टीईसी का मानक दस्तावेज
टीईसी 57110:2025
STANDARD FOR GENERIC REQUIREMENTS
TEC 57110:2025

Low Power Small Range FM Radio Broadcast Transmitting Equipment

ISO 9001:2015

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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

Contents

HISTORY SHEET

Sl. No.	**Standard / document** *No.*	*Title*	*Remarks*
1.	Standard Number TEC 57110:2025	New Standard for Generic Requirements for a Low Power Small Range FM Radio Broadcast transmitting Equipment	

REFERENCES

[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 MHz to 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**.

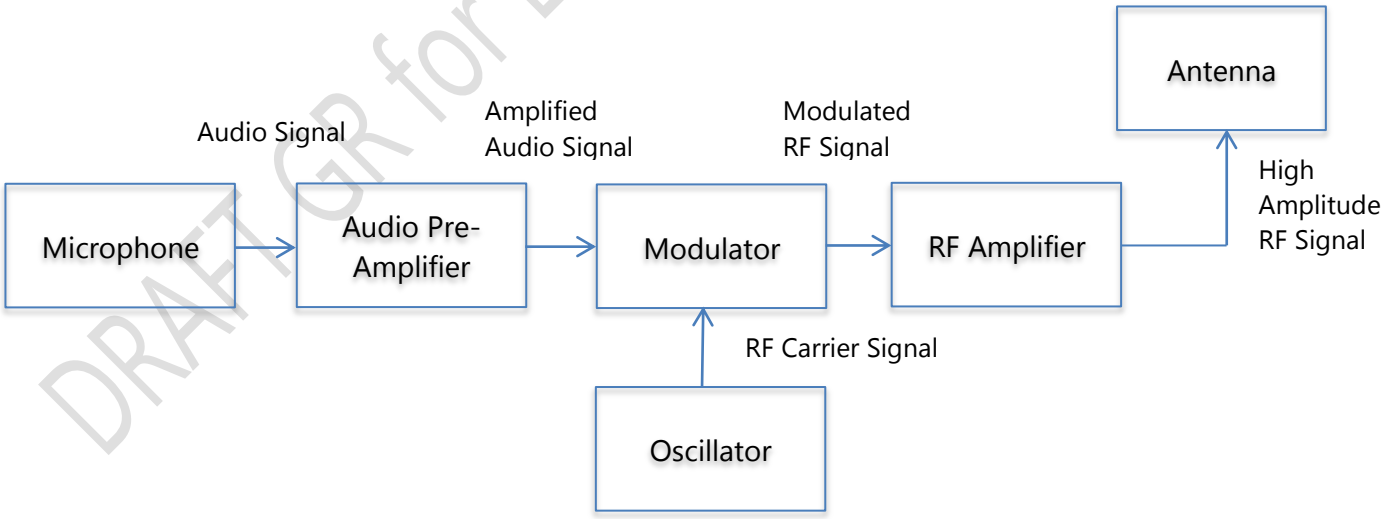
Such systems are increasingly used for applications such as community radio, rural information services, and localized communication in remote or underserved areas. LPFM transmitters are especially suited for fixed or temporary setups where conventional high-power FM broadcasting infrastructure is either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

S. No.	Specification	Range/ Parameter
1.	Low-Pass Filter	>40dB attenuation
2.	MTBF(Mean Time Between Failures)	>50,000 Hours
3.	Operating temperature Range	-10°C to +50°C
4.	Total Harmonic Distortion + Noise:	≤ 1% @ 1 kHz

1.4. Audio pre-amplifier Requirements

S. No.	Specification	Range/Parameter
1.	Audio Input and Processing	3.5mm jack, Bluetooth, Optical input (TOSLINK /SPDIF)
2.	RF Output Impedance	50 ohms
3.	RF Output Connector	BNC or N-type (small form)
4.	Pre-emphesis	50µs

1.5. Modulator Requirements

S. No.	Specification	Range/Parameter
1.	Frequency Range	88-108MHz
2.	Frequency Stability	±2000 Hz
3.	Modulation Characteristics	FM, ±75 kHz deviation

1.6. RF Amplifier Requirements

S.No.	Specification	Range/Parameter
1.	RF Output Impedance	50 ohms
2.	RF Output Connector	BNC or N-type (small form)

1.7. Antenna Requirements

S. No.	Specification	Range/Parameter
1.	Output Power	1W ± 0.5dB
2.	Signal to Noise Ratio (SNR)	>60dB
3.	VSWR	1,5:1 WITH AUTOMATIC FOLDBACK
4.	Spurious Emission	40-50dB below carrier
5.	Harmonic Emission	>60 dB below carrier

1.8. Power Supply Requirements

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

1.9. 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 9001:2000 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.

1.10. Environmental Requirements

The equipment shall conform to the requirements for Environment specified in TEC QA standards 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).

1.11. 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 accredited laboratory shall be provided. The following EMC test results shall be furnished:

S. No.	Parameter	Applicable Standard/ Test	Test Level/ Requirement
1.	Radiated Emission Test – Broadcasting Equipment	CISPR 32 (Class B)	
2.	Conducted Emission Test	CISPR 32 (Class B)	
3.	Electrostatic Discharge (ESD) Immunity	IEC 61000-4-2	±4 kV Contact Discharge, ±8 kV Air Discharge
4.	Electrostatic Fast Transient / Burst Immunity	IEC 61000-4-4	1 kV (AC/DC power lines), 0.5 kV (signal/control/data lines)
5.	Surge Immunity Test (Power Port)	IEC 61000-4-5	1.0 kV (line-ground), 0.5 kV (line-line)
6.	Radiated RF Electromagnetic Field Immunity	IEC 61000-4-3	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	3 V (150 kHz–80 MHz)

8.	Immunity to Voltage Dips and Short Interruptions (AC Mains)	IEC 61000-4-11	30% for 10ms, 60% for 100ms, 100% for 5ms/5000ms depending on class
9.	Immunity to Voltage Interruptions (DC Supply)	IEC 61000-4-29	30%/60% dips and 100% interruption for 10ms to 1s

1.12. Safety Requirements

The equipment shall conform to IS 13252 {2003} "Safety of information technology equipment including electrical business equipment" [equivalent to IEC publication 60950 {2001}] and IS 10437 {1986} "Safety requirements of radio transmitting equipment" [equivalent to IEC 60215].

1.13. Security Requirements

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

CHAPTER-2

2.1 Information for the procurer of product

ABBREVIATIONS

For the purpose of this document the following abbreviations apply:

Abbreviation	Full Form
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

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Annexure

Template for submitting Comments or Feedback

[Comments on each section/sub section/table/figure etc. of the draft TEC 57110:2025, be stated in a fresh row. Information/comments should include reasons for comments and suggestions for modified wordings of the clause]

Name of Commentator/Organization …….

S. No.	Section of the Draft Standard	Clause/Para/Table/ Figure No. of draft Standard	Comments/ Suggested modified Wordings	Justification for proposed Change
1.				
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Note- a) Kindly insert more rows as necessary for each clause/table, etc.
b) Comments may be sent in electronic form to jto-cb@gov.in, with a copy to dircb2.tec-dot@gov.in. & ddgcb.tec@gov.in , by 02-09-2025 .

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