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Commission Implementing Regulation (EU) 2016/799

of 18 March 2016

implementing Regulation (EU) No 165/2014 of the European Parliament and of the Council laying down the requirements for the construction, testing, installation, operation and repair of tachographs and their components

ANNEX I C

Requirements for construction, testing, installation, and inspection

Appendix 14

REMOTE COMMUNICATION FUNCTION

1.INTRODUCTION

This Appendix specifies the design and the procedures to follow in order to perform the remote communication function (the Communication) as required in Article 9 of Regulation (EU) No 165/2014 (the Regulation).

DSC_1Regulation (EU) No 165/2014 determines that the tachograph shall be equipped with a remote communication functionality that shall enable agents of the competent control authorities to read tachograph information from passing vehicles by using remote interrogation equipment (the Remote early detection communication reader [REDCR), specifically, interrogation equipment connecting wirelessly using CEN 5.8 GHz Dedicated Short Range Communication (DSRC) interfaces.

It is important to comprehend that this functionality is intended to serve only as a pre-filter in order to select vehicles for closer inspection, and it does not replace the formal inspection process as determined in the provisions of Regulation (EU) No 165/2014. See recital 9 in the preamble of this regulation, stating that remote communication between the tachograph and control authorities for roadside control purposes facilitates targeted roadside checks.

DSC_2 *The Data* shall be exchanged using *the Communication* which shall be a wireless intercourse using 5.8 GHz DSRC wireless communications consistent with this Appendix and tested against the appropriate parameters of EN 300 674-1, {Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Dedicated Short Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band; Part 1: General characteristics and test methods for Road Side Units (RSU) and On -Board Units (OBU)}.

DSC_3 *The Communication* shall be established with the communications equipment only when so requested by the equipment of the competent control authority using compliant radio-communication means (*the Remote early detection communication reader (REDCR)*).

DSC_4 *The Data* shall be secured to ensure integrity.

DSC_5Access to *the Data* communicated shall be restricted to competent control authorities authorised to check infringements of Regulation (EC) No 561/2006 and of Regulation (EU) No 165/2014 and to workshops in so far as it is necessary to verify the correct functioning of the tachograph.

DSC_6 *The Data* exchanged during *the Communication* shall be limited to the data necessary for the purpose of targeting roadside checks of vehicles with a potentially manipulated or misused tachograph.

DSC_7Data integrity and security shall be obtained by securing *the Data* within the Vehicle Unit (VU) and by passing only the secured payload data and security related data (see 5.4.4) across the wireless 5.8 GHz DSRC remote communication medium, meaning that only authorised persons of competent control authorities have the means to understand the data passed across *the Communication* and to verify its authenticity. See Appendix 11 Common Security Mechanisms.

DSC_8 *The Data* shall contain a timestamp for the time of its last update.

DSC_9The content of the security data shall be known only to and within the control of the competent control authorities, and those parties with whom they share this information and is outwith the provisions of *the Communication* that is the subject of this Appendix, save that *the Communication* makes provision to transfer a packet of security data with every packet of payload data.

DSC_10The same architecture and equipment shall be capable be used to acquire other data concepts (such as weigh–on-board) using the architecture specified herein.

DSC_11For clarification, in accordance with the provisions of Regulation (EU) No 165/2014 (Article 7), data concerning the identity of the driver shall not be communicated across *the Communication*.

2.SCOPE

The scope of this Appendix is to specify how agents of the competent control authorities use a specified 5.8 GHz DSRC wireless communication to remotely obtain data (*the Data*) from a targeted vehicle that identifies that the targeted vehicle is in potential violation of Regulation (EU) No 165/2014 and should be targeted for consideration to be stopped for further investigation.

Regulation (EU) No 165/2014 requires that the Data collected shall be limited to data or pertaining to data that identifies a potential infringement, as defined in Article 9 of Regulation (EU) No 165/2014.

In this scenario, the time available for communication is limited, because *the Communication* is targeted and of a short- range design. Further, the same communication means for remote tachograph monitoring (RTM) may also be used by the competent control authorities for other applications (such as the maximal weights and dimensions for heavy goods vehicles defined in Directive (EU) 2015/719) and such operations may be separate or sequential at the discretion of the competent control authorities.

This Appendix specifies:

The communications equipment, procedures and protocols to be used for *the Communication*

The Standards and Regulations to which the radio equipment shall comply

The presentation of *the Data* to *the Communication* equipment

The enquiry and download procedures and sequence of operations

The Data to be transferred

Potential interpretation of *the Data* transferred across *the Communication*

The provisions for security data relating to *the Communication*

The availability of *the Data* to the competent control authorities

How the *Remote early detection communication reader* can request different freight and fleet data concepts

For clarification, this Appendix does *not* specify:

the collection of *the Data* operation and management within the VU (which shall be a function of product design unless specified elsewhere within Regulation (EU) No 165/2014)

the form of presentation of collected data to the agent of the competent control authorities, nor the criteria which shall be used by the competent control authorities to decide which vehicles to stop (which shall be a function of product design unless specified elsewhere within Regulation (EU) No 165/2014 or a policy decision of the competent control authorities). For clarification: *the Communication* only makes *the Data* available to the competent control authorities in order that *they* may make informed decisions

Data security provisions (such as encryption) concerning the content of *the Data* (which shall be specified within Appendix 11 Common Security Mechanisms).

detail of any data concepts other than RTM which may be obtained using the same architecture and equipment

detail of the behaviour and management between VU's and the DSRC-VU, nor the behaviour within the DSRC-VU (other than to provide *the Data* when so requested by an REDCR).

3.ACRONYMS, DEFINITIONS AND NOTATIONS

The following acronyms and definitions specific to this Appendix are used in this appendix:

the Antenna

electrical device which converts electric power into radio waves, and vice versa used in combination with a radio transmitter or radio receiver. In operation, a radio transmitter supplies an electric current oscillating at radio frequency to the antenna's terminals, and the antenna radiates the energy from the current as electromagnetic waves (radio waves). In reception, an antenna intercepts some of the power of an electromagnetic wave in order to produce a tiny voltage at its terminals, that is applied to a receiver to be amplified

the Communication

exchange of information/data between a DSRC-REDCR and a DSRC-VU according to section 5 in a master-slave relationship to obtain the Data.

the Data

secured data of defined format (see 5.4.4) requested by the *DSRC-REDCR* and provided to the *DSRC-REDCR* by the *DSRC-VU* across a 5.8 GHz DSRC link as defined in 5 below

Regulation (EU) No 165/2014 of the European Parliament and of the Council of 4 February 2014 on tachographs in road transport, repealing Council Regulation (EEC) No 3821/85 on recording equipment in road transport and amending Regulation (EC) No 561/2006 of the European Parliament and of the Council on the harmonisation of certain social legislation relating to road transport

AID

Application Identifier

BLE

Bluetooth Low Energy

BST

Beacon Service Table

CIWD

Card insertion while driving

CRC

cyclic redundancy check

DSC (n)

identifier of a requirement for a specific DSRC appendix

DSRC

Dedicated Short Range Communication

DSRC-REDCR

DSRC — Remote Early Detection Communication Reader.

DSRC-VU

DSRC — Vehicle Unit. This is the ‘remote early detection facility’ defined in Annex 1C.

DWVC

Driving without valid card

EID

Element Identifier

LLC

Logical Link Control

LPDU

LLC Protocol Data Unit

OWS

Onboard Weighing System

PDU

Protocol Data Unit

REDCR

Remote early detection communication reader. This is the ‘remote early detection communication reader equipment’ defined in Annex 1C.

RTM

Remote Tachograph Monitoring

SM-REDCR

Security Module-Remote early detection communication reader

TARV

Telematics Applications for Regulated Vehicles (ISO 15638 series of Standards)

VU

Vehicle Unit

VUPM

Vehicle Unit Payload Memory

VUSM

Vehicle Unit Security Module

VST

Vehicle Service Table

WIM

Weigh in motion

WOB

Weigh on board

The specification defined in this Appendix refers to and depends upon all or parts of the following regulations and standards. Within the clauses of this Appendix the relevant standards, or relevant clauses of standards, are specified. In the event of any contradiction the clauses of this Appendix shall take precedence. In the event of any contradiction where no specification is clearly determined in this Appendix, operating within ERC 70-03 (and tested against the appropriate parameters of EN 300 674-1) shall take precedence, followed in descending order of preference by EN 12795, EN 12253 EN 12834 and EN 13372, 6.2, 6.3, 6.4 and 7.1.

Regulations and standards referenced in this Appendix are:

[1

Regulation (EU) No 165/2014 of the European Parliament and of the Council of 4 February 2014 on tachographs in road transport, repealing Council Regulation (EEC) No 3821/85 on recording equipment in road transport and amending Regulation (EC) No 561/2006 of the European Parliament and of the Council on the harmonisation of certain social legislation relating to road transport.

[2

Regulation (EC) No 561/2006 of the European Parliament and of the Council of 15 March 2006 on the harmonisation of certain social legislation relating to road transport and amending Council Regulations (EEC) No 3821/85 and (EC) No 2135/98 and repealing Council Regulation (EEC) No 3820/85 (Text with EEA relevance).

[3

ERC 70-03 CEPT: ECC Recommendation 70-03: Relating to the Use of Short Range Devices (SRD)

[4

ISO 15638 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV).

[5

EN 300 674-1 Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Dedicated Short Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band; Part 1: General characteristics and test methods for Road Side Units (RSU) and On-Board Units (OBU).

[6

EN 12253 Road transport and traffic telematics — Dedicated short-range communication — Physical layer using microwave at 5.8 GHz.

[7

EN 12795 Road transport and traffic telematics — Dedicated short-range communication — Data link layer: medium access and logical link control.

[8

EN 12834 Road transport and traffic telematics — Dedicated short-range communication — Application layer.

[9

EN 13372 Road transport and traffic telematics — Dedicated short-range communication — Profiles for RTTT applications

[10

ISO 14906 Electronic fee collection — Application interface definition for dedicated short- range communication

4.OPERATIONAL SCENARIOS

4.1 **Overview**

Regulation (EU) No 165/2014 provides specific and controlled scenarios within which *the Communication* is to be used.

The scenarios supported are:

'Communication Profile 1: Roadside inspection using a short range wireless communication Remote Early Detection Communication Reader instigating a physical roadside inspection (master-:-slave)

Reader Profile 1a: via a hand aimed or temporary roadside mounted and aimed Remote Early Detection Communication

Reader Profile 1b: via a vehicle mounted and directed Remote Early Detection Communication Reader'.

4.1.1 *Preconditions to data transfer via 5,8 GHz DSRC interface*

NOTE: In order to understand the context of the preconditions the reader is referred to Figure 14.3 below.

4.1.1.1Data held in VU

DSC_12The VU shall be responsible to keep updated every 60 seconds and maintain the data to be stored in the VU, without any involvement of the DSRC communication function. The means by which this is achieved is internal to the VU, specified in Regulation (EU) No 165/2014, Annex 1 C, section 3.19 '*Remote communication for targeted roadside checks*' and is not specified in this Appendix.

4.1.1.2Data provided to DSRC-VU Facility

DSC_13The VU shall be responsible to update the DSRC tachograph data (*the Data*) whenever the data stored in the VU is updated at the interval determined in 4.1.1.1 (DSC_12), without any involvement of the DSRC communication function.

DSC_14The VU data shall be used as a basis to populate and update *the Data*, the means by which this is achieved, is specified in Annex 1.C, section 3.19 '*Remote communication for targeted roadside checks*' or if there is no such specification it is a function of product design and is not specified in this Appendix. For the design of the connection between DSRC-VU facility and the VU, please refer to section 5.6.

4.1.1.3 Content of the Data

DSC_15The content and format of *the Data* shall be such that, once decrypted, it shall be structured and made available in the form and format specified in 5.4.4 of this Appendix (Data structures).

4.1.1.4Data presentation

DSC_16 *The Data*, having been kept frequently updated in accordance with the procedures determined in 4.1.1.1, shall be secured prior to presentation to the *DSRC-VU*, and presented as a secured data concept value, for temporary storage in the *DSRC-VU* as the current version of *the Data*. This data is transferred from the *VUSM* to the DSRC function *VUPM*. The *VUSM* and *VUPM* are functions and not necessarily physical entities. The form of physical instantiation to perform these functions shall be a matter of product design

unless specified elsewhere in Regulation (EU) No 165/2014.

4.1.1.5Security data

DSC_17Security data (*securityData*), comprising the data required by the *REDCR* to complete its ability to decrypt *the Data* shall be supplied as defined in Appendix 11 Common Security Mechanisms and presented as a data concept value, for temporary storage in the *DSRC-VU* as the current version of *securityData*, in the form defined in this Appendix section 5.4.4.

4.1.1.6VUPM data available for transfer across the DSRC interface

DSC_18The data concept which shall always be available in the DSRC function VUPM for immediate transfer upon request by the *REDCR* is defined in section 5.4.4 for full ASN.1 Module specifications.

