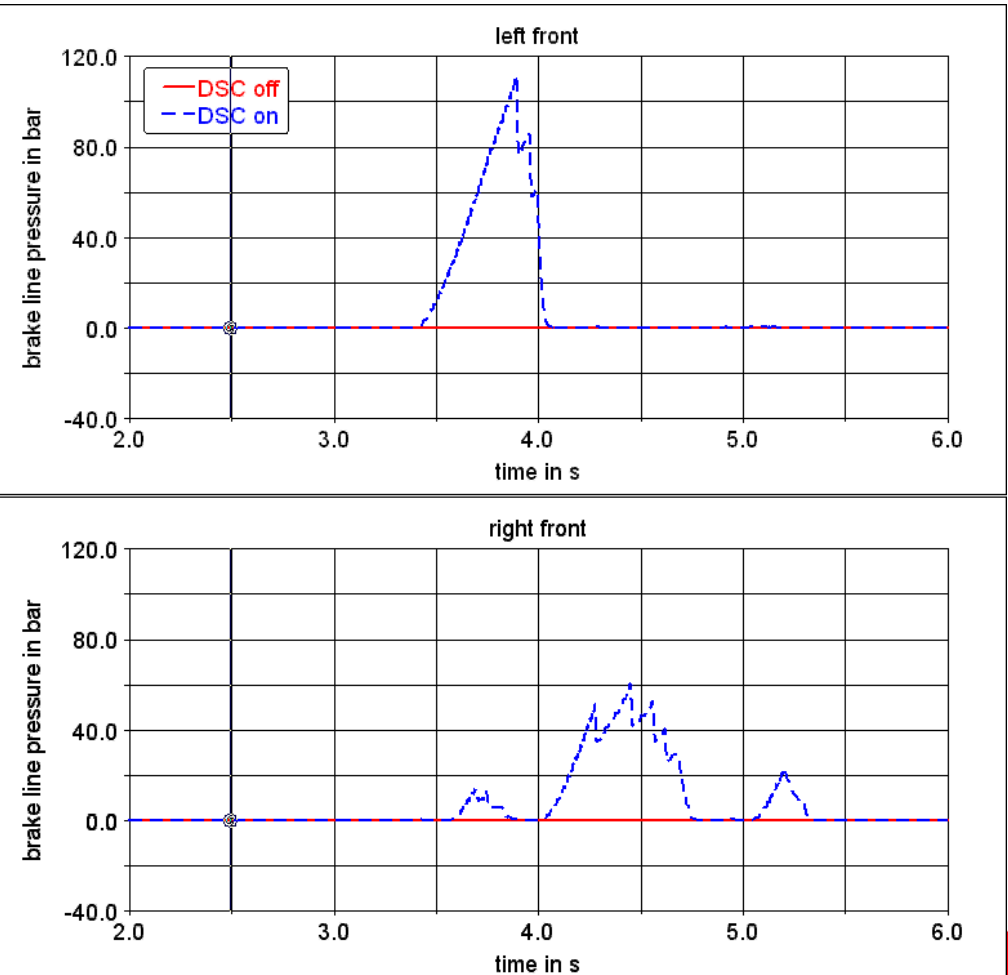
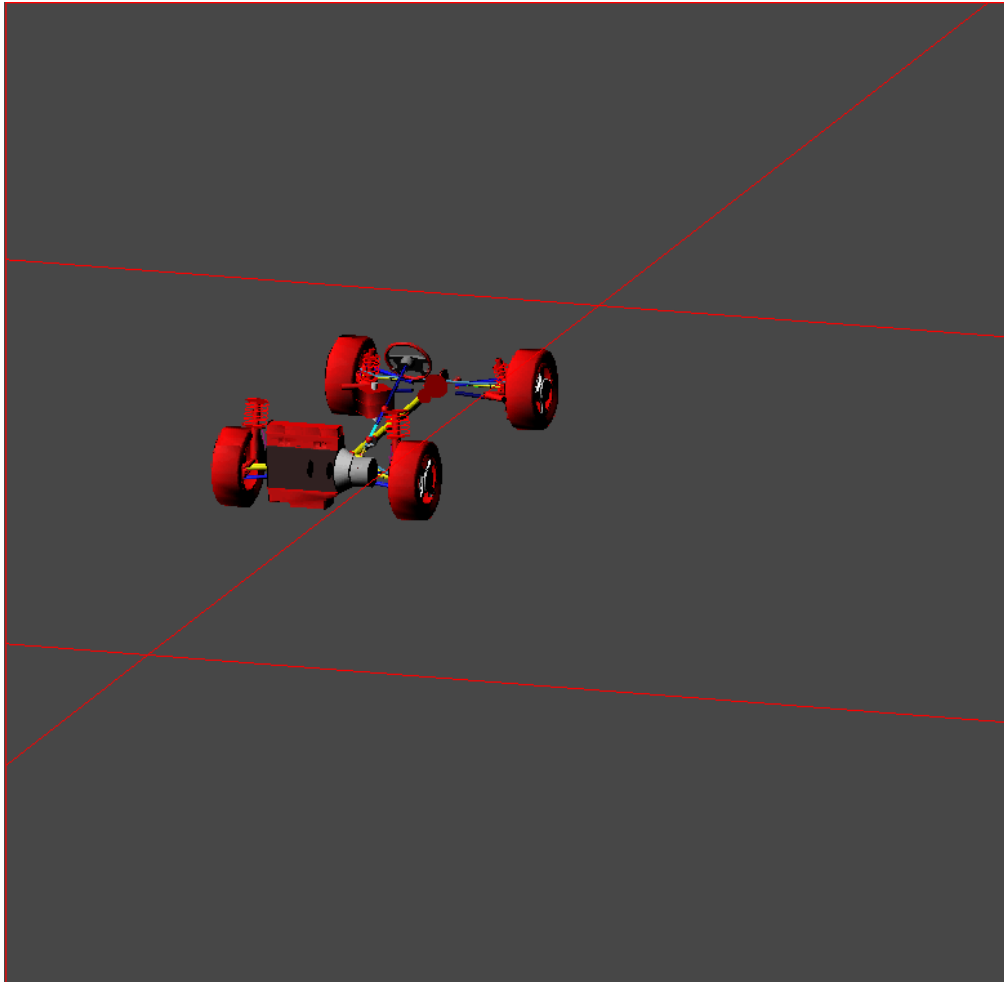




