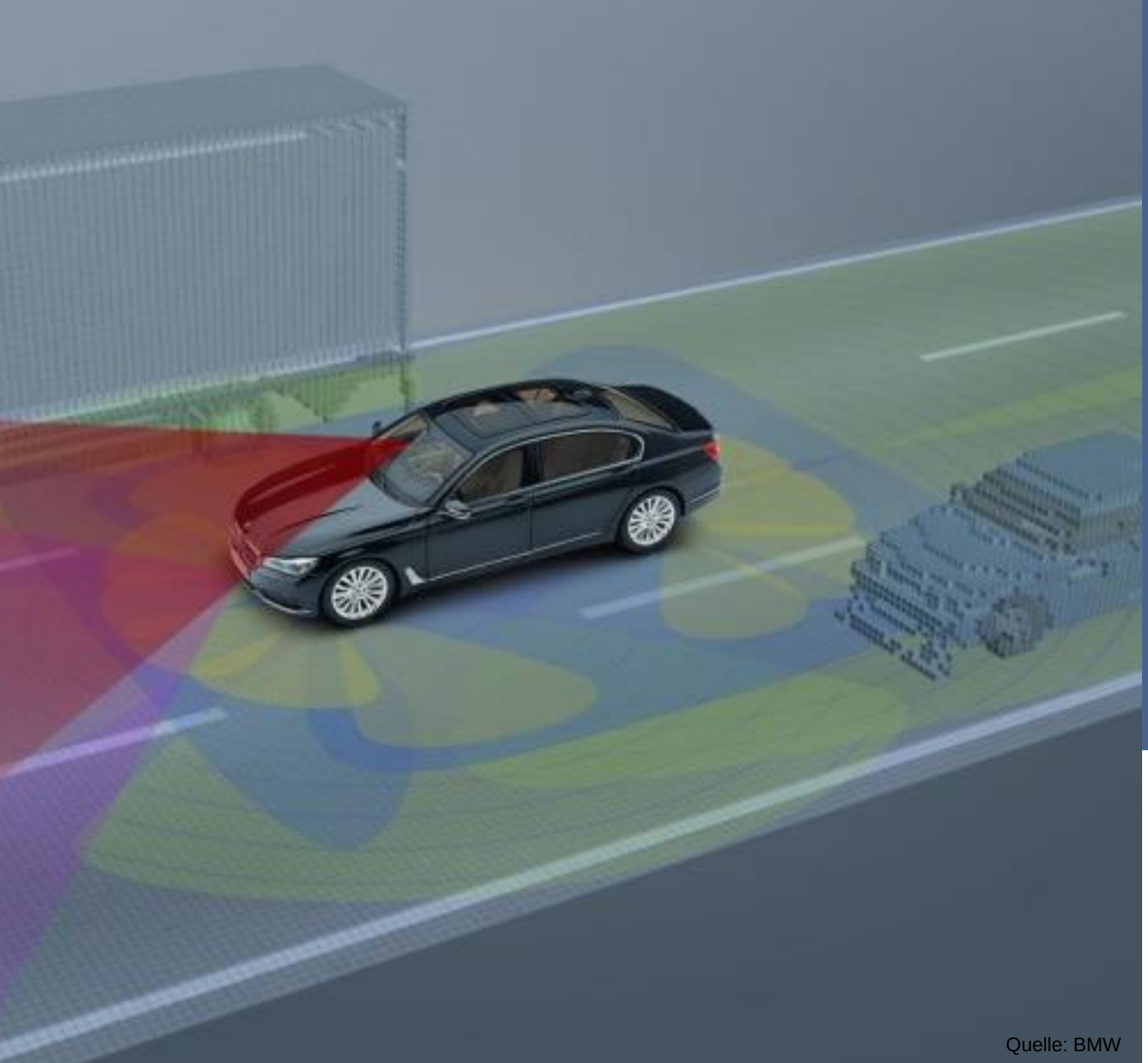


Quelle: BMW

AUTOMATED DRIVING FUNCTIONS

IMPACT POTENTIALS, CHALLENGES AND SOLUTIONS FROM THE POINT OF VIEW OF THE AZT

Dr. Johann Gwehenberger
Dr. Christoph Lauterwasser
Marcel Borrack
Melanie Kreutner

AZT Automotive GmbH

Allianz

CONTENT

ALLIANZ CENTER FOR TECHNOLOGY – ACCIDENT RESEARCH

Cooperation with OEMs and Suppliers

...

Research projects/ field tests/ queries / ADAS tests

- Research projects
- Mobileye field test
- AZT fleet

Market observation relating the development of safety systems

- Driver Assistance Systems
- Automated Driving
- C2x Communication

Scientific cooperation with Universities

- Diploma-, Bachelor-, Master-, Doctor Thesis's

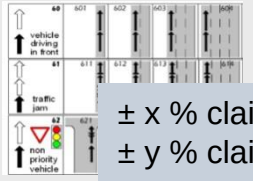
Development of in-depth claim data bases

- TPL claims
- MoD claims

Bodies and labor work

Potential and efficiency analyses of ADAS

- Support for the underwriting
- Risk evaluation

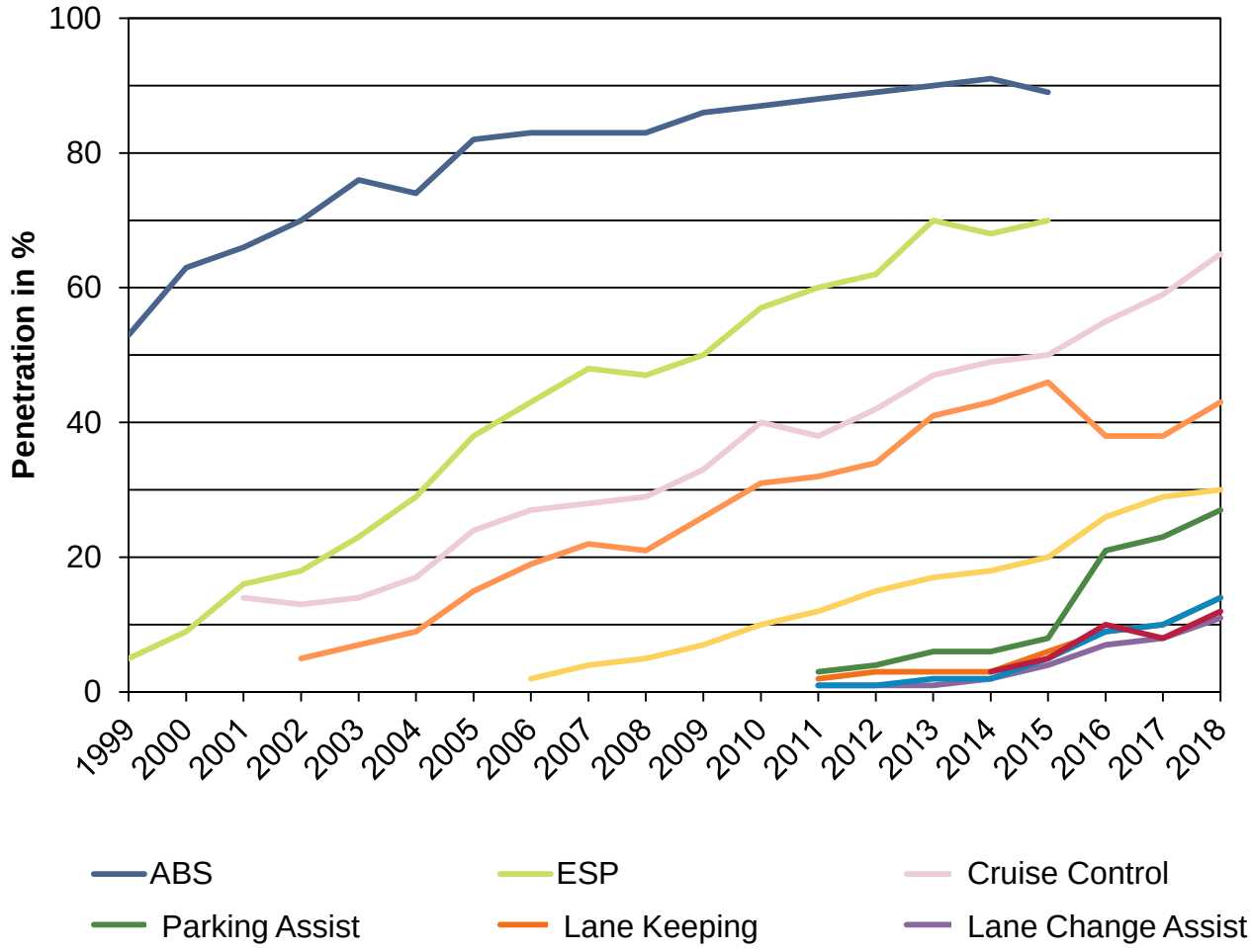


± x % claims
± y % claim costs

Education / presentation / knowledge transfer

- Internal courses for AZ experts
- Consulting of underwriting, claim department, actuaries
- Cooperation with Risk-Management for fleets

MARKET PENETRATION OF ADAS RELATED TO VEHICLE STOCK IN GERMANY

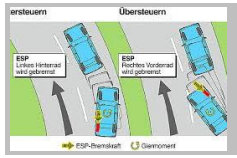
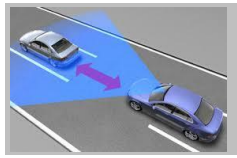
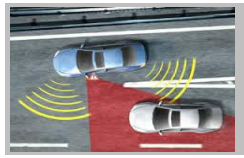
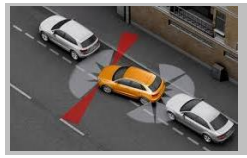


