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| 9:00 a.m.| ORAL ONLY   | Opening Keynote: ADAS, Automated Cars and Their Contribution to Vision Zero  
Anders Lie, Swedish Transport Administration |
| 9:30 a.m.| ORAL ONLY   | Overview of test methods for ADAS and automated driving  
The market introduction of advanced driver assistance systems (ADAS) in the late 1990 also required the development and application of test methods and test tools for ADAS functions and its components. Especially the environmental perceptions by means of radar, lidar and camera sensors and the interaction of the functions with the driver (e.g. warning systems or automation level 1 systems like ACC or LKA). Today, automation level 2 systems are available on the market pushing for higher automation levels. For systems up to level 2 test and evaluation frameworks have been developed and established using a variety of test tools and protocols are available. Vehicle automation with regard to automation level 3, 4 and even 5 is under research and new test and evaluation methods are required and under development.  
The presentation provides an overview of available test methods and tools for ADAS according to the state of the art and an outlook on current research approached for test and evaluation of automated driving functions. The content will focus on technical (controlled field tests including V2X, FOT/NDS and test tools) and user related evaluation (driving simulator). Examples for the evaluation in terms of content and applied methods will be given based on automated driving research activities in Germany like the PEGASUS project and on European level like AdaptIVe and a new Horizon2020 ART-02 project initiative (pilot for automated driving with about 100 vehicles driving on European roads). In this context issues like necessary test amount, data collection and useful combination of methods are presented and discussed.  
Adrian Zlocki, FKA GmbH |
| 10:00 a.m.|             | BREAK                                                                 |
| 10:30 a.m.| ORAL ONLY   | EU Project AdaptIVe: Demonstrating Automated Driving Functions on a European Level  
Ageing populations, reducing CO2 emissions and improving road safety are the main drivers for developing new driver assistance systems. Now after introducing a number of these solutions to the market, AdaptIVe is taking the next step toward the development of automated driving applications for daily traffic while considering the needs of new generations of drivers. With the AdaptIVe applications, vehicles will react more effectively to external threats, will be resilient to different types of human and machine errors and dynamically adapt the level of automation according to the current situation.  
Prasant Narula, Delphi Deutschland GmbH |
| 11:00 a.m.| ORAL ONLY   | Federal and State Laws - Effecting How Systems Are Used by OEMs  
Jonathan Weinberger, Alliance of Automobile Manufacturers Inc. |
11:30 a.m.  ORAL ONLY  Automated driving: Regulations and possible safety benefits
Ulrich Veh, BMW Group

1:30 p.m.  ORAL ONLY  Development of a Cyclist Target and Test Setup for the Evaluation of Cyclist-AEB System
Avoidance or mitigation of cyclist-car accidents are of increasing relevance for reduction of fatalities and serious injured amongst road users. This has also been recognized by Euro NCAP, which will include the assessment of cyclist-AEB systems from 2018 onwards in its star rating.
Sjef Montfort, TNO

2:00 p.m.  ORAL ONLY  Vehicle to Bicyclist Test Scenarios and Surrogate Test Target Development from U.S Data
This presentation describes the development of test scenarios and a bicyclist on top of a bicycle test surrogate that could be used for bicyclist detection system evaluation. The test scenarios were developed using bicyclist crash data from NHTSA's General Estimate System (GES), Fatality Analysis Reporting System (FARS), and analysis of 110-Car naturalistic driving data collected using video data recorders as part of this project. The 77GHz mm wave radar reflection characteristics of eight different bikes sold in US and riders on top of the bikes were measured in a lab using radar scanning and that data was used to build the surrogate. The shape and articulated motion of real bicyclists were analyzed from naturalistic driving data to measure the frequency and type of pedaling motion for designing the surrogate. Finally, the performance of the surrogate with respect to detectability and durability was tested in a test track using a test vehicle equipped with bicyclist detection system.
Rini Sherony, Toyota Motor Corporation