General overview of communication Profile 1

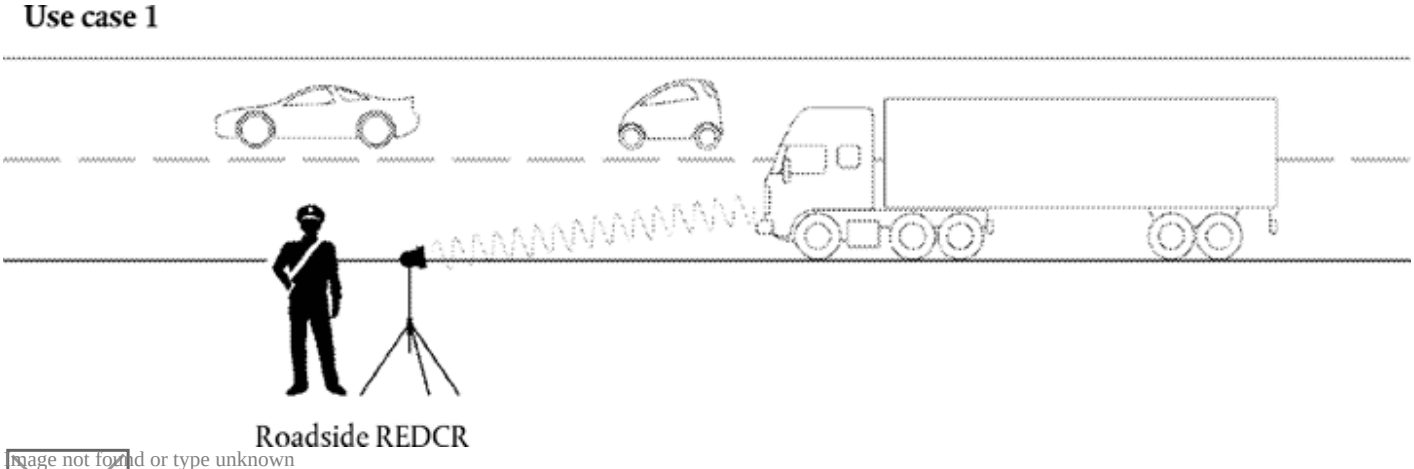
This profile covers the use case where an agent of the competent control authorities, uses a short range remote communication Remote Early Detection Communication Reader (5.8 GHz DSRC interfaces operating within ERC 70-03, and tested against the appropriate parameters of EN 300 674-1 as described in section 5) (*the REDCR*) to remotely identify a vehicle which is potentially in violation of Regulation (EU) No 165/2014. Once identified, the agent of the competent control authorities who is controlling the interrogation decides whether the vehicle should be stopped.

4.1.2 *Profile 1a: via a hand aimed or temporary roadside mounted and aimed Remote Early Detection Communication Reader*

In this use case the agent of the competent control authorities is situated at the roadside, and aims a hand held, tripod mounted, or similar portable, *REDCR* from the roadside towards the centre of the windshield of the targeted vehicle. The interrogation is made using 5.8 GHz DSRC interfaces operating within ERC 70-03, and tested against the appropriate parameters of EN 300 674-1 as described in section 5. See Figure 14.1 (Use Case 1).

Figure 14.1

Roadside interrogation using 5,8 GHz DSRC



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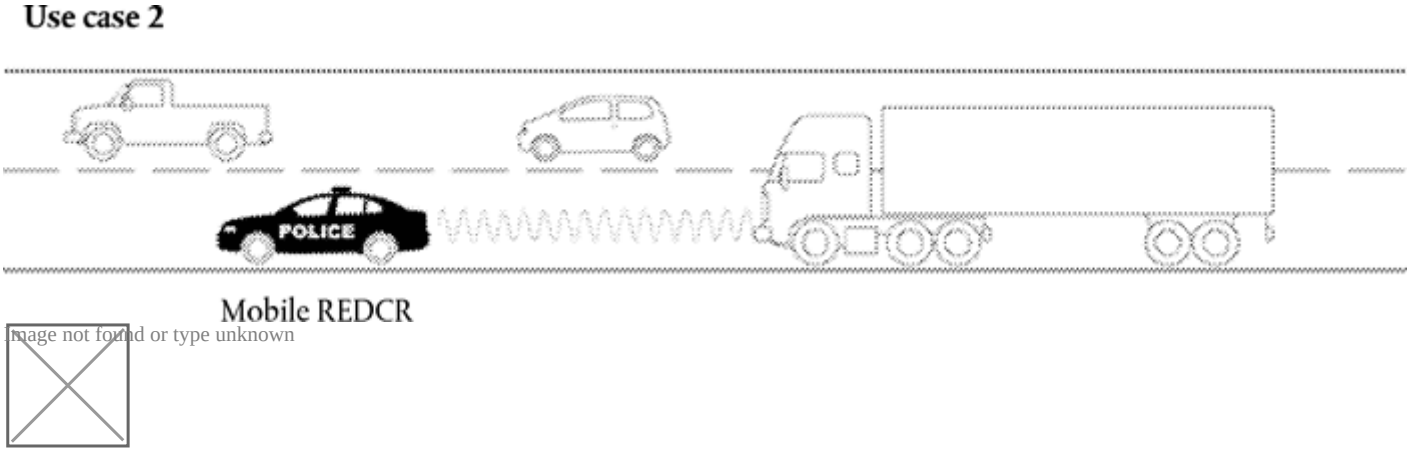
4.1.3 *Profile 1b: via a vehicle mounted and directed Remote Early Detection Communication Reader (REDCR)*

In this use case the agent of the competent control authorities is situated within a moving vehicle, and either aims a hand held, portable *REDCR* from the vehicle towards the centre of the windshield of the targeted vehicle, or *the REDCR* is mounted within or on the vehicle so as to point towards the centre of the windshield of the targeted vehicle when the Remote Early Detection Communication Reader's vehicle is in a particular position relevant to the targeted vehicle (for example directly ahead in a stream of traffic). The interrogation is made using 5.8 GHz DSRC interfaces operating within ERC 70-03, and tested against the appropriate parameters of EN 300 674-1 as described in section 5. See Figure 14.2. (Use Case 2).

Figure 14.2

Vehicle based interrogation using 5,8 GHz DSRC



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4.2 **Security/Integrity**

To give the possibility to verify the authenticity and integrity of downloaded data through the remote communication, the secured *Data* is verified and decrypted in accordance with Appendix 11 Common Security Mechanisms.

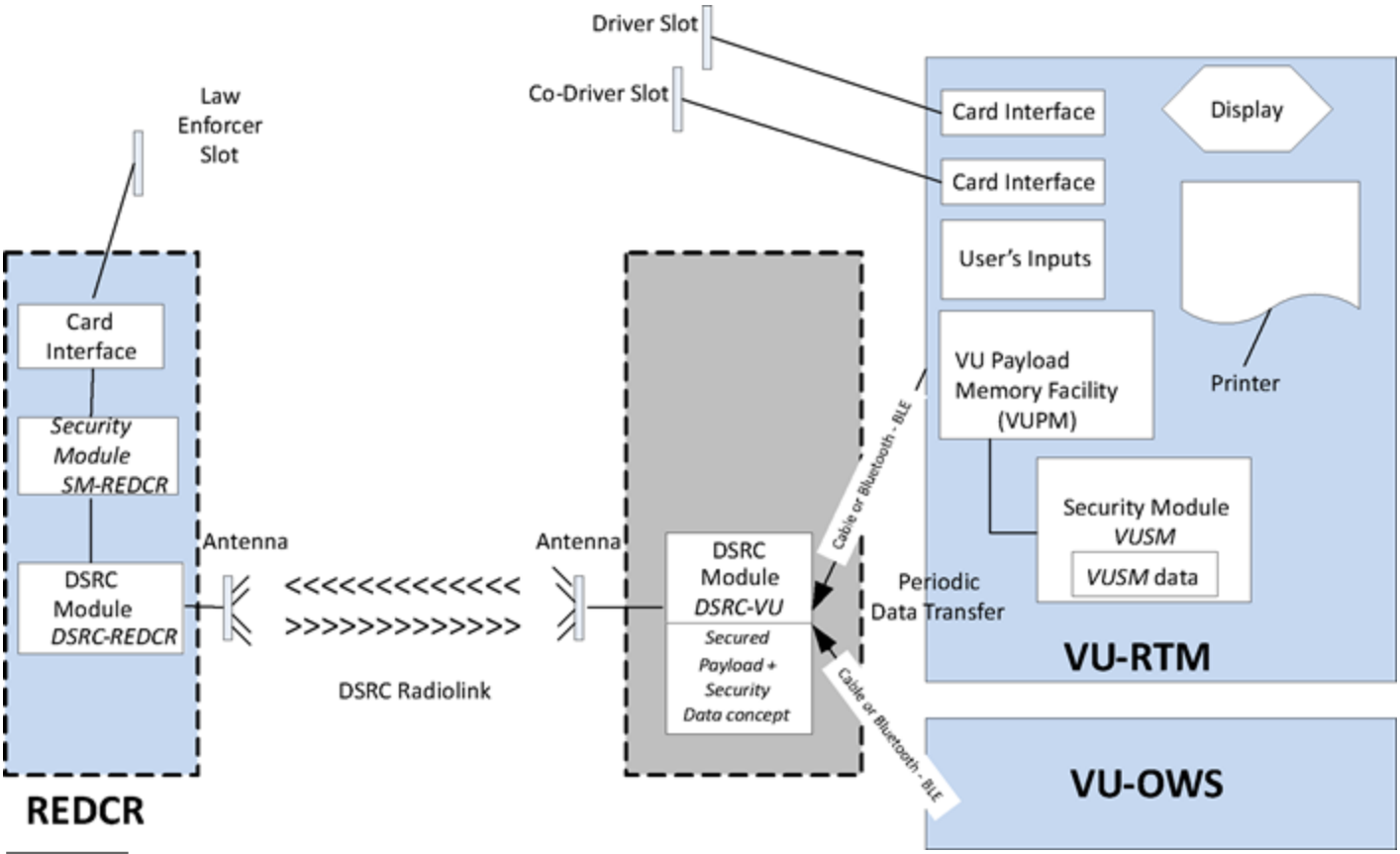
5.REMOTE COMMUNICATION DESIGN AND PROTOCOLS

5.1 **Design**

The design of the remote communication function in the Smart Tachograph is shown as described in Figure 14.3.

Figure 14.3

Design of the remote communication function



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DSC_19The following functions are located in the VU:

Security Module (*VUSM*). This function present in the VU is responsible for securing *the Data* which is to be transmitted from the *DSRC-VU* to the agent of the competent control authorities via remote communication.

The secured data is stored in the VUSM memory. At intervals determined in 4.1.1.1 (DSC_12), the VU encrypts and replenishes the RTMdata concept (which comprises payload data and security data concept values determined below in this Appendix) held in the memory of the DSRC-VU. The operation of the security module is defined in Appendix 11 Common Security Mechanisms and outwith the scope of this Appendix, save that it shall be required to provide updates to the VU Communication facility each time the VUSM data changes.

The communication between the VU and the DSRC-VU may be a wired communication or a Bluetooth Low Energy (BLE) communication, and the physical location of the DSRC-VU may be integral with the antenna on the windshield of the vehicle, may be internal to the VU, or located somewhere between.

The DSRC-VU shall have a reliable source of power available at all times. The means by which it is provided with its power is a design decision.

The memory of the DSRC-VU shall be non-volatile in order to maintain the Data in the DSRC-VU even when the vehicle ignition is switched off.

If the communication between the VU and the DSRC-VU is made via BLE and the power source is a non-recharging battery, the power source of the DSRC-VU shall be replaced at every Periodic Inspection, and the manufacturer of the DSRC-VU equipment shall be responsible to ensure that the power supply is adequate to last from one Periodic Inspection to the next Periodic Inspection, maintaining normal access to the data by an REDCR throughout the period without failure or interruption.

VU RTM ‘payload memory’ facility (*VUPM*). This function present in the VU is responsible for providing and updating *the Data*. The content of *The Data*. (‘TachographPayload’) is defined in 5.4.4/5.4.5 below and is updated at the interval determined in 4.1.1.1 (DSC_12).

DSRC-VU. This is the function, within or connected to the antenna and in communication with the VU through a wired or wireless (BLE) connection, which holds the current data (*VUPM-data*) and manages the response to an interrogation across the 5.8 GHz DSRC medium. Disconnection of the DSRC facility or interference during normal vehicle operation with the functioning of the DSRC facility shall be construed as a violation of Regulation (EU) No 165/2014.

Security module (REDCR) (*SM-REDCR*) is the function used to decrypt and check integrity of the data originating from the VU. The means by which this is achieved is determined in Appendix 11 Common Security Mechanisms, and is not defined in this Appendix.

The DSRC facility (REDCR) (*DSRC-REDCR*) function comprises a 5.8 GHz transceiver and associated firmware and software which manages *the Communication* with the *DSRC-VU* according to this Appendix.

The *DSRC-REDCR* interrogates the *DSRC-VU* of the targeted vehicle and obtains *the Data* (the targeted vehicle's current *VUPM-data*) via the DSRC link and processes and stores the received data in its *SM-REDCR*.

The DSRC-VU antenna shall be positioned at a location where it optimizes the DSRC communication between the vehicle and the roadside reader antenna, when the reader is installed 15 meters distance in front of the vehicle and 2 meters height, targeting the horizontal and vertical centre of the windscreen. For light vehicles an installation corresponding to the upper part of the windscreen is suitable. For all the other vehicles the DSRC antenna shall be installed either near the lower or near the upper part of the windscreen.

