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Radijska oprema in sistemi (RES) - Vseevropski sistem snopovnega radia (TETRA) - Prizemni snopovni radio (TETRA) - Govorni kodek za kanal s polno hitrostjo - 4. del: Preskušanje skladnosti kodeka

Terrestrial Trunked Radio (TETRA); Speech codec for full-rate traffic channel; Part 4: Codec conformance testing

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Radio Equipment and System (RES) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETS consists of four parts as follows:

Part 1: "General description of speech functions";

Part 2: "TETRA codec";

Part 3: "Specific operating features";

Part 4: "Codec conformance testing".

Transposition dates	
Date of adoption:	2 May 1997
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1 Scope

The objective of this European Telecommunication Standard (ETS) is to define the conformance bounds for the TETRA speech and channel codec as deployed in the TETRA Speech Traffic Channel (TCH/S) channel type used in the TETRA Voice plus Data (V+D) equipment.

For the speech part of the TCH/S codec, the conformance testing (clause 7 of this ETS) consists of a bit-exact test where the reference is pre-computed and fixed.

For the TCH/S channel encoding a bit exact conformance test is also defined (see subclause 6.4).

For the TCH/S channel decoding, a non-bit exact test is employed with the specifications designed such that a sufficient quality of performance is met by the TETRA equipment (see subclause 6.3).

2 Normative references

This ETS incorporates, by dated or 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] ETS 300 392-2 (1995): "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Voice plus Data; Part 2: Air Interface".

[2] ETS 300 394-1 (1995): "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Conformance testing specification; Part 1: Radio".

[3] ETS 300 395-2 (1995): "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Speech codec for full rate traffic channel; Part 2: TETRA codec".

[4] ETS 300 395-3 (1995): "Radio Equipment and Services (RES); Trans-European Trunked Radio (TETRA); Speech codec for full-rate traffic channel; Part 3: Specific operating features".

[5] ETS 300 607 (1994): "European Digital Cellular Telecommunications System (Phase 2); Mobile Station (MS) conformance specification (GSM 11.10)".

[6] CCITT Recommendation O.153: "Basic parameters for the measurement of error performance at bit rate below the primary rate".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETS, the definitions given in the following ETSs apply:

- ETS 300 392 part 2 [1], clause 3;
- ETS 300 394 part 1 [2], clause 3.

3.2 Abbreviations

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

ACELP	Algebraic Code Excited Linear Predictive
BER	Bit Error Rate
dBm	Decibels relative to one milliWatt
MER	Message Erasure Rate
PUEM	Probability of Undetected Erroneous Message
PCM	Pulse Coded Modulation

TE	Terminal Equipment
TSS	TETRA System Simulator
VAD	Voice Activity Detector
STCH	STealing CHannel
TCH/S	Full Rate Speech Traffic CHannel

See ETS 300 394 part 1 [2], clause 3, for conformance testing abbreviations.

4 General

The conformance testing of the TCH/S channel shall be conducted in identical or similar methodology as specified in ETS 300 394-1 [2]. However, as ETS 300 394-1 [2] is specified for both the TETRA V+D and TETRA Packet Data Optimized (PDO), only the TETRA V+D part of ETS 300 394-1 [2] shall be applicable to this ETS. Therefore, all references to ETS 300 394-1 [2] clauses shall refer to the TETRA V+D sections only. For the purpose of this ETS, the following where applicable shall apply:

- presentation of equipment for testing purposes shall be as specified in ETS 300 394-1 [2], subclause 4.1;
- facilities and information required for testing shall be as specified in ETS 300 394-1 [2], subclause 4.1.1;
- choice of radio frequency channels to be tested shall be as specified in ETS 300 394-1 [2], subclause 4.1.2;
- interpretation of the measurement results shall be as specified in ETS 300 394-1 [2], subclause 4.1.3;
- mechanical and electrical design shall be as specified in ETS 300 394-1 [2], subclause 4.2.

