Annexure-A

टीईसी का मानक दस्तावेज
टीईसी 57100:2025
STANDARD FOR GENERIC REQUIREMENTS
TEC 57100:2025

डिजिटल रेडियो मोंडियाल (DRM)प्रसारण प्रणाली के लिए मानक

GENERIC REQUIREMENTS FOR DIGITAL RADIO MONDIALE (DRM) BROADCAST SYSTEM

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 Centres (RTECs) have been established which are located at New Delhi, Bangalore, Mumbai, and Kolkata.

ABSTRACT

This Standard for Generic Requirements (GR) document defines the technical and functional specifications of a Digital Radio Transmission (DRT) system based on Digital Radio Mondiale (DRM) technology. It is intended to serve as a common standard for digital radio broadcasting infrastructure and receivers in India. The Standard for GR supports operation in LF, MF, HF, and VHF bands, ensuring compatibility with both legacy analogue systems and modern digital infrastructure. The document outlines mandatory features, system architecture, audio and data transmission specifications, environmental requirements, and emergency functionality essential for a nationwide roll-out. This specification facilitates interoperability, promotes open standards, and helps enable free-to-air, high-quality, resilient radio

services across the country.

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HISTORY SHEET

Sl.No.	**Standard / document *No.***	***Title***	***Remarks***
1.	Standard Number TEC 57100:2025	DIGITAL RADIO MONDIALE (DRM) BROADCAST SYSTEM	New Standard For GR

REFERENCES

[1] https://www.drm.org/about-drm/minimum-receiver-requirements/

[2] https://drm.org/wp-content/uploads/2024/03/DRM-Handbook-v5.1.pdf

[3] https://www.transmitter.be/con-418g.html?

https://www.transmitter.be/tho-tsw2250d.html?

CHAPTER-1

1.1 Introduction

The Digital Radio Mondiale (DRM) broadcasting system has been developed with the collaboration of broadcasters, transmitter and receiver manufacturers, and regulatory bodies. It is specifically designed as a high-quality digital replacement for analogue radio broadcasting in the AM and FM/VHF bands, using the same channelling and spectrum allocations currently in use.

DRM defines various operating modes optimized for specific frequency ranges:

- Below 30 MHz, DRM offers four robustness modes tailored for the diverse propagation characteristics of the AM broadcast bands, enabling regional to international coverage.
- Above 30 MHz, a dedicated robustness mode is optimized for VHF bands, particularly the FM band, suitable for local to regional coverage.

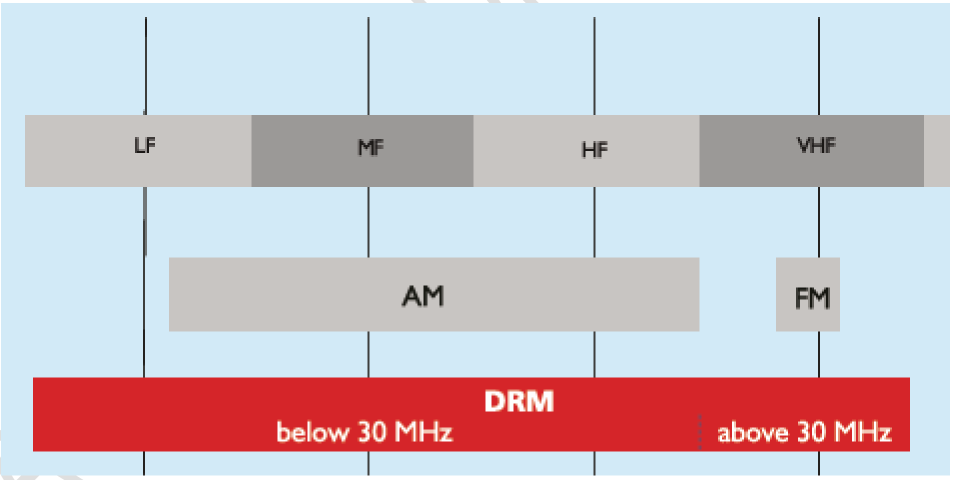

Figure: Frequency Band Overview [2]

The system supports identical service layer features across all frequency ranges, regardless of the operating mode. It is an open standard published by ETSI, with international regulatory support through ITU recommendations. This openness allows manufacturers equitable access to specifications, supporting timely market introduction and reducing equipment costs.

The adoption of DRM brings significant improvements in service reliability, audio quality, and usability over analogue systems. It offers broadcasters the flexibility to dynamically adjust audio quality, signal robustness, and coverage according to local requirements, without disrupting the audience. The system also supports seamless migration from analogue to digital through coexistence and modification of existing analogue transmitters.