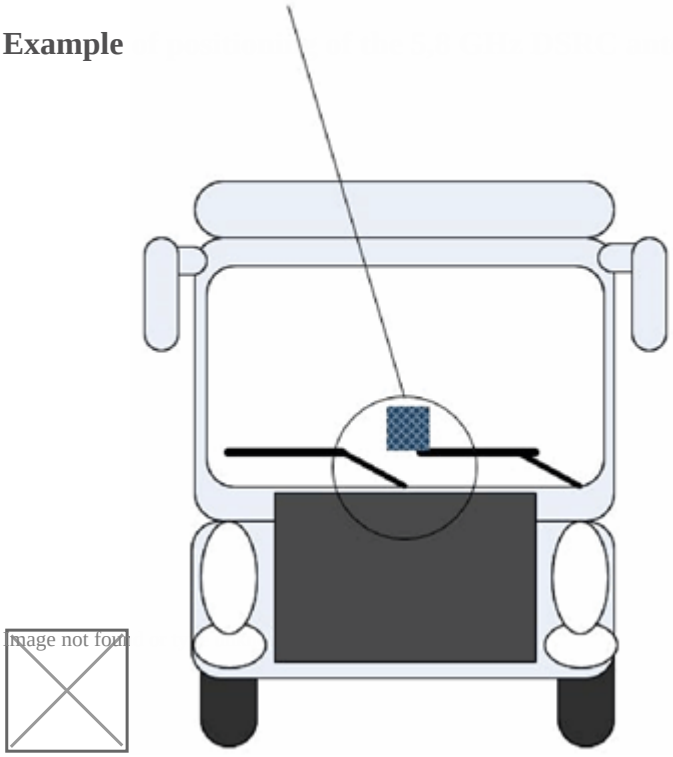
DSC_20The Antenna and The Communication shall operate within ERC 70-03, tested against the appropriate parameters of EN 300 674-1 as described in section 5. The Antenna and the Communication can implement mitigation techniques against the risk of wireless interference as described in ECC report 228 using e.g., filters in the CEN DSRC 5.8 GHz communication.

DSC_21The DSRC antenna shall be connected to the DSRC-VU facility either directly within the module mounted to or close to the windshield, or through a dedicated cable constructed in a manner to make illegal disconnection difficult. Disconnection of or interference with the functioning of Antenna shall be a violation of Regulation (EU) No 165/2014. Deliberate masking or otherwise detrimentally affecting the operational performance of the Antenna shall be construed as a violation of Regulation (EU) No 165/2014.

DSC_22 The form factor of the antenna is not defined and shall be a commercial decision, so long as the fitted DSRC-VU meets the conformance requirements defined in section 5 below. The antenna shall be positioned as determined in DSC_19 and efficiently support the use cases described in in 4.1.2 and 4.1.3.

Figure 14

Example **enna in the windshield of regulated vehicles**



The form factor of *the REDCR* and its antenna may vary according to the circumstances of the reader (tripod mounted, hand held, vehicle mounted, etc.) and the modus operandi employed by the agent of the competent control authorities.

A display and/or notification function is used to present the results of the remote communication function to the agent of the competent control authorities. A display may be provided on a screen, as a printed output, an audio signal, or a combination of such notifications. The form of such display and/or notification is a matter of the requirements of the agents of the competent control authorities and equipment design and is not specified within this Appendix.

DSC_23The design and form factor of the *REDCR* shall be a function of commercial design, operating within ERC 70-03, and the design and performance specifications defined in this Appendix, (section 5.3.2), thus providing the marketplace maximum flexibility to design and provide equipment to cover the specific interrogation scenarios of any particular competent control authority.

DSC_24The design and form factor of the *DSRC-VU* and its positioning inside or outside the VU shall be a function of commercial design, operating within ERC 70-03 and the design and performance specifications defined in this Appendix (section 5.3.2) and within this Clause (5.1).

DSC_25However, the *DSRC-VU* shall be reasonably capable to accept data concept values from other intelligent vehicle equipment by means of an open industry standard connection and protocols. (For example from weigh on board equipment), so long as such data concepts are identified by unique and known application identifiers/file names, and the instructions to operate such protocols shall be made available to the European Commission, and available without charge to manufacturers of relevant equipment.

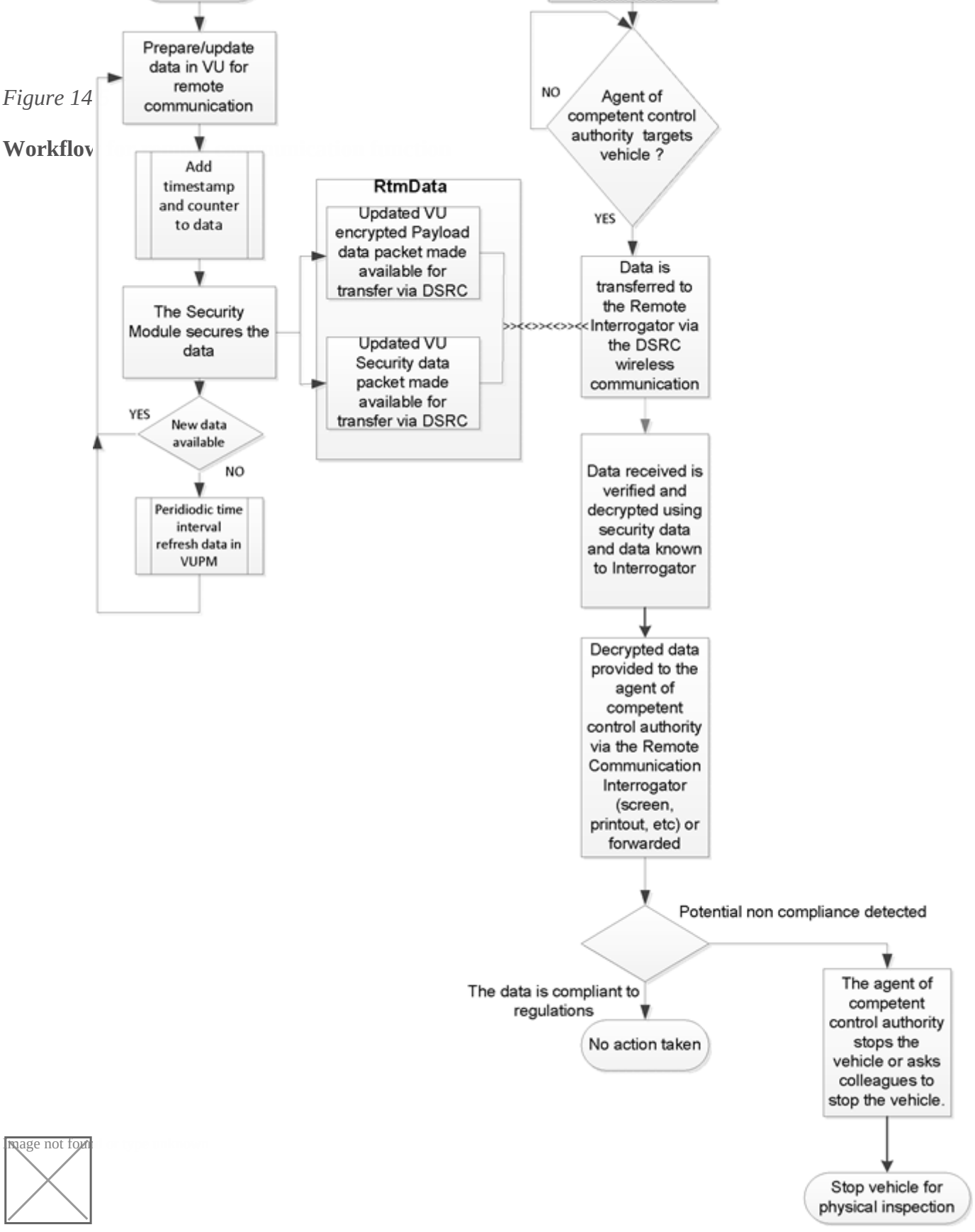
5.2 **Workflow**

5.2.1 *Operations*

The workflow of operations is represented in Figure 14.5.

Figure 14

Workflov



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The steps are described below:

a.

Whenever the vehicle is in operation (ignition ON) the tachograph is providing data to the VU function. The VU function prepares *the Data* for the remote communication function (encrypted) and updates the *VUPM* held in the memory of the *DSRC-VU* (as defined in 4.1.1.1 — 4.1.1.2). *The Data* collected shall be formatted as determined in 5.4.4 — 5.4.5 below.

b.

On every occasion that *the Data* is updated, the timestamp defined in the security data concept shall be updated.

c.

The *VUSM* function secures the data in accordance with the procedures determined in Appendix 11.

d.

On every occasion that *the Data* is updated (see 4.1.1.1 — 4.1.1.2), *the Data* shall be transferred to the *DSRC-VU*, where it replaces any previous data, in order that updated current data (*the Data*) shall always be available to be provided in the event of an interrogation by an *REDCR.* When supplied by the VU to the DSRC-VU *the Data* shall be identifiable by the filename *RTMData or* by ApplicationID and Attribute identifiers.

e.

If an agent of the competent control authorities wishes to target a vehicle and collect *the Data* from the targeted vehicle, the agent of the competent control authorities shall first insert his/her smartcard in *the REDCR* to enable *the Communication* and to allow the *SM-REDCR* to verify its authenticity and decrypt the data.

f.

The agent of the competent control authority then targets a vehicle and requests the data through remote communication. *The REDCR* opens a 5.8 GHz DSRC interface session with the *DSRC-VU* of the targeted vehicle, and requests *the Data*. *The Data* is transferred to *the REDCR* through the wireless communication system as a DSRC Attribute using the Application service GET as defined in 5.4. The Attribute contains the encrypted payload data values and the DSRC security data.

g.

The data is analyzed by the *REDCR* equipment and provided to the agent of the competent control authority.

h.

The agent of the competent control authority uses the data to assist in a decision of whether or not to stop for a detailed inspection, or ask another agent of the competent control authority to stop the vehicle.

5.2.2 *Interpretation of the Data received via the DSRC communication*

DSC_26Data received across the 5.8 GHz interface shall carry the meaning and import defined in 5.4.4 and 5.4.5 below and only that meaning and import, and shall be understood within the objectives defined therein. In accordance with the provisions of Regulation (EU) No 165/2014, *the Data* shall be used only to provide relevant information to a competent control authority to assist them to determine which vehicle should be stopped for physical inspection, and shall be subsequently destroyed in accordance with Article 9 of Regulation (EU) No 165/2014.

5.3 **DSRC Physical interface parameters for remote communication**

5.3.1 *Location constraints*

DSC_27The remote interrogation of vehicles using a 5.8GHz DSRC interface should not be used within 200 metres of an operational 5.8 GHz DSRC gantry.

5.3.2 *Downlink and uplink parameters*

DSC_28The equipment used for remote tachograph monitoring shall conform to and operate within ERC70-03 and the parameters defined in Tables 14.1 and 14.2 below.

DSC_29Further, to ensure compatibility with the operational parameters of other standardised 5.8 GHz DSRC systems, the equipment used for remote tachograph monitoring shall conform to parameters from EN 12253 and EN 13372.

Namely:

Table 14.1

Downlink parameters

a

– Downlink parameters subject to conformance testing in accordance with relevant parameter test from EN 300 674-1.

Item No	Parameter	Value(s)	Remark
D1	Downlink Carrier Frequencies	There are four alternatives which may be used by an REDCR: 5,7975 GHz 5,8025 GHz 5,8075 GHz 5,8125 GHz	Within ERC 70-03. Carrier Frequencies may be selected by the implementer of the roadside system and need not be known in the DSRC-VU (Consistent with EN 12253, EN 13372)
D1a a	Tolerance of Carrier Frequencies	within ± 5 ppm	(Consistent with EN 12253)

D2 a	RSU (REDCR) Transmitter Spectrum Mask	Within ERC 70-03. REDCR shall be according to Class B,C as defined in EN 12253. No other specific requirement within this Annex	Parameter used for controlling interference between interrogators in proximity (as defined in EN 12253 and EN 13372).
D3	OBU(DSRC-VU) Minimum Frequency Range	5,795 — 5,815 GHz	(Consistent with EN 12253)
D4 a	Maximum E.I.R.P.	Within ERC 70-03 (unlicensed) and within National Regulation Maximum + 33 dBm	(Consistent with EN 12253)
D4a	Angular E.I.R.P. mask	According to declared and published specification of interrogator designer	(Consistent with EN 12253)
D5	Polarisation	Left hand circular	(Consistent with EN 12253)
D5a	Cross-Polarisation	XPD: In bore sight: (REDCR) RSU t ? 15 dB (DSRC-VU) OBU r ? 10 dB At -3 dB area: (REDCR) RSU t ? 10 dB (DSRC-VU) OBU r ? 6 dB	(Consistent with EN 12253)
D6 a	Modulation	Two level amplitude modulation.	(Consistent with EN 12253)
D6a a	Modulation Index	0,5 ... 0,9	(Consistent with EN 12253)
D6b	Eye Pattern	? 90 % (time) / ? 85 % (amplitude)	
D7 a	Data Coding	FM0 ‘1’ bit has transitions only at the beginning and end of the bit interval. ‘0’ bit has an additional transition in the middle of the bit interval compared to the ‘1’ bit.	(Consistent with EN 12253)
D8 a	Bit rate	500 kBit/s	(Consistent with EN 12253)
D8a	Tolerance of Bit Clock	better than ± 100 ppm	(Consistent with EN 12253)
D9 a	Bit Error Rate (B.E.R.) for communication	? 10^{-6} when incident power at OBU (DSRC-VU) is in the range given by [D11a to D11b.	(Consistent with EN 12253)

