Thuringian Center of Innovation in Mobility

ThIMo

Profile

Thüringer Innovationszentrum **MOBILITÄT**

The **SPIRIT** of science

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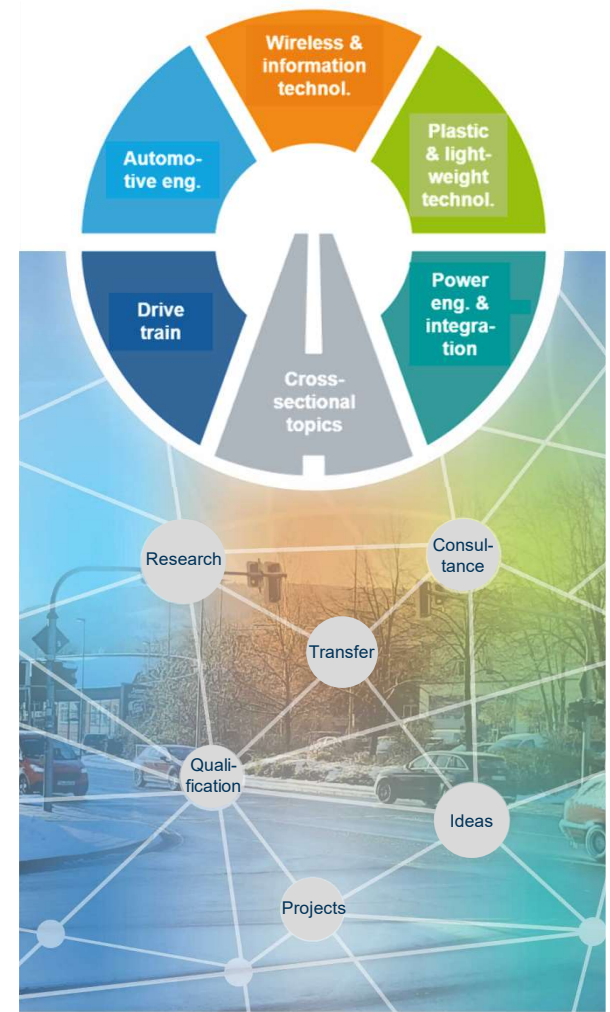
ThIMo – Innovations in mobility since 2011

Motivation

Mobility =

Private and public transportation of people and goods (using specific modes)

Progress Technology, economy, society

Change Climate, demography, energy: Automation, electrification, digitalisation, connectivity, services

Turnover Strong economic branch in Thuringia (> 4 billion EUR p.a.) and German-wide

Innovation Competitiveness through R&D, transfer & transformation

Thuringian Center of Innovation in Mobility

- Expertise, infrastructure, thinktank, science forum
- Close to applications, networked value chain
- Transfer: Education of specialists, young scientific engineers, technologies, high-level research labs

Focus areas Mobility

- Road- and rail-based vehicles, people mover and freight traffic, transportation and logistics
- Connectivity of communications, data and infrastructure
- Fabrication and verification processes

Research initiative Digital Mobility

- Test and validation of automated and connected driving functions
- Minimisation of emissions
- Human-machine interaction and AI
- Concepts for multi-modal mobility and services

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Director Automotive Enginering Group
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ThIMo – Mobility innovation
Mission and key objectives

Drivetrain technologies | Automotive engineering | Wireless & information technology | Plastics technology & lightweight design | Power electronics & functional integration

Digital revolution => Tailored solutions suitable for industrial scale and economic exploitation => Scientific excellence => *ThIMo* – Focus on public R&D

1 *Industry and Innovation:*
Linking academia and industry

2 *Positioning and Profile:*
5 core competences, international reputation

3 *Experts and Executives:*
Transfer of knowledge and people

4 *Strategy and Structure:*
Effective, efficient, and sustainable

Profile
- **Scientific performance** Inter/nat. center, broad interdisciplinary basis
- **Economic effectiveness** Service offers, consulting, bridge to intermediaries
- **Education & transfer** Center of skilled specialists

Goal branches of mobile technologies
- **Automobile OEM and tiers**
- **Wireless technologies and ICT**
- **Intermodal mobility providers**
- **Electronic sensors and data processing**
- **Energy networks (Focus mobility)**

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ThIMo – Core competences

Unique selling points: Specialisation and cooperation

Drivetrain technologies

- Simulation and modelling of drivetrains for different modes of transport
- Hybrid methods for computationally optimized design of electrical drives
- SW-based approaches for application-specific anticipation of operational status(*predictive maintenance*)
- Digital twins and digital shadows of drivetrains (efficiency, vibration, noise, thermal balance)
- Application of AI for design and analysis of motors and drive functions

Automotive engineering

- SW-basied AC drive functions (L2…L4)
- Scenario-based re-simulations of sensor-control- and data processing chains for environmental perception
- Virtual V&V methods and simulations for test and validation of AC drive functions
- Data-driven development and safety assurance of ACD
- Realistic human-machine interaction based on dynamice driving simulator
- Hybrid and cross-domain XiL-testing methods

Wireless & information technologies

- Cross-domain and cross-scales em simulations (full wave, ray tracing, macroscopic traffic)
- Hybrid measurement and simulation techniques for wireless functions of cognitive cars (antennas for mobile communication, navigation, radar)
- Szenario-based emulation of sensor and communication data for environemental perception
- Em (environmental) compatibilty (EMC), exposition measurements and evaluation

Plastic technology & lightweight design

- Powerful simulations with high level of modelling depth for devices, semi-finished products, and manufacturing processes
- Digital twins, e.g., for direct extrusion of endless fiber-reinforced thermoplastics and preparation for AI-based control
- Development and screeing of plastic-formulas with material properties tailored to applications (mechanic, thermal, electrical, magnetic, optical), e.g., for electrically conductive plastics with SW-based approaches

Power electronics & functional integration

- Fully digitised, connected, and highly efficient power electronic converters (DC-DC, DC-AC) for optimal and safe supply of all functional units in mobility carriers
- Intelligent on-board power grids
- Smart mechatronic functional units for main and auxiliary drives and actuators
- *State-of-health-* and *predictive maintenance* for high reliability
- Innovative energy and battery management

supplemented through cross-sectional topics in mobility

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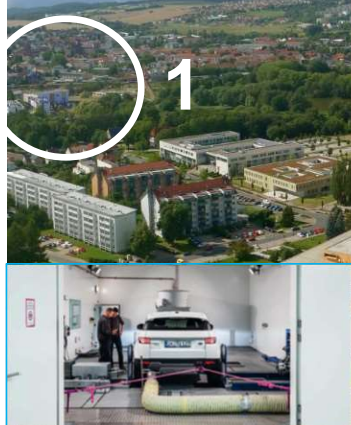# ThIMo – Core competences

Research infrastructure fit to address changes in mobility

Shielded absorber chamber for wireless automotive testing

Hot-gas and turbo-charger test stands, e-drives 50...250 kW

High-power four-wheel dynamometer

XiL-test labs, dynamic driving simulator

Plastic technology

www.mobilitaet-thueringen.de/en/

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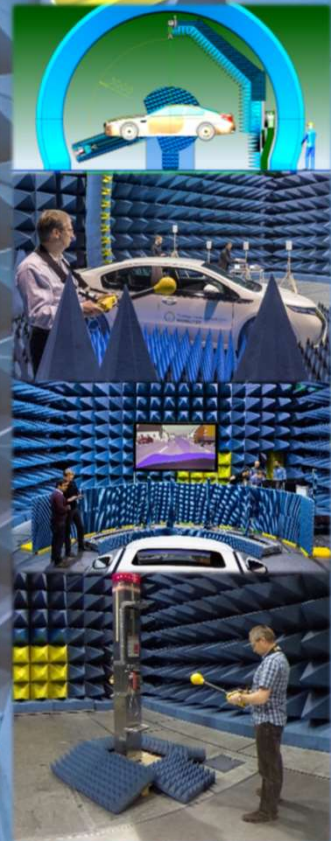**TECHNISCHE UNIVERSITÄT ILMENAU**

