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Intelligent Transport Systems (ITS);
LTE-V2X Access layer specification for Intelligent Transport Systems operating in the 5 GHz frequency band

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Foreword

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Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
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Modal verbs terminology

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Introduction

The present document outlines 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] and ETSI TS 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 [i.2]. 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.

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 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 Systems (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.

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] Rafael Molina-Masegosa and Javier Gozalvez: "A New 5G Technology for Short-Range Vehicle-to-Everything Communications", IEEE vehicular technology magazine, December 2017.

[i.2] ETSI EN 302 665 (V1.1.1): "Intelligent Transport Systems (ITS); Communications Architecture".

[i.3] ETSI.EN 302 636-4-1 (V1.4.1): "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 4: Geographical addressing and forwarding for point-to-point and point-to-multipoint communications; Sub-part 1: Media-Independent Functionality".

[i.4] ETSI TS 124 334 (V14.1.0): "Universal Mobile Telecommunications System (UMTS); LTE; Proximity-services (ProSe) User Equipment (UE) to ProSe function protocol aspects; Stage 3 (3GPP TS 24.334 version 14.1.0 Release 14)".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 302 665 [i.2] 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 Symbols

Void.

3.3 Abbreviations

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

3GPP	3rd Generation Partnership Project
ASN.1	Abstract Syntax Notation One
CAM	Cooperative Awareness Message
CBR	Channel Busy Ratio
CEN	Comité Européen de Normalisation
CN	Core Network
CR	Channel Occupancy Ratio
DENM	Decentralized Environmental Notification Message
DSRC	Dedicated Short Range Communications
E-UTRA	Evolved Universal Terrestrial Radio Access
EUTRAN	Evolved Universal Terrestrial Radio Access Network
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
IP	Internet Protocol
ITS	Intelligent Transport Systems
LTE-V2X	Long Term Evolution based Vehicle-to-Everything
MAC	Medium Access Control
MCS	Modulation and Coding Scheme
MCS-RB	Modulation and Coding Scheme - Resource Blocks
MID	Medium Access Control IDentity
NAS	Non-Access Stratum
NS	Network Signalling value
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
RAN	Radio Access Network
RB	Resource Block
RLC	Radio Link Control
RRC	Radio Resource Control
RSSI	Received Signal Strength Indication
RSU	Road Side Unit
SDU	Service Data Unit
TC	Traffic Class
TDD	Time Division Duplex
UE	User Equipment
V2X	Vehicle-to-Everything

4 General requirements

4.1 Architecture

The ITS station architecture specified in ETSI EN 302 665 [i.2] 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.

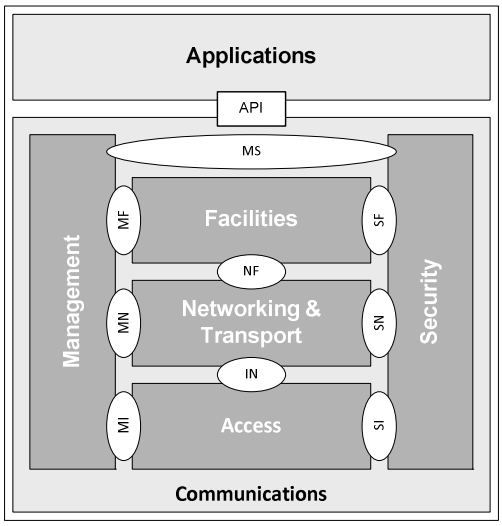

Figure 4.1-1: ITS station architecture

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

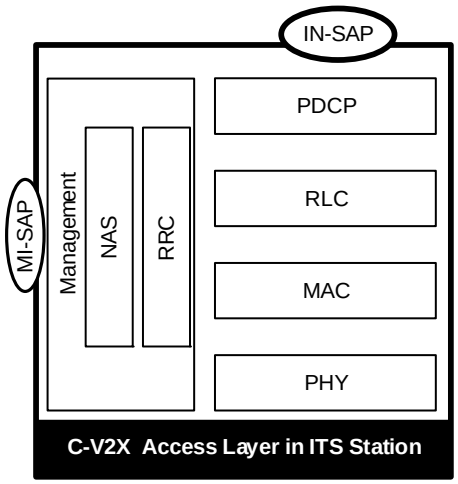

Figure 4.1-2: LTE-V2X Access Layer protocol stack

An ITS station that includes LTE-V2X as the access layer technology shall support LTE-V2X sidelink communication as defined in ETSI TS 136 300 [2] and the present document.

