



वर्गीय आवश्यकताओं के लिए मानक

टीईसी 57040:2023

STANDARD FOR GENERIC REQUIREMENTS

TEC 57040:2023

वायरलेस लैन के माध्यम से पोर्टेबल उपकरणों को प्रसारण
सामग्री वितरित करने के लिए अभिसरण गेटवे नोड

Converged Gateway Node For Delivering Broadcast Content
To Portable Devices Through Wireless LAN



ISO 9001:2015

दूरसंचार अभियांत्रिकी केंद्र

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Release: March 2023

FOREWORD

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

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

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

ABSTRACT

This standard pertains to Generic Requirements for Converged Gateway Node for delivering broadcast content to portable devices through Wireless LAN/Wi-Fi. The end users can view the television or other audiovisual content on their portable devices without consuming Mobile/Internet/Broadband data and without requiring any additional hardware or plugin, etc.

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HISTORY SHEET

<i>Sl.No.</i>	<i>Standard/ Document No.</i>	<i>Title</i>	<i>Remarks</i>
1.	TEC 57040:2023	CONVERGED GATEWAY NODE FOR DELIVERING BROADCAST CONTENT TO PORTABLE DEVICES THROUGH WIRELESS LAN	New Standard for GR

REFERENCES

<i>S.No.</i>	<i>Document No.</i>	<i>Title/Document Name</i>
(I): TEC GR/IR/SDs		
1.	TEC/SD/DD/EMC-221/05/OCT-16	Electromagnetic Compatibility Standard for Telecommunication Equipment
(II): ITU-T/ IEEE/ETSI/European Standard		
1.	H.264/AVC	Advanced Video Coding
2.	H.265/HEVC	High Efficiency Video Coding
3.	EN 300 421	Digital Video Broadcasting (DVB); Framing structure, channel coding, and modulation for 11/12 GHz satellite services
4.	EN 300 429	Digital Video Broadcasting (DVB); Framing structure, channel coding, and modulation for cable systems
5.	ETSI TS 101 154	Digital Video Broadcasting (DVB); Specification for the use of Video and Audio Coding in Broadcast and Broadband Applications
6.	ISO/IEC 14496-10	Information Technology--Coding of audio-visual objects—Part 10: Advanced video coding
7.	ISO/IEC 11172-3	Information Technology - Coding of Moving Pictures and Associated Audio for Digital Storage Media at up to About 1,5 Mbit/s - Part 3: Audio
8.	IEEE 802.3	Ethernet Standard
9.	IEE 802.11	The set of standards that define communication for wireless LANs (wireless local area networks, or WLANs)
10.	UDP	User Datagram Protocol
11.	RTMP	Real-Time Messaging Protocol

(III): Other Standards		
1.	CISPR 32(2015)/ EN 55032	Limits and methods of measurement of radio disturbance characteristics of ITE (Information Technology Equipment)
2.	IEC/EN 61000-4-2	Testing and measurement techniques – Electrostatic discharge immunity test
3.	IEC/EN 61000-4-3	Testing and measurement techniques – Radiated, Radio-frequency electromagnetic field immunity test
4.	IEC/EN 61000-4-4	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test
5.	IEC/EN 61000-4-5	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques – Surge immunity test
6.	IEC/EN 61000-4-6	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio frequency fields
7.	IEC/EN 61000-4-11	Electromagnetic compatibility (EMC) Part 4-11: Testing and measurement techniques Voltage dips, short interruptions, and voltage variations immunity tests
8.	IEC/EN 61000-4-29	Testing and measurement techniques – Voltage dips, short interruptions, and voltage variations on DC input power port immunity tests
9.	IS 13252 / IEC 60950	Information Technology Equipment -- Safety, Part 1: General Requirements
10.	IEC 62368-1	Audio/video, information, and communication technology equipment - Part 1: Safety requirements

CHAPTER-1

1.1 Introduction

The Converged Gateway Node for delivering broadcast content to portable devices through Wireless LAN/ Wi-Fi is a converged access node, that receives the linear television and other signals through the conventional modes such as satellite, cable, or terrestrial and then distributes them using Wi-Fi or other WLAN. The end users can view the television or other audiovisual content on their portable devices without consuming mobile data and without requiring any additional hardware or plugin, etc.

