

SWP4.5: Coexistence ITS-G5 - CEN-DSRC

Coexistence Test Specification

WP4 - Living Laboratory

Version: 03.60

Release Date: 2016-07-29	Author(s):
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Overview of changes

No.	Version	Status	Date	Type of Change
1	03.60	Released	2016-07-29	Third Release – Third Update

Table 1: Document History

Reference to the status- and version administration:

Status:

In progress the document is currently in editing mode
Released the document has been checked and released by quality assurance, it can only be modified if the version number is updated.

Versions:

Takes place in two stages. Released documents receive the next higher integral version number.

00.01, 00.02 etc. Not released versions, with the status in progress
01, 02, etc. Released version with the status released

Table of contents

Document Information	4
1.1 Purpose of this document	4
1.2 Definitions, Terms and Abbreviations	5
1.3 References	6
2 Description of Test Cases	7
2.1 Test cases for C-ITS-S	7
2.2 Test cases for R-ITS-S	12
2.3 Test cases for V-ITS-S	20
3 Annex	24

List of Tables

Table 1: Document History	2
Table 2 Test Case Explanation	4
Table 3: Definitions, Terms and Abbreviations	6
Table 4: TC_CoEx_001	7
Table 5: TC_CoEx_002	8
Table 6: TC_CoEx_003	9
Table 7: TC_CoEx_004	10
Table 8: TC_CoEx_005	12
Table 9: TC_CoEx_006	13
Table 10: TC_CoEx_007	14
Table 11: TC_CoEx_008	15
Table 12: TC_CoEx_009	16
Table 13: TC_CoEx_010	18
Table 14: TC_CoEx_011	18
Table 15: TC_CoEx_012	20
Table 16: TC_CoEx_013	21
Table 17: TC_CoEx_014	22
Table 18: TC_CoEx_015	23

Document Information

1.1 Purpose of this document

This document lists all test cases relevant to the topic of coexistence required for system requirements verification and validation. Each test case is described using the same template striving after completeness and comprehensibility. This template is explained in Table 2.

Table 2 Test Case Explanation

Attribute	Explanation	
Test case ID	<p>Unique Identifier with the following format:</p> <p>SWP4.1 C-ITS-S: TC_C_001</p> <p>SWP4.2 R-ITS-S: TC_R_001</p> <p>SWP4.3 V-ITS-S: TC_V_001</p> <p>SWP4.4 Security: TC_SEC_001</p> <p>SWP4.5 Coexistence: TC_CoEx_001 (or directly a component test case)</p> <p>SWP4.6 use cases:</p> <ul style="list-style-type: none"> • TC_IVI_001 • TC_RWW_001 • TC_ISS_001 • TC_CAM_001 • TC_DENM_001 <p>SWP4.7 System Requirements Verification: TC_SYS_001</p>	
Test case type	Manual or automatic execution	
Test case purpose	State a short name and describe the objective of the test case.	
Test case source	Unique requirement ID plus short name of the requirement	
Test components*	State the SUT / DUT (can be one device or more devices) of the test case	
Precondition	Quote precondition or ID of test case to be executed in advance. A certain state of the SUT / DUT might be necessary before test case execution.	
Testing environment	State the environment of the SUT / DUT (laboratory test or field test) and the test tools required for executing the respective test case (e.g. V-ITS-S test tool for validating ITS-G5).	
Test steps*	Per test step: description, input, and expected output (data with value range)	
#	Description	Input(I)/Output(O)/Validation(V)
0	Description of test step.	Input required or output expected for this test step. One

Attribute		Explanation
		validation condition per test case described in the last test step.
n	-	-
Postcondition*		State of test components after test case execution

NOTE: * = several

The list of test cases will be complete, if each requirement from Ref. [ECo-AT SWP2.3 system overview] regarding the component/topic XYZ (e.g. interface IF1) is referenced to at least one test case in this document.

