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Electronic fee collection — Localisation augmentation communication for autonomous systems

Perception de télépéage — Communications d'augmentation de localisations pour systèmes autonomes

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 204, *Intelligent transport systems.*

This first edition replaces ISO/TS 13141:2010, which has been technically revised. It also incorporates ISO/TS 13141:2010/Cor1:2013. This first edition incorporates the following main modifications compared to the previous Technical Specification:

- conversion from a Technical Specification to an International Standard;
- generalized container definition;
- amendments to reflect changes to the underlying base standards;
- addition of a new informative annex (i.e. Annex G) on how to use this International Standard for the European electronic toll service;
- editorial and formal corrections as well as changes to improve readability.

Introduction

On-board equipment (OBE) that uses satellite-based positioning technology to collect data required for charging for the use of roads operates in a so-called autonomous way (i.e. generally without relying on dedicated roadside infrastructure). However, these autonomous systems can, in particular places, need some roadside infrastructure support for proper identification of charge objects. Such assistance might be required at places where satellite-based localization accuracy or availability is insufficient or at places where the OBE is directly informed about the identity of the relevant charge object.

In an interoperable environment, it is essential that this localization information be available in a standardized way. This International Standard defines requirements for localization augmentation by dedicated short-range communication (DSRC) between roadside equipment and on-board equipment. This International Standard makes no assumptions about the operator of the roadside equipment (RSE), in terms of his role according to ISO 17573, i.e. whether the RSE is operated by an entity in the service provision role or in the toll charging role.

This International Standard has been prepared considering the following requirements:

— the localization augmentation communication (LAC) serves to transmit localization information to passing OBE without identifying individual OBE;

— the localization information contains both geographical location independent of charging context, and context-dependent identification of charge objects;

— a single roadside installation is able to provide localization augmentation for several overlapping EFC contexts;

— this International Standard is based on the EFC architecture specified in ISO 17573;

— the communication applies to all OBE architectures;

— this International Standard is applicable to various DSRC media, especially the CEN DSRC stack;

— the communication supports security services for data origin authentication, integrity and non-repudiation.

This International Standard defines an attribute, LACData, which is communicated from the RSE to the OBE by means of an acknowledged writing service, which is implemented through the SET service of DSRC Layer 7 (ISO 15628 and EN 12834). The LAC application is defined as a self-contained DSRC application with its own application identifier (AID). Regarding the DSRC communications stack, this International Standard gives definitions for the CEN DSRC stack, as used in EN 15509 and Annexes C, D and E demonstrate, respectively, the use of ISO CALM IR, the use of Italian DSRC as specified in ETSI/ES 200674-1 and ARIB DSRC.

All data relevant for the LAC application have been put into the attribute LACData, in order to create a single standard communications content transmitted by LAC RSE, and always signed as a whole. LACData can transport both geographic coordinates (latitude, longitude and altitude) and the identification of a specific charge object. All elements of LACData are mandatory, but Null values are defined to allow LAC installations to transmit only a selection of all defined data elements.

Access credentials are mandatory for writing LACData in order to protect OBE from non-authentic RSE. LACData are critical for charge determination and for providing evidence. For these purposes, the authenticators which are defined can be used to provide for data origin authentication, data integrity and non-repudiation for LACData. There are two separate authenticator fields defined to allow for separate authentication and non-repudiation, if required by the institutional arrangements of a toll system.

This International Standard is “minimalist” in the sense that it covers what is required by operational systems and systems planned in the foreseeable future.

A test suite for checking an OBE or RSE implementation for compliance with the ISO/TS 13141 is defined in the corresponding edition of ISO/TS 13140-1 and ISO/TS 13140-2. This test suite is currently being updated to reflect the changes incorporated into this first edition of ISO 13141.

Electronic fee collection — Localisation augmentation communication for autonomous systems

1 Scope

This International Standard establishes requirements for short-range communication for the purposes of augmenting the localization in autonomous electronic fee collection (EFC) systems. Localization augmentation serves to inform on-board equipment (OBE) about geographical location and the identification of a charge object. This International Standard specifies the provision of location and heading information and security means to protect from the manipulation of the OBE with false roadside equipment (RSE).

The localization augmentation communication takes place between an OBE in a vehicle and fixed roadside equipment. This International Standard is applicable to OBE in an autonomous mode of operation.

This International Standard defines attributes and functions for the purpose of localization augmentation, by making use of the dedicated short-range communications (DSRC) communication services provided by DSRC Layer 7, and makes these LAC attributes and functions available to the LAC applications at the RSE and the OBE. Attributes and functions are defined on the level of Application Data Units (ADUs, see Figure 1).

As depicted in Figure 1, this International Standard is applicable to:

— the application interface definition between OBE and RSE;

— the interface to the DSRC application layer, as specified in ISO 15628 and EN 12834;

— the use of the DSRC stack.

The localization augmentation communication is suitable for a range of short-range communication media. This International Standard gives specific definitions regarding the CEN DSRC stack as specified in EN 15509, and Annexes C, D and E give the use of the Italian DSRC as specified in ETSI/ES 200 674-1, ISO CALM IR, and ARIB DSRC.

This International Standard contains a protocol implementation conformance statement (PICS) proforma in Annex B and informative transaction examples in Annex F. The informative Annex G highlights how to use this International Standard for the European electronic toll service (as defined in Commission Decision 2009/750/EC).

Test specifications are not within the scope of this International Standard.