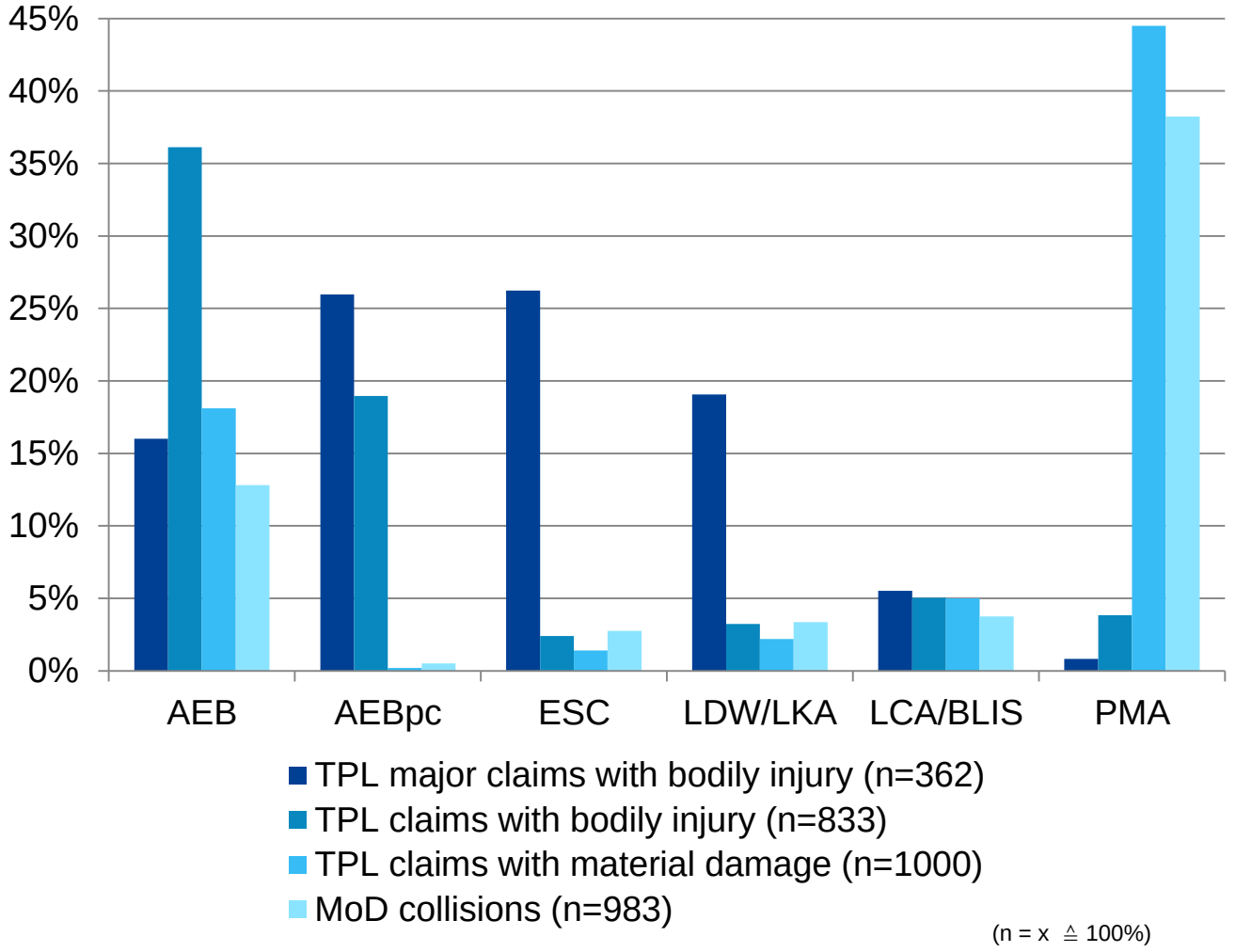
[DAT-Report, 2000-2019]

RELEVANCE OF ADAS

= **theoretical maximum** accident avoidance potential only for a perfect system!

Passenger car insurance claims

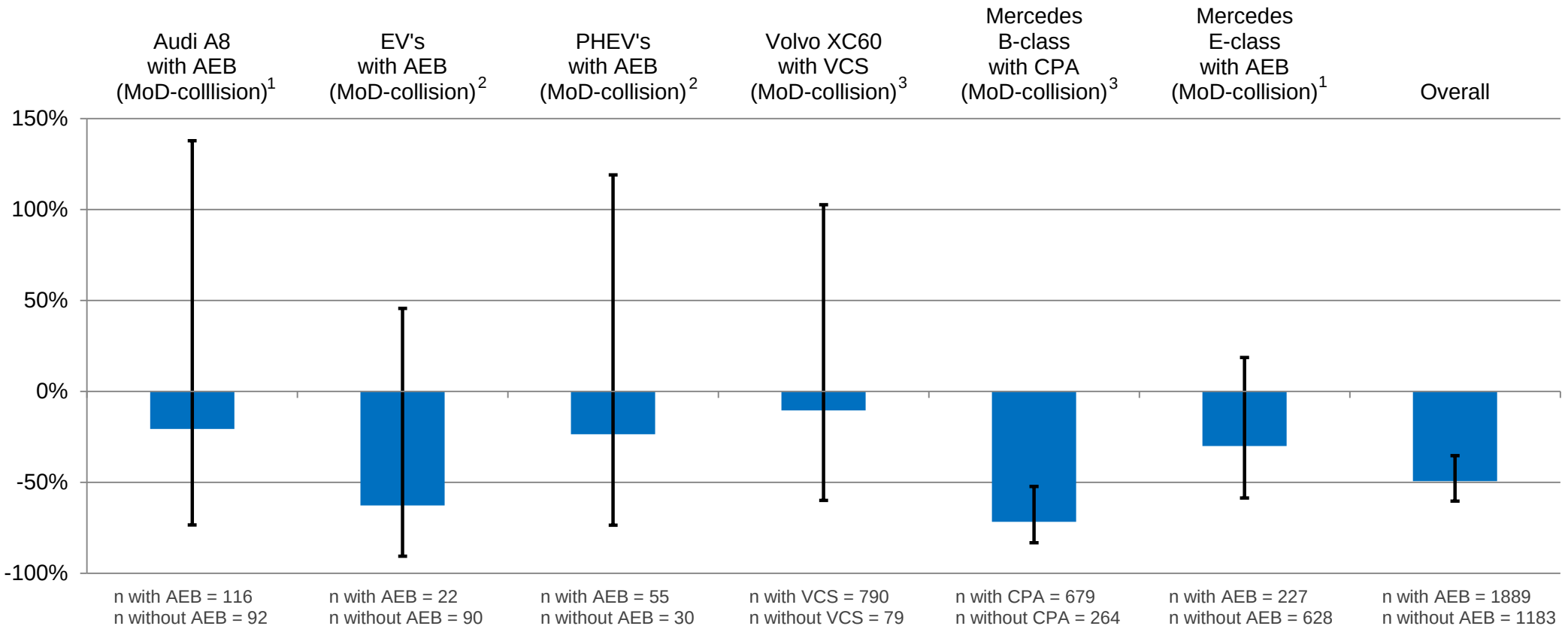
ESC		Electronic Stability Control
AEB		Autonomous Emergency Braking for Longitudinal Traffic ahead only
AEBpc		Autonomous Emergency Braking for Pedestrians and Cyclists ahead only
LDW/LKA		Lane Departure Warning Lane Keeping Assist
LCA/BLIS		Lane Change Assist Blind Spot Detection
PMA		Parking and Maneuvering Assist



(n = x ≙ 100%)

TPL: Third Party Liability
MoD: Motor own Damage

OVERVIEW OF EFFICIENCY STUDIES RELATING THE REDUCTION IN NUMBER OF REAR-END COLLISIONS DUE TO DIFFERENT CRASH AVOIDANCE SYSTEMS



