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# Triggering Conditions and Data Quality Dangerous Situation

## CAR 2 CAR Communication Consortium



# CAR 2 CAR

## COMMUNICATION CONSORTIUM

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### 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 88 members, with 18 vehicle manufacturers, 39 equipment suppliers and 31 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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## Document information

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**Table 1: Document information**

**Changes since last version**

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**Table 2: Changes since last version**

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## 1 Introduction

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### 1.1 Abstract

**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 use cases:

- Dangerous Situations - Electronic Emergency Brake Light
- Dangerous Situations - Automatic Brake Intervention
- Dangerous Situations - Occupant Restraint System Intervention

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## 2 Triggering conditions

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### 2.1 Dangerous Situations

**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 must be considered.

#### 2.1.1 Dangerous Situations - Electronic Emergency Brake Light

##### 2.1.1.1 Description of Use Case

**Other (informational)**

**RS\_tcDaSi\_218**

This use case consists of triggering a DENM due to an emergency brake by driver, e.g. as a reaction to a stationary or slower front vehicle. The ego vehicle itself turns into a possible local danger zone.

##### 2.1.1.2 Relations to other Use Cases

**Other (informational)**

**RS\_tcDaSi\_219**

The following use cases are related to the *Dangerous Situations - Electronic Emergency Brake Light* use case, because they share similar triggering conditions:

- Dangerous Situations - Automatic Brake Intervention
- Dangerous Situations - Reversible Occupant Restraint System Intervention

##### 2.1.1.3 Triggering Conditions

###### 2.1.1.3.1 Preconditions

**Requirement**

**RS\_tcDaSi\_238**

No precondition shall be satisfied for this use case.

Tested by:

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**Requirement**

**RS\_tcDaSi\_165**

A parallel activation with the other use cases shall be avoided. In case of triggering the use cases *Automatic Brake Intervention* and/or *Reversible Occupant Restraint System Intervention* simultaneously, the use cases shall be prioritized as follows:

- 1.) Electronic Emergency Brake Light (highest priority)

- 2.) Automatic Brake Intervention
- 3.) Reversible Occupant Restraint System Intervention (lowest priority)

Tested by:

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**Requirement** **RS\_tcDaSi\_166**

If one of the other use cases was already triggered and is still active regarding update, the transmission shall be aborted, if the simultaneously detected use case is of higher priority. Moreover the generation of a new DENM for the use case of higher priority shall be requested.

Tested by:

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**2.1.1.3.2 Use Case Specific Conditions**

**Requirement** **RS\_tcDaSi\_167**

Once the following condition is satisfied, the triggering conditions for this use case 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 defined in the European Norm ECE Regulations No. 48, No. 13 and 13-H, see [Reg48].

Vehicles may also use the following alternate triggering condition:

- b) The current vehicle speed is above 20 km/h and the current acceleration is below - 7 m/s<sup>2</sup> for a minimum of 500 ms.

Tested by:

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**Requirement** **RS\_tcDaSi\_168**

The acceleration of the vehicle shall be determined by the vehicle bus signal, not by GNSS. The filtered acceleration with respect to sensor noise shall be used.

Tested by:

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**2.1.1.3.3 Information Quality**

**Requirement** **RS\_tcDaSi\_169**

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

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

**Table 3: Information quality of "Electronic Emergency Brake Light"**

Tested by:

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**Requirement**

**RS\_tcDaSi\_170**

If the Triggering Conditions change in 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:

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**2.1.1.4 Termination Conditions**

**Requirement**

**RS\_tcDaSi\_171**

The use case shall be terminated when the condition a) is not any more valid. At the termination of the use case, update DENM request shall be terminated.

Tested by:

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**2.1.1.4.1 Cancellation**

**Requirement**

**RS\_tcDaSi\_172**

A cancellation DENM shall not be used for this use case.

Tested by:

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**2.1.1.4.2 Negation**

**Requirement**

**RS\_tcDaSi\_173**

A negation DENM shall not be used for this use case.

Tested by:

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**2.1.1.5 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 chapter 2.1.1.8.1. in Table 4.

Tested by:

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**2.1.1.6 Repetition Duration and Repetition Interval**

**Requirement**

**RS\_tcDaSi\_175**

A repetition of the DENM shall not be used for this use case.