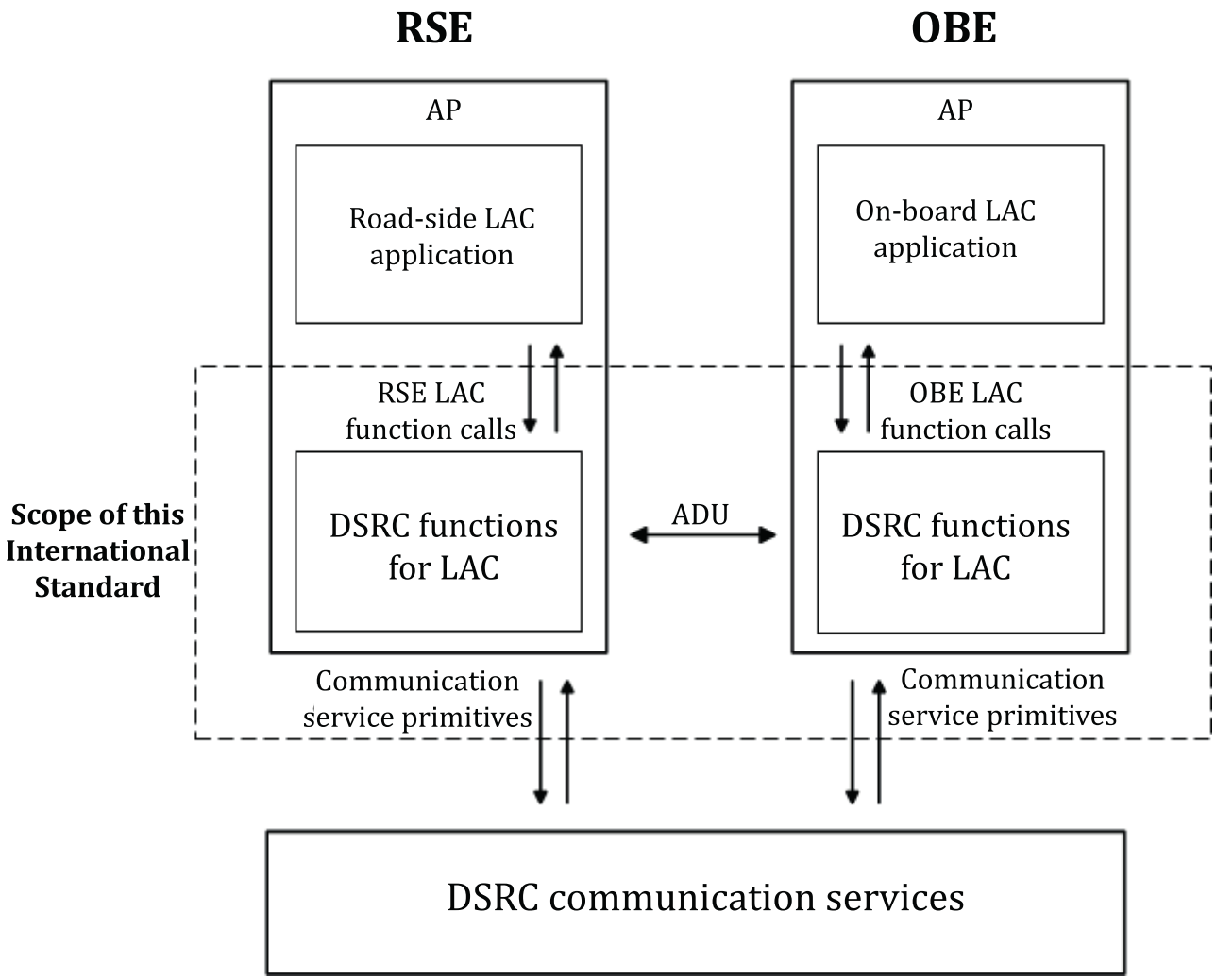

Figure 1 — The LAC application interface

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 8824-1:2008, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation — Part 1*

ISO/IEC 8825-2:2008, *Information technology — ASN.1 encoding rules: Specification of Packed Encoding Rules (PER) — Part 2*

ISO/IEC 9797-1:2011, *Information technology — Security techniques — Message Authentication Codes (MACs) — Part 1: Mechanisms using a block cipher*

ISO 12813, *Electronic fee collection — Compliance check communication for autonomous systems*

ISO 14906:2011/Amd1:2015, *Electronic fee collection — Application interface definition for dedicated short-range communication*

ISO 15628:2013, *Intelligent transport systems — Dedicated short range communication (DSRC) — DSRC application layer*

ISO 17575-1:2015,[1)] *Electronic fee collection — Application interface definition for autonomous systems — Part 1: Charging*

ISO/IEC 18033-3:2010, *Information technology — Security techniques — Encryption algorithms — Part 3: Block ciphers*

EN 12834:2003, *Road transport and traffic telematics — Dedicated Short Range Communication (DSRC) — DSRC application layer*

EN 15509:2014, *Electronic fee collection — Interoperability application profile for DSRC*

NIMA Technical Report TR8350.2 version 3, *Department of Defense World Geodetic System 1984, Its Definition and Relationships With Local Geodetic Systems*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
access credentials
trusted attestation or secure module that establishes the claimed identity of an object or application

[SOURCE: EN 15509:2014, 3.1]

3.2
attribute
addressable package of data consisting of a single data element or structured sequences of data elements

3.3
authentication
security mechanism allowing verification of the provided identity

[SOURCE: EN 301 175]

3.4
authenticator
data, possibly encrypted, that is used for authentication

[SOURCE: ISO/TS 19299:2015, 3.5]

3.5
charge object
geographic or road related object for the use of which a charge is applied

3.6
data integrity
property that data has not been altered or destroyed in an unauthorized manner

[SOURCE: ISO/TS 19299:2015, 3.28]

3.7
on-board equipment
OBE
Note 1 to entry: all required equipment on-board a vehicle for performing required EFC functions and communication services

1) To be published.

3.8
roadside equipment
RSE
equipment located along the road, either fixed or mobile

3.9
service primitive
elementary communication service provided by the application layer protocol to the application processes

[SOURCE: ISO 14906:2011, 3.18 modified]

3.10
toll context
logical view as defined by attributes and functions of the basic elements of a toll scheme consisting of a single basic tolling principle, a spatial distribution of the charge objects and a single behaviour of the related Front End

3.11
transaction
whole of the exchange of information between two physically separated communication facilities

4 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

ADU	Application data unit (ISO 14906)
AID	Application identifier (ISO 15628 and EN 12834)
ASN.1	Abstract syntax notation one (ISO/IEC 8824-1)
BST	Beacon service table (ISO 14906)
CCC	Compliance check communication (ISO 12813)
DSRC	Dedicated short-range communication (ISO 14906)
EID	Element identifier (ISO 15628 and EN 12834)
EFC	Electronic fee collection
IR	Infrared
IUT	Implementation under test
LAC	Localisation augmentation communication
MAC	Media Access control (EN 12795) or Message authentication code (ISO 14906)
OBE	On-board equipment (ISO 14906)
PICS	Protocol implementation conformance statement
RSE	Roadside equipment (ISO 14906)
VST	Vehicle service table (ISO 14906)
WGS84	World Geodetic System 1984

5 Application interface architecture

5.1 General

This clause gives an insight into the LAC architecture by identifying the functions, the use of DSRC communication primitives, and the attributes addressed. A detailed description of the functions is given in Clause 6, while details of the attributes are in Clause 7.

The LAC application interface has been designed to make use of the CEN DSRC communication stack, via the application layer as specified in ISO 15628 and EN 12834. For other identified DSRC communication media, detailed mappings to corresponding services are given in Annexes C, D and E.

5.2 Services provided

The LAC application interface offers the following services to LAC applications:

— writing of data in order for the RSE to communicate location data to the OBE;

— authentication of the RSE by the OBE by means of access credentials.

There is no read service provided within the LAC communication. The RSE transmits data to the OBE using the underlying acknowledged communication services, in order to verify that the data indeed are properly transmitted over the DSRC interface.

The above services are realized by means of protocol exchanges performed by means of communication services and transactions as described in Clause 8.

