Triggering Conditions and Data Quality Dangerous Situation

CAR 2 CAR Communication Consortium

About the C2C-CC

Enhancing road safety and traffic efficiency by means of Cooperative Intelligent Transport Systems and Services (C-ITS) is the dedicated goal of the CAR 2 CAR Communication Consortium. The industrial driven, non-commercial association was founded in 2002 by vehicle manufacturers affiliated with the idea of cooperative road traffic based on Vehicle-to-Vehicle Communications (V2V) and supported by Vehicle-to-Infrastructure Communications (V2I). Today, the Consortium comprises 61 members, with 11 vehicle manufacturers, 31 equipment suppliers and 29 research organisations.

Over the years, the CAR 2 CAR Communication Consortium has evolved to be one of the key players in preparing the initial deployment of C-ITS in Europe and the subsequent innovation phases. CAR 2 CAR members focus on wireless V2V communication applications based on ITS-G5 and concentrate all efforts on creating standards to ensure the interoperability of cooperative systems, spanning all vehicle classes across borders and brands. As a key contributor, the CAR 2 CAR Communication Consortium works in close cooperation with the European and international standardisation organisations such as ETSI and CEN.

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Table 1: Document information

Changes since last version

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Explanatory notes:			
31/07/2020	Minor corrections	Release Management	Steering Committee
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Table 2: Changes since last version

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1 Introduction

Other (informational) **RS_tcDaSi_216**

This document describes the triggering conditions for dangerous situations detected by an intervention of active safety systems for the following three C-ITS services:

- dangerous situations - electronic emergency brake light
- dangerous situations - automatic brake intervention
- dangerous situations - occupant restraint system intervention

2 Definitions

Definition **RS_tcDaSi_642**

‘*Vehicle speed*’ is the length of the velocity-vector of the reference position point.

3 Requirement specifications

Other (informational) **RS_tcDaSi_217**

In day to day traffic the traffic participants are subject to a variety of driving challenges which tend to complicate the driving task. If these so-called dangerous situations (i.e. driving challenges) are addressed in advance (i.e. even before the vehicle enters the danger zone), that would mean a significant gain in safety. The current sophistications, in terms of vehicle to vehicle communication allow the vehicle which is already in a danger zone to communicate the possible danger to other participants of the surrounding traffic. The driver of recipient vehicle can negotiate the oncoming danger through an appropriate driving behaviour and an increased attentiveness.

Active safety functions support the driver of ego-vehicle by intervening when detecting a dangerous situation in order to avoid or to mitigate the consequences of an imminent collision. In instances of multiple interventions by several safety systems, a priority has to be made as to which intervening function shall be considered.

3.1 Dangerous situations - electronic emergency brake light

3.1.1 Description of C-ITS service

Other (informational) **RS_tcDaSi_218**

This C-ITS services consists of triggering a DENM due to an emergency brake by the driver, e.g. as a reaction to a stationary or slower vehicle in front. The ego vehicle itself becomes a possible local danger zone.

Other (informational) **RS_tcDaSi_219**

The following C-ITS services are related to this service, because they share similar triggering conditions:

- ‘dangerous situations — automatic brake intervention’;
- ‘dangerous situations — reversible occupant restraint system intervention’.

3.1.2 Triggering conditions

3.1.2.1 Preconditions

Requirement **RS_tcDaSi_238**

No specific preconditions apply for this C-ITS service.

Tested by:

Requirement **RS_tcDaSi_165**

Parallel activation with the other related C-ITS services shall be avoided. Where the ‘automatic brake intervention’ and/or ‘reversible occupant restraint system intervention’ C-ITS services are triggered simultaneously, the C-ITS services shall be prioritised as follows:

1.) ‘electronic emergency brake light’ (highest priority);

2.) ‘automatic brake intervention’;

3.) ‘reversible occupant restraint system intervention’ (lowest priority).