D10	Wake-up trigger for OBU (DSRC-VU)	OBU (DSRC-VU) shall wake up on receiving any frame with 11 or more octets (including preamble)	No special wake-up pattern is necessary. DSRC-VU may wake up on receiving a frame with less than 11 octets (Consistent with EN 12253)
D10a	Maximum Start Time	? 5 ms	(Consistent with EN 12253)
D11	Communication zone	Spatial region within which a B.E.R. according to D9a is achieved	(Consistent with EN 12253)
D11a a	Power Limit for communication (upper).	– 24dBm	(Consistent with EN 12253)
D11b a	Power Limit for communication (lower).	Incident power: – 43 dBm (boresight) – 41 dBm (within – 45° ± 45°Corresponding to the plane parallel to the road surface when the DSRC-VU later is installed in the vehicle (Azimuth))	(Consistent with EN 12253) Extended requirement for horizontal angles up to ±45°, due to the use cases defined in this annex.
D12 a	Cut-off power level of (DSRC-VU)	– 60 dBm	(Consistent with EN 12253)
D13	Preamble	Preamble is mandatory.	(Consistent with EN 12253)
D13a	Preamble Length and Pattern	16 bits ± 1 bit of FM0 coded ‘1’ bits	(Consistent with EN 12253)
D13b	Preamble Wave form	An alternating sequence of low level and high level with pulse duration of 2 ?s. The tolerance is given byD8a	(Consistent with EN 12253)
D13c	Trailing Bits	The RSU (REDCR) is permitted to transmit a maximum of 8 bits after the end flag. An OBU (DSRC-VU) is not required to take these additional bits into account.	(Consistent with EN 12253)

Table 14.2

Uplink parameters

a

– Uplink parameters subject to conformance testing in accordance with relevant parameter test from EN 300 674-1

Item No.	Parameter	Value(s)	Remark
U1 a	Sub-carrier Frequencies	A OBU (DSRC-VU) shall support 1,5 MHz and 2,0 MHz An RSU (REDCR) shall support 1,5 MHz or 2,0 MHz or both. U1-0: 1,5 MHz U1-1: 2,0 MHz	Selection of sub-carrier frequency (1,5 MHz or 2,0 MHz) depends on the EN 13372 profile selected.
U1a a	Tolerance of Sub-carrier Frequencies	within ± 0,1 %	(Consistent with EN 12253)
U1b	Use of Side Bands	Same data on both sides	(Consistent with EN 12253)
U2 a	OBU (DSRC-VU) Transmitter Spectrum Mask	According to EN12253 1) Out band power: see ETSI EN 300674-1 2) In band power: [U4a dBm in 500 kHz 3) Emission in any other uplink channel: U2(3)-1 = – 35 dBm in 500 kHz	(Consistent with EN 12253)
U4a a	Maximum Single Side Band E.I.R.P. (boresight)	Two options: U4a-0: – 14 dBm U4a-1: – 21 dBm	According to declared and published specification of equipment designer
U4b a	Maximum Single Side Band E.I.R.P. (35°)	Two options: Not applicable – 17dBm	According to declared and published specification of equipment designer

U5	Polarisation	Left hand circular	(Consistent with EN 12253)
U5a	Cross Polarisation	XPD: In bore sight: (REDCR) RSU r ? 15 dB (DSRC-VU) OBU t ? 10 dB At – 3 dB: (REDCR) RSU r ? 10 dB (DSRC-VU) OBU t ? 6 dB	(Consistent with EN 12253)
U6	Sub-Carrier Modulation	2-PSK Encoded data synchronised with sub-carrier: Transitions of encoded data coincide with transitions of sub-carrier.	(Consistent with EN 12253)
U6b	Duty Cycle	Duty Cycle: 50 % ± ?, ? ? 5 %	(Consistent with EN 12253)
U6c	Modulation on Carrier	Multiplication of modulated sub-carrier with carrier.	(Consistent with EN 12253)
U7 a	Data Coding	NRZI (No transition at beginning of ‘1’ bit, transition at beginning of ‘0’ bit, no transition within bit)	(Consistent with EN 12253)
U8 a	Bit Rate	250 kbit/s	(Consistent with EN 12253)
U8a	Tolerance of Bit Clock	Within ± 1 000 ppm	(Consistent with EN 12253)
U9	Bit Error Rate (B.E.R.) for communication	$?10^{-6}$	(Consistent with EN 12253)
U11	Communication Zone	The spatial region within which the DSRC-VU is situated such that its transmissions are received by the REDCR with a B.E.R. of less than that given by U9a.	(Consistent with EN 12253)
U12a a	Conversion Gain (lower limit)	1 dB for each side band Range of angle: Circularly symmetric between bore sight and ± 35° and	

within – 45° ± 45° Corresponding to the plane parallel to the road surface when the DSRC-VU later is installed in the vehicle (Azimuth)	Greater that the specified value range for horizontal angles up to ± 45°, due to the use cases defined in this annex.		
U12b a	Conversion Gain (upper limit)	10 dB for each side band	Less than the specified value range for each side band within a circular cone around boresight of ± 45° opening angle
U13	Preamble	Preamble is mandatory.	(Consistent with EN 12253)
U13a	Preamble Length and Pattern	32 to 36 ?s modulated with sub- carrier only, then 8 bits of NRZI coded ‘0’ bits.	(Consistent with EN 12253)
U13b	Trailing Bits	The DSRC-VU is permitted to transmit a maximum of 8 bits after the end flag. A RSU (REDCR) is not required to take these additional bits into account.	(Consistent with EN 12253)

5.3.3 *Antenna design*

5.3.3.1REDCR antenna

DSC_30The design of the *REDCR* antenna shall be a function of commercial design, operating within the limits defined in 5.3.2 which is adapted to optimise the reading performance of the *DSRC-REDCR* for the specific purpose and read circumstances in which the *REDCR* has been designed to operate.

5.3.3.2VU antenna

DSC_31The design of the *DSRC-VU* antenna shall be a function of commercial design, operating within the limits defined in 5.3.2 which is adapted to optimise the reading performance of the *DSRC-REDCR* for the specific purpose and read circumstances in which the *REDCR* has been designed to operate.

DSC_32The VU antenna shall be fixed to, or close to, the front windshield of the vehicle as specified in 5.1 above.

DSC_33In the test environment in a workshop (see section 6.3), a DSRC-VU antenna, affixed according to 5.1 above, shall successfully connect with a standard test communication and successfully provide an RTM transaction as defined within this Appendix, at a distance between 2 and 10 meters, better than 99 % of the time, averaged over 1 000 read interrogations.

5.4 **DSRC Protocol requirements for RTM**

5.4.1 *Overview*

DSC_34The transaction protocol to download *the Data* across the 5.8 GHz DSRC interface link shall be according to the following steps. This section describes a transaction flow under ideal conditions without retransmissions or communication interrupts.

NOTE The purpose of the initialisation phase (Step 1) is to set up the communication between the *REDCR* and DSRC-VUs that have entered the 5.8 GHz DSRC (master-slave) transaction zone but have not yet established communication with the *REDCR*, and to notify the application processes.

— **Step 1**

Initialisation. The *REDCR* sends a frame containing a 'beacon service table' (BST) that includes the application identifiers (AIDs) in the service list that it supports. In the RTM application this will simply be the service with the AID value = 2 (Freight&Fleet). The *DSRC-VU* evaluates the received BST, and shall respond (see below) with the list of the supported applications within the Freight&Fleet domain, or shall not respond if none are supported. If the *REDCR* does not offer AID=2, the DSRC-VU shall not answer to the REDCR.

— **Step 2**

The *DSRC-VU* sends a frame containing a request for a private window allocation.

— **Step 3**

The *REDCR* sends a frame containing a private window allocation.

— **Step 4**

The *DSRC-VU* uses the allocated private window to send a frame containing its vehicle service table (VST). This VST includes a list of all the different application instantiations that this *DSRC-VU* supports in the framework of AID=2. The different instantiations shall be identified by means of uniquely generated EIDs, each associated with an Application Context Mark parameter value indicating the application and standard supported.

— **Step 5**

Next the *REDCR* analyses the offered VST, and either terminates the connection (RELEASE) since it is not interested in anything the VST has to offer (i.e. it is receiving a VST from a *DSRC-VU* that is not supporting the RTM transaction), or, if it receives an appropriate VST it starts an app instantiation.

— **Step 6**

To bring this about, the REDCR shall send a frame containing a command to retrieve the RTM data, identifying the RTM application instantiation by specifying the identifier corresponding to the RTM application instantiation (as specified by the DSRC-VU in the VST), and shall allocate a private window.

— **Step 7**

The *DSRC-VU* uses the newly allocated private window to send a frame that contains the addressed identifier corresponding to the RTM application instantiation as provided in the VST, followed by the attribute *RtmData* (payload element + security element).

— **Step 8**

If there are multiple services requested, the value ‘n’ is changed to the next service reference number and the process repeated.

— **Step 9**

The *REDCR* confirms receipt of the data by sending a frame containing a RELEASE command to the *DSRC-VU* to terminate the session OR if it has failed to validate a successful receipt of the LDPU goes back to step 6.

See Figure 14.6 for a pictorial description of the transaction protocol.

Figure 14.6

RTM over 5,8 GHz DSRC process flow

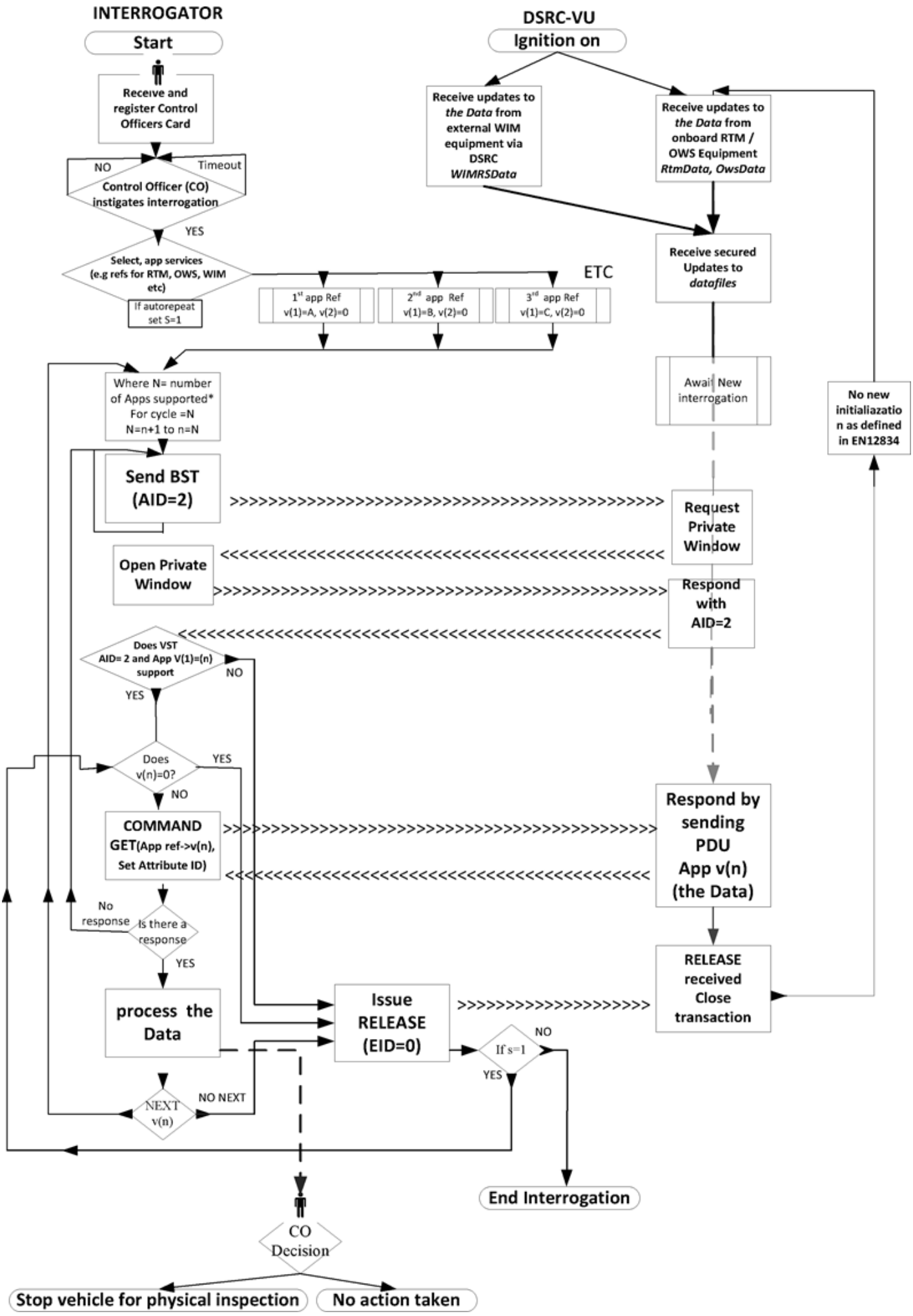

INTERROGATOR
Start
Receive and register Control Officers Card
NO
Timeout
Control Officer (CO) instigates interrogation
YES
Select, app services (e.g refs for RTM, OWS, WIM etc)
If autorepeat set S=1
ETC
1st app Ref v(1)=A, v(2)=0
2nd app Ref v(1)=B, v(2)=0
3rd app Ref v(1)=C, v(2)=0
Where N= number of Apps supported*
For cycle =N
N=n+1 to n=N
Send BST (AID=2)
Open Private Window
Does VST AID= 2 and App V(1)=(n) support
NO
YES
Does v(n)=0?
YES
NO
COMMAND GET(App ref->v(n), Set Attribute ID)
No response
Is there a response
YES
process the Data
NEXT v(n)
NO NEXT
Issue RELEASE (EID=0)
If s=1
NO
YES
End Interrogation
CO Decision
Stop vehicle for physical inspection
No action taken
DSRC-VU
Ignition on
Receive updates to the Data from external WIM equipment via DSRC WIMRSData
Receive updates to the Data from onboard RTM / OWS Equipment RtmData, OwsData
Receive secured Updates to datafiles
Awai New interrogation
Request Private Window
Respond with AID=2
Respond by sending PDU App v(n) (the Data)
RELEASE received Close transaction
No new initialiazatio n as defined in EN12834

Image not found or type unknown

5.4.2 *Commands*

DSC_35The following commands are the only functions used in an RTM transaction phase

— **INITIALISATION.request**

:

A command, issued from the REDCR in the form of a broadcast with definition of applications that the REDCR supports.

