sendtrapstothemanager. 4. Useawrongcommunitynameto get thevalue of aMIBnodeon theagent. You can seeanauthenticationfailuretrap on theSNMP manager. 5. Test“SetRequest”operation:SNMPTestingnode(SNMPmanager)sendsSNMPv2c“SetRequest”tosetSysName to “EUT1”. Verify the SysName value on the EUT. It should match the value “EUT1” set using‘SetRequest’function from theSNMP manger. 6. TestSNMPGETOperation(singleObject):Testingnode(SNMPManager)sendsSNMPv2c“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 shouldrespondwith“SysNamevalueas“EUT1”assetinthepreviousstep,verifyingthattheEUTsupportSNMP GETfunction.
ExpectedResults	1. TRAPshouldbesent byEUT(Agent) toTestingNode(SNMPManager). 2. SetRequestoperationshouldbeabletoset SysNameobjectinagent(EUT) 3. GetRequestoperationshouldbeableto getSysNameObjectfromagent(EUT) 4. Attachscreenshotsforabovesuccessfuloperations.

TestNo.22

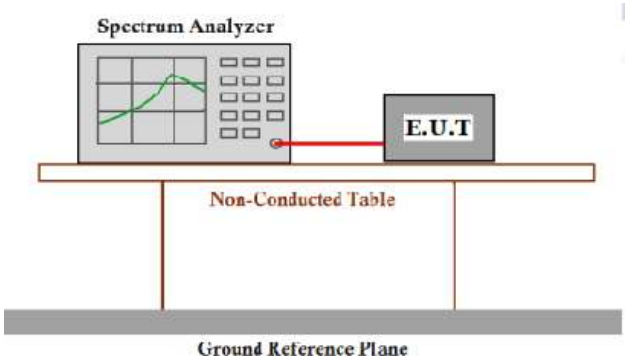
ParameterName	SNMPv3FunctionalTests
TestDetails	TestforSNMPv3management
Testinstrumentsrequired	SNMPTestTool(SNMPManager)
TestSetup	
TestProcedure	1. ConfiguretheagentonEUTandSNMPmanager onSNMPTestTooltouseSNMPv3withsecuritylevelsettingto AuthPriv. Set Authentication to SHAand Privacy(encryption) to DES. 2. TheNMS usesSNMPv3 tomonitorand managetheagent 3. Theagentautomaticallysendsnotifications toreport eventsto theNMS. 4. TheNMS andthe agentperform authenticationwhen theyestablish anSNMPsession. Theauthenticationalgorithmis SHAand theauthenticationkeyis xxxxxx.TheNMSand the agentalso encrypt theSNMP packets betweenthembyusingthe DESalgorithmand encryptionkeyyyyyyy
ExpectedResults	1. Usecorrectauthenticationcredentialstoaccesstheagent. 2. Attachtracesforsuccessfulencrypted authenticationwithcorrectcredentials 3. Useincorrectauthenticationcredentialstoaccesstheagent 4. Attachtracesforfailedauthenticationwithincorrectcredentials

TestNo.22

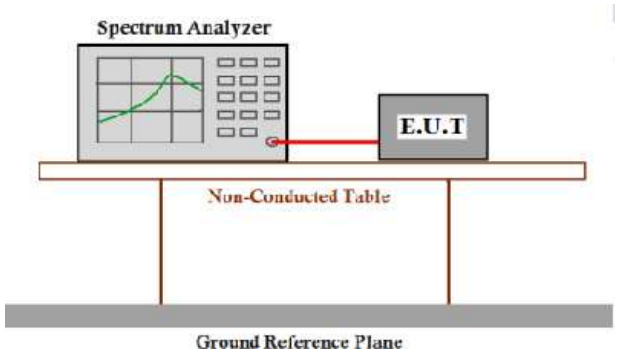
ParameterName	Supportforpriorityforemergencycalls
TestDetails	AsperDepartmentof TelecomNo.16-04/ 2015-AS-III/NP/67/120dated 4thMay2016
Standard	3GPP TS 23.067 EnhancedMulti-LevelPrecedence andPre-emptionservice(eMLPP):Stage2
TestProcedure	1. Thecall to emergencynumberis given priority. 2. Theemergencynumbersareaccessible irrespectiveof balance/limit. 3. Thenumbersareroutedthrough otheroperator,ifthesignal oftheoperator, towhich theSubscriberissubscribed,is low orunavailable. 4. Thenumbers arediallablewith orwithout SIM (subjectto implementation)
ExpectedResults	Compliance

TestNo.41

Parametername	FrequencyofoperationforBLEinterface
Testdetails	Bandedge limitations(RefStandard:-)
Testinstrumentsrequired	Spectrum analyzerPowerSupply

Testsetup	
Test Procedure	1.Remove theantennafromthe EUTandthenconnectalowRFcablefromtheantennaporttothespectrum analyzerorpowermeter. 2.Setinstrument centerfrequencytothefrequencyof theemissiontobemeasured (must bewithin2MHzofthe authorizedbandedge). 3.Setspanto 2MHz, 4.RBW=100kHz,VBW≥3×RBW 5.Detector=peak 6.Sweeptime=auto, 7.Tracemode=maxhold. 8.Allow sweeptocontinueuntilthetracestabilizes(requiredmeasurementtimemayincrease for low dutycycleapplications) 9.Measurethe powerofthe peaksoutsidethe band.
Expectedre sults	2400MHz-2483.5MHz

TestNo.42

Parameterna me	EIRPofBLEinterface,MaximumTransmittedpowerforBLEinterface,RFOutputPower
Testdetails	Peakpowermeasurement
Testinstrumen tsrequired	Spectrum analyzerPowerSupply
Testsetup	

TestProcedure	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 thespectrum. 2. SettheRBW≥DTSbandwidth 3. SettheVBW≥3x RBW 4. Setthespan≥3 xRBW. 5. Detector=peak. 6. Sweeptime=autocouple. 7. Tracemode =maxhold. 8. Usepeakmarkerfunctionto determinethe peak amplitude level. 9. Reporttheworse case 10. TocalculatetheEIRP, addtheAntenna gaintoMeasured power.
Expectedresults	Asper WPCGSR 45(E)