Tested by:

Requirement **RS_tcDaSi_166**

If a higher-priority C-ITS service is triggered, any related lower-priority C-ITS service transmission that has already been triggered and is still active regarding update, shall be aborted. In addition, the generation of a new DENM for the higher-priority C-ITS service shall be requested.

Tested by:

3.1.2.2 Service-specific conditions

Requirement **RS_tcDaSi_167**

If the following condition is satisfied, the triggering conditions for this C-ITS service are fulfilled and the generation of a DENM shall be triggered.

a) a signal representing the request for the electronic emergency brake light is detected. The conditions for such a request are set out in [ECE 48], [ECE 13] and [ECE 13H] for passenger cars and [ECE 53] and [ECE 78] for PTW.

Vehicles may also use the following alternative triggering condition instead:

b) the current vehicle speed is above 20 km/h and the current acceleration is below -7 m/s² for a minimum of 500 ms.

Tested by:

3.1.2.3 Information quality

Requirement **RS_tcDaSi_169**

The value of the data element *informationQuality* in the DENM depends on how the event is detected. The *informationQuality* value shall be set in accordance with the following table (highest possible value shall be used):

Table 3: Information quality of 'electronic emergency brake light'

Event detection	Value of InformationQuality
No TRCO-compliant implementation	0
Condition a) of RS_tcDaSi_167 fulfilled	1
Condition a) of RS_tcDaSi_167 fulfilled and current filtered longitudinal acceleration of the vehicle < -4 m/s²	2
Condition b) of RS_tcDaSi_167 fulfilled	3

Tested by:

Requirement **RS_tcDaSi_170**

If the triggering conditions change between two updates, the *informationQuality* shall not be changed until the next update. If the changed conditions are still fulfilled while the DENM is updated, the *informationQuality* shall be updated.

Tested by:

3.1.3 Termination conditions

Requirement **RS_tcDaSi_171**

The C-ITS service shall be terminated when the triggering condition a) or b) (see RS_tcDaSi_167) is no longer valid. At the termination of the C-ITS service, update DENM request shall be terminated.

Tested by:

3.1.3.1 Cancellation

Requirement **RS_tcDaSi_172**

A cancellation DENM shall not be used for this C-ITS service.

Tested by:

3.1.3.2 Negation

Requirement **RS_tcDaSi_173**

A negation DENM shall not be used for this C-ITS service.

Tested by:

3.1.4 Update

Requirement **RS_tcDaSi_174**

The generated DENM shall be updated every 100 ms if the triggering conditions are still satisfied. All data fields that are assigned new values are defined in RS_tcDaSi_177.

Tested by:

3.1.5 Repetition duration and repetition interval

Requirement **RS_tcDaSi_175**

A repetition of the DENM shall not be used for this C-ITS service.

Tested by:

3.1.6 Traffic class

Requirement **RS_tcDaSi_176**

New and update DENMs shall be set to *traffic class* 0.

Tested by:

3.1.7 Message parameters

3.1.7.1 DENM

Requirement **RS_tcDaSi_177**

The following table specifies the data elements of the DENM that shall be set.

Table 4: DENM data elements of 'electronic emergency brake light'

