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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document is part 4 of a multi-part deliverable covering the Technical Requirements for Digital Mobile Radio (DMR), as identified below:

Part 1: "DMR Air Interface (AI) protocol";

Part 2: "DMR voice and generic services and facilities";

Part 3: "DMR data protocol";

Part 4: "DMR trunking protocol".

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1 Scope

The present document contains technical requirements for Digital Mobile Radio (DMR) trunking systems operating in the existing licensed land mobile service frequency bands, as identified in CEPT/ERC/T/R 25-08 [10].

The present document describes the trunking services and facilities protocol of a scalable Digital Mobile Radio system, which covers three tiers of possible products:

Tier I: DMR equipment having an integral antenna and working in Direct Mode (unit-to-unit) under a general authorization with no individual rights operation.

Tier II: DMR systems operating under individual licences working in Direct Mode (unit-to-unit) or using a Base Station (BS) for repeating.

Tier III: DMR trunking systems under individual licences operating with a controller function that automatically regulates the communications.

NOTE: Tier II and Tier III products encompass both simulcast and non-simulcast systems.

The DMR air interface complies with either EN 300 113-1 [1], EN 300 113-2 [2] or EN 300 390-1 [3], EN 300 390-2 [4], that has been specifically developed with the intention of being suitable for all identified product tiers.

The DMR protocol is intended to be applicable to the land mobile service frequency bands, physical channel offset, duplex spacing, range assumptions and all other spectrum parameters without need for any change.

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2 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 reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://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.

2.1 Normative references

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

[1] 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".

[2] ETSI EN 300 113-2: "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 2: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".

[3] ETSI EN 300 390-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land mobile service; Radio equipment intended for the transmission of data (and speech) and using an integral antenna; Part 1: Technical characteristics and test conditions".

[4] ETSI EN 300 390-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land mobile service; Radio equipment intended for the transmission of data (and speech) and using an integral antenna; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive".

[5] ETSI TS 102 361-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Mobile Radio (DMR) Systems; Part 1: DMR Air Interface (AI) protocol".

[6] ETSI TS 102 361-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Mobile Radio (DMR) Systems; Part 2: DMR voice and generic services and facilities".

[7] ETSI TS 102 361-3: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Mobile Radio (DMR) Systems; Part 3: DMR data protocol".

[8] IEC 61162-1: "Maritime navigation and radiocommunications equipment and systems - Digital Interfaces - Part 1: Single talker and multiple listeners".

[9] "The Unicode Standard".

NOTE: Available at: http://www.unicode.org/standard/standard.html.

[10] CEPT/ERC/T/R 25-08: "Planning criteria and coordination of frequencies in the Land Mobile Service in the range 29.7-921 MHz".

NOTE: Available at http://www.erodocdb.dk/docs/doc98/official/pdf/Tr2508.pdf.

[11] ISO/IEC 646 (1991): "Information technology -- ISO 7-bit coded character set for information interchange".

[12] ISO/IEC 8859 series (1998 - 2001): "Information technology -- 8-bit single-byte coded graphic character sets".

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2.2 Informative references

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 TS 102 361-4 (All versions): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Mobile Radio (DMR) Systems; Part 4: DMR trunking protocol".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

1:1-mode: 1 payload channel mode

NOTE: 1:1-mode supports one "MS to fixed end" duplex call or one simplex call with an optional inbound Reverse Channel using a two frequency BS.

2:1-mode: 2 payload channel mode

NOTE: 2:1-mode supports two independent calls which may be either "MS to fixed end" duplex calls or simplex calls using a two frequency BS.

All_Unit IDn: range of MS IDs to address all MS in a system (see TS 102 361-1 [5], annex A)

ambient listening: optional form of voice call where the called MS answers then may enters a proprietary listening operation such as transmitting with the microphone mute open

assigned channel: channel that has been allocated by the infrastructure to certain MSs using channel allocation command(s) addressed to those MSs

NOTE: An assigned channel may be allocated for secondary control purposes or for a circuit mode call.

asynchronous access: mode of operation whereby MS are permitted access to TS by employing the polite protocol defined in TS 102 361-2 [6]

NOTE: In this mode MS are not required to listen to a TSCC to first determine their access rights.

Base Station (BS): fixed end equipment that is used to obtain DMR services

bearer service: telecommunication service providing the capability for information transfer between access points

burst: elementary amount of bits within the physical channel

NOTE 1: The burst may include a guard time at the beginning and end of the burst used for power ramp-up and ramp-down.

NOTE 2: Two bursts with different length are defined for DMR. A TDMA bursts which has a length of 30 ms and a Reverse Channel burst which has a length of 10 ms.

NOTE 3: For detailed burst definition see TS 102 361-1 [5], clause 4.2.1.

NOTE 4: A burst represents the physical content (channel) of a timeslot.

call: complete sequence of related transactions between MSs

NOTE: Transactions may be one or more bursts containing specific call related information.

Caller Line Identity (CLI): ability to see who is calling you before answering the telephone

channel: in the Time Division Multiple Access (TDMA) slot structure arrangement a channel comprises the pair of same numbered slots on the inbound and outbound duplex frequencies

composite control channel: TSCC that may temporarily revert to a payload channel (if for instance the instantaneous traffic exceeds that which may be accommodated by the available payload channels)

Control plane (C-plane): part of the DMR protocol stack dedicated to control and data services

coverage area: geographical area within which the received signal strength from a radiating BS exceeds a specified threshold value

dedicated control channel: TSCC that is continuously transmitted by a TS and never reverts to a payload channel

Digital Mobile Radio (DMR): physical grouping that contains all of the mobile and/or fixed end equipment that is used to obtain DMR services

direct mode: mode of operation where MSs may communicate outside the control of a network

NOTE: This is communication technique where any MS (MS) may communicate with one or more other MSs (MSs) without the need for any additional equipment (e.g. BS).

downlink: process of transferring information in the outbound direction (TS to MS)

duplex: mode of operation by which information can be transferred in both directions and where the two directions are independent

NOTE: Duplex is also known as full duplex.

extended address: source or destination that is not an MS address (such as a PABX extension, PSTN number or IP address)

First In First Out (FIFO): storage type that retrieves information in the order in which it was stored

fixed non-volatile storage: storage facility within a MS, the contents of which cannot be modified or added to by the operation of the MS or its user

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