



SLOVENSKI STANDARD

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**Radijska oprema in sistemi (RES) - Vseevropski 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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Foreword

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

Every ETS prepared by ETSI is a voluntary standard. This ETS contains text concerning conformance testing of the equipment to which it relates. This text should be considered only as guidance and does not make this ETS mandatory.

This ETS will consist of three parts:

Part 1: "Radio".

Part 2: "Protocol testing specification (V+D)", (DE/RES-06009-2).

Part 3: "Protocol testing specification (PDO)", (DE/RES-06009-3).

Transposition dates	
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1 Scope

This ETS specifies the minimum technical characteristics of both TETRA Voice plus Data (V+D) and Packet Data Optimised (PDO) Base Stations (BS) and Mobile Station (MS) equipment and the radio test methods used for type testing. 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 minimise harmful interference to other equipment. The document is applicable to TETRA systems operating at radio frequencies in the range of 380 MHz to 520 MHz.

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 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] ETS 300 392-2: "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".
- [2] ETS 300 393-2: "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Packet Data Optimized (PDO); Part 2: Air Interface (AI)".
- [3] CCITT Recommendation O.153: "Basic parameters for the measurement of error performance at bit rate below the primary rate".
- [4] ETR 028: "Radio Equipment and Systems (RES); Uncertainties in the measurement of mobile radio equipment characteristics".
- [5] ETS 300 113: "Radio Equipment and Systems (RES); Land mobile service; Technical characteristics and test conditions for radio equipment intended for the transmission of data (and speech) and having an antenna connector".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of this standard, the following definitions apply:

Refer to ETS 300 392-2 [1], clause 3 for common definitions.

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

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

accredited laboratory: Testing laboratory to which accreditation has been granted.

testing laboratory: A laboratory that performs tests.

transmit band of equipment: The 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 this ETS, the following symbols apply:

f _{lo}	local oscillator frequency applied to first receiver mixer
f _o	nominal centre frequency of radio channel
if ₁ ...if _n	receiver intermediate frequencies
P _{MS}	access power
P _{Tx}	MS transmit power
R _{lev}	averaged signal level received by MS

3.3 Abbreviations

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

Refer to ETS 300 392-2 [1], clause 3 for common abbreviations.

B	Measurement bandwidth
BER	Bit Error Ratio
C/I	Carrier to Interference ratio
dBc	Decibels relative to carrier power
dBm	Decibels relative to one mW
MER	Message Erasure Rate
PACQ	Probability of synchronization burst ACQuisition
PRBS	Pseudo Random Bit Sequence
PUEM	Probability of Undetected Erroneous Message
RF	Radio Frequency
RMS	Root Mean Square
Rx	Receiver
SB	Synchronization Burst
Tx	Transmitter
VSWR	Voltage Standing Wave Ratio

4 General

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4.1 Presentation of equipment for testing purposes

Each equipment submitted for type testing shall fulfil the requirements of this standard 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 ETS 300 113 [5].

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, for example PDO radio packet modem modules 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 subclause 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;
- a means to connect the equipment to the test power source according to clause 6.

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 V+D or PDO, traffic channels supported;
- information related to radio sub-system of equipment, i.e. transmit and receive frequency bands, first local oscillator frequency (flo) and intermediate frequencies (if1...ifn) of receiver;
- description how to use equipment in specific test modes and test connector interface details;
- information of power source used in equipment.

4.1.2 Choice of radio frequency channels to be tested

Unless otherwise stated, the tests described in clauses 8, 9 and 10 shall be performed on the lowest, highest and middle radio frequency channel of either the transmit or receive band of the equipment, whichever is appropriate.

4.1.3 Interpretation of the measurement results

The interpretation of the results recorded in the test report for the measurements described in this standard 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 this specification 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 [4].

This procedure for using maximum acceptable uncertainty values is valid until superseded by other appropriate ETSI publications covering this subject. The use of the measured value has been chosen because there is no definitive standard allowing for measurement uncertainty at the time of publication of this standard. Therefore, the measurement uncertainty shall be used to assess the quality of the actual measurement. The measurement uncertainty values can also be used by accreditation authorities during their accreditation procedures to ensure compliance of type testing to ETSI standards.

4.2 Mechanical and electrical design

4.2.1 General

The equipment submitted for type testing by the manufacturer or other applicant, shall be designed, constructed and manufactured in accordance with sound engineering practice and with the aim to minimise harmful interference to other equipment and services.

Those controls which if maladjusted might increase the interfering potentialities of the equipment shall not be accessible to the user.

The equipment shall be marked in a visible place. This marking shall be legible, tamperproof and durable.

The marking shall include:

- the name of the manufacturer or his trade mark;
- type number of designation and serial number;
- type approval number (when allocated by appropriate authorities).

5 Radio test configuration, test signals and test modes

This clause outlines, in terms of functional blocks, the test system required to perform the radio test procedures and test modes used in clauses 8, 9 and 10.

5.1 General functional radio test configuration

The radio test system configuration shown in figure 1 is presented for information only and is not mandatory. The equipment under test shall be connected to the test system via the antenna connector. The tasks and characteristics of the test system functional blocks are described in annex B, clause B.1. All power level and frequency characteristics specified shall be, unless otherwise stated, referred to the antenna connector of the equipment under test.

