



# SLOVENSKI STANDARD

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Digital cellular telecommunications system (Phase 2) (GSM); Base Station System (BSS) equipment specification; Part 3: Transcoder aspects (GSM 11.24 version 4.3.1)

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Part 3: Transcoder aspects  
(GSM 11.24 version 4.3.1)**

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## Contents

Intellectual Property Rights.....	5
Foreword .....	5
Introduction.....	5
1 Scope .....	7
2 Normative references.....	7
3 Definitions and abbreviations .....	9
3.1 Definitions .....	9
3.2 Abbreviations .....	9
4 Transcoding and rate adaption.....	10
4.1 Transcoder test points .....	10
4.1.1 External interfaces.....	10
4.1.1.1 Test signals applied to the antenna connector .....	10
4.1.2 Internal test points and interfaces .....	11
5 Test descriptions for speech related transcoding function.....	17
5.1 Test descriptions for full rate speech related transcoding functions.....	17
5.1.1 Uplink tests.....	17
5.1.1.1 Uplink speech transcoding - 13 kbit/s to 104 kbit/s conversion .....	17
5.1.1.2 Uplink speech transcoding - 13 kbit/s to 16 kbit/s conversion .....	18
5.1.1.3 Uplink speech transcoding - 16 kbit/s to 104 kbit/s conversion .....	18
5.1.1.4 Uplink speech transcoding - 104 kbit/s to 64 kbit/s conversion .....	19
5.1.1.5 Uplink Speech Decoder - 13 kbit/s to 104 kbit/s conversion with DTX.....	19
5.1.1.6 Uplink Speech Decoder - 13 kbit/s to 16 kbit/s conversion with DTX .....	23
5.1.1.7 Uplink Speech Decoder - 16 kbit/s to 104 kbit/s conversion with DTX.....	24
5.1.2 Downlink tests .....	26
5.1.2.1 Downlink speech transcoding - 64 kbit/s to 104 kbit/s conversion .....	26
5.1.2.2 Downlink speech transcoding - 104 kbit/s to 13 kbit/s conversion .....	26
5.1.2.3 Downlink speech transcoding - 104 kbit/s to 16 kbit/s conversion .....	27
5.1.2.4 Downlink speech transcoding - 16 kbit/s to 13 kbit/s conversion .....	28
5.1.2.5 Downlink transmitter DTX/VAD functions - 104 kbit/s to 13 kbit/s level conversion with DTX.....	28
5.1.2.6 Downlink transmitter DTX/VAD functions - 104 kbit/s to 16 kbit/s conversion process .....	29
5.1.2.7 Downlink transmitter DTX/VAD functions - 16 kbit/s to 13 kbit/s conversion .....	30
5.2 Test descriptions for half rate speech related transcoding functions.....	31
5.3 Test descriptions for enhanced full rate speech related transcoding functions.....	31
5.4 Alternative use of the 64 kbit/s A-Interface for full, half and enhanced full rate speech transcoding tests.....	32

6	Test descriptions for full rate data rate adaption functions .....	32
6.1	Uplink rate adaptation data tests .....	33
6.1.1	Uplink rate adaptation, transparent data: radio rate to 64 kbit/s level.....	33
6.1.2	Uplink rate adaptation, transparent data - radio rate to 16kbit/s conversion	34
6.1.3	Uplink rate adaption, transparent data: 16 kbit/s to 64 kbit/s.....	35
6.1.4	Uplink rate adaptation, non-transparent data: radio rates to 64 kbit/s .....	36
6.1.5	Uplink rate adaptation, non-transparent data: radio rate to 16kbit/s conversion .....	37
6.1.6	Uplink rate adaption, non-transparent data: 16 kbit/s to 64 kbit/s .....	38
6.2	Downlink rate adaptation data tests .....	39
6.2.1	Downlink rate adaptation, transparent data : 64 kbit/s to radio rates .....	39
6.2.2	Downlink rate adaptation, transparent data - 64 kbit/s to 16 kbit/s conversion .....	40
6.2.3	Downlink rate adaptation, transparent data: 16 kbit/s to radio rate .....	41
6.2.4	Downlink rate adaptation, non-transparent data: 64 kbit/s to radio rates conversion .....	41
6.2.5	Downlink rate adaptation, non-transparent data - 64 kbit/s to 16 kbit/s conversion .....	42
6.2.6	Downlink rate adaptation, non-transparent data: 16 kbit/s to radio rate .....	43
Annex A (informative):	Change history .....	45
History .....		46

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## Foreword

This European Telecommunication Standard (ETS) has been produced by the Special Mobile Group (SMG) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This European Telecommunication Standard (ETS) describes the tests for transcoding functions within the digital cellular telecommunications system (Phase 2).