DRM delivers enhanced listener experiences with features such as:

- Stereo and surround sound,
- Data services like text, images,
- Electronic programme guides and automatic tuning,
- Multilingual support, and
- Emergency warning alerts.

The system enables efficient spectrum use, lower power consumption, and increased revenue opportunities, making it a viable and sustainable choice for digital radio broadcasting. [2]

1.2 Description

For transmissions below 30 MHz, DRM uses the existing AM broadcast frequency bands and is designed to fit in with the existing AM broadcast band plans, based on signals of 9 kHz or 10 kHz bandwidth. It also has support for half-channels requiring only 4.5 kHz or 5 kHz bandwidth, and double-channels that can take advantage of wider bandwidths, 18 kHz or 20 kHz. A set of robustness modes allow the signal to be tailored to varying propagation conditions.

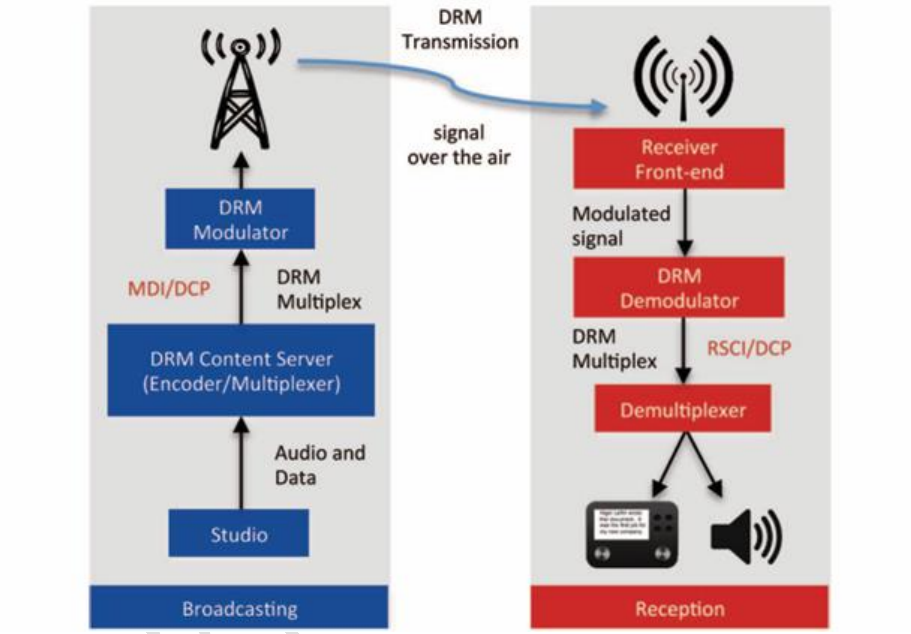

Figure: Simple DRM Broadcast chain [2]

For transmissions above 30 MHz, DRM uses robustness Mode E. It has a fixed bandwidth of 96 kHz (i.e. half the bandwidth of an analogue FM service) and is designed to fit in the FM broadcast band plan with a frequency grid of 100 kHz. Its small spectrum needs support its use in crowded bands, even if available space would not permit additional analogue FM services. DRM provides bit rates from 37 kbps to 186 kbps and, like in the AM bands, permits up to three audios plus data services. It is therefore a flexible solution allowing single or small numbers of audio services to be broadcast together, enabling efficient spectrum use.

The DRM system uses COFDM (Coded Orthogonal Frequency Division Multiplex). This means that all the data, produced from the digitally encoded audio and associated data signals, is shared out for transmission across a large number of closely spaced carriers.

All of these carriers are contained within the allotted transmission channel. Time interleaving is applied in order to mitigate against fading. Various parameters of the OFDM and coding can be varied to allow DRM to operate successfully in many different propagation environments–the selection of the parameters allows transmissions to be planned that find the best combination of transmit power, robustness and data capacity.

The DRM system uses the MPEG xHE-AAC audio codec, and–for legacy support–AAC with SBR and PS (HE-AACv2), providing high audio quality at very low data rates.
From a broadcaster's perspective,
DRM provides support for:

- Broadcasting in all frequency bands used for radio services (LF/MF/HF and VHF Bands I, II, III);
- Migration from, and co-existence with, analogue broadcasting: complies with existing spectrum masks and analogue frequency grids;
- Up to three audio services per transmission, along with multimedia data as stand-alone data services or as the PAD (programme associated data) of an audio service;
- Single-frequency and multi-frequency networks, plus associated signalling and automated receiver tuning;
- Text messaging, advanced text information, Slideshow, SPI and a wide range of similar value-added services.

