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Terrestrial Trunked Radio (TETRA) Harmonized EN for TETRA equipment covering essential requirements under article 3.2 of the R&TTE Directive; Part 1: Voice plus Data (V+D)

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Candidate Harmonized European Standard (Telecommunications series)

Terrestrial Trunked Radio (TETRA); Harmonized EN for TETRA equipment covering essential requirements under article 3.2 of the R&TTE Directive; Part 1: Voice plus Data (V+D)

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Foreword

This Candidate Harmonized European Standard (Telecommunications series) has been produced by ETSI Project Terrestrial Trunked Radio (TETRA).

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity ("the R&TTE Directive") [1].

The present document is part 1 of a multi-part deliverable covering Harmonized EN for TETRA equipment covering essential requirements under article 3.2 of the R&TTE Directive, as identified below:

Part 1: "Voice plus Data (V+D)"; (standards.iteh.ai)

Part 2: "Direct Mode Operation (DMO)".

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Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 March 2002
Date of withdrawal of any conflicting National Standard (dow):	31 March 2002

Introduction

The present document is part of a set of standards designed to fit in a modular structure to cover all radio and telecommunications terminal equipment under the R&TTE Directive [1]. Each standard is a module in the structure. The modular structure is shown in figure 1.

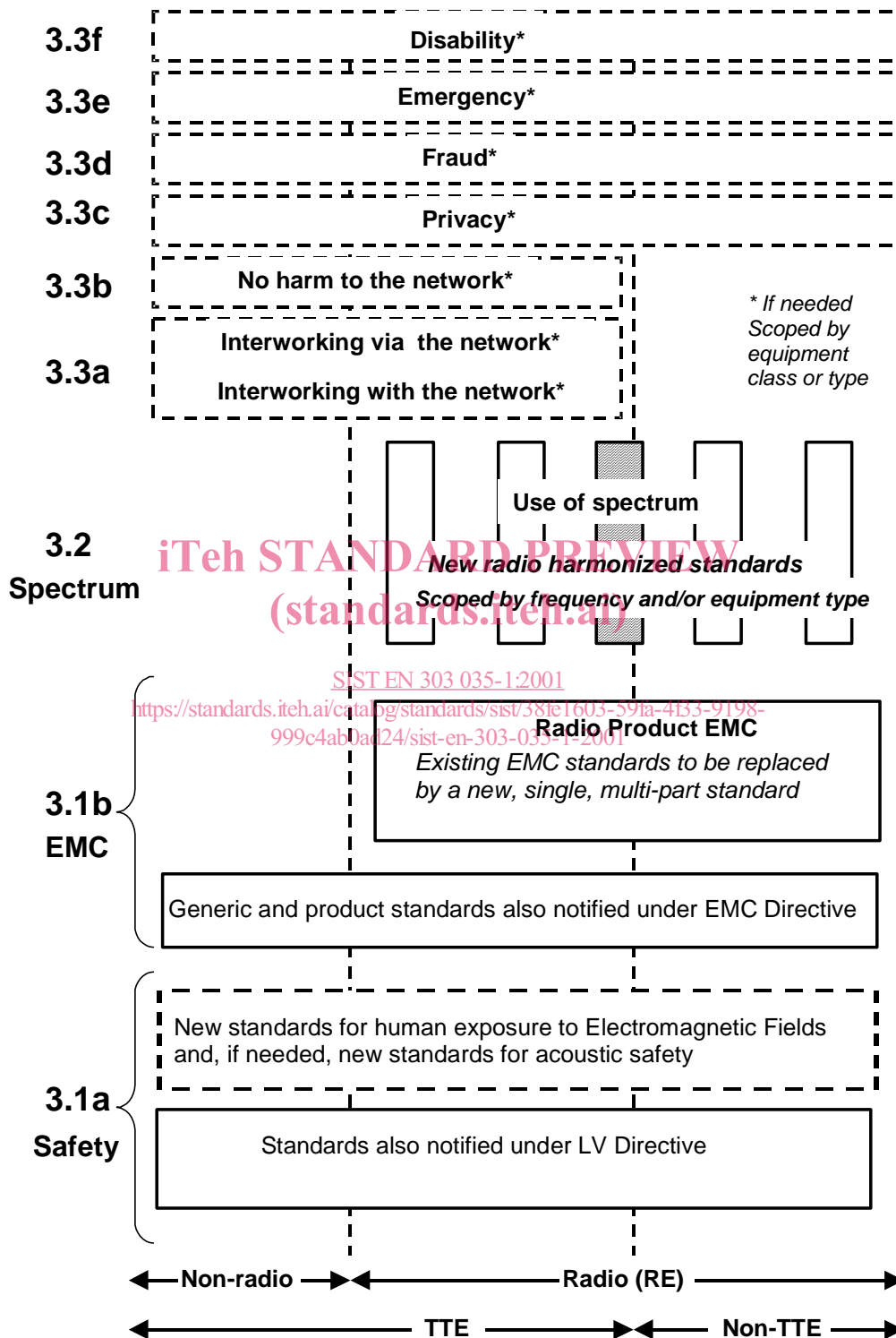


Figure 1: Modular structure for the various standards used under the R&TTE Directive

The left hand edge of the figure shows the different clauses of article 3 of the R&TTE Directive [1].

For article 3.3 various horizontal boxes are shown. Dotted lines indicate that at the time of publication of the present document, essential requirements in these areas have to be adopted by the Commission. If such essential requirements are adopted, and as far and as long as they are applicable, they will justify individual standards whose scope is likely to be specified by function or interface type.

The vertical boxes show the standards under article 3.2 for the use of the radio spectrum by radio equipment. The scopes of these standards are specified either by frequency (normally in the case where frequency bands are harmonized) or by radio equipment type.