4.2 Operating Frequencies

ETSI TS 136 101 [13] defines the operating band of LTE-V2X.

Table 4.2-1 shows the segmentation of European ITS spectrum in 5 855 MHz to 5 925 MHz.

Table 4.2-1: ITS frequency band segmentation for 5 855 MHz to 5 925 MHz

Frequency range	Usage
5 855 MHz to 5 875 MHz	ITS non-safety applications
5 875 MHz to 5 905 MHz	ITS road safety
5 905 MHz to 5 925 MHz	Future ITS applications

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

5.7.7 Interface to higher layers of ITS station

Interface to higher layers of ITS station is defined in Annex D.

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.1].

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	rohc-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 *none* 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 *gnss*, 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 *syncOffsetIndicators* shall be configured. If indicated otherwise or required by regional regulations, the *syncOffsetIndicator1* = 0 and *syncOffsetIndicator2* = 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

The MCS-RB problematic configurations for Rel-14 PSSCH transmission are shown in tables C.1 and C.2.

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): Interface to higher layers of ITS station

D.1 Fields of the GeoNetworking address

In the case that the MID field of the Geonetworking address (see ETSI EN 302 636-4-1 [i.3]) is set to a value based on the MAC address of the LTE-V2X access layer technology, Octets 2-4 of the MID field should be set to the 24-bit Destination Layer 2 ID and Octets 5-7 of the MID field should be set to zero.

D.2 Encapsulation of GeoNetworking packets

A GeoNetworking packet should be part of the overall frame/packet structure depicted in figure D.1 (without security) and figure D.2 (with security), respectively:

- The *MAC header* is the header of the MAC protocol of the LTE-V2X access layer technology, as specified in the MAC protocol specification, ETSI TS 136 321 [3].

NOTE 1: The GeoNetworking protocol sets the MAC address, or more generally the link layer address, in order to define and identify the next hop of a GeoNetworking packet.

- The *RLC header* is specified in the Radio Link Control (RLC) protocol specification, ETSI TS 136 322 [4].
- The *PDCP header* is specified in the Packet Data Convergence Protocol (PDCP) specification, ETSI TS 136 323 [5]. The *SDU Type* field of the *PDCP header* is set to 011 (i.e. Non-IP).
- The *Non-IP Type header* is specified in the Proximity-services (ProSe) User Equipment (UE) to ProSe function protocol aspects specification ETSI TS 124 334 [i.4], with settings as specified in the User Equipment (UE) to V2X control function; protocol aspects specification, ETSI TS 124 386 [12]. The *Non-IP Type* field of the *Non-IP header* indicates the *V2X message family* and is set to 3 (i.e. ETSI-ITS).
- The *GeoNetworking header* is the header of the GeoNetworking packet as defined in ETSI EN 302 636-4-1 [i.3] and ETSI EN 302 636-4-1 [i.3] and extended as needed for media-dependent GeoNetworking functionality.
- The optional payload represents the user data that are created by upper protocol entities, i.e. the T-SDU or GN6-SDU. It is passed to the GeoNetworking protocol for transmission.

NOTE 2: The general packet structure is shown as seen by the MAC protocol of the LTE-V2X access layer technology.

NOTE 3: Some GeoNetworking packets do not carry a payload, such as Beacon.

MAC Header	RLC Header	PDCP Header	Non-IP Type Header	GeoNetworking Header	Payload (optional)

Figure D.1: GeoNetworking packet structure over LTE-V2X (without security)

MAC Header	RLC Header	PDCP Header	Non-IP Type Header	GeoNetworking Basic Header	GeoNetworking Secured Packet with GeoNetworking Common Header, Optional Extended Header and Optional Payload

Figure D.2: GeoNetworking packet structure over LTE-V2X (with security)

History

Document history		
V1.1.1	November 2018	Publication as ETSI TS 103 613
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