1.2 Definitions, Terms and Abbreviations

Abbreviation / Term	Definition
BTP	Basic Transport Protocol
CAM	Common Awareness Message
C-ITS	Cooperative ITS
C-ITS-S	Central ITS Station
DENM	Decentralized Environmental Notification Message
DSRC	Dedicated Short Range Communication
DUT	Device under test
GBC	Geobroadcast
GN	Geo Network
HiL	Hardware in the loop
IF	Interface
ITS	Intelligent Transport System
IVI	In-vehicle Information
PT	Plug test
R-ITS-S	Roadside ITS Station
RWW	Roadworks Warning

Abbreviation / Term	Definition
NTP	Network Time Protocol
SHB	Single-Hop Broadcasting
SiL	Software in the loop
SPAT	Signal Phase and Timing
SUT	System under test
TC	Test case
TCC	Traffic Control Center
TLC	Traffic Light Controller
UC	Use Case
UTC	Coordinated Universal Time
V-ITS-S	Vehicle ITS Station

Table 3: Definitions, Terms and Abbreviations

1.3 References

All references in this document can be found in the master table of references available in the “ECo-AT_SWP2.3_MasterTableOfReferences_v03.60.pdf” document.

2 Description of Test Cases

2.1 Test cases for C-ITS-S

Table 4: TC_CoEx_001

Attribute		Explanation
Test case ID		TC_CoEx_001
Test case type		Manual or automatic execution, manual Validation.
Test case purpose		CEN-DSRC protected zones reception from TCC The C-ITS-S shall be able to receive CEN-DSRC protected zone data from the TCC.
Test case source		R_C_095: CEN-DSRC protected zones reception from TCC
Test components*		DUT: C-ITS-S
Precondition		C-ITS-S (DUT) is up and running. TCC test tool is up and running. Connection between TCC and C-ITS-S (IF1) is established. Predefined protected zone content.
Testing environment		Both, field test and laboratory test are usable on the level of component test. Required components: <ul style="list-style-type: none"> • C-ITS-S (DUT) • TCC test tool (TCC or TCC emulator) with ability to send protected zone data to C-ITS-S via IF1 • C-ITS-S test tool, in order to check the availability of protected zone data at the C-ITS-S
Test steps*		
#	Description	Input(I)/Output(O)/Validation(V)
0	TCC sends protected zone data to C-ITS-S via IF1	I: Trigger, in order to generate protected zone data with predefined content at the TCC test tool O: TCC test tool sends protected zone data to C-ITS-S via IF1
1	C-ITS-S receives protected zone data	I: C-ITS-S receives protected zone data from TCC test tool via IF1 O: received protected zone data at C-ITS-S is ready for mapping to IF3 message V: check with C-ITS-S test tool if the protected zone data

Attribute	Explanation
	is available at the C-ITS-S and if it is similar to the predefined protected zone data from the TCC
Postcondition*	-

Table 5: TC_CoEx_002

Attribute	Explanation	
Test case ID	TC_CoEx_002	
Test case type	Manual or automatic execution, manual Validation.	
Test case purpose	CEN-DSRC protected zones distribution The C-ITS-S shall ensure that each CEN-DSRC protected zone is at least transmitted to one R-ITS-S per stream direction.	
Test case source	R_C_097: CEN-DSRC protected zones distribution	
Test components*	DUT: C-ITS-S	
Precondition	C-ITS-S (DUT) is up and running. Predefined scenario <ul style="list-style-type: none"> • 1 CEN-DSRC tolling station on the road. • at least 2 R-ITS-S (1 R-ITS-S per stream direction of the Cen-DSRC tolling station). C-ITS-S is configured with at least 2 R-ITS-Ss. Predefined protected zone content. a) C-ITS-S test tool is up and running or b) R-ITS-Ss in the field are up and running.	
Testing environment	Preferred for this test is a field test. Required components: <ul style="list-style-type: none"> • C-ITS-S (DUT) • C-ITS-S test tool in order to trigger protected zone data as input for the dissemination algorithm • a) C-ITS-S test tool, in order to inspect to which R-ITS-S the messages are distributed or • b) R-ITS-Ss in the field connected to the C-ITS-S and R-ITS-S test tool, in order to check the available protected zones on the R-ITS-S 	
Test steps*		
#	Description	Input(I)/Output(O)/Validation(V)

Attribute		Explanation
0	dissemination algorithm selects R-ITS-Ss for protected zone data distribution	<p>I: protected zone data (from the one predefined CEN-DSRC tolling station) as input for the dissemination algorithm</p> <p>O: protected zone data is distributed to the relevant R-ITS-S</p> <p>V:</p> <p>a) Check at the C-ITS-S test tool, if at least the 2 R-ITS-S (one per stream direction of the CEN-DSRC tolling station) are selected for message distribution</p> <p>or</p> <p>b) Check with R-ITS-S test tool if at least the 2 R-ITS-S (one per stream direction of the CEN-DSRC tolling station) received the protected zone data for the one CEN-DSRC tolling station</p>
Postcondition*		-

