#H2020RTR21

Multi-Moby

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2ZERO CCAM CONNECTED, COOPERATIVE & AUTOMATED MOBILITY ERTRAC European Commission

Multi-Moby: project introduction

Safe, secure, high performing, multi-passenger and multi-use affordable electric vehicles

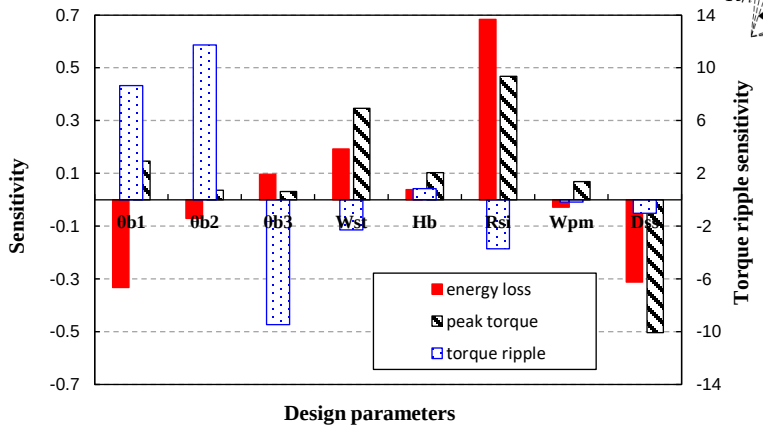
- Funding scheme: H2020 GV-08-2020
- Status: project started on December 1st, 2020
- Duration: 3 years
- Consortium: 9 participants
- Total budget: approx. 7,800 k€
- Coordinator: Infineon Technologies Austria AG

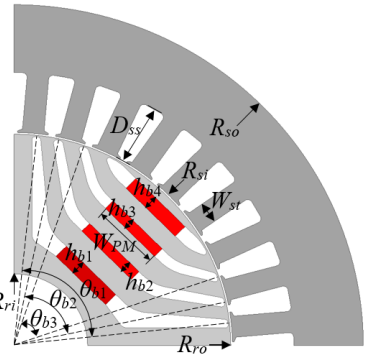
Objectives of Multi-Moby

- Three multi-passenger 4-door M1 vehicles with a 4-wheel-drive on-board centralised powertrain architecture, with two 15 kW 100 V air-cooled highly efficient powertrains based on permanent magnet assisted synchronous reluctance motors
- Three multi-purpose vans, namely an L7e-CU prototype (4-wheel-drive, with 7.5 kW 48V air-cooled powertrains and a low-cost belt-based transmission system) and two N1 versions (4-wheel-drive, one with two 15 kW 100 V air-cooled powertrains, and the second one with two 15 kW 48V liquid-cooled powertrains). One of these vehicle will be for the transport of general goods, while the other two vehicles will target the delivery of food

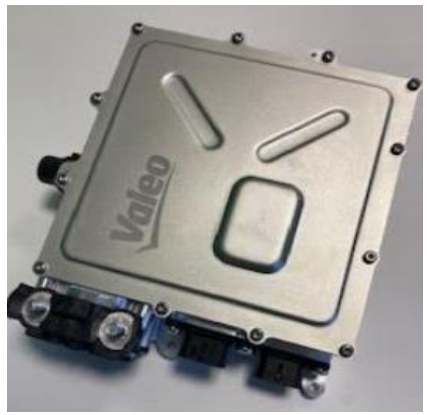
Electric powertrains

- One 100 V powertrain by DANA TM4
- Two 48 V powertrains by Valeo Powertrain Systems
- Simulation-based optimisations, implementation, vehicle installation and testing