1.2 Description

A conceptual diagram of the Converged Gateway Node for delivering broadcast content to portable devices through Wireless LAN/ Wi-Fi is shown in Figure1

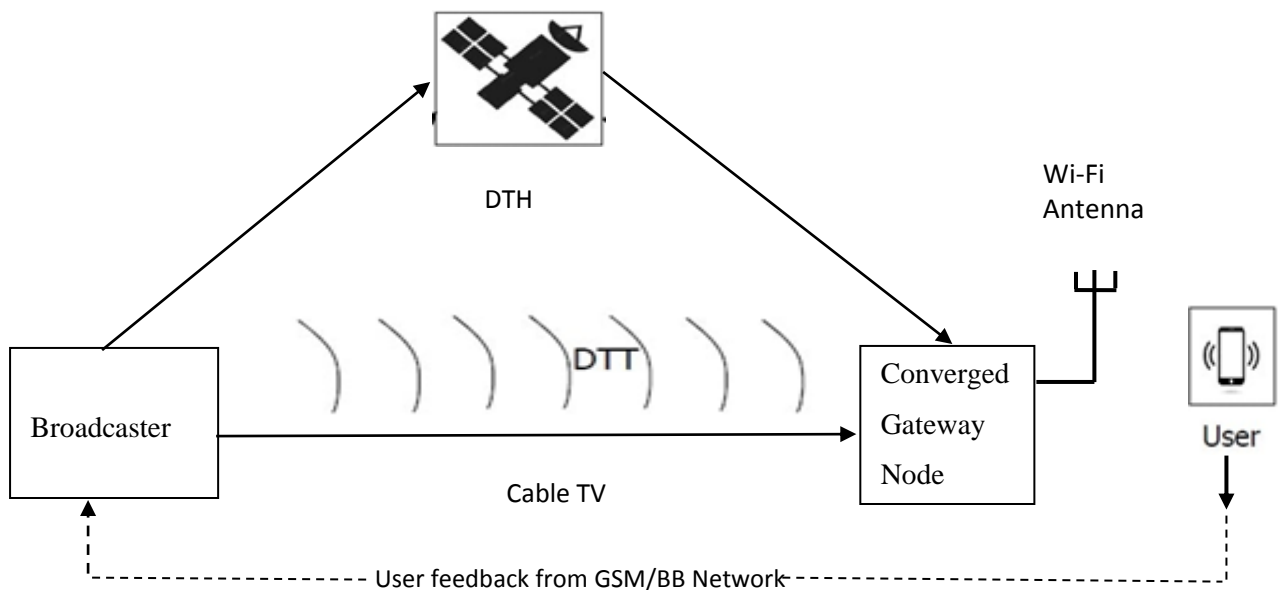


Figure 1 Conceptual diagram

In the Converged Gateway Node, Digital Terrestrial/Satellite/Cable content is received, demodulated, decoded, and finally selectively streamed in appropriate formats over the WLAN/Wi-Fi. A local content server can be hosted for various offline services. The content is consumed by end-users

using browsers on smartphones and laptops by accessing a web portal through the WLAN/Wi-Fi. Additionally, the end-user can switch to regular OTT services if the access point has been connected to the internet backhaul.

A functional block diagram of the Converged Gateway Node for delivering broadcast content to portable devices through Wireless LAN/ Wi-Fi is shown in Figure 2

