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## Terrestrial Trunked Radio (TETRA); Testing specification; Part 1: Radio

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## Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee TETRA and Critical Communications Evolution (TCCE).

The present document contains text concerning 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 present document is part 1 of a multi-part deliverable covering the 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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## Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

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## Introduction

The present document includes Direct Access and multislot receiver testing in addition to the earlier Release 2 tests and is aligned with ETSI EN 300 392-2 [1].

# 1 Scope

The present document recommends methods for testing whether TETRA Voice plus Data (V+D) Base Station (BS) and Mobile Station (MS) equipment and TETRA Direct Mode Operation (DMO) equipment achieve the performance specified in ETSI EN 300 392-2 [1]. Specific test methods for DMO equipment are recommended 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 137 MHz to 1 GHz.

Versions V3.3.1 [i.5] and earlier of the present document specified the methods used for type testing. The minimum technical characteristics of TETRA Voice plus Data (V+D) Base Station (BS) and Mobile Station (MS) equipment and TETRA Direct Mode Operation (DMO) equipment and radio test methods to be used for providing presumption of conformity, are now specified in ETSI EN 303 758 [i.4].

# 2 References

## 2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

- [1] ETSI EN 300 392-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)" / ETSI TS 100 392-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".

NOTE: The references ETSI EN 300 392-2 and ETSI TS 100 392-2 are two instances of the same document and the latest version of those is used as the normative reference. For a shorter presentation only ETSI EN 300 392-2 is used as the reference in the present document.

- [2] Recommendation ITU-T O.153: "Basic parameters for the measurement of error performance at bit rates below the primary rate".
- [3] 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".
- [4] Recommendation ITU-T V.1: "Equivalence between binary notation symbols and the significant conditions of a two-condition code".
- [5] ISO 2110:1989: "Information technology - Data communication - 25-pole DTE/DCE interface connector and contact number assignments".
- [6] ETSI EN 300 395-4: "Terrestrial Trunked Radio (TETRA); Speech codec for full-rate traffic channel; Part 4: Codec conformance testing".
- [7] ETSI EN 300 396-2: "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 2: Radio aspects".
- [8] ETSI EN 300 392-1: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 1: General Network Design".

- [9] ETSI EN 300 392-7: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 7: Security".
- [10] 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)".
- [11] 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)".
- [12] ETSI EN 300 395-2 (V3.3.1): "Terrestrial Trunked Radio (TETRA); Speech codec for full-rate traffic channel; Part 2: TETRA codec".

## 2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI ETR 028: "Radio Equipment and Systems (RES); Uncertainties in the measurement of mobile radio characteristics".
- [i.2] ETSI EN 300 396-1: "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 1: General network design".
- [i.3] ETSI TS 101 293: "Digital cellular telecommunications system (Phase 2+); Individual equipment type requirements and interworking; Special conformance testing functions (3GPP TS 04.14)".
- [i.4] ETSI EN 303 758: "TETRA radio equipment using non-constant envelope modulation operating in a channel bandwidth of 25 kHz, 50 kHz, 100 kHz or 150 kHz; Harmonised Standard for access to radio spectrum".
- [i.5] ETSI EN 300 394-1 (V3.3.1): "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 1: Radio".

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## 3 Definition of terms, symbols and abbreviations

### 3.1 Terms

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

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

**test facility:** organisation with the means and equipment needed to perform 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 symbols given in ETSI EN 300 392-2 [1] and the following apply:

$f_{lo}$	local oscillator frequency applied to first receiver mixer
$if_1...if_n$	receiver intermediate frequencies

$P_{MS}$	access power
$P_Q$	power level of test QAM burst
E	Stop bit
Message	Information on layer 3