The DRM broadcast chain includes a Content Server and Modulator, which communicate via a Multiplex Distribution Interface (MDI) using a standardised Distribution and Communications Protocol (DCP). The Content Server performs content encoding and multiplexing for audio and data streams, while also generating metadata in the Fast Access Channel (FAC) and Service Description Channel (SDC).

The modulation process includes energy dispersal, channel encoding, cell interleaving, pilot generation, and OFDM cell mapping. The final signal can be output as RF-modulated waveform, I/Q signals, or A-RFP format for amplification.
The FAC provides essential channel and service parameters for fast scanning and demodulation. The SDC contains information on how to decode the Main Service Channel (MSC), including audio/data parameters, time/date, language, reconfigurations, and alternative frequencies.

The system supports multiple services per transmission, with capacity for three audio services and additional data. Each service is defined via labels in the SDC and references

MSC streams accordingly. Bit rates vary with robustness level and bandwidth.

DRM allows both Single Frequency Networks (SFNs) and Multi-Frequency Networks (MFNs). In SFNs, multiple transmitters transmit identical DRM signals on the same frequency with overlapping coverage. MFNs use different frequencies with synchronised services and AFS for switching.

Simulcast capability enables broadcasters to transmit both analogue and DRM services from the same transmitter, particularly useful for LF/MF bands. For DRM above 30 MHz, simulcast with FM services is supported.

Alternative Frequency Signalling (AFS) allows receivers to switch between frequencies or between DRM and analogue/FM/DAB services. AFS can be seamless (requiring synchronisation) or generic (for asynchronous switching). [2]

1.3 DRM Network Topology – Overview and Working

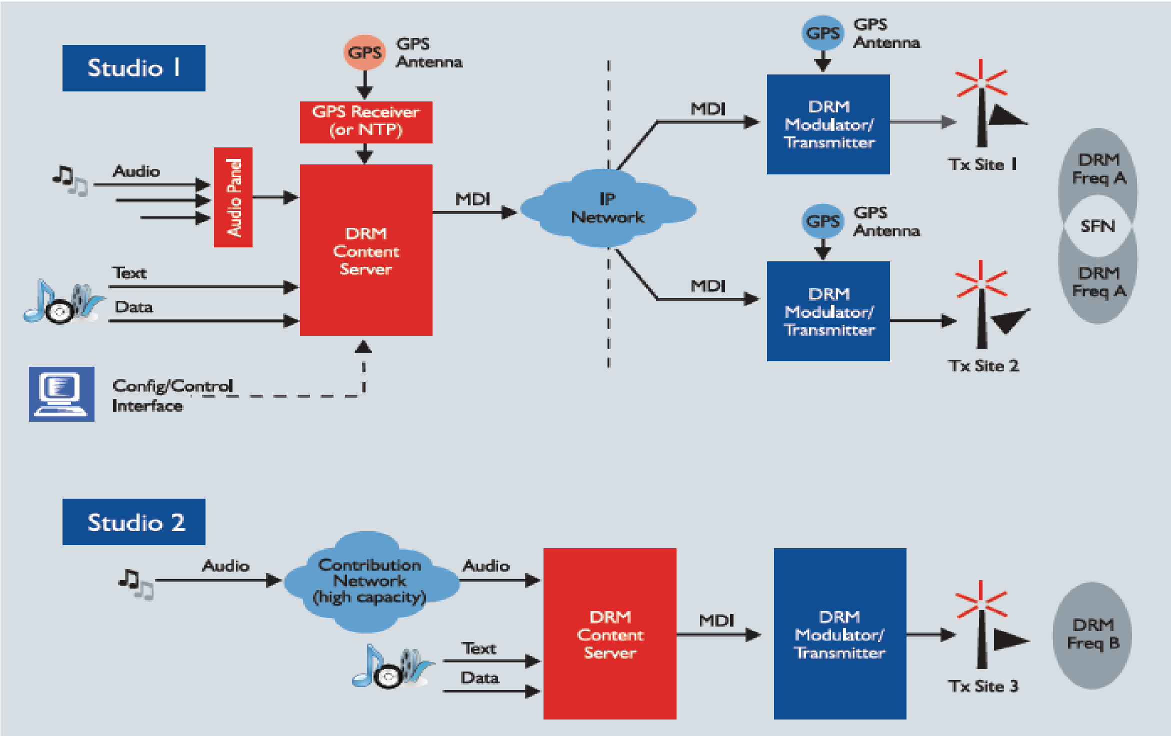

Figure : Typical DRM local/regional/national broadcast network topology [2]

The DRM Multiplex Distribution Interface (MDI) is the key format used to transfer encoded DRM multiplex information from the DRM Content Server at the studio to the DRM Modulator at transmitter sites. This stream includes:

- The DRM Multiplex (MSC, FAC, SDC),
- Configuration data like robustness mode and timestamps for SFN synchronization,
- Optional proprietary data.

