

# PRESS RELEASE

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## Mobile mapping

### Sensor box provides real-time geodata for digital urban planning

**An increasing number of municipalities are developing urban digital twins. As a rule, the more up-to-date and accurate the data, the more precisely processes can be simulated within a virtual city model. A mobile sensor box developed at Fraunhofer IPM collects highly accurate 3D geodata. Mounted on buses, taxis, or garbage trucks, the box allows the urban environment to be recorded at frequent intervals without the need for special measurement vehicles.**

What used to be the drawing board may become the digital twin: a virtual three-dimensional space where municipal projects can be planned – from network expansion, traffic route planning and maintenance, energy supply, and hazard maps to visitor flows at major events. Data is the raw material for digital city models, with georeferenced spatial data forming the basic framework. The 3D data is located in space and comes from various sources, such as satellite and aerial images, and above all from surveys carried out by measurement vehicles that scan the municipal area using laser scanners and cameras, typically every one to two years.

### Plug & measure: robust sensor technology fixed to the vehicle roof using suction cups

The Mobile Urban Mapping System MUM mini developed at Fraunhofer IPM makes it possible to collect highly accurate digital infrastructure data at much shorter intervals and instantly makes it available for digital city models. The entire sensor equipment, consisting of two laser scanners, several cameras, positioning unit, computing and storage media as well as the power supply, is housed in a compact box. Weighing around 20 kilograms, the system is not much bigger than two shoe boxes and can be installed on the roof of any vehicle using suction cups. This is how garbage trucks, cabs or buses become measuring vehicles. "This sensor box continuously records data from its surroundings," says Professor Dr. Alexander Reiterer, Head of the Object and Shape Detection department at Fraunhofer IPM. "It's basically similar to a smart watch for people, except that it's for the city."



funded by the Baden-Württemberg Ministry of Economic Affairs, Labour and Tourism

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#### Editorial notes

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## Smart data analysis in real time

In an automated process, specially trained AI algorithms identify and classify typical urban objects in the camera data. Thanks to the high data quality, even narrow objects such as fences, signs, garbage cans, and trees can be detected. A precise three-dimensional image of the surroundings, known as a 3D point cloud, is generated through fusion with the 3D data from the laser scanners. Each point in this 3D-cloud is clearly located in space. While the system is recording, the measurement data is pre-processed and reduced using a special AI and is then automatically anonymized before being stored locally. The data can be streamed directly into geoinformation systems via the 5G network. That way large volumes of data can be made available in real time for digital city models. The MUM mini system was developed as part of the MuSiS research project, which was completed in spring 2025.

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## Out and about in several cities

The first measurement runs took place in Heidelberg. Since March, the MUM mini has been on the road in Wuppertal and will carry out measurement campaigns at different times of the year until the end of 2026. Fraunhofer IPM and the city of Wuppertal are working together as part of the “DigiTal Zwilling” research cooperation, which is funded by the Federal Ministry of Housing, Urban Development and Building. The city of Freiburg is also planning to run measurements with the MUM mini system as part of its digital urban development.

## Further information

### MuSiS research project

The research work for the development of the MUM mini system was carried out as part of the MuSiS project (multimodal digital twin for a safe and sustainable city). The project was funded by the Baden-Württemberg Ministry of Economic Affairs, Labor and Tourism as part of the Invest BW funding program.

### *Project partners*

- Fraunhofer Institute for Physical Measurement Techniques IPM
- incontext.technology GmbH

### *Associated partners*

- City of Freiburg
- Freiburger Verkehrs AG
- Digital-Agentur Heidelberg GmbH
- Verband Region Rhein-Neckar

**FRAUNHOFER INSTITUTE FOR PHYSICAL MEASUREMENT TECHNIQUES IPM****DigiTal twin project**

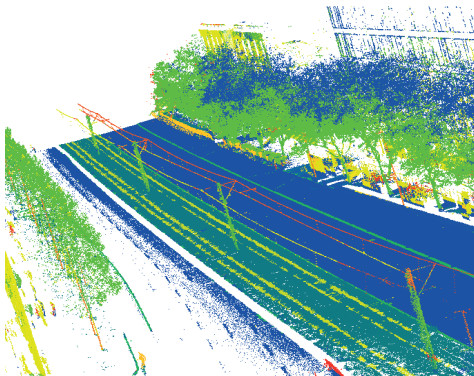
Test drives of the system are being conducted as part of the DigiTal twin research project, funded by the Federal Ministry of Housing, Urban Development and Building. This research project aims to develop and implement innovative methods for updating urban digital twins by merging mobile mapping, remote sensing and in-situ data using artificial intelligence (AI).  
Further information: <https://smart.wuppertal.de/beteiligung/forschungskooperation-digital-zwilling-2024.php>

**Project partners**

- Stadt Wuppertal
- EFTAS Fernerkundung Technologietransfer GmbH
- Chair for Technologies and Management of Digital Transformation at the University of Wuppertal
- Fraunhofer Institute for Physical Measurement Techniques IPM



**Garbage collection and measurement vehicle in one: with the compact and robust sensor box on the roof, every vehicle becomes a measurement vehicle.© AWG Wuppertal**



**The MUM mini processes and reduces the data from two laser scanners, several cameras, and other sensors directly on the measuring vehicle. Even narrow objects such as pipes or signs can be identified in the 3D point cloud. People or vehicles, on the other hand, are anonymized before the data is transmitted to geo-information systems.**

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