PRESSEINFORMATION

Federal Highway Research Institute BASt uses road surface scanner from Fraunhofer IPM for new assessment tool

The Pavement Profile Scanner PPS-Plus from Fraunhofer IPM is part of the latest measuring vehicle MESAS of the Federal Highway Research Institute BASt. The research vehicle records the condition of road surfaces and the substance of the asphalt surface and thus provides the basis for optimum maintenance planning. During test runs, MESAS has already successfully measured more than 11,000 kilometers of the federal trunk road network. Now regular operation starts.

Since the beginning of 2018, BASt has put the "multifunctional assessment tool for the structural evaluation and the design of pavements" MESAS into operation. For MESAS, innovative measurement technology was installed on a single-axle semi-trailer. In addition to the PPS-Plus, a laser-based Traffic Speed Deflectometer (TSD) measures short-term reversible deformations of the road surface, a georadar detects layer thicknesses and inhomogeneity of the road superstructure, and ambient cameras provide images for interpreting the georadar measurements, among other things. All measurement systems are synchronized and georeferenced using a GNSS system. "MESAS is a globally innovative measuring system," says Dr Dirk Jansen, head of department at BASt. "Here we have a really powerful tool at our disposal with which we can make an innovative and significant contribution to the further development of conservation planning".

Measuring evenness with millimeter precision at 80 km/h

As part of MESAS, the Pavement Profile Scanner PPS-Plus developed by Fraunhofer IPM records the transverse evenness of the road surface with high precision. The basic system Pavement Profile Scanner PPS is the only laser-based measuring system approved by the BASt for the measurement of transverse evenness of road surfaces and is the world leader in precision and resolution. The scanner, the size of a shoe box, is mounted on measuring vehicles and scans the road surface with an eye-safe laser beam over a width of about four meters. The distance to the road surface is determined with sub-millimeter accuracy using phase shift technology. The laser scans the surface with the aid of a rotating polygon mirror perpendicular to the forward movement of the vehicle and generates 800 profiles per second. Each profile consists

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of up to 900 measuring points, depending on the selected measuring frequency. In this way, the PPS generates a detailed 3D height profile of the road surface. At traveling speeds of 80 km/h, the measuring point distance in the longitudinal direction is approximately 28 millimeters, in the transverse direction it is 4.5 millimeters.

Intensity laser replaces cameras for detection of structural features of the road surface

In addition to the geometric 3D information, the scanner variant PPS-Plus integrated in the MESAS vehicle provides photorealistic grey scale images of the road surface on which even millimeter-thin structures, such as small repairs and patches, are recognizable. Until now, additional cameras were necessary to generate such images. Fraunhofer IPM has equipped the laser scanner with a separate intensity laser for this purpose. Wavelength, measuring frequency and focus size are optimally selected for measuring the intensity of the backscattered light. While the distance laser measures sufficiently fast with a measuring frequency of 1 MHz, the intensity laser operates at a speed of 80 km/h with a pixel measuring frequency of about 4 MHz. This results in a spatial resolution of about 1mm over the scan width of 4 meters. In order to achieve a greater point density in the direction of travel, the second laser beam is additionally fanned out in the direction of travel and simultaneously detected with 16 detectors.

"Our patented approach of replacing the cameras with an intensity laser has several advantages over conventional camera technology," emphasizes Prof Dr Alexander Reiterer of Fraunhofer IPM. Cameras require strong additional lighting to achieve consistent image quality. For intensity measurements, the high color dynamics of the road – from dark asphalt to bright road markings – present no problem. In contrast to bulky camera technology, the integrated distance and intensity scanner in the PPS-Plus allows a compact optical design and a flexible system design for installation on various mobile platforms. There is no need to merge the individual camera images and subsequently fuse the scanner and camera data in a time-consuming process. With PPS-Plus, distance and intensity lasers are deflected via a single scanning mirror, so that geometry and image data are always exactly superimposed. The spatial assignment of features is therefore inherent in the system.

The new measuring vehicle MESAS of the Federal Highway Research Institute is 14.5 m long and weighs 22 tons. At speeds of up to 80 km/h, MESAS records road condition parameters with high precision. The data will be used to support the maintenance planning of the road network. The Pavement Profile Scanner PPS-Plus developed by Fraunhofer IPM is mounted at the top of the rear.
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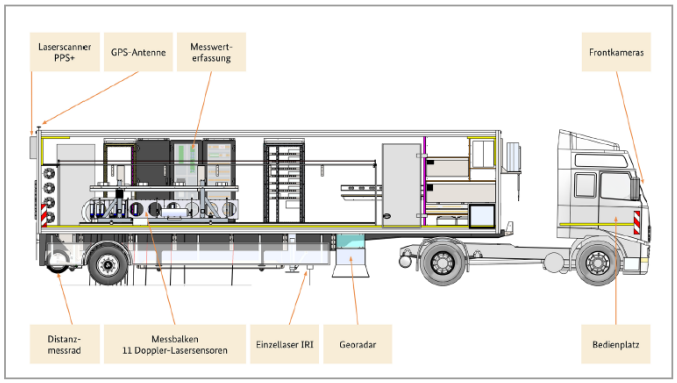

MESAS features various mainly laser-based measuring systems which record the road surface without contact. The measurement data are synchronized and georeferenced with the help of a GNSS system. Software tailored to the applicatoin manages the data and supports route planning and quality assurance during operation.
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