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TECHNICAL SPECIFICATION

**Intelligent Transport Systems (ITS);
Access layer specification for Intelligent Transport Systems
using LTE Vehicle to everything communication in
the 5,9 GHz frequency band**

Reference

DTS/ITS-004182

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS).

Modal verbs terminology

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Introduction

The present document is outlining the access layer of the Sidelink (PC5 interface) of Long Term Evolution based Vehicle to Everything (LTE-V2X) communication technology ETSI TS 136 300 [2], which can be operated at the 5,9 GHz frequency band allocated in Europe. LTE-V2X access layer consists of RRC layer, PDCP layer, RLC layer, MAC layer and Physical layer. NAS layer is also introduced as part of access layer in the present document for the provision of control. The LTE-V2X standard also adds features for congestion control to avoid unstable behaviour and for CEN DSRC protection. The LTE-V2X standards are defined in ETSI TS 136 331 [1] - ETSI EN 136 414 [17].

Pedestrian is not defined in the present document.

1 Scope

The present document defines the physical layer and the data link layer and radio resource configuration, grouped into the access layer of the ITS station reference architecture ETSI EN 302 665 [1.5]. The access layer technology that is specified in the present document refers to what is known as the sidelink or PC5 interface of LTE Vehicle to everything (LTE-V2X) for the following frequency bands:

- Operation in frequency band dedicated to ITS for safety related applications in the frequency range 5,875 GHz to 5,925 GHz.
- Operation in frequency bands dedicated to ITS non-safety applications in the frequency range 5,855 GHz to 5,875 GHz.

The LTE-V2X technology is based on 3GPP specifications.

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.

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

- [1] ETSI TS 136 331 (V14.6.2): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification (3GPP TS 36.331 version 14.6.2 Release 14)".
- [2] ETSI TS 136 300 (V14.7.0): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (3GPP TS 36.300 version 14.7.0 Release 14)".
- [3] ETSI TS 136 321 (V14.7.0): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification (3GPP TS 36.321 version 14.7.0 Release 14)".
- [4] ETSI TS 136 322 (V14.1.0): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Link Control (RLC) protocol specification (3GPP TS 36.322 version 14.1.0 Release 14)".
- [5] ETSI TS 136 323 (V14.5.0): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Packet Data Convergence Protocol (PDCP) specification (3GPP TS 36.323 version 14.5.0 Release 14)".
- [6] ETSI TS 136 211 (V14.7.0): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.211 version 14.7.0 Release 14)".
- [7] ETSI TS 136 212 (V14.6.0): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (3GPP TS 36.212 version 14.6.0 Release 14)".
- [8] ETSI TS 136 213 (V14.6.0): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (3GPP TS 36.213 version 14.6.0 Release 14)".
- [9] ETSI TS 136 214 (V14.4.0): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer; Measurements (3GPP TS 36.214 version 14.4.0 Release 14)".

- [10] ETSI TS 123 285 (V14.7.0): "Universal Mobile Telecommunications System (UMTS); LTE; Architecture enhancements for V2X services (3GPP TS 23.285 version 14.7.0 Release 14)".
- [11] ETSI TS 124 385 (V14.4.0): "LTE; V2X services Management Object (MO) (3GPP TS 24.385 version 14.4.0 Release 14)".
- [12] ETSI TS 124 386 (V14.3.0): "LTE; User Equipment (UE) to V2X control function; protocol aspects; Stage 3 (3GPP TS 24.386 version 14.3.0 Release 14)".
- [13] ETSI TS 136 101 (V14.7.0): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception (3GPP TS 36.101 version 14.7.0 Release 14)".
- [14] ETSI TS 136 133 (V14.8.0): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management (3GPP TS 36.133 version 14.8.0 Release 14)".
- [15] ETSI TS 124 301 (V14.9.0): "Universal Mobile Telecommunications System (UMTS); LTE; 5G; Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3 (3GPP TS 24.301 version 14.9.0 Release 14)".
- [16] ETSI TS 136 413 (V14.7.0): "LTE; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP) (3GPP TS 36.413 version 14.7.0 Release 14)".
- [17] ETSI TS 136 414 (V14.1.0): "LTE; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 data transport (3GPP TS 36.414 version 14.1.0 Release 14)".
- [18] ETSI TS 102 792 (V1.2.1): "Intelligent Transport Systems (ITS); Mitigation techniques to avoid interference between European CEN Dedicated Short Range Communication (CEN DSRC) equipment and Intelligent Transport Systems (ITS) operating in the 5 GHz frequency range".
- [19] ETSI TS 103 574 (V1.1.1): "Intelligent Transport System (ITS); Congestion Control Mechanisms for C-V2X PC5 interface; Access layer part".