The contents of this ETS is subject to continuing work within SMG and may change following formal SMG approval. Should SMG modify the contents of this ETS, it will be resubmitted for OAP by ETSI with an identifying change of release date and an increase in version number as follows:

Version 4.x.y

where:

- 4 indicates GSM Phase 2;
- x the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- y the third digit is incremented when editorial only changes have been incorporated in the specification.

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## Introduction

This ETS contains the test specifications relating to the speech and transcoding aspects of a Base Station System (BSS). It provides a means to ensure that the BSS operates in accordance with the core specifications defined for GSM phase 2.

This ETS is a guide for manufacturers and users of GSM equipment and provides a common basis for the characterization of the relevant system operational aspects.

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## 1 Scope

This European Telecommunication Standard (ETS) specifies the testing requirements and methods for GSM 900 and DCS 1800 Base Station Systems.

Unless otherwise specified, references to GSM also includes DCS1800.

This test specification covers the following functions in the BSS:

- definition of test points;
- speech coding/decoding;
- data rate adaption;
- speech and data transcoding with DTX;
- control of remote TRAU.

The tests in this document are based on the full set of GSM phase 2 ETSS. In case of any inconsistency between this specification and the source specifications, the source specifications shall prevail.

## 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] ETR 100 (GSM 01.04): "Digital cellular telecommunication system (Phase 2); Abbreviations and acronyms".
- [2] ETS 300 557 (GSM 04.08): "Digital cellular telecommunication system (Phase 2); Mobile radio interface layer 3 specification".
- [3] ETS 300 562 (GSM 04.21): "Digital cellular telecommunication system (Phase 2); Rate adaption on the Mobile Station - Base Station System (MS - BSS) interface".
- [4] ETS 300 574 (GSM 05.02): "Digital cellular telecommunication system (Phase 2); Multiplexing and multiple access on the radio path".
- [5] ETS 300 575 (GSM 05.03): "Digital cellular telecommunication system (Phase 2); Channel coding".
- [6] ETS 300 578 (GSM 05.08): "Digital cellular telecommunication system (Phase 2); Radio subsystem link control".
- [7] ETS 300 580-1 (GSM 06.01): "Digital cellular telecommunication system (Phase 2); Full rate speech processing functions".
- [8] ETS 300 580-2 (GSM 06.10): "Digital cellular telecommunication system (Phase 2); Full rate speech transcoding".
- [9] ETS 300 580-3 (GSM 06.11): "Digital cellular telecommunication system (Phase 2); Substitution and muting of lost frames for full rate speech channels".
- [10] ETS 300 580-4 (GSM 06.12): "Digital cellular telecommunication system (Phase 2); Comfort noise aspect for full rate speech traffic channels".
- [11] ETS 300 580-5 (GSM 06.31): "Digital cellular telecommunication system (Phase 2); Discontinuous Transmission (DTX) for full rate speech traffic channel".

- [12] ETS 300 580-6 (GSM 06.32): "Digital cellular telecommunication system (Phase 2); Voice Activity Detection (VAD)".
- [13] ETS 300 591 (GSM 08.20): "Digital cellular telecommunications system (Phase 2); Rate adaption on the Base Station System -Mobile- services Switching Centre (BSS - MSC) interface".
- [14] ETS 300 593 (GSM 08.52): "Digital cellular telecommunication system (Phase 2); Base Station Controller - Base Transceiver Station (BSC - BTS) interface; Interface principles".
- [15] ETS 300 594 (GSM 08.54): "Digital cellular telecommunication system (Phase 2); Base Station Controller - Base Transceiver Station (BSC - BTS) interface; Layer 1 structure of physical circuits".
- [16] ETS 300 596 (GSM 08.58): "Digital cellular telecommunications system (Phase 2); Base Station Controller - Base Transceiver Station (BSC -BTS) interface Layer 3 specification".
- [17] ETS 300 597 (GSM 08.60): "Digital cellular telecommunications system (Phase 2); Inband control of remote transcoders and rate adaptors for full rate traffic channels".
- [18] ETS 300 607-1 (GSM 11.10-1): "Digital cellular telecommunications system (Phase 2); Mobile Station (MS) conformance specification; Part 1: Conformance specification".
- [19] ETS 300 609-1 (GSM 11.21): "Digital cellular telecommunications system (Phase 2); Base Station System (BSS) equipment specification; Part 1: Radio aspects".
- [20] ITU-T Recommendation I.460: "Multiplexing, rate adaption and support of existing interfaces" [SIST ETS 300 609-3 E1:2003](https://standards.iteh.ai/catalog/standards/sist/37adb18e-293f-4828-a2c4-411111111111/sist-300-609-3-e1-2003)  
<https://standards.iteh.ai/catalog/standards/sist/37adb18e-293f-4828-a2c4-411111111111/sist-300-609-3-e1-2003>
- [21] ITU-T Recommendation V.110: "Support of data terminal equipments with V-Series type interfaces by an integrated services digital network".
- [22] ETS 300 581-1 (GSM 06.02): "Digital cellular telecommunication system (Phase 2); Half Rate speech; Part 1: Half rate speech processing functions".
- [23] ETS 300 581-7 (GSM 06.06): Digital cellular telecommunications system; Half rate speech; Part 7: ANSI-C code for the GSM half rate speech codec".
- [24] ETS 300 581-8 (GSM 06.07): "Digital cellular telecommunication system (Phase 2); Half rate speech; Part 8: Test sequences for the GSM half rate speech codec".
- [25] ETS 300 581-2 (GSM 06.20): "Digital cellular telecommunication system (Phase 2); Half rate speech; Part 2: Half rate speech transcoding".
- [26] ETS 300 581-3 (GSM 06.21): "Digital cellular telecommunication system (Phase 2); Half rate speech; Part 3: Substitution and muting of lost frames for half rate speech channels".
- [27] ETS 300 581-4 (GSM 06.22): "Digital cellular telecommunication system (Phase 2); Half rate speech; Part 4: Comfort noise aspects for the half rate speech traffic channels".
- [28] ETS 300 581-5 (GSM 06.41): "Digital cellular telecommunication system (Phase 2); Half rate speech; Part 5: Discontinuous Transmission (DTX) for half rate speech traffic channel".