2:30 p.m.  ORAL ONLY  Introduction of Production V2X Technologies
V2X technology refers to applications using vehicle-to-vehicle and vehicle-to-infrastructure communications at a carrier frequency of 5.9 GHz to increase road traffic safety and road traffic efficiency in Europe (a.k.a. connected vehicle technology in the US). This presentation will give an overview on the status of the V2X technology in US and Europe. It will cover some learnings from the serial development of the first vehicle application. Finally, it will also give an overview about remaining challenges, before this technology will be largely available in the US and European market.
Peter Andres, General Motors LLC

3:00 p.m.  BREAK

3:30 p.m.  ORAL ONLY  Drive Me
Trent Victor, Volvo Cars

4:00 p.m.  ORAL ONLY  Active Safety and Driver Assist Applications for Transit Vehicles
Jonathan Allan, Ford Motor Company

4:30 p.m.  ORAL ONLY  Automation trust in the context of conditional automated driving
The proposed talk would cover the role of drivers' automation trust in facilitating safe, comfortable and efficient automated driving, and tentative approaches we are currently investigating to both measure and design drivers' automation trust. In particular, this would incorporate discussing the feasibility of inferring driver's trust from their glance behavior as well as the evaluation of prototypical concepts which convey information about the performance and process of conditional automated driving systems to the driver.
Sebastian Hergeth, BMW Group
5:00 p.m. ORAL ONLY  | **Active Safety Test Equipment - Experience from ISO global standardization**
| The presentation will cover background, current status and challenges related to standardization of test equipment for active safety, specifically targets representing light vehicles, pedestrians and bicyclists. Further, the presentation will mention challenges in this area coming from more advanced active safety features and test of automated driving.
| Niklas Lundin, AstaZero

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**Wednesday, November 30**

**Advanced Driver Assist Systems: Day Two**

**Session Code:** ADAS2  
**Room TBD**  
**Session Time:** ALL DAY

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| 9:00 a.m. | ORAL ONLY | **Large Scale Field Test of Forward Collision Alert and Lane Departure Warning Systems Using OnStar Data Collection**  
|           |           | This field study used an innovative large-scale data collection technique to gather information about how crash avoidance systems operate in the field and how drivers respond to them. Although the specific systems studied were the General Motors (GM) camera-based Forward Collision Alert (FCA) and Lane Departure Warning (LDW) systems, this technique could be readily applied to other emerging Active Safety systems and used to better inform emerging Active Safety consumer metrics and future regulatory decision-making.  
|           |           | Carol A C Flannagan, UMTRI |
| 10:00 a.m.|           | **BREAK**                                                             |
| 10:30 a.m.| ORAL ONLY | **Development of Improved ADAS HMI Through Driver Performance Studies**  
|           |           | In the interaction between driver and active safety systems, there is no explicit differentiation between the human machine interface (HMI) and system design. The HMI is what the driver experiences holistically from the technical system, including e.g. dynamic vehicle behaviors. This leads to a human based view on the development of advanced driver assistance systems (ADAS) and their concepts of operation. Models of human behavior go beyond the unambiguous laws of physics. The challenge is to define human factors methods that allow for clear conclusions on system requirements. The talk provides insights in the GM approach to driver performance measures.  
|           |           | Lena Rittger, General Motors LLC |
11:00 a.m. ORAL ONLY Future EDR for Automated Vehicles

With the introduction of Airbag modules in the 1970s, event-based recording devices started to be installed on production vehicles. With time, recording capabilities evolved into Event Data Recorders (EDRs), which first appeared on production vehicles in the mid-1990s and have since become a technological staple on modern vehicles. As an increasing number of new vehicles on the road today have Advanced Driver Assistance System (ADAS) features, and we anticipate the arrival of automated vehicles, how will EDR technology, capabilities, and use evolve?

Existing EDR systems have the capability of recording an ego vehicle’s speed, service brake status, engine RPM, and throttle application percentage amongst a host of other parameters. However, with ADAS equipped and automated vehicles, a number of additional sensors such as radars, LIDARs and cameras enable a host of new measurements. For the first time, these sensors enable the measurement of the kinematics of other objects (e.g. other vehicles, bicyclists, pedestrians) which can be recorded in future EDR systems. This opens the door to new capabilities in understanding both the field performance of ADAS equipped and automated vehicles, as well the ability to analyze accidents in which vehicles with this technology played an active (contributory) or passive (observational) role.