Sources:
AZT-Studies 2016, 2017

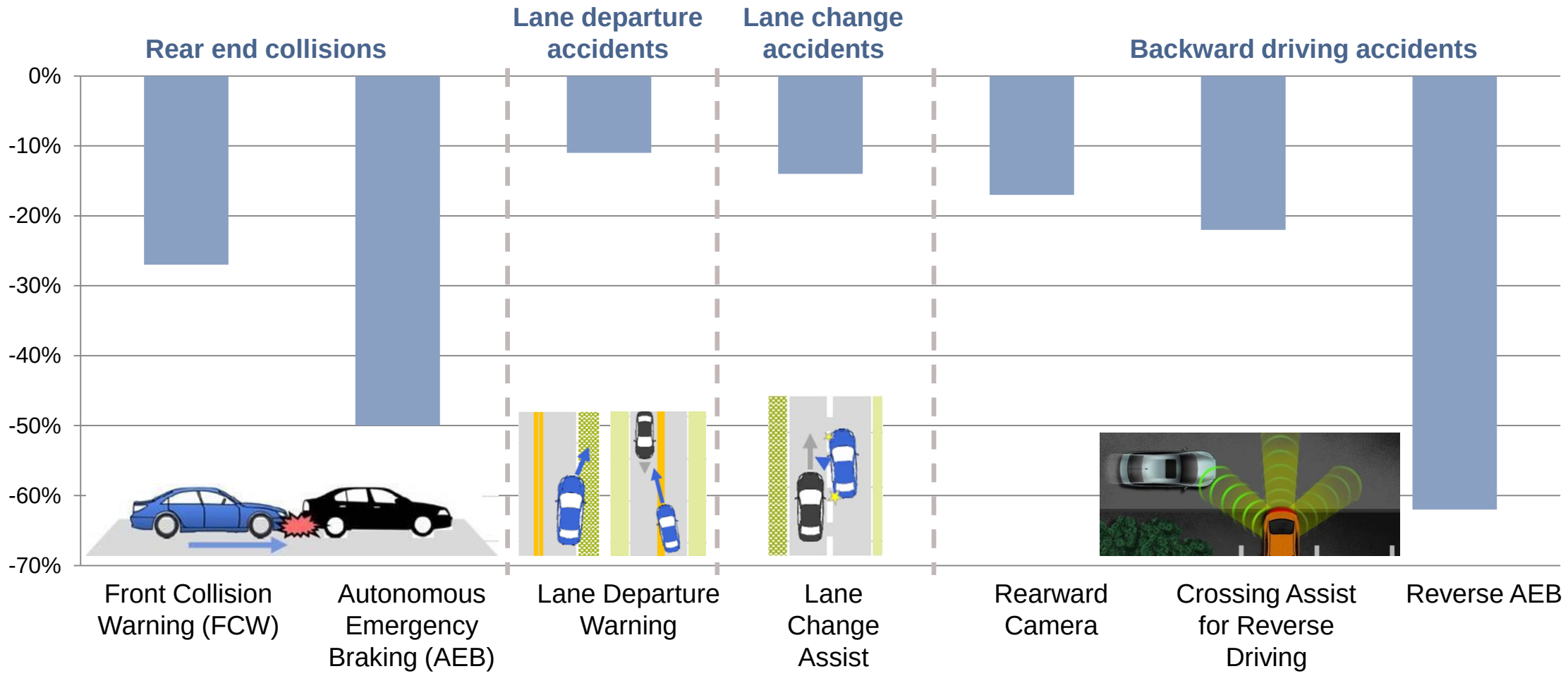
Abbreviations:
MoD: Motor own Damage
AEB: Autonomous Emergency Braking
EV: Electric-Vehicle
PHEV: Plug-In-Hybrid-Electric-Vehicle
CPA: Mercedes Collision Prevention Assist
VCS: Volvo City Safety

Note: A direct comparison or ranking between efficiency studies of different crash avoidance systems is not possible due to e.g. small sample sizes, different driver clientele, different baseline groups and different analysis methods.

[1] Comparison with the same vehicle model without system
[2] Comparison with EV's/PHEV's without system
[3] Comparison with vehicle models of same vehicle class without system

ADAS – Efficiency Study from IIHS in US

US: Frequency of relevant accidents decreases (comparison vehicle with/without ADAS)

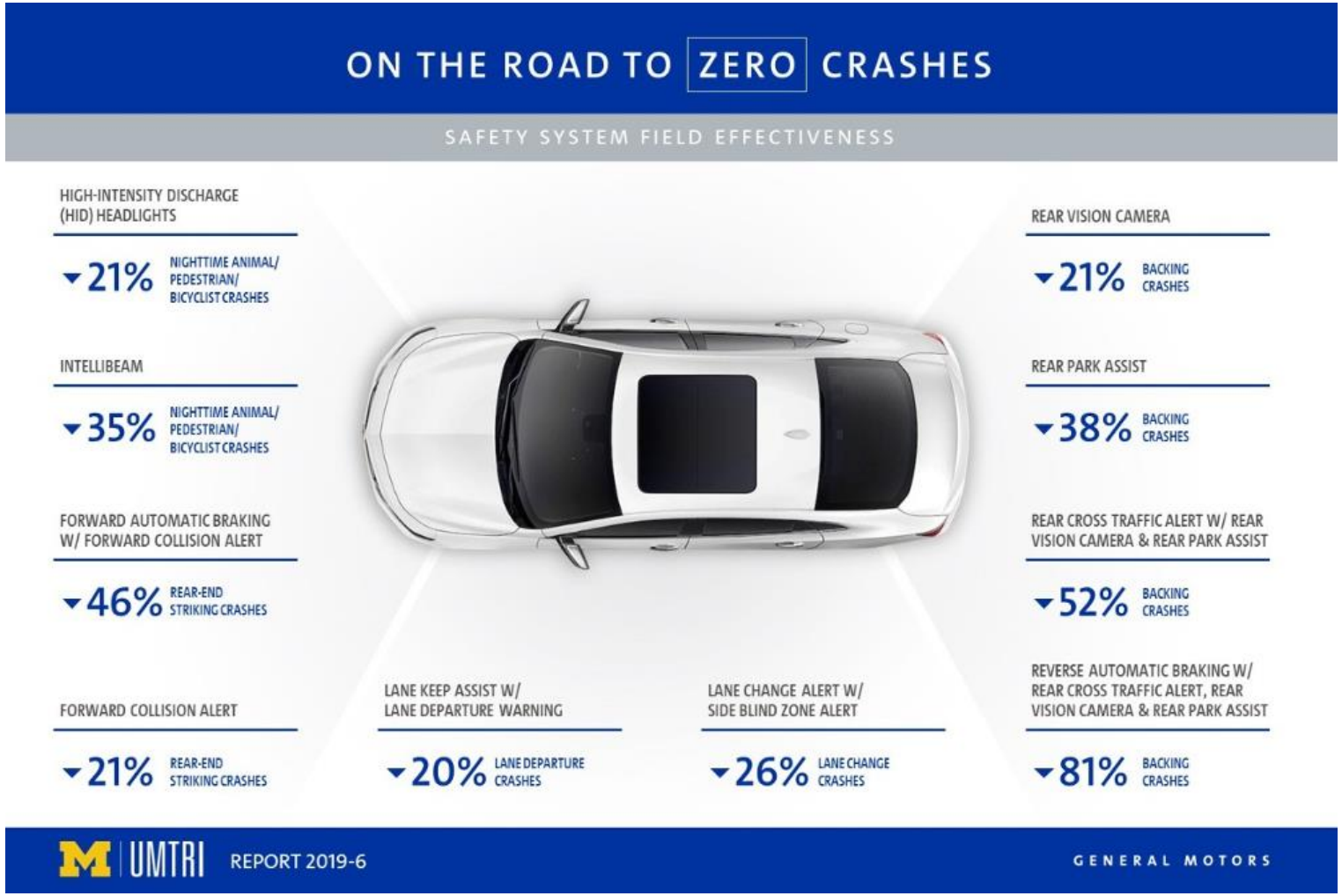


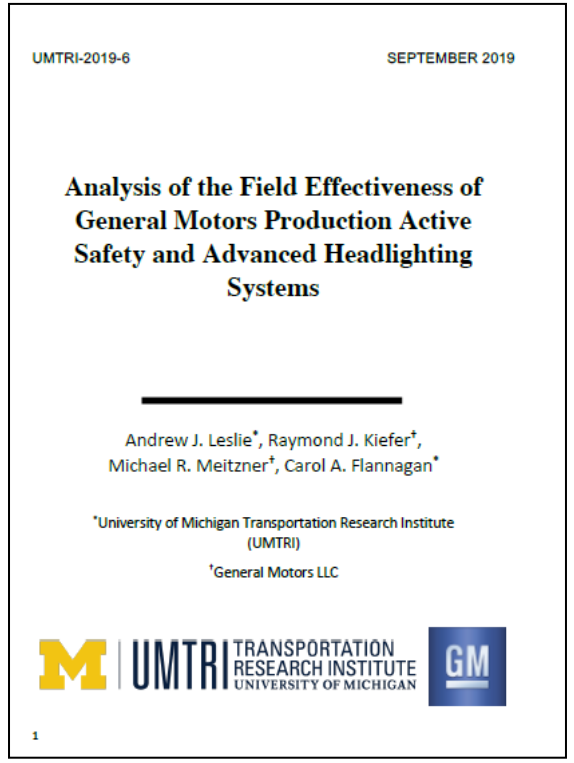
Database: police registered accidents and insurance claims in US

[IIHS, 2018]

ADAS – Efficiency Study from UMTRI/GM in US

Frequency of system relevant accidents decreases (comparison vehicle w/wo ADAS)




UMTRI-2019-6 SEPTEMBER 2019

Analysis of the Field Effectiveness of General Motors Production Active Safety and Advanced Headlighting Systems

Andrew J. Leslie*, Raymond J. Kiefer†, Michael R. Meitzner†, Carol A. Flannagan*

*University of Michigan Transportation Research Institute (UMTRI)

†General Motors LLC

UMTRI TRANSPORTATION RESEARCH INSTITUTE UNIVERSITY OF MICHIGAN GM

1

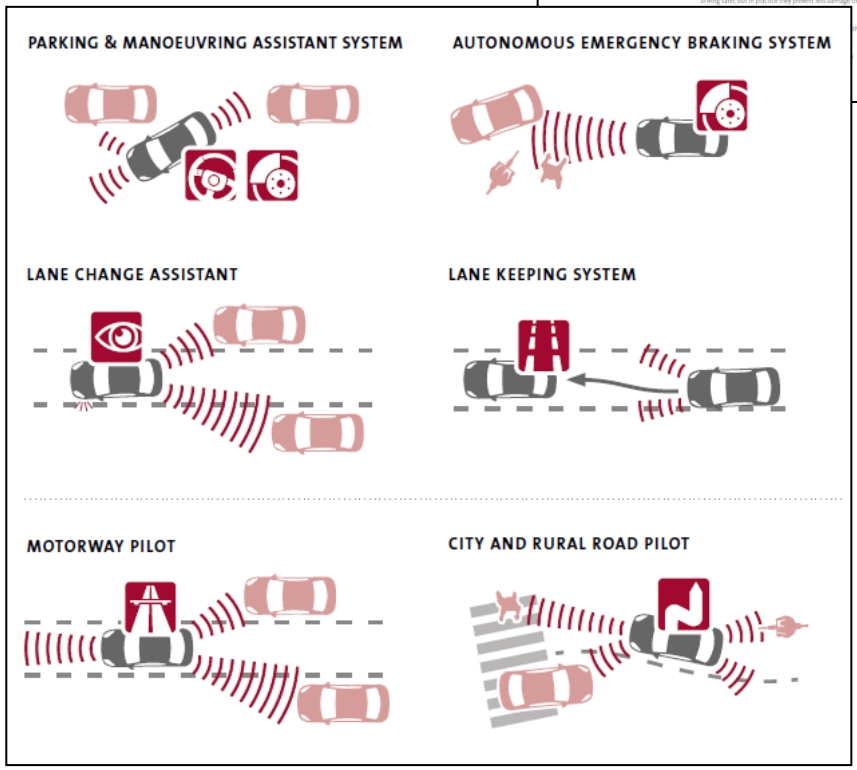
GDV-STUDY

02

GDV-STUDY “AUTOMATED DRIVING”