The services are provided by the following functions:

— the “Initialise communication” function, which shall be used to establish the LAC communication link between the RSE and OBE;

— the “Write data” function, which shall be used to send LAC attributes to the OBE;

— the “Terminate communication” function, which shall be used to terminate the LAC communication.

5.3 Attributes

There is a single attribute defined for localization augmentation. This attribute contains a set of data in order for the OBE to be able to determine its localization with better accuracy and availability or to directly receive a charge object identification related to the local toll context. This set of data contains:

— geographic coordinates (latitude, longitude and altitude);

— charge object reference.

When the RSE writes this attribute to the OBE, it shall transmit geographic coordinates or charge object reference or both.

5.4 Contract and toll context

Regarding LAC, the OBE shall identify itself in the initialisation phase with a single LAC Context Mark in the VST. This Context Mark identifies the user contract in terms of the service provider, type of contract and version information. This information enables the RSE to decide whether the OBE carries a contract which it supports, and if so, to choose the corresponding security elements.

An RSE can provide the OBE with localization augmentation for several overlapping contexts simultaneously by writing the LAC attribute (which includes the applicable toll context) several times in one transaction.

NOTE The LAC operates in a broadcast fashion, where the RSE has only minimal information about the OBE and is not able to assess the liability of a vehicle for tolls. For this reason, the OBE can receive LAC information which is not applicable.

5.5 Use of lower layers

5.5.1 Supported DSRC communication stacks

The LAC application interface makes use of the CEN DSRC communication stack as described in Table 1. Other communication media can be used as listed in Table 1 if an equivalent mapping to corresponding services is provided. Detailed examples are provided in Annexes C, D and E.

Table 1 — Supported short-range communication stacks

Medium	Application layer	Lower layers	Detailed specifications
CEN-DSRC	ISO 15628 and EN 12834	EN 12795 and EN 12253	Specification in 5.5.2
Italian DSRC	ES 200 674–1 (Clause 11 and Annex D)	ES 200 674–1 (Clauses 7 to 10 and Annex D)	Implementation example in Annex C
ISO CALM IR	ISO 15628 and EN 12834	ISO 21214	Implementation example in Annex D
ARIB DSRC	ARIB STD-T75 and ISO 15628	ARIB STD-T75 ITU-R. M1453–2	Implementation example in Annex E

NOTE EN 12795 and EN 12253 have been adopted in ITU-R.M 1453–2.

If more than one communication medium is implemented in an OBE, the OBE shall respond to RSE interrogations on the same medium as the RSE has used.

5.5.2 The use of the CEN DSRC stack

The LAC application shall be used with the CEN DSRC communication stack in the following ways:

— the OBE shall comply with EN 15509:2014, 6.1.2;

— the RSE shall comply with EN 15509:2014, 6.2.2.

NOTE Compliance with EN 15509 implies compliance of the DSRC stack with ISO 15628 and EN 12834 regarding the application layer, and EN 12795 and EN 12253 for the lower layers.

6 Conformance requirements

6.1 General

In the view of the OBE, the LAC communication is a read only data exchange. There is neither an interrogation of OBE capabilities nor feedback from the OBE regarding the received data or commands. From that this follows that the OBE shall support all standardized LAC RSE transaction sequences.

The RSE shall only broadcast, within the context of LAC transactions, attributes defined in this International Standard.

6.2 Functional requirements

6.2.1 Minimum supported transaction details

All functions defined in this clause shall be available on the OBE side.

For CEN-DSRC, the functions shall be provided by the DSRC application layer as specified in ISO 15628 and EN 12834 (services INITIALISATION, SET and RELEASE).

Only the functions for CEN DSRC are defined in 6.2.2 to 6.2.4. For other supported media according to 5.5.1, equivalent functionality shall be provided; see Annex C for ETSI/ES 200 674-1 5.8 GHz microwave DSRC, Annex D for CALM infrared DSRC and Annex E for ARIB microwave DSRC.

6.2.2 Initialising communication

Initialisation of the communication between the RSE and the OBE shall be initiated by the RSE, by means of the invocation of an initialisation request by the RSE. After successful initialisation, the function "Initialise communication" shall notify the applications on the RSE and OBE sides.

The initialisation notification on the OBE side shall carry at least the identity of the beacon (e.g. the beacon serial number) and absolute time. The initialisation notification on the RSE side shall carry the LAC application identity and also the data required for the security services (e.g. random number and key identifier).

The function "Initialise communication" shall be provided by the application layer INITIALISATION services, as specified in ISO 15628 and EN 12834. It is defined in Annex A (see LAC-InitialiseComm-Request and LAC-InitialiseComm-Response).

6.2.3 Writing of data

The function "Write data" shall be provided by the application layer SET service as specified in ISO 15628 and EN 12834, and is defined in Annex A (see LAC-DataTx-Request and LAC-DataTx-Response).

NOTE 1 The "mode" parameter in the LAC-DataTx-Request indicates whether or not the corresponding response is expected. If mode = false, the response primitive is not used and the reception is only acknowledged by the OBE on lower layers.

In the SET service primitives, iid shall not be used.

NOTE 2 The invocation of a service primitive by an application process implicitly calls upon and uses services offered by the lower protocol layers.

The SET shall always carry access credentials.

6.2.4 Termination of communication

The RSE may terminate the communication on application level with the OBE with the function "Terminate communication", by means of the invocation of a release request by the RSE.

NOTE A termination of the communication on link level is outside of the scope of this International Standard.

The function "Terminate communication" shall be provided by the application layer service EVENT-REPORT, as specified in ISO 15628 and EN 12834, and is defined in Annex A (see LAC-TerminateComm).

6.3 Security

6.3.1 General

Security is an essential part of LAC applications. This International Standard provides for both communication-related security services and communication-transparent data elements, which may provide security characteristics.

This International Standard for localization augmentation communication provides for a "Write data" function and uses access credentials as a mandatory communication security provision. Access credentials provide for protection against unauthorized writing of LAC data, and hence for authentication of the LAC RSE and the LAC data to the OBE. The detailed implementations of the communication security services are media-specific (see 6.3.2 for CEN DSRC and the annexes for other media).

NOTE 1 Authentication of the OBE to the RSE according to EN 15509 is not supported, as the identity of the OBE and contract are not relevant for the LAC application.

This International Standard provides for data elements, which may provide data origin authentication, data integrity and non-repudiation characteristics to the LAC Data. The LAC application is transparent to these authenticators, which may be stored together with the other LAC data elements as a data packet, which is protected against forgery and/or protected against repudiation (between e.g. the user and the LAC Operator).

NOTE 2 This International Standard does not provide for an encryption service. No privacy sensitive data are transferred by LAC.

6.3.2 Authentication of RSE — Access credentials

Access credentials shall be used to manage access to the LAC attribute. Access credentials are mandatory. The "Write data" function shall always carry access credentials.