While the use of data from the aforementioned sensors may open the door to privacy issues, especially in the recording of camera data, what tangible benefits are brought to bear by including them in the next-generation EDR discussion? And, what is the minimum data set across all sensors that need to be recorded to perform field performance evaluation and accident analysis without divulging proprietary information? This presentation will layout the benefits as well as potential issues in recording supplementary data from these sensors to support safety benefit analyses, field performance evaluations, and accident analyses.

Carmine Senatore, Exponent Inc.

11:30 a.m. ORAL ONLY Challenges in Global Harmonization

Anders Lie, Swedish Transport Administration

1:30 p.m. ORAL ONLY Legal/Liability Impact

Thomas P. Branigan, Bowman & Brooke

2:00 p.m. ORAL ONLY Functional Safety and Related Aspects of Highly Automated Vehicles

Functional safety and related areas such as cybersecurity are important considerations for developing and deploying highly automated vehicle features. In this presentation we will examine how some of the existing approaches such as ISO 26262 should be adapted for addressing highly automated features. Some of the particular areas will include:
- The transition to “driver out of the loop” systems, including whether different approaches are needed for stepwise development of ADAS features beyond SAE Level 2 into higher automation compared to a direct move to Level 4/5 features;
- How functional safety should be addressed in prototype development and operational trials ahead of production release;
- Addressing novel technologies and development approaches versus traditional approaches.

David Ward, Horiba Mira, Ltd.
### Development of SAE Standards for Active Safety Features

Over the past few years, the SAE Active Safety Systems Standard Committee has steadily increased activities to develop industry standards for automotive active safety systems. At the same time, additional consumer metrics and regulatory requirements are being introduced which impact active safety system design.

This presentation provides:
1. Overview of SAE standards development process
2. Overview of current Active Safety Systems Standards committee activities
3. Status of standards under development
4. Challenges of establishing industry standards in an environment of rapid technology development
5. Near & longer term project priorities and the support/resources that will be needed to complete these tasks

Michael G. Carpenter, General Motors LLC

#### 3:00 p.m.

**BREAK**

#### 3:30 p.m.

**Panel**

**Expert Panel Discussion: Sensor Inputs from ADAS to Automated Driving**

A look at the ecosystem and the respective impact of legislation, sensors, and technology from the perspective of all relevant stakeholders. We will look at the challenges between insurances and NCAP, sensor fusion, and the need for highly automated cars to be dependable safe, secure, available, and reliable. Finally looking at what it will take to gain customer acceptance and mass adoption.

**Moderators** - Scott Craig, Infineon Technologies North America Corp.

**Panelists** - Hans Adlkofer, Infineon Technologies AG; Frédéric Bourcier, Wind River; Ulrich Buker, Delphi Automotive; Christof Lauterwasser, Allianz; Tom Toma, Magna Electronics;

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**Automated Driving**

**Session Code:** ADAS3

**Room TBD**

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<td>9:00 a.m.</td>
<td>ORAL ONLY</td>
<td><strong>Smart City Update</strong></td>
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<td>Carla Bailo, Ohio State University</td>
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<td>9:30 a.m.</td>
<td>ORAL ONLY</td>
<td><strong>Situation awareness by Radar Technology</strong></td>
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<td>Alexander Ioffe, Delphi</td>
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<td>10:00 a.m.</td>
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10:30 a.m. ORAL ONLY Sensing and Perception Technologies for Automated Driving -- Road from Concept to Production

This presentation introduces GM’s research and development efforts on the automated driving technologies and its key building blocks. We will deep dive the sensing & perception module in particular and its various development/applications for automated driving and active safety features from concepts into production.

Wende Zhang

11:00 a.m. ORAL ONLY The Gap Between Consumer and Automotive Image Sensors

Tom Toma, Magna Electronics

11:30 a.m. ORAL ONLY Sensor fusion in self-driving vehicles - Challenges for development, testing, validation and certification of multi-sensor fusion systems

Due to the various situations a driverless vehicle will have to face, sensor fusion will be at the core of its embedded software, exploiting numerous high-bandwidth and heterogeneous sensors. This presentation will highlight some of the challenges engineers and researchers are working on in order to achieve safe and efficient data fusion: ensuring deterministic and time-coherent software execution in multi-core/distributed electronic architectures, offline testing with MIL/SIL/HIL systems, then validation on large sets of annotated recordings of sensors data or simulated scenarios in cloud environments.

