



# SLOVENSKI STANDARD

## SIST ETS 300 396-1 E1:2003

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Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 1: General network design

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33.070.10	Prizemni snopovni radio (TETRA)	Terrestrial Trunked Radio (TETRA)
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## Foreword

This European Telecommunication Standard (ETS) has been produced by the Terrestrial Trunked Radio (TETRA) Project of the European Telecommunications Standards Institute (ETSI).

This ETS is a multi-part standard and will consist of the following parts:

**Part 1: "General network design";**

Part 2: "Radio Aspects";

Part 3: "Mobile Station to Mobile Station (MS-MS) Air Interface (AI) protocol";

Part 4: "Repeater type 1", (DE/RES-06007-4);

Part 5: "Gateway", (DE/RES-06007-5);

Part 6: "Security", (DE/RES-06007-6);

Part 7: "Repeater type 2", (DE/TETRA-02007-7);

Part 8: "PICS proforma", (DE/TETRA-02007-8);

Part 9: "SDL model", (DE/TETRA-02007-9).

Transposition dates	
Date of adoption of this ETS:	6 March 1998
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## 1 Scope

This European Telecommunication Standard (ETS) defines the TERrestrial Trunked RADio (TETRA) Direct Mode Operation (DMO). It specifies the basic air interface, the inter-working between Direct Mode (DM) groups via repeaters, and inter-working with the TETRA Voice plus Data (V+D) system via gateways. It also specifies the security aspects in TETRA DMO, and the intrinsic services that are supported in addition to the basic bearer services and teleservices.

This part applies to the general network design of TETRA DMO as follows:

- it defines and specifies the circuit mode reference points for the Mobile Station (MS), repeater and gateway to the Switching and Management Infrastructure (SwMI);
- it defines and specifies models of the air interface protocol stack where the different functions of layers and sub-layers are listed;
- it defines and specifies the TETRA DMO addressing and identities and their organization in groups corresponding to the different functions;
- it defines and specifies the functions provided by the circuit mode teleservices used for speech and basic services used for data transfer;
- it defines and specifies the intrinsic services that extend the capabilities of the circuit mode bearer services and teleservices;
- it defines and specifies the functions related to the transport of short data messages.

NOTE: This part of this ETS may, by its nature as a general design statement, require updating as later specific parts of the ETS are completed in order to avoid any non-alignment. If a discrepancy occurs between this part and any other part of this ETS, then the other part will take precedence. This part will be updated at a frequency consistent with maintaining the integrity of this ETS as a whole.

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## 2 Normative references

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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 300 396-2: "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 2: Radio aspects".                                                        |
| [2] | ETS 300 392-1: "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Voice plus Data (V+D); Part 1: General network design".                                          |
| [3] | ETS 300 395-2: "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Speech codec for full-rate traffic channels; Part 2: TETRA codec".                               |
| [4] | ETS 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". |
| [5] | CCITT Recommendation X.121 (1992): "International numbering plan for public data networks".                                                                                               |

- [6] CCITT Recommendation E.212 (1988): "Identification plan for land mobile stations".
- [7] ITU-T Recommendation I.411 (1993): "ISDN user-network interfaces - Reference configurations".

### 3 Definitions and abbreviations

#### 3.1 Definitions

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

**Bit Error Ratio (BER):** The limit ratio of the bits wrongly received to all bits received in a given logical channel.

**call transaction:** All of the functions associated with a complete unidirectional transmission of information during a call. A call can be made up of one or more call transactions. In a simplex call these call transactions are sequential.

**Direct Mode (DM):** A mode of simplex operation where mobile subscriber radio units may communicate using radio frequencies which may be monitored by but which are outside the control of the TETRA Trunked network. DM is performed without intervention of any Base Station (BS).

**Direct Mode Call Control (DMCC):** The layer 3 entity responsible for setting up and maintaining a call in DM.

**Direct Mode Mobile Station (DM-MS):** A physical grouping that contains all of the mobile equipment that is used to obtain TETRA DM services. By definition, a DM-MS contains at least one Mobile Radio Stack (MRS). For synchronization purposes, DM-MSs can have one of two status levels:

- **master:** if the DM-MS is either active in a call transaction transmitting traffic or control data, or is reserving the channel by means of channel reservation signalling and hence is providing synchronization information to the channel;
- **slave:** if the DM-MS is receiving traffic and/or signalling and hence is deriving synchronization information from the channel.

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

**Direct Mode REPeater (DM-REP):** A device that operates in TETRA DM and provides a repeater function to enable two or more DM-MSs to extend their coverage range.

**Direct Mode REPeater/GATEway (DM-REP/GATE):** A device that combines the functionality of a DM-REP and a DM-GATE in a single unit.

**DUal mode switchable MS (DU-MS):** A MS that can operate either in TETRA DMO or TETRA V+D mode. Only one mode can be selected at any given time and the MS is not capable of monitoring DM channels while in V+D mode or V+D channels while in DMO.

