



वर्गीय अपेक्षाओं के लिए मानक

टीईसी ५७११०:२०२६

STANDARD FOR GENERIC REQUIREMENTS

TEC 57110:2026

लघु शक्ति कम-दूरी एफ.एम. रेडियो प्रसारण ट्रांसमिटिंग उपकरण
Low Power Small Range FM Radio Broadcast Transmitting
Equipment



ISO 9001:2015

दूरसंचार अभियांत्रिकी केंद्र
खुर्शीदलाल भवन, जनपथ, नई दिल्ली-110001, भारत
TELECOMMUNICATION ENGINEERING CENTRE
KHURSHID LAL BHAWAN, JANPATH, NEW DELHI-110001, INDIA
www.tec.gov.in

© टीईसी, 2026

© TEC, 2026

इस सर्वाधिकार सुरक्षित प्रकाशन का कोई भी हिस्सा, दूरसंचार अभियांत्रिकी केंद्र, नई दिल्ली की लिखित स्वीकृति के बिना, किसी भी रूप में या किसी भी प्रकार से जैसे- इलेक्ट्रॉनिक, मैकेनिकल, फोटोकॉपी, रिकॉर्डिंग, स्कैनिंग आदि रूप में प्रेषित, संग्रहीत या पुनरुत्पादित न किया जाए।

All rights reserved and no part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form and by any means - electronic, mechanical, photocopying, recording, scanning or otherwise, without written permission from the Telecommunication Engineering Centre, New Delhi.

Release 1: January, 2026

FOREWORD

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

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

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

ABSTRACT

This Standard specifies the generic requirements for Low Power FM (LPFM) Radio Broadcasting transmitter equipment used for short-range

audio transmission in localized areas. It aims to define the technical specifications, performance parameters, and compliance guidelines necessary to ensure the safe, reliable, and interference-free operation of LPFM transmitters. The purpose of this Standard is to facilitate the deployment of LPFM systems that meet regulatory norms while minimizing potential interference with other radio communication services.

CONTENTS

<i>Clause</i>	<i>Particulars</i>	<i>Page No.</i>
HISTORY SHEET		6
References		7

CHAPTER-1

1.1. Introduction.....	9
1.2. Description	9
1.3. General.....	12
1.4. Inputs.....	12
1.5. RF Output.....	13
1.6. Antenna Requirements.....	14
1.7. Power Supply Requirements	14
1.8. Quality Requirements.....	14
1.9. Environmental Requirements	15
1.10. EMI/EMC Requirements	15
1.11. Safety Requirements.....	16
1.12. Security Requirements.....	17

CHAPTER-2

2.1 Information for the procurer of product.....	19
Abbreviations	20

HISTORY SHEET

<i>Sl. No.</i>	<i>Standard / document No.</i>	<i>Title</i>	<i>Remarks</i>
1.	Standard Number TEC 57110:2026	Standard for Generic Requirements for Low Power Small Range FM Radio Broadcast Transmitting Equipment	First issue

REFERENCES

<i>S. No.</i>	<i>Document No.</i>	<i>Title/Document Name</i>
[1]	-	Consultation Paper on Issues Related to Low Power Small Range FM Radio Broadcasting
[2]		DS Series Low Power FM Transmitters
[3]		Low power FM transmitters 50w-100w - RFE Broadcast
[4]		The Complete Beginner's Guide to FM Transmitters FMUSER
[5]		Broadcast Low Power FM Transmitter Broadcast
[6]		User Manual 30 Watt Band II VHF FM Broadcasting Transmitter
[7]		https://www.interferencetechnology.com/wp-content/uploads/2012/04/Hoolihan_NA_s_DDG12.pdf

CHAPTER-1

1.1. Introduction

Low Power FM (LPFM) radio broadcasting systems are intended for short-range audio transmission over the FM broadcast band, typically within 88-108 MHz. These systems operate at low output power levels, often not exceeding **1 Watt**, and are designed to serve localized area, campus radio, community information systems, emergency alerts etc. with a coverage radius of approximately **500 meters**.

