

HEAT – Hamburg Electric Autonomous Transportation

Press release

July 31, 2019



First autonomous shuttle bus

- Next phase of groundbreaking HEAT project
- Launching in August: Test operations
- Goal: Integration into regular street traffic



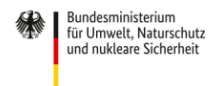
It's here – the new minibus for HEAT (Hamburg Electric Autonomous Transportation), Germany's unique research and development project to integrate an autonomous shuttle bus into regular street traffic. Five meters long, weighing just under three tons, powered emission-free with electricity: The minibus will provide space for up to ten passengers traveling through Hamburg's HafenCity as of mid-2020. The youngest member of the city's HOCHBAHN fleet will drive autonomously. In order to safely find its way along the test route, the minibus will communicate continuously with sensors installed along the route and with the central HOCHBAHN control center. The minibus will begin test operations this August.



The ambitious goal of the HEAT research and development project is to test uncharted territory: Proving that self-driving minibuses can be fully and safely integrated into street traffic and a city's public transport system. The HEAT minibus will be tested under real conditions in public streets and should, as planned, be capable of autonomous driving at speeds up to 50 km/h.

Michael Westhagemann, Hamburg's Senator for Economics, Transport and Innovation, emphasized at the vehicle's presentation: "HEAT offers the city the opportunity to explore all aspects of automated and networked driving. For us, of course, the rule is: Safety first! Public acceptance is critically important for the future use of autonomous vehicles. With this test route available to all manufacturers for networked and automated driving, and with the HEAT project, we are making it clear that we want to try out new

Gefördert durch:



aufgrund eines Beschlusses
des Deutschen Bundestages



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mobility offerings in Hamburg and provide industry and researchers optimal conditions for doing just that. At the ITS World Congress in 2021, we will use HEAT and many other projects to demonstrate that Hamburg is a pioneer in innovative mobility solutions.”

Henrik Falk, CEO of Hamburger Hochbahn AG (HOCHBAHN), which is responsible for project management, operational implementation and integration of the control center: “In the future, mobility will be emission-free and always tailored to the needs of customers. Autonomous driving offers us a perspective for creating and providing especially attractive mobility offerings. Especially for times of the day or parts of the city where today’s conventional public transport solutions are reaching their limits and thus aren’t attractive enough to motivate people to switch from private cars.”

One key feature of the HEAT project is its step-by-step approach. In the first phase, which begins with the test operations, the minibus will run along a defined route without passengers and accompanied by a professional vehicle attendant who can immediately take control if necessary. Beginning in mid-2020, the minibus will begin operating with passengers and a vehicle attendant on board. By the time the ITS World Congress opens in October 2021, the minibus should be operating autonomously (without an attendant) according to SAE Level 4 specifications.

Matthias Kratzsch, Managing Director of IAV: “The HEAT project is a prime example of how one can successfully shape the future of mobility: With the close coordination and interaction of cities, public transport systems and companies with complementary strengths. The IAV has been working since 1995 on a wide variety of technologies related to autonomous driving. We are bringing this pool of experience to the HEAT consortium. The self-driving minibus is introducing an environmentally friendly means of transport to Hamburg’s streets that sets technological standards. IAV is responsible for the development, delivery and maintenance of the minibus in the project.”

The minibus developed by IAV has been approved for transporting ten passengers and has two benches with four seats each and a foldable bench

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with two more seats. In addition, the minibus is equipped with an access ramp that enables barrier-free operation. The batteries for the vehicle's electric drive are charged by Vattenfall in HafenCity.

Along with the minibus, which was specially developed for this project, the research project is primarily focusing on issues relating to traffic and IT infrastructure, digital control technology and technical interfaces within the system. In order to integrate the minibus into real-time street traffic and enable it to reach a required top speed of 50 km/h, it was necessary to equip the vehicle with cameras, radar and lidar, as well as install supplementary intelligent infrastructure along the route, including sensors and a digital communications system.

In addition, HOCHBAHN's control center continually monitors the progress of the minibus and can also make driving commands depending on the specific traffic situation. The overall system, comprised of vehicle, roadside infrastructure and control center, ensures a high degree of safety and availability of autonomous operation.

Markus Schlitt, Head of Intelligent Traffic Systems at Siemens Mobility GmbH: "HEAT is a flagship project for us. Our intelligent infrastructure supports the HEAT minibus with an additional level of information that enables predictive driving. This contributes to the efficiency and, above all, the safety of autonomous driving. Moreover, our shuttle management will help the HOCHBAHN control center effectively control the minibuses in the future."

To prepare for the start of the test operations, it was first necessary to obtain street certification for a completely new type of vehicle that had different components and could dispense entirely with traditional features such as steering wheels and exterior mirrors. Here as well, the project's step-by-step approach provided the time needed to develop the required approvals and certifications. The minibus was approved in mid-July for its scheduled test operations.