## **Vehicle Dynamics EXPO 2011**

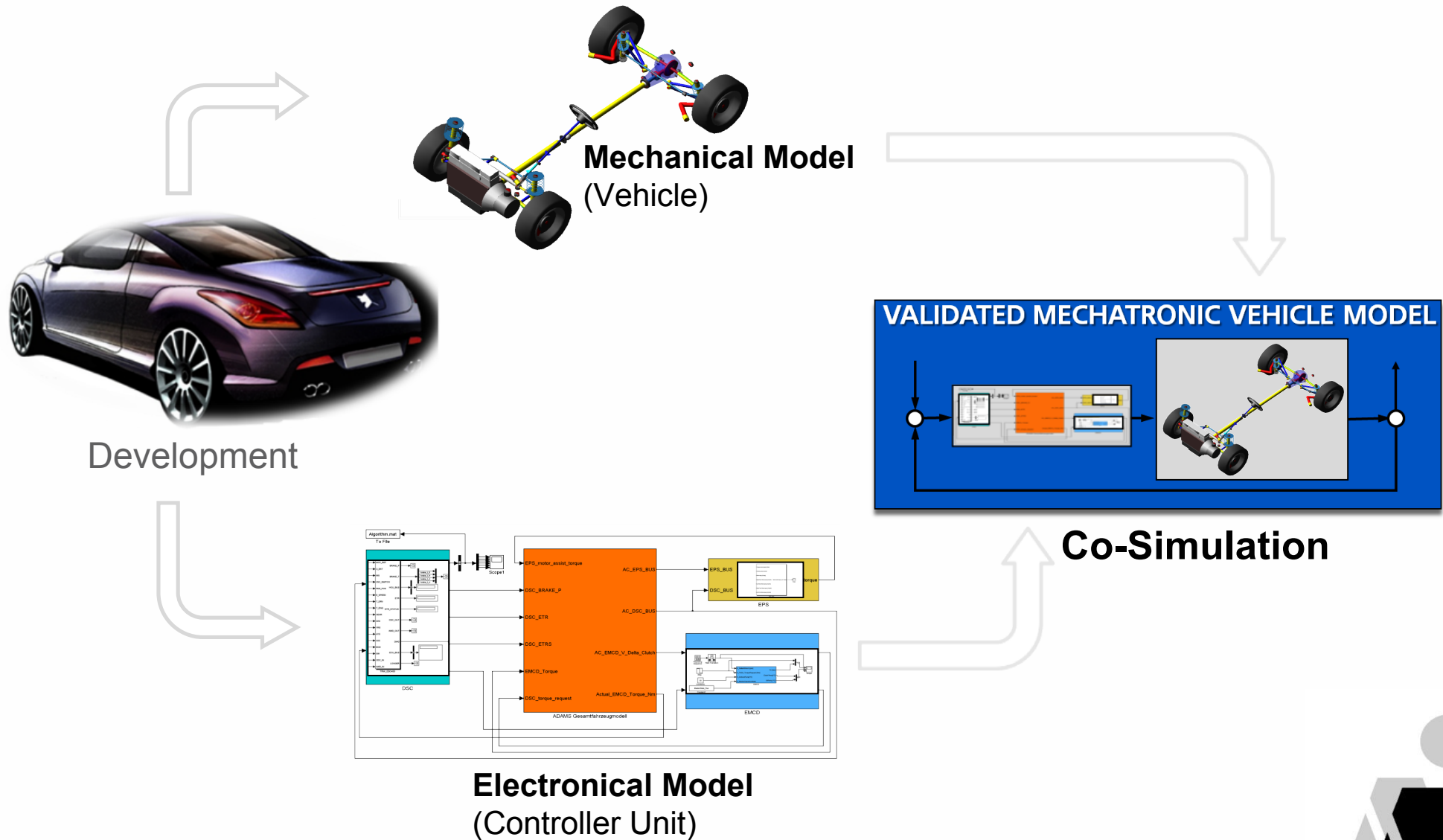
**Mechatronic MBS vehicle models for efficient vehicle handling simulations**