Tested by:

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### 2.1.1.7 Traffic class

**Requirement**

RS\_tcDaSi\_176

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

Tested by:

### 2.1.1.8 Message Parameter

#### 2.1.1.8.1 DENM

**Requirement**

RS\_tcDaSi\_177

Table 4 specifies the data elements of the DENM that shall be set.

Data Field	Value		
<b>Management Container</b>			
<i>actionID</i>	Identifier of a DENM. Shall be set according to [TS 102 894-2].		
<i>detectionTime</i>	<i>Timestamp</i> ts-Timestamp at which the event is detected by the originating ITS-S. Shall be set according to [TS 102 894-2].		
	Shall be refreshed for an update DENM.		
<i>referenceTime</i>	<i>Timestamp</i> ts-Timestamp at which a new DENM or an update DENM is generated. Shall be set according to [TS 102 894-2].		
<i>termination</i>	Shall not be set, because neither negation nor cancellation shall be used in this use case.		
<i>eventPosition</i>	<i>ReferencePosition</i> . Shall be set according to [TS 102 894-2].		
	Shall be refreshed for every update DENM.		
<i>relevanceDistance</i>	lessThan500m(3)		
<i>relevanceTrafficDirection</i>	If the roadType is known the value shall be set as follows:		
	<b>RoadType</b>	<b>Direction</b>	
	0	allTrafficDirections(0)	
	1	upstreamTraffic(1)	
	2	allTrafficDirections(0)	
	3	upstreamTraffic(1)	
Otherwise, the value shall be set to allTrafficDirections(0)			
<i>validityDuration</i>	2 seconds		
<i>stationType</i>	The type of the originating ITS-S. Shall be set according to [TS 102 894-2].		
<b>Situation Container</b>			
<i>informationQuality</i>	See RS_tcDaSi_169.		
<i>causeCode</i>	dangerousSituation(99)		
<i>subCauseCode</i>	emergencyElectronicBrakeLights(1)		

<b>Location Container</b>			
<i>eventSpeed</i>	Speed of the originating ITS-S. Shall be set according to [TS 102 894-2].		
	Shall be refreshed for an update DENM.		
<i>eventPositionHeading</i>	Heading of the originating ITS-S. Shall be set according to [TS 102 894-2].		
	Shall be refreshed for an update DENM.		
<i>traces</i>	<i>PathHistory</i> of the originating ITS-S. Shall be set according to [TS 102 894-2].		
	Shall be refreshed for an update DENM.		
<i>roadType</i>	<i>RoadType</i> of the road the detecting ITS-S is situated on.		
	Shall be refreshed for an update DENM.		
	Shall be set according to [TS 102 894-2] in combination with the following rules:		
	<b>Urban / Non-Urban</b>	<b>Structural Separation</b>	<b>Data Element</b>
	Urban	No	urban-NoStructuralSeparation ToOppositeLanes(0)
	Urban	Yes	urban-WithStructuralSeparation ToOppositeLanes(1)
	Urban	unknown	urban-NoStructuralSeparation ToOppositeLanes(0)
	Non-Urban	No	nonUrban-NoStructuralSeparation ToOppositeLanes(2)
	Non-Urban	Yes	nonUrban-WithStructuralSeparation ToOppositeLanes(3)
	Non-Urban	Unknown	nonUrban-NoStructuralSeparation ToOppositeLanes(2)
Otherwise, if the information about the urban/non-urban status cannot be determined, the data element shall be omitted.			
<b>Alacarte Container</b>			
<i>lanePosition</i>	If the lanePosition is provided by an onboard sensor (e.g. radar, camera), the value shall be set according to [TS 102 894-2]. The use of GPS and a digital map for the estimation 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.		

**Table 4: DENM data elements of "Electronic Emergency Brake Light"**

Tested by:

**2.1.1.8.2 CAM**

**Requirement**

**RS\_tcDaSi\_178**

CAM adaption shall not be used for this use case.

Tested by:

**2.1.1.9 Networking and Transport Layer**

**Requirement**

**RS\_tcDaSi\_179**

For the Day One version of this application, the destination area is the same as the relevance area - in this case, a circle of radius *relevanceDistance*. Therefore, the interface parameter *DENM destination area* between the DEN basic service and the Networking & Transport layer shall be equal to a circular shape with radius equal to *relevanceDistance*.

Tested by:

**2.1.1.10 Security Layer**

**Requirement**

**RS\_tcDaSi\_181**

If the triggering conditions as described in chapter 2.1.1.3 apply, an AT change shall be blocked for DENMs as long as *validityDuration* is not expired (see chapter 2.1.1.8.1). Corresponding new and update DENMs shall be sent with the same authorization ticket.