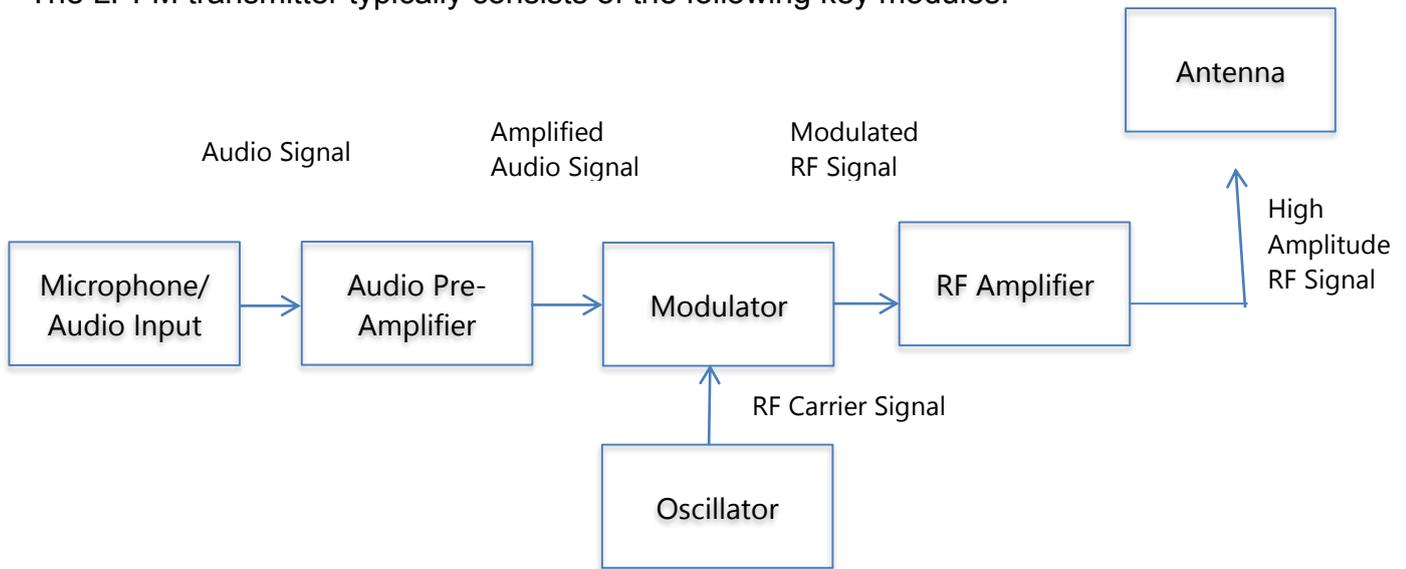
Such systems are increasingly used for applications such as community radio, rural information services, and localized communication in remote or underserved areas. LPFM transmitters are especially suited for fixed or temporary setups where conventional high-power FM broadcasting infrastructure is either impractical or cost-prohibitive.

This document outlines the generic requirements for LPFM transmitter equipment, intended to ensure reliable performance, regulatory compliance, and interference-free operation in the FM spectrum, in accordance with national standards.

1.2. Description

The Low Power FM Radio Broadcasting Transmitting Equipment described in this standard is designed to transmit audio signals over a limited geographic area, campus radio, community information systems, emergency alerts etc. using RF output power not exceeding **1 Watt**. This level of transmission power enables coverage up to approximately **500 meters**, depending on terrain, antenna gain, and environmental conditions.

The LPFM transmitter typically consists of the following key modules:



FM Transmitter Block Diagram

- **Audio Pre-amplifier:** - It serves as the entry point for audio signals into the transmitter. It receives input from sources such as microphones, audio mixers, or media playback devices. This stage typically includes input connectors, preamplifiers, and level controls to ensure that the incoming signal is properly conditioned for further processing. Its primary purpose is to match the signal level and impedance, ensuring optimal audio quality and minimal distortion as the signal moves through the system. supporting sources such as microphones, audio mixers, or media playback devices. It also enhances the quality and consistency of the input audio signal. It performs signal conditioning functions such as pre-emphasis to boost high frequencies, dynamic range compression or limiting to prevent peaks, and automatic gain control (AGC) to normalize audio levels. These processes are essential for maintaining audio clarity, preventing over-modulation, and ensuring a professional broadcast standard.
- **FM modulator:** - The FM modulator is responsible for converting the processed audio into a frequency-modulated signal within the 88–108 MHz FM band. It uses frequency deviation techniques, often with a voltage-controlled oscillator (VCO) and phase-locked loop (PLL), spectrum mask and occupied bandwidth guidance to avoid adjacent channel interference to ensure accurate and stable modulation. This step transforms the audio signal into an RF signal that can be transmitted over the air.