The CEN DSRC OBE shall support the calculation of access credentials according to security level 1, as defined in EN 15509:2014, 6.1.5.3.

The CEN DSRC RSE shall be able to calculate access credentials according to security level 1, as defined in EN 15509:2014, 6.2.5.3.

Access credentials are defined as being of ASN.1 type OCTET STRING. This only pertains to the ASN.1 syntax; the semantics are media-dependent.

6.3.3 Authentication of LAC Data

The data elements mAC-TC and mAC2 (see 7.5) may contain authenticators, as well as key references for the calculation of those authenticators, and are provided as a means to guarantee data origin authentication, integrity and non-repudiation characteristics to the LAC data.

The two data elements are provided to allow for separate elements for authentication and non-repudiation, if required. The LAC application is transparent to these authenticators, which implies that it supports various system security concepts.

The data element mAC-TC is defined as being of type MAC_TC and mAC2 is defined as being of ASN.1 type OCTET STRING. The semantics of the data elements are media-independent.

7 Attributes

7.1 General

Within the LAC context, the attributes and data elements given in Table 2 shall be made available.

Table 2 — Supported short-range communication stacks

AttributeID[a]	Attribute	Data element	Length in Octets[b]	Remarks
n.a.	LAC-ContextMark	contractProvider	3	
		typeOfContract	2	
		contextVersion	1	
54	LACData	lacOperator	3	
		rseId	2	
		latitude	4	in micro degrees
		longitude	4	in micro degrees
		altitude	2	resolution 0,25 m
		tollCharger	6	
		chargeObject	6	
		distanceToObject	2	
		lacTime	4	
		macTc	8	
		mac2	8	
87-127	ReservedForPrivateUse	—	—	

[a] The assignment of attribute IDs is aligned with ISO 14906 and ISO 12813. Attributes 87 to 127 are assigned for private use. All other remaining IDs are reserved for future use.

[b] Length information is informative. For the type OCTET STRING, the length determinant, as defined in ISO/IEC 8825-2, is explicitly stated.

The attribute LAC-ContextMark shall be part of ApplicationContextMark as specified in Annex A.

NOTE LAC-ContextMark is not an addressable attribute. It is part of the VST and can neither be read nor written by the RSE as part of the LAC application.

In the following clauses, LAC Attributes and data elements are specified in terms of

— the names of the data elements forming the LAC Attribute;

— the semantic definition of the data element; and

— informative remarks, including references to other standards.

The specification of the corresponding data types in ASN.1 is provided in Annex A.

7.2 Data regarding location reference

To translate **longitude, latitude** and **altitude** coordinates to the corresponding real position on earth or vice-versa the geodetic datum shall be WGS84(G1150), according to NIMA TR8350.2 version 3, per default unless another earth-centred earth-fixed polar coordinate geodetic datum is agreed mutually by the TC and TSP.

Furthermore, by default it is allowed to use any earth-centred earth-fixed polar coordinate geodetic datum, as long as the maximum datum displacement relative to the geodetic datum prescribed is acceptable to the Toll Charger of the related toll domain.

The maximum tolerated datum displacement, also called datum shift, should not exceed 0,4 m.

NOTE 1 The recommended maximum tolerated displacement allows, for example, for using one of the International Terrestrial Reference Frames (ITRF), the Russian PZ90.2 or one of the European Terrestrial Reference Frames (ETRF) as geodetic datums alternative to the WGS84.

The calculated datum displacement should be determined according to the definitions in ASME Y14.5 – 2009 “Dimensioning and Tolerancing”.

The data element **latitude** shall contain the latitudinal coordinate of the centre of the road surface covered by the specific LAC implementation, value in microdegrees. Values > 0 = north, < 0 = south, absolute value shall not exceed 90 degrees.

The data element **longitude** shall contain the longitudinal coordinate of the centre of the road surface covered by the specific LAC implementation, value in microdegrees. Values > 0 = east, < 0 = west, absolute value shall not exceed 180 degrees.

The data element **altitude** shall contain the altitude according to definition of the chosen geodetic model of the centre of the road surface covered by the specific LAC implementation, where a unit is 0,25 m.

In case no geographic coordinates are provided, a coding of all zero shall be used (latitude, longitude and altitude equal to zero).

NOTE 2 The location indicated by the coding for “no geographic coordinates provided” is not on land surface and does not need to be supported.

The data element **chargeObject** shall identify the charge object for which LAC is operated, according to the local definition of the Toll Charger owning the respective toll scheme. The data element contains **chargeObjectDesignation** with the same syntax and semantics as in ChargeObjectId defined in ISO 17575-1:2015, 7.6.9. The second data element regimeId is kept for backward compatibility and shall not be used anymore, i.e. shall be zero.

NOTE 3 The data element tollContext (of type Provider) in tollCharger together with chargeObjectDesignation from chargeObject are providing the information contained in ChargeObjectId as used and defined in ISO 17575-1.

In case no Toll Charger dependent information is provided, a coding of all zero shall be used (tollCharger and chargeObject equal to zero).

NOTE 4 The data element chargeObject in combination with tollCharger can be used to identify any kind of charge object, e.g. road section, passage of cordon. Identification of lanes can be provided in accordance with the restrictions of the communication medium.

The data element **distanceToObject**, shall contain the distance, in metres, to the charge object as identified by the element chargeObject, from the point of operation of the LAC. Negative values indicate that the charge object precedes the RSE in the sense of direction of traffic.

NOTE 5 In order to avoid charging errors, it is advisable to not allow vehicles to exit to another road after receiving the LAC message and without using the charge object.

7.3 Operational data

The data element **lacOperator** shall identify the organization that operates LAC, i.e. the entity responsible for data content of the LAC transaction. The data element is as defined in ISO 14906. It contains the country code and the Id of the operator assigned on a national basis.

The data element **rseId** shall contain an operator-specific identification of the RSE which operates LAC.

The data element **tollCharger** shall identify the Toll Charger which owns the toll scheme for which LAC is operated. The data element is as defined in ISO 17575-1.

The data element **lacTime** shall contain the time at which the LAC transaction occurred. The data element is as defined in ISO 14906.

7.4 OBE contractual data

The data element **lacContextMark** shall identify the user contract in terms of the service provider, type of contract and version information. It is the same as the EFC-ContextMark defined in ISO 14906.

The coding and usage of this data element is service-provider specific. It shall be used as a minimum to manage and distinguish OBE supporting different future versions of this International Standard and to identify the related LAC security elements.

NOTE It is assumed that the OBE supports only this edition of this International Standard (in order to reduce the OBE's complexity) and that the LAC RSE will support all existing OBE conforming to different editions of this International Standard.

7.5 Security-related data

The data element macTc shall be used for authentication of LAC data to the Toll Charger for non-repudiation reasons.

