MAKING OF

The Stuttgart Handling Roadway was launched by FKFS and Stuttgart University in 2019. It is currently a unique facility throughout the European research landscape. It is designed to support a large variety of research topics and is open for public research and industrial development.

The Handling Roadway was realized under the Major Research Instrumentation Programme as per Art. 91b GG funded by Stuttgart University, Baden-Württemberg Ministry of Science, Research and the Arts (MWK) and the German Research Foundation (DFG).

RESEARCH IN MOTION.

FKFS THE COMPANY

The Research Institute of Automotive Engineering and Vehicle Engines Stuttgart (FKFS) was founded in 1930. We have a multitude of dedicated, highly-qualified staff available to implement research and development projects in the fields of powertrains, vehicles and automotive mechatronics. Numerous highly-specialized test benches and our own measurement, testing and simulation procedures – developed right here at FKFS – enable us to solve complex and demanding problems.

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2019-05

AUTOMOTIVE **ENGINEERING**

STUTTGART **HANDLING ROADWAY**

3D VEHICLE DYNAMICS UNDER LABORATORY CONDITIONS

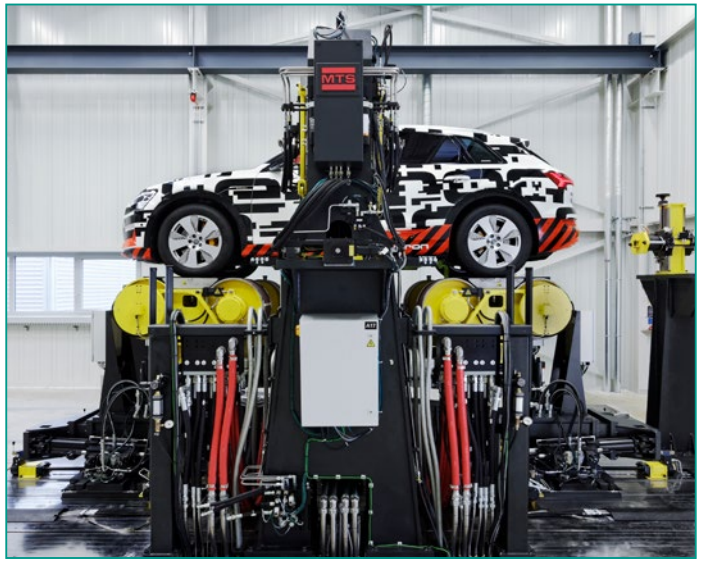
RESEARCH IN MOTION.

Universität Stuttgart
Institut für Verbrennungsmotoren
und Kraftfahrwesen

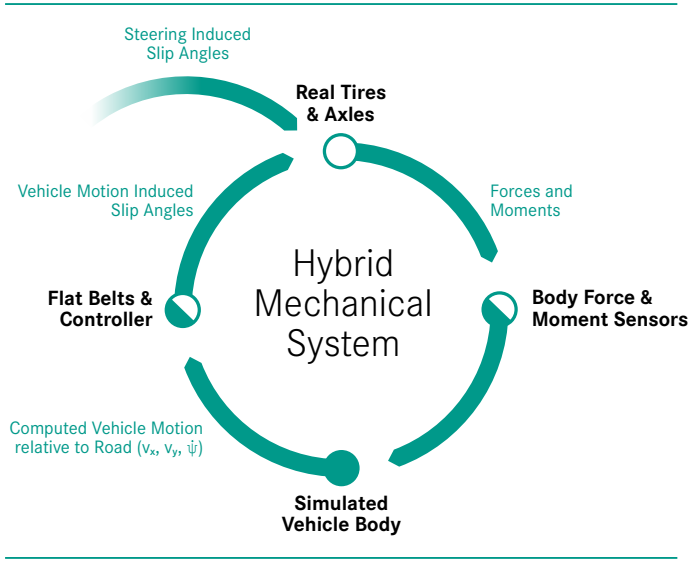
FKFS

STUTTGART **HANDLING ROADWAY** 3D VEHICLE DYNAMICS UNDER LABORATORY CONDITIONS

Stuttgart Handling Roadway - system overview



Stuttgart Handling Roadway - full vehicle testing



Operating principle for lateral dynamics testing

THE TEST BENCH

The Stuttgart Handling Roadway (HRW) features four flat belt units that can be steered about their vertical axis. This allows reproducing the relative motion between the wheels and the road plane experienced during real road testing.

The flat belt units can also be moved vertically to simulate road unevenness and provide realistic operating conditions when evaluating chassis and steering system. A robot driver provides all necessary control input.

For evaluation of longitudinal and lateral dynamics the center of gravity restraint system (CGR) is used to retain the vehicle on the test bench. It allows the vehicle to roll, pitch and heave. The restrained lateral, longitudinal and yaw motions are computed based on the acting tire forces and the simulated road load.

The CGR virtually applies the restraint forces to the vehicle center of gravity. This results in correct pitch and roll angles in response to the tire forces acting in the road plane. For additional use cases a 3-link restraint system is available as well.

APPLICATIONS

» Vehicle Dynamics Development

- Combined ride and handling evaluation
- Open and closed loop driving maneuvers
- Limit & event handling evaluation
- Suspension characterization and development
- ADAS scenario evaluation
- Support road testing

» Active Chassis System Development & Validation

- Active suspension / steering system development
- Brake system and drivetrain development
- Function development and testing
- Component and sensor evaluation

» CAE Method Development & Validation

- Model development
- Simulation validation

TECHNICAL PROPERTIES

Moving-Belt Input Channel

Belt Speed	0.5 – 220 km/h
Peak Power / Cont. Power	220 kW / 140 kW
Long. / Lat. / Vertical Load	6 kN / 10 kN / 15 kN
Frequency Bandwidth	>15 Hz

Vertical Input Channel

Acceleration	7 g
Velocity	500 mm/s
Displacement	± 75 mm
Frequency Bandwidth	30 Hz

Belt Steer Input Channel

Acceleration	4,000 deg/s²
Velocity	80 deg/s
Stroke	± 20 deg
Frequency Bandwidth	>15 Hz