

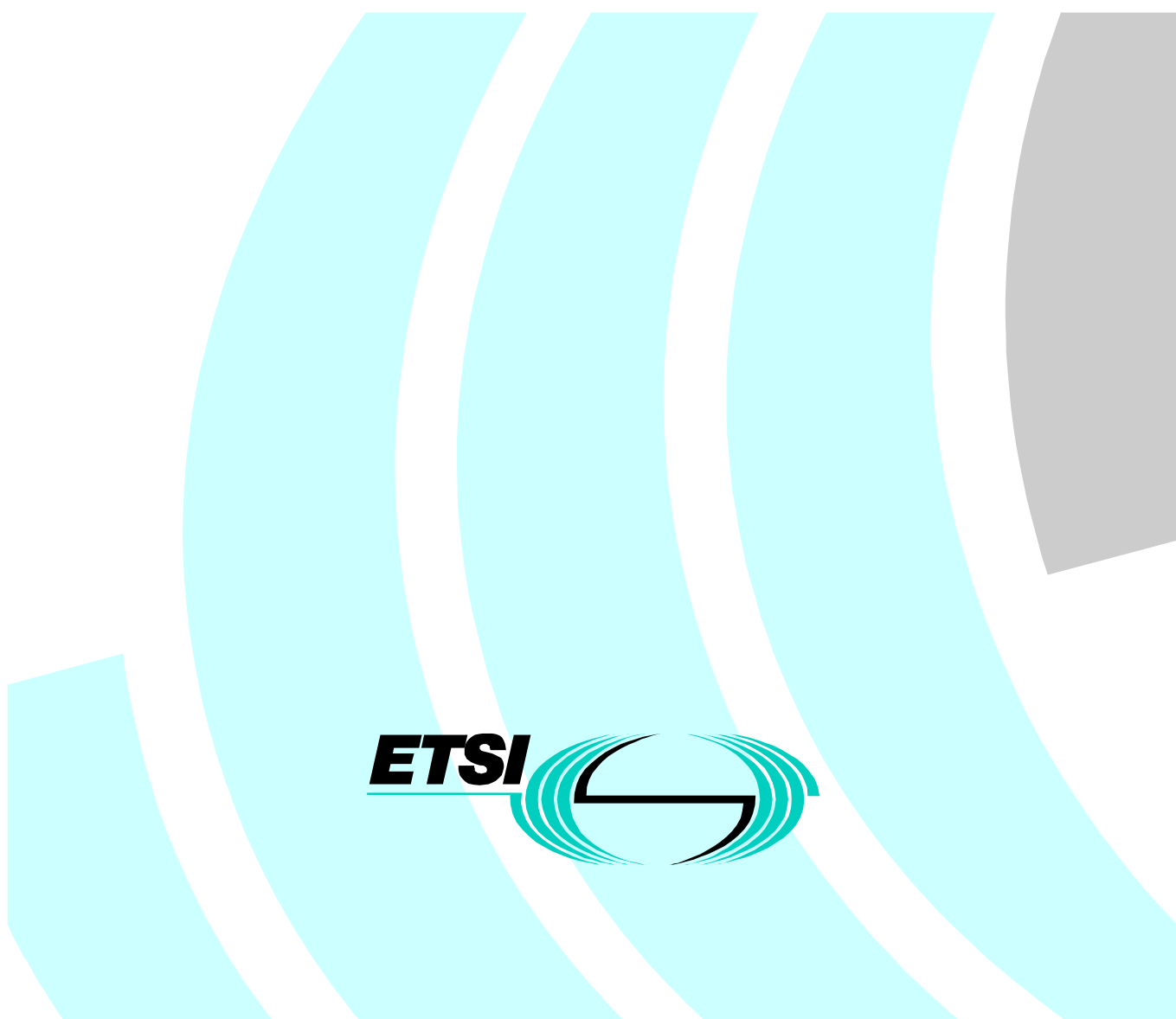
# ETSI ES 201 235-2 V1.1.1 (2000-09)

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*ETSI Standard*

## **Specification of Dual Tone Multi-Frequency (DTMF) Transmitters and Receivers; Part 2: Transmitters**

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**Reference**

DES/ATA-005076-2

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**Keywords**

Signalling, DTMF, PSTN

**ETSI**

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## Foreword

This ETSI Standard (ES) has been produced by ETSI Technical Committee Speech processing, Transmission and Quality aspects (STQ).

The present document is part 2 of a multi-part ETSI Standard covering the Specification of Dual Tone Multi-Frequency (DTMF) Transmitters and Receivers, as identified below:

Part 1: "General";

**Part 2: "Transmitters";**

Part 3: "Receivers";

Part 4: "Receivers for use in Terminal Equipment for end-to-end signalling".

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# 1 Scope

The present document specifies the Dual Tone Multi-Frequency (DTMF) signalling system.

The various parts of ES 201 235 provide a complete set of requirements for all applications intending to use DTMF signalling.

The present document is intended to provide the level of detail that will enable manufacturers of telecommunications equipment incorporating DTMF signalling, to design the equipment such that it facilitates highly reliable signalling. This should not be taken to imply that any DTMF signalling system that fails to meet all the criteria described in the present document will not provide reliable signalling.

The present document is not intended to be used for the definition of regulated interfaces.

This Part 2 covers the requirements for DTMF transmitters.