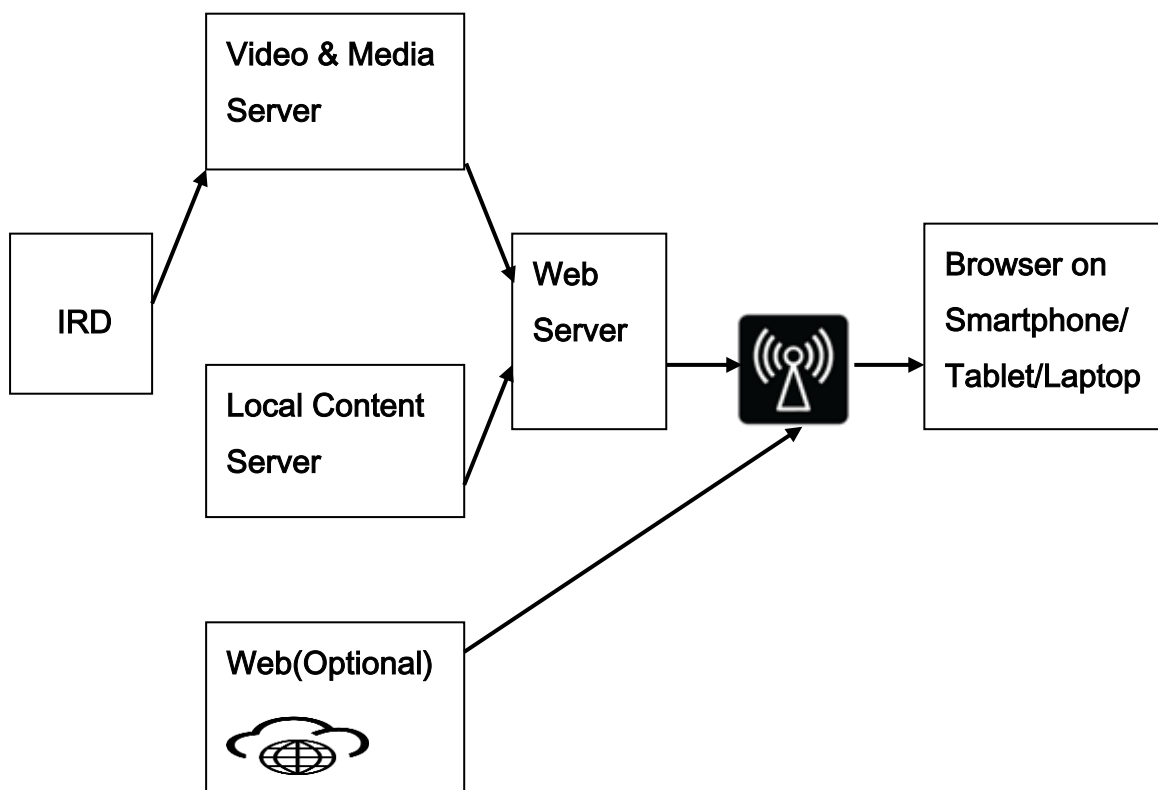


Figure2 Functional block diagram

The blocks are briefly explained below:

1.2.1 IRD (Integrated Receiver Decoder)

A dish antenna on the ground at the gateway location receives the down linked signals from the satellite. Terrestrial signals are similarly received via a smaller antenna. A device at the antenna amplifies these signals and converts them to a suitable band for consumption by demodulation devices. A demodulation device is tuned only for a particular frequency and can only

receive a certain number of channels. So ideally one would need a great number of these devices to cater to all satellite and terrestrial channels. This device further converts the signals to baseband signals containing multiple DTV or Radio channels and are streamed out.

1.2.2 **Video and Media Server**

To ensure that the audio/video content is consumed by the end user without having to rely on any kind of specialized software or plugin. Having to install third party plugins or players is not only an inconvenience but also a risk factor for the user. Streams generated in the previous step are not playable by any industry standard browser. This requirement is addressed by the Video & Media Server which transcodes the UDP stream into a stream that can be made HTML compatible to the browser. Also, it ingests a stream and breaks it down to files that can be hosted over HTML using a webserver.

1.2.3 **Self-Learning Web Server**

The function of a web server is two-fold:

- a. To act as an HTML/Web server for serving the audio/video content to the end user's browser &
- b. To learn from the user viewership statistics and come up with a list of “n” number of channels as the most watched/desired channels. The channels are thus selectively streamed initially for a period followed by a self-learning algorithm that determines the most desired/watched channels at a given location. After the algorithm converges to a decisive list over time, the channels are finalized. This brings down the cost in terms of reliance on the number of demodulating devices. As mentioned in the “IRD” section, the number of such devices can ideally be a lot but the same is not desired and that purpose is solved by the algorithm inside the web server business logic layer.

1.2.4 **Local Content Server**

A local content server can be hosted for various offline services. The content is consumed by end-users using browsers on smartphones and laptops by accessing a web portal through the WLAN/Wi-Fi.

1.2.5 End-User Browser

The end-user experience is at the heart of any solution or product. The smart phone/laptop/tab user who wants to consume content doesn't have to install any special app or plugin which is both unsafe and inconvenient. After connecting to the Wi-Fi, the user would access the web portal using an appropriate link. In the browsers, the user shall be able to find the list of channels decided by the algorithm in the previous step. The user shall be able to play the content of these channels directly in the browser by pressing the channel name.