Table 6: TC_CoEx_003

Attribute	Explanation
Test case ID	TC_CoEx_003
Test case type	Manual or automatic execution, manual Validation.
Test case purpose	Provision of CEN-DSRC protected zone data to R-ITS-S The C-ITS-S shall provide CEN-DSRC protected zone data individually to R-ITS-Ss.
Test case source	R_C_098: Provision of CEN-DSRC protected zone data to R-ITS-S
Test components*	C-ITS-S
Precondition	C-ITS-S (DUT) is up and running. R-ITS-S test tool is up and running. Connection between R-ITS-S and C-ITS-S (IF3) is established. Predefined protected zone content is available at C-ITS-S.
Testing environment	Both, field test and laboratory test are usable on the level of component test.

Attribute		Explanation
		Required components: <ul style="list-style-type: none"> • C-ITS-S (DUT) • R-ITS-S test tool, in order to check the availability of protected zone data at the R-ITS-S
Test steps*		
#	Description	Input(I)/Output(O)/Validation(V)
0	C-ITS-S sends protected zone data to R-ITS-S via IF3	I: Trigger, in order to send protected zone data with predefined content from the C-ITS-S to R-ITS-S test tool via IF3 O: C-ITS-S sends protected zone data to R-ITS-S test tool via IF3
1	R-ITS-S test tool receives protected zone data	I: R-ITS-S test tool receives protected zone data from C-ITS-S via IF3 O: - V: check with R-ITS-S test tool if the protected zone data is available at the R-ITS-S test tool and if it is similar to the predefined protected zone data from the C-ITS-S
Postcondition*		

Table 7: TC_CoEx_004

Attribute	Explanation
Test case ID	TC_CoEx_004
Test case type	Manual or automatic execution, manual Validation.
Test case purpose	Grouping of CEN-DSRC protected zones The C-ITS-S shall group CEN-DSRC protected zones for each relevant R-ITS-S (max. 16).
Test case source	R_C_096: Grouping of CEN-DSRC protected zones
Test components*	DUT: C-ITS-S
Precondition	C-ITS-S (DUT) is up and running. Predefined scenario <ul style="list-style-type: none"> • at least 2 R-ITS-Ss in the area of the CEN-DSRC tolling stations. • (16*(number of R-ITS-Ss)+8) CEN-DSRC tolling stations on the road. <ul style="list-style-type: none"> ◦ E.g.: 2 R-ITS-Ss → 40 CEN-DSRC tolling stations, 3 R-ITS-S →

Attribute		Explanation
		<p>54 CEN-DSRC tolling stations</p> <p>C-ITS-S is configured with at least 2 R-ITS-Ss.</p> <p>Predefined protected zone content.</p> <p>a) C-ITS-S test tool is up and running or</p> <p>b) R-ITS-Ss in the field are up and running.</p>
Testing environment		<p>Preferred for this test is a field test. Required components:</p> <ul style="list-style-type: none"> • C-ITS-S (DUT) • C-ITS-S test tool in order to trigger protected zone data as input for the dissemination algorithm • a) C-ITS-S test tool, in order to inspect to which R-ITS-S the messages are distributed or • b) R-ITS-Ss in the field connected to the C-ITS-S and R-ITS-S test tool, in order to check the available protected zones on the R-ITS-S
Test steps*		
#	Description	Input(I)/Output(O)/Validation(V)
0	dissemination algorithm selects R-ITS-Ss for protected zone data distribution	<p>I: protected zone data (from the all predefine CEN-DSRC tolling stations) as input for the dissemination algorithm</p> <p>O: protected zone data is distributed to the relevant R-ITS-S</p> <p>V:</p> <p>a) Check at the C-ITS-S test tool, if each R-ITS-S is selected for distribution of max. 16 protected zones</p> <p>or</p> <p>b) Check with R-ITS-S test tool if each R-ITS-S has received max. 16 protected zones</p>
Postcondition*		-