## NHTSA-Fishhook

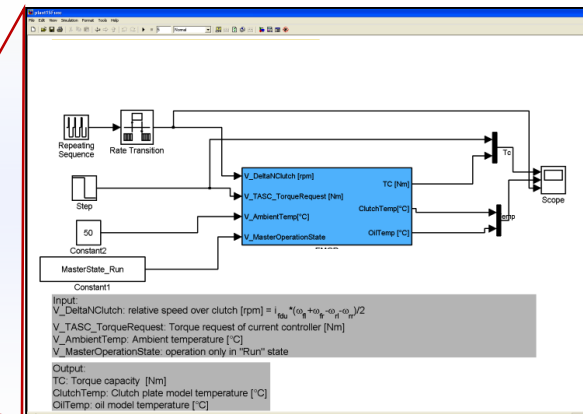
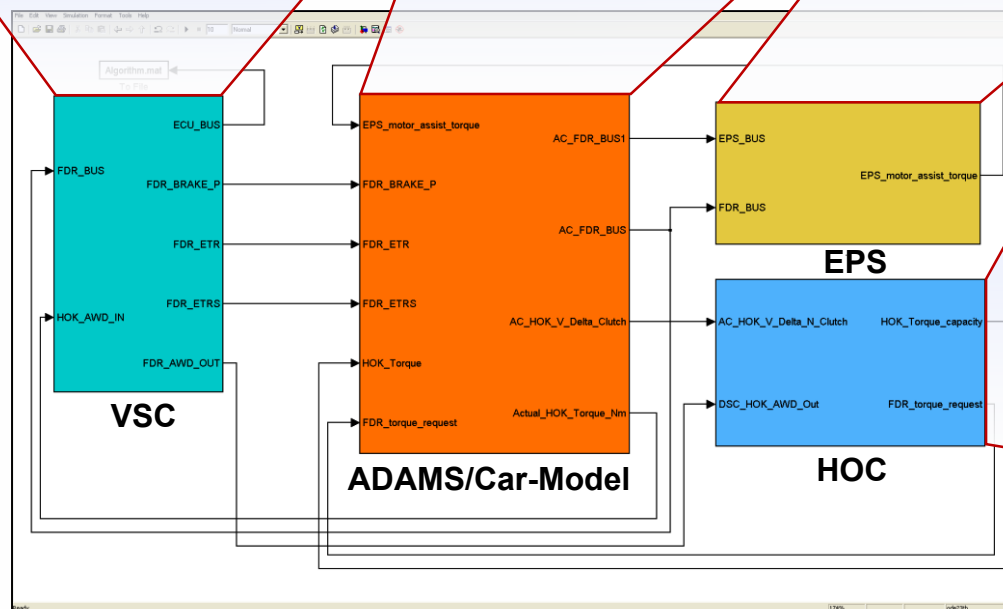
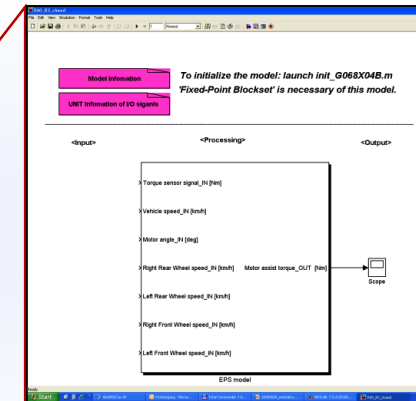
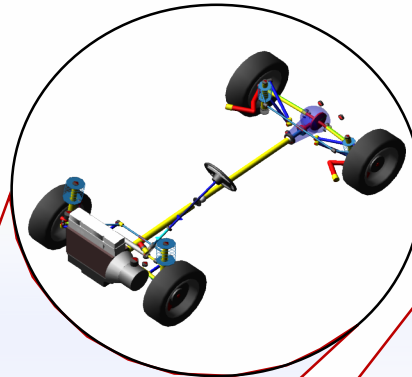
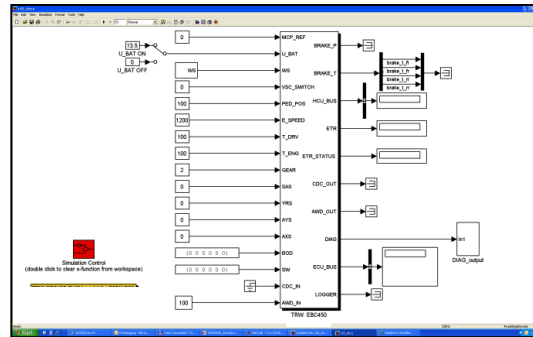
# Mechatronic Full Vehicle Model

