Vehicle Dynamics





Johann Pankau

Vertical Vehicle Dynamic

- □ Suspension / chassis requirements based on vertical dynamic
- □ Road Excitation
- Suspension / chassis components
 - □ Tire in vertical dynamic
 - □ Spring
 - □ Shock absorber
 - □ Seat
- I Modeling of vertical dynamic
 - One wheel model
 - □ Single mass model
 - □ Two mass model
 - Parameter study for vehicle springing
 - □ Active springing, active damping
 - □ Single track springing modeling
 - Double track springing modeling
 - □ Springing of the vehicle roll motion
 - Stabilizer bar, balancing spring
- Vehicle concept and springing behavior
- □ Methods of springing investigation
- □ Transfer of different vibration excitations to the driver





Vehicle Suspension Requirements



Based on vehicle vertical dynamic requirements, vehicle suspension most important quality function is to reduce, minimize vehicle body movement

In following some important ride comfort rating Criteria:

- Vibration comfort for the passengers (acting Vehicle body acceleration amplitude, direction, duration)
- Effective wheel dynamic force variation, which define the tire road force connection (safety definition) and the road surface load / stress demand (road construction fatigue)
- Suspension packaging / vehicle design
- □ Costs
- Lifespan of the components
- Environment influence sensitivity (temperature, corrosion,

...)



Vehicle Suspension Requirements





Lateral Vehicle Dynamic

- Lateral dynamic driving behavior requirements
- □ Tire in lateral dynamic
 - □ Tire requirements
 - □ Tire design
 - Force transfer in circumferential direction
 - □ Force transfer in lateral direction
 - □ Lateral force and aligning moment defined by slip angle
 - □ Lateral force and aligning moment defined by camber angle
 - □ Force transfer in circumferential and lateral direction
 - Unstable , nonlinear tire behavior
- □ Single track vehicle model
 - □ Stationary and nonstationary behavior
- □ Four-wheel modelling definition
 - Steering behavior parameter study
 - □ Center gravity position: height, position
 - □ Roll axle, roll behavior
 - □ Toe and camber angle
 - □ Traction of the driving axle
 - □ Rear axle supplemental steering
- □ Influence of longitudinal dynamic events on lateral dynamic
 - □ Acceleration during cornering
 - □ Load changes during cornering
 - □ Braking during cornering
 - Braking on surfaces with split friction coefficients