For article 3.1b the diagram shows the new single multi-part product EMC standard for radio, and the existing collection of generic and product standards currently used under the EMC Directive [2]. The parts of the present document will become available in the second half of 2000, and the existing separate product EMC standards will be used until it is available.

For article 3.1a the diagram shows the existing safety standards currently used under the LV Directive [3] and new standards covering human exposure to electromagnetic fields. New standards covering acoustic safety may also be required.

The bottom of the figure shows the relationship of the standards to radio equipment and telecommunications terminal equipment. A particular equipment may be radio equipment, telecommunications terminal equipment or both. A radio spectrum standard will apply if it is radio equipment. An article 3.3 standard will apply as well only if the relevant essential requirement under the R&TTE Directive [1] is adopted by the Commission and if the equipment in question is covered by the scope of the corresponding standard. Thus, depending on the nature of the equipment, the essential requirements under the R&TTE Directive [1] may be covered in a set of standards.

The modularity principle has been taken because:

- it minimizes the number of standards needed. Because equipment may, in fact, have multiple interfaces and functions it is not practicable to produce a single standard for each possible combination of functions that may occur in an equipment;
- it provides scope for standards to be added:
 - under article 3.2 when new frequency bands are agreed; or
 - under article 3.3 should the Commission take the necessary decisions without requiring alteration of standards that are already published;
- it clarifies, simplifies and promotes the usage of Harmonized Standards as the relevant means of conformity assessment.

1 Scope

The present document specifies the technical characteristics to be provided by Terrestrial Trunked Radio (TETRA) radio and telecommunications terminal equipment, which uses the TETRA technology for Trunked Mode Operation at the air interface to support the Voice plus Data (V+D) functionality.

The present document applies at the TETRA Voice plus Data (V+D) Air interface of the following radio and telecommunications terminal equipment types:

- 1) TETRA Base Station (BS);
- 2) TETRA Mobile Station (MS);
- 3) TETRA DMO Gateway (DM-GATE);
- 4) TETRA TMO Repeater (TMO-REP).

It applies to terminal equipment operating within the frequency ranges, allocated to TETRA by the ERC Decisions ERC/DEC/(96)01 [21] and ERC/DEC/(96)04 [22].