### 3.3 Abbreviations

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

AACH	Access Assignment CHannel
AACH-Q	Access Assignment CHannel, QAM
AC	Alternating Current
ACCH-Q	Access Assignment CHannel, QAM
AGC	Automatic Gain Control
AI	Air Interface
ASSI	Alias Short Subscriber Identity
BBK	Broadcast BloCk
BCC	Base station Colour Code
BCCH	Broadcast Control CHannel
BER	Bit Error Rate
BFI	Bad Frame Indication
BLCH	Base station Linearization CHannel
BLCH-Q	Base station Linearization CHannel, QAM
BNCH	Broadcast Network CHannel
BNCH/T	Broadcast Network CHannel, Test mode
BSCH	Broadcast Synchronization CHannel
BSCH/T	Broadcast Synchronization CHannel, Test mode
BSCH-Q	Broadcast Synchronization CHannel, QAM
BW	BandWidth
C/I	Carrier to Interference ratio
C/Ia	Carrier to Interference ratio for adjacent channel
C/Ic	Carrier to Interference ratio for co-channel
CA MS	Conventional Access Mobile Station
CA	Conventional Access
CCK	Common Cipher Key
CLCH	Common Linearization CHannel
CLCH-Q	Common Linearization CHannel, QAM
CP	Control Physical channel
CR	Change Request
CRC	Cyclic Redundancy Check
DA MS	Direct Access Mobile Station
DA	Direct Access
DATO	DATa Output
dBc	deciBels relative to carrier power
dBm	deciBels relative to one mW
DC	Direct Current
DGNA	Dynamic Group Number Assignment
DM	Direct Mode
DM-GATE	Direct Mode operation - GATEway
DM-MS	Direct Mode - Mobile Station
DMO	Direct Mode Operation
DM-REP	Direct Mode - REPeater
DM-REP/GATE	Direct Mode - REPeater/GATEway
DNB	Direct mode Normal Burst
DO-MS	Direct mode Only Mobile Station
DQPSK	Differential Quadrature Phase Shift Keying
DSB	Direct Synchronization Burst
DTX	Discontinuous Transmission
DU-MS	DUAl mode Mobile Station
DUT	Device Under Test

DW-MS	Dual Watch - Mobile Station
ETX	End of data
FCB	Frequency Correction downlink Burst
FCS	Frame Check Sequence
FER	Frame Erasure Rate
FN	Frame Number
HTHV	High Temperature High Voltage
HTLV	High Temperature Low Voltage
IE	Information Element
IMM	IMMediate access parameter
ISSI	Individual Short Subscriber Identity
ITSI	Individual TETRA Subscriber Identity
IUT	Implementation Under Test
LCH	Linearization CHannel
LDB	Linearization Downlink Burst
LLC	Logical Link Control
LTHV	Low Temperature High Voltage
LTLV	Low Temperature Low Voltage
LTT-SAP	Service Access Point for TT entity to access Mobile Link Entity (MLE)
MAC	Medium Access Control
MCC	Mobile Country Code
MCCH	Main Control CHannel
MER	Message Erasure Rate
MI	Message Identifier
MIN	Minimum
MLE	Mobile Link Entity
MM	Mobility Management
MMI	Man Machine Interface
MN	Multiframe Number
MNC	Mobile Network Code
MS/BS	MS or BS
OTAR	Over The Air Rekeying
PACQ	Probability of synchronization burst ACquisition
PCM	Pulse Code Modulation
PDU	Protocol Data Unit
PL	Power Level
PRBS	Pseudo Random Bit Sequence
PUEM	Probability of Undetected Erroneous Message
QAM	Quadrature Amplitude Modulation
RCPC	Rate Compatible Punctured Convolutional
RDC	Radio Downlink Counter
RF	Radio Frequency
RM	Reed-Muller
RMS	Root Mean Square
RMSVE	Root Mean Square Vector Error
RSSI	Received Signal Strength Indicator
Rx	Receiver
SAP	Service Access Point
SB	Synchronization downlink Burst
SCH/F	Signalling CHannel Full
SCH/H	Half-Slot Signalling Channel
SCH/HD	Signalling CHannel, Half size Downlink
SCH/HU	Signalling CHannel, Half size Uplink
SCH/S	Synchronization Channel
SDU	Service Data Unit
SICH	Slot Information CHannel
SICH-Q	Slot Information CHannel, QAM
SIM	Subscriber Identity Module
SNDCP	SubNetwork Dependent Convergence Protocol
SN-Q	Symbol Number in QAM
SS	Supplementary Service
SSI	Short Subscriber Identity

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ETSI TS 100 394-1 V4.1.1 (2021-03)

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