- **RF Amplifier:** - Following modulation, the signal enters the **RF amplifier**, which boosts it to the designated power output—in this case, not exceeding 1 Watt. At this low power level, amplification must be linear and precise to avoid introducing distortion while ensuring adequate signal strength for short-range coverage. This makes the RF amplifier a critical component in balancing performance and compliance. To ensure clean signal transmission, the output from the amplifier is routed through a low-pass filter. This filter removes unwanted harmonics and spurious frequencies that may arise during modulation or amplification. Filtering is essential to prevent interference with adjacent FM channels and ensure the transmitter conforms to national spectrum regulations.
- **Antenna Unit:** - The signal is then sent to the **antenna system**, which is responsible for radiating the RF signal into the surrounding area. Antennas for low-power FM applications are usually compact, omnidirectional types such as whip, dipole, or ground-plane designs, carefully tuned to the operating frequency for efficient radiation and minimal loss.

All system components are powered by a **power supply unit**, which provides stable and regulated DC voltage. Since LPFM systems often operate in environments with limited infrastructure, the power supply must be robust and may include protection circuits to guard against overvoltage or current surges.

This standard prescribes the minimum technical specifications and operational guidelines necessary to ensure that such LPFM broadcasting systems function reliably without causing harmful interference to licensed broadcast services or other spectrum users.

1.3. General

S. No.	Specification	Range/ Parameter
1.	Frequency Range	88-108 MHz
2.	Nominal Frequency Deviation	± 75 kHz (peak)
3.	Maximum Frequency Deviation	± 100 kHz (peak)
4.	Frequency setting	in 10 kHz steps
5.	Class of Emission	180KF8E
6.	Pre-emphasis	50 μ seconds (selectable)
7.	Transmission	Mono & Stereo
8.	Low-Pass Filter	>40dB attenuation
9.	MTBF(Mean Time Between Failures)	>50,000 Hours
10.	Outpower (Max)	1 W
11.	Operating temperature Range	-10°C to +60°C
12.	Total Harmonic Distortion + Noise:	≤ 1% @ 1 kHz

1.4. Inputs

S. No.	Specification	Range/Parameter
1.	Audio Input connector	XLR connector, balanced or unbalanced, or AES
2.	Input impedance (Analog)	10 KΩ or greater
3.	Input Impedance (AES/EBU)	110 Ω
4.		
5.	Analog Audio input level	Input Level adjustable

		from -6 dBu to +6 dBu
6.	AES/EBU input Level	Input Level adjustable from -15dBFS to 0dBFS
7.		
8.	Modulating Input Signal	Analog Mono, Analog Stereo (left and right)/ Embedded Stereo Signals (MPX), AES/EBU, RDS/DARC and SCA inputs. It should be capable for Mono and Stereo Broadcast using pilot tone system.
9.	Audio Input and Processing	3.5mm jack, XLR, Bluetooth, Optical input (TOSLINK /SPDIF)
10.	RF Output Impedance	50 ohms/75 Ohms
11.	RF Output Connector	BNC or N-type (small form)
12.	Pre-emphasis	50µs

1.5. RF Output

S.No.	Specification	Range/Parameter
1.	RF Output Impedance	50 ohms/75 Ohms, unbalanced
2.	RF Output Connector	BNC or N-type (small form)
3.	Permissible VSWR	1.3: 1 with full power;
4.	Harmonics and Spurious Suppression	Within limits as per Radio Regulations &

		ITU-R Rec.
5.	Overall Efficiency (AC to RF Out) for FM (Analog) Mode only	> 70 %.
6.	RF output power	≤ 1 W continuous
7.	Frequency Stability	±2000 Hz

1.6. Antenna Requirements

S. No.	Specification	Range/Parameter
1.	Output Power	1W ± 0.5dB
2.	Signal to Noise Ratio (SNR)	>70dB
3.	VSWR	1.3:1 WITH AUTOMATIC FOLDBACK
4.	Spurious Emission	50dB below carrier
5.	Harmonic Emission	>60 dB below carrier

1.7. Power Supply Requirements

S. No.	Specification	Range/Parameter
1.	Power Input	AC 220V, 50 Hz or DC 12V
2	Input voltage tolerance range	±10%

1.8. Quality Requirements

The manufacturer shall furnish the MTBF value. MTBF should meet the values specified in GR. The equipment shall be manufactured in accordance with international quality management system ISO 9001:2015 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.

1.9. Environmental Requirements

The equipment shall conform to the requirements for Environment specified in TEC QA standards TEC 14016:2010 {QM-333, Issue- March, 2010} "Standard for Environmental testing of Telecommunication Equipment" or any other equivalent international standard, for operation, transportation and storage. The applicable tests shall be for environmental category "A" and category "B2" including vibration and corrosion (salt mist).