These radio equipment types are capable of operating in all or any part of the frequency bands given below:

Table 1: Radio communications service frequency bands

Type of Service	Radio communications service frequency bands (MHz)	
	Uplink	Downlink
Emergency Access, ERC/DEC/(96)01 [21]	380 to 385	390 to 395
Civil Access, ERC/DEC/(96)04 [22]	410 to 420	420 to 430
Civil Access, ERC/DEC/(96)04 [22]	870 to 876	915 to 921
Civil Access, ERC/DEC/(96)04 [22]	450 to 460	460 to 470
Civil Access, ERC/DEC/(96)04 [22]	385 to 390	395 to 399,99

The present document is intended to cover the provisions of Directive 1999/5/EC (R&TTE Directive) [1], article 3.2, which states that "..... radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communications and orbital resources so as to avoid harmful interference".

In addition to the present document, other ENs that specify technical requirements in respect of essential requirements under other parts of article 3 of the R&TTE Directive [1] will apply to equipment within the scope of the present document.

NOTE: A list of such ENs is included on the web site <http://www.newapproach.org>.

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 and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

- [1] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).

- [2] 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).
- [3] Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (LV Directive).
- [4] ETSI TS 100 392-2 (V2.3.1, 2000): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".
- [5] ETSI TS 100 392-7 (V2.1.1, 2000): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 7: Security".
- [6] ETSI ETS 300 392-14 (Edition 1, 1997): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 14: Protocol Implementation Conformance Statement (PICS) proforma specification".
- [7] ETSI TS 100 392-15 (V1.1.1, 2000): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 15: TETRA frequency bands, duplex spacings and channel numbering".
- [8] ETSI TS 100 394-1 (V2.3.1, 2000): "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 1: Radio".
- [9] ETSI ETS 300 394-2-1 (Edition 1, 1998): "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 2: Protocol testing specification for Voice plus Data (V+D); Sub-part 1: Test suite structure and test purposes".
- [10] ETSI ETS 300 394-2-2 (Edition 1, 1998): "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 2: Protocol testing specification for Voice plus Data (V+D); Sub-part 2: Abstract Test Suite (ATS) for Network (NWK) layer".
- [11] ETSI ETS 300 394-2-3 (Edition 1, 1998): "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 2: Protocol testing specification for Voice plus Data (V+D); Sub-part 3: Abstract Test Suite (ATS) for Logical Link Control (LLC)".
- [12] ETSI ETS 300 394-2-4 (Edition 1, 1998): "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 2: Protocol testing specification for Voice plus Data (V+D); Sub-part 4: Abstract Test Suite (ATS) for Medium Access Control (MAC)".
- [13] ETSI ETS 300 394-4-8 (Edition 1, 1999): "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 4: Protocol testing specification for Direct Mode Operation (DMO); Sub-part 8: Test suite structure and test purposes (TSS&TP) for Direct Mode Gateway (DM-GATE)".
- [14] ETSI ETS 300 394-4-10 (Edition 1, 1999): "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 4: Protocol testing specification for Direct Mode Operation (DMO); Sub-part 10: Abstract Test Suite (ATS) for Direct Mode Gateway (DM-GATE)".
- [15] ETSI ETS 300 394-5-1 (Edition 1, 1999): "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 5: Security; Sub-part 1: Protocol Implementation Conformance Statement (PICS) proforma specification".
- [16] ETSI ETS 300 394-5-2 (Edition 1, 1999): "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 5: Security; Sub-part 2: Protocol testing specification for TETRA security".
- [17] ETSI ETS 300 394-5-3 (Edition 1, 1999): "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 5: Security; Sub-part 3: Abstract Test Suite (ATS)".
- [18] ETSI ETS 300 396-5 (Edition 1, 2000): "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 5: Gateway air interface".
- [19] ETSI ETS 300 396-8-3 (Edition 1, 1999): "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 8: Protocol Implementation Conformance Statement (PICS) proforma specification; Sub-part 3: Gateway Air Interface (AI)".