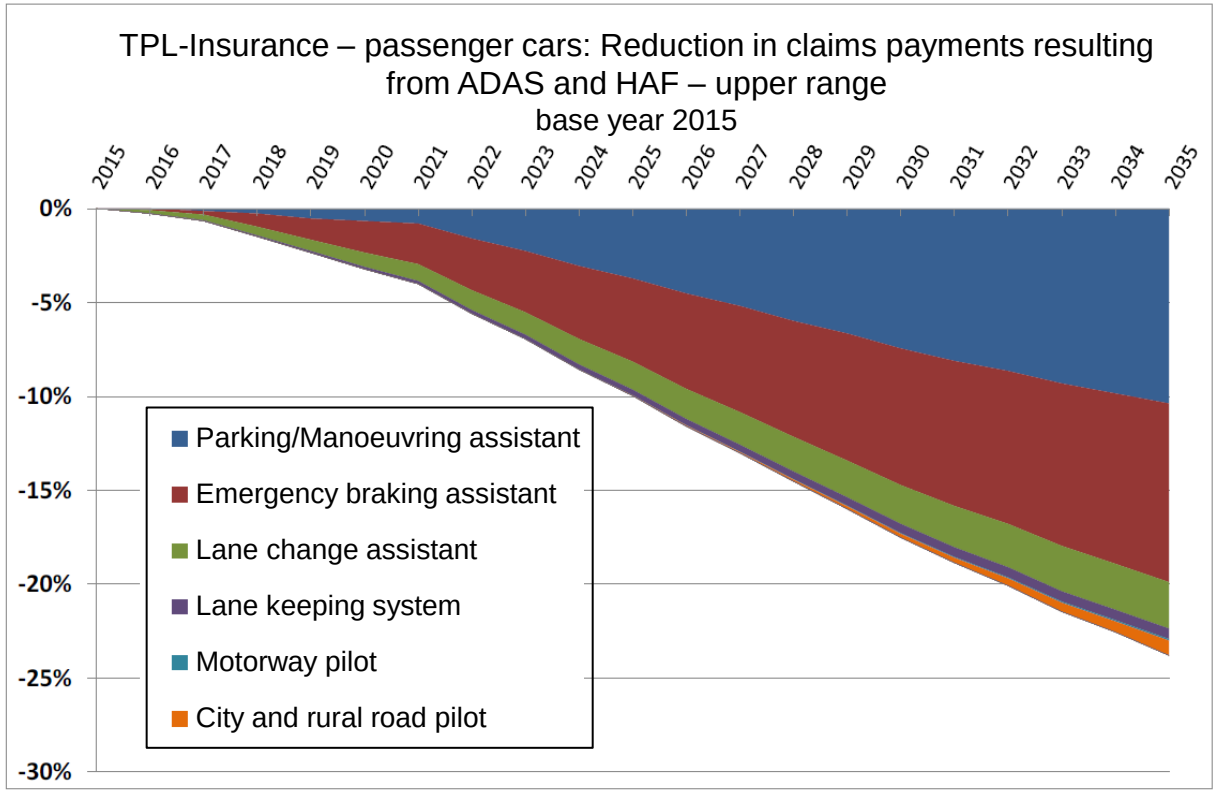
STATUS QUO, OBJECTIVES AND TASKS OF THE GDV WORK GROUP

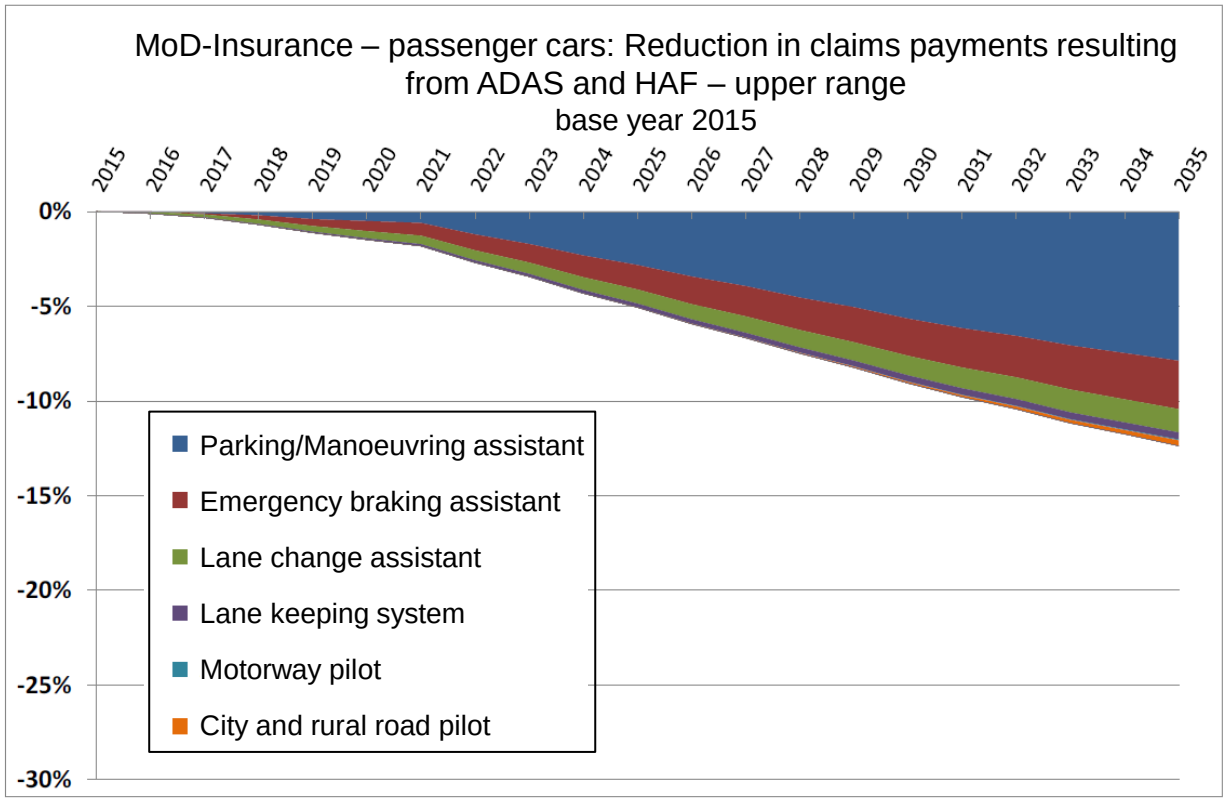
- Prognosis of the effectiveness of advanced driver assistance systems (ADAS) and highly automated driving functions (HAF) and impact on claims payments up to 2035
- Basis: Current research results of the Allianz Center for Technology (AZT) and the German Insurers Accident Research (UDV)
- Consideration of Motor Third Party Liability (TPL) and Motor own Damage (MoD) for passenger cars, trucks and buses
- Not all damages can be influenced by ADAS/HAF (e.g. limits of sensor technology, partial motor own damage losses: theft, hailstorm…)
- With HAF like motorway pilot only a small effect is to be expected, because only 4 % of TPL claims payments due to accidents on motorways