The MAC value of macTc shall be calculated by the RSE using the LAC authentication master key over the octet string represented by the LAC data elements without macTc and mac2 and a nonce value (a random generated number) from macTc (this is a string of 33 octets from the first nine LACData data elements concatenated with 2 octets from nonce). The padding of this octet string shall be according to the rules of the used enciphering and MAC algorithm.

NOTE 1 The data element lactime and nonce from macTc are the nonce, the only variable parts (6 octets) of the input to calculate the MAC for the same LAC beacon.

The RSE shall use one of the following algorithms for calculating the MAC:

1) CBC-DES according to ISO/IEC 9797-1:2011 MAC algorithm 1 using the DEA algorithm according to ISO/IEC 18033-3:2010 with a LAC authentication key of 8 octets;

2) CMAC according to ISO/IEC 9797-1:2011 MAC algorithm 5 using AES-128 according to ISO/IEC 18033-3:2010 with a LAC authentication key of 16 octets.

NOTE 2 The MAC and encryption algorithm of the first option are identical with the algorithms used in EN 15509:2014.

The data element macTc contains:

— keyRef: the reference to the key to be used for the enciphering algorithm;

— algorithmId: the algorithm option 1 or 2 to be used from the list above;

— mac: the leftmost 32 bits (4 octets) of the calculated MAC;

— nonce: 2 random octets generated by the RSE used in the MAC calculation.

The data element mac2 may contain security-related data regarding the first nine data elements of the attribute LACData (a string of 33 octets). This may comprise authenticators, as well as key references. The calculation, the coding and the applicability of this data element is outside of the scope of this International Standard.

8 Transaction model

8.1 General

The transaction model related to the LAC Application Interface for DSRC shall comply with ISO 14906, Clause 6, with the restrictions and amendments defined in 8.2 and 8.3, for implementation using the CEN DSRC communication stack. Details on the transaction model and addressing for other communication media (if any) are given in the relevant annexes.

The transaction model comprises two phases, the initialisation phase and the transaction phase.

8.2 Initialisation phase

8.2.1 General structure

Initialisation of the communication shall be carried out by the RSE by means of the function “Initialise communication”.

The OBE evaluates the initialisation request to decide whether the LAC application is supported. If the OBE does not support the LAC application, it shall not respond to the initialisation request. If the OBE supports the LAC application, it shall respond to the initialisation request.

8.2.2 LAC application-specific contents of the BST

AID = 21 shall be used for the LAC application.

The RSE shall initialise only one instance of the LAC application; this means that there shall be only one instance of AID = 21 in the BST.

NOTE This does not exclude the BST from carrying information related to other applications, which may be active at the RSE (e.g. the CCC application as given in ISO 12813).

The LAC application shall be qualified as a mandatory application. EID shall not be transmitted in the BST related to the EFC application. No parameter shall be transmitted in the BST related to the LAC application.

8.2.3 LAC application-specific contents of the VST

There shall be only one instance of AID = 21 in the ApplicationList in the VST. This instance shall contain the parameter ApplicationContextMark, as defined in EN 15509, Annex A, corresponding to Security level 1.

The Service Provider shall make use of the data element contextVersion to ensure that the value of the LAC-ContextMark corresponds to one unique dated version of ISO 13141 through a reference table, which is made available to the Toll Charger, allowing it to identify to which specific version of the LAC application interface definition the OBU complies

8.3 Transaction phase

After completion of the Initialisation phase, the RSE application shall be notified.

The transaction phase may be performed as a sequence of one or more “Write data” functions on the LAC attribute. Each “Write data” function shall write the LAC data for one particular toll context for which the LAC service is provided. “Write data” functions may be concatenated as far as allowed by the specific communication medium.

NOTE To ease the implementation of an OBE supporting the LAC application, the LAC data attribute can be implemented as an instance attribute which stores various instances of the LAC attribute, which are written during one single LAC transaction using subsequent write functions.

The OBE shall respond to the functions invoked by the RSE and shall not initiate any functions.

The RSE may terminate the communication using the function “Terminate communication”.

Annex A
(normative)

LAC data type specifications

This clause contains the Abstract Syntax Notation One (ASN.1) definition of

— the data types related to the LAC functions as specified in Clause 6,

— the data types related to the LAC attributes described in Clause 7, and

— the ASN.1 container types for ISO Layer 7,

using the ASN.1 technique in accordance with ISO/IEC 8824-1. The packed encoding rules given in ISO/IEC 8825-2 with the restrictions defined in ISO 15628:2013, 6.2.7 apply.

The actual ASN.1 module is contained in “ISO13141(2015)EfcLacV2.asn”.

NOTE The ASN.1 module is also stored at: http://standards.iso.org/iso/13141/

Annex B
(normative)

PICS proforma for the data elements in the attribute

B.1 General

This annex gives the protocol implementation conformance statement (PICS) proforma to be used for the attributes defined in Clause 7 and Annex A.

To evaluate conformance of a particular implementation, a statement of which capabilities and options have been implemented shall be provided. Such a statement is called an implementation conformance statement (ICS) or more specifically, in case it covers transactions, a PICS. This annex provides PICS templates, which shall be filled in by equipment suppliers.

B.2 Purpose and structure

The purpose of this PICS proforma is to provide a mechanism whereby a supplier of an implementation of the requirements defined in this International Standard may provide information about the implementation in a standardized manner.

The PICS proforma is subdivided into the following categories of information:

— identification of the implementation;

— identification of the protocol;

— global statement of conformance;

— PICS proforma tables.

B.3 Instruction for completing the PICS proforma

B.3.1 Definition of support

A capability is said to be supported if the Implementation Under Test (IUT) is able to:

— generate the corresponding operation parameters (either automatically or because the end user requires that capability explicitly);

— interpret, handle and when required, make available to the end user the corresponding error or result.

A protocol element is said to be supported for a sending implementation, if it is able to generate it under some circumstances (either automatically or because the end user requires relevant services explicitly).

A protocol element is said to be supported for a receiving implementation, if it is correctly interpreted and handled and also, when appropriate, made available to the end user.

B.3.2 Status column

This column indicates the level of support required for conformance to this International Standard. The values are as follows:

m mandatory support is required;

o optional support is permitted for conformance to the standard. If implemented, it shall conform to the specifications and restrictions contained in the standard. These restrictions may affect the optionality of other items.

In the PICS proforma tables, every leading item marked “m” shall be supported by the IUT. Sub-items marked “m” shall be supported if the corresponding leading item is supported by the IUT.

B.3.3 Support column

This column shall be completed by the supplier or implementer to indicate the level of implementation of each item. The proforma has been designed such that values are:

Y yes, the item has been implemented;

N no, the item has not been implemented;

— the item is not applicable.

All entries within the PICS proforma shall be made in ink. Alterations to such entries shall be made by crossing out, not erasing nor making the original entry illegible, and writing the new entry alongside. All such alterations to records shall be initialised by the staff making them.