— **INITIALISATION.response**

:

An answer from the DSRC-VU confirming the connection and containing a list of supported application instances with characteristics and information how to address them (EID).

— **GET.request**

:

A command, issued from *the REDCR* to the *DSRC-VU*, that specifies the application instantiation to be addressed by means of a defined EID, as received in the VST, instructing the *DSRC-VU* to send the selected attribute(s) with *the Data*. The objective of the GET command is for *the REDCR* to obtain *the Data* from the *DSRC-VU*.

— **GET.response**

:

An answer from the DSRC-VU that contains *the Data* requested.

— **ACTION.request ECHO**

:

A command, instructing the *DSRC-VU* to send back data from the *DSRC-VU* to *the REDCR*. The objective of the ECHO command is to enable workshops or type approval test facilities to test that the DSRC link is working without needing access to security credentials.

— **ACTION**.response ECHO

:

An answer from the DSRC VU on the ECHO command.

— **EVENT_REPORT.request** RELEASE

:

A command, instructing the *DSRC-VU* that the transaction is ended. The objective of the RELEASE command is to end the session with the *DSRC-VU*. On receipt of the RELEASE the *DSRC-VU* shall not respond to any further interrogations under the current connection. Note that according to EN 12834 a DSRC-VU will not connect twice to the same interrogator unless it has been out of the communication zone for 255 seconds or if the Beacon ID of the interrogator is changed.

5.4.3 *Interrogation command sequence*

DSC_36From the perspective of the command and response sequence, the transaction is described as follows:

Sequence	Sender		Receiver	Description	Action
1	REDCR	>	DSRC-VU	Initialisation of the communication link — Request	REDCR broadcasts BST
2	*DSRC-VU*	>	*REDCR*	*Initialisation of the communication link — Response*	*If BST supports AID=2 then DSRC-VU Requests a private window*
3	REDCR	>	DSRC-VU	Grants a private window	Sends Frame containing private window allocation
4	*DSRC-VU*	>	*REDCR*	*Sends VST*	*Sends Frame comprising VST*
5	REDCR	>	DSRC-VU	Sends GET.request for data in Attribute for specific EID	
6	*DSRC-VU*	>	*REDCR*	*Sends GET.response with requested Attribute for specific EID*	*Sends Attribute (RTMData, OWSData….) with data for specific EID*
7	REDCR	>	DSRC-VU	Sends GET.request for data of other Attribute (if appropriate)	
8	*DSRC-VU*	>	*REDCR*	*Sends GET.response with requested Attribute*	*Sends Attribute with data for specific EID*
9	REDCR	>	DSRC-VU	Acknowledges successful receipt of data	Sends RELEASE command which closes transaction
10	*DSRC-VU*			*Closes transaction*	

An example of the transaction sequence and contents of the exchanged frames is defined in clauses 5.4.7 and 5.4.8

5.4.4 *Data structures*

DSC_37The semantic structure of *the Data* when passed across the 5.8 GHz DSRC interface shall be consistent with what described in this Appendix. The way these data are structured is specified in this clause.

DSC_38The payload (RTM data) consists of the concatenation of

1.

EncryptedTachographPayload data, which is the encryption of the TachographPayload defined in ASN.1 in section 5.4.5. The method of encryption is described in Appendix 11

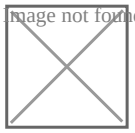
2.

DSRCSecurityData, specified in Appendix 11.

DSC_39The RTM Data is being addressed as RTM Attribute=1 and is transferred in the RTM container = 10.

DSC_40The RTM Context Mark shall identify the supported standard part in the TARV series of standards (RTM corresponds to Part 9)

The ASN.1 module definition for the DSRC data within the RTM application is defined as follows:



```
TarvRtm {iso(1) standard(0) 15638 part9(9) version1(1)}
DEFINITIONS AUTOMATIC TAGS
::= BEGIN
IMPORTS
-- Imports data attributes and elements from EFC which are used for RTM
LPN
FROM EfcDsrcApplication {iso(1) standard(0) 14906 application(0) version5(5)}

-- Imports function parameters from the EFC Application Interface Definition
SetMMIRq
FROM EfcDsrcApplication {iso(1) standard(0) 14906 application(0) version5(5)}

-- Imports the L7 DSRCData module data from the EFC Application Interface Definition
Action-Request, Action-Response, ActionType, ApplicationList, AttributeIdList, AttributeList,
Attributes,
BeaconID, BST, Dsrc-EID, DSRCApplicationEntityID, Event-Report-Request, Event-Report- Response,
EventType, Get-Request, Get-Response, Initialisation-Request, Initialisation-Response,
ObeConfiguration, Profile, ReturnStatus, Time, T-APDUs, VST
FROM EfcDsrcGeneric {iso(1) standard(0) 14906 generic(1) version5(5)};


-- Definitions of the RTM functions:
RTM-InitialiseComm-Request ::= BST
RTM-InitialiseComm-Response::= VST
RTM-DataRetrieval-Request::= Get-Request (WITH COMPONENTS {fill (SIZE(1)), eid, accessCredentials ABSENT,iid
ABSENT,  attrIdList})
RTM-DataRetrieval-Response::= Get-Response {RtmContainer} (WITH COMPONENTS {..., eid, iid ABSENT})
RTM-TerminateComm::= Event-Report-Request {RtmContainer}(WITH COMPONENTS {mode (FALSE), eid (0),
eventType (0)})

RTM-TestComm-Request::= Action-Request {RtmContainer} (WITH COMPONENTS {..., eid (0), actionType
(15), accessCredentials ABSENT, iid ABSENT})

RTM-TestComm-Response::= Action-Response {RtmContainer} (WITH COMPONENTS {..., fill (SIZE(1)), eid
(0), iid ABSENT})

   Definitions of the RTM datatypes:
RtmData ::= SEQUENCE {
     encryptedTachographPayload OCTET STRING (SIZE(67)) (CONSTRAINED BY { -- calculated encrypting
TachographPayload as per Appendix 11 --}),
     DSRCSecurityData OCTET STRING
     }
TachographPayload ::= SEQUENCE {
        (1) tp15638VehicleRegistrationPlate LPN  -  Vehicle Registration Plate as per EN 15509[1].
           tp15638SpeedingEvent             BOOLEAN,  -- 1= Irregularities in speed (see Annex 1C)
           tp15638DrivingWithoutValidCard   BOOLEAN,     -- 1= Invalid card usage (see Annex 1C)
           tp15638DriverCard                BOOLEAN,-- 0= Indicates a valid driver card  (see Annex 1C)
           tp15638CardInsertion             BOOLEAN, -- 1= Card insertion while driving (see Annex 1C)
           tp15638MotionDataError           BOOLEAN, -- 1= Motion data error (see Annex 1C)
           tp15638VehicleMotionConflict     BOOLEAN, -- 1= Motion conflict (see Annex 1C)
           tp156382ndDriverCard             BOOLEAN, -- 1= Second driver card inserted (see Annex 1C)
           tp15638CurrentActivityDriving    BOOLEAN, -- 1= other activity selected;
                                                     -- 0= driving selected
           tp15638LastSessionClosed         BOOLEAN, -- 1= improperly, 0= properly, closed
           tp15638PowerSupplyInterruption   INTEGER (0..127), -- Supply interrupts in the last 10 days
           tp15638SensorFault               INTEGER (0..255),-- eventFaultType as per data dictionary
-- All subsequent time related types as defined in Annex 1C.
           tp15638TimeAdjustment            INTEGER(0..4294967295), -- Time of the last time adjustment
           tp15638LatestBreachAttempt       INTEGER(0..4294967295), -- Time of last breach attempt
           tp15638LastCalibrationData       INTEGER(0..4294967295), -- Time of last calibration data
           tp15638PrevCalibrationData       INTEGER(0..4294967295), -- Time of previous calibration dat
           tp15638DateTachoConnected        INTEGER(0..4294967295), -- Date tachograph connected
           tp15638CurrentSpeed              INTEGER (0..255), -- Last current recorded speed
           tp15638Timestamp                 INTEGER(0..4294967295) -- Timestamp of current record(3)
           }
Rtm-ContextMark ::= SEQUENCE {
  standardIdentifier    StandardIdentifier, -- identifier of the TARV part and its version

  RtmCommProfile          INTEGER {
                             C1 (1),
                             C2 (2)
                             } (0..255) DEFAULT 1
  }
(4) RtmTransferAck ::= INTEGER {
                  Ok (1),
                  NoK (2)
                  }(1..255)
```

---

(2) ([1]) if a LPN contains an AlphabetIndicator LatinAlphabetNo2 or latinCyrillicAlphabet, the special characters are remapped at the road interrogator unit applying special rules according to Annex E of ISO/DIS.

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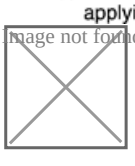


```
StandardIdentifier ::= OBJECT IDENTIFIER
RtmContainer ::= CHOICE {
        integer                         [0]    INTEGER,
        bitstring                       [1]    BIT STRING,
        octetstring                     [2]    OCTET STRING (SIZE (0..127, ...)),
        universalString                 [3]    UniversalString,
        beaconId                        [4]    BeaconID,
        t-apdu                          [5]    T-APDUs,
        dsrcApplicationEntityId         [6]    DSRCApplicationEntityID,
        dsrc-Ase-Id                     [7]    Dsrc-EID,
        attrIdList                      [8]    AttributeIdList,
        attrList                        [9]    AttributeList{RtmContainer},
        rtmData                         [10]   RtmData,
        rtmContextmark                  [11]   Rtm-ContextMark,
        reserved12                      [12]   NULL,
        reserved13                      [13]   NULL,
        reserved14                      [14]   NULL,
        time                            [15]   Time,
-- values from 16 to 255 reserved for ISO/CEN usage
        }}

END
```

5.4.5 *Elements of RtmData, actions performed and definitions*

DSC_41The data values to be calculated by the VU and used to update the secured data in the DSRC-VU shall be calculated according to the rules defined in Table 14.3:

Table 14.3

Elements of RtmData, actions performed and definitions

(1) RTM Data Element	(2) Action performed by the VU		(3) ASN.1 definition of data
RTM1 **Vehicle Registration Plate**	The VU shall set the value of the *tp15638VehicleRegistrationPlate* data element RTM1 from the recorded value of the data type *VehicleRegistrationIdentification* as defined in Appendix 1 *VehicleRegistrationIdentification*	Vehicle Registration Plate expressed as a string of characters	Image not found or type unkn

Table 14.3

Elements of RtmData, actions performed and definitions

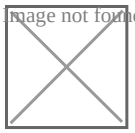
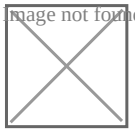
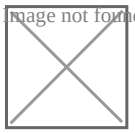
RTM2 **Speeding Event**	The VU shall generate a boolean value for data element RTM2 tp15638SpeedingEvent. The tp15638SpeedingEvent value shall be calculated by the VU from the number of Over Speeding Events recorded in the VU in the last 10 days of occurrence, as defined in Annex 1C. If there is at least one tp15638SpeedingEvent in the last 10 days of occurrence, the tp15638SpeedingEvent value shall be set to TRUE. ELSE if there are no events in the last 10 days of occurrence, the tp15638SpeedingEvent shall be set to FALSE.	1 (TRUE) — Indicates irregularities in speed within last 10 days of occurrence	
RTM3 **Driving Without Valid Card**	The VU shall generate a boolean value for data element RTM3 tp15638DrivingWithoutValidCard. The VU shall assign a value of True to the tp15638DrivingWithoutValidCard variable if the VU data has recorded at least one event in the last 10 days of occurrence of type ‘Driving without an appropriate card’ event as defined in Annex 1C. ELSE if there are no events in the last 10 days of occurrence, the tp15638DrivingWithoutValidCard variable shall be set to FALSE.	1 (TRUE) = Indicates invalid card usage	
RTM4 **Valid Driver Card**	The VU shall generate a boolean value for data element RTM4 tp15638DriverCard on the basis of the data stored in the VU and defined in Appendix 1. If no valid driver card is present the VU shall set the variable to TRUE ELSE if a valid driver card is present the VU shall set the variable to FALSE	0 (FALSE) = Indicates a valid driver card	