GDV-STUDY „AUTOMATED DRIVING“

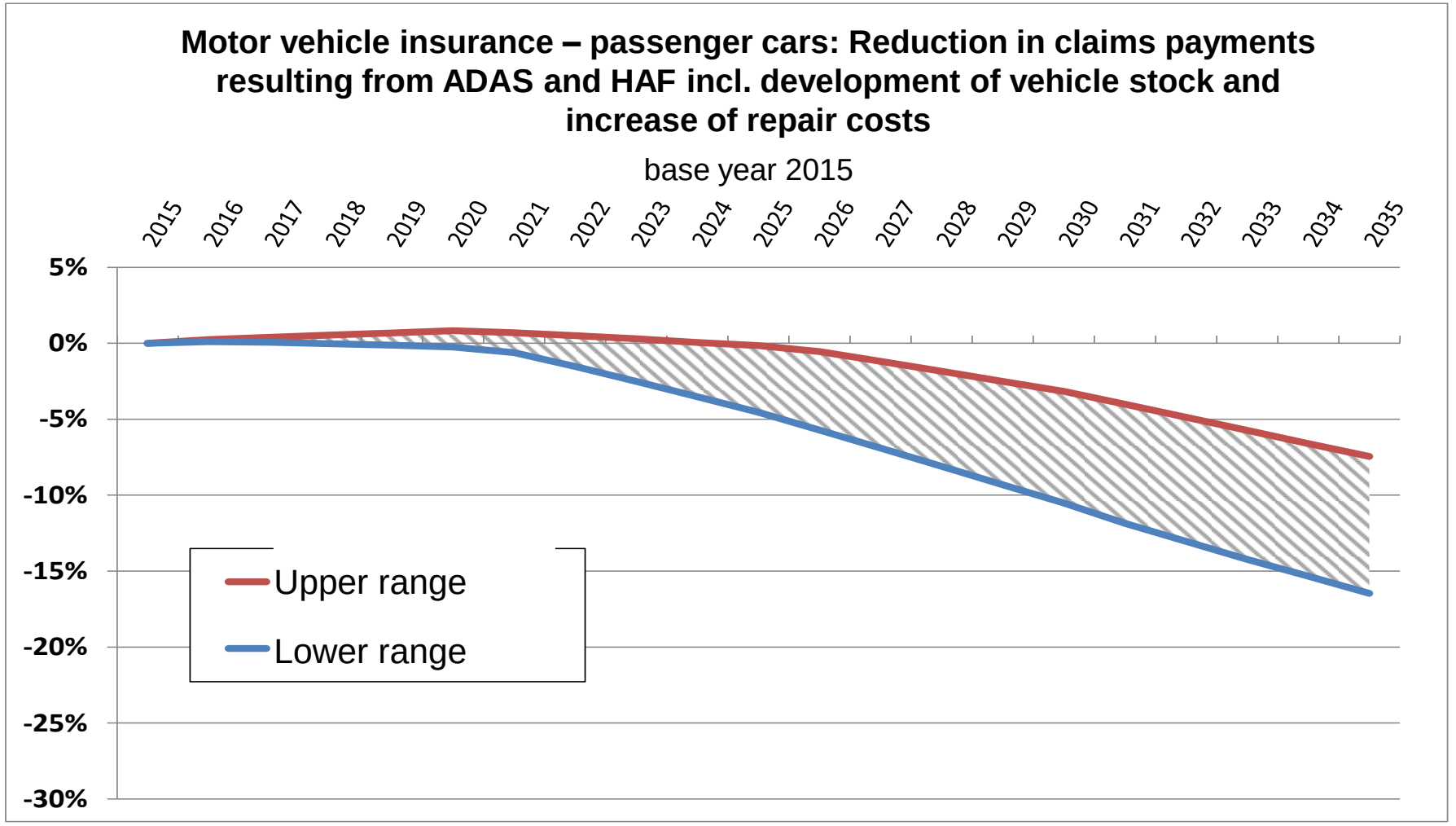
RESULTS AT A GLANCE





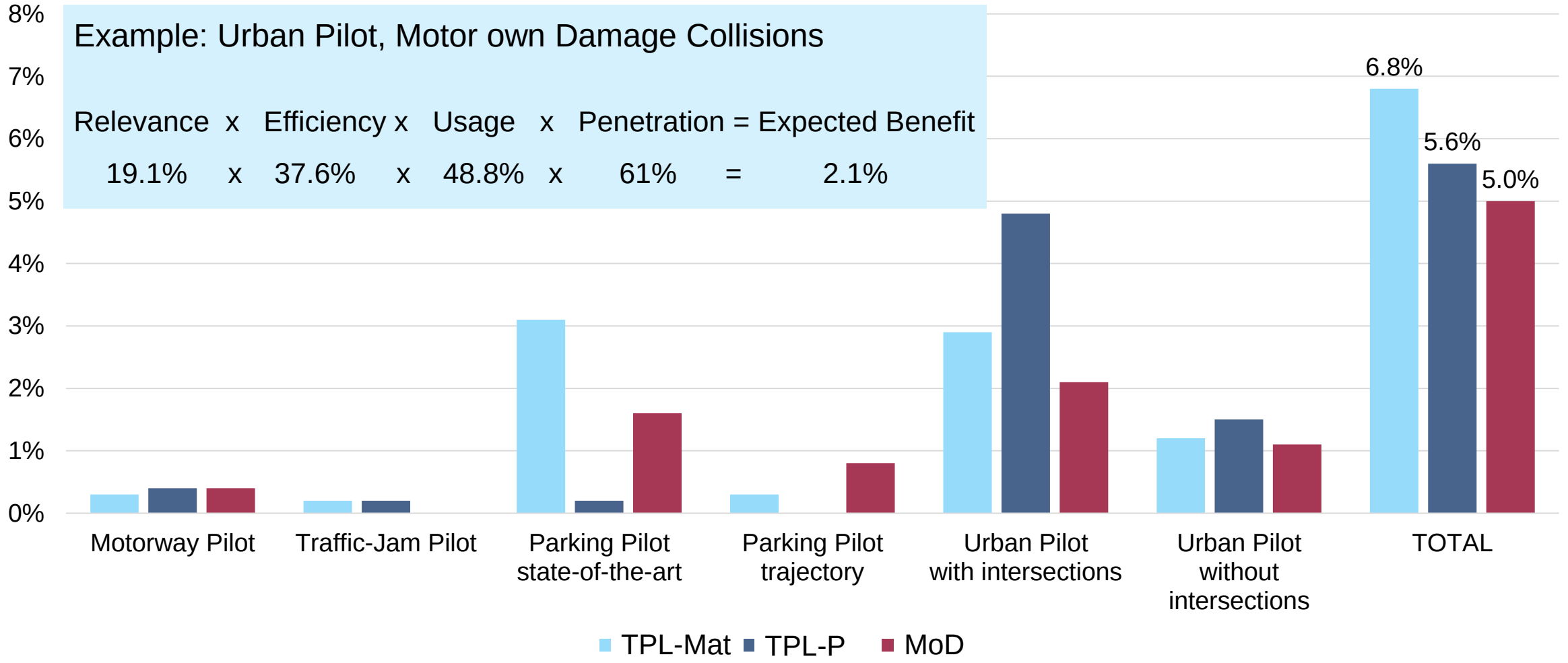
GDV-STUDY „AUTOMATED DRIVING“

RESULTS AT A GLANCE



EXPECTED BENEFIT OF L3+ FUNCTIONS

20 YEARS AFTER MARKET INTRODUCTION



Source: Ostermaier, AZT/TUM

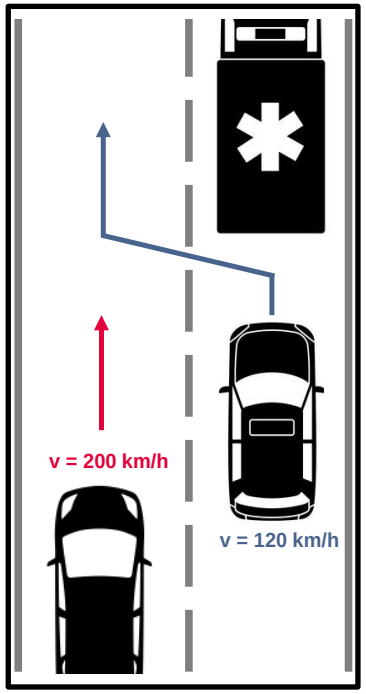
NEW CHALLENGES AND RISKS

03

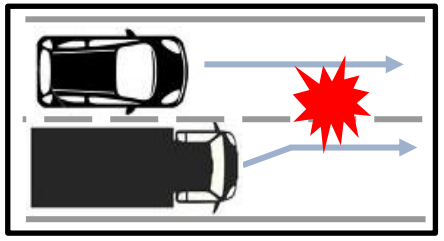
CRITICAL SCENARIOS

Transition of task

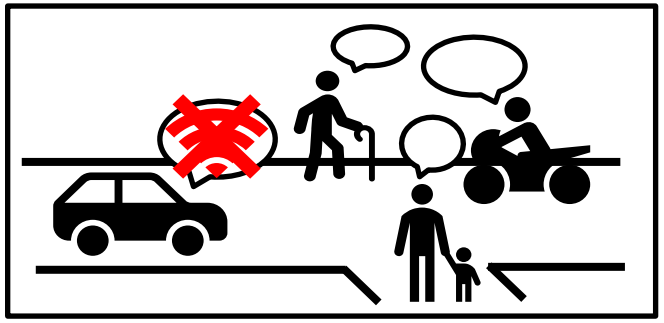
Lane change



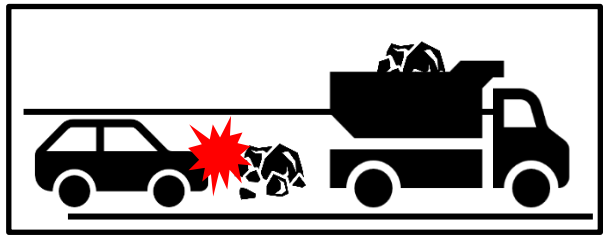
Transversely offset



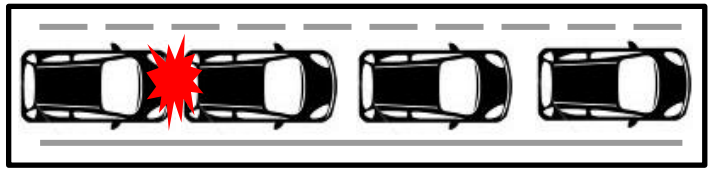
Interaction with traffic participants



Obstacle

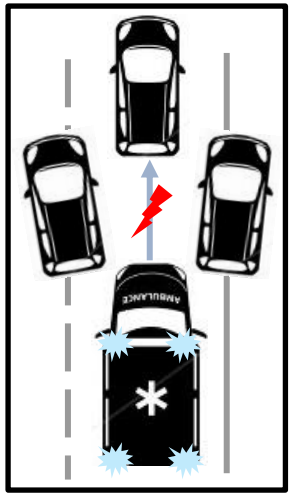


Convoy drive



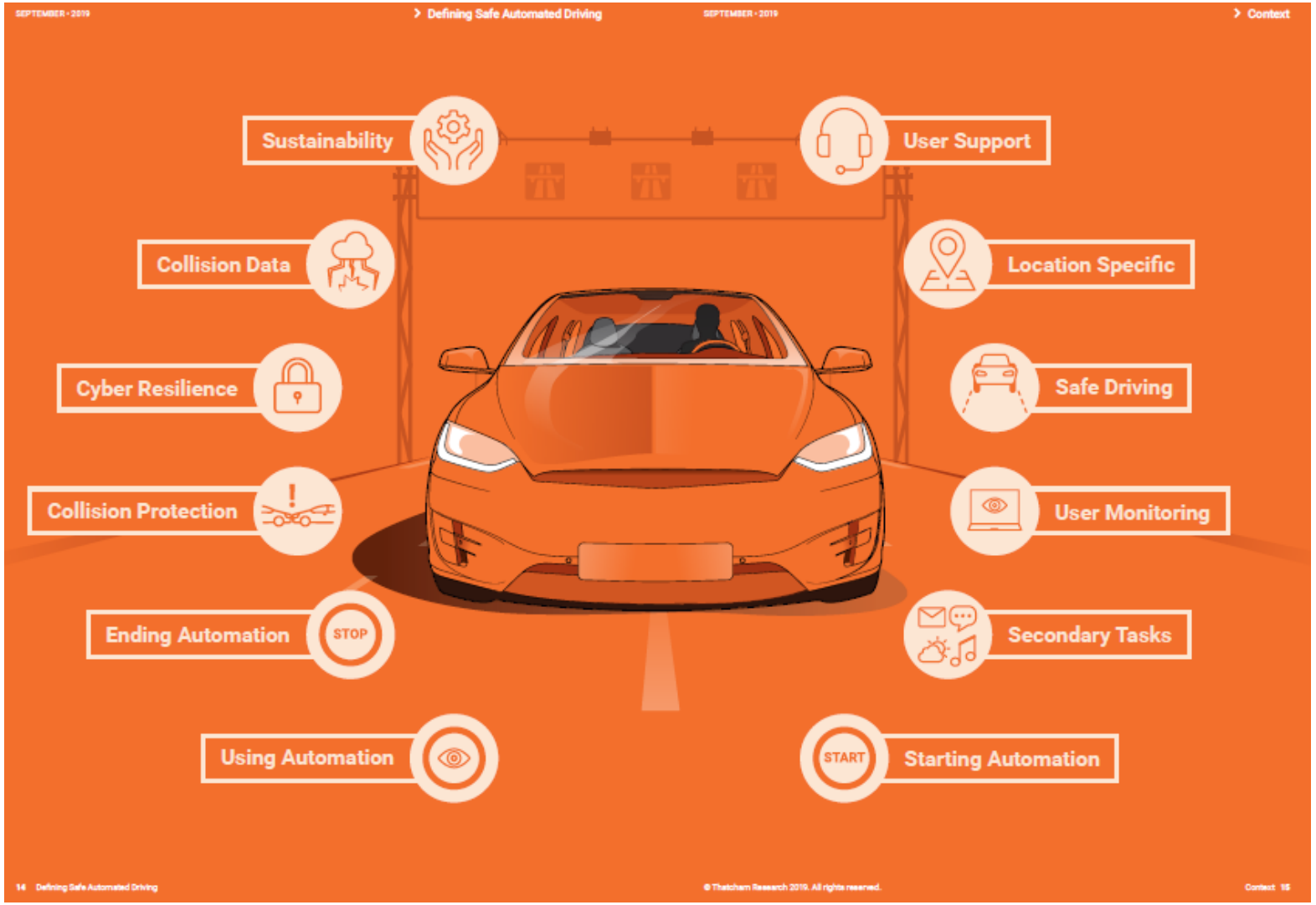
Environmental conditions

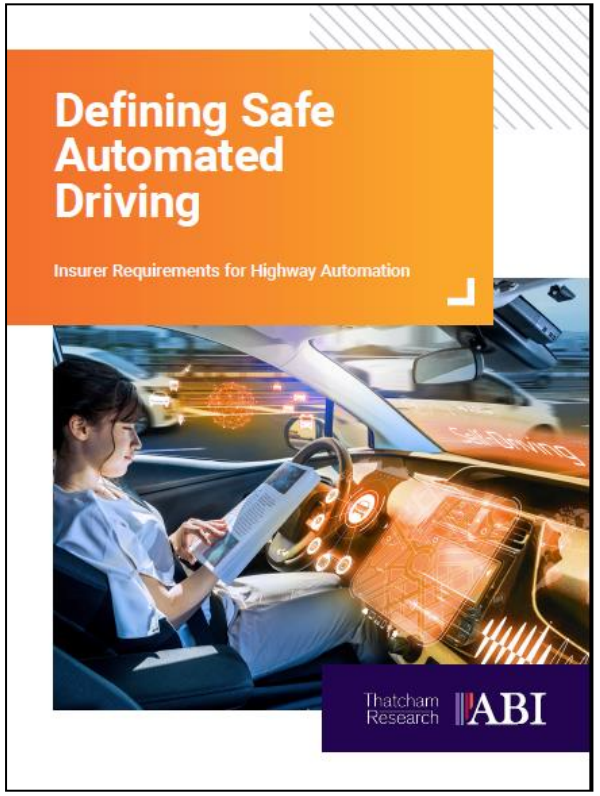
Rescue alley



(Workshop of August 22nd 2018)

KEY CRITERIA DEFINING SAFE AUTOMATED DRIVING



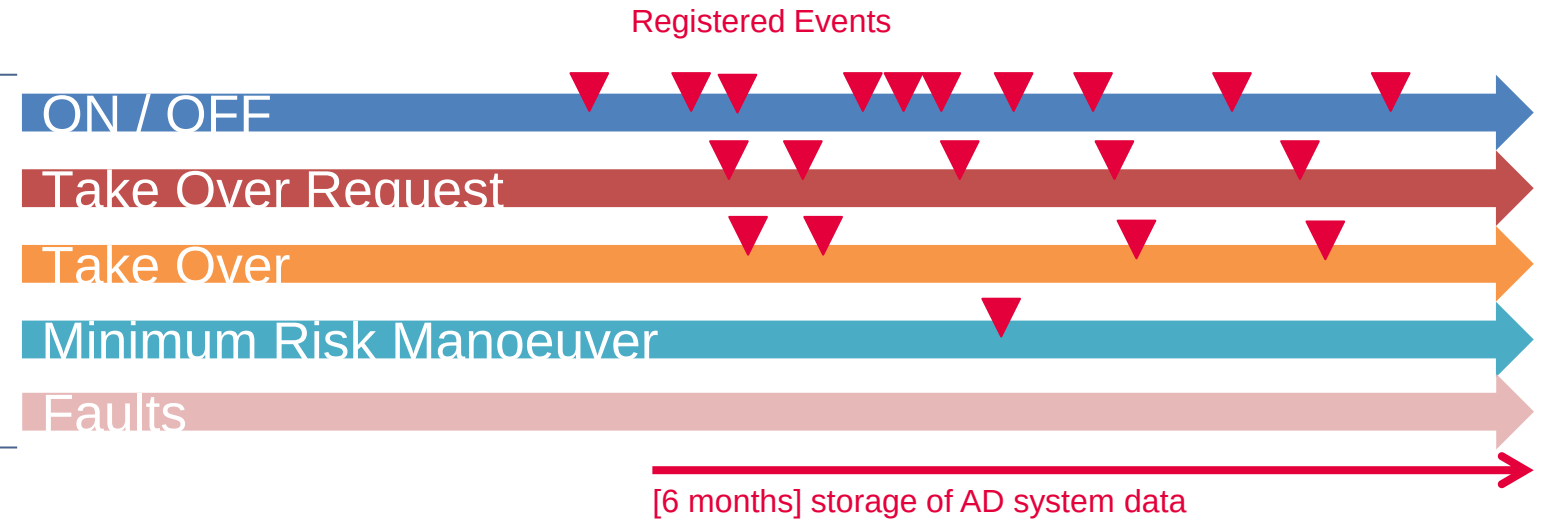


Source: Thatcham, ABI, Sept 2019