Data is transferred asynchronously in packets over a variety of transport mechanisms such as UDP/IP, serial lines, satellite, WAN/LAN, or ISDN. Because DRM multiplexing is based on a fixed frame length (100ms or 400ms), both content servers and modulators must use a synchronization source like GPS or NTP to maintain long-term timing accuracy.

Placing encoders and multiplexers at the studio allows direct encoding using efficient MPEG coding, avoiding quality loss from transcoding. The MDI stream bandwidth is around 27 kbps for HF and 35 kbps for MF transmissions. A 64-kbps link is sufficient for most DRM configurations below 30 MHz, and a 128-kbps link may suffice for VHF DRM services.

This architecture supports sending the same MDI stream to multiple DRM modulators, enabling Single Frequency Networks (SFN), where all transmitters broadcast the same content using the same DRM configuration. This allows cost-effective, high-quality, and synchronized broadcasts using just one DRM Content Server.

For broadcasters not using DRM’s value-added services, placing the content server at the transmitter site is possible, though it's preferable to maintain high bit rate distribution to avoid audio quality loss due to tandem coding. [2]

1.4 Functional/Operational Requirements

1.4.1 Frequency Band Support

The receiver shall be capable of operating in at least one of the frequency categories specified in Table 2 below. It is recommended that the receiver support all listed frequency bands.

Receiver Category	Frequency Range	Lowest centre frequency	Frequency Step	Number of Channels
LF	148.5 - 283.5 kHz	153 kHz	9 kHz	14
MF	526.5 - 1606.5 kHz 525 - 1715 kHz	531kHz 530 kHz	9 kHz 10 kHz	119 118
HF 1	2.3 - 6.2 MHz	2.305 MHz	5 kHz	779
HF 2	6.2 - 27 MHz	6.205 MHz	5 kHz	4159
Band I	47 - 68 MHz	47.05 MHz	100 kHz	209
Band II	76 - 108 MHz	76.05 MHz	50 kHz	639
Band III	174 - 240 MHz	174.05 MHz	100 kHz	659
NOTE: Some receivers may restrict tuning in band II to 87.5 to 108 MHz.				

Table2: Frequency bands [1]

The receiver shall support frequency scanning across the supported bands and present available DRM services for user selection.

1.4.2 Audio Decoder

The receiver shall support:

1. xHE-AAC and AAC audio decoding, including stereo, mono, and parametric stereo.

2. SBR (Spectral Band Replication) as part of xHE-AAC.
3. All sampling rates and bit rates up to 71.96 kbps (below 30 MHz) and up to 186.23 kbps (above 30 MHz).
4. Error concealment mechanisms to avoid unpleasant sounds during decoding failures.
5. Proper downmixing of surround content to stereo or mono as applicable.

1.4.3 Channel Decoder and Demodulator

The receiver shall conform to DRM system specifications and support:

1. Below 30 MHz: Robustness modes A-D, 4-QAM/16-QAM for SDC, 16-QAM/64-QAM for MSC, all protection levels, EEP/UEP, both interleaver depths, and spectrum occupancies 0-5.
2. Above 30 MHz: Robustness mode E, 4-QAM (SDC), 4-QAM/16-QAM (MSC), all MSC protection levels, and relevant data rates.

1.4.4 Service Selection

Receivers shall:

1. Decode FAC and SDC entities (0, 1, 5, and 9) to facilitate user service selection.
2. Present available audio/data services appropriately.
3. Hide or mark CA-restricted services as inaccessible if not supported.

1.4.5 Reconfiguration Handling

Receivers shall handle both service and channel reconfigurations with minimal interruption to audio. The FAC reconfiguration index shall be evaluated to time the transition correctly.

1.4.6 Optional Feature Handling

Receivers shall:

1. Respond deterministically to all control data states.

2. Maintain correct function regardless of optional feature usage.

1.4.7 Backwards Compatibility

Receivers shall:

1. Ignore bits marked as "reserved for addition."
2. Appropriately ignore parameters controlled by "reserved for future use" (if non-zero).
3. Reject enhancement-layer transmissions if unsupported.

1.4.8 Service Following

Receivers shall:

1. Decode SDC types 3 and 11 to support switching between alternate frequencies of the same DRM service.
2. Automatically switch without user intervention where applicable.

1.4.9 Analogue Reception

1. Receivers below 30 MHz shall support analogue AM reception.
2. Receivers above 30 MHz shall support analogue FM reception.
3. Support for AMSS and RDS is recommended but not mandatory.

1.4.10 Conditional Access (CA) Handling

Receivers without CA support shall:

1. Omit or mark inaccessible fully scrambled services.
2. Present accessible components of partially scrambled services.
3. Mute audio and indicate encryption upon transition from unscrambled to scrambled.