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.

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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] ECC Recommendation (08)01: "Use of band 5855-5875 MHz for Intelligent Transport Systems (ITS)," approved 21 February 2008 and amended 3 July 2015.
- [i.2] Commission Decision 2008/671/EC of 5 August on the harmonised use of radio spectrum in the 5875-5905 MHz frequency band for safety related application of Intelligent Transport Systems (ITS).
- [i.3] ECC Decision (08)01: "ECC Decision of 14 March 2008 on the harmonised use of the 5875-5925 frequency band for Intelligent Transport Systems (ITS)", approved 14 March 2008 and amended 3 July 2015.
- [i.4] Rafael Molina-Masegosa and Javier Gozalvez: "A New 5G Technology for Short-Range Vehicle-to-Everything Communications", IEEE vehicular technology magazine, December 2017".
- [i.5] ETSI EN 302 665 (V1.1.1): "Intelligent Transport Systems (ITS); Communications Architecture".
- [i.6] ETSI EN 302 571 (V2.1.1): "Intelligent Transport Systems (ITS); Radiocommunications equipment operating in the 5 855 MHz to 5 925 MHz frequency band; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU".

3 Definition of terms and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 302 665 [i.5] and the following apply:

channel busy ratio: portion of sub-channels in the resource pool whose S-RSSI measured by the ITS station exceed a (pre-)configured threshold sensed over last 100 ms

NOTE: This definition is access layer dependant and is specified in ETSI TS 136 214 [9].

channel occupancy ratio: fraction of the total number of sub-channels *used* by the ITS station for its transmissions out of the total number of *configured* (granted) sub-channels over a measurement period of 1 000 ms

NOTE: This definition is access layer dependant and is specified in ETSI TS 136 214 [9].

PC5: interface between the ITS stations used for V2X sidelink communication

Resource Block (RB): 7 consecutive symbols in the time domain and 12 consecutive subcarriers in the frequency domain

resource pool: set of resources that can be used for PSCCH and PSSCH

NOTE: Resource pool is defined with the help of start RB, number of sub-channels, size of sub-channel, and available subframes.

sidelink: radio link between the ITS stations for direct communication

sub-channel: set of contiguous physical resource blocks

3.2 Abbreviations

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

| | |
|---------|--|
| 3GPP | 3 rd Generation Partnership Project |
| CAM | Cooperative Awareness Message |
| CBR | Channel Busy Ratio |
| CN | Core Network |
| CR | Channel Occupancy Ratio |
| DENM | Decentralized Environmental Notification Message |
| DSRC | Dedicated Short Range Communications |
| E-UTRA | Evolved Universal Terrestrial Radio Access |
| E-UTRAN | Evolved Universal Terrestrial Radio Access Network |
| ITS | Intelligent Transport System |
| LTE-V2X | Long Term Evolution based Vehicle-to-Everything |
| MAC | Medium Access Control |
| MCS | Modulation and Coding Scheme |
| NAS | Non-Access Stratum |
| PC5 | Proximity-based Communication (Interface) 5 |
| PDCP | Packet Data Convergence Protocol |
| PPPP | ProSe Per-Packet Priority |
| ProSe | Proximity-based Service |
| PSCCH | Physical Sidelink Control CHannel |
| PSSCH | Physical Sidelink Shared CHannel |
| QoS | Quality of Service |
| RLC | Radio Link Control |
| RRC | Radio Resource Control |
| RSU | Road Side Unit |
| SDU | Service Data Unit |
| UE | User Equipment |
| V2X | Vehicle-to-Everything |

4 General requirements

4.1 Architecture

The ITS station architecture specified in ETSI EN 302 665 [i.5] is in Figure 4.1-1. LTE-V2X as defined in ETSI TS 136 300 [2] is one of the access layer technologies of the ITS station architecture.