DSSAD versus EDR

DSSAD

AD system data

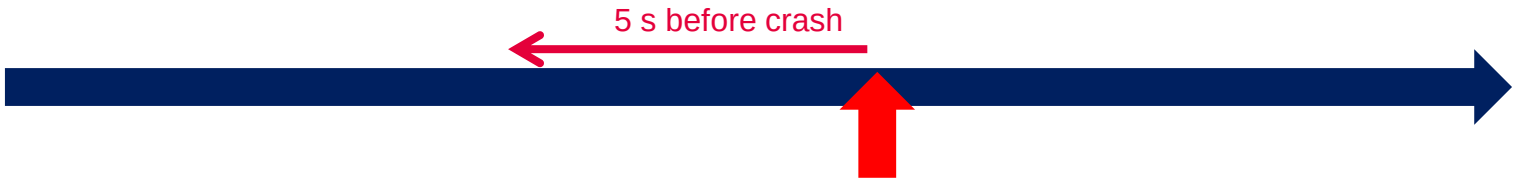


Goal:

Responsibility?

EDR

Detailed Event data



Accident Analysis

AHEAD

AGGREGATED HOMOLOGATION-PROPOSAL FOR EVENT-RECORDER-DATA FOR AUTOMATED DRIVING

- Definition and **proposal of data elements for AD** from a technical perspective
- Discuss and define necessary framework
  - expertise needed for **INTERPRETATION** of data
  - accuracy & precision of data
  - technical protection of data
- Based on claims experience, accident research and joint crash tests
- Considering various stakeholder needs
  - including drivers & keepers of vehicles, experts, accident analysts, regulator, periodical technical inspection, insurance industry
- Basis work for individual publications and individual position papers

Core Group:

CARISSMA Automotive Safety Research

DEKRA

Allianz

Continental

AXA.ch

Extended Group:

ADAC

EVU EUROPÄISCHE VEREINIGUNG FÜR UNFALLFORSCHUNG UND UNFALLANALYSE E.V.