<table>
<tr><th>Data field</th><th colspan="3">Value</th></tr>
<tr><td colspan="4">Management container</td></tr>
<tr><td>actionID</td><td colspan="3">Identifier of a DENM. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td rowspan="2">detectionTime</td><td colspan="3">TimestampIts-timestamp at which the event is detected by the originating C-ITS station. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td colspan="3">Shall be refreshed for an update DENM.</td></tr>
<tr><td>referenceTime</td><td colspan="3">TimestampIts-Timestamp at which a new DENM or an update DENM is generated. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td>termination</td><td colspan="3">Shall not be set, because neither negation nor cancellation are to be used in this C-ITS service.</td></tr>
<tr><td rowspan="2">eventPosition</td><td colspan="3">ReferencePosition. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td colspan="3">Shall be refreshed for every update DENM.</td></tr>
<tr><td>relevanceDistance</td><td colspan="3">lessThan500m(3)</td></tr>
<tr><td rowspan="7">relevanceTrafficDirection</td><td colspan="3">If the roadType is known the value shall be set as follows:</td></tr>
<tr><td>RoadType</td><td>Direction</td><td></td></tr>
<tr><td>0</td><td>allTrafficDirections(0)</td><td></td></tr>
<tr><td>1</td><td>upstreamTraffic(1)</td><td></td></tr>
<tr><td>2</td><td>allTrafficDirections(0)</td><td></td></tr>
<tr><td>3</td><td>upstreamTraffic(1)</td><td></td></tr>
<tr><td colspan="3">Otherwise, the value shall be set to allTrafficDirections(0)</td></tr>
<tr><td>validityDuration</td><td colspan="3">2 s</td></tr>
<tr><td>stationType</td><td colspan="3">The type of the originating C-ITS station. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td colspan="4">Situation container</td></tr>
<tr><td>informationQuality</td><td colspan="3">See RS_tcDaSi_169.</td></tr>
<tr><td>causeCode</td><td colspan="3">dangerousSituation(99)</td></tr>
<tr><td>subCauseCode</td><td colspan="3">emergencyElectronicBrakeLights(1)</td></tr>
<tr><td colspan="4">Location container</td></tr>
</table>

<table>
<tr><td rowspan="2">eventSpeed</td><td>Speed of the originating C-ITS station. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td>Shall be refreshed for an update DENM.</td></tr>
<tr><td rowspan="2">eventPositionHeading</td><td>Heading of the originating C-ITS station. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td>Shall be refreshed for an update DENM.</td></tr>
<tr><td rowspan="2">traces</td><td>PathHistory of the originating C-ITS station. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td>Shall be refreshed for an update DENM.</td></tr>
<tr><td rowspan="11">roadType</td><td>RoadType of the road on which the detecting C-ITS station is situated.</td></tr>
<tr><td>Shall be refreshed for an update DENM.</td></tr>
<tr><td>Shall be set in accordance with [TS 102 894-2] in combination with the following rules:
<table>
<tr><th>Urban / non-urban</th><th>Structural separation</th><th>Data element</th></tr>
<tr><td>Urban</td><td>No</td><td>urban-NoStructuralSeparation ToOppositeLanes(0)</td></tr>
<tr><td>Urban</td><td>Yes</td><td>urban-WithStructuralSeparation ToOppositeLanes(1)</td></tr>
<tr><td>Urban</td><td>Unknown</td><td>urban-NoStructuralSeparation ToOppositeLanes(0)</td></tr>
<tr><td>Non-urban</td><td>No</td><td>nonUrban-NoStructuralSeparation ToOppositeLanes(2)</td></tr>
<tr><td>Non-urban</td><td>Yes</td><td>nonUrban-WithStructuralSeparation ToOppositeLanes(3)</td></tr>
<tr><td>Non-urban</td><td>Unknown</td><td>nonUrban-NoStructuralSeparation ToOppositeLanes(2)</td></tr>
</table></td></tr>
<tr><td>If the information about the urban/non-urban status cannot be determined, the data element shall be omitted.</td></tr>
<tr><td colspan="2">Alacarte container</td></tr>
<tr><td rowspan="3">lanePosition</td><td>If the lanePosition is provided by an on-board sensor (e.g. radar, camera), the value shall be set in accordance with [TS 102 894-2]. Use of GNSS and a digital map to estimate the lane number is not legitimate for this version of the triggering condition.</td></tr>
<tr><td>If the lanePosition is unknown, the data element shall be omitted.</td></tr>
<tr><td>Shall be refreshed for an update DENM.</td></tr>
</table>

Tested by:

3.1.7.2 CAM

Requirement **RS_tcDaSi_178**

CAM adaption shall not be used for this C-ITS service.