2.2 Test cases for R-ITS-S

Table 8: TC_CoEx_005

Attribute		Explanation
Test case ID		TC_CoEx_005
Test case type		Manual or automatic execution, manual Validation.
Test case purpose		R-ITS-S identification of CEN-DSRC protected zone from implemented data base R-ITS-S shall be able to identify if within a CEN-DSRC protected zone with implemented data base as described in Ref. [ECo-AT SWP3.5 coexistence].
Test case source		R_R_079: R-ITS-S identification of CEN-DSRC protected zone
Test components*		DUT: R-ITS-S
Precondition		R-ITS-S (DUT) is connected to the testing environment, testing environment is up and running. Protected zone data base is available at the R-ITS-S. Predefined location of the R-ITS-S.
Testing environment		Preferred for this test is a laboratory test. Required components: <ul style="list-style-type: none"> R-ITS-S (DUT) R-ITS-S test tool is able to indicate if the R-ITS-S is in the protected zone
Test steps*		
#	Description	Input(I)/Output(O)/Validation(V)
0	Connection and Startup of R-ITS-S	I: Power on the R-ITS-S O: R-ITS-S is up and running, Test tools are up and running (criteria is dependent on R-ITS-S, e.g. LEDs show that state)
1	Configuration of R-ITS-S (if not preconfigured)	I: R-ITS-S configuration data O: R-ITS-S is in initial state and operation (criteria is dependent on R-ITS-S)
2	Indication if R-ITS-S is in the protected zone	I: protected zone data base O: indication with R-ITS-S test tool if R-ITS-S is in the protected zone (check with location of R-ITS-S and center/radius of protected zone) V: - if R-ITS-S is outside the protection zone the indicator

Attribute	Explanation
	shall show this - if R-ITS-S is inside the protection zone the indicator shall show this
Postcondition*	-

Table 9: TC_CoEx_006

Attribute	Explanation	
Test case ID	TC_CoEx_006	
Test case type	Manual or automatic execution, manual Validation.	
Test case purpose	R-ITS-S identification of CEN-DSRC protected zone from received CAM R-ITS-S shall be able to identify if within a CEN-DSRC protected zone by a received CAM (including protected zone info) as described in Ref. [ECo-AT SWP3.5 coexistence].	
Test case source	R_R_079: R-ITS-S identification of CEN-DSRC protected zone	
Test components*	DUT: R-ITS-S	
Precondition	R-ITS-S (DUT) is connected to the testing environment, testing environment is up and running. Predefined location of the R-ITS-S.	
Testing environment	Preferred for this test is a laboratory test. Required components: <ul style="list-style-type: none"> R-ITS-S (DUT) R-ITS-S test tool is able to indicate if the R-ITS-S is in the protected zone V-ITS-S test tool (e.g. "developer" V-ITS-S), as defined in Ref. [ECo-AT SWP3.3 V-ITS-S], with ability to send out conform CAM including protected zone data 	
Test steps*		
#	Description	Input(I)/Output(O)/Validation(V)
0	Connection and Startup of R-ITS-S	I: Power on the R-ITS-S O: R-ITS-S is up and running, Test tools are up and running (criteria is dependent on R-ITS-S, e.g. LEDs show that state)
1	Configuration of R-ITS-S (if not preconfigured)	I: R-ITS-S configuration data O: R-ITS-S is in initial state and operation (criteria is

Attribute		Explanation
		dependent on R-ITS-S)
2	V-ITS-S test tool transmits CAMs with protected zone data	I: trigger at V-ITS-S test tool, in order to transmit CAMs with protected zone data O: CAMs with protected zone data on IF4
3	Indication if R-ITS-S is in the protected zone	I: R-ITS-S receives CAMs with protected zone data on IF4 O: indication with R-ITS-S test tool if R-ITS-S is in the protected zone (check with location of R-ITS-S and center/radius of protected zone) V: - if R-ITS-S is outside the protection zone the indicator shall show this - if R-ITS-S is inside the protection zone the indicator shall show this
Postcondition*		-