5 Radio test configuration, test signals and test modes

In order to perform the conformance testing specified in this ETS, the Terminal Equipment (TE) shall have been tested to, and passed, the relevant specifications as given in ETS 300 394-1 [2]. Thus, all appropriate logical channel types apart from the TCH/S shall have been tested.

In this ETS, the TETRA speech and channel codec as specified in ETS 300 395-2 [3], shall be conformance tested under standard TETRA specified configurations. All unspecified or informative parts of the TETRA speech and channel codec shall be disabled and not tested. For example, sub-systems such as the Voice Activity Detector (VAD) as given in ETS 300 395-3 [4] shall be excluded from the tests in this ETS. If these and other speech related sub-systems are standardized in future phases of TETRA then a separate conformance test may be generated to test these new additions.

In this ETS, only the standard un-encrypted TCH/S shall be tested. Thus the TE's encryption capability, if implemented by the TE, shall be disabled for the duration of the tests specified in this ETS. Similarly, all parts related to the STealing CHannel (STCH) and the eventually associated half slot containing encoded speech shall not be tested and shall not be activated in the test.

The test signal T1 shall be as specified in ETS 300 394-1 [2], subclause 5.3.2.

In accordance to ETS 300 394-1 [2], the channel type tested under this ETS shall be designated as channel type 15 and 16 for TCH/S. For Mobile Station (MS) testing, on frame 1 to 17, table 1 shall apply. For Base Station (BS) testing, on frame 1 to 17, table 2 shall apply.

Table 1: Channel type for MS testing

<table>
<tr><th>Channel type</th><th>Burst type</th><th>Block 1</th><th>Block 2</th><th>Broadcast block</th></tr>
<tr><td>15</td><td>normal</td><td colspan="2">TCH/S</td><td>Access Assignment Channel (AACH)</td></tr>
</table>

Table 2: Channel type for BS testing

Channel type	Burst type	Sub slot 1	Sub slot 2
16	normal	TCH/S	

6 TCH/S Channel Codec

6.1 Objectives

The objective of this clause is to specify and present performance limits for the TCH/S channel encoding and decoding sub-system. The TCH/S channel encoder is specified in bit exact terms and is given in ETS 300 395-2 [3], clause 5, and all TE shall operate according to it. The TCH/S channel decoder is specified in non-bit exact terms and is given in ETS 300 395-2 [3], clause 6, while an informative example implementation is given in ETS 300 395-2 [3], annex A. The performance of the TCH/S channel decoder is specified in this clause.

6.2 Conformance test methodology

The presentation of the conformance testing procedures for the TCH/S shall be the same as for the other logical channel types as specified in ETS 300 394-1 [2]. Therefore, as described in ETS 300 394-1 [2], all conformance test data between the TETRA System Simulator (TSS) and the TE shall be via two ports, namely the antenna port and the test connector.

The type tests described in this ETS shall be performed under normal test conditions as specified in ETS 300 394-1 [2], subclauses 6.2 and 6.2.1.

6.3 Test decoding mode

For the TCH/S channel decoding test mode, the TE under test shall perform the test in a similar manner as other channel coded channels as specified in ETS 300 394-1 [2], subclause 5.2.1.

6.3.1 General

The test set up, procedures and measurement methods detailed in ETS 300 394-1 [2] shall be used in testing TETRA V+D equipment TCH/S performance.

The required minimum number of samples and test limit error rates used in the following TCH/S receiver test are defined such that:

a) the probability of passing a bad unit is lower than 0,3 %;

b) the probability of passing a good unit, operating on the limit of performance, is at least 99,5 %.

The Bit Error Ratio/Message Erasure Rate (BER/MER) test limits adopted have been selected in order not to pass a unit with a sensitivity performance 1 dB worse than that of an unit which just meets the specification.

NOTE: The above definition does not apply to Probability of Undetected Erroneous Message (PUEM) measurements.

6.3.2 TCH/S reference sensitivity performance

The minimum required reference sensitivity performance for V+D equipment is specified in ETS 300 392-2 [1] according to test condition, propagation condition and receiver class.

The maximum dynamic and static reference sensitivity levels for a BS receiver under normal test conditions shall not exceed the signal levels shown in table 3.