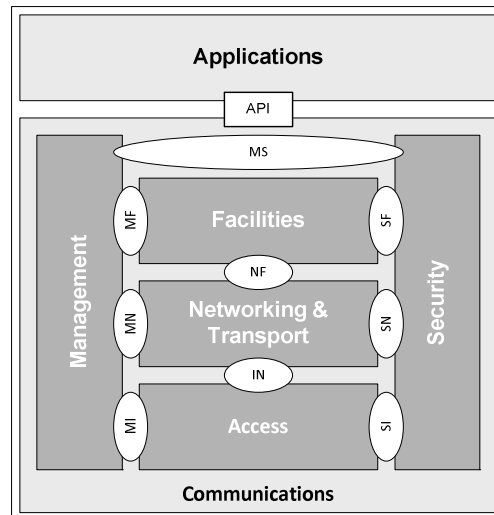


Figure 4.1-1: ITS station architecture

The LTE-V2X access layer is shown in Figure 4.1-2.

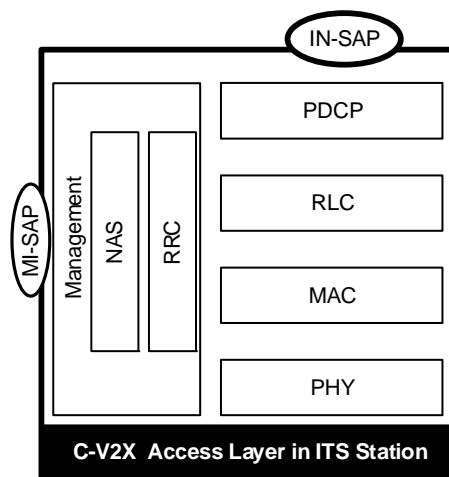


Figure 4.1-2: LTE-V2X Access Layer protocol stack

An ITS station using LTE-V2X shall be compliant with the functionality of each layer as defined in clause 5.

4.2 Frequency allocation

The frequency band and channel allocation for LTE-V2X are defined in ETSI TS 136 101 [13].

Table 4.2-1 shows the segmentation of European ITS spectrum in 5 855 - 5 925 MHz compliant with the ETSI EN 302 571 [i.6].

Table 4.2-1: ITS frequency band segmentation for 5855 - 5925 MHz

| Frequency range | Usage | Regulation |
|------------------------|-----------------------------|--|
| 5 855 MHz to 5 875 MHz | ITS non-safety applications | ECC Recommendation (08)01 [i.1] |
| 5 875 MHz to 5 905 MHz | ITS road safety | Commission Decision 2008/671/EC [i.2] ECC Decision (08)01 [i.3] |
| 5 905 MHz to 5 925 MHz | Future ITS applications | ECC Decision (08)01 [i.3] |

NOTE: Band 47 in ETSI TS 136 101 [13] corresponds to the European ITS spectrum in 5 855 to 5 925 MHz.

4.3 Transmit and receive requirement

An ITS station using LTE-V2X shall fulfil the transmit and receive requirement defined for Band 47 in ETSI TS 136 101 [13] and ETSI TS 136 133 [14].

5 LTE-V2X access layers

5.1 Physical layer

The physical layer is mainly responsible for encoding/decoding, modulation/demodulation, etc. and shall be as defined in ETSI TS 136 211 [6], ETSI TS 136 212 [7], ETSI TS 136 213 [8] and ETSI TS 136 214 [9].

The minimum set of the essential LTE-V2X information elements defined in ETSI TS 136 331 [1] and their default/initial values shall be as in Annex B, Tables B.1 to B.6.

Additionally, for Rel-14 PSSCH transmission, MCS-RB problematic configurations listed in Annex C shall be excluded.

5.2 MAC layer

The MAC layer of the sidelink (PC5 interface) is mainly responsible for resource allocation for V2X sidelink communications, and shall be as defined in ETSI TS 136 321 [3].

5.3 RLC layer

The Radio Link Control (RLC) of sidelink (PC5 interface) is mainly responsible for segmentation and concatenation of SDU, and shall be as defined in ETSI TS 136 322 [4].

5.4 PDCP layer

The PDCP layer of sidelink (PC5 interface) is mainly responsible for differentiating multiple types of SDUs (e.g. IP, Non-IP), and shall be as defined in ETSI TS 136 323 [5].

5.5 RRC layer

The RRC layer of sidelink (PC5 interface) is mainly responsible for access stratum management, and shall be as defined in ETSI TS 136 331 [1].

5.6 NAS layer

The NAS layer of sidelink (PC5 interface) is mainly responsible for requesting the CN providing subscription information to the RAN, as well as indicating the RRC layer for RRC establishment cause for PC5 communication, and shall be as defined in ETSI TS 124 301 [15].

5.7 Additional LTE-V2X access layer functionality for PC5 interface

5.7.1 Transmission/reception of V2X communication over PC5

Additional LTE-V2X access layer functionality for transmission/reception of V2X communication over PC5 shall be compliant with ETSI TS 124 385 [11] and ETSI TS 124 386 [12].