B.3.4 Item reference numbers

Each line within the PICS proforma, which requires that implementation details be entered, is numbered on the left-hand edge of the line. This numbering is included as a means of uniquely identifying all possible implementation details within the PICS proforma. This referencing is used both inside the PICS proforma and for references from other test specification documents.

The means of referencing individual responses is carried out in the following sequence:

— a reference to the smallest enclosing the relevant item;

— a solidus character, ‘/’;

— the reference number of the row in which the response appears;

— if, and only if, more than one response occurs in the row identified by the reference number, then each possible entry is implicitly labelled a, b, c, etc., from left to right and this letter is appended to the sequence.

B.4 PICS proforma for the OBE

B.4.1 Identification of the implementation

Table B.1 — Identification of PICS

Item No.	Question	Response
1	Date of statement (DD/MM/YY)	
2	PICS serial number	
3	System conformance statement cross-reference	

Table B.2 — Identification of the implementation and / or system

Item No.	Question	Response
1	Service provider or EFC context name	
2	Version number	
3	Other information	

Table B.3 — Identification of the OBE supplier

Item No.	Question	Response
1	Organization name	
2	Contact name(s)	
3	Address	
4	Telephone number	
5	E-mail address	
6	Other information	

Table B.4 — Identification of the OBE

Item No.	Question	Response
1	Brand name	
2	Type, version	
3	Manufacturer ID	
4	Equipment class	
5	Serial numbers of supplied units	
6	Other information	

B.4.2 Identification of the standard

Table B.5 — Identification of the standard

Item No.	Question	Response
1	Title, reference no., publication date of the International Standard	
2	International Standard edition number	
3	Implemented annexes	
4	Implementer's Guide version no.	
5	Implementation defect reports (ref. no.)	
6	Other information	

B.4.3 Global statement of conformance

Are all mandatory capabilities implemented? (Yes/No) .....

NOTE 1 Answering "No" to this question indicates non-conformance with the specification. Non-supported mandatory capabilities are identified in the ICS, with an explanation of why the implementation is non-conforming, on pages attached to the ICS proforma.

Which security level is implemented (0/1).....

NOTE 2 For definition of the security levels, see 6.2 and Annex D.

B.4.4 PICS proforma tables

This part of the PICS proforma identifies the supported application context, the communication services and attributes (ADUs).

Table B.6 — Security requirements

Item No.	Element	Reference	Status	Support
1	Security level 1 — Access credentials	EN 15509, 6.1.5.3	m	

Table B.7 — Required Layer 7 functions

Item No.	Element	Subclause No./Reference	Status	Support
1	INITIALISATION	6.2.2	m	
2	SET	6.2.3	m	
5	EVENT_REPORT	6.2.4	m	

Table B.8 — Implemented DSRC stacks

Item No.	Element	Subclause No./Reference	Status	Support
1	CEN DSRC	5.5.2	o[a]	
2	CALM IR	Annex D	o[a]	
3	Italian DSRC ETSI/ES 200 674–1	Annex C	o[a]	
4	ARIB DSRC	Annex E	o[a]	

[a] One or more DSRC stacks shall be implemented.

Table B.9 — Data requirements regarding the LAC-Context Mark

Item No.	Element	Subclause No./Reference	Status	Support coding
1	LAC-ContextMark	7.4	m	

Table B.10 — Data requirements regarding location reference

Item No.	Element	Subclause No./ Reference	Status	Support read protection	Support coding
1	LACOperator	7.3	m		
2	RSEId	7.3	m		
3	Latitude	7.2	m		
4	Longitude	7.2	m		
5	Altitude	7.2	m		
6	TollCharger	7.3	m		
7	ChargeObjectId	7.2	m		
8	DistanceToObject	7.2	m		
9	LACTime	7.3	m		
10	MAC-TC	7.5	m		
11	MAC2	7.5	m		

B.5 PICS proforma for the RSE

B.5.1 Identification of the implementation

Table B.11 — Identification of PICS

Item No.	Question	Response
1	Date of statement (DD/MM/YY)	
2	PICS serial number	
3	System conformance statement cross-reference	

Table B.12 — Identification of implementation and/or system

Item No.	Question	Response
1	Service provider or EFC context name	
2	Version number	
3	Other information	

Table B.13 — Identification of the RSE supplier

Item No.	Question	Response
1	Organization name	
2	Contact name(s)	
3	Address	
4	Telephone number	
5	E-mail address	
6	Other information	

Table B.14 — Identification of the RSE

Item No.	Question	Response
1	Brand Name	
2	Type, Version	
3	Manufacturer ID	
4	Serial numbers of supplied units	
5	Other information	

Table B.15 — Identification of the standard

Item No.	Question	Response
1	Title, reference no., publication date of the International Standard	
2	International Standard edition number	
3	Implemented annexes	
4	Implementer's Guide version no.	
5	Implementation defect reports (ref. no.)	
6	Other information	

B.5.2 Global statement of conformance

Are all mandatory capabilities implemented? (Yes/No).....

NOTE 1 Answering "No" to this question indicates non-conformance to the specification. Non-supported mandatory capabilities are identified in the ICS, with an explanation of why the implementation is non-conforming, on pages attached to the ICS proforma.

Which security level is implemented? (0/1).....

NOTE 2 For definition of the security levels, see 6.2 and Annex D.

B.5.3 PICS proforma tables

This part of the PICS proforma identifies the supported application context, the communication services and attributes (ADUs).

Table B.16 — Security requirements

Item No.	Element	Reference	Status	Support
1	Security level 1 – Access credentials	EN 15509:2014, 6.2.5.3	m	
2	LAC data non-repudiation to the Toll Charger	7.5	o	

Table B.17 — Required Layer 7 functions

Item No.	Element	Subclause No./ Reference	Status	Support
1	INITIALISATION	6.2.2	m	
2	SET	6.2.3	m	
5	EVENT_REPORT	6.2.4	m	

Table B.18 — Implemented DSRC stacks

Item No.	Element	Subclause No./ Reference	Status	Support
1	CEN DSRC	5.5.2	o[a]	
2	CALM IR	Annex D	o[a]	
3	Italian DSRC ETSI/ES 200 674–1	Annex C	o[a]	
4	ARIB DSRC	Annex E	o[a]	
[a] One or more DSRC stacks shall be implemented.				

