German Aerospace Center
Institute of Transportation Systems

Digital Test Areas

“Application Platform for urban Intelligent Mobility” in Braunschweig
“Test Area Lower Saxony” on Highways nearby Braunschweig

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German Aerospace Center

- Research & Development in
  - Aeronautics
  - Space
  - Transport
  - Energy
  - Defense and Security

- Approx. 8000 Employers
- 2015: 885 Mio € budget

Institute of Transportation Systems, Prof. Dr.-Ing. Karsten Lemmer

- Idea: “Aerospace technology for transport systems (road, rail, management)”

- Creating concepts and designs for cooperative and automated driving
- Developing connected and automated vehicle functions
- Operation of test areas and simulation environments
Current Institutes H2020 C-ITS research projects

- **Autopilot**, IoT-01-2016, Valet-Parking with infrastructure support
- **L3-Pilot**, ART-02-2016, in-vehicle human factors
- **XCycle**, MG-3.4-2014, infrastructure support for VRU
- **Automate**, MG 3.6-2017, automation HF
- **MAVEN**, MG 3.6-2017, management of automation
- **ADAS & ME**, MG 3.6-2017, situation awareness
- **CARTRE**, ART-06-2016, networking
- **InterACT**, ART-04-2017, driver / automation interaction, project coordinator
- **C-Mobile**, MG 6.2, impact assessment in large scale city pilots
- **TransAID**, ART-05-2016, traffic management, project coordinator

Years:
- 2017
- 2018
- 2019
- 2020
In Operation:
Test Area „Application Platform for Intelligent Mobility“ - AIM
AIM: Support of connectivity and automation in real traffic

• R&D platform for vehicle and mobility applications and services in real traffic situations

• Focused on future mobility scenarios including connectivity and automation

• Additional modules (virtual test area, simulators, methods and toolchains, communication protocols, situation detection, research vehicles, etc.)
Urban Test Area AIM – ITS G5 Modules
ITS G5 reference track in the city of Braunschweig

- 35 ITS roadside stations at traffic light poles
- Direct link to traffic light controllers
- Uplinks to SW-management
- Wi-Fi Clusters combine RSUs for real-time processing and local data aggregation
- Development and test of cooperative systems

Current AIM communication protocols
- SPaT: SAE J2735 region-D definition
- MAP: SAE J2735 region-D definition
- CAM: v1.3.2 (EN 302 637-2, 2014-09)
- DENM: v1.2.2 (EN 302 637-3, 2014-09)
- GeoNetworking: v1.2.1 (EN 302 636-4-1, 2014-05)
- GeoNetworking BTP: v1.2.1 (EN 302 636-5-1, 2013-10)

IRS = Intelligent Roadside Station
Realization 2014: Large variety of laboratories and test vehicles available
Under Construction:
Test Area „Lower Saxony“
Already in operation.

Plan: Build Motorway Test Area on E30 for several CAD testing purposes.
Test Area “Lower Saxony”

- High precise digital map
- Virtualized traffic signs
- Track with sensors and communication modules
- DLR is an associated partner in C-Roads

AIM Braunschweig
Objectives Test Area “Lower Saxony”

- Development and Validation Platform for C-ITS Day 1 Applications
- Test and Optimization of CAD by having a Ground Truth
- Development environment for swarm intelligence
- Test area for technology evaluation (e.g. ITS-G5 vs. 4G/5G)
- Interoperability Tests for cooperative features/interfaces
- Real test area for HAD.
Objectives Test Area “Lower Saxony”

- Analysis of Message Hopping by using RSUs
- Test and optimization of e-Horizon systems
- Optimization of local situation recognition by using Car2X sensor information and development environment for car2x sensor sharing.
- Development environment for landmark navigation approaches.
Support of test and deployment of CAD – Hardware setup, example for small part on A39:

- Digital map
- Virtualized traffic signs

Sensors and communication

Communication

Kreuz Wolfsburg/Königslutter (A2 / A39)

Kreuz Braunschweig Süd (A39 / A391)

Anschlussstelle Cremlingen (A39)

Q1-Q3 2018

Q3 2017
Current Situation

- First tests have been performed (mainly communication -> where to place RSUs)
- Sensor concepts have been elaborated (stereoscopic cameras with auto calibration)
- Road-side works are going to be tendered within the next weeks.
- Specific requirements of partners are collected, first applications are designed.
- Backend systems are set up, works for connection to DLR site are in preparation (all-glass fiber cables available next to road).
Challenges

- Which qualities and which standards are necessary?
- Which measures are defined and how do we classify scenarios?
- Which architectures are adequate for HAD?
- How can we increase safety in HAD?
- How can we describe HAD functions and applications formally?
- Which methods for homologation procedures are required?