5.7.2 Congestion control

An LTE-V2X ITS station shall adapt its CR according to the measured Channel Busy Ratio (CBR) in order to comply with the required CR limit, as defined in ETSI TS 103 574 [19].

5.7.3 CEN DSRC protection

An ITS station using LTE-V2X in Band 47 shall avoid harmful interference to CEN DSRC.

The ITS station shall be conformant to ETSI TS 102 792 [18].

If the ITS station is inside the protected zone, it shall adjust its output power level to maximum 10 dBm e.i.r.p. If the ITS station is inside the protected zone, it shall fulfil the spurious emissions limit of maximum -65 dBm/MHz within 5 795 MHz to 5 815 MHz.

NOTE: In addition any regional or local regulations will apply.

The upper layers of the ITS station is responsible for detecting that the ITS station is within proximity of CEN DSRC protection zone and then sending an indication to access layers to trigger power level adjustment.

5.7.4 QoS management

An ITS station using LTE-V2X shall (de)prioritize a data packet according to its PPPP value in access layer as defined in ETSI TS 136 331 [1] and ETSI TS 136 213 [8].

5.7.5 PC5 parameter provisioning

The required provisioning parameters used by a UE to perform V2X Communication shall be as defined in ETSI TS 123 285 [10], ETSI TS 136 413 [16], ETSI TS 136 414 [17] and ETSI TS 103 574 [19].

5.7.6 Synchronization

An ITS station using LTE-V2X shall synchronize with a synchronization reference in both time and frequency before communicating with other ITS stations using LTE-V2X. The Synchronization related functionality of an ITS station using LTE-V2X shall be compliant with ETSI TS 136 331 [1]. For the scenario where ITS station selects synchronization reference on the sidelink (PC5 interface), whether to (pre-)configure *syncOffsetIndicators* as defined in ETSI TS 136 331 [1] shall be according to different regions/nations' implementation. For the case where *syncOffsetIndicators* is not (pre-)configured, at least RSU ITS station shall be allowed to transmit sidelink synchronization signalling on the subframes that are not configured to transmit V2X messages, e.g. including the reserved subframes calculated according to ETSI TS 136 213 [8] and the subframes indicated as "0" in *sl-Subframe* of the transmission pool as per ETSI TS 136 331 [1].

NOTE 1: From transmission-side perspective, whether or not to transmit sidelink synchronization signalling is based on the ITS station's capability.

NOTE 2: From reception-side perspective, for this case where *syncOffsetIndicators* is not provided, the parameters used for sidelink synchronization signalling measurement such as *filterCoefficient*, *syncRefMinHyst* and *syncRefDiffHyst* can be preconfigured by implementation.

Annex A (informative): Introduction of LTE-V2X

A.1 Introduction

For an overview of LTE-V2X, please refer to "A New 5G Technology for Short-Range Vehicle-to-Everything Communications" [i.4].

Annex B (normative): LTE-V2X information elements

The minimum set of the essential LTE-V2X information elements defined in ETSI TS 136 331 [1] and their default/initial values shall be as specified in Tables B.1 to B.6.

For the ASN.1 representation of the below described information elements, see clause 6.3.8 in ETSI TS 136 331 [1].

Table B.1: General LTE-V2X information elements

| Item | LTE-V2X information element | Default/initial value | Comment |
|------|-----------------------------|---|--|
| 1 | rohcn-Profiles | All "False" | Indicates robust header compression profiles can be supported in SL-V2X-Preconfiguration. |
| 2 | carrierFreq | the frequencies regulated in Europe for ITS communication | Indicates one EUTRAN frequency. |
| 3 | maxTxPower | 23 | Indicates maximal transmit power in dBm per ITS station in the frequency identified in item 2. |
| 4 | additionalSpectrumEmission | NS 33 | Indicates the additional spectrum emission requirements and power reduction for protected zone. See ETSI TS 136 101 [13]. |
| 5 | sl-bandwidth | n50 | Indicates the carrier bandwidth. See ETSI TS 136 331 [1]. n50 for 10 MHz channel. n100 for 20 MHz channel. |
| 6 | tdd-ConfigSL | none | TDD configuration. The value <i>none</i> means that Frame Structure Type 1 specified in ETSI TS 136 211 [6] is used. |
| 7 | SyncPriority | gnss | Indicates the synchronization priority order. When this field is set to <i>gnss</i> , the ITS station shall prioritize the Global Navigation Satellite System (GNSS). |
| 8 | syncOffsetIndicators | empty | Indicates the transmission windows of the sidelink synchronization signalling. By default, no <i>syncOffsetIndicators</i> shall be configured. If indicated otherwise or required by regional regulations, the <i>syncOffsetIndicator1</i> = 0 and <i>syncOffsetIndicator2</i> = 80, see clause 5.7.6. |
| 9 | threshS-RSSI-CBR | 9 | Indicates the S-RSSI threshold for determining the contribution of a sub-channel to the CBR measurement. |

