

# ETSI TS 123 014 V9.0.0 (2010-01)

---

*Technical Specification*

**Digital cellular telecommunications system (Phase 2+);  
Universal Mobile Telecommunications System (UMTS);  
Support of Dual Tone Multi-Frequency (DTMF) signalling  
(3GPP TS 23.014 version 9.0.0 Release 9)**

---



---

Reference

RTS/TSGC-0123014v900

---

Keywords

GSM, UMTS

**ETSI**

650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° 7803/88

---

**Important notice**

Individual copies of the present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<http://portal.etsi.org/tb/status/status.asp>

If you find errors in the present document, please send your comment to one of the following services:

[http://portal.etsi.org/chaicor/ETSI\\_support.asp](http://portal.etsi.org/chaicor/ETSI_support.asp)

---

**Copyright Notification**

No part may be reproduced except as authorized by written permission.  
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2010.  
All rights reserved.

**DECT™**, **PLUGTESTS™**, **UMTS™**, **TIPHON™**, the TIPHON logo and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.

**3GPP™** is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

**LTE™** is a Trade Mark of ETSI currently being registered

for the benefit of its Members and of the 3GPP Organizational Partners.

**GSM®** and the GSM logo are Trade Marks registered and owned by the GSM Association.

---

## Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<http://webapp.etsi.org/IPR/home.asp>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

---

## Foreword

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under <http://webapp.etsi.org/key/queryform.asp>.

---

# Contents

Intellectual Property Rights .....	2
Foreword.....	2
Foreword.....	4
1 Scope .....	5
2 References .....	5
3 Abbreviations .....	5
4 Requirement .....	5
5 Cause of DTMF generation.....	6
6 Support of DTMF across the air interface.....	6
6.1 General .....	6
6.2 Specific.....	6
6.3 Tone durations.....	7
7 Effect of Handover .....	10
7.1 Internal Handover.....	10
7.2 External Handover.....	11
<b>Annex A (informative): Change history .....</b>	<b>12</b>
History .....	13

---

# Foreword

This Technical Specification has been produced by the 3<sup>rd</sup> Generation Partnership Project (3GPP).

The present document defines Dual Tone Multi Frequency (DTMF) signalling within the 3GPP system.

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of this TS, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 Indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the specification;

---

## 1 Scope

The present document describes how Dual Tone Multi Frequency (DTMF) signals are supported in the 3GPP system.

---

## 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. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] Void.
- [1a] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 45.002: "Multiplexing and Multiple Access on the Radio Path".
- [3] ETSI ES 201 235-1, v1.1.1: "Specification of Dual Tone Multi-Frequency (DTMF); Transmitters and Receivers; Part 1: General".
- [4] ETSI ES 201 235-2, v1.2.1: "Specification of Dual Tone Multi-Frequency (DTMF); Transmitters and Receivers; Part 2: Transmitters".
- [5] ETSI ES 201 235-3, v1.2.1: "Specification of Dual Tone Multi-Frequency (DTMF); Transmitters and Receivers; Part 3: Receivers".
- [6] ITU-T Recommendation H.245: "Control protocol for multimedia communication"

---

## 3 Abbreviations

For the purposes of the present document, the abbreviations used in the present document are listed in 3GPP TR 21.905 [1a].

---

## 4 Requirement

Dual Tone Multi Frequency (DTMF) is an inband one out of four plus one out of four signalling system, primarily used from terminal instruments in telecommunication networks. The international recommendations which apply are ETSI ES 201 235 [3, 4, 5] as detailed in subclauses 6.2 and 6.3. For PCS 1900 for North America the Standards which apply are operator specific.

In the 3GPP system the MSC must support DTMF in the mobile to land direction.

The support of this facility in the land to mobile direction is for further study.

The use of DTMF is only permitted:

- when the speech teleservice is being used or during the speech phase of alternate speech/data and alternate speech/facsimile teleservices; the DTMF is transmitted across the radio interface as specified in subclause 6 of this specification; and

- during a multimedia call; the DTMF is transmitted across the radio interface using the H.245 UserInputIndication message (see ITU-T H.245 [6]). This is transparent for the MSC.

