SAFESPOT INTEGRATED PROJECT - IST-4-026963-IP

DELIVERABLE 4.6.1

SP4 – SCOVA – Cooperative Systems Applications Vehicle Based

Pilot Plan – Annex

Deliverable No. (use the number indicated on technical annex)		**D4.6.1 – Annex**	
SubProject No.	**SP4**	**SubProject Title**	**SCOVA**
Workpackage No.	**WP6**	**Workpackage Title**	**Validation**
Task No.	**T4.6.1**	**Task Title**	**Pilot Plan**
Authors (per company, if more than one company provide it together)		**Frederik Diederichs (USTUTT), Dehlia Willemsen, Arjan van Leysen (TNO), Giulio Vivo (CRF), Maria-Carmela De Gennaro (MMSE), Harri Koskinen (VTT), Erik Nordin (VOLVO)**	
Status (F: final; D: draft; RD: revised draft):		**F**	
Version No:		**1.6**	
File Name:		**SF_D4.6.1_PilotPlan_Annex_v1.6.doc**	
Planned Date of submission according to TA:		**31/01/2009**	
Issue Date:		**20/04/2009**	
Project start date and duration		**01 February 2006, 48 Months**	

Revision Log

Version	Date	Reason	Name and Company
1.0	09.04.09	Document aggregation from partners contributions, up to chapter 3.4	F. Diederichs (USTUTT) G. Vivo (CRF)
1.1	10.04.09	Document completed in all its parts	F. Diederichs (USTUTT) G. Vivo (CRF)
1.2	13.04.09	New Running Heads	F. Diederichs (USTUTT)
1.3	15.04.09	Updating Description of Pilot Plan Template explanation	F. Diederichs (USTUTT)
1.4	16.04.09	Updating layout of printable questionnaires	F. Diederichs (USTUTT)
1.5	20.04.09	Updating Layout of all templates	F. Diederichs (USTUTT)
1.6	20.04.09	Final version	F. Diederichs (USTUTT) G. Vivo (CRF)

Abbreviation List

FCW	Frontal Collision Warning
GW	Gateway
HF	Human Factors
HMI	Human Machine Interface
HURR	SAFESPOT High level objectives, User needs, Requirements and Risks
HW	Hardware
LAN	Local Area Network
LDM	Local Dynamic Map
NASA TLX	National American Space Agency – Task Load Index
PC	Personal Computer
RSU	Road Site Unit
SCOVA	Cooperative Systems Applications Vehicle Based
SMA	Safety Margin Assistant
SP	Subproject
SUS	System Usability Scale
SW	Software
UDP	User Datagram Protocol
VANET	Vehicle Ad Hoc Network
WP	Work Package
WT	Work Task

Table of contents

EXECUTIVE SUMMARY

This document is the annex of D4.6.1 – Pilot Plan. It is submitted jointly with the D4.6.1 – Pilot Plan, with the purpose of providing a comprehensive description of all tests planned for the validation, in the Test Sites, of the final versions of the SCOVA applications. In the following phases of the SP activities, it will be adopted (and eventually updated) whenever the planned tests will be executed by partners.

It consists of three parts (reported as chapters) deeply related to the operational implementation of the Pilot Plan: the test checklist, the human factors questionnaires, and the complete set of test forms defined for the test sessions to conduct at the Test Sites.

The first two chapters of the Annex to the Pilot Plan are designed for helping the test leader in conducting the tests in a standardized way. For this reason, both chapters are formatted with a layout suitable for printout and usage as operational documents. The test checklist is aimed at helping the test leader to follow the same steps in each repetition of the experiment and hence is an important tool to achieve standardization and constant context factors during the tests. The human factor questionnaires are designed to collect information on the user profile, notes during the experiment and the main indicators of usability, acceptance and workload, as well as the categories for a structured interview. The layout of those questionnaires is also optimized for printout, allowing the easy preparation of a notebook with sections dedicated to the single test participants.. The third chapter contains the current test forms for all planned tests. They can be changed and revised, if needed, until the actual testing of the SP4 SCOVA applications is carried out in the test sites environment.

The test forms have been organized following the standard order and numbering adopted in the SCOVA SP.

Note: the present annex should be considered as a working and “living” document. In order to make updates easily possible, the digital versions of the templates is available in the following folder on the bscw area:

http://bscw.safespot-eu.org/bscw/bscw.cgi/188030.

1 Test check list

This section lists the procedure for the actual testing. The challenge here is to be general and cover all possible tests. The user is allowed and asked to add missing items for his/her specific tests. During the preparation of the experiment the test check list should be prepared and further specified. The level of detail should be related to the experience of test leaders. It is also recommended to have a high level of detail in case different test leaders are involved in performing the different trials. By this a standardized procedure of testing can be assured easily.

Testing is done in three phases:

- Preparation
- Execution
- Wrap-up

The checklist follows these phases. It is assumed, that test vehicles are already equipped with the necessary sensors, actuators and data logging systems, and all software has been implemented and installed, including logging functionality.

Test check list.

Test phase	Action	Remarks
Preparation	**Set-up test forms**	**Use one form per test and leave enough space for recording test conditions/parameters (weather, vehicles, traffic, software settings, etc.) and remarks. Use unique numbering of each test.**
	Inform all test participants like drivers, subjects, emergency services, …	**Take into consideration if and in what detail possible subjects are informed about the system to be tested and the scenario.**
	System startup	**Preferably following a startup checklist of the subsystems.**
	Check communication devices	
	Go to starting positions	
Execution	**Start logging**	**Data logging, video, …**
	Record (write down) test conditions, parameters, participants, subjects and test number	**On test form. Test number is preferably already printed on the test form.**
	Execute test	**Test leader gives formal 'go-ahead' using unique test number.**
	Save data	**Using the test number, so that test forms can be easily connected to the recorded test parameters and logging files**
	Record test remarks	**Like abnormalities, changes in test scenario**
	Record subject ratings/remarks	
	Proceed to next test	**Several tests may be performed sequentially.**
Wrap-up	**Data collection**	**Collect data files, maybe make a backup. Collect test forms of participants.**
	Have subjects to fill in questionnaires	**If required for the test**

2 Human factors questionnaires

The human factors questionnaires in this annex of D4.6.1 are meant for printout and use during the human factors pilots. Since most of the material is formatted in MS Word tables it is also easy for the test leader to adopt and change or enlarge sections of the questionnaires.

It is recommended to printout a set of needed questionnaires for each participant and to have the questionnaires at hand during the experiment.

The following sequence of questionnaires is recommended. This sequence ensures that the participants give their impressions in the best possible order, e.g. the acceptance questionnaire requires intuitive answers without much thinking – so it is proposed to start with this questionnaire right after the experiment.

- SAFESPOT pilot test data (before the experiment by test leader)
- Not intended events (during the experiment by test leader or while participant fills other questionnaires if no intention of test leader is required)
- Acceptance (after the experiment by participant)
- Workload NASA TLX (after the experiment by participant)
- Usability SUS (after the experiment by participant)
- Interview (after the experiment by test leader together with participant)
- Participants profile (some fields after the experiment by interview, some fields to be filled by experimenter according to his/her observation)

SAFESPOT Pilot

Pilot No: _____

Participants No: _____

Date: _____

Start Time: _____

End Time: _____

Test Site and specific location: _____

Test Leader: _____

2.1 Not intended events during the experiment

During the tests several not intended factors might influence the results. Please note any of the following aspects if applicable during the experiment:

- **Function performance** of the system during the test. Note what happened and when (use time stamps) in terms of non-compliance or any other unplanned behaviour of the system.

_____

_____

_____

- Any **environmental influences**, i.e. rain, noise, time pressure, disturbances).

_____

_____

_____

- Any **personal influences**, i.e. tiredness, sickness, negative attitude, etc).

_____

_____

_____

2.2 User Acceptance Scale:

My judgements of the system are ... (tick one box in every line)

1	**Useful**	☐☐☐☐☐	**Useless**
2	**Pleasant**	☐☐☐☐☐	**Unpleasant**
3	**Bad**	☐☐☐☐☐	**Good**
4	**Nice**	☐☐☐☐☐	**Annoying**
5	**Effective**	☐☐☐☐☐	**Superfluous**
6	**Irritating**	☐☐☐☐☐	**Likeable**
7	**Assisting**	☐☐☐☐☐	**Worthless**
8	**Undesirable**	☐☐☐☐☐	**Desirable**
9	**Raising alertness**	☐☐☐☐☐	**Sleep-inducing**

2.3 Workload: NASA TLX:

Instruction for participants before conducting the NASA TLX (from NASA TLX handbook, minimally adjusted by D4.6.1 authors):

Throughout this study rating scales will be used to assess your experiences in different task conditions. Scales of this sort are extremely useful but their ability suffers from the tendency people have to interpret them in individual ways. For example, some people feel that mental or temporal demands are the essential aspects of workload regardless of the effort they expended or the performance they achieved. Others feel that if they performed well the workload must be low and vice versa. Yet others feel that effort or feelings of frustration are the most important factors in workload and so on. The results of previous studies have already found every conceivable pattern of values. In addition, the factors that create levels of workload differ depending on the task. For example, some tasks might be difficult because they must be completed very quickly. Others may seem easy or hard because of the intensity of mental or physical effort required. Yet others feel difficult because they cannot be performed well, no matter how much effort is expended.

The evaluation you are about to perform is a technique that has been developed by NASA to assess the relative importance of six factors in determining how much workload you experienced. The procedure is simple. You will be presented with a series of pairs of rating scale titles (for example Effort vs. Mental Demands) and asked to choose which of the items was more important to your experience of workload in the task(s) that you just performed. Each pair of scale titles will appear separately on the screen. Select the Scale Title that represents the more important contributor the workload for the specific task(s) you performed in this study.

Please read the descriptions of the scales carefully or ask the test leader to explain them to you. If you have a question about any of the scales, feel free to ask about it. It is extremely important that they be clear to you.

First you will be presented with pairs of workload rating scale titles. Select the scale title that you feel contributed the most to the workload of the specific task you just completed.

After this you will receive six rating scales. You will evaluate the task by checking the box at the point that matches your experience. Note that "Own Performance" goes from "good" on the left, to bad on the right. This order has been confusing for some people.

Remember that the system you are testing is under evaluation – not yourself. So please give your feedback freely and without hesitation. You may ask now any questions and start.

Sources of Workload:
Select for each pair the more important source of the Workload you perceived.

☐	**Effort**	☐	**Performance**
	or		**or**
☐	**Mental Demand**	☐	**Mental Demand**
☐	**Effort**	☐	**Performance**
	or		**or**
☐	**Physical Demand**	☐	**Frustration**
☐	**Effort**	☐	**Performance**
	or		**or**
☐	**Temporal Demand**	☐	**Physical Demand**
☐	**Effort**	☐	**Performance**
	or		**or**
☐	**Frustration**	☐	**Temporal Demand**
☐	**Effort**	☐	**Frustration**
	or		**or**
☐	**Performance**	☐	**Temporal Demand**
☐	**Mental Demand**	☐	**Frustration**
	or		**or**
☐	**Frustration**	☐	**Physical Demand**
☐	**Mental Demand**	☐	**Physical Demand**
	or		**or**
☐	**Temporal Demand**	☐	**Temporal Demand**
☐	**Mental Demand**		
	or		
☐	**Physical Demand**		

NASA TLX workload scales.

Check the box at the point that matches your experience.
Note that "Own Performance" goes from "good" on the left, to bad on the right.

Mental Demand How mentally demanding was the task?

Very Low Very High

Physical Demand How physically demanding was the task?

Very Low Very High

Temporal Demand How hurried or rushed was the pace of the task?

Very Low Very High

Performance How successful were you in accomplishing what you were asked to do?

Perfect Failure

Effort How hard did you have to work to accomplish your level of performance

Very Low Very High

Frustration How insecure, discouraged, irritated, stressed and annoyed were you?

Very Low Very High

2.4 System Usability Scale

	Strongly disagree				Strongly agree
1 I think that I would like to use this system frequently	1	2	3	4	5
2 I found the system unnecessarily complex	1	2	3	4	5
3 I thought the system was easy to use	1	2	3	4	5
4 I think that I would need the support of a technical person to be able to use this system	1	2	3	4	5
5 I found the various functions in this system were well integrated	1	2	3	4	5
6 I thought there was too much inconsistency in the system	1	2	3	4	5
7 I would imagine that most people would learn to use this system very quickly	1	2	3	4	5
8 I found the system very cumbersome to use	1	2	3	4	5
9 I felt very confident using the system	1	2	3	4	5
1 0. I needed to learn a lot of things before I could get going with this system	1	2	3	4	5

2.5 Question categories for the open structured interview:

Question categories:

Did the comfort/safety/critical warning arrive in time for you to react comfortably/safely/critically?

Did the warning distract from the event? Why? / How?

Did the warning help to manage the event? Why? / How?

Did you understand the warning? What did you understand? To what event the warning was in your opinion related?

What did you appreciate most about the system

What did you appreciate the least of the system

How can the SMA (warnings) be optimized in your opinion?

How is your behaviour influenced by having the SMA system activated?

Do you have further comments about the presentation of information (HMI)?

2.6 Participants profile

Age

Gender

Km driven last year?

Brand, model, year of the car(s) driven in most of the time?"

Brand: _____

Model: _____

Year: _____

Experiences with the system of any kind before the test started (i.e. note if staff of the same company or same campus/location is participating).

Driving style applied in most of the time during THIS test session.

Sportive-spontaneous	Efficient-determined	Anticipatory-comfortable
☐	☐	☐

- Time of day when the test was conducted?

_____

- How was the person contacted?

_____

- How was the person informed about the tests and the system?

_____

- What was the precise instruction received before the test?

__(annex written instruction)_____

4 Test Forms

The Pilot Plan template was compiled within WT4.6 and distributed to application leaders and test site leaders. In order to facilitate the filling in of the template following general explanations and notes to the test forms were provided.

[1]
Task
Detailed descriptions of the different tasks:
Task 4.6.3: Evaluation of the accidents impact through simulation methods and tools
The aim of this task is to determine the effect of the SAFESPOT system on traffic (fleet) safety. This will consist of traffic network simulation to assess the different benefits of applications on a network level based on driver behaviour response. The impact of SMA on road accident situation will be evaluated while varying the penetration rates. The scenario selection will be based on D4.2.3 Use Cases and accident situations and input for driver behaviour could come from Task 4.6.5 HF driving simulator study. Input from T4.5.1 on worst and best performance of the underlying system would improve the results. Within SP5 a similar task is foreseen.

Task 4.6.4: Technical evaluation of the safety margin and related application with expert drivers
The aim of this task is to determine the technical performance under specific situations and technical function of integrated system under realistic conditions at the different test sites. The test cases will primarily be based on D4.2.4 User needs and requirements. The application parameters such as boundaries between safety margin stages will be evaluated. The work will mostly evaluate the technical function of the SAFESPOT system. For some cases a more detailed evaluation will be performed that will evaluate the technical performance of the system. This task plans all evaluation tests that are performed with implemented vehicles at the different test sites and collect the results.
All applications should be evaluated at some level.

Task 4.6.5: Evaluation of the safety margin an related application with subjects (to be updated)
The aim of this task is to determine Human Acceptance of such a system and evaluate human behaviour
Driving Simulation for safety critical situations
Determine human behaviour for specific cases
Determine human acceptance
HMI evaluation
D4.2.4 User needs and requirements.
Approach is coordinated with the similar task in SP5 COSSIB.

[2]
Sheet No:
Give this sheet a reference number. The following nomenclature shall be applied.

- Application abbreviation e.g. SLSD (speed limitation and safety distance)
- Test Site abbreviation e.g. IT (Italian test site)
- A continuous number for each test case you run → e.g. for total name: **SLSD_IT_1**

Applications **(D4.2.4)**		Test Sites	
RIS	**– Road intersection safety**	**WE**	**– West test site**
LCM	**– Lane change maneuver**	**IT**	**– italian test site**
SO	**– Safe overtaking**	**GE**	**– German Test Site**
HOCW	**– Head on collision warning**	**SWE**	**– swedish test site**
RECO	**– Rear end collision**	**NL**	**– Netherlands test site**
SLSD	**– Speed limitation and safety distance**	**DS**	**– driving simulator**
FCW	**– Frontal collision warning**	**TS**	**– traffic simulator**
RCS	**– Road condition status**		
CUWA	**– Curve warning**		
VRUAA	**– Vulnerable road user accident avoidance**		

[3]
Vehicle / RSU
List all **vehicles** and **road site units (RSU)** that are applied in the test. For each Vehicle and RSU fill in the installed **Hardware (HW)** and **Software (SW)** components / modules.

[4]
Test Type
Are you going to conduct a technical evaluation, a human factors test, or an evaluation of the effect on safety? If you do a technical evaluation and have e.g. an acceptance questionnaire included please select both.

[5]
Test Purpose:

Usability	**Testing how the user interacts with the system.**
Acceptance	**Testing user acceptance of the system.**
Performance	**Test about resource usage, throughput, stimulus-response time.**
Reliability	**The system developed must not fail in unexpected or catastrophic ways. Robustness testing and stress testing are variances of reliability**
Correctness	**testing based on this simple criterion.**
	Test of functionality.

[6]
Use Cases
Which use case of D4.2.3 is the basis for your test case? It is not necessary to have a test case for every use case; therefore you may redefine the use cases if this helps you to fuse some use cases to one general one. This shall help to address as many use cases as possible with less efforts. Always specify the use cases reference number(s).

[7]
Test setup and scenario
Describe the test setup and the scenario in detail.
Refer to the vehicles / RSU applied, their position and movements and the use case(s).
Human factors: How many subjects are planned for? What is the experimental design?
Technical evaluation: How many repetitions are planned?
Describe the variations of your plan. E.g. you may vary factors and within each factor you may vary as well different grades (see table). A recommendation is to have not too much variation in order to reduce complexity of the tests.

Factors	Grades
Speed	**e.g. 30km/h / 50km/h / 80km/h**
Following Distance	**e.g. Not yet specified - range from 10m to 50m**

SAFESPOT system	**Activated / not activated**
…	**…**

[8]
Success Criteria
a) For each application special **Requirements** have been defined in D4.2.4. Please copy the requirements for the application(s) tested. In the case you are testing more than one application, copy the requirements from all applications. You may only copy those requirements that are relevant for this test case, however try taking as many requirements as possible into account.
b) Please describe how you consider this requirement in your test case scenario. You may slightly reformulate the requirement here for better fit.
c) Then state in the next column which results you are going to retrieve will prove that the requirement is met / or not met. Be very specific and precise (numbers / thresholds). If there is no specific threshold, state the measure you will report the performance for.
d) In the last column please specify which methods / tools / measurements you are going to apply in order to achieve your results.

Do the same for all **User Needs** from D4.2.4 that refer to your application(s).
[9]
High level objectives (HLO)
The SAFESPOT Technical Annex (TA) states a number of **High Level Objectives (HLO)** that describes in a very general manner the success criteria for the SAFESPOT project on a "high level". You find a description of the HLO in the template. Please read them carefully and think how we can prove as many of them by our evaluations tests (pilots) as possible. You may redefine the HLO according to your test case or you may be able to prove the HLO partly or to some extend or just laterally. Many times a performance report for special values can be enough (e.g. Collision warning arrives 8 seconds TTC (time to collision) – this can be compared to a collision warning of other projects that have no C2C communication module. Please try to contribute as much as possible in order to fulfil the HLO.
Sources of HLO:

- http://www.SAFESPOT-eu.org
- TA Chapter Technical objectives and other SAFESPOT objectives, section 2.5 and 2.6
- TA SP4 section 8.4.2 objectives

[10]
Extra success criteria that are worth testing.
If you have any further success criteria that you are going to test in the test case please state them here! This may apply especially for multiple application tests or human factors tests (both are underrepresented in the High Level Objectives).