- [20] ETSI TS 101 789-1 (V1.1.1, 2000): "Terrestrial Trunked Radio (TETRA); TMO Repeaters; Part 1: Requirements, test methods and limits".
- [21] CEPT ERC/DEC/(96)01: "ERC Decision of 7 March 1996 on the harmonized frequency band to be designated for the introduction of the Digital Land Mobile System for the Emergency Services".
- [22] CEPT ERC/DEC/(96)04: "ERC Decision of 7 March 1996 on the frequency bands for the introduction of the Trans European Trunked Radio System (TETRA)".
- [23] ETSI ETR 028 (Edition 2, 1994): "Radio Equipment and Systems (RES); Uncertainties in the measurement of mobile radio equipment characteristics".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in the R&TTE Directive [1] and the following apply.

acknowledged data transfer: service provided by the layer below which gives an acknowledgement back over the air interface from the lower layer peer entity. This service is used by the layer 3 entities to get a secure transmission including re-transmissions

announced cell re-selection: cell re-selection where MS-MLE informs the SwMI both in the old cell (leaving cell) and in the new cell (arriving cell) that cell change is performed

Associated Control CHannel (ACCH): dedicated signalling channel associated with a channel that has been assigned for circuit mode traffic. It comprises the Fast Associated Control CHannel (FACCH), which uses frames 1 to 18 when there is no traffic in a given direction, or the Slow Associated Control CHannel (SACCH), which is always available in frame 18 when there is traffic

attached: a MS is said to be attached to a cell when the MS is camped and registered on the cell. The MS may be in idle mode (i.e. not actively processing a transaction) or in active mode (i.e. actively processing a transaction in reception and/or in transmission). It is the MM, which decides when a MS is said to be attached

basic link: bi-directional connectionless path between one or several MS and a BS, with a provision of both unacknowledged and acknowledged services on a single message basis

broadcast: unidirectional point to multi-point mode of transmission

cell re-selection: act of changing the serving cell from an old cell to a new cell. The cell re-selection is performed by procedures located in the MLE and in the MAC. When the re-selection is made and possible registration is performed, the MS is said to be attached to the cell

common control channels: control channels transmitted by the infrastructure to control the MS population. They comprise the Main Control Channel (MCCH) and common Secondary Control Channels (SCCH)

Direct Mode GATEway (DM-GATE): device which provides gateway connectivity between a Direct Mode Mobile Station and the TETRA V+D network. The gateway provides the interface between TETRA DMO and TETRA V+D mode

direct set-up signalling: signalling procedure where immediate communication can take place between the calling and the called users without the alerting process and without an explicit response from the called user that he has answered

duplex frequency spacing: fixed frequency spacing between up and downlink frequencies directions

environmental profile: range of environmental conditions under which equipment within the scope of the present document is required to comply with the provisions of the present document

Individual TETRA Subscriber Identity (ITSI): identity used to specify an individual TETRA user. An ITSI cannot be shared by multiple users

initial cell selection: act of choosing a first serving cell to register in. The initial cell selection is performed by procedures located in the MLE and in the MAC. When the cell selection is made and possible registration is performed, the MS is said to be attached to the cell

Linearization CHannels (BLCH and CLCH): channels, which may be used by the equipment to linearize its transmitter. The linearization burst contains no useful bits

logical channel: generic term for any distinct data path. Logical channels are considered to operate between logical endpoints

Main Control Channel (MCCH): principal common control channel transmitted by the infrastructure to control the MSs in a cell. The frequency of the main carrier for the cell is broadcast by the infrastructure, and the MCCH is located on timeslot 1 of the main carrier

on/off hook signalling: signalling procedure, which includes an alerting process to the called user. An explicit response from the called user that he has answered is waited before the call can be set-up

Random Challenge (RAND1, RAND2): random value generated by the infrastructure to authenticate a user or in an MS to authenticate the infrastructure, respectively