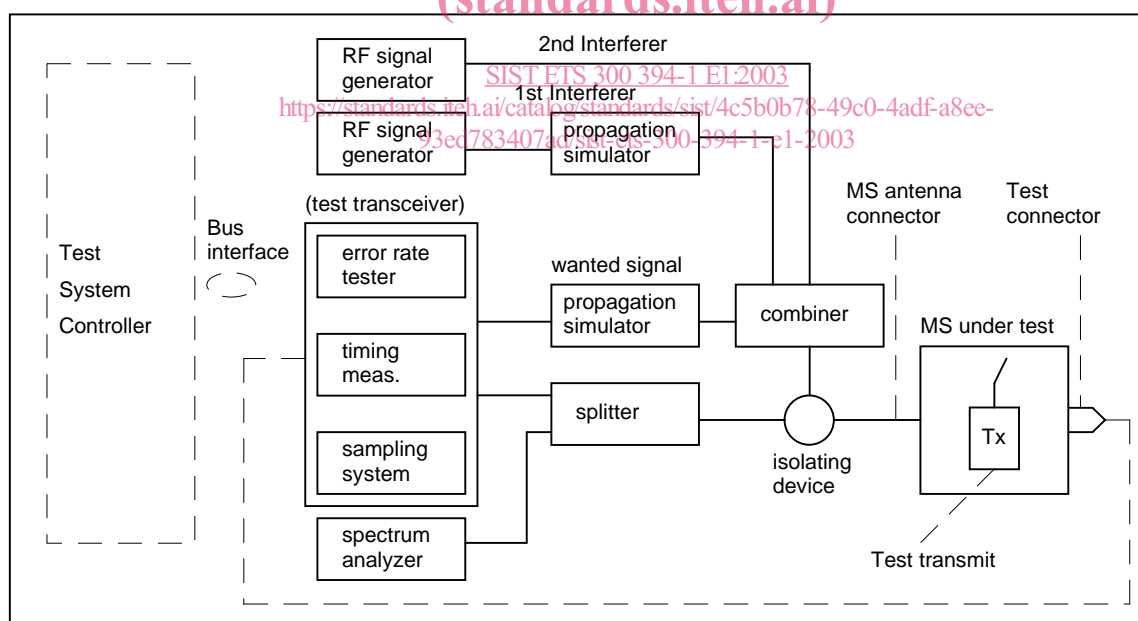


Figure 1: Radio test configuration

5.2 Radio test modes

The manufacturer shall provide the means to operate the equipment under test in either test transmit or test receive modes. The MS under test shall be instructed which test mode to operate in using the Tx_on parameter contained in the BNCH/T(V+D) or MBCH/T(PDO) channels of test signal T1 transmitted by the test system. Further details of test signal T1 and the contents of BNCH/T and MBCH/T are found in subclause 5.3.2 and annex A, clause A.3. For a BS under test the manufacturer shall provide the means to configure the BS operation for all type tests to be conducted.

5.2.1 Test receive mode**5.2.1.1 MS test receive mode**

In test receive mode the MS under test shall provide at the test connector a decoded data output for each downlink logical channel (control, traffic) to be tested. The logical channel type to be decoded is indicated using the T1_burst_type parameter in the BNCH/T(V+D) or MBCH/T(PDO).

In all cases whenever the MS decodes a timeslot containing BSCH and BNCH/T(V+D) or MBCH/T(PDO) the MS shall provide the data decoded from these channels at the test connector. In the case where the MS detects an erroneous message on the BSCH, BNCH/T(V+D) or MBCH(TPDO) transmitted by the test equipment during frame 18, the MS shall remain in the same state as it was on frames 1 to 17.

5.2.1.2 BS test receive mode

Using the method provided by the manufacturer, the BS in test receive mode shall be configured to receive the desired logical channel type from the test system. The BS shall operate in its normal mode and provide at the test connector the decoded data output of each uplink logical channel tested.

A V+D BS shall be configured to receive the desired logical channel on timeslot 1 of each uplink frame. During testing the test system shall use the down link BS transmissions to synchronise its uplink burst frequency and timing. The BS shall transmit in timeslot 1 of frame 18 a downlink synchronization burst according to table 1.

Table 1: Base Station down link synchronization burst

Burst type	Block 1	Block 2	Broadcast Block
synchronization	BSCH	BNCH/T	AACH

The downlink synchronization burst contains both BSCH and BNCH/T channels, which includes the T1_burst_type parameter indicating the logical channel the BS is expecting to receive. The BNCH/T is a logical channel specific to the test mode. The contents of the BSCH and BNCH/T channels used during testing are defined in annex A, clause A.3. For a V+D BS in continuous mode time slots 1 to 4 of downlink frames 1 to 17 and time slots 2 to 4 of downlink frame 18 are filled with a channel type 1 signal, see subclause 5.3.2 for details of channel types. For a V+D BS in discontinuous mode time slot 1 of downlink frames 1 to 17 are filled with a channel type 1 signal.

Unless otherwise specified the following configuration shall be used:

- channel type 1 (see subclause 5.3.2 for details);
- the parameters MS_TXPWR_MAX_CELL shall be set to 15 dBm;
- the parameter ACCESS_PARAMETER shall be set to - 53 dBm.

A PDO BS shall transmit in sub burst 1 a down link synchronization burst according to table 2.

Table 2: Sub burst type

Sub burst type	
synchronization	MBCH/T

The downlink synchronization burst shall be used by the test system to synchronise its uplink sub burst frequency and timing.

The MBCH/T is a logical channel specific to the test mode. The contents of the MBCH/T used during testing are defined in annex A, clause A.3. On down link sub bursts 2 to 150 a channel type 6 signal shall be sent by the BS under test.