1.4.11 Time-to-Audio

Receivers shall:

1. Provide visual/audible feedback during signal acquisition.

2. Meet the time-to-audio thresholds under Gaussian channel conditions as shown below:

Frequency Range	Mode	Max Time-to-Audio
MF (9 kHz, Mode A)	64-QAM	< 4 sec
HF (10 kHz, Mode B)	64-QAM	< 5 sec
VHF (100 kHz, Mode E)	16-QAM	< 2 sec

Table : Required time-to-audio [1]

1.4.12 Signal Integrity Indication

For portable/external antenna receivers:

1. Signal quality shall be displayed using SNR, BER, field strength, or similar metrics to aid in optimal positioning.

1.4.13 Online Monitoring Service

1. The transmitted DRM signal can be decoded locally by a DRM software receiver, providing the same audio quality and multimedia experience as any compliant DRM radio upon reception.
2. DRM Consortium members have access to an online DRM monitoring service, allowing live access to many DRM transmissions worldwide via any HTML5-compliant web browser.

1.4.14 Transmitter Monitoring

1. DRM transmitter monitoring requires a different approach than analogue broadcasting monitoring.
2. Observation of the DRM RF envelope or spectrum on typical equipment provides limited useful information.
3. A software receiver using an analogue front-end and PC decoder can be used as a simple, effective monitoring solution.
4. The decoder system can be portable for field maintenance or included in a station

monitoring system.

5. Some DRM exciters have built-in test receivers for output signal supervision.

1.4.15 Characterising Transmitter Performance

1. Transmitter Voltage & Power Supply
   i. Power Source: 440 VAC, 50 Hz, 3-phase. [3]
2. Radiated Power & Efficiency
   i. RF Output Power : 50-160 kW RMS.
   ii. Overall Efficiency: 70-74%.[3]
3. Noise Levels & Emissions
   i. Carrier Noise: -56 dB. [3]
4. The Modulation Error Ratio (MER) is a key parameter to characterise DRM transmitter performance alongside the out-of-band (OOB) power spectrum mask compliance.
5. The DRM signal consists of multiple discrete, equally spaced carriers, each modulated in amplitude and phase.
6. MER is the ratio between the ideal transmitted carrier vector and the error vector caused by modulation, phase noise, and transmitter imperfections, expressed in dB.
7. High MER values indicate low error and easier decoding at the receiver.
8. For DRM transmitters operating below 30 MHz, an MER ≥ 30 dB is expected; above 30 MHz, an MER ≥ 21 dB is expected.
9. MER is measured at nominal transmitter power and must comply with OOB emissions limits.
10. DRM signals have a peak-to-mean ratio approximately 4 dB higher than 100% AM modulation, reducing effective power.
11. Clipping the DRM signal peak envelope can increase power but at the cost of

decreased MER.

1.4.16 Reception Monitoring

1. Quality assurance of radio transmissions involves monitoring received signals in the target coverage area.
2. Traditional analogue monitoring involves signal strength measurement and subjective audio quality assessment.
3. Modern methods use unmanned, remotely controlled or scheduled receivers that record signal parameters including MER and audio bit error rate.
4. Continuous reception monitoring data improves understanding of propagation channels.
5. Data can be stored locally and downloaded or accessed in near real-time, enabling fully automated monitoring.
6. DRM specifies a control interface (RSCI, ETSI TS 102 349) to standardise control and data retrieval from monitoring receivers.
7. This allows multi-vendor monitoring equipment interoperability and shared use among operators or broadcasters.
8. Example implementations include the BBC MF monitoring system and the Hungarian Communications Authority's DRM monitoring station.
9. The Hungarian station logs hourly DRM transmission quality parameters and provides online access to audio and measurement data.

1.5 Standard for Interface Requirements for a Product/Equipment

1.5.1 RF Input

i. An internationally recognised antenna connector should be used.

1.5.2 Data Interface

1. For DRM receivers with a data interface, the recommended protocol is the

Receiver Status & Control Interface (RSCI), based on Distribution & Communication Protocol (DCP).

i. RSCI provides:

   a. Full received digital DRM Multiplex information (FAC, SDC, MSC).

   b. Reception statistics data after the channel decoder/demodulator to external decoder/monitoring/visualisation units.

ii. Optional control commands can be accepted via RSCI (e.g., remote frequency tuning).

iii. DRM Multiplex output may also use the Multiplex Distribution Interface (MDI over DCP), a subset of RSCI.

iv. The receiver may also accept digital DRM Multiplex input via MDI or RSCI to bypass HF and demodulation stages.

v. A combination of MDI/RSCI input and output can enable:

   a. External conditional access decoding.

   b. Temporary storage for delayed playback (including all data services and DRM signalling).

   c. Recording/playback of DRM transmissions and MDI/RSCI streams (e.g., for demonstration purposes).

