



Fraunhofer

IBP

**FRAUNHOFER INSTITUTE FOR
BUILDING PHYSICS IBP**

AUTOMOTIVE CLIMATE, COMFORT AND AIR QUALITY IN VEHICLES



OUR SERVICES

- Development, testing and optimization of concepts, technologies and components to improve acoustic and thermal comfort as well as air quality
- Consideration and evaluation of alternative energy and mobility concepts, taking sustainability into account
- Integration of different functionalities into materials and components – such as climate control components with materials that absorb noise and emissions, or surfaces with catalytic, self-cleaning or biostatic properties
- Development of innovative concepts for the alternative use of vehicle interiors, e.g. as an office or for entertainment purposes
- Research and development tasks for partners from various sectors of the automotive industry (manufacturers, suppliers)
- Tests tailored to individual customer specifications
- Optimization of prototypes and mass-produced vehicles

You benefit from our interdisciplinary network:

- We provide coordinated solutions from a single source
- Use of synergy effects and short pathways
- No additional work required to coordinate and steer several different research or development partners
- Support, especially for small and medium-sized enterprises, with research and development activities

Today, the automotive industry faces a multitude of issues and challenges: from e-mobility and autonomous driving to the enhancements of assistance systems and mobility concepts. The main focus is on improving traffic flows, reducing the risk of accidents and also on improving driving comfort.

For many years now, we have successfully dedicated ourselves to these topics with our research on acoustic comfort, climate control and thermal comfort, as well as on air quality and innovative energy concepts.

Through our broad range of expertise and close interdisciplinary cooperation, we generate trend-setting knowledge on the use and optimization of materials, components and systems for vehicles.

Our experts on acoustics, indoor climate, chemistry and biology, as well as on sustainability issues related to mobility and energy, work together to develop innovative solutions. We also have modern test facilities and use our own simulation and analysis methods.

You can rely on our know-how.



OPTIMAL VEHICLE ACOUSTICS FOR QUALITY, SAFETY AND COMFORT

At our Stuttgart branch, we operate a modern assessment and testing center for vehicle acoustics. Our test facility with roller dynamometer and acoustic test chamber gives us unique opportunities to conduct interdisciplinary, pre-competitive research:

- Acoustic pass-by measurements are compulsory before new vehicles are approved. In contrast to outdoor tests according to DIN ISO 362-1, using our test facility we can carry out simulated pass-by measurements according to DIN ISO 362-3 independent of weather conditions.
- Our 4-wheel drive roller dynamometer features four individually controllable rollers, high-precision controls and comprehensive measuring instruments. We use test procedures such as decoupling studies or cleat tire tests to reliably identify and analyze sources of noise in vehicles.
- In order to characterize and optimize vehicle acoustics, we perform acoustic and vibration analyses on the behavior of vehicles, components and ancillary equipment with regard to noise vibration harshness (NVH). For this, we use modern noise analysis techniques such as binaural dummy head recordings.
- Through our research work, we contribute to a sustained improvement in the quality, safety and comfort of vehicles and develop solutions to acoustic problems of the mobility of the future.



INNOVATIVE CLIMATE CONTROL IN VEHICLES

In addition to research on climatic conditions in vehicle cabins, we focus on developing and validating entire systems under real conditions with different climate control solutions:

- We develop new methods for assessing user comfort in vehicle cabins, e.g. for local climate control and during heat-up and cool-down phases.
- We test technologies and develop simulation models based on the Modelica library IESS “Indoor Environment Simulation Suite”, which has been evaluated and validated repeatedly in test facilities.
- We determine comfort using not only specially developed methods for assessing thermal comfort but also our “DressMAN” measuring system, as well as evaluation of results by means of subject tests.
- We develop innovative climate control and thermal comfort concepts to improve the range of electric vehicles, evaluating measures with regard to user acceptance, energy efficiency and control strategy.



INTERIOR AIR QUALITY AND COMPONENT EMISSIONS

Nearly all materials release substances into their environment – this plays a particular role in vehicles. We therefore conduct research into the effects of emitted substances on humans and the environment and offer support. We study and analyze:

- Vehicle components (interior and exterior): measurement of the emission potential of components and groups of components in special test environments (SHED chambers). Identification of substance groups based on normative and own standards, comparing the measured concentrations with guideline or limit values.
- Vehicle interiors: simulation of different stationary and driving scenarios with precisely defined boundary conditions, simulation of various thermal loads, targeted application of undesired substances to the vehicle environment, e.g. to determine the efficiency of cabin air filters, evaluate odors and analyze air samples.
- Vehicle propulsion systems: during the development of new generations of engines, we conduct tests on their evaporative emission behavior in a unique test field in close compliance with official test regulations. We also evaluate the emission behavior of individual relevant components, ensuring that even very low emission values are measured.



SUSTAINABLE ENERGY AND MOBILITY CONCEPTS

In addition to the continuous advancement of conventional vehicles in terms of production, fuel consumption and emissions during operation, the automotive industry is increasingly focusing on the development of alternative concepts. We offer long-term support with:

- Ecological assessments and sustainability analyses for fuels and mobility concepts.
- Analysis of current and future drive technologies and their integration into mobility concepts.
- Life Cycle Assessment of the production and use of alternative fuels such as hydrogen or biofuels.
- Addressing current electromobility issues with future scenarios.
- Evaluation of lightweight construction concepts and compilation of material databases (e.g. CFRP).

Contact

Fraunhofer Institute for Building Physics IBP
Fraunhoferstrasse 10
83626 Valley, Germany

Dr. Florian Mayer
Phone +49 8024 643-238
florian.mayer@ibp.fraunhofer.de

www.ibp.fraunhofer.de/en

For inquiries, advice or a non-binding offer, please do not hesitate to contact us.

Fraunhofer IBP is a member of the Fraunhofer Traffic and Transportation Alliance. In the course of its research and development work, IBP cooperates nationally and internationally with a number of other renowned scientific institutions and well-known companies in the automotive industry.

Photo acknowledgments

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