Table 14.3

Elements of RtmData, actions performed and definitions

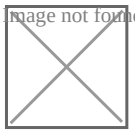
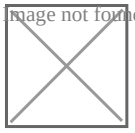
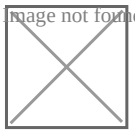
RTM5 **Card Insertion while Driving**	The VU shall generate a boolean value for data element RTM5. The VU shall assign a value of TRUE to the tp15638CardInsertion variable if the VU data has recorded in the last 10 days of occurrence at least one event of type 'Card insertion while driving.' as defined in Annex 1C. ELSE if there are no such events in the last 10 days of occurrence, the tp15638CardInsertion variable shall be set to FALSE.	1 (TRUE) = Indicates card insertion while driving within last 10 days of occurrence	
RTM6 **Motion Data Error**	The VU shall generate a boolean value for data element RTM6. The VU shall assign a value of TRUE to the tp15638MotionDataError variable if the VU data has in the last 10 days of occurrence recorded at least one event of type 'Motion data error' as defined in Annex 1C. ELSE if there are no such events in the last 10 days of occurrence, the tp15638MotionDataError variable shall be set to FALSE.	1 (TRUE) = Indicates motion data error within last 10 days of occurrence	
RTM7 **Vehicle Motion Conflict**	The VU shall generate a boolean value for data element RTM7. The VU shall assign a value of TRUE to the tp15638vehicleMotionConflict variable if the VU data has in the last 10 days recorded at least one event of type Vehicle Motion Conflict (value '0A'H). ELSE if there are no events in the last 10 days of occurrence, the tp15638vehicleMotionConflict variable shall be set to FALSE.	1 (TRUE) = Indicates motion conflict within last 10 days of occurrence	

Table 14.3

Elements of RtmData, actions performed and definitions

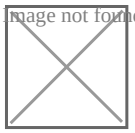
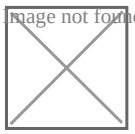
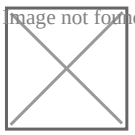
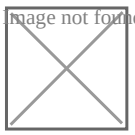
RTM8 **2nd Driver Card**	The VU shall generate a boolean value for data element RTM8 on the basis of Annex 1C ('Driver Activity Data' CREW and CO-DRIVER). If a 2nd valid driver card is present the VU shall set the variable to TRUE ELSE if a 2nd valid driver card is not present the VU shall set the variable to FALSE	1 (TRUE) = Indicates a second driver card inserted	
RTM9 **Current Activity**	The VU shall generate a boolean value for data element RTM9. If the current activity is recorded in the VU as any activity other than 'DRIVING' as defined in Annex 1C the VU shall set the variable to TRUE ELSE if the current activity is recorded in the VU as 'DRIVING' the VU shall set the variable to FALSE	1 (TRUE) = other activity selected; 0 (FALSE) = driving selected	
RTM10 **Last Session Closed**	The VU shall generate a boolean value for data element RTM10. If the last card session was not properly closed as defined in Annex 1C the VU shall set the variable to TRUE. ELSE if the last card session was properly closed the VU shall set the variable to FALSE	1 (TRUE) = improperly closed 0 (FALSE) = properly closed	
RTM11 **Power Supply Interruption**	The VU shall generate an integer value for data element RTM11. The VU shall assign a value for the tp15638PowerSupplyInterruption variable equal to the longest power supply interruption according to Article 9, Reg (EU) 165/2014 of type 'Power supply interruption' as defined in Annex 1C. ELSE if in the last 10 days of occurrence there are have been no Power supply interruption events the value of the integer shall be set to 0.	— Number of power supply interruptions in last 10 days of occurrence	

Table 14.3

Elements of RtmData, actions performed and definitions

		– sensor fault one octet as per data dictionary
RTM12 Sensor Fault	The VU shall generate an integer value for data element RTM12. The VU shall assign to the variable sensorFault a value of: 1 if an event of type ‘ 35H ’ Sensor fault has been recorded in the last 10 days, 2 if an event of type GNSS receiver fault (either internal or external with enum values ‘ 36’H or ‘37 ’ H) has been recorded in the last 10 days. 3 if an event of type ‘ 0E ’ H Communication error with the external GNSS facility event has been recorded in the last 10 days. 4 If both Sensor Fault and GNSS receiver faults have been recorded in the last 10 days 5 If both Sensor Fault and Communication error with the external GNSS facility event have been recorded in the last 10 days 6 If both GNSS receiver fault and Communication error with the external GNSS facility event have been recorded in the last 10 days 7 If all three sensor faults, have been recorded in the last 10 days ELSE it shall assign a value of 0 if no events have been recorded in the last 10 days	
		Time of the last time adjustment
RTM13 **Time Adjustment**	The VU shall generate an integer value (timeReal from Appendix 1) for data element RTM13 on the basis of the presence of Time Adjustment data as defined in Annex 1C. The VU shall assign the value of time at which the last time adjustment data event has occurred. ELSE if no ‘Time Adjustment’ event. as defined in Annex 1C is present in the VU data it shall set a value of 0	

Table 14.3

Elements of RtmData, actions performed and definitions

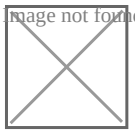
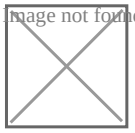
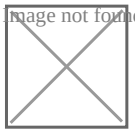
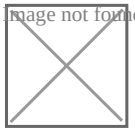
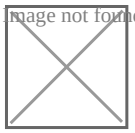
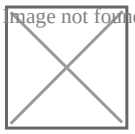
RTM14 **Security Breach Attempt**	The VU shall generate an integer value (timeReal from Appendix 1) for data element RTM14 on the basis of the presence of a Security breach attempt event as defined in Annex 1C. The VU shall set the value of the time of the latest security breach attempt event recorded by the VU. ELSE if no ‘security breach attempt’ event as defined in Annex 1C is present in the VU data it shall set a value of 0x00FF.	Time of last breach attempt — Default value =0x00FF	
RTM15 **Last Calibration**	The VU shall generate an integer value (timeReal from Appendix 1) for data element RTM15 on the basis of the presence of Last Calibration data as defined in Annex 1C. The VU shall set the value of time of the latest two calibrations (RTM15 and RTM16), which are set in VuCalibrationData defined in Appendix 1. The VU shall set the value for RTM15 to the timeReal of the latest calibration record.	Time of last calibration data	
RTM16 **Previous Calibration**	The VU shall generate an integer value (timeReal from Appendix 1) for data element RTM16 of the calibration record preceding that of the last calibration ELSE if there has been no previous calibration the VU shall set the value of RTM16 to 0.	Time of previous calibration data	
RTM17 **Date Tachograph Connected**	For data element RTM17 the VU shall generate an integer value (timeReal from Appendix 1). The VU shall set the value of the time of the initial installation of the VU. The VU shall extract this data from the VuCalibrationData (Appendix 1) from the vuCalibrationRecords with CalibrationPurpose equal to: ‘03’H	Date tachograph connected	

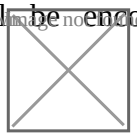
Table 14.3

Elements of RtmData, actions performed and definitions

RTM18 **Current Speed**	The VU shall generate an integer value for data element RTM18. The VU shall set the value for RTM16 to the last current recorded speed at the time of the latest update of the RtmData.	Last current recorded speed	
RTM19 **Timestamp**	For data element RTM19 the VU shall generate an integer value (timeReal from Appendix 1). The VU shall set the value for RTM19 to the time of the latest update of the RtmData.	Timestamp of current TachographPayload record	

5.4.6 *Data transfer mechanism*

DSC_42Payload data defined previously are requested by the REDCR after initialisation phase, and consequently transmitted by the *DSRC-VU* in the allocated window. The command GET is used by the REDCR to retrieve data.

DSC_43 For all DSRC exchanges, data shall be encoded using PER (Packed Encoding Rules) UNALIGNED, apart from and  , which shall be encoded using OER (Octet Encoding Rules) defined in ISO/IEC 8825-7, Rec. ITU-T X.696.

5.4.7 *Detailed DSRC transaction description*

DSC_44Initialisation is performed according to DSC_44 — DSC_48 and Tables 14.4 — 14.9. In the initialisation phase, the REDCR starts sending a frame containing a BST (Beacon Service Table) according to EN 12834 and EN 13372, 6.2, 6.3, 6.4 and 7.1 with settings as specified in the following Table 14.4.

Table 14.4

Initialisation — BST frame settings

Field	Settings
Link Identifier	Broadcast address
BeaconId	As per EN 12834
Time	As per EN 12834
Profile	No extension, 0 or 1 to be used

Table 14.4

Initialisation — BST frame settings

MandApplications	No extension, EID not present, Parameter not present, AID= 2 Freight&Fleet
NonMandApplications	Not present
ProfileList	No extension, number of profiles in list = 0
Fragmentation header	No fragmentation
Layer 2 settings	Command PDU, UI command

A practical example of the settings specified in Table 14.4, with an indication of bit encodings, is given in the following Table 14.5.

Table 14.5

Initialisation — BST frame contents example

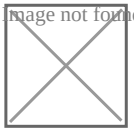
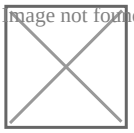
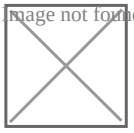
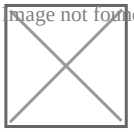
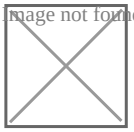
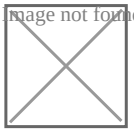
Octet #	Attribute/Field	Bits in octet	Description
1	FLAG		Start flag
2	Broadcast ID		Broadcast address
3	MAC Control Field		Command PDU
4	LLC Control field		UI command
5	Fragmentation header		No fragmentation
6	BST		Initialisation request
	SEQUENCE {		

Table 14.5

Initialisation — BST frame contents example

OPTION indicator	Image not found or type unknown	NonMand applications not present
BeaconID		
SEQUENCE {		
ManufacturerId		
INTEGER (0..65535)		
	Image not found or type unknown	Manufacturer Identifier
7	Image not found or type unknown	
8	Image not found or type unknown	
	Image not found or type unknown	27 bit ID available for manufacturer
IndividualID		
INTEGER (0..134217727)		
9 }	Image not found or type unknown	
10	Image not found or type unknown	
11	Image not found or type unknown	
12	Image not found or type unknown	32 bit UNIX real time
Time		
INTEGER (0..4294967295)		

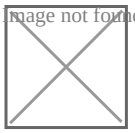
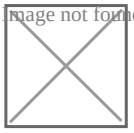
Table 14.5

Initialisation — BST frame contents example

13	Image not found or type unknown		
14	Image not found or type unknown		
15	Image not found or type unknown		
16	Profile INTEGER (0..127,...)	Image not found or type unknown	No extension. Example profile 0
17	MandApplications SEQUENCE (SIZE(0..127,...)) OF {	Image not found or type unknown	No extension, Number of mandApplications = 1
18	SEQUENCE { OPTION indicator	Image not found or type unknown	EID not present
	OPTION indicator	Image not found or type unknown	Parameter not present
	AID DSRCApplicationEntityID } }	Image not found or type unknown	No extension. AID= 2 Freight&Fleet
19	ProfileList SEQUENCE (0..127,...) OF Profile }	Image not found or type unknown	No extension, number of profiles in list = 0
20	FCS	Image not found or type unknown	Frame check sequence

Table 14.5

Initialisation — BST frame contents example

21			
22	Flag		End Flag

DSC_45A *DSRC-VU*, when receiving a BST, requires the allocation of a private window, as specified by EN 12795 and EN 13372, 7.1.1, with no specific RTM settings. Table 14.6 provides an example of bit encoding.

Table 14.6

Initialisation — Private window allocation request frame contents

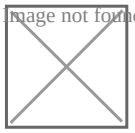
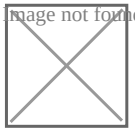
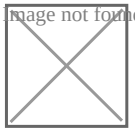
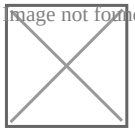
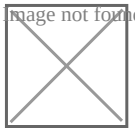
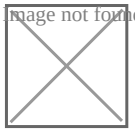
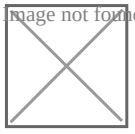
Octet #	Attribute/Field	Bits in octet	Description
1	FLAG		Start flag
2	Private LID		Link address of specific DSRC-VU
3			
4			
5			
6	MAC Control field		Private window request
7	FCS		Frame check sequence

Table 14.6

Initialisation — Private window allocation request frame contents

8	Image not found or type unknown		
9	Flag	Image not found or type unknown	End Flag

DSC_46The REDCR then answers by allocating a private window, as specified by EN 12795 and EN 13372, 7.1.1 with no specific RTM settings.

Table 14.7 provides an example of bit encoding.

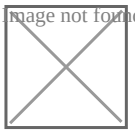
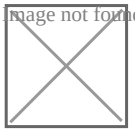
Table 14.7

Initialisation — Private window allocation frame contents

Octet #	Attribute/Field	Bits in octet	Description
1	FLAG	Image not found or type unknown	Start flag
2	Private LID	Image not found or type unknown	Link address of the specific DSRC-VU
3		Image not found or type unknown	
4		Image not found or type unknown	
5		Image not found or type unknown	
6	MAC Control field	Image not found or type unknown	Private window allocation
7	FCS	Image not found or type unknown	Frame check sequence

Table 14.7

Initialisation — Private window allocation frame contents

8			
9	Flag		End Flag

DSC_47The *DSRC-VU*, when receiving the private window allocation, sends its VST (Vehicle Service Table) as defined in EN 12834 and EN 13372, 6.2, 6.3, 6.4 and 7.1 with settings as specified Table 14.8, using the allocated transmission window.

Table 14.8

Initialisation — VST frame settings

Field	Settings
Private LID	As per EN 12834
VST parameters	Fill=0, then for each supported application: EID present, parameter present, AID=2, EID as generated by the OBU
Parameter	No extension, Contains the RTM Context Mark
ObeConfiguration	The optional ObeStatus field may be present, but shall not be used by the REDCR
Fragmentation header	No fragmentation
Layer 2 settings	Command PDU, UI command

DSC_48The *DSRC-VU* shall support the ‘Freight and Fleet’ application, identified by the Application Identifier ‘2’. Other Application Identifiers may be supported, but shall not be present in this VST, as the BST only requires AID=2. The ‘Applications’ field contains a list of the supported application instances in the *DSRC-VU*. For each supported application instantiation, a reference to the appropriate standard is given, made of an Rtm Context mark, which is composed of an OBJECT IDENTIFIER representing the related standard, its part (9 for RTM) and possibly its version, plus an EID that is generated by the DSRC-VU, and associated to that application instance.