Nicolas du Lac, Intempora

1:00 p.m. ORAL ONLY LIDAR Systems

Considering established Advance Driver Assistance Systems the driver is still in charge of the driving task. Today’s design focus is on avoiding any kind of unintended activations as ADAS is strictly in a supportive role. Future systems will take over higher level of responsibility. They will focus on even more comprehensive data gathering. In addition to well established technologies like RADAR and Camera, LIDAR can provide complementary data with superior capabilities of detecting and measuring the distance of objects and obstacles, identification of road boundaries, ability of under or override and free space detection. The presentation will provide an insight into this technology.

Christian Schumacher, Continental Automotive Systems US Inc.
Fail-safe to Fail-operational

The trend towards even more sophisticated driver assistance systems and growing automation of driving sets new requirements for the robustness and availability of the involved automotive systems. In case of an error, today it is still sufficient that safety related systems just fail safe or silent to prevent safety related influence of the driving stability resulting in a functional deactivation. But the reliance on mechanical fallbacks and the human driver taking over control, being inevitable in such a scenario, are expected to get more and more insufficient along with a rising degree of driving automation.

The intended and proposed advantage of highly or even fully automated driving is that driver as well as passengers can use the travel time to put more or less of their attention on other tasks instead of monitoring the car’s behavior. Hence, it can no longer be expected that the driver will take over control of the vehicle quickly and taking into account the idea of a driverless car, this option might get even completely dispensable. This aspect dramatically raises the requirements for availability and robustness of the involved car systems to be able to provide functionality even in case of an error or defect which often will lead to a demand for a certain degree of redundancy.

Currently this is quite often implemented by physical duplication of hardware and the involved software including duplication of certain hardware costs as well as package, weight and energy consumption drawbacks with their influence on fuel efficiency.

In this paper we will point out how an optimized fail operational approach could be realized. We also present different concepts for an implementation and identify deficits in design and implementation of today’s automotive Electronic Control Units (ECUs), involved semiconductor products and software approaches. This is where we expect the main challenges to realize an optimized redundancy, especially for X-by-Wire systems. The hardware architecture of semiconductors as well as applied the software architecture on ECUs must be designed accordingly in order to reach smarter solutions.

Udo Dannebaum, Infineon Technologies AG

High-definition reference maps for autonomous driving & production, challenges and future developments

High-definition reference maps are regarded as possibly mandatory additional sensor of unlimited range for autonomous driving applications. The technical solution for digitizing test tracks, race tracks and public roads with sufficient accuracy and resolution is high-end mobile surveying using high-resolution scanners and multiple cameras. 3D Mapping now deploys a number of system for worldwide automobile applications, e.g. the Mobile Road Mapping System (MoSES), which has been pushed in development for years, so that the system qualifies for automobile applications. The presentation will explain the data acquisition and processing following an exemplary customer-project. The project target is the digitalization of a complex digital map for autonomous driving.

Gunnar Grafe, 3D Mapping Solutions GmbH

Coherent Optical Radar

Nate Meir, Oryx Vision

BREAK

Insurance Perspective

Robert Korn, Allianz Global Corporate
Automated Driving Development Challenges in a Diverse Global Regulatory Environment Panel Discussion

The introduction of automated driving systems is challenged not just by the state of the technology itself but also by the myriad regulatory issues and consumer expectations. Current ECE and FMVSS regulations, for example, need to be updated to accommodate introduction of these technologies. Brand new local & state regulations, however, have also emerged in the last few years, some by agencies that traditionally have not engaged in automotive regulation. What impact does this have on OEM & supplier development? What are the main issues driving regulatory action? What are the consumer expectations & concerns with these technologies and how are they being addressed by regulators & industry?

Moderators - Carla Bailo, Ohio State University
Panelists - Lueder Kaiser, Allianz Global Corporate; Christian Schumacher, ADC GmbH; Trent Victor, Volvo Technology Corp.;