Random Seed (RS): random value used to derive a session authentication key from the authentication key

Response (RES1, RES2): value calculated in the MS from RAND1 and a session key to prove the authenticity of a user to the infrastructure or by the infrastructure from RAND2 and a session key to prove its authenticity to a user, respectively

Secondary Control Channel (SCCH): control channel other than the MCCH

TETRA Equipment Identity (TEI): electronic serial number that is permanently embedded in the TETRA equipment

TMO Repeater: bi-directional Radio Frequency (RF) amplifier which can amplify and transmit a received Mobile Station (MS) signal in the TETRA MS transmit band, simultaneously it can amplify and transmit a received Base Station (BS) RF signal in the TETRA BS transmit band

Trunked Mode operation (TMO): mode of operation where a network is used for communication

unacknowledged data transfer: service provided by the layer below which does not give any acknowledgement back to over the air interface from the lower layer peer entity

unannounced cell re-selection: cell re-selection where the MS-MLE does not inform the old cell (leaving cell) that it intends to change to a new cell. Only the new cell (arriving cell) is informed about the MS-MLE

undeclared cell re-selection: cell re-selection where the MS-MLE does not inform the old cell (leaving cell) nor the new cell (arriving cell) that cell change is performed

useful part of a burst: modulation symbol times SN0 to SNmax of a burst

V+D operation: mode of operation where MSs may communicate via the TETRA V+D air interface, which is controlled by the TETRA Switching and Management Infrastructure (SwMI)

3.2 Abbreviations

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

AACH	Access Assignment CHannel
ACCH	Associated Control CHannel
AT	ATtachment
ATS	Abstract Test Suite
BA	Basic link, Acknowledged service
BCCH	Broadcast Control CHannel
BI	Behaviour Invalid
BLCH	Base station Linearization CHannel
BNCH	Broadcast Network CHannel
BS	Base Station

BSCH	Broadcast Synchronization CHannel
BV	Behaviour Valid
CA	CApability test
CC	Call Control
CLCH	Common Linearization CHannel
CM	Circuit Mode
CMCE	Circuit Mode Control Entity
CR	Cell Reselection
CSS	Carrier Specific Signalling
DM-GATE	Direct Mode GATEway
DM-MS	Direct Mode Mobile Station
DMO	Direct Mode Operation
EMC	Electro-Magnetic Compatibility
EN	European Norme
EN-RT	EN Requirement Table
ETS	European Telecommunication Standard
FCS	Frame Check Sequence
GC	Group Call
GSSI	Group Short Subscriber Identity
GW	Direct Mode GateWay
HD	Half-slot Down-link
HU	Half-slot Up-link
IC	Individual Call
ID	Identity
IMP	IMPlicit
ITSI	Individual TETRA Subscriber Identity
IUT	Implementation Under Test
L3	Layer 3
LA	Location Area
LLC	Logical Link Control
LV	Low Voltage
MA	MAintenance
MAC	Medium Access Control
MCC	Mobile Country Code
MCCH	Main Control CHannel
MCM	Minimum Control Mode
MLE	Mobile Link Entity
MM	Mobility Management
MNC	Mobile Network Code
MNI	Mobile Network Identity
MS	Mobile Station
NB	Network Broadcast
NCM	Normal Control Mode
NWK	NetWorK layer
OC	Outgoing Call
PD	Permanent Disable
PDU	Protocol Data Unit
PICS	Protocol Implementation Conformance Statement
PIXIT	Protocol Implementation eXtra Information for Testing
R&TTE	Radio and Telecommunications Terminal Equipment
RA	Random Access
RAND1	RANDom challenge 1
RE	REserved Access (for MAC layer), or REgistration (for MLE layer), or Radio Equipment
RES2	RESponse 2
RF	Radio Frequency
RS	Random Seed
RT	Requirements Table
s	Seconds
SCCH	Secondary Control CHannel
SCH	Signalling CHannel
SCH/F	Signalling CHannel, Full-slot
SCH/H	Signalling CHannel, Half-slot

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