Table B.19 — Data requirements regarding the LAC-Context Mark

Item No.	Element	Subclause No./ Reference	Status	Support coding
1	LAC-ContextMark	7.4	m	

Table B.20 — Data requirements regarding location reference

Item No.	Element	Subclause No./ Reference	Status	Support write protection	Support coding
1	LACOperator	7.3	m		
2	RSEId	7.3	m		
3	Latitude	7.2	m		
4	Longitude	7.2	m		
5	Altitude	7.2	m		
6	TollCharger	7.3	m		
7	ChargeObjectId	7.2	m		
8	DistanceToObject	7.2	m		
9	LACTime	7.3	m		
10	MAC-TC	7.5	m		
11	MAC2	7.5	m		

Annex C
(informative)

ETSI/ES 200-674-1 communication stack usage for LAC applications

C.1 General

This annex:

— lists the requirements which are fulfilled by an LAC application in order to use the ETSI/ES 200 674-1 standard as a communication media;

— shows how LAC generalized communication functions are mapped onto ETSI/ES 200 674-1 service primitives;

— gives the memory locations of specific LAC attributes.

Security algorithms and calculations, as well as the transaction model, are as specified in Annex D of ETSI/ES 200 674-1.

C.2 Requirements

Using the ETSI/ES 200 674-1 communication stack for transferring LAC data requires being compliant to the whole standard, including its Annex D.

C.3 Function correspondences

Table C.1 shows the correspondence between LAC functions and the directives defined in Clause 11 of ETSI/ES 200 674-1. Different directives are used to access data, which are located in different memory regions.

Table C.1 — Functions correspondences

LAC function	ES 200 674–1 directive
Initialise communication	Open-rq, concatenated with Get-TBA-Random-Rq, concatenated with Get-Master-Record-Rq
Data Writing	For Application Core: Write-Appl-Core-Rq For Application Record: Write-Appl-Record-Next-Rq
Authenticated data writing	Concatenation of: Set-Credential-Rq, a Data writing operations as above in this table
Terminate communication	Close-Rq

It is recommended that:

a) after the first interaction to initialise the communication link, a Select-TBA-Id-Rq directive be concatenated to all other requests;

b) if the write transaction spans a number of DSRC interactions, the RSE repeats its authentication, as long as there is room for authentication data and primitives in that interaction.

The address of the LAC application (AID parameter) corresponds to the Called AP Invocation Identifier parameter in the A-Associate service primitive.

C.4 Data storage and addressing

The main characteristic of OBE data addressing in ETSI/ES 200 674-1 is that data are referenced by position, i.e. by specifying their location in the OBE virtual memory. There is a specific virtual memory structure for each application type. This clause describes the OBE virtual memory structure for the LAC application.

The ETSI/ES 200 674-1 virtual memory is structured for each and every application into two areas:

1) Master;

2) Application.

The master area is common to all applications, it is read/only, and contains information that is of common use. It is divided into two subareas that can be accessed via specific directives, as specified in Table C.2.

Table C.2 — Master subarea directives

Subarea	Directives
Core	Read-Master-Core-Rq
Record	Get-Master-Record-Rq

The application area is application-specific, and generally read/write. It is also divided into two subareas that can be accessed via specific directives, as specified in Table C.3.

Table C.3 — Application subarea directives

Subarea	Directives
Core	Read-Appl-Core-Rq, Write-Appl-Core-Rq
Record	Read-Appl-Record-Rq, Write-Appl-Record-Curr-Rq

NOTE Other ETSI/ES 200 674–1 directives are available for writing and reading in the Application area, but are not used for LAC applications, and are not listed here.

The following table shows where relevant LAC information is stored in the ES 200674-1 virtual memory.

Table C.4 — ES 200 674–1 data storage for LAC attributes

Area	Displacement	Length	Description
Master Core	0	2	ManufacturerId
	2	2	Equipment Class
	4	10	Reserved
Master Record	0	2	EFC application. Has the value of 50F0 (Hex)
	2	2	EFC application sub-identifier. Has the value of 0001 (Hex) for the LAC application
	4	6	EFCContextMark (LAC Context Mark)
	10	2	AC_CR-KeyReference
Application Core	0	8	MAC-TC
	8	8	MAC2

Table C.4 *(continued)*

Area	Displacement	Length	Description
Application Record	0	3	LACOperator
	3	2	RSEId
	5	4	Latitude
	9	4	Longitude
	13	2	Altitude
	15	6	TollCharger
	21	6	ChargeObject
	27	2	DistanceToObject
	29	4	LACTime

Reading or writing multiple attributes in a single DSRC interaction is possible for attributes which are stored sequentially in the same memory region. This can be accomplished by specifying a displacement corresponding to first attribute to be read or written, and a length equal to the sum of the attributes' lengths.

EXAMPLE Setting the Latitude and Longitude attributes can be accomplished by means of an operation like: Write-Appl-Record-Curr-Rq, with offset = 5, and length = 8.

Annex D
(informative)

IR communication usage for LAC applications

D.1 Using the IR Communication stack (CALM IR)

This Annex specifies the use in localization augmentation applications of the CALM (communications access for land mobiles) IR (infrared) stack, as defined in ISO 21214.

D.1.1 DSRC requirements

The OBE and RSE should be according to ISO 21214 in the compatibility mode.

NOTE ISO 21214 defines the physical and data link layer of CALM IR.

D.1.2 Functions

The LAC specific functions should be implemented as specified in Clause 6.

D.1.3 Data requirements

The addressing of the EFC system and application data implemented by the OBE and RSE should be according to the rules given in 5.3 in ISO 14906.

The OBE should implement the LAC attributes defined in Clause 7.

The RSE should support any OBE that is otherwise compliant.

D.1.4 Security requirements

The security requirements should be as specified in 6.3.

D.1.5 Transaction requirements

The transaction requirements should be as specified in Clause 8.

Annex E
(informative)

ARIB DSRC communication stack usage for LAC applications

E.1 Using the ARIB DSRC communication stack

This Annex specifies the use of the ARIB 5.8 GHz microwave DSRC link for localization augmentation applications.

E.1.1 DSRC requirements

The DSRC should be according to ARIB STD-T75, Clause 2. The DSRC communication stack should be according to ARIB STD-T75, Clause 4.

E.1.2 LAC functions

The LAC functions should be implemented as DSRC Layer 7 services, as defined in ARIB STD-T75, 4.4.2.1.2.

The SET service should always carry AC-CR for secure communication.

E.1.3 Data requirements

The addressing of the EFC system and application data implemented by the OBE and RSE should be according to the rules given in ISO 14906:2011, 5.3. For LAC application data, EID should always be used.

The OBE should implement the LAC attributes defined in Clause 7.

The RSE should support any OBE that is otherwise compliant.

E.1.4 Security requirements

A security mechanism can be specified independent of ARIB DSRC in the future, in the form of security guidelines, as given in ISO/TS 17574.

E.1.5 Transaction requirements

The EFC transaction model is compliant with ISO 14906:2011, Clause 6, with the restrictions and amendments defined in E.1.5.1 to E.1.5.3.

E.1.5.1 Initialisation phase — LAC application-specific contents of the BST

AID = 21 should be used for the LAC application. There should be only one instance of AID = 21 in the BST.

The LAC application should be qualified as a mandatory application.