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# 2 References

The following documents contain provisions, which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- [1] ITU-T Recommendation Q.23: "Technical features of push-button telephone sets".
- [2] ITU-T Recommendation Q.24: "Multifrequency push-button signal reception".
- [3] ETSI TR 101 182: "Analogue Terminals and Access (ATA); Definitions, abbreviations and symbols".
- [4] ITU-T Recommendation P.57: "Artificial ear".

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# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

**High group:** signalling frequencies, which have nominal values of 1 209 Hz, 1 336 Hz, 1 477 Hz and 1 633 Hz

**Low group:** signalling frequencies, which have nominal values of 697 Hz, 770 Hz, 852 Hz and 941 Hz

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

dBV	Absolute voltage level expressed in decibels relative to 1 volt.
$Z_R$	Reference impedance defined in TR 101 182 [3], subclause 2.1.

## 3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ADSI	Analogue Display Services Interface
DTMF	Dual Tone Multi-Frequency
PSTN	Public Switched Telephone Network
SCWID	Spontaneous Call Waiting Identification
TE	Terminal Equipment

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# 4 DTMF Transmitter

## 4.1 Area of application and general

The present part 2 of the standard describes the properties of the DTMF transmitter function for terminal and for network equipment.

The transmitter design is optimized for signalling to a local exchange in the PSTN. However the use of DTMF as a method of end-to-end signalling between TE or between TE and a private exchange is also considered.

NOTE: DTMF Receivers designed to parts 3 and 4 of the present document are compatible with DTMF Transmitters designed to this specification.

## 4.2 Signal output requirements

### 4.2.1 Frequency tolerances

The tolerances of the output frequencies shall be within  $\pm 1,5$  % of their nominal values.

NOTE: The tolerance specified in ITU-T Recommendation Q.23 [1] is 1,8 %. However, for Europe the tolerance is considered to be 1,5 % according to the practice as presented in Annex A of ITU-T Recommendation Q.24 [2].

### 4.2.2 Sending level

The sending levels when the DTMF transmitter is terminated with the reference impedance  $Z_R$ , shall be:

- for the high frequency group: -9,0 dBV, +2,0 dB / -2,5 dB;
- for the low frequency group: -11,0 dBV, +2,5 dB / -2,0 dB.

The level of the higher frequency component of the signal shall be between 1 dB and 4 dB greater than the level of the lower frequency component.

NOTE: Where TE is required to produce a confidence tone in a telephone receiver, a level of about 65 to 85 dB relative to 20  $\mu$ Pa measured in an artificial ear complying with ITU-T Recommendation P.57 [4] may be considered acceptable.

### 4.2.3 Unwanted frequency components when a DTMF code is being transmitted

This requirements apply when the DTMF transmitter is terminated with the reference impedance  $Z_R$ .

#### a) Total power of unwanted components

The total power level of all unwanted frequency components in the frequency range of 250 Hz to 4 300 Hz shall be at least 20 dB below the level of the low group frequency component of the signal.

#### b) Level of individual unwanted components

In the range 4,3 kHz to 20 kHz, the individual level of any single frequency component shall not exceed -35,7 dBV.

In the range 20 kHz to 200 kHz, the individual level of any single frequency component shall not exceed -40,7 dBV.

NOTE: The purpose of this clause is to avoid interference to this and other inband signalling systems and other channels in multiplex systems.

### 4.2.4 Signal timing

#### 4.2.4.1 Tone duration

Where the DTMF signalling tone duration is controlled automatically by the transmitter, the duration of any individual DTMF tone combination sent shall not be less than 65 ms. The time shall be measured from the time when the tone reaches 90 % of its steady-state value, until it has dropped to 90 % of its steady-state value.

NOTE: For correct operation of supplementary services such as SCWID (Spontaneous Call Waiting Identification) and ADSI (Analogue Display Services Interface), DTMF tone bursts should not be longer than 90 ms.

#### 4.2.4.2 Pause duration

Where the DTMF signalling pause duration is controlled automatically by the transmitter the duration of the pause between any individual DTMF tone combination shall not be less than 65 ms. The time shall be measured from the time when the tone has dropped to 10 % of its steady-state value, until it has risen to 10 % of its steady-state value.

NOTE: In order to ensure correct reception of all the digits in a network address sequence, some networks may require a sufficient pause after the last DTMF digit signalled and before normal transmission starts.

### 4.3 Electrical characteristics

NOTE: The electrical characteristics of the interface will be determined by the apparatus into which the function of the DTMF transmitter has been incorporated.

#### 4.3.1 Speech suppression

When a DTMF signal is sent to the line, the sending sensitivity of any microphone capable of sending signals to line shall be decreased by at least 50 dB.

#### 4.3.2 Dial tone

When transmitting DTMF tone combinations in the presence of dial tone, the spectral output shall comply with the requirements of subclause 4.2.3.

For the purpose of this requirement, the dial tone is defined as a single tone signal, delivered from a generator with a source impedance equal to  $Z_R$ , with a frequency of 425 Hz, at the level of -10 dBV when measured across the reference impedance  $Z_R$ .

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## History

<b>Document history</b>		
V1.1.1	May 2000	Membership Approval Procedure    MV 20000728: 2000-05-30 to 2000-07-28
V1.1.1	September 2000	Publication