

# TAVF Test track for automated and connected driving in Hamburg

In the centre of Hamburg, a more than 12-kilometre-long, open and free test track is available for automated and connected driving. More than 50 traffic lights and a bascule bridge are equipped with Roadside-ITS-Stations for infrastructure-to-vehicle (I2V) and vehicle-to-infrastructure (V2I) communication to exchange data with connected road users. The urban traffic situation enables the testing of cooperative Intelligent Transport Systems and Services (C-ITS) using WLAN-based ITS-G5 in a urban traffic environment. Since spring 2020, all traffic lights have been certified with state-of-the-art PKI v1.3.1 (PKI = Public Key Infrastructure) security standard. Vehicle manufacturers, technology companies and research institutions can test innovative mobility services such as automated driving functions, safety assistance systems or environment sensor technology in real traffic on public roads.

## What does TAVF offer?

With the test track, the Free and Hanseatic City of Hamburg has created an open platform on which research institutions and companies can test and trial applications of V2I/I2V communication and connected and automated driving. TAVF is equipped with the following features:

### Transmission technology:

- > ITS G5 (IEEE 802.11p)
- > Hybrid communication (in preparation)

### Technical equipment:

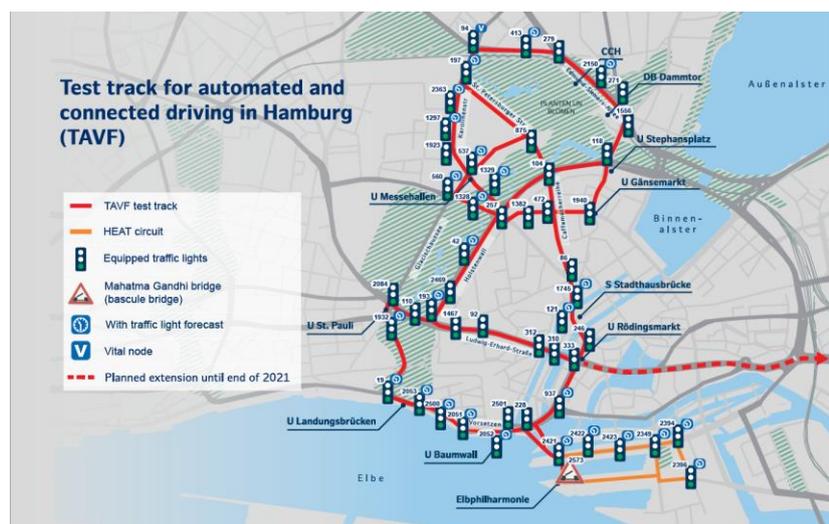
- > More than 50 traffic lights and one bridge with Roadside-ITS-Stations (R-ITS-S)
- > Thermographic cameras systems
- > Intelligent street beacons
- > Cooperative environmental sensors

### Information provision:

- > Open data platform (Hamburg Urban Data Platform)
- > Highly accurate maps
- > SPaT/MAP messages and forecast of the signal phase at all traffic lights
- > Virtual signs (IVI)
- > Sensor data for VRU protection (CPM)
- > PKI V1.3.1 at all traffic signals

### Special features of the routing:

- > Various urban street topologies (including one-way streets, multi-lane streets, main and side streets)
- > intersections with and without traffic lights
- > Connection to the Motorway
- > Demanding urban challenges such as a high proportion of mixed traffic or deep urban canyons with limited GPS



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### Focus of the trials:

- > Automated driving in urban areas
- > Cooperation and Connection
  - Collision warnings in junction areas for the protection of vulnerable road users (VRU)
  - Real-time road works information
  - Cooperative control of junctions
  - Infrastructural awareness
  - Virtual signage (IVS)
  - Probe vehicle data collection (PVD)
  - Green light optimized speed advisory (GLOSA)
  - Traffic signal priority request for public transport and emergency vehicles (TSP)
- > Combination of automated and connected driving
  - Intelligent road equipment (Focus on traffic lights)
  - Barrier-free and open data and service platform
  - IT-secure operation of cooperative ITS components (Public Key Infrastructure)
  - New mobility concepts in the context of automated and connected driving (e. g. on-demand Services)



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### What is special about TAVF?

Since the beginning of 2021, the inner-city TAVF test track and the circuit in HafenCity of the Hamburg Electric Autonomous Transportation (HEAT) research and development project have been connected. The link between the two test sites has been completed by equipping the Mahatma Gandhi Bridge in HafenCity with R-ITS-S. The Mahatma Gandhi Bridge is the first bascule bridge in the world to be V2X-capable. A wide variety of innovative mobility applications are being tested and analysed on the test track, which is open to users and manufacturers. Various cooperations with TAVF users within the framework of user meetings and workshops have led to the joint development of various use cases, such as emergency vehicle prioritisation. In addition, the City of Hamburg is active in the harmonisation activities of C-ITS services within the framework of C-Roads Germany - Urban Nodes. A continuous expansion of the test track as well as the transfer of successfully tested C-ITS services to other urban areas will continue.

### Become TAVF user

The test track is an open, provider-independent platform for vehicle manufacturers, technology companies, and research institutions to trial innovative mobility services, such as automated driving functions, safety assistance systems or environmental sensors in real traffic conditions on public roads. Interested companies and institutions can contact the TAVF coordination centre via a contact form. For the selection of potential users, the TAVF coordination centre together with the Free and Hanseatic City of Hamburg assesses the innovation content of the proposed applications as well as their benefit for traffic management, traffic flow optimization, air quality and traffic safety improvement. In addition, the coordination centre gathers technical as well as data privacy requirements and framework conditions of the applications. As the test track will be operated in the long-term beyond 2021, currently neither an application deadline nor a limitation of the number of users exists.

# TAVF

### Contact

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