Table 10: TC_CoEx_007

Attribute	Explanation
Test case ID	TC_CoEx_007
Test case type	Manual or automatic execution, manual Validation.
Test case purpose	R-ITS-S identification of CEN-DSRC protected zone from detector R-ITS-S shall be able to identify if within a CEN-DSRC protected zone by a CEN-DSRC detector as described in Ref. [ECo-AT SWP3.5 coexistence].
Test case source	R_R_079: R-ITS-S identification of CEN-DSRC protected zone
Test components*	DUT: R-ITS-S
Precondition	R-ITS-S (DUT) is connected to the testing environment, testing environment is up and running.
Testing environment	Preferred for this test is a laboratory test. Required components: <ul style="list-style-type: none"> • R-ITS-S (DUT) • R-ITS-S test tool is able to indicate if the R-ITS-S is in the protected zone • CEN-DSRC RSU test tool with ability to transmit a CEN-DSRC tolling signal

Attribute		Explanation
		<ul style="list-style-type: none"> CEN-DSRC detector installed at the R-ITS-S
Test steps*		
#	Description	Input(I)/Output(O)/Validation(V)
0	Connection and Startup of R-ITS-S	I: Power on the R-ITS-S O: R-ITS-S is up and running, Test tools are up and running (criteria is dependent on R-ITS-S, e.g. LEDs show that state)
1	Configuration of R-ITS-S (if not preconfigured)	I: R-ITS-S configuration data O: R-ITS-S is in initial state and operation (criteria is dependent on R-ITS-S)
2	CEN-DSRC RSU test tool transmits CEN-DSRC tolling signal	I: trigger at CEN-DSRC RSU test tool, in order to transmit CEN-DSRC tolling signal O: CEN-DSRC tolling signal
3	CEN-DSRC detector at R-ITS-S detects the CEN-DSRC tolling signal	I: CEN-DSRC detector detects CEN-DSRC tolling signal O: CEN-DSRC detector forwards protected zone information to R-ITS-S
4	Indication if R-ITS-S is in the protected zone	I: information from CEN-DSRC detector that there is a protected zone O: indication with R-ITS-S test tool if R-ITS-S is in the protected zone V: R-ITS-S test tool indicator shows that inside a protected zone
Postcondition*		-

Table 11: TC_CoEx_008

Attribute	Explanation
Test case ID	TC_CoEx_008
Test case type	Manual or automatic execution, manual Validation.
Test case purpose	R-ITS-S identification of CEN-DSRC protected zone from C-ITS-S R-ITS-S shall be able to identify if within a CEN-DSRC protected zone with C-ITS-S information as described in Ref. [ECo-AT SWP3.5 coexistence].
Test case source	R_R_079: R-ITS-S identification of CEN-DSRC protected zone

Attribute		Explanation
Test components*		DUT: R-ITS-S
Precondition		R-ITS-S (DUT) is connected to the testing environment, testing environment is up and running. R-ITS-S received protected zone data from C-ITS-S (TC_CoEx_009). Predefined location of the R-ITS-S.
Testing environment		Preferred for this test is a laboratory test. Required components: <ul style="list-style-type: none"> R-ITS-S (DUT) R-ITS-S test tool is able to indicate if the R-ITS-S is in the protected zone
Test steps*		
#	Description	Input(I)/Output(O)/Validation(V)
0	Connection and Startup of R-ITS-S	I: Power on the R-ITS-S O: R-ITS-S is up and running, Test tools are up and running (criteria is dependent on R-ITS-S, e.g. LEDs show that state)
1	Configuration of R-ITS-S (if not preconfigured)	I: R-ITS-S configuration data O: R-ITS-S is in initial state and operation (criteria is dependent on R-ITS-S)
2	Indication if R-ITS-S is in the protected zone	I: protected zone data (from C-ITS-S) O: indication with R-ITS-S test tool if R-ITS-S is in the protected zone (check with location of R-ITS-S and center/radius of protected zone) V: - if R-ITS-S is outside the protection zone the indicator shall show this - if R-ITS-S is inside the protection zone the indicator shall show this
Postcondition*		-