1.3 Dimensioning

- 1.3.1 The system shall be capable of supporting a minimum of 20 FTA program channels in total, from at least 4 carrier/transponder frequencies at a given time. The system shall have the capabilities to support a minimum of 200 active connections simultaneously. The actual number of simultaneous active connections supported in a deployed end-to-end scenario, also depends on the capabilities of other network elements outside this system and may vary.
- 1.3.2 The IRD should have Minimum 4 RF Tuner inputs and shall be expandable up to 16 RF tuner inputs in a supported configuration.
- 1.3.3 Web server should cater to at least five times to the number of simultaneous users of Wi-Fi system. Wi-Fi system to cater to minimum 40 simultaneous users in both 2.4GHz and 5 GHz frequencies.

1.4 Use Cases

- 1.4.1 The Converged Gateway Node can be used in various scenarios such as Bharat Net in rural areas. Wi-Fi access points through PM-WANI can also deploy Converged Gateway Node so that the broadcast channels are also available to users without using internet data.
- 1.4.2 The Converged Gateway Node can be deployed for inflight entertainments.
- 1.4.3 The Converged Gateway Node can be deployed in Railway Stations and Airports.
- 1.4.4 The Converged Gateway Node can be deployed in Shopping Malls.

- 1.4.5 The Converged Gateway Node can be deployed in moving vehicles (like State Road Transport Buses / City Buses/ Trains/ Taxis/Cars, etc.)
- 1.4.6 It can be interfaced with OLT in a GPON / fibre distribution network and the contents can be consumed by the end customers using Wi-Fi interfaced at ONT.
- 1.4.7 Integration of Converged Gateway Node with GPON-OLT integration / Network integration is illustrated in Figure 3:

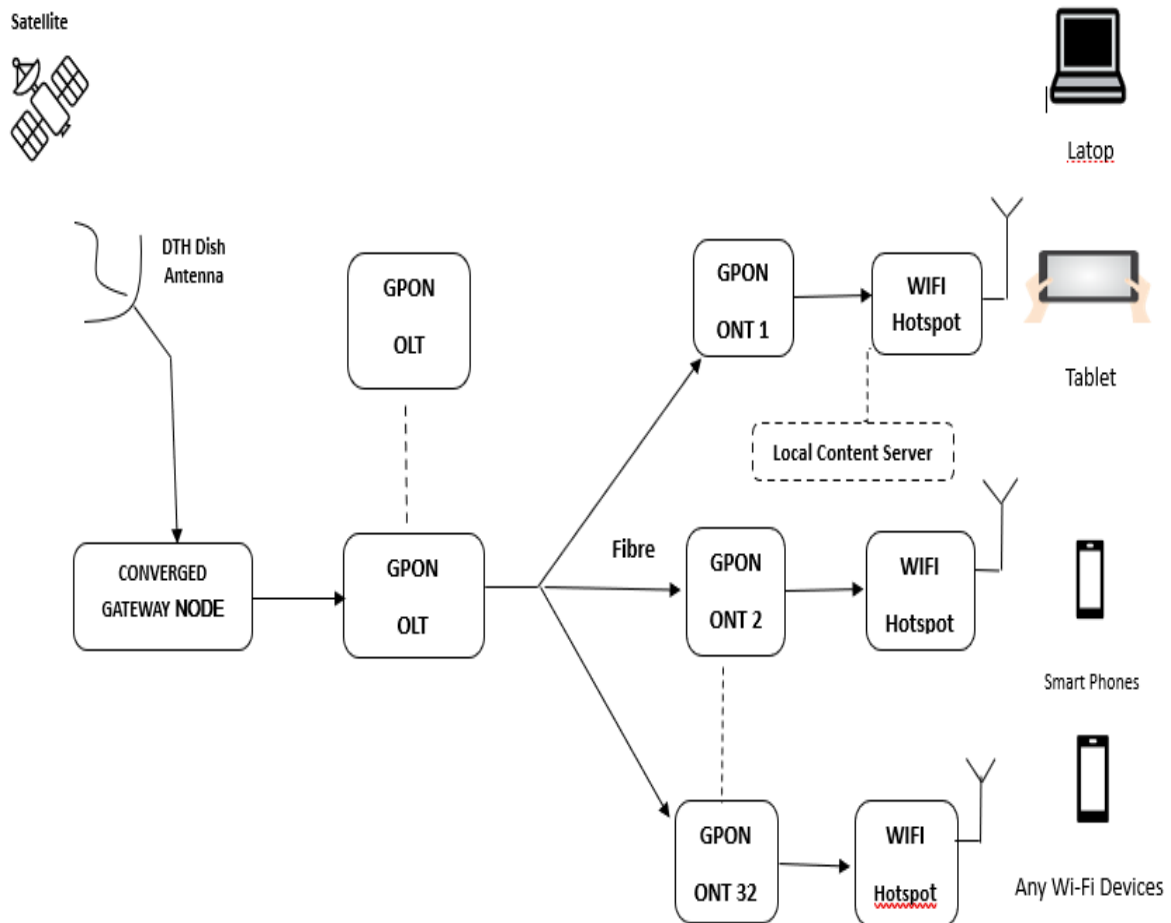


Figure 3 Interfacing with GPON- OLT

1.5 Functional/Operational Requirements

- 1.5.1 System shall support DVB-S/S2 (950MHz-2150MHz)/ DVB-C (47-862MHz)/DVB-T/T2 RF input stream.
- 1.5.2 The system shall support static video, audio and readable content.
- 1.5.3 The system shall support input streams with video codecs such as MPEG-2, H.264/AVC, and H.265/HEVC etc. and with audio codecs such as MPEG-1 audio, mp3, AAC and AC3 etc.
- 1.5.4 The system shall support demodulation and decoding as per EN 300421/EN 300429/ETSI TS 101 154 of the RF input stream.
- 1.5.5 The system shall be capable of supporting individual channels by performing the required de-multiplexing of the MPTS stream to support individual channels by the end users.
- 1.5.6 The system shall support video transcoding as per ISO/IEC14496-10
- 1.5.7 The system shall support audio transcoding as per ISO/IEC 11172-3
- 1.5.8 The system shall support output container formats such as flv, mkv and mov etc.
- 1.5.9 The system shall support video streaming protocols such as MPEG-DASH and HLS to allow mobile browser compatibility.
- 1.5.10 The system shall support the hosting of live and static content through a webserver.
- 1.5.11 The system may have backhaul Internet connectivity.
- 1.5.12 The system shall support (enable) playback of content in mobile browsers without any extra plugins.
- 1.5.13 The system shall support administrator authentication for the configuration of IRD, Video Server, and Web Server modules through GUI.
- 1.5.14 The system may support Remote configuration and management.
- 1.5.15 The system shall support IRD configuration for the selection of frequency and streaming channels.
- 1.5.16 The system may support the configuration of a Video server and Web server to allow dynamic updating of streamed channels.
- 1.5.17 The system may support alert services, local advertisements etc.
- 1.5.18 The system shall allow the administrator to view viewership statistics
- 1.5.19 The system shall display the I/P and O/P streaming status and power ON/OFF

status through LEDs.

- 1.5.20 The system shall operate on power from 230VAC, 50Hz.
- 1.5.21 The system should be able to operate in the environment -0C to 50C.
- 1.5.22 The system components except Wi-Fi access points shall operate in an indoor environment 24x7.
- 1.5.23 The system shall provide an User friendly GUI to the end users (through the browser) for channel program selection.
- 1.5.24 The System shall support smooth streaming and viewer experience wrt audio, video contents.
- 1.5.25 The system shall support both video and audio (radio) program channels for all types of primary input feeds.

1.6 Interface Requirements

- 1.6.1 The system shall support RF Interface as per the DVB-S/S2/DVB-C/)/DVB-T/T2 input stream.
- 1.6.2 The system shall support a USB interface for programming and debugging of IRDs.
- 1.6.3 The system shall support Ethernet Interface (IEEE 802.3) for communication and data transmission between IRD, Video Server and Web Server blocks.
- 1.6.4 The system shall support Ethernet/Wireless interface (IEEE 802.11) to Wi-Fi access points as per network topology.
- 1.6.5 The system may use UDP for IRD to video-server interfacing.
- 1.6.6 The system may use RTMP for Video Server to Media Server interfacing.
- 1.6.7 The system shall support streaming protocols like MPEG-DASH and HLS for audio/video playback on end-user devices.
- 1.6.8 The system may support internet backhaul through WAN (IEEE 802.3)

1.7 Quality Requirements

- 1.7.1 The manufacturer shall furnish the MTBF value. The minimum value of MTBF shall be 500,000 hours. The calculations shall be based on the guidelines given in either QA document No. QM-115 {January 1997} "Reliability Methods and Predictions" or any other international standards.
- 1.7.2 The equipment shall be manufactured in accordance with the international

quality management system ISO 9001:2015 or any other equivalent ISO certificate for which the manufacturer should be duly accredited. A quality plan describing the quality assurance system followed by the manufacturer would be required to be submitted.