Tested by:

3.1.8 Network and transport layer

Requirement **RS_tcDaSi_179**

The interface parameter destination area in IF.DEN.1 [ETSI EN 302 637-3] shall be equal to a circular shape with center point equal to *eventPosition* and radius equal to r*elevanceDistance*.

Tested by:

3.1.9 Security layer

Requirement **RS_tcDaSi_181**

When the triggering conditions as described in chapter 3.1.2 apply, the application shall request the blocking of the AT changeover as defined in RS_BSP_184.

Tested by:

3.2 Dangerous situations - automatic brake intervention

3.2.1 Description of C-ITS service

Other (informational) **RS_tcDaSi_223**

This C-ITS service describes the triggering of a V2V DENM when a danger of collision is detected and an autonomous emergency braking intervention is carried out. Also, in this C-ITS service the ego vehicle itself becomes a possible local danger zone.

Note: Referring to ‘Euro NCAP Rating Review – Report from the Ratings Group’ there are two C-ITS services that have to be covered. A DENM has to be sent if the intervention of an active safety system is detected that fits to Autonomous Emergency Braking system for mid to high speed rear-end longitudinal car collisions (AEB Interurban), see also ‘Euro NCAP Rating Review – Report from the Ratings Group’. The other C-ITS service is related to the detection of intervention of an Autonomous Emergency Braking system for pedestrians which will be scored by Euro NCAP within the area ‘Pedestrian Protection’.

Other (informational) **RS_tcDaSi_224**

The following C-ITS services are related to this service, because they share similar triggering conditions:

- ‘dangerous situations — emergency electronic brake light’;
- ‘dangerous situations — reversible occupant restraint system intervention’.

3.2.2 Triggering conditions

3.2.2.1 Preconditions

Requirement **RS_tcDaSi_239**

No specific preconditions apply for this C-ITS service.

Tested by:

Requirement **RS_tcDaSi_183**

Parallel activation with the other related C-ITS services shall be avoided. Where the '*electronic emergency brake light'* and/or '*reversible occupant restraint system intervention'* C-ITS services are triggered simultaneously, the C-ITS services shall be prioritised as follows:

1.) 'electronic emergency brake light' (highest priority);

2.) 'automatic brake intervention';

3.) 'reversible occupant restraint system intervention' (lowest priority).

Tested by:

Requirement **RS_tcDaSi_184**

If a higher-priority C-ITS service is triggered, any related lower-priority C-ITS service transmission that has already been triggered and is still active regarding update, shall be aborted. In addition, the generation of a new DENM for the higher-priority C-ITS service shall be requested.

Tested by:

3.2.2.2 Service-specific conditions

Requirement **RS_tcDaSi_185**

If the following condition is satisfied, the triggering conditions for this C-ITS service are fulfilled and the generation of a DENM shall be triggered:

a) a signal representing a request for the intervention of an autonomous emergency braking system is detected.

Tested by:

3.2.2.3 Information quality

Requirement **RS_tcDaSi_187**

The value of the data element *informationQuality* in the DENM depends on how the event is detected. The *informationQuality* value shall be set in accordance with the following table (highest possible value shall be used):

Table 5: Information quality of 'automatic brake intervention'

Event detection	Value of InformationQuality
No TRCO-compliant implementation	0

Condition a) of RS_tcDaSi_185 fulfilled	1
Condition a) of RS_tcDaSi_185 fulfilled and current filtered longitudinal acceleration of the vehicle < -4 m/s^2	2

Tested by:

Requirement **RS_tcDaSi_188**

If the triggering conditions change between two updates, the *informationQuality* shall not be changed until the next update. If the changed conditions are still fulfilled while the DENM is updated, the *informationQuality* shall be updated.

Tested by:

3.2.3 Termination conditions

Requirement **RS_tcDaSi_189**

The C-ITS service shall be terminated when condition a) is no longer valid. At the termination of the C-ITS service, update DENM request shall be terminated.