Tested by:

**2.1.2 Dangerous Situations - Automatic Brake Intervention**

**2.1.2.1 Description of Use Case**

**Other (informational)**

**RS\_tcDaSi\_223**

This section 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 use case the ego vehicle itself turns into a possible local danger zone.

**2.1.2.2 Relations to other Use Cases**

**Other (informational)**

**RS\_tcDaSi\_224**

The following use cases are related to the *Dangerous Situations - Automatic Brake Intervention* use case, because they share similar triggering conditions:

- Dangerous Situations - Emergency Electronic Brake Light
- Dangerous Situations - Reversible Occupant Restraint System Intervention

### 2.1.2.3 Triggering Conditions

#### 2.1.2.3.1 Preconditions

**Requirement**

**RS\_tcDaSi\_239**

No precondition shall be satisfied for this use case.

Tested by:

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**Requirement**

**RS\_tcDaSi\_183**

A parallel activation with the other use cases shall be avoided. In case of triggering the use cases *Electronic Emergency Brake Light* and/or *Reversible Occupant Restraint System Intervention* simultaneously, the use cases shall be prioritized as follows:

- 1.) Electronic Emergency Brake Light (highest priority)
- 2.) Automatic Brake Intervention
- 3.) Reversible Occupant Restraint System Intervention (lowest priority)

Tested by:

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**Requirement**

**RS\_tcDaSi\_184**

If one of the other use cases was already triggered and is still active regarding update, the transmission shall be aborted, if the simultaneously detected use case is of higher priority. Moreover the generation of a new DENM for the use case of higher priority shall be requested.

Tested by:

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#### 2.1.2.3.2 Use Case Specific Conditions

**Requirement**

**RS\_tcDaSi\_185**

Once the following condition is satisfied, the triggering conditions for this use case are fulfilled and the generation of a DENM shall be triggered.

- a) A signal representing the request for the intervention of an Autonomous Emergency Braking system is detected.

Tested by:

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**Requirement**

**RS\_tcDaSi\_186**

The acceleration of the vehicle shall be determined by the vehicle bus signal, not by GNSS. The filtered acceleration with respect to sensor noise shall be used.

NOTE: Referring to “Euro NCAP Rating Review – Report from the Ratings Group” there are two use cases 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 use case 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”.

Tested by:

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### 2.1.2.3.3 Information Quality

**Requirement**

**RS\_tcDaSi\_187**

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

Event detection	Value of InformationQuality
No TC compliant implementation	InformationQuality 0
Condition a) fulfilled	InformationQuality 1
Condition a) fulfilled and current filtered longitudinal acceleration of the vehicle < -4 m/s <sup>2</sup>	InformationQuality 2

**Table 5: Information quality of "Automatic Brake Intervention"**

Tested by:

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**Requirement**

**RS\_tcDaSi\_188**

If the Triggering Conditions change in 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:

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### 2.1.2.4 Termination Conditions

**Requirement**

**RS\_tcDaSi\_189**

The use case shall be terminated when the condition a) is not any more valid. At the termination of the use case, update DENM request shall be terminated.

Tested by:

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#### 2.1.2.4.1 Cancellation

**Requirement**

**RS\_tcDaSi\_190**

A cancellation DENM shall not be used for this use case.

Tested by:

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#### 2.1.2.4.2 Negation

**Requirement**

**RS\_tcDaSi\_191**

A negation DENM shall not be used for this use case.

Tested by:

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#### 2.1.2.5 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 chapter 2.1.2.8.1. in Table 6 and in chapter 2.1.2.3.3 in Table 5.

Tested by:

### 2.1.2.6 Repetition Duration and Repetition Interval

#### Requirement

RS\_tcDaSi\_193

A repetition of the DENM shall not be used for this use case.

Tested by:

### 2.1.2.7 Traffic class

#### Requirement

RS\_tcDaSi\_194

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

Tested by:

### 2.1.2.8 Message Parameter

#### 2.1.2.8.1 DENM

#### Requirement

RS\_tcDaSi\_195

Table 6 specifies the data elements of the DENM that shall be set.