1.5.3 Antenna Systems

1. HF and FM analogue broadcasting antennas are generally suitable for DRM services in the same band.

2. LF and MF Bands:

   i. The key requirement is adequate bandwidth, defined by transmitter return-loss.

ii. Critical for:

a. 18 or 20 kHz DRM signal radiation.

b. Simulcast operation (9/10 kHz DSB & DRM signals on adjacent channels).

iii. Existing antennas may not be usable without economic modifications.

3. Bandwidth Restrictions:

i. Can distort amplitude/phase of outer carriers (DRM can correct this).

ii. May impact transmitter OOB power (increase or attenuate).

iii. Excessive reflected power can trigger power cutback or shutdown.

iv. Antenna characteristics must be considered during pre-correction.

1.5.4 MF Antennas

1. Typically tuned to the service frequency.

2. Used for ground-wave and/or sky-wave propagation.

3. Key characteristics:

i. Present resistive load at service frequency.

ii. Complex impedance away from centre frequency.

iii. Recommended symmetrical impedance around centre frequency.

a. Imaginary component should change sign symmetrically.

4. VSWR Recommendation:

i. 1.05:1 at ±5 kHz from centre.

ii. 1.1:1 at ±10 kHz from centre.

5. Wider bandwidth may be needed for DRM 18/20 kHz signals.

6. Antenna “Q” factor affects bandwidth:

   i. Low Q (e.g., “cigar” shaped mast) → Wide bandwidth.
   ii. High Q (“thin” mast) → Narrow bandwidth.
7. Multi-mast configurations (e.g., Yagi arrays) may require tuning for wider bandwidth.

1.5.5 LF Antennas

1. Example: 220-metre base-fed mast.
   i. Mostly capacitive with 5-10 Ohms resistance.
2. Non-resonant antennas:
   i. May reduce bandwidth (not discussed here).
3. Smith Chart Analysis:
   i. Used to measure impedance before/after ATU (matching unit).
   ii. Broadband ATU optimises impedance response for DRM.

1.5.6 Matching and Combining Networks

1. Matching/feeder system should be:
   i. An integer-multiple of quarter wavelengths at channel centre frequency.
2. If not:
   i. Add phase shift/rotation networks to restore symmetry and improve bandwidth.
3. Networks with rejection filters/combiners may restrict bandwidth.
4. Solutions for restricted bandwidth are discussed in the next section.

1.5.7 Implementing DRM on Existing Antenna Systems

1. HF and FM: Usually no modifications needed.

2. LF and MF:

    i. Measure antenna impedance using Network Analyser.

    ii. Smith Chart helps determine necessary phase rotation.

        a. Apply through phase shift network or modify existing circuit.

    iii. If VSWR is suboptimal:

        a. Measure total system response (antenna + transmitter).

        b. Apply pre-correction at DRM Modulator.

    iv. Better solution:

        a. Redesign antenna system with supplier support for wider bandwidth.

1.6 Quality Requirements

1.6.1 Transmission Modes: DRM transmitters must support all applicable robustness modes (Modes A, B, and E), appropriate for the operating frequency bands and expected propagation conditions.

1.6.2 Modulation and Protection Levels: The system shall support modulation schemes such as 16-QAM and 64-QAM, along with variable protection levels (0 to 3). The selection must consider channel bandwidth and desired data rate versus robustness trade-offs.

1.6.3 Error Performance:

1. For MF band (e.g., Modes A/0, A/1, A/2), minimum usable field strength shall be maintained to achieve a Bit Error Rate (BER) of 1×10^{-4} at the receiver.
2. For HF band (e.g., Mode B/1 and B/3), transmitters shall ensure appropriate error protection is applied. Use of 64-QAM with protection levels 2 and 3 is not recommended due to bit error floors at high SNR.

1.6.4 Power Control and Protection Ratios:

1. The transmitted signal shall not introduce greater interference to adjacent AM services than the legacy AM signal it replaces.
2. RF protection ratios as specified in ITU-R BS.1615 and EBU Tech 3330 shall be adhered to.
3. Transmitter output power may require reduction based on differential protection ratio values between AM and DRM emissions as per Recommendation ITU-R BS.560 and Resolution 543 (WRC-03).

1.6.5 Synchronization:

1. DRM transmitters must support Single Frequency Network (SFN) operation with echo delay tolerance up to 75 km, corresponding to a guard interval of 0.25 ms in OFDM transmission.