The responsibility for checking this lies in the MS.

---

## 5 Cause of DTMF generation

A user may cause a DTMF tone to be generated by depression of a key in the Mobile Station (MS). Optionally (on a MS basis) manufacturers of mobile equipment may choose to allow DTMF to be controlled from a remote terminal.

The man-machine interface questions associated with this facility are not discussed further in the present document.

---

## 6 Support of DTMF across the air interface

### 6.1 General

A message based signalling system is used across the 3GPP system air interface.

This requires that the relevant user action (e.g. a key depression) is interpreted by the MS as a requirement for a DTMF digit to be sent, this is converted by the MS into a message, the message is transmitted across the air interface, and is converted by the MSC into a DTMF tone which is applied towards the network, which should then respond with an acknowledgement. When the user completes the key depression, an message that the DTMF sending should cease is also passed to the MSC, which again will respond with an acknowledgement.

### 6.2 Specific

The messages to be sent across the air interface will use the frame stealing mode of transmission.

The messages when sent across the air interface should contain the following information:

- a) START DTMF: Containing the digit value (0-9,A,B,C,D,\*,#);
- b) START DTMF ACKNOWLEDGE: Containing the digit value (0-9,A,B,C,D,\*,#) corresponding to the DTMF tone that the network applies towards the remote user;
- c) STOP DTMF: No further info;
- d) STOP DTMF ACKNOWLEDGE: No further info.

Only a single digit will be passed in each START DTMF and START DTMF ACKNOWLEDGE message.

The messages will be passed transparently through the base station and interpreted at the MSC.

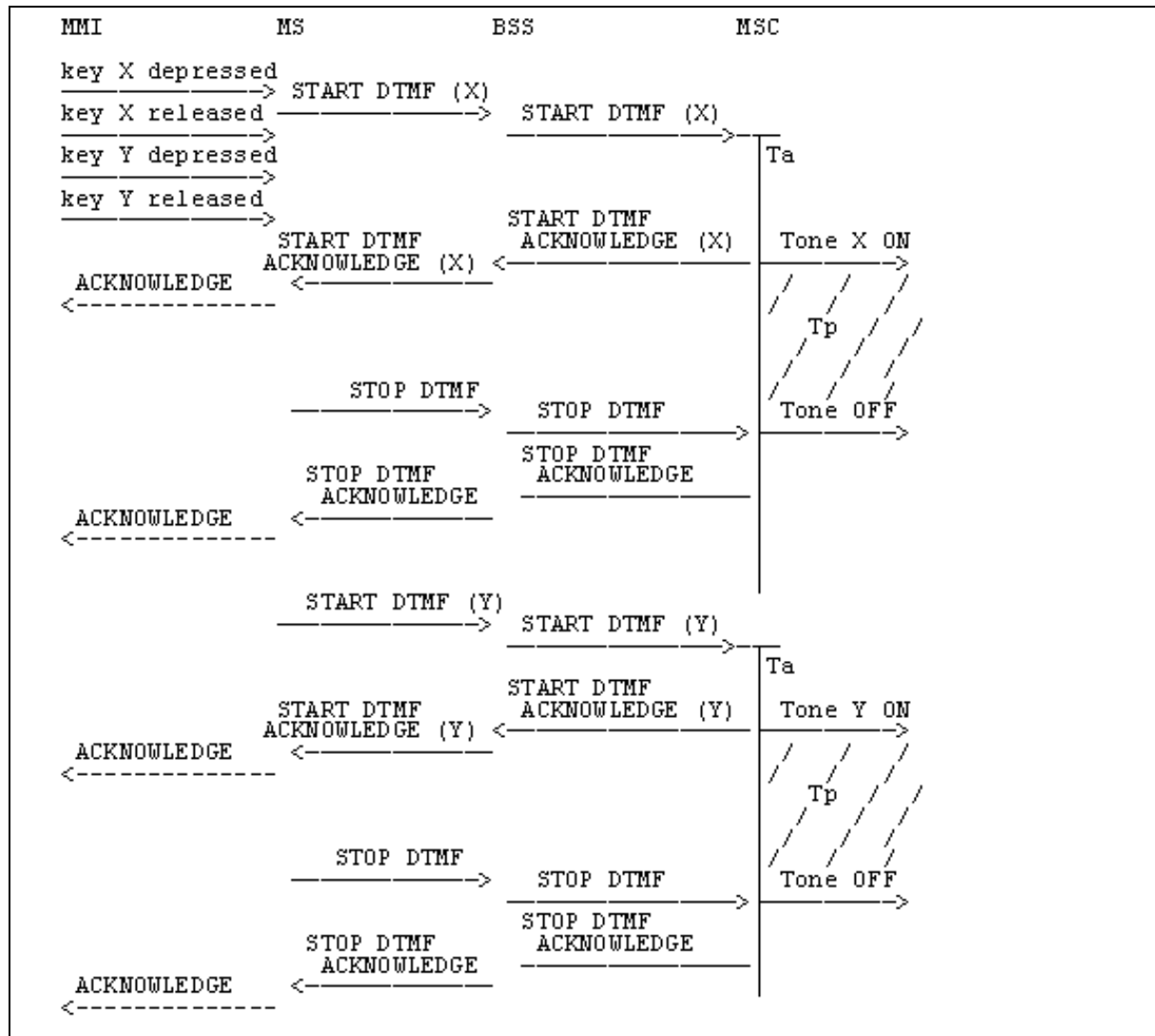
On receipt of a START DTMF message, the MSC will connect the correct dual-tone to line. This tone will remain connected until either the call is cleared or a STOP DTMF message is received.