Data Field	Value		
<b>Management Container</b>			
<i>actionID</i>	Identifier of a DENM. Shall be set according to [TS 102 894-2].		
<i>detectionTime</i>	<i>Timestamppts</i> -Timestamp at which the event is detected by the originating ITS-S. Shall be set according to [TS 102 894-2].		
	Shall be refreshed for an update DENM.		
<i>referenceTime</i>	<i>Timestamppts</i> -Timestamp at which a new DENM or an update DENM is generated. Shall be set according to [TS 102 894-2].		
<i>termination</i>	Shall not be set, because neither negation nor cancellation shall be used in this use case.		
<i>eventPosition</i>	<i>ReferencePosition</i> . Shall be set according to [TS 102 894-2].		
	Shall be refreshed for every update DENM.		
<i>relevanceDistance</i>	lessThan500m(3)		
<i>relevanceTrafficDirection</i>	If the roadType is known the value shall be set as follows:		
	<b>RoadType</b>	<b>Direction</b>	
	0	allTrafficDirections(0)	
1	upstreamTraffic(1)		

	2	allTrafficDirections(0)	
	3	upstreamTraffic(1)	
	Otherwise, the value shall be set to allTrafficDirections(0)		
<i>validityDuration</i>	2 seconds		
<i>stationType</i>	The type of the originating ITS-S. Shall be set according to [TS 102 894-2].		
<b>Situation Container</b>			
<i>informationQuality</i>	See RS_tcDaSi_187.		
<i>causeCode</i>	dangerousSituation(99)		
<i>subCauseCode</i>	aebActivated(5)		
<b>Location Container</b>			
<i>eventSpeed</i>	Speed of the originating ITS-S. Shall be set according to [TS 102 894-2].		
	Shall be refreshed for an update DENM.		
<i>eventPositionHeading</i>	Heading of the originating ITS-S. Shall be set according to [TS 102 894-2].		
	Shall be refreshed for an update DENM.		
<i>traces</i>	<i>PathHistory</i> of the originating ITS-S. Shall be set according to [TS 102 894-2].		
	Shall be refreshed for an update DENM.		
<i>roadType</i>	<i>RoadType</i> of the road the detecting ITS-S is situated on.		
	Shall be refreshed for an update DENM.		
	Shall be set according to [TS 102 894-2] in combination with the following rules:		
	<b>Urban / Non-Urban</b>	<b>Structural Separation</b>	<b>Data Element</b>
	Urban	No	urban-NoStructuralSeparationToOppositeLanes(0)
	Urban	Yes	urban-WithStructuralSeparationToOppositeLanes(1)
	Urban	unknown	urban-NoStructuralSeparationToOppositeLanes(0)
	Non-Urban	No	nonUrban-NoStructuralSeparationToOppositeLanes(2)
Non-Urban	Yes	nonUrban-WithStructuralSeparationToOppositeLanes(3)	

	Non-Urban	Unknown	nonUrban- NoStructuralSeparation ToOppositeLanes(2)
Otherwise, if the information about the urban/non-urban status cannot be determined, the data element shall be omitted.			
<b>Alacarte Container</b>			
<i>lanePosition</i>	If the <i>lanePosition</i> is provided by an onboard sensor (e.g. radar, camera), the value shall be set according to [TS 102 894-2]. The use of GPS and a digital map for the estimation of the lane number is not legitimate for this version of the triggering condition.		
	If the <i>lanePosition</i> is unknown, the data element shall be omitted.		
	Shall be refreshed for an update DENM.		

**Table 6: DENM data elements of "Automatic Brake Intervention"**

Tested by:

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**2.1.2.8.2 CAM**

**Requirement**

**RS\_tcDaSi\_196**

CAM adaption shall not be used for this use case.

Tested by:

---

**2.1.2.9 Networking and Transport Layer**

**Requirement**

**RS\_tcDaSi\_197**

For the Day One version of this application, the destination area is the same as the relevance area - in this case, a circle of radius *relevanceDistance*. Therefore, the interface parameter *DENM destination area* between the DEN basic service and the Networking & Transport layer shall be equal to a circular shape with radius equal to *relevanceDistance*.

Tested by:

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**2.1.2.10 Security Layer**

**Requirement**

**RS\_tcDaSi\_199**

If the triggering conditions as described in chapter 2.1.2.3 apply, an AT change shall be blocked for DENMs as long as *validityDuration* is not expired (see chapter 2.1.2.8.1). Corresponding new and update DENMs shall be sent with the same authorization ticket.