Table 12: TC_CoEx_009

Attribute	Explanation
Test case ID	TC_CoEx_009

Attribute		Explanation
Test case type		Manual or automatic execution, manual Validation.
Test case purpose		CEN-DSRC protected zones reception from C-ITS-S The R-ITS-S shall be able to receive CEN-DSRC protected zone data from the C-ITS-S.
Test case source		R_R_077: CEN-DSRC protected zones reception from C-ITS-S
Test components*		DUT: R-ITS-S
Precondition		R-ITS-S (DUT) is up and running. C-ITS-S test tool is up and running. Connection between R-ITS-S and C-ITS-S (IF3) is established. Predefined protected zone content.
Testing environment		Both, field test and laboratory test are usable on the level of component test. Required components: <ul style="list-style-type: none"> R-ITS-S (DUT) C-ITS-S test tool (C-ITS-S or C-ITS-S emulator) with ability to send protected zone data to R-ITS-S via IF3 R-ITS-S test tool, in order to check the availability of protected zone data at the R-ITS-S
Test steps*		
#	Description	Input(I)/Output(O)/Validation(V)
0	Connection and Startup of R-ITS-S	I: Power on the R-ITS-S O: R-ITS-S is up and running, Test tools are up and running (criteria is dependent on R-ITS-S, e.g. LEDs show that state)
1	Configuration of R-ITS-S (if not preconfigured)	I: R-ITS-S configuration data O: R-ITS-S is in initial state and operation (criteria is dependent on R-ITS-S)
2	C-ITS-S sends protected zone data to R-ITS-S via IF3	I: Trigger, in order to generate protected zone data with predefined content at the C-ITS-S test tool O: C-ITS-S test tool sends protected zone data to R-ITS-S via IF3
3	R-ITS-S receives protected zone data	I: R-ITS-S receives protected zone data from C-ITS-S test tool via IF3 O: - V: check with R-ITS-S test tool if the protected zone data is available at the R-ITS-S and if it is similar to the

Attribute	Explanation
	predefined protected zone data from the C-ITS-S
Postcondition*	-

Table 13: TC_CoEx_010

Attribute	Explanation	
Test case ID	TC_CoEx_010	
Test case type	Manual or automatic execution, manual Validation.	
Test case purpose	CEN-DSRC Coexistence All R-ITS-S shall use the techniques described in the ECo-AT coexistence description document, Ref. [ECo-AT SWP3.5 coexistence] and in Ref. [ETSI 102 792], in order to avoid interference with CEN-DSRC tolling stations on the 5.8 GHz band.	
Test case source	R_R_059: CEN-DSRC Coexistence	
Test components*	DUT: R-ITS-S	
Precondition	R-ITS-S (DUT) is connected to the testing environment, testing environment is up and running. R-ITS-S is in coexistence mode (R-ITS-S inside the CEN-DSRC protection zone) (indication by TC_CoEx_005, TC_CoEx_006, TC_CoEx_007, or TC_CoEx_008)	
Testing environment	Preferred for this test is a laboratory test. Required components: <ul style="list-style-type: none"> R-ITS-S (DUT) Measurement device, in order to measure RF output power, unwanted emission, and duty cycle 	
Test steps*		
#	Description	Input(I)/Output(O)/Validation(V)
0	Test case is defined in Ref. [ETSI 302 571], clause 5.3.9.	
Postcondition*	-	

Table 14: TC_CoEx_011

Attribute	Explanation
Test case ID	TC_CoEx_011

Attribute		Explanation
Test case type		Manual or automatic execution, manual Validation.
Test case purpose		CEN-DSRC protected zone data in CAM CAMs from R-ITS-Ss shall contain CEN-DSRC protected zone information (if received from C-ITS-S) according to Ref. [ETSI 302 637-2] (RSUContainerHighFrequency).
Test case source		R_R_078: CEN-DSRC protected zone data in CAM
Test components*		DUT: R-ITS-S
Precondition		R-ITS-S (DUT) is connected to the testing environment, testing environment is up and running. R-ITS-S is able to encode and transmit CAMs (TC_R_010). Protected zone data is available at the R-ITS-S.
Testing environment		Preferred for this test is a laboratory test. Required components: <ul style="list-style-type: none"> R-ITS-S (DUT) V-ITS-S test tool for validating ITS-G5 conform messages on air interface (IF4) as defined in Ref. [ECo-AT SWP3.3 V-ITS-S] (e.g. sniffer, "developer" V-ITS-S)
Test steps*		
#	Description	Input(I)/Output(O)/Validation(V)
0	Connection and Startup of R-ITS-S	I: Power on the R-ITS-S O: R-ITS-S is up and running, Test tools are up and running (criteria is dependent on R-ITS-S, e.g. LEDs show that state)
1	Configuration of R-ITS-S (if not preconfigured)	I: R-ITS-S configuration data O: R-ITS-S is in initial state and operation (criteria is dependent on R-ITS-S)
2	Activate transmission of CAM with protected zones data at R-ITS-S	I: activation of CAM generation at the R-ITS-S O: R-ITS-S transmits CAM with protected zone information. V-ITS-S test tool receives the CAM. V: - V-ITS-S test tool decoding was without failure - V-ITS-S test tool data has the same protected zone content compared to the content sent out by the R-ITS-S
Postcondition*		-