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The necessary legal support for the HEAT project is being provided by the Institute for Climate Protection, Energy and Mobility (IKEM), along with the related legal requirements for the vehicle, infrastructure and regular passenger operations. The unique legal feature of autonomous driving is that technology must take over all driver tasks for complying with traffic rules.

Matthias Hartwig, Project Manager at IKEM: “HEAT aims to show how vehicles equipped with autonomous driving functions can be properly and safely approved and operated. This is new legal territory. During the test operations, we will see how traffic laws need to be developed and adapted to this new situation. HEAT will provide impulses for the necessary laws.”

The test route in Hamburg’s HafenCity will be 1.8 kilometers long. In a change to the original plans, the route had to be shortened due to major construction projects in HafenCity, but this will not affect the project’s research and development results. The minibus will make five stops along the route, including three regular HVV stops and two new HEAT stops.

The test operation’s route was deliberately designed in sections in order to collect data and experience for each part of the route and use this information to extend the route, increase the degree of automation and raise the speed of the minibus. The scope and phased development of the test operation has been planned to ensure the highest possible level of safety is always guaranteed, as was required in the project’s approval process.

In the first phase, the minibus will drive along the streets *Am Dalmannkai*, *Großer Grasbrook*, *Am Sandtorkai* and *Am Sandtorpark*. On this route, the vehicle will first be tested for autonomously crossing the intersection of *Am Dalmannkai* and *Großer Grasbrook* as well as how it communicates with sensors along the route and the control center. In the second phase, the minibus will also operate on *Am Kaiserkai* and thus drive directly past Hamburg’s Elbe Philharmonic Hall.

Particular attention in the HEAT project is being given to the people for whom the new autonomous bus transport mode is being designed. Use of the

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minibus should be simple, pleasant and associated with a feeling of complete safety and security. Project partner German Aerospace Center (DLR) is conducting the related research and determining user requirements to derive ideas for developing the vehicle and transportation service. The research also includes evaluating the system's acceptance by passengers and assessing the interaction between the autonomous minibus and other road users on the HafenCity test route.

Dr. Annika Dreßler, DLR Project Manager for related user-centered research in the HEAT project: “We want to use this opportunity to design public mobility services in such a way that users see them as an attractive alternative to their own car. To achieve this, we are asking the users themselves what they need and developing ideas together with them.”

The Free and Hanseatic City of Hamburg has commitments for a total of €3.7 million in funding for the HEAT project. Hamburg's Authority for Economics, Transport and Innovation (BWVI), the city's Department of Roads, Bridges and Water (LSBG) and Hamburg Verkehrsanlagen GmbH (HHVA) account for €2.7 million of this sum. HOCHBAHN is receiving around €1 million for the project management and is bearing a further €1.5 million from its own budget.

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Project partners

Hamburger Hochbahn AG

Founded in 1911, Hamburger Hochbahn AG carries over 1.2 million passengers daily with its fleet of 250 metro trains and 1,000 buses. As one of 34 partners in the Hamburger Verkehrsverbund (HVV), HOCHBAHN serves over 1,400 stops in the city and is the largest transport company in the HVV. Around 5,000 employees work for HOCHBAHN around the clock to provide attractive public transport and convenient, highly modern mobility in Hamburg.

Authority for Economics, Transport and Innovation

The BWVI is one of eleven specialized authorities of the Free and Hanseatic City of Hamburg and is responsible for economic and transport policy as well as for promoting innovation. To implement the HEAT project, the BWVI is drawing on the competencies of the Department of Home Affairs and Sport, the Police Traffic Directorate, the Department of Roads, Bridges and Water (LSBG) and the municipal Hamburg Verkehrsanlagen (HHVA). Within the project, the LSBG is responsible for traffic planning, while HHVA implements and operates the roadside infrastructure.

IAV

With more than 7,000 employees, the IAV is one of the world's leading engineering partners to the automotive industry. The company has been developing innovative concepts and technologies for future vehicles for 35 years. Its core competencies lie in developing production-ready solutions in all areas of electronics, powertrain and vehicle engineering.

Siemens Mobility GmbH

Siemens Mobility is a separately managed company of Siemens AG. As a leader in transport solutions for more than 160 years, Siemens Mobility is constantly innovating its portfolio in its core areas of rolling stock, rail automation and electrification, turnkey systems, intelligent traffic systems as well as related services. With digitalization, Siemens Mobility is enabling



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mobility operators worldwide to make infrastructure intelligent, increase value sustainably over the entire lifecycle, enhance passenger experience and guarantee availability.

IKEM

IKEM – the Institute for Climate Protection, Energy and Mobility – is an independent research institute that addresses current climate protection, energy and mobility transformation issues. One of the institute's focal points is autonomous driving: Among other things, IKEM is responsible for the legal support of test operations and evaluating business and operator models for autonomous shuttles.

DLR

The German Aerospace Center e.V. (DLR) is operated by the federal government. It also conducts research and development work in the fields of energy, transport, security and digitalization. In the HEAT project, DLR researchers are investigating the needs and responses of users and other road users related to autonomous buses.