- 1.7.3 The equipment shall conform to the requirements for the Environment specified in TEC QA standards QM-333 {Issue- March 2010} "Standard for Environmental testing of Telecommunication Equipments" or any other equivalent international standard, for operation, transportation and storage. The applicable tests shall be for environmental category "D" including vibration and corrosion (salt mist).

1.8 EMI/EMC Requirements

The equipment shall conform to the EMC requirements as per the following standards and limits indicated therein. A test certificate and test report from an accredited test lab shall be furnished by a testing agency.

a) Conducted and radiated emissions (applicable to telecom equipment):

Name of EMC Standard: "CISPR 32 (2015) with amendments - Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment".

Limits:-

- i) To comply with Class B of CISPR 32 (2015) with amendments for indoor deployments and Class A of CISPR 32 (2015) with amendments for outdoor deployments.

b) Immunity to Electrostatic discharge:

Name of EMC Standard: IEC 61000-4-2 {2008} "Testing and measurement techniques of Electrostatic discharge immunity test".

Limits:-

- i) Contact discharge level 2 { ± 4 kV} or higher voltage;
- ii) Air discharge level 3 { ± 8 kV} or higher voltage;

c) Immunity to radiated RF:

Name of EMC Standard: IEC 61000-4-3 (2010) "Testing and measurement

techniques-Radiated RF Electromagnetic Field Immunity test".

Limits:-

For Telecom Equipment and Telecom Terminal Equipment without Voice interface (s)

Under Test level 2 {Test field strength of 3 V/m} for general purposes in the frequency range 80 MHz to 1000 MHz and protection against digital radio telephones and other RF devices in frequency ranges 800 MHz to 960 MHz and 1.4 GHz to 6.0 GHz.

d) Immunity to fast transients (burst):

Name of EMC Standard: IEC 61000-4-4 {2012} "Testing and measurement techniques of electrical fast transients/burst immunity test".

Limits:-

Test Level 2 i.e.

- a) 1 kV for AC/DC power lines;
- b) 0.5 kV for signal/control/data/telecom lines;

e) Immunity to surges:

Name of EMC Standard: IEC 61000-4-5 (2014) "Testing & Measurement techniques for Surge immunity test".

Limits:-

- i) For mains power input ports : (a) 2 kV peak open circuit voltage for the line to ground coupling (b) 1 kV peak open circuit voltage for the line to line coupling
- ii) For telecom ports : (a) 2kV peak open circuit voltage for the line to ground (b) 2KV peak open circuit voltage for the line to line coupling.

f) Immunity to conducted disturbance induced by Radio frequency fields:

Name of EMC Standard: IEC 61000-4-6 (2013) with amendments) "Testing & measurement techniques-Immunity to conducted disturbances induced by radio frequency fields".

Limits:-

Under the test level 2 {3 V r.m.s.} in the frequency range 150 kHz-80 MHz for AC

/ DC lines and Signal /Control/telecom lines.

g) Immunity to voltage dips & short interruptions (applicable to only AC mains power input ports, if any):

Name of EMC Standard: IEC 61000-4-11 (2004) "Testing & measurement techniques- voltage dips, short interruptions and voltage variations immunity tests".

Limits:-

- i) a voltage dip corresponding to a reduction of the supply voltage of 30% for 500ms (i.e. 70 % supply voltage for 500 ms)
- ii) a voltage dip corresponding to a reduction of the supply voltage of 60% for 200ms; (i.e. 40% supply voltage for 200ms) and
- iii) a voltage interruption corresponding to a reduction of the supply voltage of > 95% for 5s.
- iv) a voltage interruption corresponding to a reduction of the supply voltage of >95% for 10s.

h) Immunity to voltage dips & short interruptions (applicable to only DC power input ports, if any):

Name of EMC Standard: IEC 61000-4-29:2000: Electromagnetic compatibility (EMC) - Part 4-29: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on DC input power port immunity tests.