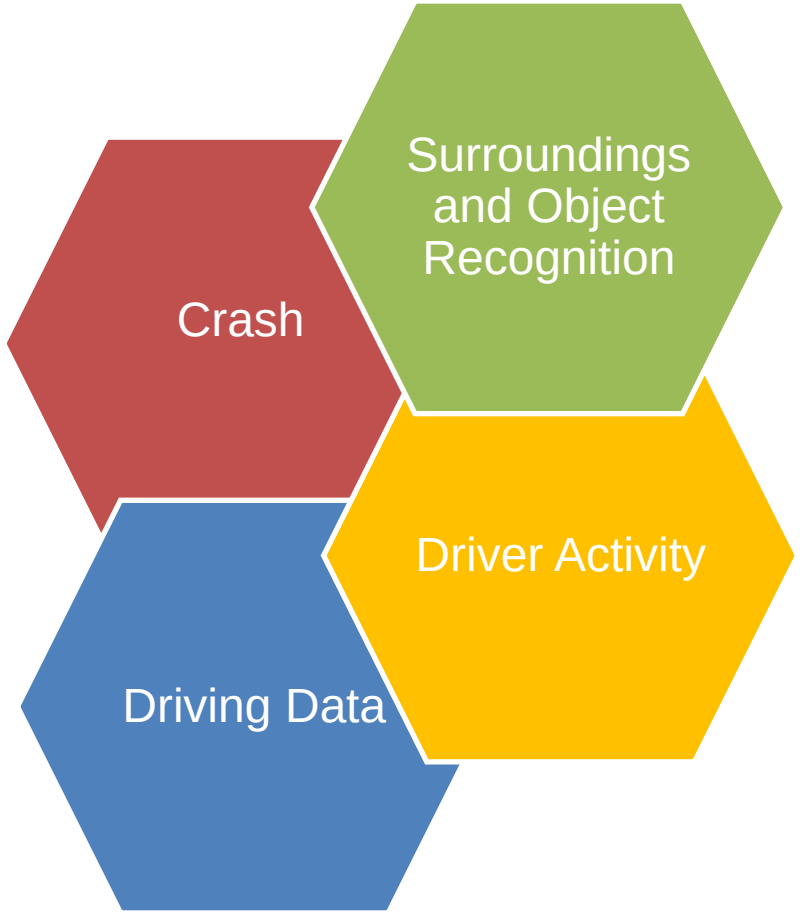
FSD Zentrale Stelle

KAST Kast GmbH

ProDigi Nordrhein-Westfalen Sicherung digitaler Fahrzeugspuren zur Verkehrsunfallaufnahme durch die Polizei NRW

AHEAD DATA MODEL

Subdivision of the data elements in 4 standardized categories:



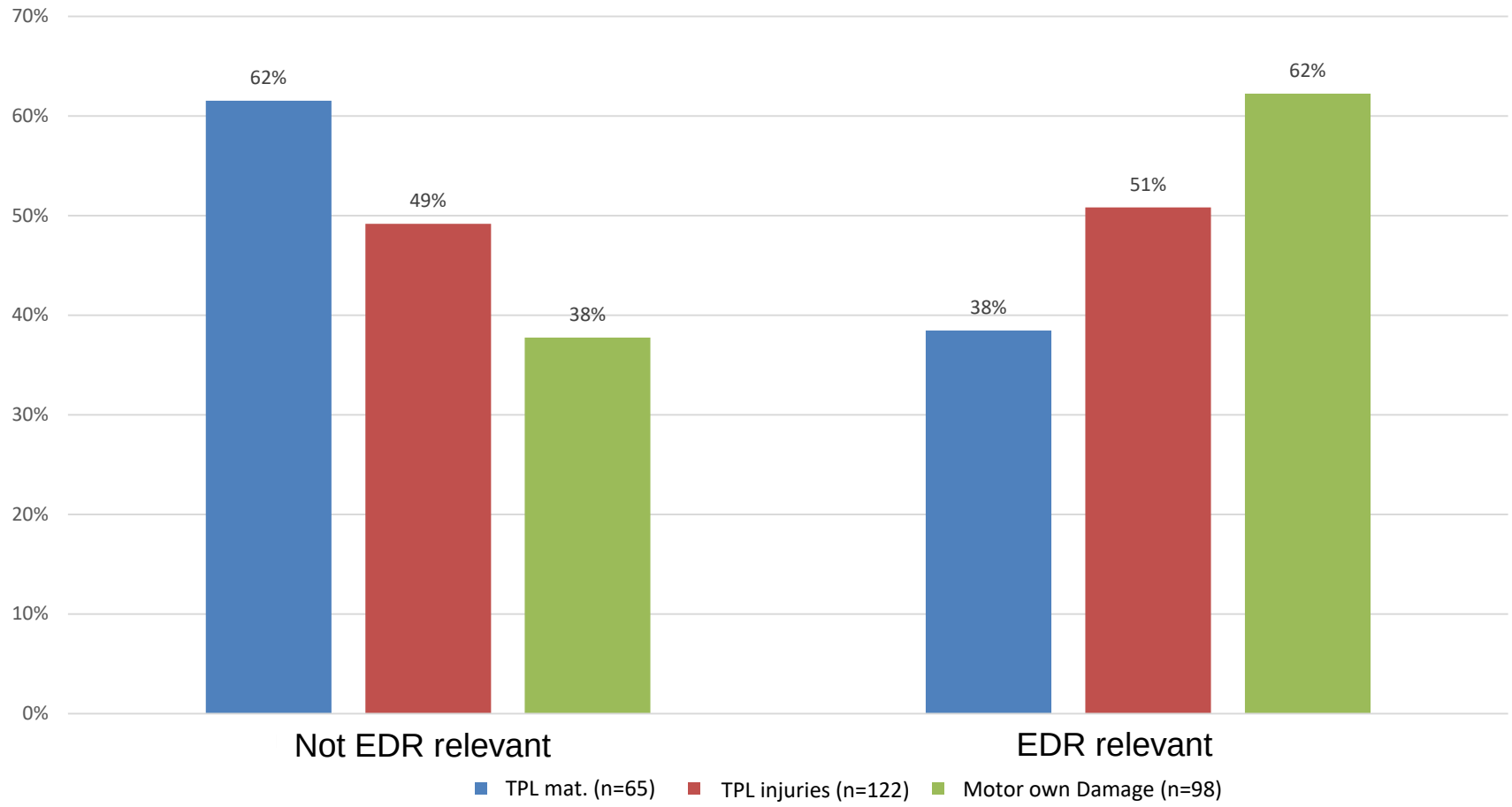
Date, Timestamp, Location, Acceleration, Collision Speed, Seat Belt Status, Airbag, Restraint System…

Video feeds from front and rear-facing cameras, Sensor Data, Classified Objects, Object Position, Object Direction, Object Speed, Calculated Movement…

Steering, Seat Position, Pedal Positions, Driver Alertness…

Vehicle Status, Operation Mode (e.g. manual, autonomous, remotely controlled), Speed, Yaw Angle, DTC …

RELEVANCE OF EDR ON MOTORWAYS



Source: Bachelor Thesis Oliver Braxmeier, 2019

EDR DETECTION RATE ON MOTORWAYS - 8 LEVELS OF DETECTION

EDR Level 1
- Surrounding with 360° cameras and sensors
- Driver monitoring with cameras und sensors
- Driving data and crash data

EDR Level 2
- Surrounding with 360° cameras and sensors (front/back)
- Driver monitoring with cameras und sensors
- Driving data and crash data

EDR Level 3
- Surrounding with sensors
- Driver monitoring with cameras und sensors
- Driving data and crash data

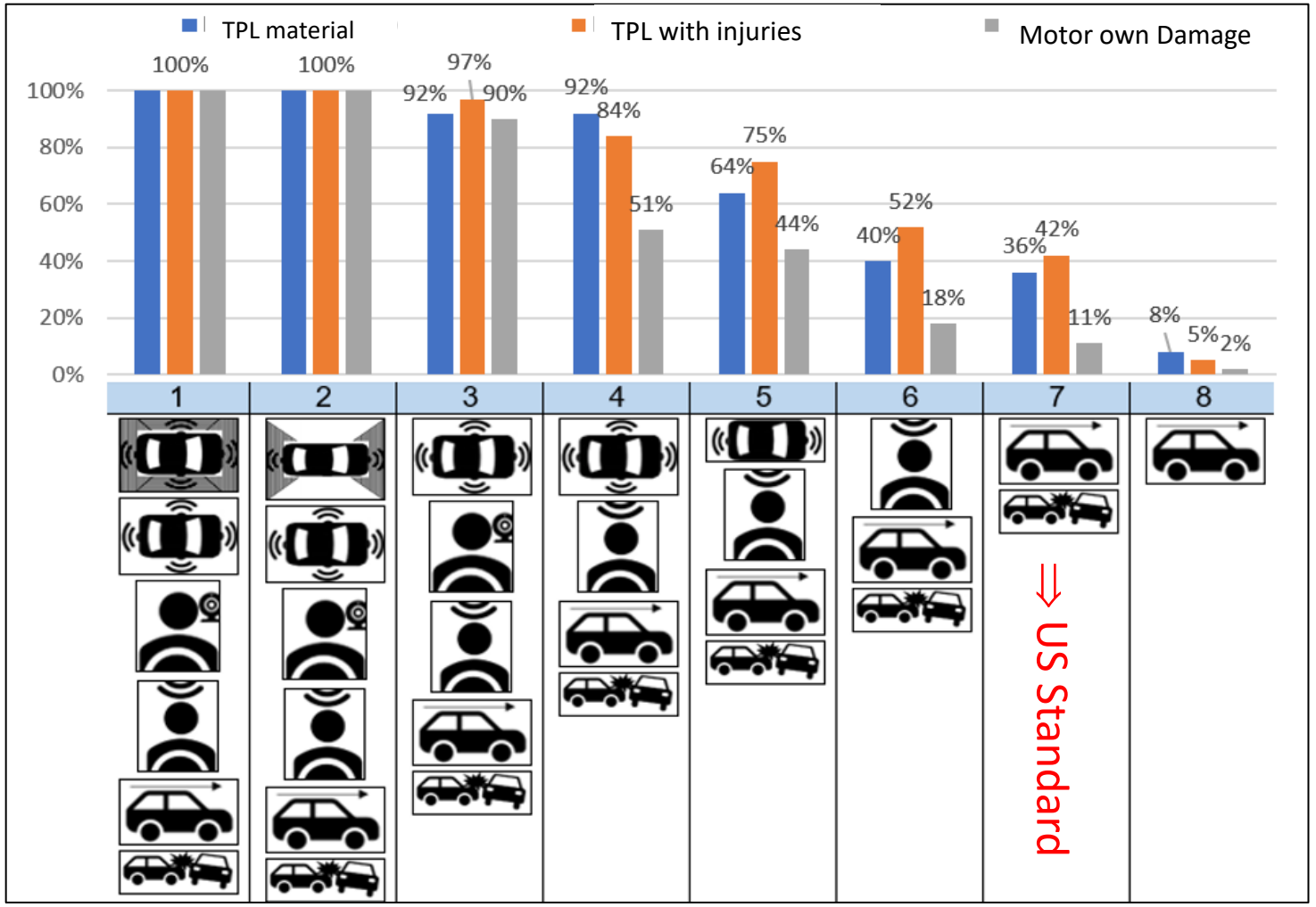
EDR Level 4
- Surrounding with sensors
- Driver monitoring with sensors
- Driving data and crash data