Tested by:

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**2.1.3 Dangerous Situations - Reversible Occupant Restraint System Intervention**

**2.1.3.1 Description of Use Case**

**Other (informational)**

**RS\_tcDaSi\_225**



The following use cases are related to the *Dangerous Situations - Reversible Occupant Restraint System Intervention* use case, because they share similar triggering conditions:

- Dangerous Situations - Electronic Emergency Brake Light
- Dangerous Situations - Automatic Brake Intervention

### 2.1.3.2 Relations to other Use Cases

#### 2.1.3.3 Triggering Conditions

##### 2.1.3.3.1 Preconditions

###### Requirement

RS\_tcDaSi\_240

No precondition shall be satisfied for this use case.

Tested by:

---

###### Requirement

RS\_tcDaSi\_201

A parallel activation with the other use cases shall be avoided. In case of triggering the use cases *Electronic Emergency Brake Light* and/or *Automatic Brake Intervention* simultaneously, the use cases shall be prioritized as follows:

- 1.) Electronic Emergency Brake Light (highest priority)
- 2.) Automatic Brake Intervention
- 3.) Reversible Occupant Restraint System Intervention (lowest priority)

Tested by:

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###### Requirement

RS\_tcDaSi\_202

If one of the other use case was already triggered and is still active regarding update, the transmission shall be aborted, if the simultaneously detected use case is of higher priority. Moreover the generation of a new DENM for the use case of higher priority shall be requested.

Tested by:

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##### 2.1.3.3.2 Use Case Specific Conditions

###### Requirement

RS\_tcDaSi\_203

Once the following condition is satisfied, the generation of a DENM shall be triggered.

- a) A signal representing the 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:

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##### 2.1.3.3.3 Information Quality

###### Requirement

RS\_tcDaSi\_204

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

Event detection	Value of InformationQuality
No TC compliant implementation	InformationQuality 0
Condition a) fulfilled	InformationQuality 1
Condition a) fulfilled and current filtered longitudinal acceleration of the vehicle $< -4 \text{ m/s}^2$	InformationQuality 2

**Table 7: Information quality of "Reversible Occupant Restraint System Intervention"**

Tested by:

**Requirement**

**RS\_tcDaSi\_205**

If the Triggering Conditions change in 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:

**2.1.3.4 Termination Conditions**

**Requirement**

**RS\_tcDaSi\_206**

The use case shall be terminated when the condition a) is not any more valid. At the termination of the use case, update DENM request shall be terminated.

Tested by:

**2.1.3.4.1 Cancellation**

**Requirement**

**RS\_tcDaSi\_207**

A cancellation DENM shall not be used for this use case.

Tested by:

**2.1.3.4.2 Negation**

**Requirement**

**RS\_tcDaSi\_208**

A negation DENM shall not be used for this use case.

Tested by:

**2.1.3.5 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 chapter 2.1.3.8.1. in Table 8 and in chapter 2.1.3.3.3 in Table 7.

Tested by:

**2.1.3.6 Repetition Duration and Repetition Interval**

**Requirement**

**RS\_tcDaSi\_210**

A repetition of the DENM shall not be used for this use case.

Tested by:

**2.1.3.7 Traffic class**

**Requirement**

**RS\_tcDaSi\_211**

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

Tested by:

**2.1.3.8 Message Parameter**

**2.1.3.8.1 DENM**

**Requirement**

**RS\_tcDaSi\_212**

Table 8 specifies the data elements of the DENM that shall be set.

Data Field	Value	
<b>Management Container</b>		
<i>actionID</i>	Identifier of a DENM. Shall be set according to [TS 102 894-2].	
<i>detectionTime</i>	<i>Timestamp</i> ts-Timestamp at which the event is detected by the originating ITS-S. Shall be set according to [TS 102 894-2].	
	Shall be refreshed for an update DENM.	
<i>referenceTime</i>	<i>Timestamp</i> ts-Timestamp at which a new DENM or an update DENM is generated. Shall be set according to [TS 102 894-2].	
<i>termination</i>	Shall not be set, because neither negation nor cancellation shall be used in this use case.	
<i>eventPosition</i>	<i>ReferencePosition</i> . Shall be set according to [TS 102 894-2].	
	Shall be refreshed for every update DENM.	
<i>relevanceDistance</i>	lessThan500m(3)	
<i>relevanceTrafficDirection</i>	If the roadType is known the value shall be set as follows:	
	<b>RoadType</b>	<b>Direction</b>
	0	allTrafficDirections(0)
	1	upstreamTraffic(1)
	2	allTrafficDirections(0)
	3	upstreamTraffic(1)
Otherwise, the value shall be set to allTrafficDirections(0)		