As an operator option, the tone may be ceased after a pre-determined time whether or not a STOP DTMF message has been received.



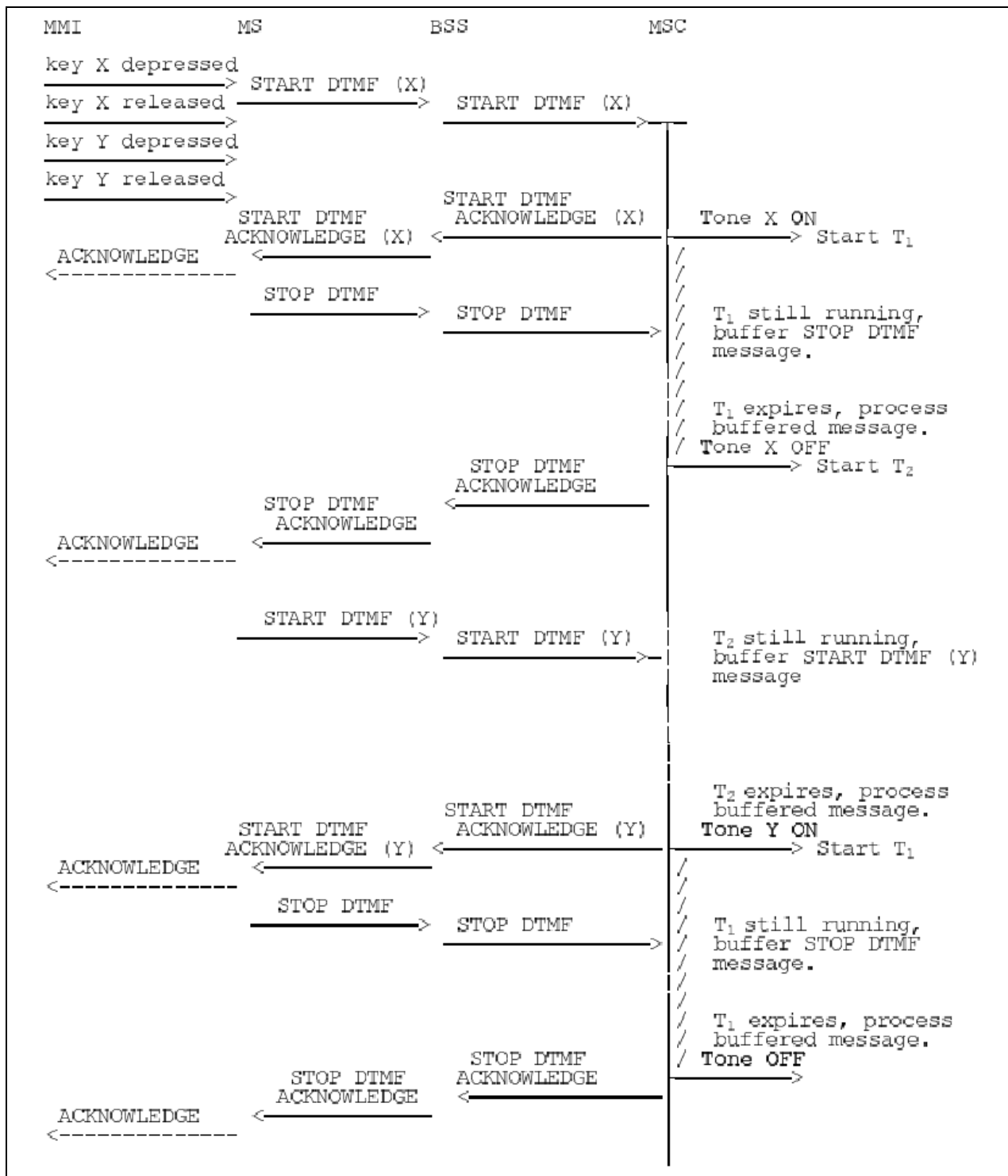






- Ta Association time for DTMF Generation in MSC, implementation dependant but low.
- Tp Pre-determined maximum tone length, operator option.
- T<sub>2</sub> Minimum gap between tones.

**Figure 3: Two Single DTMF Transmission**



T<sub>1</sub> Minimum length of tones  
 T<sub>2</sub> Minimum gap between tones.

Figure 4: Two Single DTMF Transmissions, Short Gap Between Key Presses

## 7 Effect of Handover

### 7.1 Internal Handover

There is unlikely to be any impact on DTMF due to internal handover.

## 7.2 External Handover

Depending on the exact moment when handover occurs, there may be a slight possibility of cutting short a DTMF tone.

For protocol reasons, in the case of an MSC receiving a STOP DTMF message when no tone is being sent, it should respond with an acknowledgement as usual.

No other impact is seen due to external handover.