EDR Level 5
- Surrounding with sensors (front/back)
- Driver monitoring with sensors
- Driving data and crash data

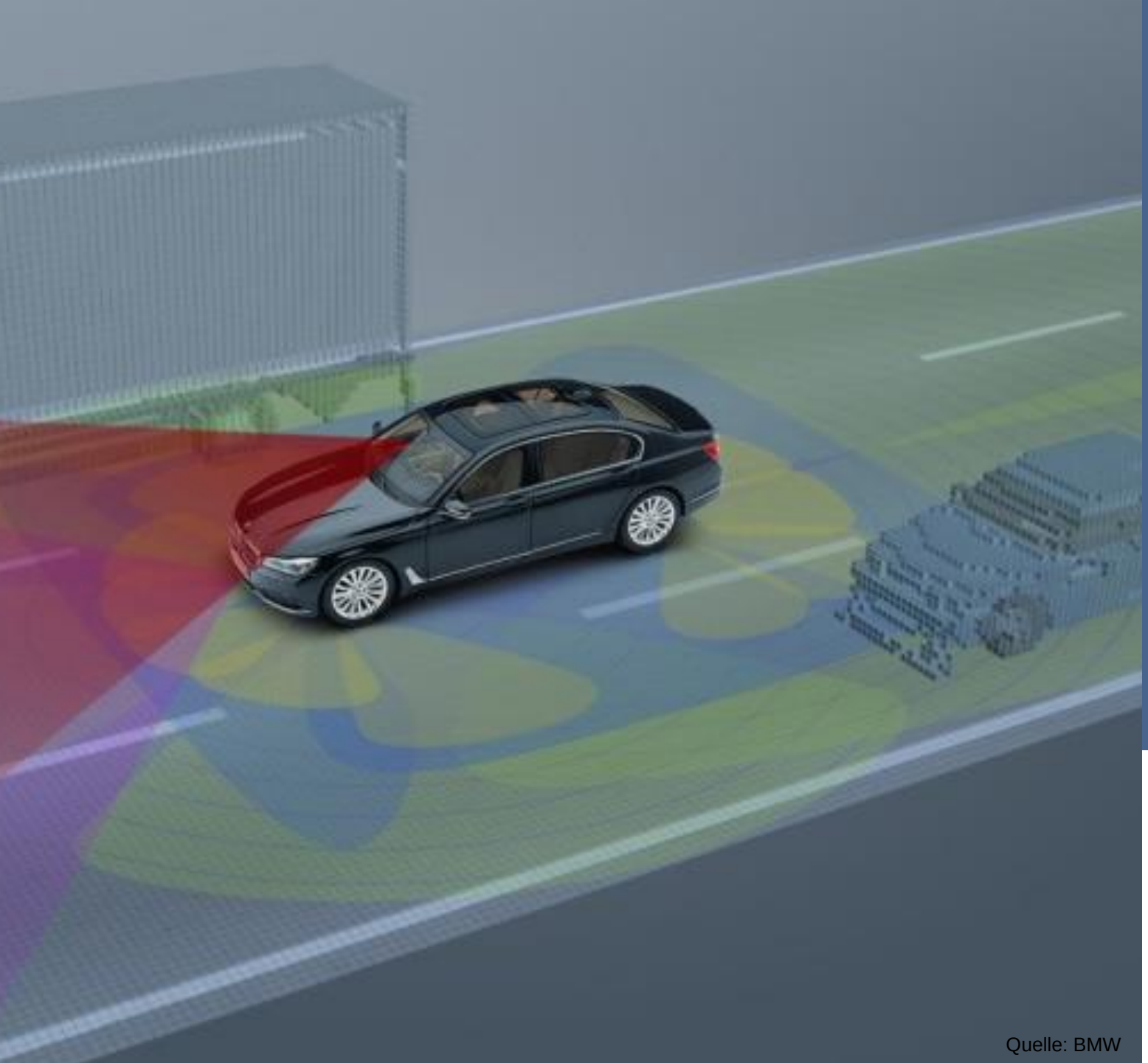
EDR Level 6
- Driver monitoring with sensors
- Driving data and crash data

EDR Level 7
- Driving data and crash data

EDR Level 8
- Driving data



Source: Bachelor Thesis Oliver Braxmeier, 2019

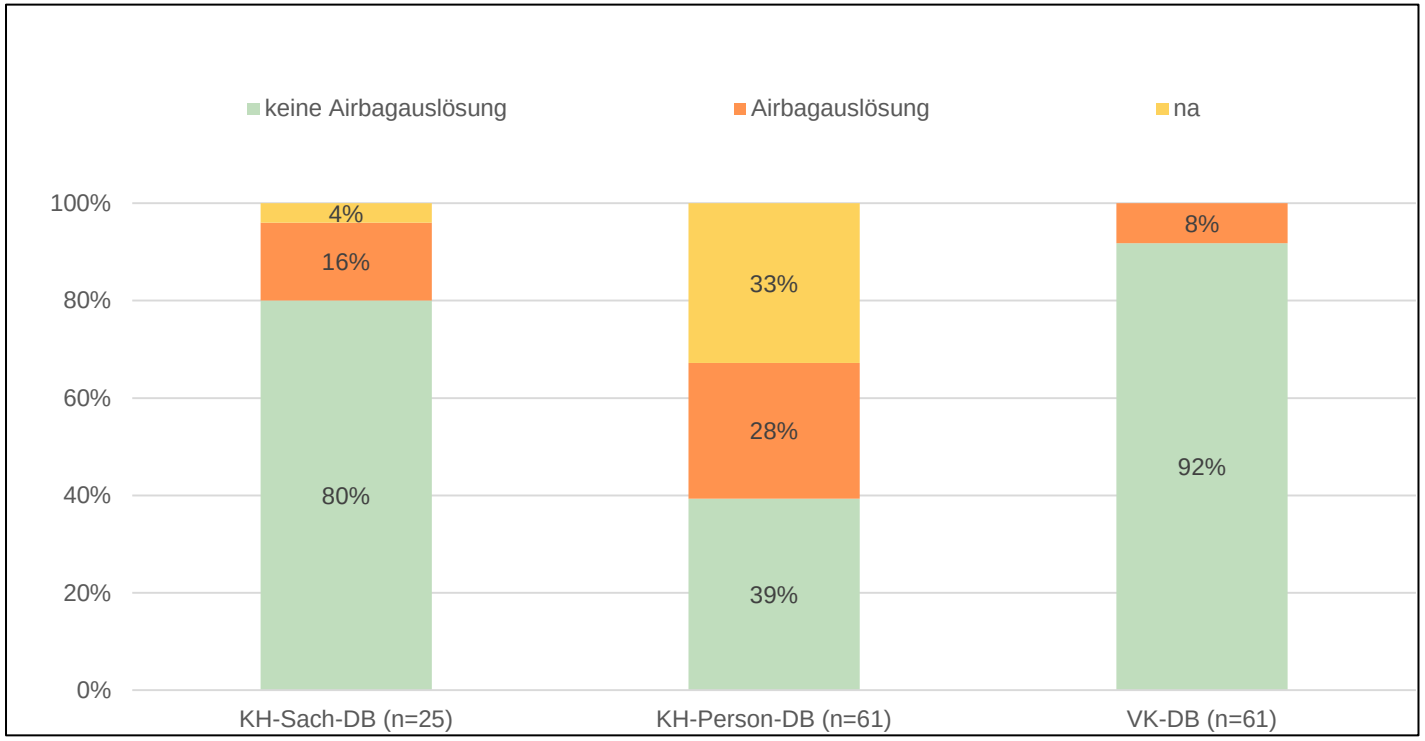


Quelle: BMW

THANK YOU FOR YOUR ATTENTION!

Allianz

TRIGGER-METHODE AIRBAG



→Die Merkmalverteilung lässt die Aussage zu, dass eine Airbagauslösung nicht als (einziger) EDR-Trigger ausreichen kann.