1.10. EMI/EMC Requirements

The equipment shall conform to Electromagnetic Compatibility (EMC) requirements to ensure it does not emit or suffer from unacceptable electromagnetic interference. A test certificate and report from an NABL/ TEC accredited laboratory shall be provided. The following EMC test results shall be furnished:

S. No	Parameter	Latest Version of Applicable Standard	Test Level/ Requirement
1.	Radiated Emission Test – Broadcasting Equipment	CISPR 32:2015	
2.	Conducted Emission Test	CISPR 32:2015	
3.	Electrostatic Discharge (ESD) Immunity	IEC 61000- 4-2:2025	Contact discharge - Level 2 {± 4 kV}, or higher voltage; Performance Criteria B Air discharge - Level 3 {± 8 kV} or higher voltage; Performance Criteria B
4.	Electrostatic Fast Transient / Burst Immunity	IEC 61000- 4-4:2012	1 kV (AC/DC power lines), 0.5 kV (signal/control/data lines)
5.	Surge Immunity Test (Power Port)	IEC 61000- 4-5:2014	2kV (line to ground – power port) 1kV (line to line – power port)

6.	Radiated RF Electromagnetic Field Immunity	IEC 61000- 4- 3:2020	3 V/m (80 MHz–1 GHz); 10 V/m (800– 960 MHz & 1.4–6.0 GHz)
7.	RF Conducted Immunity (Signal/Power Ports)	IEC 61000- 4- 6:2023	3 V (150 kHz–80 MHz)
8.	Immunity to Voltage Dips and Short Interruptions (AC Mains)	IEC 61000- 4- 11:2020	30% for 500ms, 60% for 200ms, 100% for 5s/5000ms depending on class
9.	Immunity to Voltage Interruptions (DC Supply)	IEC 61000- 4- 29:2025	Immunity to voltage dips & short interruption: Voltage dip corresponding to 40% & 70% of supply for 10ms, 30 ms. Voltage dip corresponding to 40% & 70% of supply for 100ms, 300ms and 1000 ms.

1.11. Safety Requirements

In order to provide safeguard to users/service persons from risk of injury or damage, the radio transmitting equipment shall conform to Safety Requirement mentioned in IS 10437: 2019/ IEC 60215: 2016 9or the latest). The audio and other equipment shall conform to IS/IEC 62368-1:2018 (or the latest)

1.12. Security Requirements

There should be password protection for accessing the configuration ports by Bluetooth pairing authentication or logging and access control for digital interfaces.

- 1.12.1 Access to management system shall be protected with multi-level passwords.
- 1.12.2 Management system shall have a Login Protection Security on all the System Access Ports.
- 1.12.3 Tracking of old passwords per account for preventing the user to enter same password twice.
- 1.12.4 All interfaces on the provisioning side shall be secured.
- 1.12.5 Security control standard ISO/IEC 27001 should be included as it is international standard for information security management system.
- 1.12.6 Rules under DPDP-Act (Digital Personal Data Protection) shall be applicable to LPFM Transmitter.

CHAPTER-2

2.1 Information for the Procurer of Product

Purchaser may decide upon features/components most suitable and appropriate for him wherever there are options to choose from, and mention the same while purchasing.

ABBREVIATIONS

For the purpose of this document the following abbreviations apply:

AC	:Alternating Current
AGC	:Automatic Gain Control
BNC	:Bayonet Neill–Concelman (Connector)
CISPR	:Comité International Spécial des Perturbations Radioélectriques (International Special Committee on Radio Interference)
dB	:Decibel
DC	:Direct Current
ESD	:Electrostatic Discharge
EMC	:Electromagnetic Compatibility
EMI	:Electromagnetic Interference
FM	:Frequency Modulation
GR	:Generic Requirements
Hz	:Hertz
IEC	:International Electrotechnical Commission
IS	:Indian Standard
ISO	:International Organization for Standardization
kHz	:Kilohertz
LPFM	:Low Power Frequency Modulation
MTBF	:Mean Time Between Failures
PLL	:Phase-Locked Loop
RF	:Radio Frequency
SNR	:Signal-to-Noise Ratio
SPDIF	:Sony/Philips Digital Interface Format
TOSLINK	:Toshiba Link (Optical Audio Interface)
VCO	:Voltage-Controlled Oscillator
VSWR	:Voltage Standing Wave Ratio
µs	:Microseconds
V/m	:Volts per Meter
W	:Watt

===== End of the document =====