Table B.2: LTE-V2X information elements for transmission pool

| Item | LTE-V2X information element | Default/initial value | Comment |
|------|-----------------------------|-----------------------|---|
| 1 | sl-Subframe | bs100-r14 | Indicates the bitmap of the resource pool. By default, all bits are set to "1". Other implementation options may be considered. |
| 2 | adjacencyPSCCH-PSSCH | True | Indicates whether an ITS station shall always transmit PSCCH and PSSCH in adjacent Resource Blocks (RBs). |
| 3 | sizeSubchannel | 10 | Indicates the number of Physical Resource Blocks (PRBs) of each sub-channel in the corresponding resource pool. |
| 4 | numSubchannel | 5 | Indicates the number of sub-channels in the corresponding resource pool. For 10 MHz the value is 5. For 20 MHz the value is 10. |
| 5 | startRB-Subchannel | 0 | Indicates the lowest Resource Block (RB) index of the sub-channel with the lowest index. |

Table B.3: LTE-V2X information elements for reception pool

| Item | LTE-V2X information element | Default/initial value | Comment |
|------|-----------------------------|-----------------------|---|
| 1 | sl-Subframe | bs100-r14 | Indicates the bitmap length of the resource pool. All bits are "1". |
| 2 | adjacencyPSCCH-PSSCH | True | Indicates whether an ITS station shall always transmit PSCCH and PSSCH in adjacent Resource Blocks (RBs). |
| 3 | sizeSubchannel | 10 | Indicates the number of Physical Resource Blocks (PRBs) of each sub-channel in the corresponding resource pool. |
| 4 | numSubchannel | 5 | Indicates the number of sub-channels in the corresponding resource pool. For 10 MHz the value is 5. For 20 MHz the value is 10. |
| 5 | startRB-Subchannel | 0 | Indicates the lowest Resource Block (RB) index of the sub-channel with the lowest index. |

Table B.4: LTE-V2X information elements for SL-PSSCH

| Item | LTE-V2X information element | Default/initial value | Comment |
|------|-----------------------------|-----------------------|---|
| 1 | thresUE-Speed | kmph160 | Indicates an ITS station speed threshold. |

Table B.5: PSSCH Tx Parameters for Below Speed Threshold

| Item | LTE-V2X information element | Default/initial value | Comment |
|------|-----------------------------|---|---|
| 1 | minMCS-PSSCH | 0 or 3 | Indicates the minimal allowed MCS. "0" for the transmission using one sub-channel; "3" for the transmission using multiple subchannels. |
| 2 | maxMCS-PSSCH | 11 for non-RSU ITS station, 17 for RSU ITS station | Indicates maximal allowed MCS. |
| 3 | allowedRetxNumberPSSCH | Both | Indicates the allowed retransmission number. Up to implementation. |

Table B.6: PSSCH Tx Parameters for Equal to or Above Speed Threshold

| Item | LTE-V2X information element | Default/initial value | Comment |
|------|-----------------------------|-----------------------|--|
| 1 | minMCS-PSSCH | 0 | Indicates the minimal allowed MCS. |
| 2 | maxMCS-PSSCH | 8 | Indicates maximal allowed MCS. |
| 3 | allowedRetxNumberPSSCH | n1 | Indicates the allowed retransmission number. |

LTE-V2X shall support the mapping of CAMs and DENMs to PPPP levels as defined in Table B.7.

Table B.7: Mapping between Traffic Class (TC) and PPPP

| TC | PPPP | Intended Use |
|----|------|---|
| 0 | 2 | High priority DENMs |
| 1 | 4 | Normal DENMs |
| 2 | 5 | CAMs |
| 3 | 7 | Forwarded DENMs and other low priority messages |

Annex C (normative): List of MCS-RB problematic cases

Table C.1: Single transmission

| I_{MCS} | I_{TBS} | N_{PRB} |
|------------------|------------------|--|
| 0 | 0 | N/A |
| 1 | 1 | N/A |
| 2 | 2 | N/A |
| 3 | 3 | N/A |
| 4 | 4 | N/A |
| 5 | 5 | N/A |
| 6 | 6 | N/A |
| 7 | 7 | N/A |
| 8 | 8 | 81 |
| 9 | 9 | 4, 6, 8, 16, 30, 36, 60, 72, 96 |
| 10 | 10 | 20, 27, 32, 40, 54, 64 |
| 11 | 10 | 32, 64 |
| 12 | 11 | 75 |
| 13 | 12 | 25, 50 |
| 14 | 13 | 5, 10, 45, 60, 90 |
| 15 | 14 | 20, 40, 54, 80, 81, 90 |
| 16 | 15 | 50, 75 |
| 17 | 16 | N/A |
| 18 | 17 | 12, 16, 24, 27, 32, 40, 45, 48, 50, 54, 64, 72, 75, 80, 90, 96 |
| 19 | 18 | 3, 4, 5, 6, 8, 9, 10, 12, 15, 16, 18, 20, 24, 25, 27, 30, 32, 36, 40, 45, 48, 50, 54, 60, 64, 72, 75, 80, 81, 90, 96 |
| 20 | 19 | 3, 4, 5, 6, 8, 9, 10, 12, 15, 16, 18, 20, 24, 25, 27, 30, 32, 36, 40, 45, 48, 50, 54, 60, 64, 72, 75, 80, 81, 90, 96 |

Table C.2: Two transmissions

| I_{MCS} | I_{TBS} | N_{PRB} |
|------------------|------------------|--|
| 0 | 0 | N/A |
| 1 | 1 | N/A |
| 2 | 2 | N/A |
| 3 | 3 | N/A |
| 4 | 4 | N/A |
| 5 | 5 | N/A |
| 6 | 6 | N/A |
| 7 | 7 | N/A |
| 8 | 8 | N/A |
| 9 | 9 | N/A |
| 10 | 10 | N/A |
| 11 | 10 | N/A |
| 12 | 11 | N/A |
| 13 | 12 | N/A |
| 14 | 13 | N/A |
| 15 | 14 | N/A |
| 16 | 15 | N/A |
| 17 | 16 | N/A |
| 18 | 17 | 16, 32, 64 |
| 19 | 18 | N/A |
| 20 | 19 | 27, 36, 54, 60 |
| 21 | 19 | 27, 36, 54, 60 |
| 22 | 20 | 25, 50, 54 |
| 23 | 21 | 30, 45, 50 |
| 24 | 22 | 48 |
| 25 | 23 | 10, 20, 27, 40, 45 |
| 26 | 24 | 25 |
| 27 | 25 | 4, 9, 18, 24, 36, 40, 90 |
| 28 | 26 | 3, 4, 5, 6, 8, 9, 10, 12, 15, 16, 18, 20, 24, 25, 27, 30, 32, 36, 40, 45, 48, 50, 54, 60, 64, 72, 75, 80, 81, 90, 96 |

Annex D (informative): Change History

| Date | Version | Information about changes |
|-------------------|---------|--|
| 17 June 2018 | 0.0.1 | Early draft. |
| 28 June 2018 | 0.0.2 | Output of WG4#43. |
| 18 July 2018 | 0.0.3 | Output of drafting meeting. |
| 19 August 2018 | 0.0.4 | Further proposals. |
| 3 September 2018 | 0.1.0 | Output of drafting meeting. Stable draft. |
| 20 September 2018 | 0.1.1 | New annex B. |
| 26 September 2018 | 0.1.2 | Definitive values in Annex B. Table B.1. Item 8 defined. New item 9. Table B.2. Items 3 and 4, brackets removed and value fixed. Table B.3. Items 3 and 4, brackets removed and value fixed. Table B.5. Item 2, add "ITS station". |
| 26 September 2018 | 0.2.0 | Output of drafting meeting #3. Changes in 5.7.3, Tables B.1, B.2, B.3 and B.6. |
| 1 October 2018 | 0.3.0 | Output of drafting meeting #4. Changes in introduction, 3.2, 5.7.3, Tables B.1 and B.5. Draft for approval at ITS4#44. |
| 11 October 2018 | 0.3.1 | Resolution of comments received during WG4#44. Changed parts highlighted in green and yellow. |
| 12 October 2018 | 0.3.2 | Inclusion of closing plenary comments ITS#32. |

History

| Document history | | |
|-------------------------|---------------|-------------|
| V1.1.1 | November 2018 | Publication |
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