Tested by:

3.2.3.1 Cancellation

Requirement **RS_tcDaSi_190**

A cancellation DENM shall not be used for this C-ITS service.

Tested by:

3.2.3.2 Negation

Requirement **RS_tcDaSi_191**

A negation DENM shall not be used for this C-ITS service.

Tested by:

3.2.4 Update

Requirement **RS_tcDaSi_192**

The generated DENM shall be updated every 100 ms if the triggering conditions are still satisfied. All data fields that are assigned new values are defined in RS_tcDaSi_195 and in RS_tcDaSi_187.

Tested by:

3.2.5 Repetition duration and repetition interval

Requirement **RS_tcDaSi_193**

A repetition of the DENM shall not be used for this C-ITS service.

Tested by:

3.2.6 Traffic class

Requirement **RS_tcDaSi_194**

New and update DENMs shall be set to *traffic class* 0.

Tested by:

3.2.7 Message parameters

3.2.7.1 DENM

Requirement **RS_tcDaSi_195**

The following table specifies the data elements of the DENM that shall be set.

Table 6: DENM data elements of 'automatic brake intervention'

<table>
<tr><th>Data field</th><th colspan="3">Value</th></tr>
<tr><td colspan="4">Management container</td></tr>
<tr><td>actionID</td><td colspan="3">Identifier of a DENM.Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td rowspan="2">detectionTime</td><td colspan="3">TimestampIts-timestamp at which the event is detected by the originating C-ITS station. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td colspan="3">Shall be refreshed for an update DENM.</td></tr>
<tr><td>referenceTime</td><td colspan="3">TimestampIts-timestamp at which a new DENM or an update DENM is generated. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td>termination</td><td colspan="3">Shall not be set, because neither negation nor cancellation are to be used in this C-ITS service.</td></tr>
<tr><td rowspan="2">eventPosition</td><td colspan="3">ReferencePosition. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td colspan="3">Shall be refreshed for every update DENM.</td></tr>
<tr><td>relevanceDistance</td><td colspan="3">lessThan500m(3)</td></tr>
<tr><td rowspan="7">relevanceTrafficDirection</td><td colspan="3">If the roadType is known the value shall be set as follows:</td></tr>
<tr><td>RoadType</td><td>Direction</td><td></td></tr>
<tr><td>0</td><td>allTrafficDirections(0)</td><td></td></tr>
<tr><td>1</td><td>upstreamTraffic(1)</td><td></td></tr>
<tr><td>2</td><td>allTrafficDirections(0)</td><td></td></tr>
<tr><td>3</td><td>upstreamTraffic(1)</td><td></td></tr>
<tr><td colspan="3">Otherwise, the value shall be set to allTrafficDirections(0)</td></tr>
<tr><td>validityDuration</td><td colspan="3">2 s</td></tr>
</table>