<i>validityDuration</i>	2 seconds		
<i>stationType</i>	The type of the originating ITS-S. Shall be set according to [TS 102 894-2].		
<b>Situation Container</b>			
<i>informationQuality</i>	See RS_tcDaSi_204.		
<i>causeCode</i>	dangerousSituation(99)		
<i>subCauseCode</i>	preCrashSystemActivated(2)		
<b>Location Container</b>			
<i>eventSpeed</i>	Speed of the originating ITS-S. Shall be set according to [TS 102 894-2].		
	Shall be refreshed for an update DENM.		
<i>eventPositionHeading</i>	Heading of the originating ITS-S. Shall be set according to [TS 102 894-2].		
	Shall be refreshed for an update DENM.		
<i>traces</i>	<i>PathHistory</i> of the originating ITS-S. Shall be set according to [TS 102 894-2].		
	Shall be refreshed for an update DENM.		
<i>roadType</i>	<i>RoadType</i> of the road the detecting ITS-S is situated on.		
	Shall be refreshed for an update DENM.		
	Shall be set according to [TS 102 894-2] in combination with the following rules:		
	<b>Urban / Non-Urban</b>	<b>Structural Separation</b>	<b>Data Element</b>
	Urban	No	urban-NoStructuralSeparationToOppositeLanes(0)
	Urban	Yes	urban-WithStructuralSeparationToOppositeLanes(1)
	Urban	unknown	urban-NoStructuralSeparationToOppositeLanes(0)
	Non-Urban	No	nonUrban-NoStructuralSeparationToOppositeLanes(2)
Non-Urban	Yes	nonUrban-WithStructuralSeparationToOppositeLanes(3)	
Non-Urban	Unknown	nonUrban-NoStructuralSeparationToOppositeLanes(2)	

	Otherwise, if the information about the urban/non-urban status cannot be determined, the data element shall be omitted.
<b>Alacarte Container</b>	
<i>lanePosition</i>	If the lanePosition is provided by an onboard sensor (e.g. radar, camera), the value shall be set according to [TS 102 894-2]. The use of GPS and a digital map for the estimation 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.

**Table 8: DENM data elements of "Reversible Occupant Restraint System Intervention"**

Tested by:

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### 2.1.3.8.2 CAM

**Requirement**

**RS\_tcDaSi\_213**

CAM adaptation is not required for this use case.

Tested by:

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### 2.1.3.9 Networking and Transport Layer

**Requirement**

**RS\_tcDaSi\_214**

For the Day One version of this application, the destination area is the same as the relevance area - in this case, a circle of radius *relevanceDistance*. Therefore, the interface parameter *DENM destination area* between the DEN basic service and the Networking & Transport layer shall be equal to a circular shape with radius equal to *relevanceDistance*.

Tested by:

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### 2.1.3.10 Security Layer

**Requirement**

**RS\_tcDaSi\_227**

If the triggering conditions as described in chapter 2.1.3.3 apply, n AT change shall be blocked for DENMs as long as *validityDuration* is not expired (see chapter 2.1.3.8.1). Corresponding new and update DENMs shall be sent with the same authorization ticket.

Tested by:

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### 3 Appendix

#### 3.1 Scenarios

**Other (informational)** **RS\_tcDaSi\_228**

This section 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 use case:

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

**Table 9: Scenarios for "Dangerous Situations"**

#### 3.2 List of abbreviations

**Other (informational)** **RS\_tcDaSi\_233**

ABS	Anti-lock Braking System
ASN.1	Abstract Syntax Notation One
ASR	Anti-Slip Regulation
AT	Authorization Ticket
AUT	Automatic Transmission
CAM	Cooperative Awareness Message
C2C-CC	Car to Car Communication Consortium
CDD	Common Data Dictionary
DEN	Decentralized Environmental Notification
DENM	DEN Message

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ECE	Economic Commission for Europe
ETSI	European Telecommunications Standards Institute
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
ITS	Intelligent Transport System
ITS-S	ITS Station
TTC	Time To Collision
TC	Triggering Condition
V2V	Vehicle to Vehicle

**Table 10: Abbreviations**