- [29] ETS 300 581-6 (GSM 06.42): "Digital cellular telecommunication system (Phase 2); Half rate speech; Part 6: Voice Activity Detection (VAD)".
- [30] ETS 300 598 (GSM 08.61): "Digital cellular telecommunications system (Phase 2); Inband control of remote transcoders and rate adaptors for half rate traffic channels".
- [31] ETS 300 725 (GSM 06.54 ): "Digital cellular telecommunications system (Phase 2); Test vectors for the GSM Enhanced Full Rate (EFR) speech codec".
- [32] ETS 300 723 (GSM 06.51): "Digital cellular telecommunications system; Enhanced Full Rate (EFR) speech coding functions; General description".
- [33] ETS 300 724 (GSM 06.53): "Digital cellular telecommunications system; ANSI-C code for the GSM Enhanced Full Rate (EFR) speech codec".
- [34] ETS 300 726 (GSM 06.60): "Digital cellular telecommunications system; Enhanced Full Rate (EFR) speech transcoding".
- [35] ETS 300 727 (GSM 06.61): "Digital cellular telecommunications system; Substitution and muting of lost frames for Enhanced Full Rate (EFR) speech traffic channels".
- [36] ETS 300 728 (GSM 06.62): "Digital cellular telecommunications system; Comfort noise aspects for Enhanced Full Rate (EFR) speech traffic channels".
- [37] ETS 300 729 (GSM 06.81): "Digital cellular telecommunications system; Discontinuous Transmission (DTX) for Enhanced Full Rate (EFR) speech traffic channels".
- [38] ETS 300 730 (GSM 06.82): "Digital cellular telecommunications system; Voice Activity Detection (VAD) for Enhanced Full Rate (EFR) speech traffic channels".
- [39] ETS 300 609-2 (GSM 11.23): "Digital cellular telecommunications system (Phase 2); Base Station System (BSS) equipment specification; Part 1: Signalling aspects".

### 3 Definitions and abbreviations

#### 3.1 Definitions

Error-free radio conditions	A condition for a test signal applied to the antenna connector, defined in subclause 4.1.1.1
Perfect radio conditions	A condition for a test signal applied to the antenna connector, defined in subclause 4.1.1.1

#### 3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply in addition to those given in ETR 100 (GSM 01.04) [1]:

AGCH	Access Grant CHannel
BCCH	Broadcast Control CHannel
BSS	Base Station System
BTS	Base Transceiver Station
CCU	Channel Coder Unit
DTX	Discontinuous Transmission
FACCH	Fast Associated Control CHannel
FS	Full rate Speech
HS	Half rate Speech
MSC	Mobile Switching Centre

OMC	Operations and Maintenance Centre
PCH	Paging CHannel
PCM	Pulse Code Modulation
RA	Rate Adaption
RACH	Random Access CHannel
TCH	Traffic CHannel
SACCH	Slow Associated Control CHannel
SDCCH	Standalone Dedicated Control CHannel
SCH	Synchronization Channel

## 4 Transcoding and rate adaption

The Transcoding and Rate Adaption Unit (TRAU) is a GSM entity which converts between the 64 kbit/s per channel bit rate at the MSC and a net rate of 13 kbit/s for the radio interface in the case of Full Rate (FR) speech. For terrestrial links the 13 kbit/s data is transmitted over 16 kbit/s after the addition of synchronisation and control information. On the radio interface the 13 kbit/s is padded to 22.8 kbit/s after channel coding. In the case of data the net bit rates used as the bearer can be either 12 kbit/s, 6 kbit/s or 3,6 kbit/s. Again channel coding results in a radio interface data rate of 22.8 kbit/s. While the transcoder is considered functionally part of the BSS it can be located at either the MSC location, BSC location or BTS location. This aspect is illustrated in figure 11.24-1. The 16 kbit/s terrestrial link to the remote transcoder may be (4 to 1) multiplexed onto a single 64 bit/s link as shown in BSS types 2,4 and 6.

