The Federal Highway Research Institute (BASt) operates an innovative measuring vehicle for structural evaluation at traffic speed – the multifunctional assessment tool for the structural evaluation and the design of pavements (MESAS). It is based on a fast-moving bearing-capacity measurement system, the Traffic Speed Deflectometer (TSD).

Process description
The measuring system is installed in an articulated vehicle. The core part is the single-axle semi-trailer equipped with various measuring systems. All measuring systems are designed for assessment at driving speeds of up to 80 km/h, so that measurements can be carried out “with the flow of traffic”. The lowest measuring speed is about 40 km/h. MESAS is therefore primarily designed for measurements at network level. It consists of the following subsystems.

**Traffic Speed Deflectometer**
The single axle of the semi-trailer applies a static load of ten tonnes on the road pavement. The dynamic axle load generated while the vehicle is in motion is continuously recorded. The resulting short-term deformation of the road surface, which is completely reversible, is detected without contact in the wheel track at various distances in front of the axle and behind it. For this purpose, Doppler laser sensors measure the deformation velocity, and deflexions (deformations) are determined by mathematical derivation. These deformations are output as mean values over ten meters. One of the innovative features here is the recording of deformations in front of the load axel, but also behind it. This allows an in-depth analysis of the bearing capacity. The measurements are currently carried out on asphalt pavements, the application on concrete pavements is the subject of further developments.

**Ground penetrating radar (GPR)**
MESAS is equipped with a 2 GHz horn antenna for the non-destructive detection of layer thicknesses and inhomogeneities in pavement structures and in the subgrade.

**PPS+**
A second generation pavement profile scanner is installed at the rear of MESAS. This laser scanner allows the acquisition of transverse evenness and the recording of surface images over the entire width of a lane. The system works with eye-safe laser technology. It is planned to derive further data on geometry and longitudinal evenness from the measurement data. Additionally a single laser with an accelerometer
Technical data
Dimensions L/W/H: 14.5 m/2.55 m/3.96 m
Weight: 22 t
Axle load of the semi-trailer: 10 t (variable between 9 and 13 t)
Measuring speed: up to 80 km/h
Measuring performance: up to 600 km/day (60,000 measurement points with an averaging length of 10 m)

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