## Model Junction via Co-Simulation



# Mechatronic Full Vehicle Model

## Co-Simulation of ADAMS/Car & MATLAB/Simulink

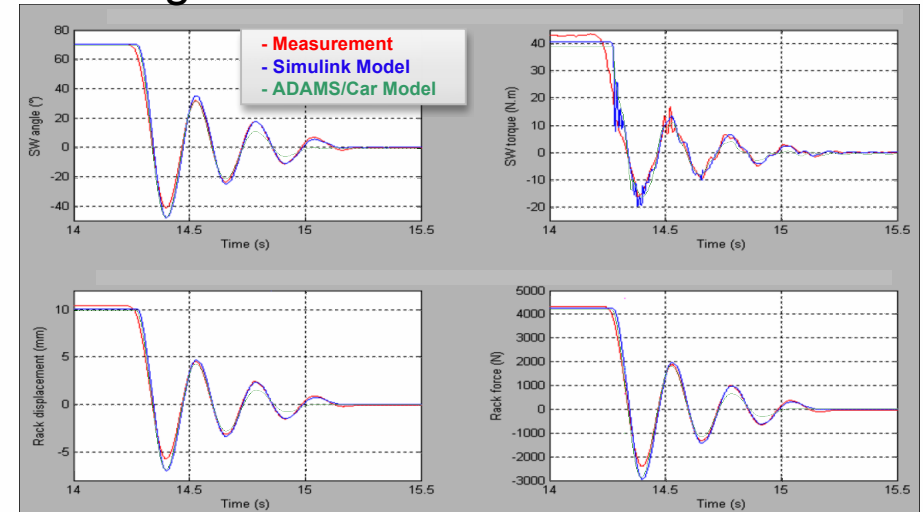


# Testrig Validation: Electronic Power Steering

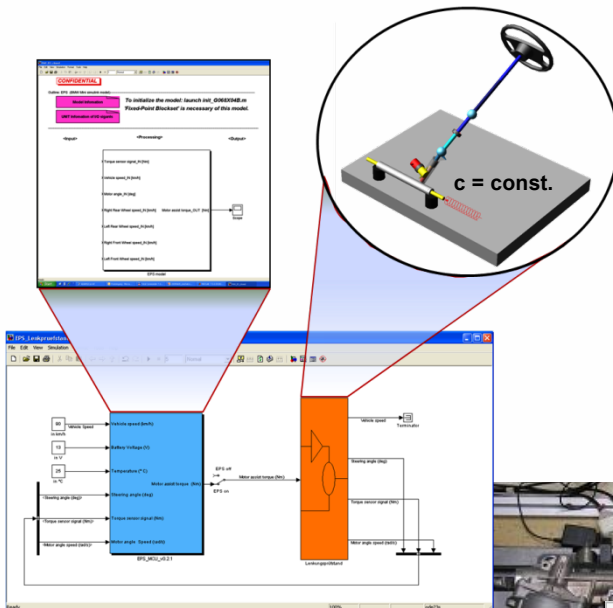
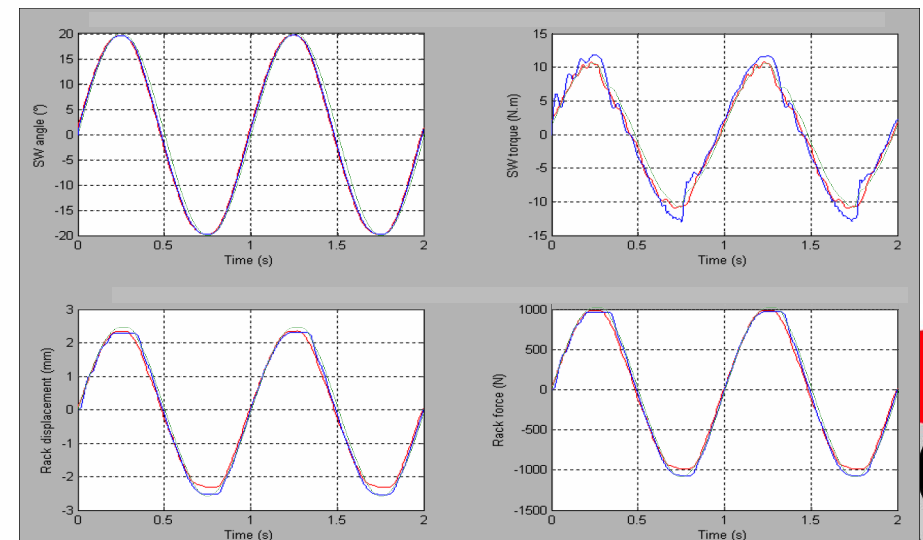
## testrig maneuvers:

- sine steer @ 1 & 4 Hz
- step steer
- steering wheel release

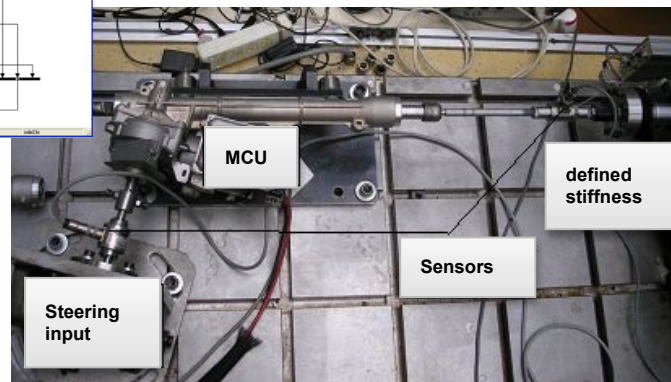
## steering wheel release



## sine steer



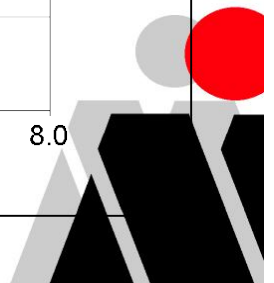
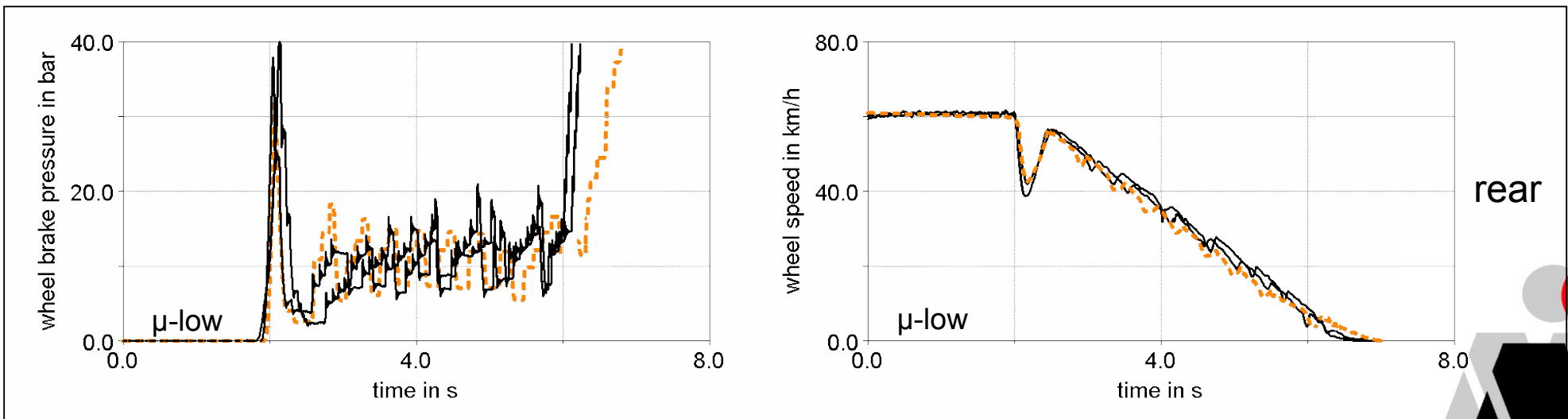
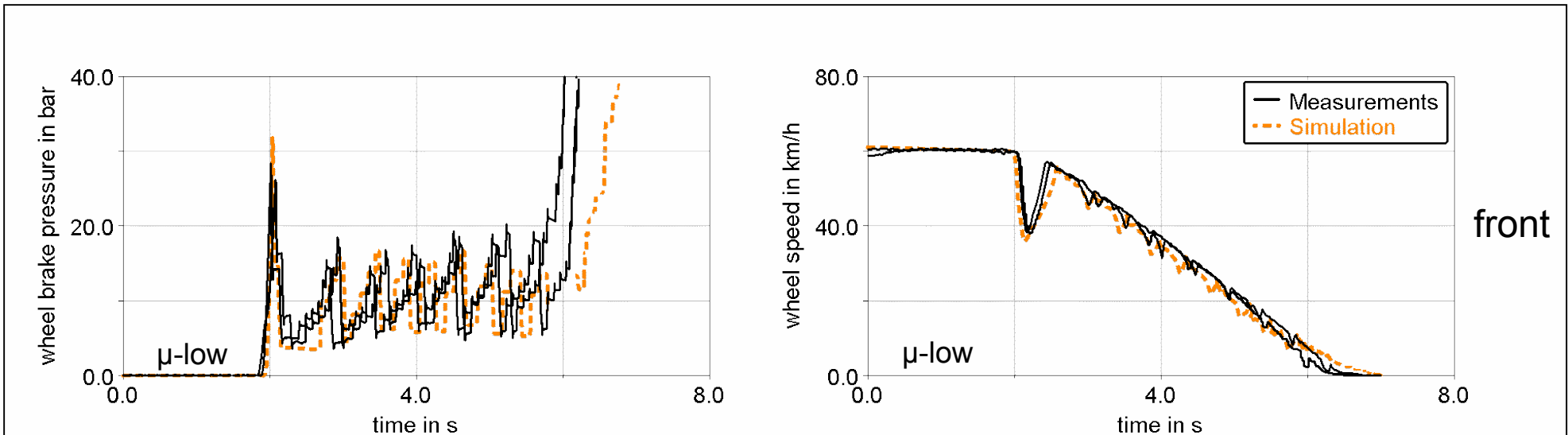
steering testrig model