2.3 Test cases for V-ITS-S

Table 15: TC_CoEx_012

Attribute		Explanation
Test case ID		TC_CoEx_012
Test case type		Manual or automatic execution, manual Validation.
Test case purpose		V-ITS-S identification of CEN-DSRC protected zone from implemented data base V-ITS-S shall be able to identify if within a CEN-DSRC protected zone with implemented data base as described in Ref. [ECo-AT SWP3.5 coexistence].
Test case source		R_V_002: V-ITS-S identification of CEN-DSRC protected zone
Test components*		DUT: V-ITS-S
Precondition		V-ITS-S (DUT) is connected to the testing environment, testing environment is up and running. Protected zone data base is available at the V-ITS-S. Predefined location of the V-ITS-S.
Testing environment		Preferred for this test is a laboratory test. Required components: <ul style="list-style-type: none"> V-ITS-S (DUT) V-ITS-S test tool is able to indicate if the V-ITS-S is in the protected zone
Test steps*		
#	Description	Input(I)/Output(O)/Validation(V)
0	Connection and Startup of V-ITS-S	I: Power on the V-ITS-S O: V-ITS-S is up and running, Test tools are up and running (criteria is dependent on V-ITS-S, e.g. LEDs show that state)
1	Configuration of V-ITS-S (if not preconfigured)	I: V-ITS-S configuration data O: V-ITS-S is in initial state and operation (criteria is dependent on V-ITS-S)
2	Indication if V-ITS-S is in the protected zone	I: protected zone data base O: indication with V-ITS-S test tool if V-ITS-S is in the protected zone (check with location of V-ITS-S and center/radius of protected zone)

Attribute	Explanation
	<p>V:</p> <ul style="list-style-type: none"> - if V-ITS-S is outside the protection zone the indicator shall show this - if V-ITS-S is inside the protection zone the indicator shall show this
Postcondition*	-

Table 16: TC_CoEx_013

Attribute	Explanation	
Test case ID	TC_CoEx_013	
Test case type	Manual or automatic execution, manual Validation.	
Test case purpose	V-ITS-S identification of CEN-DSRC protected zone from received CAM V-ITS-S shall be able to identify if within a CEN-DSRC protected zone by a received CAM (including protected zone info) as described in Ref. [ECo-AT SWP3.5 coexistence].	
Test case source	R_V_002: V-ITS-S identification of CEN-DSRC protected zone	
Test components*	DUT: V-ITS-S	
Precondition	V-ITS-S (DUT) is connected to the testing environment, testing environment is up and running. Predefined location of the V-ITS-S.	
Testing environment	Preferred for this test is a laboratory test. Required components: <ul style="list-style-type: none"> • V-ITS-S (DUT) • V-ITS-S test tool is able to indicate if the V-ITS-S is in the protected zone • V-ITS-S test tool (e.g. “developer” V-ITS-S), as defined in Ref. [ECo-AT SWP3.3 V-ITS-S], with ability to send out conform CAM including protected zone data 	
Test steps*		
#	Description	Input(I)/Output(O)/Validation(V)
0	Connection and Startup of V-ITS-S	<p>I: Power on the V-ITS-S</p> <p>O: V-ITS-S is up and running, Test tools are up and running (criteria is dependent on V-ITS-S, e.g. LEDs show that state)</p>

Attribute		Explanation
1	Configuration of V-ITS-S (if not preconfigured)	I: V-ITS-S configuration data O: V-ITS-S is in initial state and operation (criteria is dependent on V-ITS-S)
2	V-ITS-S test tool (not the DUT) transmits CAMs with protected zone data	I: trigger at V-ITS-S test tool (not the DUT), in order to transmit CAMs with protected zone data O: CAMs with protected zone data on IF4
3	Indication if V-ITS-S is in the protected zone	I: V-ITS-S (DUT) receives CAMs with protected zone data on IF4 O: indication with V-ITS-S test tool if V-ITS-S is in the protected zone (check with location of V-ITS-S and center/radius of protected zone) V: - if V-ITS-S is outside the protection zone the indicator shall show this - if V-ITS-S is inside the protection zone the indicator shall show this
Postcondition*		-