Automotive test range

VISTA –
Virtual road
simulation
and test area

1. Automotive antennas & RCS   2. Virtual drive testing   3. Automotive EMC
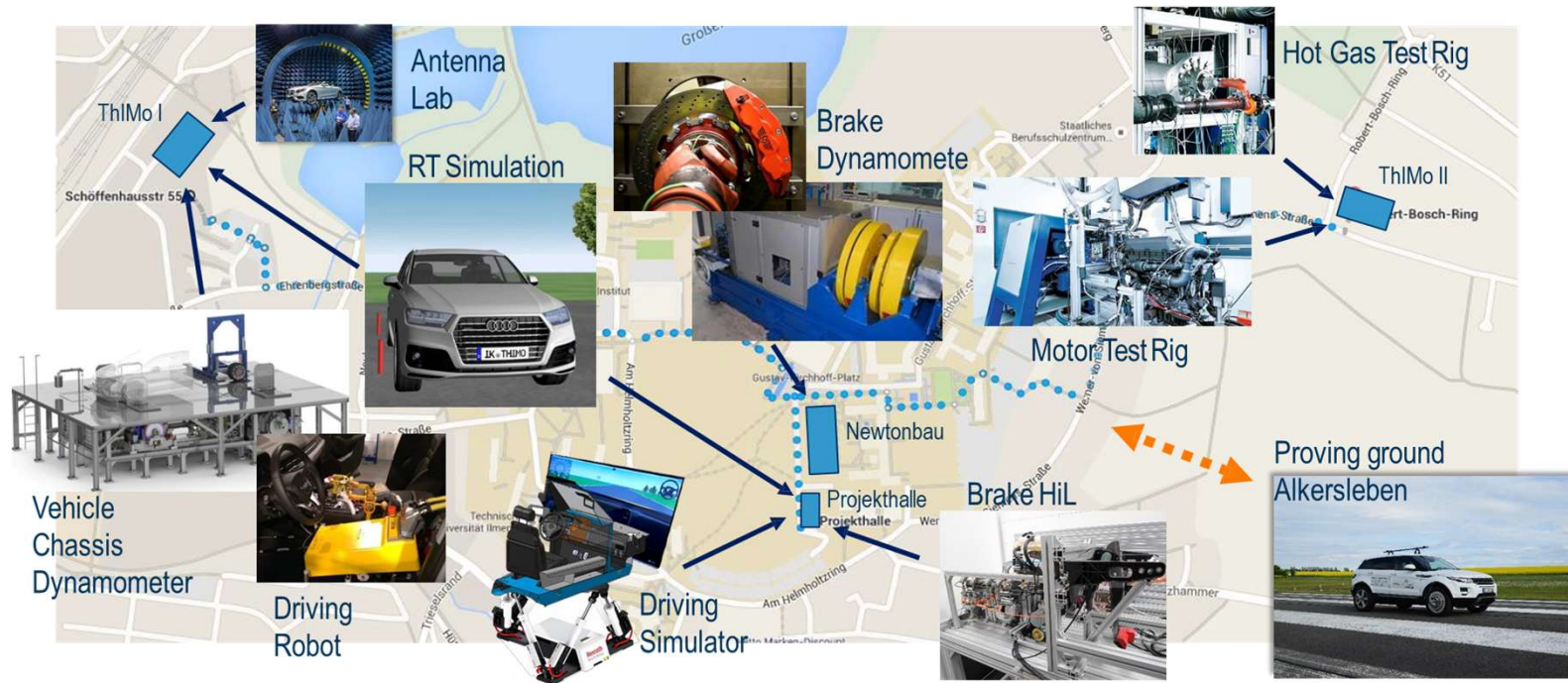
Dynamic driving simulator
Overview

- **Hexapod motion system (Bosch Rexroth)**
- **Vehicle mockup (Ergoneers)**
- **98" 4K Visualisation (iiyama)**
- **Active steering wheel simulator SensoWheel (sensodrive)**
- **Active pedal simulator SensoPedal (sensodrive)**
- **Real time computing Scalexio (dSpace)**
- **complex driving simulation (IPG Automotive)**
- **Sound simulation (Adletec)**

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Research areas
Driving simulator + XiL-network

Connecting dynamic driving simulator with other test stands

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Thank you for your kind attention!

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