1.6.6 Receiver Sensitivity:

1. Receivers must maintain reception at minimum usable field strengths as defined for various modes and protection levels, ensuring reliable decoding at a BER of 1×10^{-4}.
2. Receiver sensitivity shall be validated for typical operating environments–urban, suburban, and rural.
3. Sensitivity values for different broadcasting bands.

Min. requirement	**LF**	**MF**	**HF 1**	**HF 2**
Field strength (TEM cell measurement)	58 dBµV/m	52 dBµV/m	44 dBµV/m	40 dBµV/m
Voltage at signal generator output (Portable receiver network)	80 dBµV	74 dBµV	66 dBµV	62 dBµV
Voltage at signal generator output (Portable receiver high level network))	49 dBµV	43 dBµV	35 dBµV	31 dBµV
Voltage at signal generator output (Car receiver network or without network)	8 dBµV	8 dBµV	8 dBµV	8 dBµV

Table: Sensitivity values

1.6.7 Robust Reception Support:

1. Must support reception across defined robustness modes (e.g., Mode B for HF, Mode E for VHF).

2. Shall operate under high time- and frequency-selective fading conditions without substantial loss of service continuity.

1.6.8 Reception Scenarios:

1. Receivers should be operable in all DRM-supported reception modes:
   i. Fixed (FX)
   ii. Portable Outdoor (PO)
   iii. Portable Indoor (PI)
   iv. Portable Outdoor Handheld (PO-H)
   v. Portable Indoor Handheld (PI-H)
   vi. Mobile (MO)
2. Interoperability Testing:
   DRM receivers and transmitters from different vendors must demonstrate compatibility during testing. TEC-approved labs shall conduct functional interoperability tests as part of MTCTE certification.

1.6.9 Reception Quality Factors:

1. Receiver quality must account for antenna performance, selectivity, overload behaviour, and man-made noise rejection.
2. For indoor handheld devices, building penetration loss and signal variability must be compensated using appropriate correction factors.

1.6.10 Field Strength Planning:

1. Receiver design should ensure compliance with planning requirements using correction factors such as:
   i. Antenna gain
   ii. Building penetration loss
   iii. Location variability
   iv. Implementation loss
   v. Polarization discrimination

1.7 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

1.8 Safety Requirements

The equipment shall conform to:

i. IS 10437: 2019 “Safety Requirements for Radio Transmitting Equipment”

OR

ii. IEC 60215: 2016 “Safety requirements for radio transmitting equipment”.

1.9 Security Requirements

1.9.1 The DRM system shall support Alternative Frequency Signalling (AFS) through the Service Description Channel (SDC) to enable receivers to switch between frequencies broadcasting the same service, ensuring reception continuity under varying propagation conditions. The receiver shall decode SDC data entities type 3 and 11 to execute this switching without requiring user intervention.

1.9.2 For improved switching performance across broadcast systems (e.g., AM with AMSS, FM with RDS, DAB), the receiver is recommended to support decoding of SDC data entities.

1.9.3 DRM receivers shall implement Conditional Access (CA) control, ensuring secure access to scrambled service components. If a receiver lacks the required CA capability, it shall:

1. Prevent selection of fully scrambled services, or
2. Clearly indicate their scrambled and inaccessible status.
3. Still present non-scrambled components of partially scrambled services.

1.9.4 During service reconfiguration, if a selected service transitions from unscrambled to scrambled, the receiver shall mute the audio and notify the user appropriately.

1.9.5 DRM receivers supporting Emergency Warning Functionality (EWF) shall comply with the "Considerations for receiver implementations" outlined in the DRM EWF documentation. Upon reception of an alarm announcement, such receivers shall automatically:

1. Switch to the designated emergency programme using AFS.
2. Present both audio and multilingual advanced text instructions, including support for non-native language speakers and the hearing impaired.

1.9.6 DRM EWF-capable receivers shall support instant switch-on from standby mode, at minimum when:

1. Connected to AC power with optional battery backup, or
2. While a car ignition system is active.

1.10 Various requirements of the category/configuration of the product for testing // Other Requirements

1.10.1 Channel Decoder and Demodulator Requirements

DRM receivers under test shall support the channel decoding and demodulation functionalities as per the system requirements.

1. For Receivers Operating Below 30 MHz:

   i. Robustness Modes: A, B, C, and D.

   ii. Signal Constellations:

      a. SDC: 4-QAM, 16-QAM

      b. MSC: 16-QAM, 64-QAM

   iii. Protection Levels:

      a. 64-QAM: Levels 0, 1, 2, 3

      b. 16-QAM: Levels 0, 1

   iv. Error Protection Support:

      a. Equal Error Protection (EEP) and Unequal Error Protection (UEP) with all allowed partitioning of data lengths for MSC parts A and B.

   v. Interleaver Depths: Long and short.

vi. Spectrum Occupancies: All defined (0 to 5), covering bandwidths of 4.5 kHz, 5 kHz, 9 kHz, 10 kHz, 18 kHz, and 20 kHz.

vii. Transmission Data Rates: All rates up to 92.77 kbps (before channel decoding).