**Dual Watch MS (DW-MS):** A MS that can operate either in TETRA DMO or TETRA V+D mode. Only one mode can be selected at any given time but the MS is capable of monitoring the V+D mode control channel while in DMO or a DM channel while in V+D mode.

**frequency efficient mode:** Mode of operation where two independent DM communications are supported on a single radio frequency carrier. In frequency efficient mode the two DM channels are identified as channel A and channel B.

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

**Message Erasure Rate (MER):** The limit ratio of the messages detected as wrong by the receiver to all messages received in a given logical channel.

**normal mode:** Mode of operation where only one DM communication is supported on a radio frequency carrier.

**recent user:** The DM-MS that was master of the call transaction immediately prior to the current master's call transaction in a call.

**recent user priority:** A service which gives the recent user a preferred access to request transmission when the current master is ceasing its call transaction in a group call. This service is controlled by the current master.

**simplex:** A mode of single or dual frequency working in which information can be transferred in both directions but not at the same time.

### 3.2 Abbreviations

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

AI	Air Interface
BER	Bit Error Rate
BS	Base Station
CRC	Cyclic Redundancy Check
DLL	Data Link Layer
DM-GATE	Direct Mode GATEway.
DM-MS	Direct Mode Mobile Station
DM-REP	Direct Mode REPeater
DM-REP/GATE	Direct Mode REPeater/GATEway
DMCC	Direct Mode Call Control
DMMM	Direct Mode Mobility Management
DMO	Direct Mode Operation
DO-MS	Direct mode Only Mobile Station
DSDA	Destination Short Data Agent
DSB	Direct mode Synchronization Burst
DU-MS	DUAL mode switchable Mobile Station
DW-MS	Dual Watch Mobile Station
ESN	Electronic Serial Number
FAC	Final Assembly Code
FEC	Forward Error Correction
GSSI	Group Short Subscriber Identity
GTSI	Group TETRA Subscriber Identity
ISSI	Individual Short Subscriber Identity
ITSI	Individual TETRA Subscriber Identity
LS	Line connected Station
MCC	Mobile Country Code
MER	Message Erasure Rate
MMI	Man Machine Interface
MNC	Mobile Network Code
MNI	Mobile Network Identity
MRS	Mobile Radio Stack
MS	Mobile Station
MT	Mobile Termination
OSD	Originating Short Data
OSDA	Originating Short Data Agent
OTAR	Over The Air Re-keying
PACQ	Probability of synchronization burst ACQuisition
PDU	Protocol Data Unit
PL	Physical Layer
RSSI	Radio-Signal-Strength-Indicator
SCH	Signalling CHannel
SCK	Static Cipher Key
SDS	Short Data Service

SDU	Service Data Unit
SIM	Subscriber Identity Module
SS	Supplementary Services
SSCK	Sealed Static Cipher Key
SSI	Short Subscriber Identity
SwMI	Switching and Management Infrastructure
TAC	Type Approval Code
TEI	TETRA Equipment Identity
TSI	TETRA Subscriber Identity
TVP	Time Variant Parameter
Ud	abbreviation for Direct Mode Air Interface
Um	abbreviation for Trunked Mode (V+D) Air Interface
V+D	Voice plus Data

## 4 DMO reference points

In this clause a number of reference models are identified which apply to TETRA DMO. The purpose behind these models is to assist in providing a definition of the interfaces which exist between various device types and, if relevant, to any other involved terminal or network entities.

The reference models cover all distinct operating possibilities and provide a framework for describing the technical requirements for the various interfaces.

The abbreviations used in the reference models are defined in clause 3. The abbreviation DM-MS is used throughout the ETS as a generalized term to include all MSs capable of working in DMO. The full capability of any particular DM-MS is not a standardized parameter but is an issue for implementation.

Some basic assumptions on the likely types of mobile are however useful in order to define specific operational issues and where this is appropriate in this ETS, the following terminology is used:

DM-MS:	generalized term for any DMO capable MS;
DO-MS:	Direct mode Only MS;
DU-MS:	DUAL mode switchable MS;
DW-MS:	Dual Watch MS;
DM-REP:	Direct Mode REPeater;
DM-GATE:	Direct Mode GATEway;
DM-REP/GATE:	Direct Mode REPeater/GATEway.

Implementations which combine dual functionality in a single unit, e.g. a DM-REP and MS end equipment (see subclause 4.2), are not considered to be distinct and separate stations, but for the purposes of this ETS are considered to be combinations of those listed above.

In general DM-MS will be used as applying to all DM-MSs, but the other terms listed above may be applied where specific differentiation is necessary.

### 4.1 Reference models

#### 4.1.1 DM-MS

The basic reference model for DMO applies to a simple point-to-point or point-to-multipoint communication between DM-MSs using the Direct Mode Air Interface, Ud. Figure 1 shows the most basic configuration and is the most simple with which to define the range of services which are to be supported by DMO.

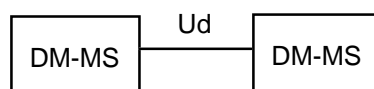


Figure 1: DM-MS connected to DM-MS via DM air interface, Ud