steering testrig

# Full Vehicle Validation: Anit-Lock Braking System

braking maneuver on  $\mu$ -split road:





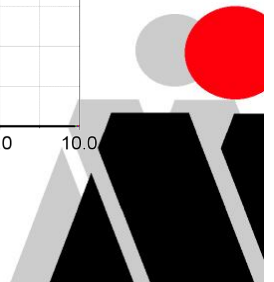
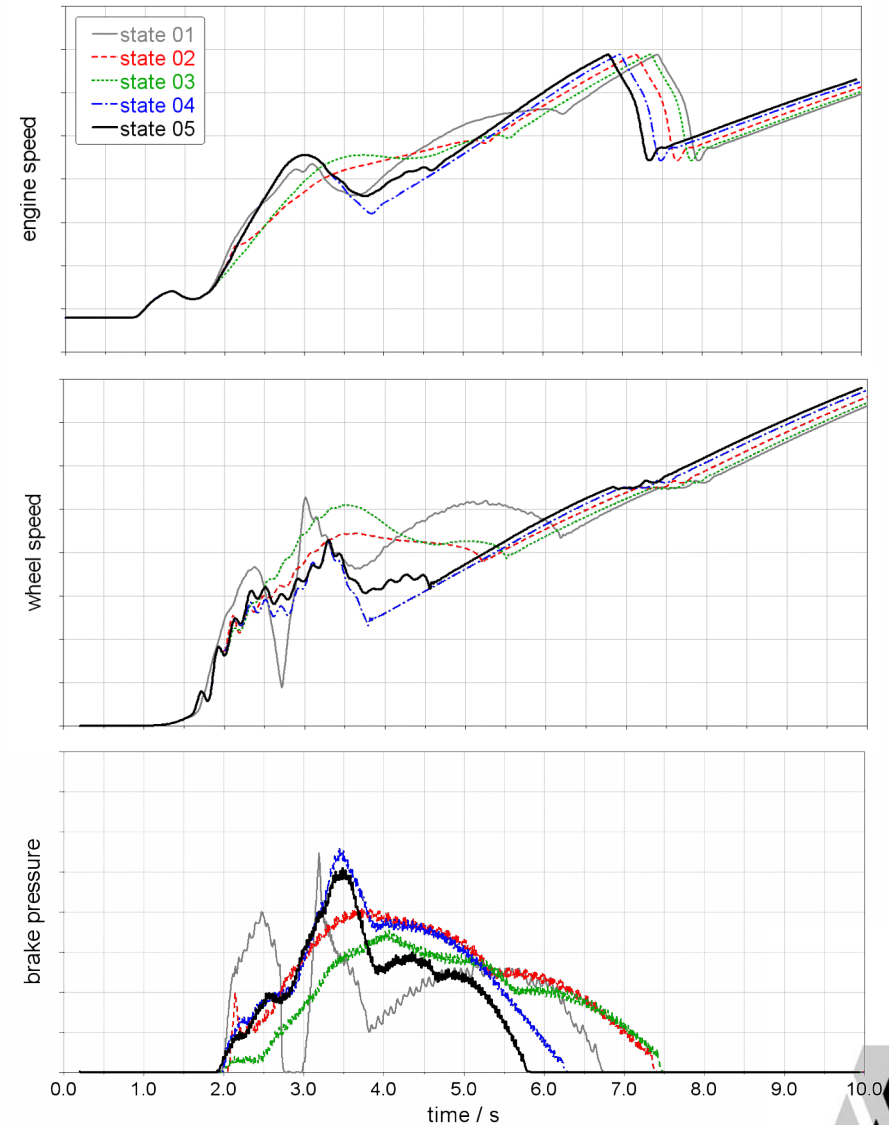
# Vehicle Handling Application

## WOT-Acceleration on $\mu$ -split

The availability of mechatronic vehicle models enables to analyse and highlight the overall vehicle handling behaviour.

### Manoeuvre: WOT-Acceleration

- WOT from standstill
- Steering controller: straight-line
- $\mu$ -split condition ( $\mu_{\text{low}} = 0.1$ )
- Mechanical vehicle model identical
- Vehicle Stability Controller behaviour
- Traction Control
- Request to Hang On Clutch
- Influence of five different controller software states during vehicle development



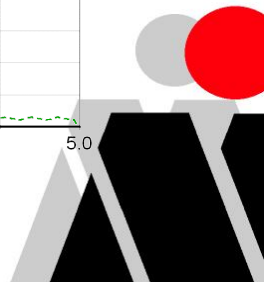
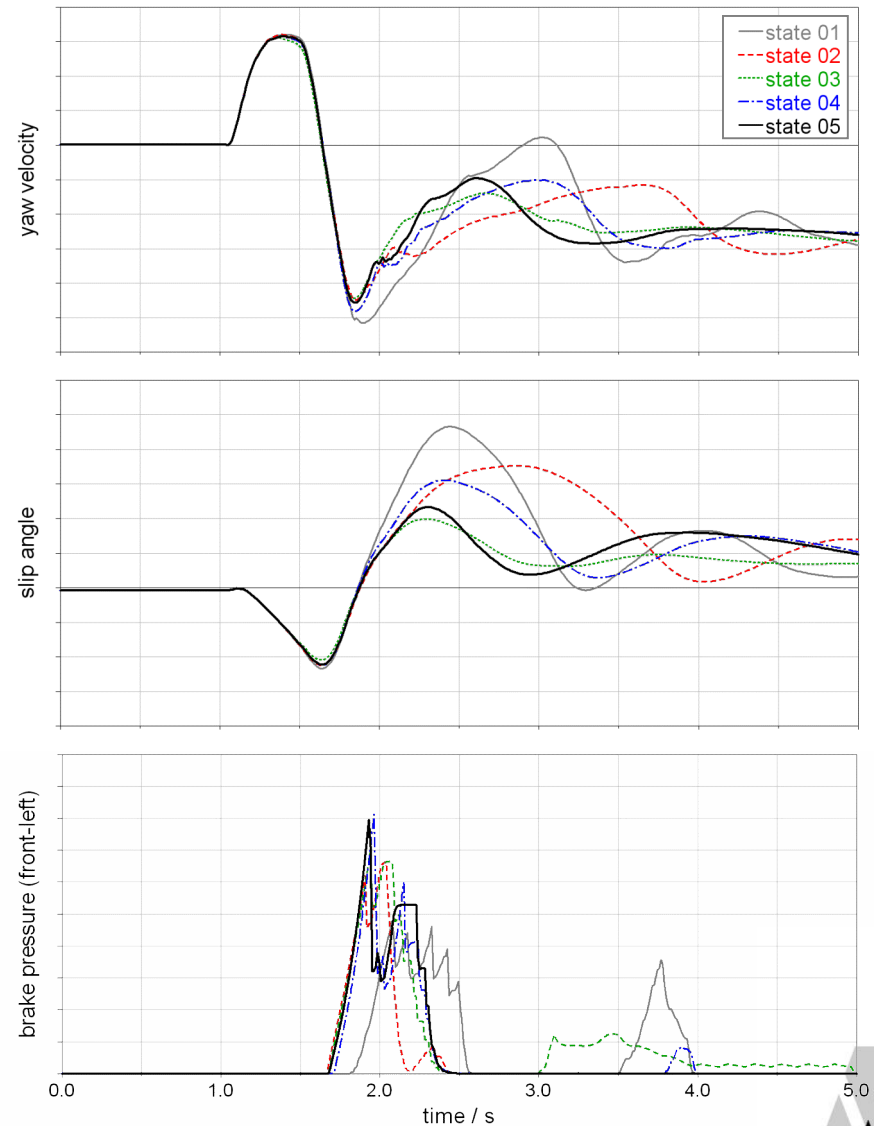
# Vehicle Handling Application

## NHTSA-Fishhook

The availability of mechatronic vehicle models enables to analyse and highlight the overall vehicle handling behaviour.