<table>
<tr><td>stationType</td><td>The type of the originating C-ITS station. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td colspan="2">Situation container</td></tr>
<tr><td>informationQuality</td><td>See RS_tcDaSi_187.</td></tr>
<tr><td>causeCode</td><td>dangerousSituation(99)</td></tr>
<tr><td>subCauseCode</td><td>aebActivated(5)</td></tr>
<tr><td colspan="2">Location container</td></tr>
<tr><td rowspan="2">eventSpeed</td><td>Speed of the originating C-ITS station. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td>Shall be refreshed for an update DENM.</td></tr>
<tr><td rowspan="2">eventPositionHeading</td><td>Heading of the originating C-ITS station. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td>Shall be refreshed for an update DENM.</td></tr>
<tr><td rowspan="2">traces</td><td>PathHistory of the originating C-ITS station. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td>Shall be refreshed for an update DENM.</td></tr>
<tr><td rowspan="11">roadType</td><td>RoadType of the road on which the detecting C-ITS station is situated on.</td></tr>
<tr><td>Shall be refreshed for an update DENM.</td></tr>
<tr><td>Shall be set in accordance with [TS 102 894-2] in combination with the following rules:</td></tr>
<tr><td>
<table>
<tr><th>Urban / non-urban</th><th>Structural separation</th><th>Data element</th></tr>
<tr><td>Urban</td><td>No</td><td>urban-NoStructuralSeparation ToOppositeLanes(0)</td></tr>
<tr><td>Urban</td><td>Yes</td><td>urban-WithStructuralSeparation ToOppositeLanes(1)</td></tr>
<tr><td>Urban</td><td>Unknown</td><td>urban-NoStructuralSeparation ToOppositeLanes(0)</td></tr>
<tr><td>Non-urban</td><td>No</td><td>nonUrban-NoStructuralSeparation ToOppositeLanes(2)</td></tr>
<tr><td>Non-urban</td><td>Yes</td><td>nonUrban-WithStructuralSeparation ToOppositeLanes(3)</td></tr>
<tr><td>Non-urban</td><td>Unknown</td><td>nonUrban-NoStructuralSeparation ToOppositeLanes(2)</td></tr>
</table>
</td></tr>
<tr><td>If the information about the urban/non-urban status cannot be determined, the data element shall be omitted.</td></tr>
</table>

Alacarte container	
lanePosition	If the *lanePosition* is provided by an on-board sensor (e.g. radar, camera), the value shall be set in accordance with [TS 102 894-2]. Use of GNSS and a digital map to estimate of the lane number is not legitimate for this version of the triggering condition.
	If the *lanePosition* is unknown, the data element shall be omitted.
	Shall be refreshed for an update DENM.

Tested by:

3.2.7.2 CAM

Requirement **RS_tcDaSi_196**

CAM adaption shall not be used for this C-ITS service.

Tested by:

3.2.8 Network and transport layer

Requirement **RS_tcDaSi_197**

The interface parameter destination area in IF.DEN.1 [ETSI EN 302 637-3] shall be equal to a circular shape with center point equal to *eventPosition* and radius equal to r*elevanceDistance*.

Tested by:

3.2.9 Security layer

Requirement **RS_tcDaSi_199**

When the triggering conditions as described in chapter 3.2.2 apply, the application shall request the blocking of the AT changeover as defined in RS_BSP_184.

Tested by:

3.3 Dangerous situations - reversible occupant restraint system intervention

3.3.1 Description of C-ITS service

Other (informational) **RS_tcDaSi_225**

The following C-ITS services are related to this service, because they share similar triggering conditions:

- ‘dangerous situations — electronic emergency brake light’;
- ‘dangerous situations — automatic brake intervention’.

3.3.2 Triggering conditions

3.3.2.1 Preconditions

Requirement **RS_tcDaSi_240**

No specific preconditions apply for this C-ITS service.

Tested by:

Requirement **RS_tcDaSi_201**

Parallel activation with the other related C-ITS services shall be avoided. Where the '*electronic emergency brake light'* and/or '*automatic brake intervention'* C-ITS services are triggered simultaneously, the C-ITS services shall be prioritised as follows:

1.) 'electronic emergency brake light' (highest priority);

2.) 'automatic brake intervention';

3.) 'reversible occupant restraint system intervention' (lowest priority).

Tested by:

Requirement **RS_tcDaSi_202**

If a higher-priority C-ITS service is triggered, any related lower-priority C-ITS service transmission that has already been triggered and is still active regarding update, shall be aborted, In addition, the generation of a new DENM for the higher priority C-ITS service shall be requested.

Tested by:

3.3.2.2 Service-specific conditions

Requirement **RS_tcDaSi_203**

If the following condition is satisfied, the generation of a DENM shall be triggered:

a) a signal representing a request for the active intervention of a reversible occupant restraint system (e.g. reversible belt-tightener) is detected due to a critical driving situation.