Table 17: TC_CoEx_014

Attribute	Explanation
Test case ID	TC_CoEx_014
Test case type	Manual or automatic execution, manual Validation.
Test case purpose	V-ITS-S identification of CEN-DSRC protected zone from detector V-ITS-S shall be able to identify if within a CEN-DSRC protected zone by a CEN-DSRC detector as described in Ref. [ECo-AT SWP3.5 coexistence].
Test case source	R_V_002: V-ITS-S identification of CEN-DSRC protected zone
Test components*	DUT: V-ITS-S
Precondition	V-ITS-S (DUT) is connected to the testing environment, testing environment is up and running.
Testing environment	Preferred for this test is a laboratory test. Required components: <ul style="list-style-type: none"> V-ITS-S (DUT) V-ITS-S test tool is able to indicate if the V-ITS-S is in the protected

Attribute		Explanation
		zone <ul style="list-style-type: none"> • CEN-DSRC RSU test tool with ability to transmit a CEN-DSRC tolling signal • CEN-DSRC detector installed at the V-ITS-S
Test steps*		
#	Description	Input(I)/Output(O)/Validation(V)
0	Connection and Startup of V-ITS-S	I: Power on the V-ITS-S O: V-ITS-S is up and running, Test tools are up and running (criteria is dependent on V-ITS-S, e.g. LEDs show that state)
1	Configuration of V-ITS-S (if not preconfigured)	I: V-ITS-S configuration data O: V-ITS-S is in initial state and operation (criteria is dependent on V-ITS-S)
2	CEN-DSRC RSU test tool transmits CEN-DSRC tolling signal	I: trigger at CEN-DSRC RSU test tool, in order to transmit CEN-DSRC tolling signal O: CEN-DSRC tolling signal
3	CEN-DSRC detector at V-ITS-S detects the CEN-DSRC tolling signal	I: CEN-DSRC detector detects CEN-DSRC tolling signal O: CEN-DSRC detector forwards protected zone information to V-ITS-S
4	Indication if V-ITS-S is in the protected zone	I: information from CEN-DSRC detector that there is a protected zone O: indication with V-ITS-S test tool if V-ITS-S is in the protected zone V: V-ITS-S test tool indicator shows that inside a protected zone
Postcondition*		-

Table 18: TC_CoEx_015

Attribute	Explanation
Test case ID	TC_CoEx_015
Test case type	Manual or automatic execution, manual Validation.
Test case purpose	CEN-DSRC Coexistence All V-ITS-S shall use the techniques described in the ECo-AT coexistence

Attribute		Explanation
		description document, Ref. [ECo-AT SWP3.5 coexistence] and in Ref. [ETSI 102 792], in order to avoid interference with CEN-DSRC tolling stations on the 5.8 GHz band.
Test case source		R_V_003: CEN-DSRC Coexistence
Test components*		DUT: V-ITS-S
Precondition		V-ITS-S (DUT) is connected to the testing environment, testing environment is up and running. V-ITS-S is in coexistence mode (R-ITS-S inside the CEN-DSRC protection zone) (indication by TC_CoEx_012, TC_CoEx_013, or TC_CoEx_014)
Testing environment		Preferred for this test is a laboratory test. Required components: <ul style="list-style-type: none"> • V-ITS-S (DUT) • Measurement device, in order to measure RF output power, unwanted emission, and duty cycle
Test steps*		
#	Description	Input(I)/Output(O)/Validation(V)
0	Test case is defined in Ref. [ETSI 302 571], clause 5.3.9.	
Postcondition*		-

3 Annex

ID	Date	Tester	Comment	Result
TC_CoEx_001				
TC_CoEx_002				
TC_CoEx_003				
TC_CoEx_004				
TC_CoEx_005				
TC_CoEx_006				
TC_CoEx_007				

ID	Date	Tester	Comment	Result
TC_CoEx_008				
TC_CoEx_009				
TC_CoEx_010				
TC_CoEx_011				
TC_CoEx_012				
TC_CoEx_013				
TC_CoEx_014				
TC_CoEx_015				

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