[11]

Risks.

Within SP6 several risks are identified by relevant stakeholders for the development of SF like systems. On the BSCW a list of 25 risks is available that was compiled especially for WP4.6. If there are risks which you can cover with your test case, add them here.

After the first templates were compiled and filled in some questions came up which were collected in a frequently asked questions (FAQ) section added to the template on November 03rd 2008:

1. What is the difference between WP4.5 and WP5.6 tests:

A) WP4.5 tests are conducted under laboratory conditions, WP4.6 tests are conducted on the pilot sites under real traffic and environmental conditions.
B) WP4.6 tests will serve as demonstrators for the outcome of SAFESPOT WP4.
C) WP4.5 tests serve to test the integration of SP1 and SP3 components and to deliver tested applications in tested vehicles to the test sites (and WP4.6).
D) WP4.5 takes mainly the technical Requirements of D4.2.4 into account, WP4.6 is mainly for the User Needs and High Level Objectives regarding the user and traffic on a high level.

Specifically:
WP4.5 - test and validation:
-Test of the functioning and performance of the applications.
-Test of the functioning and performance of the integrated system (the whole SF system and applications integrated in a vehicle)
- Both under laboratory conditions.

WP4.6 - evaluation test trials
-Evaluation of the complete SF system: technical functioning and (!) technical performance under realistic test site conditions tested on the driver's perception level.
-Evaluation of the effect on non-expert drivers with on road tests and driving simulators.
-Evaluation of the effect of the system on overall safety with traffic simulators.

2. A common difficulty is to decide when to use a new template.

The answer is (as stated hidden in the draft version of D4.6.1):
"When to use a new template:
You may fill in a new template whenever one of the following factors changes:
new application
new vehicles
new hardware (HW)
new software (SW)
new test environment (test site)
new use case
new test setup"
In other words: Use a new template when you run a new experiment. Usually you consider an experiment as separate when it becomes too complex to be handled in one experiment. In case of any doubt it is up to you to decide how you want to report the planning and results of your experiments.

A second indicator for using a new template is for tests that have no comparison with each other, e.g.:
A) Test the C2C communication in a city and in a tunnel and compare the received data quality.
B) Test the range for sending data between cars in the tunnel and in the city. This is a new test and a new template, since comparison between A and B makes no sense.

3. Level of detail for "Test setup and scenario".

A proper test plan is supposed to plan the experiment in all detail. This includes
- the variation factors (e.g. speed and distance) and the variation grades of these factors (e.g. 30km/h and 50km/h or 20m and 100m)
- the experimental design
- a clear description of the test setup and how it is going to be conducted (story book).
- the comparisons planned
- the number of repetitions
--> At this time of planning it is very early to plan the experiment in detail (early when considering the state of the project, in time when considering the TA-Gantt Chart ;-))
We ask you for this reason to be as specific as possible at this moment. Any changes will be possible and the template will be available until the day your experiment starts since it is well known that most changes occur at the last second. However the WP4.6 template helps you to

plan the experiment in accordance to the SF-SP4 requirements, user needs, risks and high level objectives which is extremely important!
The requirements, user needs, risks and high level objectives especially help you to define:
- the measures to be taken in the experiment
- the specification of success criteria
- and may give a hint for adding important variations to the experimental plan in order to fulfil the SP4 requirements and user needs.
Also in D4.6.1 you (will) get help for your experimental testing and some guidelines for quality management and reporting.

4. Multiple Applications
It is not the intention to report "as many application tests as possible" in one template. This field aims at the few test cases that should be run with multiple applications. Those special test cases (experiments) have as the only objective (success criteria) to prove that the system can handle multiple applications without dropdown in performance or function!

5. The work to copy all the requirements, user needs and risks into the template:
Copy only the relevant requirements, user needs and risks.
The following documents are helpful for a fast overview:
- User needs and requirements compilation http://bscw.safespot-eu.org/bscw/bscw.cgi/d192802/Link%20to%20User%20needs%20and%20Requirements%20Compilation%20V2.3.xls <.
- Risks: http://bscw.safespot-eu.org/bscw/bscw.cgi/d192631/SP6_projectmanagementtrisks_v2%201b.xls

6. Requirements:
Requirements are mainly relevant for WP4.5 since they state mostly technical aspects for the Applications, SP1 and SP3 Components and the System. However you may find requirements for the application tested that are really reasonable to test (as well) in WP4.6. Please refer only to requirements when you can add an extra value by testing them in WP4.6 and focus your test on the driver perception or on aspects that can only be tested on the road (on the test site)!

7. Risks:
The list of Risks contains 25 items especially compiled for WP4.6 http://bscw.safespot-eu.org/bscw/bscw.cgi/d192631/SP6_projectmanagementtrisks_v2%201b.xls
Risks can not directly be translated into "Success Criteria". Do your best to refer to any risk that is addressed in / or relevant for you test.

8. Explanations at the end of the template.
You may print them out and have them at hand. They are very helpful but I admit that it is a lot of scrolling if you do not print them.
Same applies probably for these FAQ.

9. Examples
There are examples to have a look at:
TNO example for the NL test site and lane change manoeuvre: http://bscw.safespot-eu.org/bscw/bscw.cgi/d192777/SP4%20WP6%20TEST%20CASE%20example.doc
CRF example for the CRF test track and rear end collision avoidance application that reports one experiment in all detail, ready to start the experiment. [http://bscw.safespot-eu.org/bscw/bscw.cgi/d223471/SP4_WP6_TestCase_RECO_IT_01_example.doc

4.1 Road Intersection Safety CAS

4.1.1 Use Case 1A - Road intersection Safety - Accident at intersections

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	Staelin / CAS	Date:	7.11.2008	Sheet No.: [2]	RIS_WE_1A
Application(s) tested:	1. Road intersection Safety - Accident at intersections	Vehicles / RSU: [3]	1. Egovehicle 2. Accident Vehicle (3. 2nd Accident Vehicle)	HW - components to be used in test [3]	1. 2. 3. 4. 5.	SW-components / modules to be used in the test [3]	1. Datafusion 2. LDM 3. Positioning 4. Router 5. Application

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☐	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☐	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☒	**Test Site West**	☒
Other:		**Reliability**	☒	**Test Site Italy**	☐
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Specific area at test site:	

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	Road intersection Safety - Accident at intersections - UC1A
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]
Accident Vehicle (and maybe second Accident Vehicle) is placed at intersection. Egovehicle is approaching intersection where Accident Vehicle is placed. Egovehicle gets warning according to safety marging definition. Driving performed by expert drivers due to safety reasons. Scenarios: 1. Accident Vehicles are always statically placed at the intersection, engines stopped (unless safety restrictions forbid) 2. Egovehicle is approaching Intersection at different speeds 3. Accident Vehicles turn on Accident Information at different distances to Egovehicle to match comfort, safety and critical zone of the safety margin The test should be repeated without accident vehicles on the intersection. Speed Ranges: 30 kph - 60 kph All data will be logged and evaluated afterwards.

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4-REQ_00_14 - Sending after engine stop or crash	Engines of the accident vehicles are turned off	If the egovehicle receives the information, the test is successful	If the egovehicle receives the information, the test is successful
User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_01_01 - The user shall be able to know about the presence of other relevant vehicles/objects in the surrounding	Warning about the accident vehicles		If the egovehicle receives the information, the test is successful
#SP4_UN_01_03 - The user shall not be informed about the presence of other vehicles/objects in the surrounding not relevant to the driver.	Test without accident vehicles. There no warning should occur		If the egovehicle does not receive any information in this case, the test is successful
#SP4_UN_01_07 - The system shall be available all the time, whatever location, whatever daytime, …	The system should work all the time		If the system worked all the time, no matter what daytime, weather, etc., the test is successful

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The test will show that road safety is improved. Without the cooperative System the egovehicle won't be able to detect the accident early enough.
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	The danger of a second accident happening due to a first accident is greatly reduced and therefore the number of fatalities related to accidents at intersections (which is a high number).
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The information for the cause and type of a "standing object" (the accident in this case) is hard to get otherwise
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☒ No, ☐ Yes	
To manage existing incidents to minimise further negative safety impact.	☐ No, ☒ Yes	That's the main reason for this use case
To increase safety for all road users in a specific situation.	☐ No, ☒ Yes	Second accidents due to first accidents are a high risk and are reduced by the use case.
To show that the safety impact can be achieved without affecting transport efficiency.	☐ No, ☒ Yes	Traffic flow at the intersection won't be influenced
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☐ No, ☒ Yes	The information for the cause and type of a "standing object" (the accident in this case) is hard to get otherwise

To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☒ No, ☐ Yes		
To open the development of new safety applications based on a cooperative approach.	☒ No, ☐ Yes		
Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			
Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.1.2 Use Case 1B - Road intersection Safety - Obstructed view at intersections

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	Staelin / CAS	Date:	7.11.2008	Sheet No.: [2]	RIS_WE_1B
Application(s) tested:	1. Road intersection Safety - Obstructed view at intersections	Vehicles / RSU: [3]	1. Egovehicle 2. Approaching Vehicle 3. Vehicle blocking view	HW - components to be used in test [3]	1. 2. 3. 4. 5.	SW-components / modules to be used in the test [3]	1. Datafusion 2. LDM 3. Positioning 4. Router 5. Application

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☐	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☐	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☒	**Test Site West**	☒
Other:		**Reliability**	☒	**Test Site Italy**	☐
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Specific area at test site:	

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	Road intersection Safety - Obstructed view at intersections - UC 1b
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]
Driving is performed by expert drivers. Scenario 1: Vehicle is standing at intersection to block the view and indicating to turn left. Both other vehicles are approaching the intersection. The ego vehicle is trying to turn left in front of the vehicle blocking the view. Scenario 2: Like scenario 1, but the vehicle blocking the view is now also approaching the intersection, always driving in front of the second vehicle Speed Ranges: 30 kph - 60 kph Several repetitions of each scenario. Scenario 1 and 2 should be repeated without a second vehicle approaching the intersection to check for false alarms All data will be logged and evaluated afterwards.

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4-REQ_01_05 - Receiving information from hidden vehicles	One vehicle is blocking the view for the other vehicles	If the vehicles are informed about each other or not.	If the vehicles are informed about each other even if they can't see each other the test is successful
User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_01_01 - The user shall be able to know about the presence of other relevant vehicles/objects in the surrounding	Information about hidden vehicles		If the vehicles are informed about each other even if they can't see each other the test is successful

#SP4_UN_01_03 - The user shall not be informed about the presence of other vehicles/objects in the surrounding not relevant to the driver.	Test without second vehicle approaching the intersection		If the egovehicle does not receive any information in this case, the test is successful
#SP4_UN_01_04 - The user shall be informed in time about the presence of relevant vehicles/objects in the surrounding.	Time at which the warning occurs compared to the distance to the other vehicle	Distance to blocking vehicle vehicle and time till second vehicle has passed	Time and distance are measured
#SP4_UN_01_07 - The system shall be available all the time, whatever location, whatever daytime, …	The system should work all the time		If the system worked all the time, no matter what daytime, weather, etc., the test is successful
Add further User Needs here:			

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The test will show that road safety is improved. Without the cooperative System the egovehicle won't be able to detect the second vehicle at all
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	The danger of accidents due to obstructed view is greatly reduced
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The information about the area around the car is more complete and therefore also the quality and reliability of safety-related information
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	Driver support can be given if the driver could not foresee a danger

To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☐ No, ☒ Yes	The danger of accidents due to another vehicle not seing the ego vehicle is greatly reduced
To show that the safety impact can be achieved without affecting transport efficiency.	☐ No, ☒ Yes	Traffic flow at the intersection won't be influenced
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☒ No, ☐ Yes	
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	Obstructed objects are integreated in the environmental model of the ego vehicle
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	Obstructed objects can now be taken into account

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			
Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.1.3 Use Case 1C - Road intersection Safety - Permission denial to go-ahead

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	Staelin / CAS	Date:	7.11.2008	Sheet No.: [2]	RIS_WE_1C
Application(s) tested:	1. Road intersection Safety - Permission denial to go-ahead	Vehicles / RSU: [3]	1. Egovehicle 2. Approaching Vehicle	HW - components to be used in test [3]	1. 2. 3. 4. 5.	SW-components / modules to be used in the test [3]	1. Datafusion 2. LDM 3. Positioning 4. Router 5. Application

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☐	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☐	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☒	**Test Site West**	☒
Other:		**Reliability**	☒	**Test Site Italy**	☐
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Specific area at test site:	

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	Road intersection Safety - Permission denial to go-ahead - UC 1C
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]
Driving is performed by expert drivers. The ego vehicle is standing at the intersection. The second vehicle is approaching the intersection (at constant speed and at changing speed). The driver of the egovehicle is trying to go-ahead at different distances between the ego vehicle and the approaching vehicle. One test should be to try to go-ahead after the approaching vehicle has passed Speed Ranges: 30 kph - 60 kph Several repetitions of each scenario. The scenario should be repeated without an approaching vehicle to check for false alarms. All data will be logged and evaluated afterwards.

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4-REQ_01_06 - Prevent starting	Main functionality of the application		If the driver is stopped from going-ahead the test was successful
#SP4-REQ_01_08 - Approaching vehicles at intersection	The approaching vehicle should be detected by the ego vehicle		if the ego vehicle gets information from the approaching vehicle, the test is successful
User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_01_01 - The user shall be able to know about the presence of other relevant vehicles/objects in the surrounding	Information about approaching vehicle vehicles		If the vehicles are informed about each other the test is successful

#SP4_UN_01_03 - The user shall not be informed about the presence of other vehicles/objects in the surrounding not relevant to the driver.	Test without second vehicle approaching the intersection, test with vehicle trying to go-ahead after the vehicle has passed		If the ego vehicle is not stopped from going-ahead in the defined situation the test was successful
#SP4_UN_01_04 - The user shall be informed in time about the presence of relevant vehicles/objects in the surrounding.	Time at which the warning occurs compared to the distance to the other vehicle	Distance to other vehicle and time till other vehicle passes ego vehicle	Time and distance are measured
#SP4_UN_01_07 - The system shall be available all the time, whatever location, whatever daytime, …	The system should work all the time		If the system worked all the time, no matter what daytime, weather, etc., the test is successful
#SP4_UN_01_08 - The user shall get a recommendation for actions to be taken in order to avoid a safety critical situation.	The system should tell the driver not to go-ahead, if this would lead to an accident		If the driver is stopped from going-ahead in the relevant cases the test is successful
Add further User Needs here:			

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The test will show that road safety is improved. Without the cooperative System the egovehicle won't be able to detect the second vehicle
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	The danger of accidents due to crossing traffic is greatly reduced

To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The information about the area around the car, especially about crossing traffic, is more complete and therefore also the quality and reliability of safety-related information
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	Driver support can be given if the driver could not foresee a danger
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☐ No, ☒ Yes	The danger of accidents due to another vehicle not seing the ego vehicle is greatly reduced
To show that the safety impact can be achieved without affecting transport efficiency.	☐ No, ☒ Yes	Traffic flow at the intersection won't be influenced unless necessary to keep safe traffic state
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☒ No, ☐ Yes	
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	crossing traffic is integrated in the environmental model of the ego vehicle
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	crossing traffic can now be taken into account

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

Use Case 1D - Road intersection Safety - Defect traffic signs

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	Staelin / CAS	Date:	7.11.2008	Sheet No.: [2]	RIS_WE_1D
Application(s) tested:	1. Road intersection Safety - Defect traffic signs	Vehicles / RSU: [3]	1. Egovehicle 2. Approaching Vehicle 3. Traffic light with RSU	HW - components to be used in test [3]	1. 2. 3. 4. 5.	SW-components / modules to be used in the test [3]	1. Datafusion 2. LDM 3. Positioning 4. Router 5. Application

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☐	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☐	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☒	**Test Site West**	☒
Other:		**Reliability**	☒	**Test Site Italy**	☐
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Specific area at test site:	

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	Road intersection Safety - Defect traffic signs - UC 1d
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]
Driving is performed by expert drivers. Traffic light shows green for both directions. Ego vehicle is approaching intersection. Second vehicle is approaching intersection. Speed Ranges: 30 kph - 60 kph Several repetitions of the scenario. At least one repetition without the second vehicle to check for false alarms. At least one repetition with a traffic light that shows correct states to check for false alarms All data will be logged and evaluated afterwards.

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4-REQ_01_01- Receiving traffic sign/light status	The information about the traffic light is taken into account for the warning decision		If the ego vehicle gets the information about the wrong traffic light, the test is successful
#SP4-REQ_01_08 - Approaching vehicles at intersection	The approaching vehicle should be detected by the ego vehicle		if the ego vehicle gets information from the approaching vehicle, the test is successful
User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_01_01 - The user shall be able to know about the presence of other relevant vehicles/objects in the surrounding	Information about approaching vehicle vehicles		If the vehicles are informed about each other the test is successful

#SP4_UN_01_03 - The user shall not be informed about the presence of other vehicles/objects in the surrounding not relevant to the driver.	Test without second vehicle approaching the intersection, test with correct traffic signs		If the ego vehicle is not warned in the defined situation the test was successful
#SP4_UN_01_04 - The user shall be informed in time about the presence of relevant vehicles/objects in the surrounding.	Time at which the warning occurs compared to the distance to the other vehicle	Distance to other vehicle and time till other vehicle passes ego vehicle	Time and distance are measured
#SP4_UN_01_07 - The system shall be available all the time, whatever location, whatever daytime, …	The system should work all the time		If the system worked all the time, no matter what daytime, weather, etc., the test is successful
#SP4_UN_01_02 - The user shall be informed about the correct traffic-sign and/or traffic-light situation.	Information about traffic light status is given to the driver of the ego vehicle		If the correct traffic light information is given to the driver of the ego-vehicle, the test is successful
Add further User Needs here:			

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The test will show that road safety is improved. Without the cooperative System the egovehicle won't be able to detect that the traffic light is defect
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	The danger of accidents due to defect traffic lights is greatly reduced

To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The information about the area around the car, especially about crossing traffic and traffic light status, is more complete and therefore also the quality and reliability of safety-related information
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	Driver support can be given if the driver could not foresee a danger
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☐ No, ☒ Yes	The danger of accidents due to wrong assumptions about the situation at the intersection is greatly reduced
To show that the safety impact can be achieved without affecting transport efficiency.	☐ No, ☒ Yes	Traffic flow at the intersection won't be influenced unless necessary to keep safe traffic state
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☒ No, ☐ Yes	
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	crossing traffic and traffic light status is integrated in the environmental model of the ego vehicle
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	crossing traffic and traffic light status can now be taken into account

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.1.4 Use Case 1F - Road intersection Safety - Approaching emergency vehicle warning

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	Staelin / CAS	Date:	7.11.2008	Sheet No.: [2]	RIS_WE_1F
Application(s) tested:	1. Road intersection Safety - Approaching emergency vehicle warning	Vehicles / RSU: [3]	1. Egovehicle 2. Emergency vehicle	HW - components to be used in test [3]	1. 2. 3. 4. 5.	SW-components / modules to be used in the test [3]	1. Datafusion 2. LDM 3. Positioning 4. Router 5. Application

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☐	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☐	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☒	**Test Site West**	☒
Other:		**Reliability**	☒	**Test Site Italy**	☐
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Specific area at test site:	

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	Road intersection Safety - Approaching emergency vehicle warning - UC 1f
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]
Driving is performed by expert drivers. Emergency Vehicle is approaching intersection sending out information about being an emergency vehicle. Ego vehicle is approaching intersection at different distances to the emergency vehicle (sometimes crossing the intersection before, sometimes after the emergency vehicle) Speed Ranges: 30 kph - 60 kph Several repetitions of the scenario. At least one repetition without the emergency vehicle sending out being an emergency vehicle to check for false alarms. At least one repetition without the emergency vehicle approaching the intersection. All data will be logged and evaluated afterwards.