Tested by:

3.3.2.3 Information quality

Requirement **RS_tcDaSi_204**

The value of the data element *informationQuality* in the DENM depends on how the event is detected. The *informationQuality* value shall be set in accordance with the following table (highest possible value shall be used):

Table 7: Information quality of 'reversible occupant restraint system intervention'

Event detection	Value of InformationQuality
No TRCO-compliant implementation	0

Condition a) of RS_tcDaSi_203 fulfilled	1
Condition a) of RS_tcDaSi_203 fulfilled and current filtered longitudinal acceleration of the vehicle < -4 m/s^2	2

Tested by:

Requirement **RS_tcDaSi_205**

If the triggering conditions change between two updates, the *informationQuality* shall not be changed until the next update. If the changed conditions are still fulfilled while the DENM is updated, the *informationQuality* shall be updated.

Tested by:

3.3.3 Termination conditions

Requirement **RS_tcDaSi_206**

The C-ITS service shall be terminated when condition a) is no longer valid. At the termination of the C-ITS service, update DENM request shall be terminated.

Tested by:

3.3.3.1 Cancellation

Requirement **RS_tcDaSi_207**

A cancellation DENM shall not be used for this C-ITS service.

Tested by:

3.3.3.2 Negation

Requirement **RS_tcDaSi_208**

A negation DENM shall not be used for this C-ITS service.

Tested by:

3.3.4 Update

Requirement **RS_tcDaSi_209**

The generated DENM shall be updated every 100 ms if the triggering conditions are still satisfied. All data fields that are assigned new values are defined in RS_tcDaSi_212 and in RS_tcDaSi_204.

Tested by:

3.3.5 Repetition duration and repetition interval

Requirement **RS_tcDaSi_210**

A repetition of the DENM shall not be used for this C-ITS service.

Tested by:

3.3.6 Traffic class

Requirement **RS_tcDaSi_211**

New and update DENMs shall be set to *traffic class* 0.

Tested by:

3.3.7 Message parameters

3.3.7.1 DENM

Requirement **RS_tcDaSi_212**

The following table specifies the data elements of the DENM that shall be set.

Table 8: DENM data elements of 'reversible occupant restraint system intervention'

Data Field	Value		
Management container			
actionID	Identifier of a DENM. Shall be set in accordance with [TS 102 894-2].		
detectionTime	*TimestampIts*-timestamp at which the event is detected by the originating C-ITS station. Shall be set in accordance with [TS 102 894-2].		
	Shall be refreshed for an update DENM.		
referenceTime	*TimestampIts*-timestamp at which a new DENM or an update DENM is generated. Shall be set in accordance with [TS 102 894-2].		
termination	Shall not be set, because neither negation nor cancellation are to be used in this C-ITS service.		
eventPosition	*ReferencePosition*. Shall be set in accordance with [TS 102 894-2].		
	Shall be refreshed for every update DENM.		
relevanceDistance	lessThan500m(3)		
relevanceTrafficDirection	If the roadType is known the value shall be set as follows:		
	RoadType	**Direction**	
	0	allTrafficDirections(0)	
	1	upstreamTraffic(1)	
	2	allTrafficDirections(0)	
	3	upstreamTraffic(1)	
	Otherwise, the value shall be set to allTrafficDirections(0)		
validityDuration	2 s		