Limits:-

- i. Voltage Interruption with 0% of supply for 10ms. Applicable Performance Criteria shall be B.
- ii. Voltage Interruption with 0% of supply for 30ms, 100ms, 300ms and 1000ms. Applicable Performance Criteria shall be C.
- iii. Voltage dip corresponding to 40% & 70% of supply for 10ms, 30 ms. Applicable Performance Criteria shall be B.
- iv. Voltage dip corresponding to 40% & 70% of supply for 100ms, 300 ms and 1000ms. Applicable Performance Criteria shall be C.

- v. Voltage variations correspond to 80% and 120% of supply for 100 ms to 10s as per Table 1c of IEC 61000-4-29. Applicable Performance Criteria shall be B.

Note: - For checking compliance with the above EMC requirements, the method of measurement shall be in accordance with TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16 and the referenced base standards i.e. IEC and CISPR standards and the references mentioned therein unless otherwise specified specifically. Alternatively, corresponding relevant Euro Norms of the above IEC/CISPR standards are also acceptable subject to the condition that frequency range and test level are met as per above mentioned sub clauses (a) to (h) and TEC Standard TEC/SD/DD/EMC-221/05/OCT-16.

The details of IEC/CISPR and their corresponding Euro Norms are as follows:

IEC/CISPR	Euro Norm
CISPR 11	EN 55011
CISPR 32	EN55032
IEC 61000-4-2	EN 61000-4-2
IEC 61000-4-3	EN 61000-4-3
IEC 61000-4-4	EN 61000-4-4
IEC 61000-4-5	EN 61000-4-5
IEC 61000-4-6	EN 61000-4-6
IEC 61000-4-11	EN 61000-4-11
IEC 61000-4-29	EN 61000-4-29

1.9 Safety Requirements

1.9.1 The equipment shall conform to:

- i. IS 13252 part 1: 2010 “Information Technology Equipment –Safety- Part 1: General Requirements” [equivalent to IEC 60950-1 {2005} “Information Technology Equipment –Safety- Part 1: General Requirements”]

OR

IEC 62368-1: 2018 “Audio/video, information and communication technology equipment - Part 1: Safety requirements”

1.10 Security Requirements

1.10.1 Equipment shall conform to WPA2 based on IEEE 802.11i standard, access control authentication based on 802.1X / EAP Standard and in case of IEEE 802.11ax, equipment shall also conform to WPA3 personal and WPA 3 enterprise.

1.10.2 Equipment shall conform to Media Access control security based on 802.1 AE as an optional requirement.

1.10.3 Service Set Identifier (SSID) shall be definable by Administrator.

1.10.4 In case of authentication and authorization is implemented through a RADIUS server, IETF RFC 2865 should be supported and optionally if required IETF RFC 2866, 2867 may also be supported.

ABBREVIATIONS

For the purpose of this document the following abbreviations apply:

AAC	: Advanced Audio Coding
AC3	: Digital audio codec
DTH	: Direct to Home
DTT	: Digital Terrestrial Television
DTV	: Digital Television
DVB-C	: Digital Video Broadcasting - Cable
DVB-S/S2	: Digital Video Broadcasting – Satellite/ Satellite - Second Generation
EAP	: Extensible Authentication Protocol
EMC	: Electromagnetic Compatibility
EMI	: Electromagnetic interference
ETSI	: European Telecommunications Standards Institute
flv	: Flash Video - File Extensions
FTA	: Free to Air
GPON	: Gigabit Passive Optical Network
HLS	: HTTP Live Streaming
HTML	: Hypertext markup language
IEEE	: Institute of Electrical and Electronics Engineers
IETF	: Internet Engineering Task Force
IRD	: Integrated Receiver Decoder
LAN	: Local area network
MP3	: MPEG-1 Audio Layer III
MPEG-1	: Moving Picture Experts Group Phase 1
MPEG-DASH	: Dynamic Adaptive Streaming over HTTP
MPTS	: Multiple Program Transport Stream
Mkv	: Multimedia standard that holds an unlimited number of audio, video and subtitles files within one file format

Mov : Filename extension for the QuickTime multimedia file format

MTBF : Mean time between failures

OLT : Optical Line Termination

OTT : Over-the-top

PM-WANI : Prime Minister Wi-Fi Access Network Interface

RADIUS : Remote Authentication Dial-In User Service

RFC : Request for Comments

RTMP : Real-Time Messaging Protocol

SSID : Service Set Identifier

UDP : User Datagram Protocol

WAN : Wide area network

Wi-Fi : Wireless Fidelity

WLAN : Wireless local area network

WPA : Wi-Fi Protected Access

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