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4-REQ_01_07 - Emergency Vehicle	This is the main information for the use case tested		If the ego vehicle gets information about the approaching emergency vehicle the test is successful
#SP4-REQ_01_08 - Approaching vehicles at intersection	The approaching vehicle should be detected by the ego vehicle		if the ego vehicle gets information from the approaching emergency vehicle, the test is successful
User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_01_01 - The user shall be able to know about the presence of other relevant vehicles/objects in the surrounding	Information about approaching emergency vehicle		If the vehicles are informed about each other the test is successful
#SP4_UN_01_03 - The user shall not be informed about the presence of other vehicles/objects in the surrounding not relevant to the driver.	Test without emergency vehicle approaching the intersection, test where the ego vehicle crosses the intersection after the emergency vehicle		If the ego vehicle is not warned in the defined situation the test was successful

#SP4_UN_01_04 - The user shall be informed in time about the presence of relevant vehicles/objects in the surrounding.	Time at which the warning occurs compared to the distance to the emergency vehicle	Distance to emergency vehicle and time till emergency vehicle passes ego vehicle	Time and distance are measured
#SP4_UN_01_07 - The system shall be available all the time, whatever location, whatever daytime, …	The system should work all the time		If the system worked all the time, no matter what daytime, weather, etc., the test is successful
#SP4_UN_01_10 - The user shall be informed about approaching emergency vehicles	This is the main information for the use case tested		If the driver of the ego vehicle is informed about the approaching emergency vehicle the test is successful

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The test will show that road safety is improved. Without the cooperative system the driver of the ego vehicle won't always notice that an emergency vehicle is approaching
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	The danger of accidents due to approaching emergency vehicles is greatly reduced
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The information about emergency vehicles in the area around the car increases the quality and reliability of safety-related information
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	Driver support can be given if the driver could not foresee a danger

To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☐ No, ☒ Yes	The danger of accidents due to unnoticed emergency vehicles is greatly reduced
To show that the safety impact can be achieved without affecting transport efficiency.	☐ No, ☒ Yes	Traffic flow at the intersection won't be influenced unless necessary to keep safe traffic state
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☒ No, ☐ Yes	
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	the presence of emergency vehicles is integrated in the environmental model of the ego vehicle
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	the special behavior of emergency vehicles can now be taken into account

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			
Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.2 Lane Change Manoeuvre PIAGGIO

4.2.1 Use Case 2GC – Lane Change Manoeuvre - General Case

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**							
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	Paolo Cravini Piaggio & C. S.p.a.	Date:	18/12/08	Sheet No.: [2]		LCM_IT_UC2GC
Application(s) tested:	1. Lane Change Manoeuvre 2. n.	Vehicles / RSU: [3]	1. Car (Ego Vehicle 2. PTW (Probe Vehicle) n.	HW - components to be used in test [3]	1. APX - Piaggio Gateway 2. Main PC - Ebox638 3. GPS Module 4. RS232-Ethernet Converter 5. Vanet Router	SW-components / modules to be used in the test [3]		1. Datafusion 2. LDM 3. Positioning 4. Router 5. Application

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☐	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☐	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☐	**Test Site West**	☐
Other:		**Reliability**	☐	**Test Site Italy**	☒
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Specific area at test site:	

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	UC2GC - Lane Change Manoeuvre General Case
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]
Test Setup is composed by two vehicles. Ego vehicle V1 and Probe vehicle V2. V1 is running in the leftmost lane of the road. V2 is running in the rightmost lane of the road. V2 is approaching from the behind of V1. V1 is starting a lane change manoeuvre from the leftmost to the rightmost lane. Driving scenario: straight strecht of a oneway two lane road The test will be executed according to UC2GC described in D4.3.1. Vehicle speed: V1 at a constant speed of 50km/h. V2 at a constant speed of 60km/h in case of comfort situation, 70km/h in case of safety situation, 80km/h in case of critical situation. Distance between vehicle: V2 is incoming, in the rightmost lane, behind V1 starting from a distance of 100meters till to impact. Time to impact (V2 vs V1): greater than 25sec in case of comfort, between 25sec and 15sec in case of safety, less than 15sec in case of critical. Test case is repeated with PTW V2 at a speed of 60km/h (comfort case), 70km/h (safety case), 80km/h (critical case) Application Manager shall activate for each the above condition the UC2GC (General Case for LCM) of the DAA (Driver Assistance Application) module Message Manager shall activate for each the above condition the UC2GC (General Case for LCM) of the CSA (Cooperative Support Application) module

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.

User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
SP4_UN_02_01 - Driver of Ego vehicle wants to be informed about the presence of probe vehicle V2 around him during manoeuvre, especially during lane change manoeuvre.	The hazardous situation consisting in the OV V2 approaching from the behind of Ego vehicle V1 while V1 starts a Lane Change Manoeuvre in the lane covered by V2.	Situation is analyzed depending on the position of V1 in relation to the travelled lane, on its lateral motion and acceleration, on the distance between V1 and V2 and on the relative speed of V1 with respect to V2. Successful end condition is evaluated on the following threshold: if "time to impact" is greater than 25sec sholud lead to comfort warning, if "time to impact" is included between 25sec and 15sec should lead to safety warning, if "time to impact" is lower tha 15sec should lead to critical warning.	All of the (time stamped) data for the tested manoeuvres will be logged. The correctness of the measures will be provided by means of comparison tables where input values ("time to impact" values) are put in relationship with the time the expected warning is provided.
SP4_UN_02_04 - Ego vehicle V1 driver wants to be informed timely of the presence of Other Vehicle V2 around him.	The timely intervention of the driver HMI is considered by precisely measuring and logging the absolute time (millisec. precision) of HMI activation.	Both the absolute times of HMI activation and deactivation for two Safety Margin areas (Comfort and Safety) will be measured (and logged) with the millisec. accuracy.	The analysis of the logged information will be performed off line and compared to predefined "time to impact" thresholds. These "time to impact" thresholds (25sec and 15sec) defines the transitions in the Comfort Area and in the Safety Area
Add further User Needs here:			

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	To show the feasibility of the system to increase road safety, the system should function, and the timing of the warnings should be adequate. To improve the driver information about the presence of other vehicles around him. Some lateral collision can be avoided with other vehicles.
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☒ No, ☐ Yes	
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	Improve the method to detect in advance potentially dangerous situation and extend in “space and time” drivers’ awareness of the surrounding environment with a direct functional dependence from the thresholds controlling the safety margins,
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	To inform the driver about modalities and timings of the actions to take in order to minimise the risk of an accident. To define and improve the safety margin thresholds that can be expressed in terms of distances, times, speeds or accelerations.
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☐ No, ☒ Yes	To detect in advance potentially dangerous situation and extend in “space and time” user awareness of the surrounding environment
To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☐ No, ☒ Yes	To define and improve the safety margin thresholds that can be expressed in terms of distances, times, speeds or accelerations.

To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	To obtain a deep understanding of the working mechanisms of the co-operative applications, both in terms of internal specifications and in terms of descriptive elements directed
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	The method that has been applied to analyse UC data set, could be used, application by application, to develop new application based on the safety margin detected by the system.

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Risk 1 - The system gives wrong information to the users	By identifying the three areas for SMA (critical/safety/comfort), the Driver Assistance Application can take into account also the information relative to the driver commands; then it evaluates how these commands affect the trajectory of vehicle, before collocating V1 and V2 in a given assistance area.	The application estimates the area (comfort/safety/critical) corresponding to the situation of Lane Change Manoeuvre Warning where vehicle lays. To achieve this evaluation, the application needs the speed of V1 and V2, the relative distance between V1 and V2 (at the instant t=0), the limit value of V2 deceleration and trajectories of vehicle V1 and V2. Then identifies the time tc corresponding the two points P1 and P2, on the trajectories of V1 and V2 respectively, which have the minimum relative distance. If the minimum relative distance is equal to 0, the collision is sure, in relation to the estimated trajectories at time t;	Compare inputs from the system and outputs from the driver
Add further lines here:			

Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
Fill in a table reporting the V1-V2 distance vs the time to impact in each case of SMA situation (comfort, safety, critical) To fill in after performing test

4.2.2 Use Case 2A – Lane Change Manoeuvre for a car with blind spots - Human factors experiment at NL test site

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	Wilschut, Feenstra/TNO	Date:	11/11/08	Sheet No.: [2]	LCM_NL_1_HF
Application(s) tested:	1. LCM 2. n.	Vehicles / RSU: [3]	1. Citroen C4 2. VW passat n.	HW - components to be used in test [3]	1. TNO gateway on - autobox 2. Main pc fused with app pc - laptop 3. Pos pc -laptop 4. Router pc - self assembled car pc with qfree wlan card 5. No laserscanner/radar	SW-components / modules to be used in the test [3]	1. Datafusion 2. LDM 3. Positioning 4. Router 5. Application

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☒	**Usability**	☒	**Traffic Simulation**	☐
Technical Evaluation	☐	**Acceptance**	☒	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☐	**Test Site West**	☐
Other:		**Reliability**	☐	**Test Site Italy**	☐
		Correctness	☐	**Test Site Germany**	☐
		Other:	**Workload**	**Test Site Sweden**	☐
				Test Site NL	☒
				Specific area at test site:	**Helmond**

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	Lane Change manoeuvre for a car with blind spots - 2a
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]
Vehicle A and B will drive on a public road in the Netherlands. Vehicle A representing a car will change lane while vehicle B is approaching in the adjacent lane. The relative distance between the vehicles when vehicle A starts the manoeuvre will be 10m. The difference of speed between vehicle A and B will be 10km/h, the speed of vehicle A will be varying between 30-50 km/h. The vehicles will be driven by experts The following variations will be applied in a total of 10 runs: -The relative distance between vehicle A and B when A starts the lane change, ranging from the comfort warning zone to the safety warning zone -The lane change will be executed on different parts of the road, (varying amount of trees and houses) -The speed of both vehicles will be varied between 30-60km/h All structured data will gathered the van der Laan acceptance scale will be used to evaluate the LCM, a selected section of the AIDE-HMI questionnaire and mental effort with the RSME. The LCM system performance will only be scored in terms of hit, miss and false alarms.

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4-REQ_02_06 LCM - Understandable HMI	The system shall be able to provide understandable and timely recommendation to the driver about the lane change manouvre i.e. giving information about vehicles in the blind spot.	van der Laan acceptance scale will be used to evaluate the LCM + a selected section of the AIDE-HMI questionnaire to measure usability Ratings on the van der Laan need to be >0 (range -2/2)	Questionnaires and expert opinion

User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_02_08 Ego vehicle driver wants to receive understandable information / warning / recommendation	Users of the system are supposed being normal drivers, not trained about the system, and possibly unaware about its presence	van der Laan acceptance scale will be used to evaluate the LCM + a selected section of the AIDE-HMI questionnaire	Questionnaires and expert opinion
#SP4_UN_02_09 Ego vehicle driver do not want to be unnecessarily disturbed by obtrusive or redundant information/warnings/recommendations	HMI should be meaningful, not repetitive, and not obtrusive	van der Laan acceptance scale will be used to evaluate the LCM + a selected section of the AIDE-HMI questionnaire	Questionnaires and expert opinion
Add further User Needs here:			

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	There will be a look at the acceptance and usablility of such co-operative systems from a human factors perspective.

To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☒ No, ☐ Yes	
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	To improve the quality and the reliablity of the interface.
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☒ No, ☐ Yes	
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☐ No, ☒ Yes	By adequate HMI design traffic safety will be increased e.g. preventing that people direct their gaze to the system > 2 seconds (Tijerina, 2000)
To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☒ No, ☐ Yes	
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☒ No, ☐ Yes	
To open the development of new safety applications based on a cooperative approach.	☒ No, ☐ Yes	

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
risk number12) The system provides wrong information to the user This wrong information causes accidents and lack of public confidence in the service	usability (reliability) and acceptance	van der Laan scale	questionnaires, expert opinion
Add further lines here:			
Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.2.3 Use Case 2A – Lane Change Manoeuvre for trucks with blind spots – Technical test at NL test site

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	Leijsen / TNO	Date:	17102008	Sheet No.: [2]	LCM_NL_1
Application(s) tested:	1. lane change manoeuvre 2. n.	Vehicles / RSU: [3]	1. Citroen C4 2. VW passat n.	HW - components to be used in test [3]	1. TNO gateway on - autobox 2. Main pc fused with app pc - laptop 3. Pos pc -laptop 4. Router pc - self assembled car pc with qfree wlan card 5. No laserscanner/radar	SW-components / modules to be used in the test [3]	1. Datafusion 2. LDM 3. Positioning 4. Router 5. Application

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☐	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☐	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☐	**Test Site West**	☐
Other:		**Reliability**	☒	**Test Site Italy**	☐
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☒
				Specific area at test site:	**Helmond, public road**

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	lane change manoeuvre for trucks with blind spots - 2a
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]
Vehicle A and B will drive on a public road in Helmond the Netherlands. Vehicle A representing a truck will change lane while vehicle B is approaching in the adjacent lane. The relative distance between the vehicles when vehicle A starts the manoeuvre will be 10m. The speed of vehicle A will be 40kph, the speed of vehicle B will be 50 kph. The vehicles will be driven by expert technical drivers that know the system. No subjects (=non expert drivers unfamiliar with the system) will be used. The following variations will be applied in a total of 10-20 runs: -The relative distance between vehicle A and B when A starts the lane change, ranging from the comfort zone to the critical zone -The lane change will be executed on different parts of the road, (varying amount of trees and houses) -The speed of both vehicles will be varied between 30-80kph -The timing of the indicator switch with respect to the start of the lane change steering motion -The steering behavoiur of the driver while he keeps his lane (to check for false alarms), when the driver approaches the adjacent lane) -The test case is repeated under rainy conditions All data will be logged and evaluated afterwards.

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested in sufficiently WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.

User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
un_02_01/un_02_04 driver of truck wants to be informed about the presence of other vehicle during lane change	It will be checked whether the HMI in the vehicle will warn the driver for each test case	Number of missed alarms will be described	Missed alarm detection after test driver for the different safety margin zones: critical, safety and comfort
un_02_05 if ego not performing lane change, then no warning	It will be checked whether the HMI in the vehicle will warn the driver for each test case especially when varying the steering behaviour of the driver while not exiting the lane	Number of false alarms will be described.	False alarm detection from log files after test runs
Un_02_10 the system should be available in all weather conditions	Test will be performed under different conditions	Number of missed and false alarms under different test conditions will be described	Detection from log files after test runs
un_02_11 driver interface should timely reflect the changes in driving situation	The response time of the complete system will be measured	The time between start of lane change (bliker or steering motion) and occurance of warning	Detection from log files after test runs
Add further User Needs here:			

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	To show the feasibility of the system to increase road safety, the system should function, and the timing of the warnings should be adequate. It must be noted that for this application there are current systems that can have the same performance, but possibly at a higher cost (blind spot monitoring). No comparison with such a system is foreseen.

To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☒ No, ☐ Yes	
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	For the system to function, there needs to be communication between vehicle A and B. Showing the functioning of the system will prove that this communication is possible. In comparison with state of the art safety systems this data is more reliable, since it is send from the source itself, instead of interpreted by a sensor.
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	If the system functions correctly and the warnings are on time, the driver is supported when executing a lane change
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☐ No, ☒ Yes	If the system functions and the warnings are on time, the dirver of vehicle A will be warned tat the start of a possibly dangerous lane change. The driver of vehicle B will not be confonted with the possible dangerous behaviour of vehicle A.
To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☐ No, ☒ Yes	If the system functions and the warnings are on time, the dirver of vehicle A will be warned tat the start of a possibly dangerous lane change in the three defined sm zones.
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	If the system functions, the system will contain an LDM which contains a real time reconstruction of the driving context and environment
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	Since the LCM application is a very critical application concerning latency times in the system. If the evaluation shows good performance even in the critical sm zone, then the platform can be used for a range of new safety applications.

Risks of SP6 (BLADE) that are covered? [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Several of the SP6 risks are covered in the test scenario above			
Add further lines here:			
Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.3 Safe Overtaking PIAGGIO

4.3.1 Use Case 3GC – Safe Overtaking - General Case

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	Paolo Cravini Piaggio & C. S.p.a.	Date:	18/12/08	Sheet No.: [2]	SO_IT_UC3GC
Application(s) tested:	1. Safe Overtaking 2. n.	Vehicles / RSU: [3]	1. Car (Ego Vehicle 2. PTW (Probe Vehicle) 3. Other Vehicle V3	HW - components to be used in test [3]	1. APX - Piaggio Gateway 2. Main PC - Ebox638 3. GPS Module 4. RS232-Ethernet Converter 5. Vanet Router	SW-components / modules to be used in the test [3]	1. Datafusion 2. LDM 3. Positioning 4. Router 5. Application

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☐	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☐	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☐	**Test Site West**	☐
Other:		**Reliability**	☐	**Test Site Italy**	☒
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Specific area at test site:	

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	UC3GC - Safe Overtaking General Case
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]
Test Setup is composed by three vehicles: Host vehicle V1, PTW V2 and Other vehicle V3. V1 is running in the rightmost lane of the road. OV V3 is in front of V1. V1 starts the overtaking manoeuvre. PTW V2 is incoming from the behind in the left most lane. PTW V2 is already in overtaking manoeuvre of V1. V1 is informed of the presence of PTW V2. Driving scenario: straight strecht of a oneway two lane road The test will be executed according to UC3GC described in D4.3.1. Vehicle speed: V3 at a constant speed of 40km/h. V1 at a constant speed of 50km/h. V2 at a constant speed of 60km/h in case of comfort situation, 70km/h in case of safety situation, 80km/h in case of critical situation. Distance between vehicle: distance between V1 and V3 is of 20meters. V2 is incoming, in the leftmost lane, behind V1 starting from a distance of 100meters till to impact. Time to impact (V2 vs V1): greater than 25sec in case of comfort, between 25sec and 15sec in case of safety, less than 15sec in case of critical. Test case is repeated with PTW V2 at a speed of 60km/h (comfort case), 70km/h (safety case), 80km/h (critical case) Application Manager shall activate for each the above condition the UC3GC (General Case for SO) of the DAA (Driver Assistance Application) module Message Manager shall activate for each the above condition the UC3GC (General Case for SO) of the CSA (Cooperative Support Application) module

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.