## Annex A (informative): Change history

Change history						
TSG CN#	Spec	Version	CR	<Phase>	New Version	Subject/Comment
Apr 1999	3GPP TS 03.14	7.0.0				Transferred to 3GPP CN1
CN#03	23.014				3.0.0	Approved at CN#03
CN#06	23.014	3.0.0	001r1	R99	3.1.0	Clarification of DTMF procedure
CN#11	23.014	3.1.0		Rel-4	4.0.0	TSG CN#11 decided to issue this specification as Release 4 on 03-2001
NP-16	23.014	4.0.0		Rel-5	5.0.0	TSG CN#16 decided to issue this specification as part of release 5 on June 2002. ETSI/MCC updated this version with references and editorials.
NP-17 NP-020365	23.014 N1-021655 (wrongly used N1-021654 inside the CR itself)	5.0.0	006	Rel-5	5.1.0	Dual Tone Multi-Frequency signalling : Support in the whole 3GPP system, and editorial modifications.  Cat A CR
NP-26	23.014	5.1.0	007	Rel-6	6.0.0	Introduction of new references for DTMF
		6.0.0			7.0.0	Upgraded to Rel-7 (MCC)
CP-42	23.014	7.0.0	008r1	Rel-8	8.0.0	DTMF transmission during multimedia call
CP-46				Rel-9	9.0.0	Upgraded to Rel-9 (MCC)

---

## History

<b>Document history</b>		
V9.0.0	January 2010	Publication