### Manoeuvre: NHTSA-Fishhook

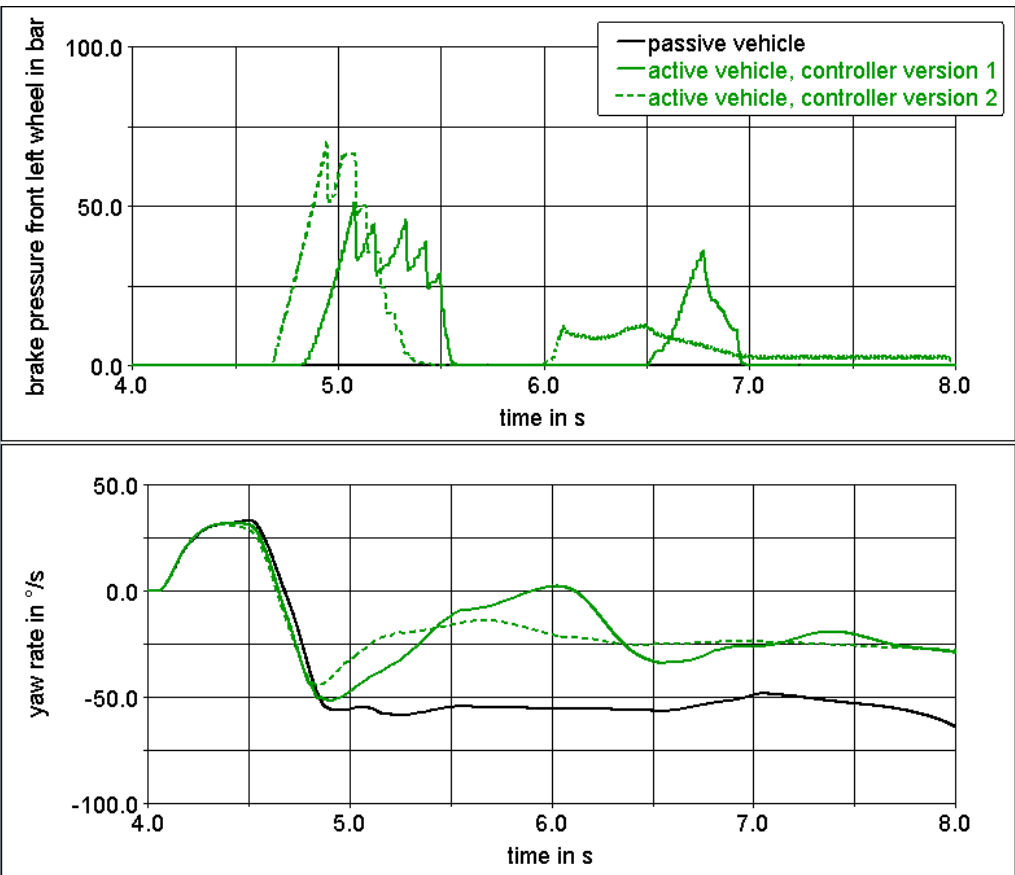
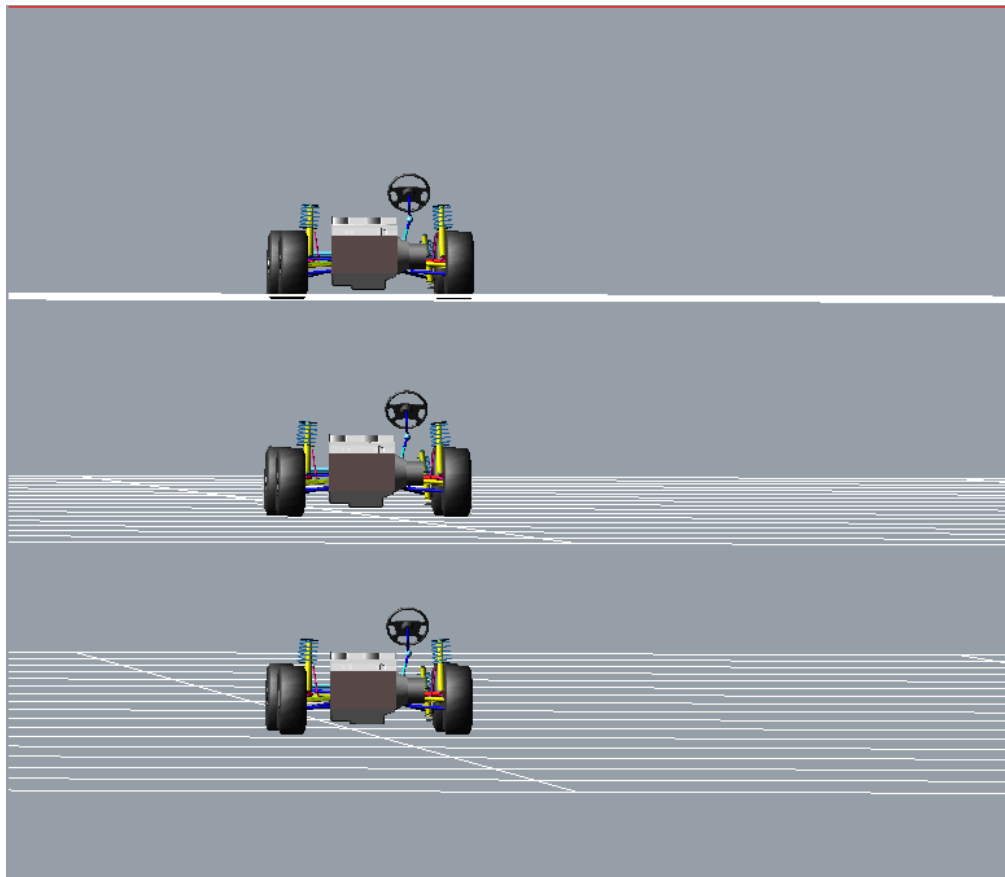
- Open-loop steering input
- Testing rollover- and swerve stability
- Mechanical vehicle model identical
- Vehicle Stability Controller behaviour
- Influence of five different controller software states during vehicle development





# Vehicle Handling Application

## NHTSA-Fishhook



## NHTSA-Fishhook