User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
SP4_UN_03_01 - Driver of Ego vehicle wants to be informed, before to overtake V3, about the approaching of a PTW V2 which is performing an overtaking manoeuvre	The hazardous situation consisting in the presence of a PTW in overtaking manoeuvres (in the leftmost lane of the road) while an Ego vehicle V1 starts an overtaking manoeuvre in the lane covered by PTW V2.	Situation is analyzed depending on the position of V1 in relation to the travelled lane, on its lateral motion and acceleration, on the distance between V1 and V2 and on the relative speed of V1 with respect to V2. Successful end condition is evaluated on the following threshold: if "time to impact" is greater than 25sec sholud lead to comfort warning, if "time to impact" is included between 25sec and 15sec should lead to safety warning, if "time to impact" is lower tha 15sec should lead to critical warning.	All of the (time stamped) data for the tested manoeuvres will be logged. The correctness of the measures will be provided by means of comparison tables where input values ("time to impact" values) are put in relationship with the time the expected warning is provided.
SP4_UN_03_04 - Ego vehicle V1 driver wants to be informed timely of the presence and action of PTW V3	The timely intervention of the driver HMI is considered by precisely measuring and logging the absolute time (millisec. precision) of HMI activation.	Both the absolute times of HMI activation and deactivation for two Safety Margin areas (Comfort and Safety) will be measured (and logged) with the millisec. accuracy.	The analysis of the logged information will be performed off line and compared to predefined "time to impact" thresholds. These "time to impact" thresholds (25sec and 15sec) defines the transitions in the Comfort Area and in the Safety Area
Add further User Needs here:			

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	To show the feasibility of the system to increase road safety, the system should function, and the timing of the warnings should be adequate. To improve the driver information about the presence of other vehicles around him. Some lateral collision can be avoided with other vehicles.
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☒ No, ☐ Yes	
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	Improve the method to detect in advance potentially dangerous situation and extend in “space and time” drivers’ awareness of the surrounding environment with a direct functional dependence from the thresholds controlling the safety margins,
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	To inform the driver about modalities and timings of the actions to take in order to minimise the risk of an accident. To define and improve the safety margin thresholds that can be expressed in terms of distances, times, speeds or accelerations.
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☐ No, ☒ Yes	To detect in advance potentially dangerous situation and extend in “space and time” user awareness of the surrounding environment
To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☐ No, ☒ Yes	To define and improve the safety margin thresholds that can be expressed in terms of distances, times, speeds or accelerations.

To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	To obtain a deep understanding of the working mechanisms of the co-operative applications, both in terms of internal specifications and in terms of descriptive elements directed
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	The method that has been applied to analyse UC data set, could be used, application by application, to develop new application based on the safety margin detected by the system.

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Risk 1 - The system gives wrong information to the users	By identifying the three areas for SMA (critical/safety/comfort), the Driver Assistance Application can take into account also the information relative to the driver commands; then it evaluates how these commands affect the trajectory of vehicle, before collocating V1 and V2 in a given assistance area.	The application estimates the area (comfort/safety/critical) corresponding to the situation of Safe Overtaking Warning where vehicle lays. To achieve this evaluation, the application needs the speed of V1 and V2, the relative distance between V1 and V2 (at the instant t=0), the limit value of V2 deceleration and trajectories of vehicle V1 and V2. Then identifies the time tc corresponding the two points P1 and P2, on the trajectories of V1 and V2 respectively, which have the minimum relative distance. If the minimum relative distance is equal to 0, the collision is sure, in relation to the estimated trajectories at time t;	Compare inputs from the system and outputs from the driver
Add further lines here:			

Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
Fill in a table reporting the V1-V2 distance vs the time to impact in each case of SMA situation (comfort, safety, critical) To fill in after performing test

4.4 Head On Collision Warning CRF

4.4.1 Use Case 4GC – Head On Collision Warning - General Case

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	CRF / G. Vivo	Date:	17/11/2008	Sheet No.: [2]	HOCW_IT_01
Application(s) tested:	#4 - Head On Collision Warning	Vehicles / RSU: [3]	1. Fiat Bravo Red 2. Fiat Bravo Blue	HW - components to be used in test [3]	1. SP1 platform including: CRF gateway VGX SBC, Main PC, Laser Scanner and its own PC on Fiat Bravo Red, Radar on both Fiat Bravo Cars; 2. Application PC 3. Router PC 4. Positioning PC 5. ESPOSYTOR PC.	SW-components / modules to be used in the test [3]	1. Positioning SW 2. Laser scanner SW 3. HOCW application 4. Router SW 5. ESPOSYTOR tool.

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☐	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☐	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☐	**Test Site West**	☐
Other:		**Reliability**	☒	**Test Site Italy**	☒
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Specific area at test site:	**CRF Test Track**

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6]	Application #4 - Head On Collision Warning: Use Case 4, General Case
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]
Vehicle A and B drive on the CRF Test Track. The test track will be prepared in order to test the manoeuvre in completely safe conditions, and suitable escape lanes will be present in the place of the HOCW test. The vehicles will drive in the same lane but in opposite directions, keeping a head-to-head collision trajectory. The speeds of each vehicle, in the 10-20 runs of the test, will be progressively increased from ~40 to ~80 Km/h (leading to relative speeds between ~80 and ~160 Km/h). The trajectories of the two vehicles will be kept in the head-to-head collision path until the time to collision value drops to the minimum of 6 sec. (Safety Area). Then the collision trajectory will be left, by taking the escape lane, on the right side of each vehicle. The vehicles will be driven by expert technical drivers that know the system. No subjects (=non expert drivers unfamiliar with the system) will be used. The following variations will be applied in a total of 10-20 runs: -The timing when the two vehicles leave the head-to-head collision trajectory will be progressively reduced, up to 6 sec. to the time-of-collision, in order to log the time when the warning is issued. The behaviour of the system will be assessed in the no-warning area, in the comfort warning area and in the safety warning area (the critical warning area will be NEVER entered, for obvious safety reasons); -The speed of both vehicles will be varied between 40 to 80 km/h - Acting on the direction indicators and driving more or less close to the lane borders (but still keeping the head-to-head collision trajectory) to check for false alarms All data will be logged and evaluated afterwards.

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.

User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_04_04 - Vehicle drivers wants to receive some safety driving recommendations regarding hazardous situations potentially leading to the head on collisions (vehicle around, type of road…).	The hazardous situation consisting in the presence of a second vehicle on a head-to-head collision trajectory in the same lane is considered in the computation of the warning signal going to the HMI.	The hazardous situation will be assessed by considering: Other Vehicle ID, Analysis of the EV and OV trajectories (probability of intersection of the trajectories >= 80%), distance between EV and OV along the road (m.), time to collision between the two vehicles (in sec.). When the above probability is higher than the stated threshold, TTC values below 12 sec. should lead to comfort warnings, TTC values below 8 sec should lead to safety warnings.	All of the (time stamped) data for the tested manoeuvres will be logged. The correctness of the measures will be provided by means of comparison tables where input values (TTC values) are put in relationship with the time the expected warning is provided.
#SP4_UN_04_09 - Driver interface should timely reflect the persistence or the changes related to the dangerous situation.	The timely intervention of the driver HMI is considered by precisely measuring and logging the absolute time (millisec. precision) of HMI activation.	Both the absolute times of HMI activation and deactivation for two Safety Margin areas (Comfort and Safety) will be measured (and logged) with the millisec. accuracy.	The analysis of the logged information will be performed off line and compared to predefined TTC thresholds. These TTC thresholds (12 s. and 8 s.) defines the transitions in the Comfort Area and in the Safety Area.

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The test is directly related with this HLO, especially concerning point c). For the transition in the comfort area, the foreseen activation time, at 12 sec. of TTC, places the application into a domain totally outside of the capabilities for a classical ADAS approach. Also in the other areas (Safety and Critical) the cooperative approach places the OV in the "detection area" - the LDM of the EV, by means of the VANET communication, leading to simpler, safer and more robust implementation and deployment of the tested application.

To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	The head-to-head collisions are acknowledged among the most dangerous situations, since the relative speed of the involved vehicle is the direct sum of the speeds of EV and OV. The diffusion of the Head On Collision Warning application will have direct (positive) consequences in terms of life saving.
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The reliability test is performed since any test condition is repeated a number of times that is sufficient for a prototype to demonstrate the right behaviour.
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	The test is explicitly addressing the support to drivers by preventing the head-to-head collisions.
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☒ No, ☐ Yes	
To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☐ No, ☒ Yes	This HLO can be tested, for instance, by showing that the Safety Margin (in the transition to the comfort area, ~12 sec. before the time when TTC=0) is extended at a level where - possibly - the EV and OV are not even in the direct line of sight. This will demonstrate that a (proper) warning signal can be issued when there is no evidence of any danger for the EV driver, with an extension of the Safety Margin beyond his/her perception capabilities.
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	This HLO is just partially covered. Even though the extended cooperative awareness in not the specific focus of the application, the Head On Collision Warning (as it is for all other SP4-SCOVA applications) is based on the real time reconstruction of the driving context and environment around the EV, which is the straight concept of the LDM database.
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	The overall test is designed and devoted to show the direct benefits of the cooperative approach, by means of a novel class of applications (V2V communication).

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Risk3 -The SMA supplies too much information and also too many warnings to the driver.	The HMI of the application is provided with an interface that decides the warning to be sent, based on a priority of applications, and a period of changing warning, that should avoid the continuing flikering among multiple warning.	The output of the applications tests is logged, together with the output going to the driver, to show how many warning are produced and how many are actually sent to the drivers.	The measure is a comparison between inputs of the HMI from application side, and outputs to the driver.
Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.4.2 Use Case 4A and 4B – Head On Collision Warning – UC4A and UC4B

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	CRF / G. Vivo	Date:	17/11/2008	Sheet No.: [2]	HOCW_IT_02
Application(s) tested:	#4 - Head On Collision Warning	Vehicles / RSU: [3]	1. Fiat Bravo Red 2. Fiat Bravo Blue 3. A third vehicle, not equipped	HW - components to be used in test [3]	1. SP1 platform including: CRF gateway VGX SBC, Main PC, Laser Scanner and its own PC on Fiat Bravo Red, Radar on both Fiat Bravo Cars; 2. Application PC 3. Router PC 4. Positioning PC 5. ESPOSYTOR PC.	SW-components / modules to be used in the test [3]	1. Positioning SW 2. Laser scanner SW 3. HOCW application 4. Router SW 5. ESPOSYTOR tool.

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☐	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☐	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☐	**Test Site West**	☐
Other:		**Reliability**	☒	**Test Site Italy**	☒
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Specific area at test site:	**CRF Test Track**

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6]	Application #4 - Head On Collision Warning: Use Cases 4A and 4B
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]
Vehicle A and B drive on the CRF Test Track. The test track will be prepared in order to test the manoeuvre in completely safe conditions for the HOCW test. Specifically, by complying with some simple (and totally safe) preparation procedures, it will be possible to test also the Critical Safety Margin Conditions, in addition to the Comfort and Safety ones, which differentiates radically this test case respect to HOCW_IT_01. The Test Site scenario will be prepared with three vehicles, in the configuration of UC4A. Since UC4B is symmetrical, and both the primary actor and the secondary actor can be equipped with the same type of data logging devices, an unified test form will be adopted for the evaluation purposes of SP4 test. The ego vehicle will travel on a given lane; the cooperative vehicle will drive in the opposite direction, on a adjacent lane; a third vehicle (not equipped) will drive in front of the EV, in the same lane and in the same direction. The speeds of each vehicle, in the 10-20 runs of the test, will be progressively increased from ~40 to ~80 Km/h (leading to relative speeds between ~80 and ~160 Km/h). Whenever the TTC is below the activation thresholds for the Comfort, Safety and Critical areas, every attempt of overtaking the third vehicle, performed by the EV, should lead to the activation of the UC4A-DAA. Time to collision values will range from 30s till 2s in step of 1s. Since the attempts of overtaking can be instantiated by the simple (and safe) activation of the direction indicator, no issues will arise concerning the safety conditions of the test. In any case the test manoeuvres will be conducted in areas of the Test Track where suitable escape lanes exist, at the right side of each SAFESPOT vehicle. Drivers of the vehicles will be professionals, with a good technical knowledge of the system. No subjects (=non expert drivers unfamiliar with the system) will be used. The following variations will be applied in a total of 10-20 runs: -The timing when the EV simulates the overtaking (direction indicator activation) will be progressively reduced, up to 2 sec. to the time-of-collision, in order to log the time when the warning is issued. The behaviour of the system will be assessed in the no-warning area, in the comfort warning area, in the safety warning area and in the critical warning area; -The speed of both vehicles will be varied between 40 to 80 km/h - Acting on the direction indicators outside of the comfort area and driving more or less close to the lane borders to check for false alarms All data will be logged and evaluated afterwards.

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.

User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_04_01 - Driver of vehicle 1 wants to be informed about the presence of a second vehicle which is approaching from the opposite lane.	The presence of a second vehicle which is approaching from the opposite lane (becoming a danger source after the activation of the direction indicator) is considered in the computation of the warning signal going to the HMI.	The presence of a second vehicle will be assessed by means of: Other Vehicle ID, Analysis of the EV and OV trajectories (probability of intersection of the trajectories >= 80%), distance between EV and OV along the road (m.), time to collision between the two vehicles (in sec.), acting on the direction indicator performed by the EV. When the evaluated probability is higher than the stated threshold, TTC values below 12 sec. should lead to comfort warnings, TTC values below 8 sec should lead to safety warnings, TTC values below 3 sec. should lead to Critical warnings.	All of the (time stamped) data for the tested manoeuvres will be logged. The correctness of the measures will be provided by means of comparison tables where input values (TTC values) are put in relationship with the time the expected warning is provided.

#SP4_UN_04_02 - Driver of vehicle 1 wants to be informed about the attempt of a lane change manoeuvre from other vehicles travelling from the opposite lane.	The attempt of lane change performed by an OV is considered in the computation of the warning signal going to the HMI.	The attempt of lane change will be assessed by means of: Other Vehicle ID, Analysis of the EV and OV trajectories (probability of intersection of the trajectories >= 80%), distance between EV and OV along the road (m.), time to collision between the two vehicles (in sec.), acting on the direction indicator performed by the EV. When the evaluated probability is higher than the stated threshold, TTC values below 12 sec. should lead to comfort warnings, TTC values below 8 sec should lead to safety warnings, TTC values below 3 sec. should lead to Critical warnings.	All of the (time stamped) data for the tested manoeuvres will be logged. The correctness of the measures will be provided by means of comparison tables where input values (TTC values) are put in relationship with the time the expected warning is provided.
#SP4_UN_04_09 - Driver interface should timely reflect the persistence or the changes related to the dangerous situation.	The timely intervention of the driver HMI is considered by precisely measuring and logging the absolute time (millisec. precision) of HMI activation.	Both the absolute times of HMI activation and deactivation for two Safety Margin areas (Comfort and Safety) will be measured (and logged) with the millisec. accuracy.	The analysis of the logged information will be performed off line and compared to predefined TTC thresholds. These TTC thresholds (12 s. and 8 s.) defines the transitions in the Comfort Area and in the Safety Area.

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The test is directly related with this HLO, especially concerning point c). For the transition in the comfort area, the foreseen activation time, at 12 sec. of TTC, places the application into a domain totally outside of the capabilities for a classical ADAS approach. Also in the other areas (Safety and Critical) the cooperative approach places the OV in the "detection area" - the LDM of the EV, by means of the VANET communication, leading to simpler, safer and more robust implementation and deployment of the tested application.

To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	The head-to-head collisions are acknowledged among the most dangerous situations, since the relative speed of the involved vehicle is the direct sum of the speeds of EV and OV. The diffusion of the Head On Collision Warning application will have direct (positive) consequences in terms of life saving.
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The reliability test is performed since any test condition is repeated a number of times that is sufficient for a prototype to demonstrate the right behaviour.
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	The test is explicitly addressing the support to drivers by preventing the head-to-head collisions.
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☒ No, ☐ Yes	
To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☐ No, ☒ Yes	This HLO can be tested, for instance, by showing that the Safety Margin (in the transition to the comfort area, ~12 sec. before the time when TTC=0) is extended at a level where - possibly - the EV and OV are not even in the direct line of sight. This will demonstrate that a (proper) warning signal can be issued when there is no evidence of any danger for the EV driver, with an extension of the Safety Margin beyond his/her perception capabilities.
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	This HLO is just partially covered. Even though the extended cooperative awareness in not the specific focus of the application, the Head On Collision Warning (as it is for all other SP4-SCOVA applications) is based on the real time reconstruction of the driving context and environment around the EV, which is the straight concept of the LDM database.
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	The overall test is designed and devoted to show the direct benefits of the cooperative approach, by means of a novel class of applications (V2V communication).

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Risk3 -The SMA supplies too much information and also too many warnings to the driver.	the HMI of the application is provided with an interface that decides the warning to be sent, based on a priority of applications, and a period of changing warning, that should avoid the continuing flikering among multiple warning.	the output of the applications tests is logged, together with the output going to the driver, to show how many warning are produced and how many are actually sent to the drivers.	the measure is a comparison between inputs of the HMI from application side, and outputs to the driver.
Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.5 Rear End Collision CRF

4.5.1 Use Case 5 GC – Rear End Collision – UC5 General Case

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	CRF / G. Vivo	Date:	21/11/2008	Sheet No.: [2]	RECO_IT_01
Application(s) tested:	#5 - Rear End Collision	Vehicles / RSU: [3]	1. Fiat Bravo Red 2. Fiat Bravo Blue	HW - components to be used in test [3]	1. SP1 platform including: CRF gateway VGX SBC, Main PC, Laser Scanner and its own PC on Fiat Bravo Red, Radar on both Fiat Bravo Cars; 2. Application PC 3. Router PC 4. Positioning PC 5. ESPOSYTOR PC.	SW-components / modules to be used in the test [3]	1. Positioning SW 2. Laser scanner SW 3. RECO application 4. Router SW 5. ESPOSYTOR tool.

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☐	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☐	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☐	**Test Site West**	☐
Other:		**Reliability**	☒	**Test Site Italy**	☒
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Specific area at test site:	**CRF Test Track**

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6]	Application #5 - Rear End Collision: Use Case 5, General Case
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]
Vehicle A and B drive on the CRF Test Track. The test track will be prepared in order to test the manoeuvre in safe conditions; since the vehicle drivers will be professionals and the dynamics character is not as demanding as it is in other applications, these conditions should be easily achievable. The vehicles will drive in the same lane and in the same directions, starting from an initial distance of more than 200 meters. The speeds of each vehicle, in the 10-20 runs of the test, will be mostly constant for both vehicles. The leading vehicle - ego vehicle, and primary actor of the use case - will drive at a low speed (for instance ~40 Km/h); the following vehicle - secondary actor - will approach at a higher speed (for instance ~40 Km/h). The trajectories of the two vehicles will be kept in the head-to-tail collision path until the time to collision value drops to a minimum around 6 or 7 sec. (beginning of the Safety Area). Then the secondary actor will decrease its speed, in order to perform a queuing manoeuvre, which will reach a steady condition with the two vehicles aligned at 10 m of distance each other, both running at ~40 Km/h. The vehicles will be driven by expert technical drivers that know the system. No subjects (=non expert drivers unfamiliar with the system) will be used. The following variations will be applied in a total of 10-20 runs: -The timing when the second vehicle starts its queuing manoeuvre can be progressively reduced, up to 4 sec., in order to log the time when the warning is issued. The behaviour of the system will be assessed in the no-warning area, in the comfort warning area and in the safety warning area (the critical warning area will be tested with the test case #2); -The relative speed between the vehicle will be varied between 20 to 60 km/h - Acting on the direction indicators and driving more or less close to the lane borders (but still keeping the head-to-tail collision trajectory) to check for false alarms All data will be logged and evaluated afterwards.

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Note: for the Rear End Collision application the success criteria are defined based on the full coverage of the stated Users Needs and the fulfilment of the HLO. All vital requirements not reported here for the application are addressing the components and the basic technologies adopted for the application deployment; these aspects are fully covered within WP 4.5.			