2. For Receivers Operating Above 30 MHz:

   i. Robustness Mode: E.

   ii. Signal Constellations:

      a. SDC: 4-QAM (code rates 0.25 and 0.5)

      b. MSC: 4-QAM, 16-QAM

   iii. MSC Protection Levels: 0, 1, 2, 3.

   iv. Error Protection Support: EEP and UEP with all allowed partitioning for MSC parts A and B.

   v. Transmission Data Rates: All rates up to 298.4 kbps (before channel decoding).

1.10.2 Receiver Reaction to Multiplex Reconfiguration

Receivers shall correctly handle:

1. Service Reconfiguration: Changes in MSC data capacity between services.
2. Channel Reconfiguration: Changes in FAC parameters (spectrum occupancy, interleaver depth, MSC mode, robustness mode).
3. The receiver shall:

   i. Use FAC reconfiguration index to evaluate timing.

   ii. Maintain audio with minimal interruption.

   iii. Utilize SDC entities (types 0, 9, 10) for optimized performance.

1.10.3 Backwards Compatibility

1. Receivers shall ignore bits marked “reserved for addition” and check “reserved for future use” (RFU) bits explicitly.

2. If RFU bits deviate from expected values, associated parameters shall be ignored to maintain system compatibility.

3. Receivers not supporting the “Enhancement Layer” flag must disregard related DRM transmissions.

1.10.4 Time-to-Audio Performance

1. The receiver shall:

    i. Indicate ongoing DRM signal acquisition.

    ii. Meet the specified time-to-audio limits under Gaussian channel conditions with good signals.

    iii. Ensure timely and clean audio output upon successful signal detection.

    iv. Provide user feedback (visual or audible) during signal acquisition.

1.10.5 Accessibility Requirements

Though not mandatory for testing, it is recommended that receivers incorporate features to support disabled users, such as:

1. Tactile buttons, acoustic menu navigation, scroll indicators, and captioned radio.

2. Manuals in accessible electronic formats.

CHAPTER-2

2.1 Information for the procurer of product

Procurer may specify the frequency band(s) for equipment.

ABBREVIATIONS

AAC	Advanced Audio Coding
AC	Alternating Current
AFS	Alternative Frequency Signalling
AM	Amplitude Modulation
AMSS	Amplitude Modulation Signalling System
ATU	Antenna Tuning Unit
BER	Bit Error Rate
CA	Conditional Access
COFDM	Coded Orthogonal Frequency Division Multiplexing
DAB	Digital Audio Broadcasting
DCP	Distribution and Communication Protocol
DRM	Digital Radio Mondiale
EEP	Equal Error Protection
ETSI	European Telecommunications Standards Institute
EWF	Emergency Warning Functionality
FAC	Fast Access Channel
FM	Frequency Modulation
FX	Fixed Reception
GPS	Global Positioning System
HE-AACv2	High-Efficiency Advanced Audio Coding version 2
HF	High Frequency
I/Q	In-phase and Quadrature
ISDN	Integrated Services Digital Network
kbps	Kilobits per second
LF	Low Frequency
MDI	Multiplex Distribution Interface
MER	Modulation Error Ratio
MF	Medium Frequency
MFN	Multi Frequency Network
MO	Mobile
MSC	Main Service Channel
NTP	Network Time Protocol
OFDM	Orthogonal Frequency Division Multiplexing
PAD	Programme Associated Data
PI	Portable Indoor
PI-H	Portable Indoor Handheld
PO	Portable Outdoor
PO-H	Portable Outdoor Handheld
PS	Parametric Stereo
Q (factor)	Quality Factor (of antenna)
QAM	Quadrature Amplitude Modulation
RDS	Radio Data System
RF	Radio Frequency
RFU	Reserved for Future Use

RSCI	Receiver Status and Control Interface
SBR	Spectral Band Replication
SDC	Service Description Channel
SFN	Single Frequency Network
SNR	Signal-to-Noise Ratio
SPI	Service and Programme Information
UDP/IP	User Datagram Protocol / Internet Protocol
UEP	Unequal Error Protection
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio
WAN/LAN	Wide Area Network / Local Area Network
xHE-AAC	Extended High Efficiency Advanced Audio Coding

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Annexure

Template for submitting Comments or Feedback

[Comments on each section/sub section/table/figure etc. of the draft TEC 57100:2025, 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 01-09-2025 .

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