A practical example of the settings specified in Table 14.8, with an indication of bit encodings, is given in Table 14.9.

Table 14.9

Initialisation — VST frame contents example

Octet #	Attribute/Field	Bits in octet	Description

Table 14.9

Initialisation — VST frame contents example

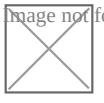
1	FLAG		Start flag
2	Private LID		Link address of the specific DSRC-VU
3			
4			
5			
6	MAC Control field		Command PDU
7	LLC Control field		UI command
8	Fragmentation header		No fragmentation
9	VST SEQUENCE {		Initialisation response
	Fill BIT STRING (SIZE(4))		Unused and set to 0
10	Profile INTEGER (0..127,...)		No extension. Example profile 0
11	Applications SEQUENCE OF {		No extension, 1 application
12	SEQUENCE { OPTION indicator		EID present

Table 14.9

Initialisation — VST frame contents example

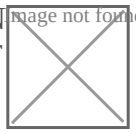
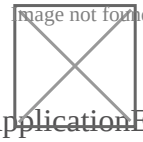
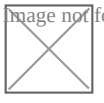
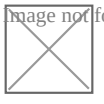
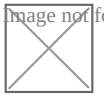
OPTION indicator			Parameter present
AID DSRCApplicationEntityID			No extension. AID= 2 Freight&Fleet
13	EID Dsrc-EID		Defined within the OBU and identifying the application instance.
14	Parameter Container {		No extension, Container Choice = 02, Octet string
15			No extension, Rtm Context Mark length = 8
16	Rtm-ContextMark::= SEQUENCE {		Object Identifier of the supported standard, part, and version. Example: ISO (1) Standard (0) TARV (15638) part9 (9) Version1 (1).
17	StandardIdentifier standardIdentifier		First octet is 06H, which is the Object Identifier. Second octet is 06H, which is its length. Subsequent 6 octets encode the example Object Identifier.
18			
19			
20			
21			
22			
23			
24	ObeConfiguration Sequence {		
	OPTION indicator		ObeStatus not present

Table 14.9

Initialisation — VST frame contents example

	Image not found or type unknown EquipmentClass INTEGER (0..32767)		
25		Image not found or type unknown	
26	ManufacturerId	Image not found or type unknown	Manufacturer identifier for the DSRC-VU as described in ISO 14816 Register
27	INTEGER (0..65535)	Image not found or type unknown	
28	FCS	Image not found or type unknown	Frame check sequence
29		Image not found or type unknown	
30	Flag	Image not found or type unknown	End Flag

DCS_49The REDCR then reads the data by issuing a GET command, conforming to the GET command defined in EN 13372, 6.2, 6.3, 6.4 and EN 12834, with settings as specified in Table 14.10.

Table 14.10

Presentation — GET request frame settings

Field	Settings
Invoker Identifier (IID)	Not present
Link Identifier (LID)	Link address of the specific DSRC-VU
Chaining	No
Element Identifier (EID)	As specified in the VST. No extension
Access Credentials	No
AttributeIdList	No extension, 1 attribute, AttributeID = 1 (RtmData)
Fragmentation	No
Layer2 settings	Command PDU, Polled ACn command

Table 14.11 shows an example of reading the RTM data.

Table 14.11

Presentation — Get Request frame example

Octet #	Attribute/Field	Bits in octet	Description
1	FLAG	Image not found or type unknown	Start flag
2	Private LID	Image not found or type unknown	Link address of the specific DSRC-VU
3		Image not found or type unknown	
4		Image not found or type unknown	
5		Image not found or type unknown	
6	MAC Control field	Image not found or type unknown	Command PDU
7	LLC Control field	Image not found or type unknown	Polled AC n command, n bit
8	Fragmentation header	Image not found or type unknown	No fragmentation
9	Get.request SEQUENCE {	Image not found or type unknown	Get request
	OPTION indicator	Image not found or type unknown	Access Credentials not present
	OPTION indicator	Image not found or type unknown	IID not present
	OPTION indicator	Image not found or type unknown	AttributeIdList present

Table 14.11

Presentation — Get Request frame example

Fill BIT STRING(SIZE(1))	Image not found or type unknown	Set to 0.	
10	EID INTEGER(0..127,…)	Image not found or type unknown	The EID of the RTM application instance, as specified in the VST. No extension
11	AttributeIdList SEQUENCE OF {	Image not found or type unknown	No extension, number of attributes = 1
12	AttributeId }}	Image not found or type unknown	AttributeId=1, RtmData. No extension
13	FCS	Image not found or type unknown	Frame check sequence
14		Image not found or type unknown	
15	Flag	Image not found or type unknown	End Flag

DSC_50The *DSRC-VU*, when receiving the GET request, sends a GET response with the requested data conforming to the GET response defined in EN 13372, 6.2, 6.3, 6.4 and EN 12834, with settings as specified in Table 14.12.

Table 14.12

Presentation — GET response frame settings

Field	Settings
Invoker Identifier (IID)	Not present
Link Identifier (LID)	As per EN 12834
Chaining	No
Element Identifier (EID)	As specified in the VST.
Access Credentials	No
Fragmentation	No

Table 14.12

Presentation — GET response frame settings

Layer2 settings	Response PDU, Response available and command accepted, ACn command

Table 14.13 shows an example of reading the RTM data.

Table 14.13

Presentation — Response frame contents example

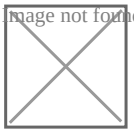
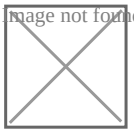
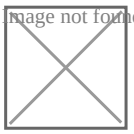
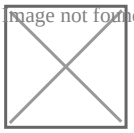
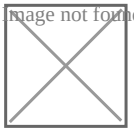
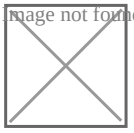
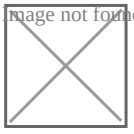
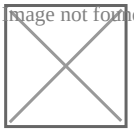
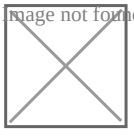
Octet #	Attribute/Field	Bits in octet	Description
1	FLAG		Start flag
2	Private LID		Link address of the specific DSRC-VU
3			
4			
5			
6	MAC Control field		Response PDU
7	LLC Control field		Response available, ACn command n bit
8	LLC Status field		Response available and command accepted
9	Fragmentation header		No fragmentation

Table 14.13

Presentation — Response frame contents example

10	Get.response SEQUENCE {	Image not found or type unknown	Get response
	OPTION indicator	Image not found or type unknown	IID not present
	OPTION indicator	Image not found or type unknown	Attribute List present
	OPTION indicator	Image not found or type unknown	Return status not present
	Fill BIT STRING(SIZE(1))	Image not found or type unknown	Not used
11	EID INTEGER(0..127,…)	Image not found or type unknown	Responding from the RTM application Instance. No extension,
12	AttributeList SEQUENCE OF {	Image not found or type unknown	No extension, number of attributes = 1
13	Attributes SEQUENCE { AttributeId	Image not found or type unknown	No extension, AttributeId=1 (RtmData)
14	AttributeValue CONTAINER {	Image not found or type unknown	No extension, Container Choice = 10_{10}.
15		Image not found or type unknown	RtmData

Table 14.13

Presentation — Response frame contents example

16	Image not found or type unknown		
17	Image not found or type unknown		
…	…		
n	}}}}	Image not found or type unknown	
n+1	FCS	Image not found or type unknown	Frame check sequence
n+2		Image not found or type unknown	
n+3	Flag	Image not found or type unknown	End Flag

DSC_51The REDCR then closes the connection by issuing a EVENT_REPORT, RELEASE command conforming to EN 13372, 6.2, 6.3, 6.4 and EN 12834,7.3.8, with no specific RTM settings. Table 14.14 shows a bit encoding example of the RELEASE command.

Table 14.14

Termination. EVENT_REPORT Release frame contents

Octet #	Attribute/Field	Bits in octet	Description
1	FLAG	Image not found or type unknown	Start flag
2	Private LID	Image not found or type unknown	Link address of the specific DSRC-VU
3		Image not found or type unknown	

Table 14.14

Termination. EVENT_REPORT Release frame contents

4	Image not found or type unknown		
5	Image not found or type unknown		
6	MAC Control field	Image not found or type unknown	The frame contains a command LPDU
7	LLC Control field	Image not found or type unknown	UI command
8	Fragmentation header	Image not found or type unknown	No fragmentation
9	EVENT_REPORT.request SEQUENCE {	Image not found or type unknown	EVENT_REPORT (Release)
	OPTION indicator	Image not found or type unknown	Access Credentials not present
	OPTION indicator	Image not found or type unknown	Event parameter not present
	OPTION indicator	Image not found or type unknown	IID not present
	Mode BOOLEAN	Image not found or type unknown	No response expected
10	EID INTEGER (0..127,…)	Image not found or type unknown	No extension, EID = 0 (System)

Table 14.14

Termination. EVENT_REPORT Release frame contents

11	EventType INTEGER (0..127,…) }	Image not found or type unknown	Event type 0 = Release
12	FCS	Image not found or type unknown	Frame check sequence
13		Image not found or type unknown	
14	Flag	Image not found or type unknown	End Flag

DSC_52The *DSRC-VU* is not expected to answer to the Release command. The communication is then closed.

5.4.8 *DSRC Test transaction description*

DSC_53Full tests that include securing the data, need to be carried out as defined in Appendix 11 Common Security Mechanisms, by authorised persons with access to security procedures, using the normal GET command as defined above.

DSC_54 Commissioning and periodic inspection tests that require decrypting and comprehension of the decrypted data content shall be undertaken as specified in Appendix 11 Common Security Mechanisms and Appendix 9, Type Approval List of Minimum required tests.

However, the basic DSRC communication can be tested by the command ECHO. Such tests may be required on commissioning, at periodic inspection, or otherwise to the requirement of the competent control authority or Regulation (EU) No 165/2014 (See 6 below)

DSC_55In order to effect this basic communication test, the ECHO command is issued by the REDCR during a session, i.e., after an initialisation phase has been completed successfully. The sequence of interactions is thus similar to that of an interrogation:

— Step 1

The REDCR sends a ‘beacon service table’ (BST) that includes the application identifiers (AIDs) in the service list that it supports. In the RTM applications this will simply be the service with the AID value = 2.

The *DSRC-VU* evaluates the received BST, and where it identifies that the BST is requesting Freight&Fleet (AID = 2), the *DSRC-VU* shall respond. If *the REDCR* does not offer AID=2, the *DSRC-VU* shall shut down its transaction with *the REDCR.*

— Step 2

The DSRC-VU sends a request for a private window allocation.

— Step 3

The REDCR sends a private window allocation.

— Step 4

The *DSRC-VU* uses the allocated private window to send its vehicle service table (VST). This VST includes a list of all the different application instantiations that this *DSRC-VU* supports in the framework of AID=2. The different instantiations shall be identified by means of uniquely EIDs, each associated with a parameter value indicating the instance of the application that is supported.

— Step 5

Next *the REDCR* analyses the offered VST, and either terminates the connection (RELEASE) since it is not interested in anything the VST has to offer (i.e., it is receiving a VST from a *DSRC-VU* that is not an RTM VU, or, if it receives an appropriate VST it starts an app instantiation.

— Step 6

The *REDCR* shall issue a command (ECHO) to the specific *DSRC-VU*, and allocates a private window.

— Step 7

The *DSRC-VU* uses the newly allocated private window to send an ECHO response frame.

The following tables give a practical example of an ECHO exchange session.

DSC_56Initialisation is performed according to 5.4.7 (DSC_44 — DSC_48) and Tables 14.4 — 14.9

DSC_57The REDCR then issues an ACTION, ECHO command conforming to ISO 14906, containing 100 octets of data and with no specific settings for RTM. Table 14.15 shows the contents of the frame sent by the REDCR.

Table 14.15

ACTION, ECHO request frame example

Octet #	Attribute/Field	Bits in octet	Description
1	FLAG	Image not found or type unknown	Start flag
2	Private LID	Image not found or type unknown	Link address of the specific DSRC-VU
3		Image not found or type unknown	

Table 14.15

ACTION, ECHO request frame example

4	Image not found or type unknown		
5	Image not found or type unknown		
6	MAC Control field	Image not found or type unknown	Command PDU
7	LLC Control field	Image not found or type unknown	Polled ACn command, n bit
8	Fragmentation header	Image not found or type unknown	No fragmentation
9	ACTION.request SEQUENCE {	Image not found or type unknown	Action request (ECHO)
	OPTION indicator	Image not found or type unknown	Access Credentials not present
	OPTION indicator	Image not found or type unknown	Action parameter present
	OPTION indicator	Image not found or type unknown	IID not present
	Mode BOOLEAN	Image not found or type unknown	Response expected
10	EID INTEGER (0..127,…)	Image not found or type unknown	No extension, EID = 0 (System)

Table 14.15

ACTION, ECHO request frame example

11	ActionType INTEGER (0..127,…)	Image not found or type unknown	No extension, Action type ECHO request
12	ActionParameter CONTAINER {	Image not found or type unknown	No extension, Container Choice = 2
13		Image not found or type unknown	No extension. String length = 100 octets
14		Image not found or type unknown	Data to be echoed
…		…	
113	}}	Image not found or type unknown	
114	FCS	Image not found or type unknown	Frame check sequence
115		Image not found or type unknown	
116	Flag	Image not found or type unknown	End Flag

DSC_58The *DSRC-VU*, when receiving the ECHO request, sends an ECHO response of 100 octets of data by reflecting the received command, according to ISO 14906, with no specific settings for RTM. Table 14.16 shows a bit level encoding example.