<table>
<tr><td>stationType</td><td>The type of the originating C-ITS station. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td colspan="2">Situation container</td></tr>
<tr><td>informationQuality</td><td>See RS_tcDaSi_204.</td></tr>
<tr><td>causeCode</td><td>dangerousSituation(99)</td></tr>
<tr><td>subCauseCode</td><td>preCrashSystemActivated(2)</td></tr>
<tr><td colspan="2">Location container</td></tr>
<tr><td rowspan="2">eventSpeed</td><td>Speed of the originating C-ITS station. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td>Shall be refreshed for an update DENM.</td></tr>
<tr><td rowspan="2">eventPositionHeading</td><td>Heading of the originating C-ITS station. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td>Shall be refreshed for an update DENM.</td></tr>
<tr><td rowspan="2">traces</td><td>PathHistory of the originating C-ITS station. Shall be set in accordance with [TS 102 894-2].</td></tr>
<tr><td>Shall be refreshed for an update DENM.</td></tr>
<tr><td rowspan="11">roadType</td><td>RoadType of the road on which the detecting C-ITS station is situated.</td></tr>
<tr><td>Shall be refreshed for an update DENM.</td></tr>
<tr><td>Shall be set in accordance with [TS 102 894-2] in combination with the following rules:</td></tr>
<tr><td>
<table>
<tr><th>Urban / non-urban</th><th>Structural separation</th><th>Data element</th></tr>
<tr><td>Urban</td><td>No</td><td>urban-NoStructuralSeparation ToOppositeLanes(0)</td></tr>
<tr><td>Urban</td><td>Yes</td><td>urban-WithStructuralSeparation ToOppositeLanes(1)</td></tr>
<tr><td>Urban</td><td>Unknown</td><td>urban-NoStructuralSeparation ToOppositeLanes(0)</td></tr>
<tr><td>Non-urban</td><td>No</td><td>nonUrban-NoStructuralSeparation ToOppositeLanes(2)</td></tr>
<tr><td>Non-urban</td><td>Yes</td><td>nonUrban-WithStructuralSeparation ToOppositeLanes(3)</td></tr>
<tr><td>Non-urban</td><td>Unknown</td><td>nonUrban-NoStructuralSeparation ToOppositeLanes(2)</td></tr>
</table>
</td></tr>
<tr><td>If the information about the urban/non-urban status cannot be determined, the data element shall be omitted.</td></tr>
</table>

Alacarte container	
lanePosition	If the lanePosition is provided by an on-board sensor (e.g. radar, camera), the value shall be set in accordance with [TS 102 894-2]. Use of GNSS and a digital map to estimate the lane number is not legitimate for this version of the triggering condition.
	If the lanePosition is unknown, the data element shall be omitted.
	Shall be refreshed for an update DENM.

Tested by:

3.3.7.2 CAM

Requirement **RS_tcDaSi_213**

CAM adaption shall not be used for this C-ITS service.

Tested by:

3.3.8 Network and transport layer

Requirement **RS_tcDaSi_214**

The interface parameter destination area in IF.DEN.1 [ETSI EN 302 637-3] shall be equal to a circular shape with center point equal to *eventPosition* and radius equal to r*elevanceDistance*.

Tested by:

3.3.9 Security layer

Requirement **RS_tcDaSi_227**

When the triggering conditions as described in chapter 3.3.2 apply, the application shall request the blocking of the AT changeover as defined in RS_BSP_184.

Tested by:

4 Appendix

4.1 Scenarios

Other (informational) **RS_tcDaSi_228**

This chapter has an informational character and is not part of the requirement specification.

Other (informational) **RS_tcDaSi_229**

The following list encompasses scenarios which are regarded as relevant or irrelevant considering the present C-ITS service:

Table 9: Scenarios for 'dangerous situations'

Count	Description	Status
SC_0	Urban environment.	Irrelevant
SC_1	The ego vehicle is in a breakdown state.	Irrelevant
SC_2	The ego vehicle is in a crash state.	Irrelevant.
SC_3	Current road situation and conditions	Not directly relevant
SC_4	Traffic in the opposite driving direction.	Irrelevant
SC_5	The Ego vehicle performs a braking maneuver, such that the 'electronic emergency brake light' is triggered. The reason is irrelevant and does not have be detected.	Relevant
SC_6	An 'autonomous emergency brake function' was triggered. The reason is irrelevant and does not have be detected.	Relevant
SC_7	A 'reversible occupant restraint system' was triggered. The reason is irrelevant and does not have be detected.	Relevant