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**Prizemni snopovni radio (TETRA) – Specifikacija za preskušanje skladnosti – 1.
del: Radio**

Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 1: Radio

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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

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Terrestrial Trunked Radio (TETRA).

The present document contains text concerning conformance testing of the equipment to which it relates. This text should be considered only as guidance and does not make the present document mandatory.

The technical specifications relevant to the EMC Directive are listed in annex G of the present document.

The present document is part 1 of a multi-part deliverable covering the conformance testing specification, as identified below:

Part 1: "Radio";

Part 2: "Protocol testing specification for Voice plus Data (V+D)";

Part 4: "Protocol testing specification for Direct Mode Operation (DMO)";

Part 5: "Security".

NOTE: Part 2, part 4 and part 5 of this multi-part deliverable are in status "historical" and are not maintained.

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1 Scope

The present document specifies the minimum technical characteristics of TETRA Voice plus Data (V+D) Base Stations (BS) and Mobile Station (MS) equipment, and TETRA Direct Mode Operation (DMO) equipment, and the radio test methods used for type testing. Specific test methods for DMO equipment are defined in annex F of the present document. The purpose of these specifications is to provide a sufficient quality of radio transmission and reception for equipment operating in a TETRA system and to minimize harmful interference to other equipment. The present document is applicable to TETRA systems operating at radio frequencies in the range of 300 MHz to 1 GHz.

These specifications do not necessarily include all the characteristics which may be required by a user of equipment, nor do they necessarily represent the optimum performance achievable.

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.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

- STANDARD PREVIEW**
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- [1] ETSI EN 300 392-2 (V2.5.1): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".
- [2] ITU-T Recommendation Q.153: "Basic parameters for the measurement of error performance at bit rates below the primary rate".
- [3] ETSI ETR 028: "Radio Equipment and Systems (RES); Uncertainties in the measurement of mobile radio equipment characteristics".
- [4] ETSI EN 300 113-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land mobile service; Radio equipment intended for the transmission of data (and/or speech) using constant or non-constant envelope modulation and having an antenna connector; Part 1: Technical characteristics and methods of measurement".
- [5] ITU-T Recommendation V.1: "Equivalence between binary notation symbols and the significant conditions of a two-condition code".
- [6] ISO 2110: "Information technology - Data communication - 25-pole DTE/DCE interface connector and contact number assignments".
- [7] ETSI EN 300 395-4: "Terrestrial Trunked Radio (TETRA); Speech codec for full-rate traffic channel; Part 4: Codec conformance testing".
- [8] ETSI ETS 300 396-1: "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 1: General network design".
- [9] ETSI EN 300 396-2: "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 2: Radio aspects".
- [10] ETSI EN 300 396-3: "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 3: Mobile Station to Mobile Station (MS-MS) Air Interface (AI) protocol".

- [11] ETSI EN 300 392-1: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 1: General Network Design".
- [12] ETSI EN 300 392-7: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 7: Security".
- [13] ETSI ETS 300 392-11-22: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 11: Supplementary services stage 2; Sub-part 22: Dynamic Group Number Assignment (DGNA)".
- [14] ETSI EN 300 392-12-22: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3; Sub-part 22: Dynamic Group Number Assignment (DGNA)".
- [15] ETSI EN 300 827: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for Terrestrial Trunked Radio (TETRA) and ancillary equipment".
- [16] ETSI EN 300 395-2: "Terrestrial Trunked Radio (TETRA); Speech codec for full-rate traffic channel; Part 2: TETRA codec".
- [17] Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive).
- [18] ETSI TS 101 293: "Digital cellular telecommunications system (Phase 2+); Individual equipment type requirements and interworking; Special conformance testing functions (3GPP TS 04.14)".

3 Definitions, symbols and abbreviations

3.1 Definitions

SIST EN 300 394-1 V2.4.1:2006

For the purposes of the present document, the terms and definitions given in EN 300 392-2 [1] and the following apply:

accreditation body: body that conducts and administers a laboratory accreditation system and grants accreditation

accredited laboratory: testing laboratory to which accreditation has been granted

receive band of the equipment: maximum frequency range (declared by the manufacturer) over which the receiver can be operated without reprogramming or realignment

testing laboratory: laboratory that performs tests

transmit band of the equipment: maximum frequency range (declared by the manufacturer) over which the transmitter can be operated without reprogramming or realignment

3.2 Symbols

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

f_{lo}	local oscillator frequency applied to first receiver mixer
$f_{1...if_n}$	receiver intermediate frequencies
P_{MS}	access power
R_{lev}	averaged signal level received by MS

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in EN 300 392-2 [1] and the following apply:

AI	Air Interface
BFI	Bad Frame Indication
C/I	Carrier to Interference ratio
dBc	deciBels relative to carrier power
dBm	deciBels relative to one mW
DM-MS	Direct Mode - Mobile Station
DMO	Direct Mode Operation
DM-GATE	Direct Mode operation - GATEway
DM-REP	Direct Mode - REPeater
DM-REP/GATE	Direct Mode - REPeater/GATEway
DW-MS	Dual Watch - Mobile Station
HTHV	High Temperature High Voltage
IUT	Implementation Under Test
LTHV	Low Temperature High Voltage
LTLV	Low Temperature Low Voltage
B	Measurement bandwidth
PRBS	Pseudo Random Bit Sequence
Rx	Receiver
SCH/F	Signalling CHannel Full
TEI	TETRA Equipment Identity
TT	TETRA Test
TTCI	TETRA Test Connector Interface
TD	Timing Delay
Tx	Transmitter
TMO	Trunked Mode Operation
V+D	Voice plus Data

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4 General

4.1 Presentation of equipment for testing purposes

Each equipment submitted for type testing shall fulfil the requirements of the present document on all channels over which it is intended to operate. The manufacturer, or other applicant, shall provide one or more production model(s) of the equipment, as appropriate, for type testing. If type approval is given on the basis of tests on pre-production models, those models shall be manufactured in accordance with the same production drawings and manufacturers specifications as the later production models. This fact shall be declared by the manufacturer in the application form. For more details refer to EN 300 113-1 [4].

4.1.1 Facilities and information required for testing

The applicant shall, when submitting equipment for type testing, provide the following facilities:

- at least one antenna connector as a test point;
- for equipment supporting diversity, or for any other reason having more than one antenna connector, the applicant shall supply coupling and/or terminating devices so that the tests can be performed via a single antenna connector;
- TETRA equipment, which may not have an antenna connector, may be submitted for type testing by the manufacturer, or other applicant, if a suitable jig or adapter is supplied which allows the conducted tests to be carried out;
- specific test modes, as defined in clause 5.2;

- a test connector which provides decoded data output for all uplink logical channels in the case of BS and downlink logical channels in the case of MS to be tested. The test connector shall also provide any test signalling data. The use of the term "Test Connector" throughout the present document shall mean either a physical connection, as defined in annex C, or a virtual connection by means of an RF Loopback Facility as defined in annex D;
- for BS equipment a trigger signal which can be used by the test equipment for uplink synchronization. The trigger signal shall be sent once within a multiframe structure and it shall have an arbitrary but fixed relationship (frame, timeslot), defined by the base station manufacturer, to the multiframe structure. The trigger signal shall have TTL level, the timing uncertainty shall be less than $\pm 2,5 \mu\text{s}$ and the rise time and fall time shall each be less than 50 ns;
- a means to connect the equipment to the test power source according to clause 6.

Equipment submitted for type testing shall be capable of performing conformance tests using the T1 Test Signal, whether or not the optional requirements of the RF Loopback Facility are implemented. It is at the discretion of the test laboratory whether to implement a test system supporting the optional requirements of the RF Loopback Facility.

The applicant shall provide the following information to the test laboratory:

- power class of equipment;
- receiver class A, B or E (MS only);
- other capabilities and options implemented in equipment, including traffic channels supported;
- information related to radio sub-system of equipment, i.e. transmit and receive frequency bands, first local oscillator frequency (f_{LO}) and intermediate frequencies ($if_1 \dots if_n$) of receiver;
- description how to use equipment in specific test modes and test connector interface details;
- information of power source used in equipment.

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4.1.2 Choice of radio frequency channels to be tested

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The tests described in clauses 8 to 10 shall be performed on one or more frequency channels selected from the lowest 5, the highest 5 and the middle 5 radio frequency channels of either the transmit or receive band of the equipment, whichever is appropriate. The channels required to be tested are defined in clauses 8 to 10 for each individual test.

The use of the terms "lowest radio frequency channel", "highest radio frequency channel" and "middle radio frequency channel" throughout the present document shall mean one of the lowest 5, one of the highest 5 and one of the middle 5 radio frequency channels respectively.

4.1.3 Interpretation of the measurement results

The interpretation of the results recorded in the test report for the measurements described in the present document shall be as follows:

- a) the measured value related to the corresponding limit will be used to decide whether an equipment meets the minimum requirements of the specification in accordance with the shared risk method;
- b) the actual measurement uncertainty of the test laboratory carrying out the measurement, for each particular measurement, shall be included in the test report;
- c) the values of the actual measurement uncertainty shall be, for each measurement, equal to or lower than the figures given in clause 11. The measurement uncertainty requirements given in the present document corresponds to a confidence level of 95 %, unless otherwise stated. The confidence level is the probability that the true value of the measured parameter lies within the range of values bounded by the uncertainty as described in ETR 028 [3].