E.1.5.2 Initialisation phase — LAC application-specific contents of the VST

There should be only one instance of AID = 21 in the ApplicationList in the VST. This instance should contain the parameter ApplicationContextMark as defined in ISO 15628:2013, A.2.

Hence, the reference to Security level 1 and the last sentence shall be deleted (i.e. 'Numbering of AID should be according to ISO 15628 (where AID from 0 to 19 are already defined' shall be deleted).'

E.1.5.3 Transaction phase

The transaction requirements should be the same as described in Clause 8.

Annex F
(informative)

LAC transaction example

This Annex gives an example of an LAC transaction for the case of an RSE sending localization augmentation data for two overlapping toll contexts.

For the two toll contexts, the LAC data provided differ in the Toll Charger and can also differ in the identification of the Charge Object and possibly in the LAC Operator. These differences in data content naturally also lead to different message authentication codes.

Table F.1 — LAC transaction example

Phase	Roadside equipment		On-board equipment	Remarks
Initialisation	INITIALISATION.request (BST)	→		RSE periodically sends BST.
(BST – VST)		←	INITIALISATION.response (VST) • LAC-ContextMark • AC_CR-KeyReference • RndOBE	A newly arrived OBE answers with VST. The LAC Context Mark contains information on the toll contract. AC-CR-KeyReference is the reference to the access credential keys to be used by the RSE. RndOBE is a random number that the RSE uses when calculating the access credentials. The OBE gives access only when RSE provides the correct access credentials (AC_CR) in the subsequent phases.

Table F.1 *(continued)*

Phase	Roadside equipment		On-board equipment	Remarks
Transaction	SET.request • AC_CR LACData LACOperator RSEId Latitude Longitude Altitude TollCharger ChargeObject DistanceToObject LACTime MAC-TC MAC2	→		The RSE writes the LAC Data attribute to the OBE twice, corresponding to the two overlapping toll contexts. The SET service contains access credentials that authenticate the RSE.
		←	SET.response	OBE confirms reception (optional).
	SET.request • AC_CR LACData LACOperator RSEId Latitude Longitude Altitude TollCharger ChargeObject DistanceToObject LACTime MAC-TC MAC2	→		
		←	SET.response	OBE confirms reception (optional).
Closing	EVENT_REPORT.request (Release)	→		RSE closes the transaction and releases the OBE.

Annex G
(informative)

Use of this International Standard for the EETS

G.1 General

In 2004 an EU Directive 2004/52/EC of the European parliament and of the council "on the interoperability of electronic road toll systems in the community" was adopted. This EU-Directive calls for the establishment of a European Electronic Toll Service (EETS).

In 2009 an EC-decision 2009/750/EC "on the definition of the European Electronic Toll Service and its technical elements" was adopted. It sets out the necessary technical specifications and requirements for that purpose, and contractual rules relating to EETS provision. The decision lays down rights and obligations on EETS Providers, Toll Chargers and EETS Users.

NOTE Other requirements and other EU Directives may also be applicable to the product(s) falling within the scope of this International Standard.

G.2 Overall relationship between European standardization and the EETS

The EU Directive 2004/52/EC also triggered the establishment of a standardization mandate (M/338, "Standardisation mandate to CEN, CENELEC and ETSI in support of Interoperability of electronic road toll systems in the Community") that called for development of technical standards in support of the EETS. Activities under m/338 is supervised by the "ITS co-ordination group" (ITS-CG, previously ICTSB/ITSSG).

The M/338 does not explicitly call for the provision of harmonized standards (according to Directive 98/34/EC on the new approach to technical harmonization and standards), which means that this possibility is not available for the European standards that are developed in support of the EETS. Instead, this brief informative annex provides an outline on how this International Standard could be used in the context of the EETS.

EC-Decisions can point out the use of specific standards, even if they are not formally harmonized. This is also done in EC-decision 2009/750/EC for a few standards (i.e. those that were available at the time of its approval). In case there will be more EC-decisions in support of the EC-Directive, further European standards could be referenced there as well.

The European Commission also published in 2011 a "Guide for the Application of Directive on the Interoperability of Electronic Road Toll Systems" (ISBN 978-92-79-18637-0). This guide is intended to be a reference manual for all parties directly or indirectly concerned by Directive 2004/52/EC and Decision 2009/750/EC. It aims at providing help for the implementation of the EETS, including a list of standards that might be of use. The guide is only informative (e.g. the document cannot notify certain standards as "mandatory" for use in the EETS) and is intended to be updated on regular basis.

G.3 European standardization work supporting the EETS

Many of the standards developed by CEN/TC278 have been drafted with the EETS-requirements in mind (including the use of the results from European projects such as CARDME, PISTA, CESARE and RCI). CEN-representatives have also taken part as observers in working groups etc. initiated by the EC for the EETS. Hence, some work has been done in close co-operation between CEN working groups and the EC.

It should be noted that no CEN/ISO standards are "turnkey" solutions for the EETS. They are to be used as "building blocks" for the EETS, supporting the EETS legal framework and agreements between

the parties concerned by the EETS. A precise EETS-specification is not within the scope of CEN/ISO standards, but remains the task of the owners of the EETS-scheme.

It should also be noted that CEN/ISO has a wider scope than the EETS, which is a complementary service to the national services of the Members States and optional for the users, whereas CEN/ISO standards should be applicable to all EFC-services worldwide.

G.4 Correspondence between this International Standard and the EETS

This International Standard defines requirements for GNSS/CN based EFC schemes to augment the position determination capability of the OBE at specific locations with insufficient GNSS reception quality. This may be caused by, e.g. urban canyons, deep mountain valleys or tall constructions like bridges or sound absorbing walls. It can also be used at road construction sites for temporally redefinition of charge object locations.

This international standardised functionality is used by Toll Chargers in coordination with Toll Service Providers to limit roadside installation to the most critical locations.

This International Standard is intended to be implemented in all EETS-compliant OBE providing all specified functional elements with no options.

This International Standard defines requirements that correspond to the requirements listed in EC-decision 2009/750/EC.

Table G.1 — ISO 13141 and EC-Decision 2009/750/EC

Clause(s)/sub-clause(s) of this International Standard	Essential Requirements of EC Decision 2009/750/EC	Qualifying remarks/Notes
Whole standard except the informative annexes and the Bibliography	Annex II Clause 3. (c)	Localization augmentation (where applicable)

Bibliography

[1] ISO/TS 17574, *Electronic fee collection — Guidelines for security protection profiles*

[2] ASME Y14.5:2009, *Dimensioning and Tolerancing*

[3] ETSI/ES 200 674-1 version 2.4.1 (2013-05), *Intelligent Transport Systems (ITS); Road Transport and Traffic Telematics (RTTT); Dedicated Short Range Communications (DSRC); Part 1: Technical characteristics and test methods for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band*

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