Table 14.16

ACTION, ECHO response frame example

Octet #	Attribute/Field	Bits in octet	Description
1	FLAG	Image not found or type unknown	Start flag

Table 14.16

ACTION, ECHO response frame example

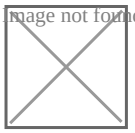
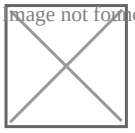
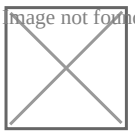
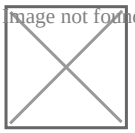
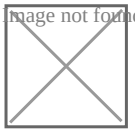
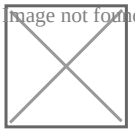
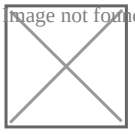
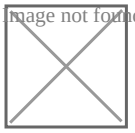
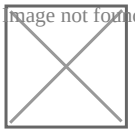
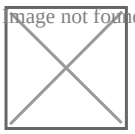
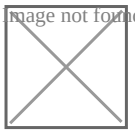
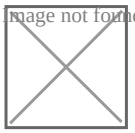
2	Private LID		Link address of the specific VU
3			
4			
5			
6	MAC Control field		Response PDU
7	LLC Control field		ACn command n bit
8	LLC status field		Response available
9	Fragmentation header		No fragmentation
10	ACTION.response SEQUENCE {		ACTION response (ECHO)
	OPTION indicator		HD not present
	OPTION indicator		Response parameter present
	OPTION indicator		Return status not present

Table 14.16

ACTION, ECHO response frame example

Fill BIT STRING (SIZE (1))	Image not found or type unknown	Not used
11	EID INTEGER (0..127,…)	Image not found or type unknown No extension, EID = 0 (System)
12	ResponseParameter CONTAINER {	Image not found or type unknown No extension, Container Choice = 2
13		Image not found or type unknown No extension. String length = 100 octets
14		Image not found or type unknown Echoed data
…		…
113	}}	Image not found or type unknown
114	FCS	Image not found or type unknown Frame check sequence
115		Image not found or type unknown
116	Flag	Image not found or type unknown End Flag

5.5 **Support for Directive (EU) 2015/719**

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5.6 **Data transfer between the DSRC-VU and VU**

5.6.1 *Physical Connection and interfaces*

DSC_66The connection between the *VU* and the *DSRC-VU* can be either by physical cable or short range wireless communication based on Bluetooth v4.0 BLE.

DSC_67Regardless of the choice of the physical connection and interface, the following requirements shall be satisfied:

DSC_68

a) In order that different suppliers may be contracted to supply the VU and the DSRC-VU, and indeed different batches of DSRC-VU, the connection between the VU and the DSRC-VU not internal to the VU shall be an open standard connection. The VU shall connect with the DSRC-VU either

i)

using fixed cable of at least 2 meters, using a Straight DIN 41612 H11 Connector — 11 pin approved male connector from the DSRC-VU to match a similar DIN/ISO approved female connector from the VU device,

ii)

using Bluetooth Low Energy (BLE)

iii)

using a standard ISO 11898 or SAE J1939 connection

DSC_69

b) The definition of the interfaces and connection between the VU and DSRC-VU must support the application protocol commands defined in 5.6.2. and

DSC_70

c) The VU and DSRC-VU must support the operation of the data transfer via the connection in regard to performance and power supply.

5.6.2 *Application Protocol*

DSC_71The application protocol between the VU Remote Communication facility and DSRC-VU is responsible for periodically transferring the remote communication data from the VU to the DSRC.

DSC_72The following main commands are identified:

1.

Initialisation of the communication link — Request

2.

Initialisation of the communication link — Response

3.

Send Data with Identifier of the RTM application and Payload defined by RTM Data

4.

Acknowledgment of the data

5.

Termination of the communication link — Request

6.

Termination of the communication link — Response

DSC_73In ASN1.0, the previous commands may be defined as:

```
}

RCDT-Communication Link Initialization - Response::= SEQUENCE {
     LinkIdentifier INTEGER,
     answer         BOOLEAN
}

     RCDT- Send Data ::=
     SEQUENCE { LinkIdentifier
     INTEGER, DataTransactionId
     INTEGER, RCDTData
     SignedTachographPayload
}

     RCDT Data Acknowledgment ::
     SEQUENCE { LinkIdentifier
     INTEGER, DataTransactionId
     INTEGER,
     answer         BOOLEAN
}

     RCDT-Communication Link Termination - Request ::= SEQUENCE {
     LinkIdentifier INTEGER
}

     RCDT-Communication Link Termination - Response::= SEQUENCE {
     LinkIdentifier INTEGER,
     answer         BOOLEAN
}

End
```

Image not found or type unknown

DSC_74The description of the commands and parameters is following:

Image not found or type unknown

RCDT-Communication Link Initialization – Request is used to initialize the communication link. The command is sent by the VU to the DSRC-VU. The LinkIdentifier is set by the VU and communicated to the DSRC-VU to track a specific communication link.

(*Note:* this is to support future links and other application/modules like Weighing on board).

Image not found or type unknown

RCDT-Communication Link Initialization – Response is used by the DSRC-VU to provide the response of the request to initialize the communication link. The command is sent by the DSRC-VU to the VU. The command provides the result of the initialisation as answer = 1 (Success) or =0 (Failure).

DSC_75The initialization of the communication link shall be done only after installation, calibration, and start of the engine/VU is switched on.

Image not found or type unknown

RCDT-Send Data is used to by the VU to send the signed RCDTData (i.e., *the remote communication Data*) to the DSRC-VU. The data will be sent every 60 seconds. The DataTransactionId parameter identifies the specific transmission of data. The LinkIdentifier is also used to ensure that the appropriate link is correct.

https://www.legislation.gov.uk/eur/2016/799/images/eur_20160799_2020-02-26_en_899?view=plain

Image not found or type unknown is sent by the DSRC-VU to provide the feedback to the VU on the reception of the data from a

Image not found or type unknown command identified by the DataTransactionId parameter. The Answer parameter is 1 (Success) or =0 (Failure). If a VU receives more than three answers equal to 0 or if the VU does not receive a RCDT Data Acknowledgment for a specific previously sent RCDT- Send Data with a specific DataTransactionId, the VU will generate and record an event.

Image not found or type unknown RCDT-Communication Link Termination request is sent by the VU to DSRC-VU to terminate a link for a specific LinkIdentifier.

DSC_76At the restart of the DSRC-VU or a VU, all the existing Communication Links should be removed as there could be ‘dangling’ Links due to the sudden shutdown of a VU.

Image not found or type unknown RCDT-Communication Link Termination – Response is sent by the DSRC-VU to the VU to confirm the request of termination of the link by the VU for the specific LinkIdentifier.

5.7 **Error handling**

5.7.1 *Recording and communication of the Data in the DSRC-VU*

DSC_77 *The Data* shall be provided, already secure *d, b* y the *VUSM* function to the *DSRC-VU* . The *VUSM* shall verify that data recorded in the *DSRC-VU* has been recorded correctly. The recording and reporting of any errors in the transfer of data from the *VU* to the memory of the *DSRC-VU* shall be recorded with type EventFaultType and enum value set to ‘0C’H Communication error with the remote communication facility event together with the timestamp.

DSC_78The *VU* shall maintain a file identified by a unique name that is easily identifiable by inspectors for the purpose of recording ‘VU internal communication failures’.

DSC_79If the VUPM attempts to obtain VU data from the security module (to pass to the VU-DSRC), but fails to do so, it shall record that failure with type EventFaultType and enum value set to *‘62’H Remote Communication Facility*' communication fault together with the timestamp. The failure of the communication

is detected when a RCDT Data Acknowledgment message is not received for the related (i.e., with the same DataTransactionId in the Send Data and Acknowledgment messages) RCDT Send Data for more than three consecutive times.

5.7.2 *Wireless Communication errors*

DSC_80Communication error handling shall be consistent with the related DSRC standards, namely EN 300 674-1, EN 12253, EN 12795, EN 12834 and the appropriate parameters of EN 13372.

5.7.2.1 *Encryption and signature errors*

DSC_81Encryption and signature errors shall be handled as defined in Appendix 11 Common Security Mechanisms and are not present in any error messages associated with the DSRC transfer of data.

5.7.2.2 *Recording of errors*

The DSRC medium is a dynamic wireless communication in an environment of uncertain atmospheric and interference conditions, particularly in the ‘portable REDCR’ and ‘moving vehicle’ combinations involved in this application. It is therefore necessary to ascertain the difference between a ‘read failure’ and an ‘error’ condition. In a transaction across a wireless interface, read failure is common and the consequence is usually to retry, i.e. rebroadcast the BST and reattempt the sequence, which will in most circumstances lead to a successful communication connection and transfer of data, unless the target vehicle moves out of range during the time required to retransmit. (A ‘successful’ instance of a ‘read’ may have involved several attempts and retries).

Read failure may be because the antennas were not paired properly (failure of ‘aiming’); because one of the antennas is shielded — this may be deliberate, but also can be caused by the physical presence of another vehicle; radio interference, especially from circa 5.8 GHz WIFI or other public access wireless communications, or may be caused by radar interference, or difficult atmospheric conditions (e.g. during a thunderstorm); or simply by moving out of the range of the DSRC communication. Individual instances of read failures, by their nature, cannot be recorded, simply because the communication simply did not occur.

However, if the agent of the competent control authority targets a vehicle and attempts to interrogate its *DSRC-VU*, but no successful transfer of data ensues, this failure could have occurred because of deliberate tampering, and therefore the agent of the competent control authority needs a means to log the failure, and alert colleagues downstream that there may be a violation. The colleagues can then stop the vehicle and carry out a physical inspection. However, as no successful communication has taken place, the DSRC-VU cannot provide data concerning the failure. Such reporting shall therefore be a function of REDCR equipment design.

‘Failure to read’ is technically different to an ‘error’. In this context an ‘error’ is the acquisition of a wrong value.

Data transferred to the *DSRC-VU* is supplied already secured, therefore must be verified by the supplier of the data (see 5.4).

Data subsequently transferred across the air interface is checked by cyclic redundancy checks at the communications level. If the CRC validates, then the data is correct. If the CRC does not validate, the data is retransmitted. The probability that data could successfully pass through a CRC incorrectly is statistically so highly improbable that it may be discounted.

If the CRC does not validate and there is no time to retransmit and receive the correct data, then the result will not be an error, but an instantiation of a specific type of read failure.

The only meaningful 'failure' data that can be recorded is that of the number of successful initiations of transactions that occur, that do not result in a successful transfer of data to the REDCR.

DSC_82The *REDCR* shall therefore record, time-stamped, the number of occasions where the 'initialisation' phase of a DSRC interrogation is successful, but the transaction terminated before *the Data* was successfully retrieved by the REDCR. This data shall be available to agent of the competent control authority and shall be stored in the memory of the REDCR equipment. The means by which this is achieved shall be a matter of product design or the specification of a competent control authority.

The only meaningful 'error' data that can be recorded is the number of occasions where the REDCR fails to decrypt *the Data* received. However, it should be noted that this will only relate to the efficiency of the REDCR software. Data may be technically decrypted, but make no semantic sense.

DSC_83The *REDCR* shall therefore record, time-stamped, the number of occasions where it has attempted but failed to decipher data received across the DSRC interface.

6.COMMISSIONING AND PERIODIC INSPECTION TESTS FOR THE REMOTE COMMUNICATION FUNCTION

6.1 **General**

DSC_84Two type of tests are foreseen for the remote communication function:

1)

An ECHO test to validate the *DSRC-REDCR >>-:-<DSRC-VU wireless* communication channel.

2)

A End-to-end security test to ensure that a workshop card is able to access the encrypted and signed data content created by the VU and transmitted over the wireless communication channel.

6.2 **ECHO**

This clause contains provisions specifically made to test only that the *DSRC-REDCR >>-:-<DSRC-VU* is functionally active.

The objective of the ECHO command is to enable workshops or type approval test facilities to test that the DSRC link is working without needing access to security credentials. The tester's equipment therefore only needs to be able to initialise a DSRC communication (sending a BST with AID=2) and then send the ECHO command, and, assuming the DSRC is working, will receive the ECHO response. See 5.4.8 for details. Assuming it receives this response correctly, the DSRC link (*DSRC-REDCR >>-:-<DSRC-VU*) may be validated as functioning correctly.

6.3 **Tests to validate the secure data content**

DSC_85This test is execute to validate the end-to-end security flow of data. A DSRC test reader is needed for such test. The DSRC test reader performs the same functionality and it is implemented with the same specifications of the reader used by the law enforcers, with the difference that a workshop card shall be used to authenticate the user of the DSRC test reader rather than a control card. The test can be executed after the initial activation of a Smart Tachograph or at the end of the calibration procedure. After the activation, the vehicle unit shall generate and communicate to the DSRC-VU the secured early detection data.

DSC_86The workshop personnel must position the DSRC test reader at a distance between 2 and 10 metres in front of the vehicle.

DSC_87Then the workshop personnel will insert a workshop card in the DSRC test reader to request the interrogation of the early detection data to the vehicle unit. After a successful interrogation, the workshop personnel will access the received data to ensure that it has been successfully validated for integrity and decrypted.