User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_05_01 - Driver of vehicle 1 want to be informed about the dynamic information (including relative speed, acceleration, direction indicators, lateral position) of a second vehicle, approaching from behind at a speed significantly higher speed respect to own vehicle.	The presence of a second vehicle which is approaching from behind (becoming a danger source in case its speed is significantly higher than the one of the EV) is considered in the computation of the warning signal going to the HMI.	The presence of a second vehicle will be assessed by means of: Other Vehicle ID, Analysis of the EV and OV trajectories (probability of intersection of the trajectories >= 80%), distance between EV and OV along the road (m.), time to collision between the two vehicles (in sec.), acting on the direction indicator performed by the OV. When the evaluated probability is higher than the stated threshold, TTC values below 12 sec. should lead to comfort warnings, TTC values below 8 sec should lead to safety warnings.	All of the (time stamped) data for the tested manoeuvres will be logged. The correctness of the measures will be provided by means of comparison tables where input values (TTC values) are put in relationship with the time the expected warning is provided.
#SP4_UN_05_04 - Vehicle drivers want to receive some safety driving recommendations regarding the presence of black spots or road scenarios potentially leading to the rear end collisions.	The hazardous situation consisting in the presence of a second vehicle on a head-to-tail collision trajectory in the same lane is considered in the computation of the warning signal going to the HMI.	The hazardous situation will be assessed by considering: Other Vehicle ID, Analysis of the EV and OV trajectories (probability of intersection of the trajectories >= 80%), distance between EV and OV along the road (m.), time to collision between the two vehicles (in sec.). When the above probability is higher than the stated threshold, TTC values below 12 sec. should lead to comfort warnings, TTC values below 8 sec should lead to safety warnings.	All of the (time stamped) data for the tested manoeuvres will be logged. The correctness of the measures will be provided by means of comparison tables where input values (TTC values) are put in relationship with the time the expected warning is provided.

#SP4_UN_05_09 - Driver interface should timely reflect the persistence or the changes related to the dangerous situation.	The timely intervention of the driver HMI is considered by precisely measuring and logging the absolute time (millisec. precision) of HMI activation.	Both the absolute times of HMI activation and deactivation for two Safety Margin areas (Comfort and Safety) will be measured (and logged) with the millisec. accuracy.	The analysis of the logged information will be performed off line and compared to predefined TTC thresholds. These TTC thresholds (12 s. and 8 s.) defines the transitions in the Comfort Area and in the Safety Area.

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The test is directly related with this HLO, especially concerning point c). For the transition in the comfort area, the foreseen activation time, at 12 sec. of TTC, places the application into a domain totally outside of the capabilities for a classical ADAS approach. Also in the other areas (Safety and Critical) the cooperative approach places the OV in the "detection area" - the LDM of the EV, by means of the VANET communication, leading to simpler, safer and more robust implementation and deployment of the tested application.
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	The rear end collisions (head-to-tail between vehicles) are acknowledged among the most frequent accident situations, especially in urban areas and at intersections. Even thought the test case is not specific for these scenarios, the diffusion of the Rear End Collision Warning application will have direct (positive) consequences in terms of life saving.
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The reliability test is performed since any test condition is repeated a number of times that is sufficient for a prototype to demonstrate the right behaviour.
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	The test is explicitly addressing the support to drivers by preventing the head-to-tail collisions.
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	

To increase safety for all road users in a specific situation.	☒ No, ☐ Yes	
To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☐ No, ☒ Yes	This HLO can be tested, for instance, by showing that the Safety Margin (in the transition to the comfort area, ~12 sec. before the time when TTC=0) is extended at a level where - possibly - the EV and OV are not even in the direct line of sight. This will demonstrate that a (proper) warning signal can be issued when there is no evidence of any danger for the EV driver, with an extension of the Safety Margin beyond his/her perception capabilities.
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	This HLO is just partially covered. Even though the extended cooperative awareness in not the specific focus of the application, the Rear End Collision Warning (as it is for all other SP4-SCOVA applications) is based on the real time reconstruction of the driving context and environment around the EV, which is the straight concept of the LDM database.
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	The overall test is designed and devoted to show the direct benefits of the cooperative approach, by means of a novel class of applications (V2V communication).

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Risk3 -The SMA supplies too much information and also too many warnings to the driver.	The HMI of the application is provided with an interface that decides the warning to be sent, based on a priority of applications, and a period of changing warning, that should avoid the continuing flikering among multiple warning.	The output of the applications tests is logged, together with the output going to the driver, to show how many warning are produced and how many are actually sent to the drivers.	The measure is a comparison between inputs of the HMI from application side, and outputs to the driver.

Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Note: for the Rear End Collision application no extra success criteria are defined, since the compliance with the Users Needs and with all the stated HLO is judged as largely sufficient for the proper assessment of these criteria.			
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.5.2 Use Case 5 GC – Rear End Collision – UC5 General Case

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	CRF / G. Vivo	Date:	21/11/2008	Sheet No.: [2]	RECO_IT_02
Application(s) tested:	#5 - Rear End Collision	Vehicles / RSU: [3]	1. Fiat Bravo Red 2. Fiat Bravo Blue	HW - components to be used in test [3]	1. SP1 platform including: CRF gateway VGX SBC, Main PC, Laser Scanner and its own PC on Fiat Bravo Red, Radar on both Fiat Bravo Cars; 2. Application PC 3. Router PC 4. Positioning PC 5. ESPOSYTOR PC.	SW-components / modules to be used in the test [3]	1. Positioning SW 2. Laser scanner SW 3. RECO application 4. Router SW 5. ESPOSYTOR tool.

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☐	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☐	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☐	**Test Site West**	☐
Other:		**Reliability**	☒	**Test Site Italy**	☒
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Specific area at test site:	**CRF Test Track**

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6]	Application #5 - Rear End Collision: Use Case 5, General Case
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]
Vehicle A and B drive on the CRF Test Track. The test track will be prepared in order to test the manoeuvre in safe conditions; since the vehicle drivers will be professionals and the dynamics character is not as demanding as it is in other applications, these conditions should be easily achievable. The vehicles will drive in the same lane and in the same directions, starting from an initial distance of more than 200 meters. The speeds of each vehicle, in the 10-20 runs of the test, will be mostly constant for both vehicles. The leading vehicle - ego vehicle, and primary actor of the use case - will drive at a low speed (for instance ~40 Km/h); the following vehicle - secondary actor - will approach at a higher speed (for instance ~40 Km/h). The trajectories of the two vehicles will be kept in the head-to-tail collision path until the time to collision value drops to a minimum around 1 or two sec. (in the straight Critical Area). Then the secondary actor will overtake the primary actor. The vehicles will be driven by expert technical drivers that know the system. No subjects (=non expert drivers unfamiliar with the system) will be used. The following variations will be applied in a total of 10-20 runs: -The timing when the second vehicle starts its overtaking manoeuvre can be slightly varied, in order to log the time when the warning is issued. The behaviour of the system will be assessed in the no-warning area, in the comfort warning area and in the safety warning area and in the critical warning area; -The relative speed between the vehicle will be varied between 20 to 60 km/h - Acting on the direction indicators and driving more or less close to the lane borders (but still keeping the head-to-tail collision trajectory) to check for false alarms All data will be logged and evaluated afterwards.

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.

User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_05_01 - Driver of vehicle 1 want to be informed about the dynamic information (including relative speed, acceleration, direction indicators, lateral position) of a second vehicle, approaching from behind at a speed significantly higher speed respect to own vehicle.	The presence of a second vehicle which is approaching from behind (becoming a danger source in case its speed is significantly higher than the one of the EV) is considered in the computation of the warning signal going to the HMI.	The presence of a second vehicle will be assessed by means of: Other Vehicle ID, Analysis of the EV and OV trajectories (probability of intersection of the trajectories >= 80%), distance between EV and OV along the road (m.), time to collision between the two vehicles (in sec.), acting on the direction indicator performed by the OV. When the evaluated probability is higher than the stated threshold, TTC values below 12 sec. should lead to comfort warnings, TTC values below 8 sec should lead to safety warnings, TTC values below 3 sec. should lead to Critical warnings.	All of the (time stamped) data for the tested manoeuvres will be logged. The correctness of the measures will be provided by means of comparison tables where input values (TTC values) are put in relationship with the time the expected warning is provided.
#SP4_UN_05_04 - Vehicle drivers want to receive some safety driving recommendations regarding the presence of black spots or road scenarios potentially leading to the rear end collisions.	The hazardous situation consisting in the presence of a second vehicle on a head-to-tail collision trajectory in the same lane is considered in the computation of the warning signal going to the HMI.	The hazardous situation will be assessed by considering: Other Vehicle ID, Analysis of the EV and OV trajectories (probability of intersection of the trajectories >= 80%), distance between EV and OV along the road (m.), time to collision between the two vehicles (in sec.). When the above probability is higher than the stated threshold, TTC values below 12 sec. should lead to comfort warnings, TTC values below 8 sec should lead to safety warnings, TTC values below 3 sec. should lead to Critical warnings.	All of the (time stamped) data for the tested manoeuvres will be logged. The correctness of the measures will be provided by means of comparison tables where input values (TTC values) are put in relationship with the time the expected warning is provided.

#SP4_UN_05_09 - Driver interface should timely reflect the persistence or the changes related to the dangerous situation.	The timely intervention of the driver HMI is considered by precisely measuring and logging the absolute time (millisec. precision) of HMI activation.	Both the absolute times of HMI activation and deactivation for two Safety Margin areas (Comfort and Safety) will be measured (and logged) with the millisec. accuracy.	The analysis of the logged information will be performed off line and compared to predefined TTC thresholds. These TTC thresholds (12 s., 8 s. and 3 s.) defines the transitions in the Comfort Area, in the Safety Area and in the Critical Area.

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The test is directly related with this HLO, especially concerning point c). For the transition in the comfort area, the foreseen activation time, at 12 sec. of TTC, places the application into a domain totally outside of the capabilities for a classical ADAS approach. Also in the other areas (Safety and Critical) the cooperative approach places the OV in the "detection area" - the LDM of the EV, by means of the VANET communication, leading to simpler, safer and more robust implementation and deployment of the tested application.
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	The rear end collisions (head-to-tail between vehicles) are acknowledged among the most frequent accident situations, especially in urban areas and at intersections. Even thought the test case is not specific for these scenarios, the diffusion of the Rear End Collision Warning application will have direct (positive) consequences in terms of life saving.
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The reliability test is performed since any test condition is repeated a number of times that is sufficient for a prototype to demonstrate the right behaviour.
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	The test is explicitly addressing the support to drivers by preventing the head-to-tail collisions.

To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☒ No, ☐ Yes	
To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☐ No, ☒ Yes	This HLO can be tested, for instance, by showing that the Safety Margin (in the transition to the comfort area, ~12 sec. before the time when TTC=0) is extended at a level where - possibly - the EV and OV are not even in the direct line of sight. This will demonstrate that a (proper) warning signal can be issued when there is no evidence of any danger for the EV driver, with an extension of the Safety Margin beyond his/her perception capabilities.
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	This HLO is just partially covered. Even though the extended cooperative awareness in not the specific focus of the application, the Rear End Collision Warning (as it is for all other SP4-SCOVA applications) is based on the real time reconstruction of the driving context and environment around the EV, which is the straight concept of the LDM database.
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	The overall test is designed and devoted to show the direct benefits of the cooperative approach, by means of a novel class of applications (V2V communication).

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Risk3 -The SMA supplies too much information and also too many warnings to the driver.	The HMI of the application is provided with an interface that decides the warning to be sent, based on a priority of applications, and a period of changing warning, that should avoid the continuing flikering among multiple warning.	The output of the applications tests is logged, together with the output going to the driver, to show how many warning are produced and how many are actually sent to the drivers.	The measure is a comparison between inputs of the HMI from application side, and outputs to the driver.

Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.6 Speed Limitation and Safety Distance MMSE

4.6.1 Use Case 6 GC – Speed Limitation and Safety Distance – UC6 General Case

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**							
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	MMSE / Mortara-De Gennaro	Date:	06/11/2008	Sheet No.: [2]		SLSD_IT_01
Application(s) tested:	#6 - Speed Limitation Safety Distance	Vehicles / RSU: [3]	1. Fiat Bravo Red 2. Fiat Bravo Blue 3. RSU	HW - components to be used in test [3]	1, 2. SP1 platform with: CRF gateway VGX SBC, Main PC, Laser Scanner and its own PC on Fiat Bravo Red, Radar on both Fiat Bravo Cars, Application PC, Router PC, Positioning PC, ESPOSYTOR PC. 3. RSU with SP2 platform including: Main Pc, VTT camera, wireless sensors, Router PC for RSU.	SW-components / modules to be used in the test [3]		1,2. Positioning SW , Laser scanner SW, SLSD application, Router SW , ESPOSYTOR tool. 3. VTT camera SW, Router SW, ESPOSYTOR tool for RSU.

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☐	**Usability**	☒	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☒	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☒	**Test Site West**	☐
Other:		**Reliability**	☒	**Test Site Italy**	☒
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Specific area at test site:	**CRF Test Track**

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	Application #6 - Speed Limitation and Safety Distance between vehicles: Use Case 6, General Case
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]

Vehicle A and B drive on the CRF Test Track. Vehicle A representing the ego vehicle, which follows vehicle B on the same lane. Vehicle A is provided of the laser scanner, while Vehicle B is not provided of it.
Vehicles A and B move at differet speeds (70 to 100 Km/h) changing their relative distance (100-20 m).
An RSU is placed on the Test Track, and sends periodically information about weather conditions to vehicles A and B.
The vehicles will be driven by expert technical drivers that know the system.
The following variations will be applied in a total of 20-30 runs:
1) The relative distance between vehicles A and B ranging from the pre-comfort zone (no alert present) toward comfort, safety, until critical zones.
2) The test case is repeated under different simulated weather conditions (forced by the RSU), to check the correct application of different Safety Margin thresholds.
3) Vehicle B shuts down the SAFEPROBE platform. The same tests 1) and 2) are repeated.
All data will be logged and evaluated afterwards.

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4-REQ_06_05 - SLSD-Infrastructure data accessibility	the Infrastructure data accessibility allows to make comparison between results obtained in the same test 1) with different weather conditions sent by RSU to vehicles.	the measure done is about the safety distance computed by vehicles, with the same distance between vehicles, under different weather conditions.	the comparison between results computed with vehicles at the same distances, with different weather conditions, will show warning signals closer to the criticality when weather are made worse.

User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_06_01 - Most accurate distance from preceding vehicle knowledge	the distance is considered in the computation of the warning signal going to the HMI	The distance between vehicles can be measured by fixing on the test sites some points at well known distances. Vehicles are placed initially for some seconds in two points at well known distance, and the application computes this distance, and reports this value in a log file. If computed distance is different from the expected value with an error of some cm, the measure results correct.	To measure the wellness of the computation, simply a comparison between input data (starting distances, known initially) and results computed by application is done.
#SP4_UN_06_03 - Behaviour of preceding vehicle evaluation	The evaluation of the V2V communication is done comparing the results obtained with tests 1) and 2) with the correspondent results obtained with tests 3)	Measure the improvement of the information due to the cooperation. The absence of communication will provide a warning signal to the driver of the SAFESPOT vehicle, which will be given with some delay, if compared with the tests done in 1)-2), where not only on board sensor work, but communication also.	The measure is done by comparing the results of the tests 1) and 3) or 2) and 3) when vehicles have the same distance, and the warning signals sent to the driver of vehicle A change of ciriticality, based on the activation/deactivation of the SAFEPROBE platform on vehicle B.

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The test is related with this HLO, particularly for the tests 3), when application 6 running on vehicle A uses first data from the vehicle B (cooperating with communication), and then uses data coming only from sensors on board (since vehicle B has the SAFESPOT system shut down).

To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☒ No, ☐ Yes	
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The reliability test is performed since any test condition is repeated a number of times that is sufficient for a prototype to demonstrate the right behaviour.
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	the tests can be considered as supporting drivers for the manouvre of keep appropriate safety distance .
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☒ No, ☐ Yes	
To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☐ No, ☒ Yes	This HLO can be tested with the support of the RSU. Changing the weather conditions manually in the RSU, the warning signals going to the drivers should be gradually more critical, showing the connection between infrastructure information and answer of the system.
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☒ No, ☐ Yes	
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	These tests show how the cooperative approach improves the warning signals to the drivers, particularly in tests 3).

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Risk3 -The SMA supplies too much information and also too many warnings to the driver.	the HMI of the application is provided with an interface that decides the warning to be sent, based on a priority of applications, and a period of changing warning, that should avoid the continuing flikering among multiple warning.	the output of the applications tests is logged, together with the output going to the driver, to show how many warning are produced and how many are actually sent to the drivers	the measure is a comparison between inputs of the HMI from application side, and outputs to the driver.
Risk 22 - The user receives no information when its needed, due to wrong analysis of the situation	This can happen during tests 3) when one vehicle does not communicate with the other.	the behavior of vehicle A (with active SAFESPOT system) is compared in this tests with the behavior in test 1) and 2), when B has SAFESPOT active.	the presence/absence of warning signals comparing tests 1)-2) with 3), in same initial conditions, and the difference of warning signal is considered.
Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.6.2 Use Case 6C – Speed Limitation and Safety Distance – UC6C Lane Restriction

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	MMSE / Mortara-De Gennaro	Date:	06/11/2008	Sheet No.: [2]	SLSD_IT_02
Application(s) tested:	#6 - Speed Limitation Safety Distance	Vehicles / RSU: [3]	1. Fiat Bravo Red 2. Fiat Bravo Blue 3. RSU 4. Mobile RSU	HW - components to be used in test [3]	1, 2. SP1 platform with: CRF gateway VGX SBC, Main PC, Laser Scanner and its own PC on Fiat Bravo Red, Radar on both Fiat Bravo Cars, Application PC, Router PC, Positioning PC, ESPOSYTOR PC. 3. RSU with SP2 platform including: Main Pc, VTT camera, wireless sensors, Router PC for RSU. 4. Mobile RSU with SP1-SP2 platform, Router PC, Positioning PC.	SW-components / modules to be used in the test [3]	1,2. Positioning SW , Laser scanner SW, SLSD application, Router SW , ESPOSYTOR tool. 3. VTT camera SW, Router SW, ESPOSYTOR tool for RSU. 4. Router SW, SP1-2 mixed platform SW, Router SW

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☐	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☐	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☒	**Test Site West**	☐
Other:		**Reliability**	☒	**Test Site Italy**	☒
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Specific area at test site:	**Torino - Caselle highway**

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	Application #6 - Speed Limitation and Safety Distance between vehicles: Use Case 6, Case C : lane restriction
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]

Vehicle A and B drive on the Torino- Caselle Highway. Vehicle A representing the ego vehicle, which follows vehicle B on the same lane. Vehicle A is provided of the laser scanner, while Vehicle B is not provided of it.
Vehicles A and B move at differet speeds (70 to 100 Km/h) changing their relative distance (100-20 m).
A mobile RSU is moving on the highway.
The vehicles will be driven by expert technical drivers that know the system.
The following variations will be applied in a total of 20-30 runs:
1) The relative distance between vehicles A and B ranging from the pre-comfort zone (no alert present) toward comfort, safety, until critical zones.
2) The mobile RSU sends some times the information of lane restrictions.
All data will be logged and evaluated afterwards.
The precision of distance calculation between vehicles
and the receiving information about lane restrictions from RSU will be tested.
Performance will be reported for both.

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4-REQ_06_05 - SLSD-Infrastructure data accessibility	the Infrastructure data accessibility allows to have information about lane restriction. without this information the Use Case cannot be activated.	The entire tests done in this case are based on the measure relieved from the moving RSU. If this information is not send, the application is not activated.	the measure in this case is simply activation/deactivation of the application

User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_06_01 - Most accurate distance from preceding vehicle knowledge	the distance is considered in the computation of the warning signal going to the HMI	The distance between vehicles can be measured by fixing on the test sites some points at well known distances. Vehicles are placed initially for some seconds in two points at well known distance, and the application computes this distance, and reports this value in a log file. If computed distance is different from the expected value with an error of some cm, the measure results correct.	To measure the wellness of the computation, simply a comparison between input data (starting distances, known initially) and results computed by application is done. The application output is saved in a log file that reads all data that arrive at the HMI data interface connection.
#SP4_UN_06_05 -For lane reduction, lane geometry forward must be known accurately	Lane geometry shall be known by the mobile RSU which sends this information to vehicles. If it is received, the application is activated and the warning is sent to the driver of vehicle A.	The entire tests done in this case are based on the measure relieved from the moving RSU. If this information is not send, the application is not activated.	the measure in this case is simply activation/deactivation of the application The elapsed time between information sending and output at HMI in the vehicle is measured as well

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The test is related with this HLO, since without communication between RSU and vehicles, the knowledge of lane reduction is not available for vehicles, so the application cannot be tested.

To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☒ No, ☐ Yes	
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The reliability test is performed since any test condition is repeated a number of times that is sufficient for a prototype to demonstrate the right behaviour.
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	the tests can be considered as supporting drivers for the manouvre in case of lane restriction, to keep an appropriate safety distance.
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☒ No, ☐ Yes	
To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☐ No, ☒ Yes	This HLO can be tested with the support of the RSU. Without the support of the RSU the changes in the road conditions cannot be observed by vehicles.
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☒ No, ☐ Yes	
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	These tests show how the cooperative approach improves the warning signals to the drivers.

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Risk6 The reaction time of the system is too slow	This should happen if the receiving information about lane restrictions from RSU will not arrive in a due time and will be checked with the performances test.	The delay time between the message generated by RSU and the corresponding event detected by the application is measured	Log files with time stamped event
Risk 18 The communication bandwidth is too low in some situations	The Information about lane restrictions from RSU will not arrive in a due	The mobile RSU can emulates different situations (ex. the location) For each situation the delay time between the message generated by RSU and the corresponding event detected by the application is measured	Log files with time stamped event
Add further lines here:			
Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.7 Frontal Collision Warning VOLVO

4.7.1 Use Case 7A – Frontal collision warning due to static obstacle in front – 7a

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	Johan Fjellström , Volvo	Date:	20090115	Sheet No.: [2]	FCW_WE_02
Application(s) tested:	1. Frontal Collision Warning 2. n.	Vehicles / RSU: [3]	1. Renault Truck 2. Volvo Car n.	HW - components to be used in test [3]	1. Volvo GW 2. VANET Router (e-box with q-free card) 3. Positioning PC (AEC 6920) 4.U-blox GPS receiver 5. Aglia camera 6. Main PC (e-box) 7. Application PC (e-box)	SW-components / modules to be used in the test [3]	1. GW SW 2. VANET SW 3. Positioning SW 4. SP1 bundle 5. Application SW

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☒	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☒	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☒	**Test Site West**	☒
Other:		**Reliability**	☒	**Test Site Italy**	☐
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Specific area at test site:	**La Valbonne**

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	Frontal collision warning due to static obstacle in front – 7a
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]			
There are two vehicles in the scenario, one truck and one car. The car is stationary and is located just after one of the big curves at the proving ground La Valbonne outside Lyon. The truck is travelling in 90 kph on the proving ground in the same lane as car is located. The test will be performed only by expert drivers, who are well aware about the vehicles' dynamics. The speed of the truck can be altered to test the system more deeply.			
Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5): REQ are less important for WP4.6	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4-REQ_00_17, Common - Information Presentation Decision	Do the warnings come in the right time followed by each other and also if there are any false warnings during the test run.	The feeling by the drivers of the warning timings and if there were any false warnings	Interview the driver after the test run.
#SP4-REQ_07_04, FCW - Provide understandable information	The driver will have all types of warnings (comfort, safety and critical)	The understandability of the warning.	Interview the driver after the test run.
User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met. Clearly define HOW you are going to operazionalize the User Need.	How are you going to measure this? Define your measuring tools. Define the “tool” = scale or question to be used…
#SP4_UN_07_01, Driver wants to be informed when approaching vehicles in following situation: - Vehicle is immobilized on the road or on the emergency road (due to vehicle breakdown...) -Vehicle is at a lower speed than the normal speed (due to vehicle problems, obstacle in the road, or abnormal driver behaviour)	The driver will be informed with warnings.	Measure the HMI data interface and check if messages arrive?	Interview the driver after the test run. Specifically the driver will be asked whether he/she got the warning Also recording from wireshark will be used to define in which moment the warning was issued.
#SP4_UN_07_02, Driver wants to be informed in time about hazardous situation on the road in front.	The driver will be informed.	If the driver got the warnings in a good time.	Interview the driver after the test run..
#SP4_UN_07_05, Driver wants to receive understandable information/warning/recommendation	The driver will be informed.	If the driver understand what the meaning of the warning is	Interview the driver after the test run about the understandability of the warning.

#SP4_UN_07_08, Driver wants to be informed in time if the situation and recommendation has been changed	The driver will be informed with warnings of three different kinds (comfort, safety and critical)	Does the driver feel the change of warning states from comfort to safety to critical is good.	Interview the driver after the test run.
Add further User Needs here:			

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The improvement is that the system can get information about vehicles which is in front, even if there are some vehicles in between.
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	The frontal collision warning clearly aides the driver to prevent a collision.
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The range of the vehicles in this test can be increased to the level that it shows that it improves the range and quality comparing with conventional sensors (radar, lidar).
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	The test can show that it is possible to give information in an early stage about the danger ahead, which will enable the driver to take necessary action in a early stage, and thereby in a safe way.

To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☐ No, ☒ Yes	If the system functions and the warnings are on time, the driver of the truck will be warned about the danger ahead.
To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☐ No, ☒ Yes	The range of the vehicles in this test can be increased to the level that it shows that it improves the range and quality comparing with conventional sensors (radar, lidar). This enables to give the driver of the truck a warning well in advance.
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	In the scenario the warning application will use these kind of information from the LDM
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	The cooperative approach enables the frontal collision warning application to work in new type of scenarios, as the one explained in this test.

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Inappropriate HMI provided for SMA (e.g. the screen is too small or inappropriately sited)	The driver will get all three types of warnings	If the HMI is understandable for the driver.	Interview the drivers
Driver confused by the presentation of the information because it is not user-friendly	The driver will get all three types of warnings.	How user friendly the the information is. If the driver in the first times he/she see the warning finds it understandable, then it is user friendly	Interview the drivers
Performance of relative positioning techniques are insufficient for key SF applications (e.g. accuracy, integrity, availability, …)	the positioning must be on lane level accuracy	The lane level position accuracy	This will be done by confirming that all the vehicles were map matched to the correct lane.
The time delay between sending and receiving varies too much (latency times)	Will the warningtiming be the same between different tests	What Time To Collision it will be when the different warnings appear	This could be measured with some reference positioning equipment.
Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.7.2 Use Case 7B – Frontal collision warning due to static obstacle in a tunnel

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	Johan Fjellström , Volvo	Date:	20090116	Sheet No.: [2]	FCW_SW_01
Application(s) tested:	1. Frontal Collision Warning 2. n.	Vehicles / RSU: [3]	1. Volvo Truck 2. Volvo Car n.	HW - components to be used in test [3]	1. Volvo GW 2. VANET Router (e-box with q-free card) 3. Positioning PC (AEC 6920) 4.U-blox GPS receiver 5. Aglia camera 6. Main PC (e-box) 7. Application PC (e-box)	SW-components / modules to be used in the test [3]	1. GW SW 2. VANET SW 3. Positioning SW 4. SP1 bundle 5. Application SW

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☒	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☒	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☒	**Test Site West**	☐
Other:		**Reliability**	☒	**Test Site Italy**	☐
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☒
				Test Site NL	☐
				Specific area at test site:	

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	Frontal collision warning due to static obstacle in a tunnel – 7b
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]			
There are two vehicles in the scenario, one truck and one car. The car is stationary and is located just in the Lunby tunnel in Gothenburg. The truck is travelling in 70 kph in the same lane as car is located. The test will be performed only by expert drivers, who are well aware about the vehicles' dynamics and during a time when the tunnel is closed for normal traffic. The speed of the truck can be altered to test the system more deeply.			
Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5): REQ are less important for WP4.6	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4-REQ_00_17, Common - Information Presentation Decision	Do the warnings come in the right time followed by each other and also if there are any false warnings during the test run.	The feeling by the drivers of the warning timings and if there were any false warnings	Interview the driver after the test run.
#SP4-REQ_07_04, FCW - Provide understandable information	The driver will have all types of warnings (comfort, safety and critical)	The understandability of the warning.	Interview the driver after the test run.
User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met. Clearly define HOW you are going to operazionalize the User Need.	How are you going to measure this? Define your measuring tools. Define the “tool” = scale or question to be used…
#SP4_UN_07_01, Driver wants to be informed when approaching vehicles in following situation: - Vehicle is immobilized on the road or on the emergency road (due to vehicle breakdown...) -Vehicle is at a lower speed than the normal speed (due to vehicle problems, obstacle in the road, or abnormal driver behaviour)	The driver will be informed with warnings.	Measure the HMI data interface and check if messages arrive?	Interview the driver after the test run. Specifically the driver will be asked whether he/she got the warning Also recording from wireshark will be used to define in which moment the warning was issued.
#SP4_UN_07_02, Driver wants to be informed in time about hazardous situation on the road in front.	The driver will be informed.	If the driver got the warnings in a good time.	Interview the driver after the test run..
#SP4_UN_07_05, Driver wants to receive understandable information/warning/recommendation	The driver will be informed.	If the driver understand what the meaning of the warning is	Interview the driver after the test run about the understandability of the warning.

#SP4_UN_07_08, Driver wants to be informed in time if the situation and recommendation has been changed	The driver will be informed with warnings of three different kinds (comfort, safety and critical)	Does the driver feel the change of warning states from comfort to safety to critical is good.	Interview the driver after the test run.
Add further User Needs here:			

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The improvement is that the system can get information about vehicles which is in front, even if there are some vehicles in between and that it is located in tunnel which has curves.
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	The frontal collision warning clearly aides the driver to prevent a collision.
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The range of the vehicles in this test can be increased to the level that it shows that it improves the range and quality comparing with conventional sensors (radar, lidar).
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	The test can show that it is possible to give information in an early stage about the danger ahead, which will enable the driver to take necessary action in a early stage, and thereby in a safe way.
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☐ No, ☒ Yes	If the system functions and the warnings are on time, the driver of the truck will be warned about the danger ahead.

To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☐ No, ☒ Yes	The range of the vehicles in this test can be increased to the level that it shows that it improves the range and quality comparing with conventional sensors (radar, lidar). This enables to give the driver of the truck a warning well in advance.
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	In the scenario the warning application will use these kind of information from the LDM
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	The cooperative approach enables the frontal collision warning application to work in new type of scenarios, as the one explained in this test.

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Inappropriate HMI provided for SMA (e.g. the screen is too small or inappropriately sited)	The driver will get all three types of warnings	If the HMI is understandable for the driver.	Interview the drivers
Driver confused by the presentation of the information because it is not user-friendly	The driver will get all three types of warnings.	How user friendly the the information is. If the driver in the first times he/she see the warning finds it understandable, then it is user friendly	Interview the drivers
Performance of relative positioning techniques are insufficient for key SF applications (e.g. accuracy, integrity, availability, …)	the positioning must be on lane level accuracy	The lane level position accuracy	This will be done by confirming that all the vehicles were map matched to the correct lane.
The communication range is too low in some situations (tunnels,buildings).	We need to communicate all the way outside the tunnel, via RSU	That we have communication outside the tunnel	By seeing if we have communication
The positioning is not accurate enough in some situation (tunnels,buildings).	the positioning must be on lane level accuracy	The lane level position accuracy	This will be done by confirming that all the vehicles were map matched to the correct lane.
The time delay between sending and receiving varies too much (latency times)	Will the warningtiming be the same between different tests	What Time To Collision it will be when the different warnings appear	This could be measured with some reference positioning equipment.

Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.7.3 Use Case 7C – Frontal collision warning due to abnormal vehicle behaviour in front – 7c

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	Johan Fjellström , Volvo	Date:	20081106	Sheet No.: [2]	FCW_WE_01
Application(s) tested:	1. Frontal Collision Warning 2. n.	Vehicles / RSU: [3]	1. Renault Truck 2. Volvo Car n.	HW - components to be used in test [3]	1. Volvo GW 2. VANET Router (e-box with q-free card) 3. Positioning PC (AEC 6920) 4.U-blox GPS receiver 5. Aglia camera 6. Main PC (e-box) 7. Application PC (e-box)	SW-components / modules to be used in the test [3]	1. GW SW 2. VANET SW 3. Positioning SW 4. SP1 bundle 5. Application SW

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☒	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☒	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☒	**Test Site West**	☒
Other:		**Reliability**	☒	**Test Site Italy**	☐
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Specific area at test site:	**La Valbonne**

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	Frontal collision warning due to abnormal vehicle behaviour in front – 7c
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]			
Vehicle A, B and C are travelling on the proving ground La Valbonne outside Lyon, which is a part of the west test site. All vehicles are travelling with 70 kph in the same lane and with a distance of 70 meters between each. When the vehicles are on the straight part of the testing track the vehicle furthest in front (vehicle C) start decelerating with 3 m/s^2, and continues with this until it is at stand still. Vehicle A will continue with constant speed during the test until it gets the critical warning (or whenever the driver feels uncomfortable with the situation), when the driver can change lane and pass vehicle C. Vehicle B (vehicle in middle) should continue with constant speed and pass vehicle C on the left. The lane change of vehicle B should be as late as possible, so that it cover vehicle C as long time as possible for vehicle A. Vehicle B is preferable a truck, all to minimize the possibility for the driver in vehicle A to see what is happening with the vehicle C. The test will be performed only by expert drivers, who are well aware about the vehicles' dynamics. The speed of the vehicles, distance between the vehicles and amount of deceleration can by altered to test the system more deeply. Very precise test setup and scenario description! Totally clear.			
Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5): REQ are less important for WP4.6	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4-REQ_00_17, Common - Information Presentation Decision	Do the warnings come in the right time followed by each other and also if there are any false warings during the test run.	The feeling by the drivers of the warning timings and if there were any false warnings	Interview the driver after the test run.
#SP4-REQ_07_04, FCW - Provide understandable information	The driver will have all types of warnings (comfort, safety and critical)	The understandability of the warning.	Interview the driver after the test run.
User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met. Clearly define HOW you are going to operazionalize the User Need.	How are you going to measure this? Define your measuring tools. Define the “tool” = scale or question to be used…
#SP4_UN_07_01, Driver wants to be informed when approaching vehicles in following situation: - Vehicle is immobilized on the road or on the emergency road (due to vehicle breakdown...) -Vehicle is at a lower speed than the normal speed (due to vehicle problems, obstacle in the road, or abnormal driver behaviour)	The driver will be informed with warnings.	Measure the HMI data interface and check if messages arrive?	Interview the driver after the test run. Specifically the driver will be asked whether he/she got the warning Also recording from wireshark will be used to define in which moment the warning was issued.

#SP4_UN_07_02, Driver wants to be informed in time about hazardous situation on the road in front.	The driver will be informed.	If the driver got the warnings in a good time.	Interview the driver after the test run..
#SP4_UN_07_05, Driver wants to receive understandable information/warning/recommendation	The driver will be informed.	If the driver understand what the meaning of the warning is	Interview the driver after the test run about the understnadability of the warning.
#SP4_UN_07_08, Driver wants to be informed in time if the situation and recommendation has been changed	The driver will be informed with warnings of three different kinds (comfort, safety and critical)	Does the driver feel the change of warning states from comfort to safety to critical is good.	Interview the driver after the test run.
Add further User Needs here:			

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The improvement is that the system can get information about vehicles which is in front, even if there are some vehicles in between.
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	The frontal collision warning clearly aides the driver to prevent a collision.
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The range of the vehicles in this test can be increased to the level that it shows that it improves the range and quality comparing with conventional sensors (radar, lidar).
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	The test can show that it is possible to give information in an early stage about the danger ahead, which will enable the driver to take necessary action in a early stage, and thereby in a safe way.

To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☐ No, ☒ Yes	If the system functions and the warnings are on time, the driver of vehicle A will be warned about the danger ahead.
To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☐ No, ☒ Yes	The range of the vehicles in this test can be increased to the level that it shows that it improves the range and quality comparing with conventional sensors (radar, lidar). This enables to give the driver of vehicle A a warning well in advance.
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	In the scenario the warning application will use these kind of information from the LDM
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	The cooperative approch enables the frontal collision warning application to work in new type of scenarios, as the one explained in this test.

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Inappropriate HMI provided for SMA (e.g. the screen is too small or inappropriately sited)	The driver will get all three types of warnings	If the HMI is understandable for the driver.	Interview the drivers
Driver confused by the presentation of the information because it is not user-friendly	The driver will get all three types of warnings.	How user friendly the the information is. If the driver in the first times he/she see the warning finds it understandable, then it is user friendly	Interview the drivers
Performance of relative positioning techniques are insufficient for key SF applications (e.g. accuracy, integrity, availability, …)	the positioning must be on lane level accuracy	The lane level position accuracy	This will be done by confirming that all the vehicles were map matched to the correct lane.
The time delay between sending and receiving varies too much (latency times)	Will the warningtiming be the same between different tests	What Time To Collision it will be when the different warnings appear	This could be measured with some reference positioning equipment.
Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

Use Case 7C – Frontal Collision Warning due to abnormal behaviour of vehicle in front - Conducted in Driving Simulator by USTUTT

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**	

Task [1]	Task 4.6.5	Company:	USTUTT	Date:	30.11.2008	Sheet No.: [2]	FCW_DS_1
Application(s) tested:	1. frontal collision warning 2. n.	Vehicles / RSU: [3]	1. 2. n.	HW - components to be used in test [3]	1. 2. 3. 4. 5.	SW-components / modules to be used in the test [3]	1. 2. 3. 4. 5.

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☒	**Usability**	☒	**Traffic Simulation**	☐
Technical Evaluation	☐	**Acceptance**	☒	**Driving Simulation**	☒
Safety and traffic evaluation	☐	**Performance**	☐	**Test Site West**	☐
Other:		**Reliability**	☐	**Test Site Italy**	☐
		Correctness	☐	**Test Site Germany**	☐
		Other:	**Behaviour, Compliance**	**Test Site Sweden**	☐
				Test Site NL	☐
				Other:	

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	Frontal Collision Warning due to abnormal behaviour of vehicle in front - 7c
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]
The ego vehicle is following a car A. The car A accelerates, but then suddenly brakes because of a suddenly crossing pedestrian. The warning stage for the ego vehicle is varied: __ no warning A: comfort warning B: safety warning C: critical warning D: comfort warning - and deleeting comfort warning due to the fact that the pedestrian has crossed the road successfully and the danger is over. 10 participants will drive in each condition (50 in total) (in-between subject design) In a pre-experiment the optimal warning time thresholds will be tested and applied in the experiment. Results will be expected as follows and in line with Requirements and user needs below: no warning and critical warning --> reaction time --> deceleration in m/s --> number of collisions --> distance between vehicles when both vehicles are stopped completelly --> question about disturbance and effectivity of warning safety warning --> number of critical warnings necessary --> deceleration in m/s --> description of behaviour --> question about disturbance and effectivity of warning comfort warning --> number of safety warnings necessary --> deceleration in m/s --> description of behaviour --> question about disturbance and effectivity of warning deleted comfort warning --> description of behaviour --> question about disturbance and effectivity of warning

Success Criteria [8] :	How considered in the test case?	State what you are going to measure (units) and if possible define a treshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Requirements for this application (D4.2.4):			
#SP4-REQ_07_04 The system shall be able to provide understandable recommendation to the driver in term of - Distance and/or time from the obstacle - Lane recommendation - Speed recommendation - Brake recommendation - Level of risk and reaction time needed Standard message has to be elaborated and used	The test case will be used to evaluate the SF HMI and will evaluate if the HMI "recommendation" is "understood" correctly. The warning given in the test case shall lead to a "faster situation recognition" and will give a "brake recommendation". By variing the warning stage the "level of risk" is displayed. The SF "standard message" for FCW will be applied.	Reaction time for leaving the throttle pedal will be the indicator for "understandability" of the recommendation given. --> The recommendation is understood if the subject released the trottle pedal by at least 30% before this reaction could be attributed to other stimuli. Faster situation recognition is also measured by reaction time (ms) for releasing the throttle pedal by 30%, --> Reaction time needs to be significantly faster with the SF warning.	The position of the gas throttle is measured constantly. A time-stamp for warning, hazard appearance and throttle movements is applied.
#SP4-REQ_07_13 The system should be able to inform/warn the driver in three different levels -The comfort information should be presented so that the driver could have a reaction time of 5s and doesn't need to decelerate more than 1.5m/s^2 to avoid a collision. - The safety information should be presented so that the driver could have a reaction time of 3 s and doesn't need to decelerate more than 3m/s^2 to avoid a collision. - The critical warning should be presented so that the driver could have a reaction time of 1 s and doesn't need to decelerate more than 5m/s^2 to avoid a collision.	All 3 warning stages will be evaluated in this test case. The time for warning will be initially tuned as recommended in SP4-REQ_07_13 but in a pre-experiement we will optimize the warning thresholds (and report the optimal thresholds for this application/situation). It is not yet clear if the deceleration numbers given can be avauated since the deceleration feeling in the driving simulater is not the same as in a real car. However the different deceleration rates between comfort, safety and critical warning conditions can be compaired.	Reaction time of driver will be measured by position of gas throttle. --> A reaction is assumed when the gas throttle is released by 30%. Deceleration is measured.	see SP4-REQ_07_04 And logging of deceleration in m/s

User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a treshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_07_02 Driver wants to be informed in time about hazardous situation on the road in front.	The driver will be informed. The optimal time for the message of each warning stage will be evaluated in a pre-experiment.	see SP4-REQ_07_13 Additionally it is measured if a collision is avoided successfully --> significantly less collisions in compairison to a situation without warning is a success. If the ego vehicle comes to a stop it might also be measured the distance to the stopped vehicle in front. --> Significantly larger distances than in a condition without warning are a success.	see SP4-REQ_07_04 Additionally maybe measurements of distance between vehicles after stop.
#SP4_UN_07_03 Driver wants to receive some safety driving recommendations regarding the hazardous situation in front and its environment (vehicle around, traffic, type of road…)	The driver will receive the SF HMI warning for the situation.		
#SP4_UN_07_04 Driver does not want to be informed about a hazardous situation if he is not concerned by it. (location and time criteria, not too early for instance)	The comfort warning will be deleted in the moment the hazard does not exist any more.	Drivers reaction to a deleted warning will be described.	Behaviour description in plain text. Maybe a question after the test regarding the driver's thoughts.
#SP4_UN_07_05 Driver wants to receive understandable information/warning/recommendation	see SP4-REQ_07_04	see SP4-REQ_07_04	see SP4-REQ_07_04
#SP4_UN_07_06 Driver does not want to be disturbed by the system information/warning/recommendation	This applies for the comfort warning	A question after the experiment will ask if the driver felt disturbed by the message at this time. --> Less than 20% of the drivers shall answer this question with "yes"	Question about disturbance.

#SP4_UN_07_08 Driver wants to be informed in time if the situation and recommendation has been changed	This applies for the comfort warning that disappears if the hazard disappears.	see SP4_UN_07_04	see SP4_UN_07_04
Add further User Needs here:			

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The benefit of the cooperative system will be proved by the fact that a warning can be given to the ego-vehicle BEFORE any sensor of this ego-vehicle could detect that the front vehicle would suddenly brake due to a pedestrian crossing.
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	If an accident can be avoided this is a potential for saving lifes, saving money. If the ego-vehicle brakes earlier but not as hard this is reducing the risk of a collision from a following vehicle.
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The ego-vehicle can be warned even befor itself could detect any danger (higher range).
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	The driver will be supported to brake by an early warning
To manage existing incidents to minimise further negative safety impact.	☐ No, ☒ Yes	The ego-vehicle might brake less hard due to an early warning and this will reduce the risk for a collision from behind by a following vehicle.

To increase safety for all road users in a specific situation.	☐ No, ☒ Yes	By the warning safety is increased probably.
To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☐ No, ☒ Yes	The ego-vehicle can be warned even befor itself could detect any danger (higher range).
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☒ No, ☐ Yes	
To open the development of new safety applications based on a cooperative approach.	☒ No, ☐ Yes	

Risks of SP6 (BLADE) that are covered? [11]			
Add further lines here:			
Extra success criteria that are worth testing? [10]			
The system shall be accepted by drivers.	Questions regarding acceptance will be asked.	Acceptance in terms of subjectively perceived effectivity and in terms of disturbance will be measured.	A questionnaire with questions regarding subjectively perceived effectivity and disturbance.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.8 Road Condition Status – Slippery Road VOLVO

4.8.1 Use Case 8A – Road Condition Status warning due to slippery area ahead with information from infrastructure and detection of slippery area from sensor equipped truck

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	Erik Agardt / Volvo Technology Corperation	Date:	20081215	Sheet No.: [2]	RCS_SWE_01
Application(s) tested:	1. Road Condition Status 2. n.	Vehicles / RSU: [3]	1. Volvo Truck 2. Volvo Truck 2 3. Road side unit	HW - components to be used in test [3]	1. Road eye 1:st gen. 2. Volvo GW 3. VANET Router 4. Positioning PC 5. Main PC 6. Application PC	SW-components / modules to be used in the test [3]	1. GW SW 2. VANET SW 3. Positioning SW 4. SP1 bundle 5. Application SW

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☒	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☒	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☒	**Test Site West**	☐
Other:		**Reliability**	☒	**Test Site Italy**	☐
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☒
				Test Site NL	☐
				Specific area at test site:	

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	Road Condition Status warning due to slippery area ahead with information from infrastructure and detection of slippery area from sensor equipped truck -UC8a.
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]			
Vehicle A (Truck with road eye) is driving in a straight line and in a normal behaviour (50 km/h)and detects a slippery area on the proving ground. The information of the detected slippery area is uploaded to the infrastructure. Vehicle B (Ego Vehicle) is driving towards the slippery area at a speed of 50 km/h. When vehicle B has a travel time of 15 seconds to the start of the slippery area the comfort warning will occur. The speed of vehicle B is maintained and when leaving the slippery area the comfort warning will disappear. The test will be performed only by expert drivers, who are well aware about the vehicles dynamics.			
Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4-REQ_00_17, Common - Information Presentation Decision	Do the warnings come in the right time followed by each other and also if there are any false warnings during the test run	The feeling by the drivers of the warning timings and if there were any false warnings	Interview with the driver after the test run.
#SP4-REQ_08_02	The system shall be able to receive data about road condition from infrastructure devices located within at least 300 meters in the future expected path of the vehicle.	Is the warning triggered at the correct distance	Interview with the driver after the test run.
#SP4-REQ_08_04	A vehicle equipped with relevant sensors shall be able to transmit data about road condition to infrastructure devices located on the same road within at least 300 meters.	Is the data received by the infrastucture.	Is the data uploded to the LDM.

User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_08_01	The user needs to know the road conditions ahead in order to make relevant manoeuvre decisions, such as reducing speed or to make changes in route to avoid a critical section. The road condition can be affected by various parameters such as sand, ice, gravel, leaves, oil etc on the road.	Is the correct data received to trigger a warning and when the warning is given to the driver.	Interview with the driver after the test run. Specifically the driver will be asked wheteher he/she got the warning and if the timing was appropriate. Questions TBD. For measuring the moment of the warning was issued, wireshark is used
#SP4_UN_08_03	The vehicle is a probe vehicle for the infrastructure (and applications in the traffic control centre)	Is the detected slippery area uploaded to the LDM.	Is the slippery area in the LDM after detection and uploading from the probe vehicle.
Add further User Needs here:			

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The improvement is that the vehicle can get information of the road condition further ahead to be able to adapt the vehicle speed regarding the surface friction.
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	The function aides the driver to adapt the speed to the surface friction before entering the slippery area to avoid accident.

To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The range and quality in this test is improved in comparison with standard temperature sensors and information from other vehicles that have detected for the driver unknown slippery areas in the oncoming road section.
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	The test can show that it is possible to give information in an early stage about the danger ahead, which will enable the driver to take necessary action in a early stage, and thereby in a safe way.
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☐ No, ☒ Yes	If the system functions and the warnings are on time, the driver of vehicle B will be warned about the danger ahead
To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☒ No, ☐ Yes	
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	In the scenario the warning application will use these kind of information from the LDM.
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	The cooperative approach enables the road condition status warning application to work in new type of scenarios, as the one explained in this test

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
The system gives wrong information to the users (Risk nr 1).	Compare the result of the warnings with the known road conditions.	If the warning was presented correctly regarding the surface.	Compare the result of the warnings with the known road conditions.

The SMA supplies too much information and also too many warnings to the driver. The driver is confused by the presentation of the information (Risk nr 3 and 5).	Is the choosen HMI suitable to present this type of warning. Due to the different warniglevels, the driver might estimate the traction in a different way then the system and disagree or might get distracted from the information given.	Drivers oppinion.	Interview with the driver, questions TBD.
		Drivers oppinion.	Interview with the driver, questions TBD.
The system provides too many false alarms (Risk nr 11).	If the alarms are set in the correct positions and situatuions.	Is there any false alarms (wrong level or situation etc).	Notation when alarm is set.
Performance of relative positioning techniques are insufficient for key SF applications (e.g. accuracy, integrity, availability, …) (Risk nr 14).	Is it possible to determain if only one road lane is affected of a slippery area due to accuracy of position	How precise can we detect the slippey area [m (x,y) and m^2]	Compare the detected position with reference measurement of the actual position.
Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.8.2 Use Case 8B – Road Condition Status warning due to slippery area ahead with information from vehicle to vehicle communication and detection of slippery area from sensor equipped truck

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	Erik Agardt / Volvo Technology Corperation	Date:	20081215	Sheet No.: [2]	RCS_SWE_02
Application(s) tested:	1. Road Condition Status 2. n.	Vehicles / RSU: [3]	1. Volvo Truck 2. Volvo Truck 2 3. Road side unit	HW - components to be used in test [3]	1. Road eye 1:st gen. 2. Volvo GW 3. VANET Router 4. Positioning PC 5. Main PC 6. Application PC	SW-components / modules to be used in the test [3]	1. GW SW 2. VANET SW 3. Positioning SW 4. SP1 bundle 5. Application SW

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☒	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☒	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☒	**Test Site West**	☐
Other:		**Reliability**	☒	**Test Site Italy**	☐
		Correctness	☐	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☒
				Test Site NL	☐
				Specific area at test site:	

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	Road Condition Status warning due to slippery area ahead with information from vehicle to vehicle communication and detection of slippery area from sensor equipped truck -UC8b.
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]			
Vehicle A (Truck with road eye) is driving in a straight line and in a normal behaviour (50 km/h)and detects a slippery area on the proving ground. The information of the detected slippery area is broadcasted to the surrounding vehicles. Vehicle B (Ego Vehicle) is driving towards the slippery area (in the same lane and direction) at a speed of 50 km/h and receives the information from Vehicle A. When vehicle B has a travel time of 15 seconds to the start of the slippery area the comfort warning will occur. The speed of vehicle B is maintained and when leaving the slippery area the comfort warning will disappear. The test will be performed only by expert drivers, who are well aware about the vehicles dynamics.			
Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4-REQ_00_17, Common - Information Presentation Decision	Do the warnings come in the right time followed by each other and also if there are any false warnings during the test run	The feeling by the drivers of the warning timings and if there were any false warnings	Interview with the driver after the test run.
#SP4-REQ_08_02	The system shall be able to receive data about road condition from infrastructure devices located within at least 300 meters in the future expected path of the vehicle.	Is the warning triggered at the correct distance	Interview with the driver after the test run.
#SP4-REQ_08_04	A vehicle equipped with relevant sensors shall be able to transmit data about road condition to infrastructure devices located on the same road within at least 300 meters.	Is the data received by the infrastucture.	Is the data uploded to the LDM.

User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_08_01	The user needs to know the road conditions ahead in order to make relevant manoeuvre decisions, such as reducing speed or to make changes in route to avoid a critical section. The road condition can be affected by various parameters such as sand, ice, gravel, leaves, oil etc on the road.	Is the correct data received to trigger a warning and when the warning is given to the driver.	Interview with the driver after the test run. Specifically the driver will be asked wheteher he/she got the warning and if the timing was appropriate. Questions TBD. For measuring the moment of the warning was issued, wireshark is used
#SP4_UN_08_03	The vehicle is a probe vehicle for the infrastructure (and applications in the traffic control centre)	Is the detected slippery area uploaded to the LDM.	Is the slippery area in the LDM after detection and uploading from the probe vehicle.
Add further User Needs here:			

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The improvement is that the vehicle can get information of the road condition further ahead to be able to adapt the vehicle speed regarding the surface friction.
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	The function aides the driver to adapt the speed to the surface friction before entering the slippery area to avoid accident.

To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The range and quality in this test is improved in comparison with standard temperature sensors and information from other vehicles that have detected for the driver unknown slippery areas in the oncoming road section.
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	The test can show that it is possible to give information in an early stage about the danger ahead, which will enable the driver to take necessary action in a early stage, and thereby in a safe way.
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☐ No, ☒ Yes	If the system functions and the warnings are on time, the driver of vehicle B will be warned about the danger ahead
To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☒ No, ☐ Yes	
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	In the scenario the warning application will use these kind of information from the LDM.
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	The cooperative approach enables the road condition status warning application to work in new type of scenarios, as the one explained in this test

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
The system gives wrong information to the users (Risk nr 1).	Compare the result of the warnings with the known road conditions.	If the warning was presented correctly regarding the surface.	Compare the result of the warnings with the known road conditions.

The SMA supplies too much information and also too many warnings to the driver. The driver is confused by the presentation of the information (Risk nr 3 and 5).	Is the choosen HMI suitable to present this type of warning. Due to the different warniglevels, the driver might estimate the traction in a different way then the system and disagree or might get distracted from the information given.	Drivers oppinion.	Interview with the driver, questions TBD.
		Drivers oppinion.	Interview with the driver, questions TBD.
The system provides too many false alarms (Risk nr 11).	If the alarms are set in the correct positions and situatuions.	Is there any false alarms (wrong level or situation etc).	Notation when alarm is set.
Performance of relative positioning techniques are insufficient for key SF applications (e.g. accuracy, integrity, availability, …) (Risk nr 14).	Is it possible to determain if only one road lane is affected of a slippery area due to accuracy of position	How precise can we detect the slippey area [m (x,y) and m^2	Compare the detected position with reference measurement of the actual position
Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.9 Curve Warning CRF

4.9.1 Use Case 9GC – Curve Warning - General Case

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	CRF / G. Vivo	Date:	13/01/2009	Sheet No.: [2]	CUWA_IT_01
Application(s) tested:	#9 - Curve Warning	Vehicles / RSU: [3]	1. Fiat Bravo Red 2. Fiat Bravo Blue 3. Road Side Unit (dedicated to the CUWA application)	HW - components to be used in test [3]	1. SP1 platform including: CRF gateway VGX SBC, Main PC, on Fiat Bravo Red and Blue cars 2. Application PC 3. Router PC 4. Positioning PC 5. RSU Application PC 6. ESPOSYTOR PC.	SW-components / modules to be used in the test [3]	1. Positioning SW 2. CUWA application (host vehicles) 3. CUWA application (RSU) 4. Router SW 5. ESPOSYTOR tool.

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☐	**Usability**	☐	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☐	**Driving Simulation**	☐
Safety and traffic evaluation	☐	**Performance**	☐	**Test Site West**	☐
Other:		**Reliability**	☒	**Test Site Italy**	☒
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Specific area at test site:	**CRF Test Track**

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6]	Application #9 - Curve Warning: Use Case 9, General Case
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]
The present test case for the Curve Warning application will be performed on the CRF Test Track. This test track will be prepared in order to perform the manoeuvre in completely safe conditions, and suitable escape lanes will be present in the place of the CUWA test. Learning phase, composed only by POSITIVE samples: the probe vehicle(s) - Fiat Bravo RED and BLUE cars - make several travels, along a curve road segment in the test site, specifically equipped for the testing of the application. The RSU is placed in order to cover the whole area of testing. In the learning phase the probe vehicle(s) travel by repeating the following manoeuvre: 1 - While approaching to the dangerous bend, the probe vehicle enters at a given time in the detection zone of the application (polygonal area covered by the RSU), keeping the average speed of 50 Km/h; 2 - The probe vehicle minimum speed should not drop below 40 Km/h and its maximum speed should not exceed 60 Km/h; 3 - The probe vehicle lateral position should be close to the center of the lane and its heading angle should be aligned with a given reference trajectory (the one of comfortable driving along the curve); During the learning phase, the analysis of the vehicle trajectories will be performed by the RSU. Whenever the conditions for the positive triggering of the learning are met (average speed ~40 Km/h, lateral position and heading as defined in the steps 4 and 5 above), the positive sample is evaluated by the RSU and the estimation of the reference trajectory (the optimal one for travelling along the curve) is estimated. Driving support phase. Whenever host vehicle(s) travel along the dangerous bend, the reference trajectory is deliverer by the RSU to the Host Vehicle; in case the speed and the lateral position are evaluated as "safe", no warning is delivered to the driver. Depending on the disalignement of the vehicle parameters (speed, lateral position, heading) respect to the reference trajectory, a Comfort, Safety or Critical warning is issued. In the driving support phase, after the sending of the reference trajectory, the role of the RSU ends, and the overall further analysis is performed in the Host Vehicle. The condition of "No Warning" is summarised by the following steps: 1 - The learning phase is assumed it was properly completed in advance by the RSU, and the reference trajectory is available in the RSU LDM; 2 - The host vehicle approaches to the curve (in the detection zone of the application, which is a polygonal area covered by the RSU), and receives the reference trajectory from the RSU; 3 - The host vehicle travels along the curve (again in the detection zone of the application), keeping the average speed of 50 Km/h; 4 - The host vehicle lateral position should be close to the center of the lane; 5 - The host vehicle heading should be aligned with the reference trajectory (the one of comfortable driving along the curve). In the condition of "Curve Warning", the steps 3…5 above are chanded as follows: 3 - The host vehicle travels along the curve keeping an average speed higher than 50 Km/h; 4 - The host vehicle lateral position is NOT close to the center of the lane; 5 - The host vehicle heading is NOT well aligned with the reference trajectory (the one of comfortable driving along the curve). The vehicles will be driven by expert technical drivers that know the system. No subjects (=non expert drivers unfamiliar with the system) will be used. The following variations will be applied in a total of 10-20 runs: - The speed of approach to the dangerous curve will be progressively increased, between 40 and 80 Km/k; - The lateral position of the Host Vehicle respect to the centre of the lane; - The heading angle alignment of the Host Vehicle respect to the reference trajectory. The behaviour of the system will be assessed in the no-warning area, in the comfort warning area and in the safety warning area (the critical warning area will be NEVER entered, for obvious safety reasons); all data, including the time when the warning is issued, will be logged and evaluated afterwards.

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_09_02 - Drivers of host vehicles, travelling the curve after the probe vehicle, and acting as probes on their own for further following vehicles, want to be informed about the dynamic information (including speed and lateral position) in order to adapt and optimise the manoeuvre, mimicking the optimal trajectory validated by the system.	In the test case, the reference trajectory to keep for the proper travelling across the curve is evaluated (by the RSU) and transmitted to the Host Vehicle as soon as it enters in the coverage area of the application.	The dynamic information needed in order to keep a comfortable travel along the dangerous curve will be assessed by considering: Time of delivering the reference trajectory to the Host Vehicle <= few hundred of millisec.; alignement of the reference trajectory respect to the Host Vehicle trajectory >= 90%; the alignement level will be evaluated by means of a similarity definition (predefined metrics) taking into account the Host Vehicle speed, lateral position and heading angle.	During the tests the relevant parameters to measure (reference trajectory, Host Vehicle dynamics) will be logged in real time. The relative evaluation and analysis will be performed off line. The tools of data analysis will be the standard software adopted in the CRF laboratories for such purpose (Matlab, Simulink, Mathematica, etc.). The delivery time of the reference trajectory should be less than few hundred of millisecs and the level of alignment of the Host Vehicle trajectory respect to the reference trajectory should be better than 90% (based on the predefined metrics).

#SP4_UN_09_08 - Driver interface should timely reflect the persistence or the changes related to the dangerous situation.	The timely intervention of the driver HMI is considered by precisely measuring and logging the absolute time (millisec. precision) of HMI activation.	Both the absolute times of HMI activation and deactivation for two Safety Margin areas (Comfort and Safety) will be measured (and logged) with the millisec. accuracy.	The analysis of the logged information will be performed off line and compared to predefined HMI activation thresholds. These thresholds should be less than few hundred of millisecs. The offsets of the Host Vehicle dynamic parameters (speed, lateral position, heading) respect to the reference trajectory define the transitions in the Comfort Area and in the Safety Area.

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The test is directly related with this HLO, especially concerning points b) and c). Depending on the specific conformation of the dangerous bend, the reference trajectory for the save (and comfortable) travel along the curve will be sent to the Host Vehicle well before its approach to the curve, placing the application into a domain totally outside of the capabilities for a classical ADAS approach. In all areas of the Safety Margin Assistance (Comfort, Safety and Critical) the cooperative approach delivers the needed information to the Host Vehicle by means of the VANET communication, leading to simpler, safer and more robust implementation and deployment of the tested application.
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	Dangerous bends are considered (by well known reasons) as very dangerous "black spots", where the weather conditions or other reasons (road works, accidents, etc.) may contribute to make the travelling conditions unsafe. The diffusion of the Curve Warning application will have direct (positive) consequences in terms of life saving.

To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	The reliability test is performed since any test condition is repeated a number of times that is sufficient for a prototype to demonstrate the right behaviour.
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	The test is explicitly addressing the support to the drivers, by preventively delivering information on the proper trajectory to keep while travelling along "black spots", such as dangerous bend.
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☒ No, ☐ Yes	
To show that the safety impact can be achieved without affecting transport efficiency.	☒ No, ☐ Yes	
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☐ No, ☒ Yes	This HLO can be tested, for instance, by showing that the Safety Margin is extended at a level where - possibly - the Host Vehicle is far away in its approach to the dangerous bend. This will demonstrate that a (proper) warning signal can be issued when there is no evidence of any danger for the driver, with an extension of the Safety Margin beyond his/her perception capabilities.
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	This HLO is just partially covered. Even though the extended cooperative awareness in not the specific focus of the application, the Curve Warning (as it is for all other SP4-SCOVA applications) is based on the real time reconstruction of the driving context and environment around the EV, which is the straight concept of the LDM database.
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	The overall test is designed and devoted to show the direct benefits of the cooperative approach, by means of a novel class of applications (V2V and V2I communication).

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Risk3 -The SMA supplies too much information and also too many warnings to the driver.	The HMI of the application is provided with an interface that decides the warning to be sent, based on a priority of applications, and a period of changing warning, that should avoid the continuing flikering among multiple warning.	The output of the applications tests is logged, together with the output going to the driver, to show how many warning are produced and how many are actually sent to the drivers.	The measure is a comparison between inputs of the HMI from application side, and outputs to the driver.
Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.10 Vulnerable Road User Detection VOLVO

4.10.1 Use Case 10a1 - Vulnerable road user accident avoidance: warning to a vehicle overtaking the egovehicle which senses a pedestrian crossing the road

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.4	Compiled by (Author) / Company:	Marco Dozza / Volvo	Date:	20081110	Sheet No.: [2]	VRUAA_SWE_01
Application(s) tested:	1. Vulnerable User Accident Avoidance.	Vehicles / RSU: [3]	1. Volvo Truck 2. Volvo Truck 2	HW - components to be used in test [3]	1. IBEO laser scanner 2. Volvo GW 3. VANET Router 4. Positioning PC 5. Main PC 6. Application PC	SW-components / modules to be used in the test [3]	1. GW SW 2. VANET SW 3. Positioning SW 4. SP1 bundle 5. Application SW

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☒	**Usability**	☒	**Traffic Simulation**	☐
Technical Evaluation	☒	**Acceptance**	☒	**Driving Simulation**	☒
Safety and traffic evaluation	☐	**Performance**	☒	**Test Site West**	☐
Other:		**Reliability**	☒	**Test Site Italy**	☐
		Correctness	☒	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☒
				Test Site NL	☐
				Specific area at test site:	**will you perform the same test in driving simulation AND real road? What are the different objectives for both types of tests? Probably 2 templates will fit this approach better.**

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	Vulnerable road user accident avoidance: warning to a vehicle overtaking the egovehicle which senses a pedestrian crossing the road - UC10a1
Are multiple applications evaluated simultaneously?	☒ No, ☐ Yes

Test setup and scenario [7]

Vehicel A and vehicle B are equipped with SAFESPOT VRUAA and the application is on. Vehicle B is 50 m behind vehicle A.Vehicle A (truck with laser scanner) is driving in a straight, 2-lane, road segment at 30, 40 and 50 km/h. These conditions will be repeated with a pedestrian initiating or non initiating the crossing in both condition a second pedestrian will stay on the sidewalk close to the pedestrian crossing. Vehicle A decelerate and vehicle B, originally behind vehicle A, keeps going 10, 30, 50Km/h and starts an overtaking. Vehicle A sends pedestrian info to Vehicle B. Vehicle B receives a comfort, safety, and critical warning at time to collision with the pedestrian line of crossing 10, 6, and 3s, then vehicle B brakes and stops before the pedestrian line of crossing. The test will be performed only by expert drivers, who are well aware about the vehicles' dynamics and this application. Further the pedestrian will be an expert on the SAFESPOT application and will be in real-time audio contact with both the trucks during the test. In addition, the pedestrian will initiate the crossing but not actually step in front of vehicle A until vehicle A is stopped and the pedestrian will never reach the second lane of the road segment where vehicle B is travelling for safety purpose.
Good description. Any idea about number of repetition of the test yet? Why is it useful to have different speeds? Maybe an other factor would lead to more interesting results or to delete this factor would lead to less test trails.
How about a table like this additionally:

		FACTOR C, GRADE 1 COMFORT	FACTOR C, GRADE 2 SAFETY	FACTOR C, GRADE 3 CRITICAL
Factor A Grade 1 Pedestrian Crossing	Factor B, Grade 1 10km/h			
Factor A, Grade 1 Pedestrian Crossing	Factor B, Grade 2 30 km/h			
Factor A Grade 1 Pedestrian Crossing	Factor B, Grade 3 50km/h			
Factor A, Grade 2 Pedestrian NOT Crossing	Factor B, Grade 1 10km/h			
Factor A Grade 2 Pedestrian NOT Crossing	Factor B, Grade 2 30 km/h			
Factor A, Grade 2 Pedestrian NOT Crossing	Factor B, Grade 3 50km/h			

Success Criteria [8] :			
Requirements (D4.2.4) for this application that are vital for WP4.6 (note: state only REQ that cannot be tested sufficiently in WP4.5):	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4-REQ_00_17, Common - Information Presentation Decision	Do the warnings come in the right time followed by each other and also if there are any false warnings during the test run	The feeling by the drivers of the warning timings and if there were any false warnings	Interview with the driver after the test run.
#SP4_REQ_03, VRUAA - on board VRU detection system - performance	Depending whether the first pedestrian crosses the road or not we should have 2 very different results: warning or no-warning.	Presence of VRUAA in vehicle A LDM after the pedestrian has initiated crossing. Warning occurrence.	Exposytor to see the LDM (directe measure). The warning is issued when expected (indirect measure)
#SP4_REQ_05, VRUAA - Vehicle Information	Overtake manouvre must be recognized for warning to happen	Warning occurrence.	The warning is issued when expected (indirect measure)
User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
#SP4_UN_10_01, Driver wants to receive some information and warning about possible VRU presence on the road and in front of its vehicle especially if he didn't detect it	The Driver of ego-vehicle will be informed about a crossing pedestrian by a message received from vehicle B.	Time when the warning was issued and how the driver liked it.	Interview with the driver after the test run.Specifically the driver will be asked whether he/she got the warning and if the timing was appropriate. Also recording from wireshark will be used to define in which moment the warning was issued.

#SP4_UN_10_02, Driver wants to be informed about a VRU who started to cross the road from both side of the road.	The user will receive three different levels of warning	Time when the warning was issued and how the driver liked it.	Interview with the driver after the test run.Specifically the driver will be asked whether he/she got the warning and if the timing was appropriate. Also recording from wireshark will be used to define in which moment the warning was issued.
#SP4_UN_10_05, Driver wants to receive understandable information/warning/recommendation	The user will receive three different levels of warning.	Question to the driver: is the information understandable?	Interview with the driver after the test run.
#SP4_UN_10_06, Vehicle drivers do not want to be un-necessarily disturbed by obtrusive or redundant information/warnings/recommendations	The user will receive three different levels of warning.	Question to the driver: is the information minimal?	Interview with the driver after the test run.
#SP4_UN_10_08, Driver interface should timely reflect the persistence or the changes related to the dangerous situation	Three warnings should be transmitted	Time of each warning	Interview with the driver after the test run.
Add further User Needs here:			

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	VRUAA application enables vehicle B to receive an information which is impossible to obtain without co-operative systems and which improves safety.
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c)	☐ No, ☒ Yes	VRUAA avoid for a vehicle to hit a pedestrian which is hidden by another vehicle.

d)		
To improve the a) range b) quality and c) reliability of the safety-related information.	☐ No, ☒ Yes	VRUAA application provides information on pedestrian crossing which would not be available otherwise.
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☐ No, ☒ Yes	VRUAA application provides in an early stage information about a pedestrian crossing ahead. This information enables the driver to brake in time to avoid the collision.
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☐ No, ☒ Yes	VRUAA application increases vehicles and pedestrian safety.
To show that the safety impact can be achieved without affecting transport efficiency.	☐ No, ☒ Yes	VRUAA application induces vehicles to slow down. However in case of no false alarms the extent to which this slow down can negatively affect mobility is well balanced by avoiding the potential jamming connected to an accident with a pedestrian (which necessarily includes emergency vehicles)
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☐ No, ☒ Yes	VRUAA application enables vehicle B to have information which increase safety and that would not be available otherwise.
To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☐ No, ☒ Yes	VRUAA will use information from the LDM and algorithm in the CSA and DAA to reconstruct the traffic scenario, transmit the necessary data, and trigger the convenient warnings at the right time.
To open the development of new safety applications based on a cooperative approach.	☐ No, ☒ Yes	VRUAA is possible, in this scenario, only because a cooperative approach is utilized.

Any risks of SP6 that are covered? Refer to the WP4.6 risks compilation with 25 risks. [11]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Inappropriate HMI provided for SMA (e.g. the screen is too small or inappropriately sited)	The driver will get all three types of warnings	If the HMI is understandable for the driver.	Interview the drivers
Performance of relative positioning techniques are insufficient for key SF applications (e.g. accuracy, integrity, availability, …)	the positioning must be on lane level accuracy	The lane level position accuracy	This will be done by confirming that all the vehicles and VRU's were map matched to the correct lane.
Inappropriate HMI provided for SMA (e.g. the screen is too small or inappropriately sited)	The driver will get all three types of warnings	If the HMI is understandable for the driver.	Interview the drivers
Extra success criteria that are worth testing? [10]	How considered in the test case?	State what you are going to measure (units) and if possible define a threshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test

4.11 Multiple Applications All Application Leaders

4.11.1 Traffic simulations for multiple applications

SAFESPOT COOPERATIVE SYSTEMS FOR ROAD SAFETY	**SAFESPOT SP4 WP6 TEST CASE Definition for Evaluation**						
Task [1]	Task 4.6.3	Company:	TNO	Date:	24/10/2008	Sheet No.: [2]	RECO_TS_1
Application(s) tested:	1. RECO 2. HOCW 3. SLSD 4. RCS	Vehicles / RSU: [3]		HW - components to be used in test [3]		SW-components / modules to be used in the test [3]	1. ITS-Modeller 2. 3. 4. 5.

Test Type (multiple possible) [4]		Test Purpose (multiple possible) [5]		Test Environment	
Human Factors	☐	**Usability**	☐	**Traffic Simulation**	☒
Technical Evaluation	☐	**Acceptance**	☐	**Driving Simulation**	☐
Safety and traffic evaluation	☒	**Performance**	☒	**Test Site West**	☐
Other:		**Reliability**	☐	**Test Site Italy**	☐
		Correctness	☐	**Test Site Germany**	☐
		Other:		**Test Site Sweden**	☐
				Test Site NL	☐
				Other:	

Which SF use case(s) do you refer to (derive from D4.2.3 for your application)? Try to fuse different use cases to one test case scenario if possible. [6] Will you evaluate multiple applications simultaneously	SP4_UC_RearEndCollision – 5a SP4_UC_SpeedAndDistance – 6a SP4_UC_FrontalCollisionWarning – 7a SP4_UC_FrontalCollisionWarning – 7c SP4_UC_RoadConditionStatusV2V – 8b
Are multiple applications evaluated simultaneously?	☐ No, ☒ Yes

Test setup and scenario [7]			
An arbitrary developed test-bed will be about 5 kilometer motorway section with 3-4 lanes including on and off ramps, bottle neck, locations for slippery road and accidents. The experimental design will explore the following overall configurations: Do nothing case SAFESPOT applications – V2V (two applications), V2I (two applications), and V2X (1 case) + upper ceiling cases (a total of 5 cases) Cooperative system coverage (in meters) – V2V coverage as well as V2I coverage [assumed to be 300 meters] Compliance rate (%) – We will assume 100% for now. Further human factor study (to be conducted) will provide better input later on. Traffic conditions (uncongested and congested)			
Success Criteria [8] :	How considered in the test case?	State what you are going to measure (units) and if possible define a treshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Requirements for this application (D4.2.4):			
In order to avoid collision, the safety distance shall be defined with an error of 10cm(0,1m)	The safety distance is considered on a larger scale (compared to 10 cm). Therefore the 10cm is not actively taken into account		
The system should be able to detect the presence of a second vehicle which is approaching from behind	The ITS-Modeller constantly measures the distance between vehicles	Safeheadway Distance Time to collsion. Threshold is defined in time and depends on the speed of the vehicle and the assumed reaction time of the driver	Using the ITS-Modeller
The system shall be able to receive information relative to its environment to decide of the best recommendation: Position Accuracy of obstacles and vehicles -- For vehicles with a range further away than 200 m Longitudinal, 15 m. Lateral, number of lane --For vehicles between a range of 80 to 200 m Longitudinal, 2m Lateral, 0.4 m --For vehicles with a range less than 80 m Longitudinal, 1 m Lateral, 0.1 m	The type of message and the contents is not direct considered inside the ITS-Modeller. The new communication module will however be able to shed some light on these issues	The time to collision and the Safeheadway distance will be the main output here. Also througput will be measured which can indicate if lateral changes were indicated on time	Using the ITS-Modeller

The system shall be able to receive data about road condition from other vehicles located within at least 300 meters in the future expected path of the vehicle.	The range of the messages is currently designed to be 300m. A single stretch of road is being taken into account and the slippery road part is at a constant location. The vehicles receiving these messages will be informed earlier compared to none-equipped vehicles	The time to collision and the Safeheadway distance will be the main output here. Also througput will be measured which can indicate if lateral changes were indicated on time	Using the ITS-Modeller
User Needs from D4.2.4:	How considered in the test case?	State what you are going to measure (units) and if possible define a treshold to prove that this success criteria is met.	How are you going to measure this? Define your measuring tools.
Driver of vehicle 1 want to be informed about the dynamic information (including relative speed, acceleration, direction indicators, lateral position) of a second vehicle, approaching from behind at a speed significantly higher speed respect to own vehicle	The relative distance between the vehicles is constantly monitored inside the ITS-Modeller	Safeheadway distance Time to Collision	Using the ITS-Modeller
Most accurate distance from preceding vehicle knowledge	The relative distance between the vehicles is constantly monitored inside the ITS-Modeller	Safeheadway distance Time to Collision	Using the ITS-Modeller
Driver wants to receive some safety driving recommendations regarding the hazardous situation in front and its environment (vehicle around, traffic, type of road…)	On the test track a piece of slippery road will be implemented	Safeheadway distance Time to Collision	Using the ITS-Modeller
The user shall be informed about road conditions in the future expected path of the vehicle. Road condition is defined as the condition that defines the grip between the road and the tire.	On the test track a piece of slippery road will be implemented	Safeheadway distance Time to Collision	Using the ITS-Modeller
Add further User Needs here:			

High level objectives (HLO) [9]	Is this HLO (partly = a,b,c) considered in the test case?	Describe how your test can be related to this HLO? How can your measurements be related to his HLO?
a) The main aim of the project will be to show the feasibility and benefits of Co-operative Systems solutions b) in improving road safety c) well beyond the level which can be achieved with autonomous solutions (vehicle or infrastructure based).	☐ No, ☒ Yes	The improving of road safety will be measured in the number of accidents that is prevented based on the Safe Headway Distance measure.
To demonstrate benefits for accident types with a calculated potential safety impact in terms of a) saving of lifes as well as other gains such as: b) c) d)	☐ No, ☒ Yes	See above
To improve the a) range b) quality and c) reliability of the safety-related information.	☒ No, ☐ Yes	
a) To support drivers preventively to the proper manoeuvres in the different contexts; b) To optimise the intervention of vehicle controls with respect to critical situations.	☒ No, ☐ Yes	
To manage existing incidents to minimise further negative safety impact.	☒ No, ☐ Yes	
To increase safety for all road users in a specific situation.	☒ No, ☐ Yes	
To show that the safety impact can be achieved without affecting transport efficiency.	☐ No, ☒ Yes	A comparison will be made also with the througput numbers in a situation with and without SAFESPOT
To increase the Safety Margin of vehicles using in-vehicle and infrastructure information.	☒ No, ☐ Yes	

To create applications for extended cooperative awareness by means of real time reconstruction of the driving context and environment.	☒ No, ☐ Yes	
To open the development of new safety applications based on a cooperative approach.	☒ No, ☐ Yes	

Risks of SP6 (BLADE) that are covered? [11]			
Add further lines here:			
Extra success criteria that are worth testing? [10]			
Fuel consumption Emission Total network travel time (e.g., vehicle-hours traveled) System throughput Average speed, etc.			
Add further lines here:			

Non-Compliance Reporting
To fill in after performing test
Obtained values / results
To fill in after performing test