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Radio broadcasting systems; Very High Frequency (VHF), frequency modulated, sound broadcasting transmitters

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Very High Frequency (VHF), frequency modulated,
sound broadcasting transmitters**

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Foreword

This European Telecommunication Standard (ETS) has been produced under the authority of the Joint Technical Committee (JTC) of the European Broadcasting Union (EBU) and the European Telecommunications Standards Institute (ETSI).

This ETS defines the performance characteristics of Very High Frequency (VHF), frequency modulated, monophonic and stereophonic sound broadcasting transmitters operating in the frequency band 87,5 MHz to 108 MHz.

NOTE: The EBU/ETSI JTC was established in 1990 to co-ordinate the drafting of ETSs in the specific fields of radio, television and data broadcasting. The EBU is a professional association of broadcasting organizations whose work includes co-ordination of its Members activities in the technical, legal, programme-making and programme-exchange domains. The EBU has active members in about 60 countries in the European broadcasting area; its headquarters is in Geneva,

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1 Scope

This European Telecommunication Standard (ETS) covers those performance requirements for Very High Frequency (VHF) Frequency Modulation (FM) sound broadcasting transmitters operating in the frequency band 87,5 MHz to 108 MHz, and modulated in accordance with CCIR Recommendation 450-1 [1], which has some bearing on the Radio Frequency (RF) spectrum. Monophonic signals are transmitted in accordance with section 1, and stereophonic signals in accordance with section 2.2 (pilot tone system) of CCIR Recommendation 450-1 [1]. This ETS also covers the transmission of supplementary signals as described in CCIR Recommendation 450-1 [1] and/or EN 50067 [2].

This ETS considers only those technical characteristics that relate to the radiated signal and hence directly affect the efficient use of RF spectrum.

The use of CCIR Recommendation 412-5 [3] for planning sound broadcasting services is assumed.

Spurious and out-of-band emission limits specified in figures 1 and 3 respectively are incorporated to protect both aeronautical navigation and communication services operating in the frequency band 108 MHz to 137 MHz and rebroadcast reception in the frequency band 87,5 MHz to 108 MHz.

In those areas where reliance on a transmitter specification alone cannot guarantee protection of the RF spectrum (e.g. reverse intermodulation), recommendations appropriate to installed systems are described in ETSI Technical Report (ETR) 132 [8].

Electro Magnetic Compatibility (EMC) aspects for equipment covered by this ETS are given in ETS 300 447 (see annex E, bibliography).

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

- | | |
|-----|---|
| [1] | CCIR Recommendation 450-1 (1982): "Transmission standards for FM sound broadcasting at VHF". |
| [2] | EN 50067: "Specification of the Radio Data System (RDS)". |
| [3] | CCIR Recommendation 412-5 (1990): "Planning standards for FM sound broadcasting at VHF". |
| [4] | IEC 244-1: "General conditions of measurements, frequency, output power". |
| [5] | IEC 244-2: "Bandwidth, out of band power and power of non-essential oscillations". |
| [6] | EN 60244-13: "Methods of measurements for radio transmitters, Performance characteristics for FM sound broadcasting". |
| [7] | CCIR Recommendation 468-4 (1986): "Measurement of audio frequency noise voltage levels in sound broadcasting". |
| [8] | ETR 132: "Code of practice for site engineering of VHF, frequency modulated, sound broadcasting transmitters". |

3 Definitions and abbreviation

3.1 Definitions

For the purposes of this ETS the following definitions apply:

out-of-band emissions: Emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions.

spurious emissions: Emission on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out of band emissions.

unwanted emissions: Consist of spurious emissions and out of band emissions.

signal L: Signal L corresponds to the information in the left channel.

signal R: Signal R corresponds to the information in the right channel.

sum signal M: $M=(L+R)/2$; this information is also the signal for the monophonic receiver.

difference signal S: $S=(L-R)/2$; this information allows the stereo-receiver to regain signals L and R in conjunction with the M signal.

Multiplex (MPX) signal: This signal contains all information, including the pilot tone and any supplementary signal which is used to frequency modulate the VHF FM transmitter.

stereo subcarrier: The subcarrier (38 kHz) converts the S signal to the carrier-frequency position (23 kHz - 53 kHz).

pilot tone: The pilot tone (19 kHz) is used to regain the stereo subcarrier in the stereo-receiver.

Radio Data System (RDS): RDS is a signal containing information on programmes and broadcasting network as defined in EN 50067 [2]. This signal is carried by a subcarrier at 57 kHz, amplitude modulated by the encoded data with suppressed carrier in a frequency band of $\pm 2,4$ kHz.

supplementary signal: This signal can operate in the range between 53 kHz and 76 kHz, according to CCIR Recommendation 450-1 [1].

3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

AF	Audio Frequency
AM	Amplitude Modulation
EMC	Electro Magnetic Compatibility
FM	Frequency Modulation
ISS	Interfering Signal Source
MPX	Multiplex
RDS	Radio Data System
RF	Radio Frequency
rms	root mean square
S/N	Signal to Noise
TUT	Transmitter Under Test
VHF	Very High Frequency

4 Technical requirements

The transmitter shall be tested:

- at its rated output power, as declared by the manufacturer;
- into a load as defined in subclause 4.13 a), unless otherwise stated.

The transmitter operating at any frequency in the range 87,5 MHz to 108 MHz shall comply with the requirements of this clause.

If the transmitter incorporates RDS, then the transmission shall be in accordance with CCIR Recommendation 450-1 [1] and EN 50067 [2]. If the transmitter incorporates any other form of supplementary signal(s), then the transmission shall be in accordance with CCIR Recommendation 450-1 [1].

The method of measurement for the parameters listed in the following subclauses shall be in accordance with EN 60244-13 [6], IEC 244-1 [4] and IEC 244-2 [5], unless otherwise stated.

4.1 Characteristics of RF interface ports

All RF output ports designated to interface with other equipment shall operate into a nominal impedance of 50 Ω .

All RF input ports designated to interface with other equipment shall have a nominal impedance of 50 Ω when driven in accordance with the manufacturers specifications.

4.2 Transmitter input configuration

If the transmitter does not incorporate a stereo encoder and is intended for stereo operation then a test encoder to the specification given in annex A shall be used.

If the transmitter is designed only for monophonic transmissions (i.e. without an MPX input) out-of-band emissions shall be tested in accordance with subclause 4.11.3.

4.3 Transmitter output characteristics

The carrier output power shall be within $\pm 1,0$ dB of the rated output power under normal operating conditions as defined in subclause 5.1. The carrier output power under extreme conditions, as defined in subclause 5.2, shall be within +2,0 dB and -3,0 dB of the rated output power.

The transmitter shall be capable of delivering its rated RF output power into an antenna with an input return loss of ≥ 16 dB at all phase angles.

The transmitter shall be capable of operating without damage into loads including open and short circuits, and may shut down or operate at reduced RF output power level to meet this requirement.

The reverse intermodulation performance at the operating frequency or frequencies of the transmitter shall be measured according to the method described in annex D. The frequency offset of the interfering source shall be varied over the range 300 kHz to 20 MHz maximum on both sides of the carrier, but shall remain within the range 87,5 MHz to 108 MHz.

The reverse intermodulation shall not exceed -10 dB at all frequency offsets within the above range.