In situations where the TRAU is located remote from the radio interface (i.e. BSS type 2, 4-7) speech or data is transferred between the TRAU and channel codec unit (CCU) in frames of fixed length of 320 bits (20ms). These "TRAU frames" also carry control signals that signal frame type and timing information. For example in-call modifications from speech to data will be signalled from the CCU to the TRAU within the frame structure. In the case of timing control the CCU checks the synchronisation of the downlink radio link and signals advance/retard information to the TRAU over the uplink TRAU frames. Corrections are then made to the downlink phasing of the TRAUs. For more information see GSM 08.60 [17].

Testing for the transcoding function will be divided into three categories:

- speech transcoding/DTX which is independent of BSS type;
- data rate adaption; <https://standards.iteh.ai/catalog/standards/sist/37adb18e-293f-4828-a2c4-9db49a268ed4/sist-ets-300-609-3-e1-2003>

and

- In-band control which relates to types 2,4-7.

### 4.1 Transcoder test points

To facilitate the standardization of the testing the following interfaces are required:

#### 4.1.1 External interfaces

The mandatory external interfaces of the BSS (according to figure 11.24-1) are listed below:

1. The antenna connector.
2. The A-interface to the MSC.

An additional optional external interface may be required:

3. The separate OMC-interface.

##### 4.1.1.1 Test signals applied to the antenna connector

The purpose of the tests in this specification are to test the transcoding function of the BSS. Where tests are performed using the antenna connector as an external interface, the characteristics of the RF test signal should be chosen so as to minimise the contribution of the BTS (especially its RF parts) the measurement results.

NOTE: The BTS can contribute to the measurement result is due to the introduction of bit errors. This is most likely to occur if the level of the input signal is not large enough compared to the noise floor of the receiver, but can also occur if the input signal overloads the receiver.

The manufacturer may specify the RF characteristics of the test signal for these tests, which meet these requirements.

If the manufacturer does not specify the characteristics of the test signal, the signal and general test method defined in GSM 11.21 [19] for static reference sensitivity may be used, except that the level of the signal should be increased by at least 20dB.

Perfect radio conditions: Using a test signal as defined above, applied continuously to the antenna connector.

Error-free radio conditions: Using a test signal as defined above, applied for certain parts of the GSM radio interface frame structure, as defined in each test.

Alternatively, an internal interface point within the BTS may be used, with a test signal comprising the bit sequence which would result at the internal interface point for an error free test signal applied to the antenna connector.

#### 4.1.2 Internal test points and interfaces

In addition to the external interfaces in clause 4.1.1 the following internal logical interfaces shall as a minimum be accessible in the equipment in order to carry out the measurements in this specification:

1. Input and output bit access to 104 kbit/s level, 13 bit linear PCM for full rate speech channels (TCH/FS) in both directions of transmission and reset control of the speech encoder and decoder.
2. Output bit access after channel decoding including frame erasure information (FEI or BFI) for all channel types.
3. Input bit access before channel encoding for all channel types.
4. The optional internal TRAU interface (referred to as Abis in GSM 08.60 [17]), if used.

Where an internal access is required, the implementation of this is up to the manufacturer. However, in order to physically interface with the BSSTE, the implementation is restricted to the following options:

- a. Direct physical access to the logical interface.
- b. Physical access via a dedicated external interface adapter.
- c. Physical access to bits (insertion and monitoring) before channel encoding/after channel decoding via a loop-back over the radio path as defined in GSM 11.10-1 [18] for the Mobile Station.
- d. Physical access to bits (insertion and monitoring) before channel encoding/after channel decoding from the A-interface using the A-interface rate adaptation functions.
- e. Physical access to bits (insertion and monitoring) before channel encoding/after channel decoding from the Abis-interface using the 16 kbit/s Abis-interface rate adaptation and speech handling functions, if any.
- f. Physical access to 13 bit/8 kHz PCM samples via a special combination of 2 x A- or Abis-interface 64 kbit/s channels.

A dedicated external adapter shall, if used, be supplied by the BSS manufacturer.

The internal test points or interfaces are illustrated in figure 11.24-2 and figure 11.24-3 for the various Base Station System types described in figure 11.24-1.

The detailed specifications of the interface points are: