

ITS World Congress 2010

eVALUE – A Test Programme for Active Safety Systems

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VOLVO

vti

Applus⁺
IDIADA

tecnalia

SICK



Agenda

- Project Overview
 - Introduction
 - Motivation
 - Approach
- Testing Protocols
 - Details
 - Validation Efforts
- Summary & Outlook

Project Overview

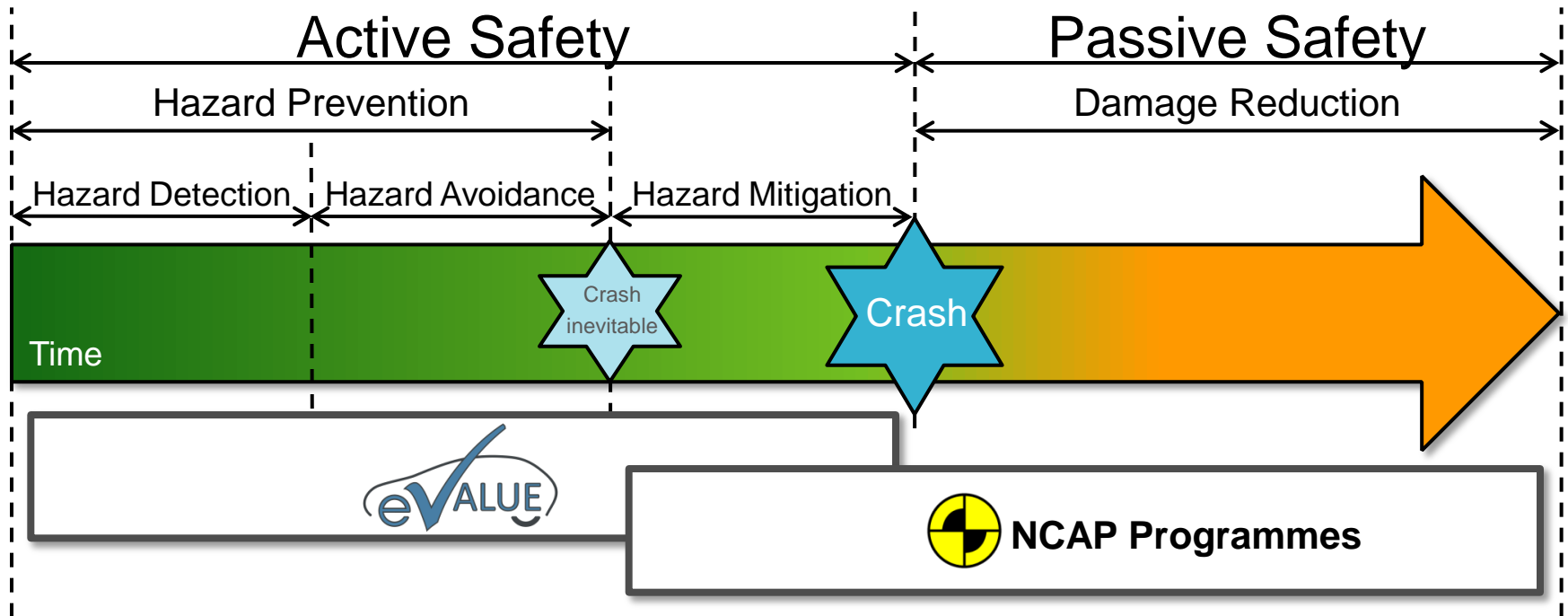
Introduction

- Active safety is a key measure when it comes to decreasing traffic accidents, injuries and deaths.
- Advanced driver assistance systems are massively introduced into new vehicles, and many of them also contribute with active safety functionality.
- However, and in opposition to passive safety, the car buyer cannot judge the performance of a vehicle's active safety based on objective measures.
- Every vehicle OEM is promoting active safety, but mainly on system functionality rather than on safety impact.

Need for objective test methods for active safety!

Project Overview

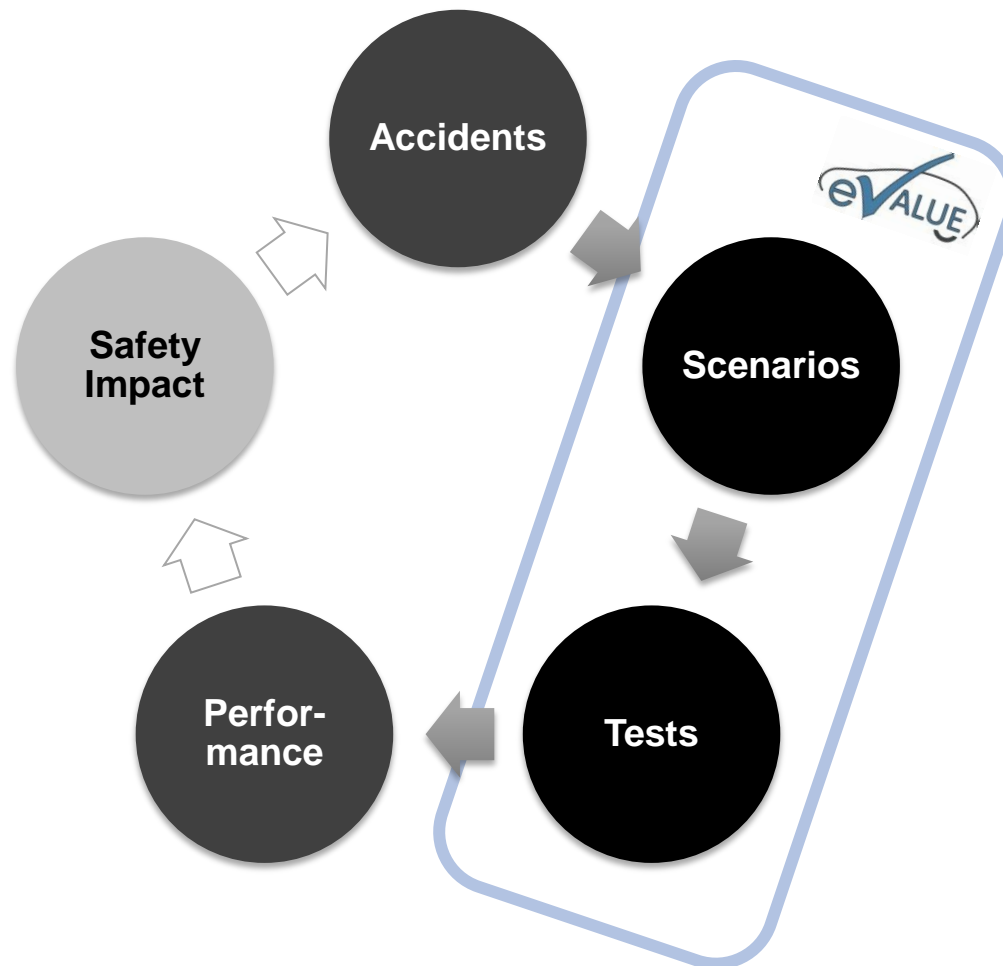
Motivation



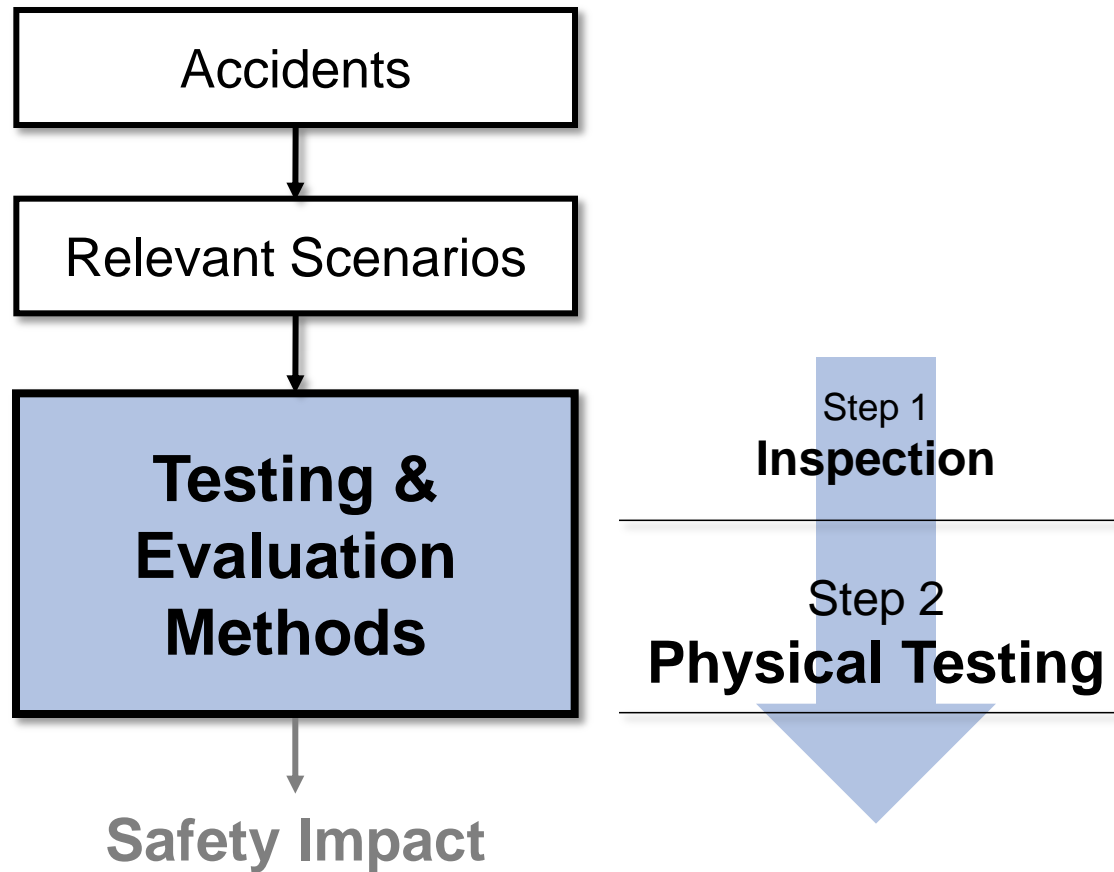
Active safety performance on full vehicle rather than on system level.

Project Overview

Scope



Project Overview Approach



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Testing Protocols Inspections

- An inspection is based on simple questions and basic data.
- It may require information provided by the OEM, but is mainly based on the vehicle itself and its standard documentation.
- Requirements or limitations as stated in the vehicle documentation will be taken into account as input for physical testing.
- HMI and functional safety assessment will be based on inspections only.

Deliverable D3.2

Inspection of Type of Vehicle

No.	QUESTION	ANSWER
Name/designation		
A	What trade name is used for the subject vehicle?	
B	Are there other trade names for the same vehicle?	
C	What is the date of production (model year) of the vehicle?	
Prototype		
D	Is the vehicle a prototype vehicle? If so, please identify all active safety functions including electronic hardware and software versions extra carefully. (See question C.)	
Chassis		
E	Which chassis is used for the subject vehicle?	
F	Are there other chassis types for which the test results should be considered valid?	
G	If the vehicle is a truck, what trailer is used at the performance testing?	
Engine		
H	Which engine is used in the subject vehicle?	
I	Are there other engines for which the test results should be considered valid?	
Brakes		
J	Which brakes are used in the subject vehicle?	
K	Are there other brakes for which the test results should be considered valid?	
Suspension		
L	Which brakes are used in the subject vehicle?	

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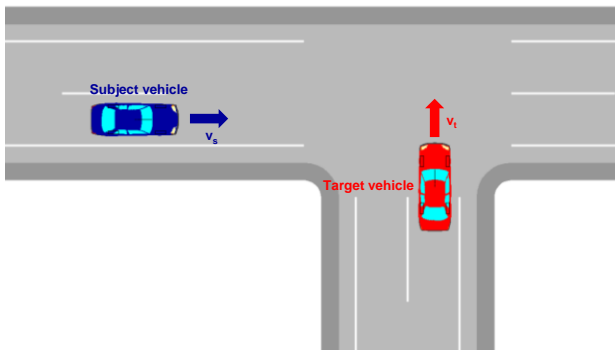
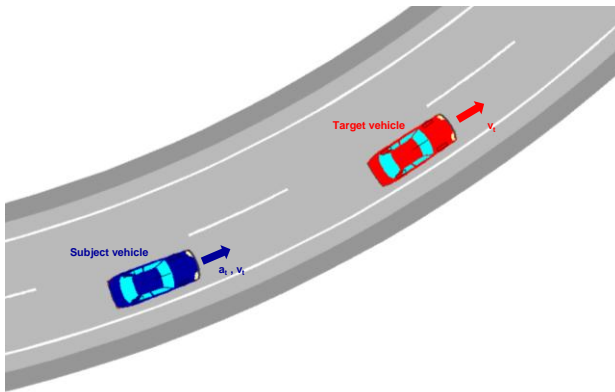
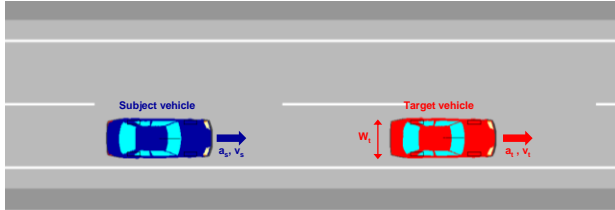
Testing Protocols

Physical Testing

- The protocols for physical testing are based on relevant traffic scenarios, which have been analysed in the beginning of the project.
- They are separated in three clusters that represent different functionality: longitudinal, lateral and stability.
- Each protocol follows a standardised format and contains instructions for:
 - Test principle
 - Objectives
 - Drivers
 - Equipment
 - Environment
 - Required input
 - Vehicle preparation
 - Test procedure
 - Data processing
 - Uncertainties
 - Result generation
 - etc.

Testing Protocols

Scenarios for Longitudinal Functionality

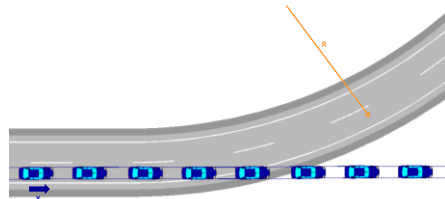
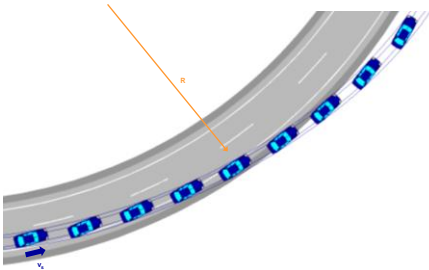
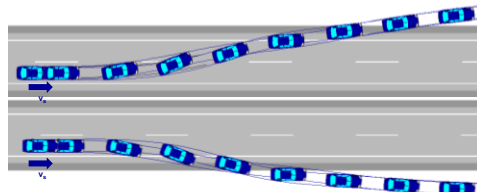
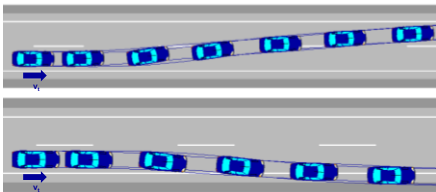


Avoidance of rear end collision (open loop)

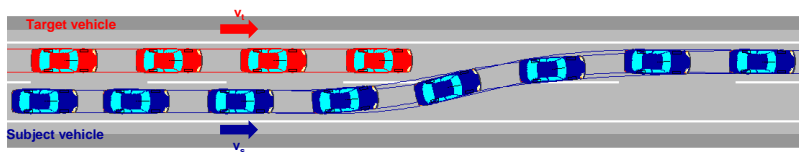
Avoidance of collision with transversally moving target (open loop)

Testing Protocols

Scenarios for Lateral Functionality



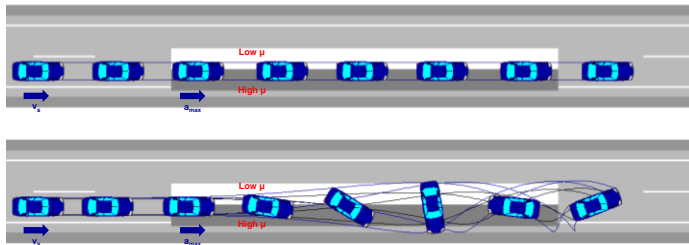
Avoidance of lane departure (open loop)



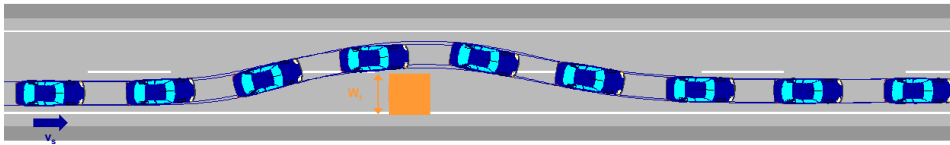
Avoidance of lane change collision (open loop)

Testing Protocols

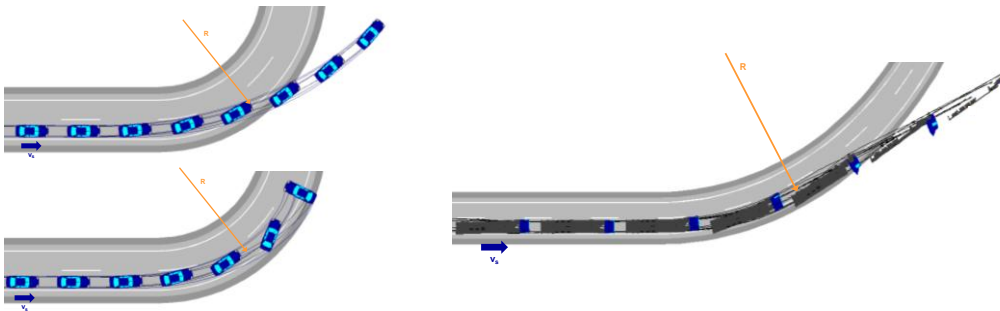
Scenarios for Stability Functionality



Emergency braking
on μ -split
(open and closed loop)



Obstacle avoidance
(open loop)



Highway exit
(open loop)

Testing Protocols

Safety Performance Indicators

Longitudinal Functionality

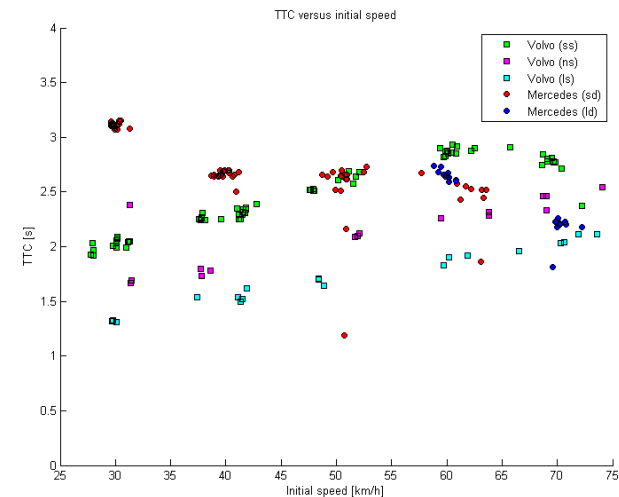
- Collision speed
- Time of warning (TTC)

Lateral Functionality

- Time of warning (TTC)
- Status of warning over time

Stability Functionality

- Equivalent deceleration
- Use of adherence
- Yaw rate
- Lateral displacement
- Steering wheel torque
- Relative Radius



Testing Protocols Validation Efforts



Partner	Test location	Duration	Test runs	Scenarios tested
VTI/SP/VTEC	Hällered Vårgårda Gothenburg Stora Holm	10 days	500	FCW static target/moving target/intersection LDW (open loop) Lane change collision Highway exit (open loop)
VTEC	Hällered	4 days	200	LDW (open loop)
IDIADA/Tecnalia	L'Albornar	10 days	60	LDW (open, closed loop)
CRF	Balocco	15 days	500	μ -split braking (open, closed loop)
IDIADA/VTEC	L'Albornar	10 days	40	Lane change collision
IDIADA	L'Albornar	15 days	350	μ -split braking (open, closed loop) Collision avoidance stability Highway exit (open loop)
IKA/SICK	Aachen	2 days	50	FCW static target/moving target
VTI	Papenburg	5 days	100	μ -split braking (open loop) Highway exit (open loop)
Sum		71 days	1,800	

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Summary & Outlook

- Objective test methods for active safety performance are highly needed and currently under development by different stakeholders.
- The eVALUE project presents a broad approach for the assessment of vehicles based on traffic scenarios and derived test methods.
- Major efforts need to be invested into every single test procedure in order to reach acceptance by all involved stakeholders.
- Further research is needed especially for the derivation of true safety indicators based on accident statistics.
- Discussion of the existing approaches should be open and free for all interested parties.

Thank you for your kind attention!

www.evalue-project.eu



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