- Follow-up of the methodology developed within the H2020 project TELL



Passive safety

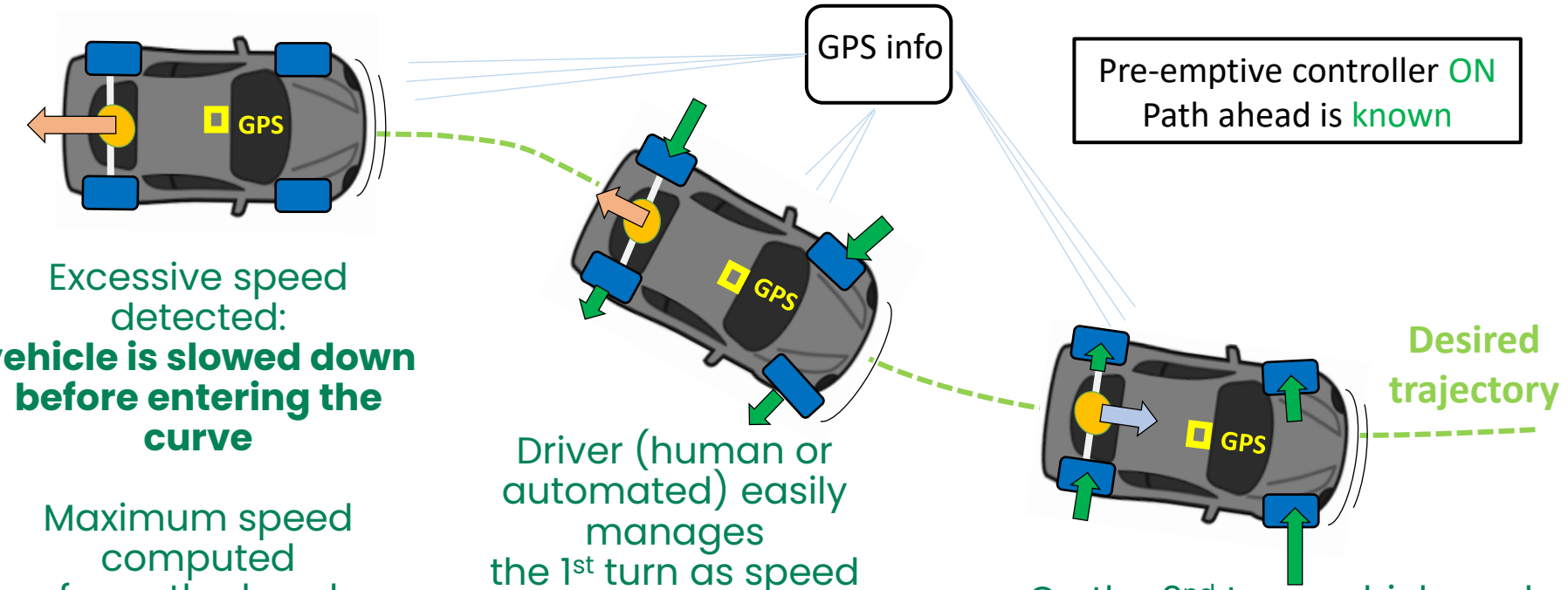
- High strength steel structure combining low cost with high energy absorption capability and stiffness (follow-up of the FP7 project PLUS-MOBY)
- Different products of the Dual Phase steel family are suitably combined
- FEA followed by physical crash tests

Digital twinning of the passive safety aspects

Physical crash tests

Active safety

- Example of Multi-Moby function: **pre-emptive trail braking control**



Excessive speed detected:
vehicle is slowed down before entering the curve

Maximum speed computed for path ahead

Driver (human or automated) easily manages the 1st turn as speed is now acceptable

On the 2nd turn: vehicle under control; driver can start re-accelerating

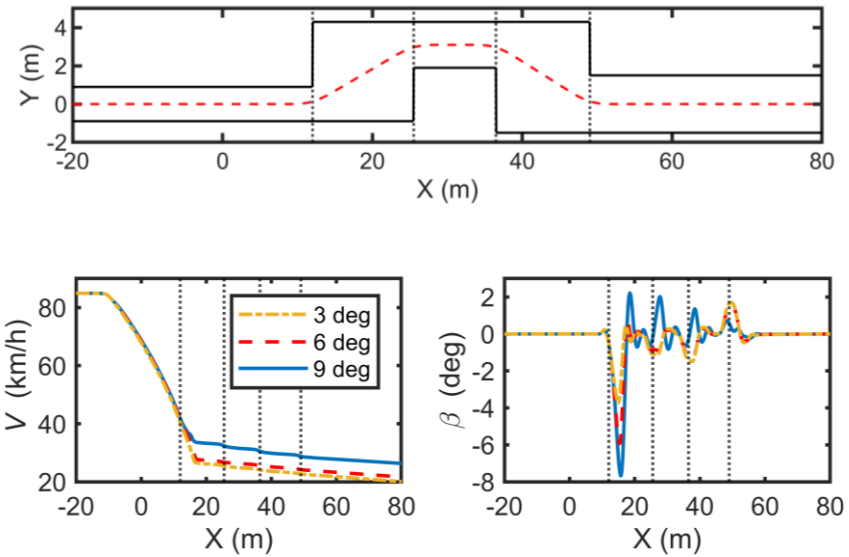
A conventional **ESP would not address** this situation!

Follow-up of the H2020 project STEVE

Active safety

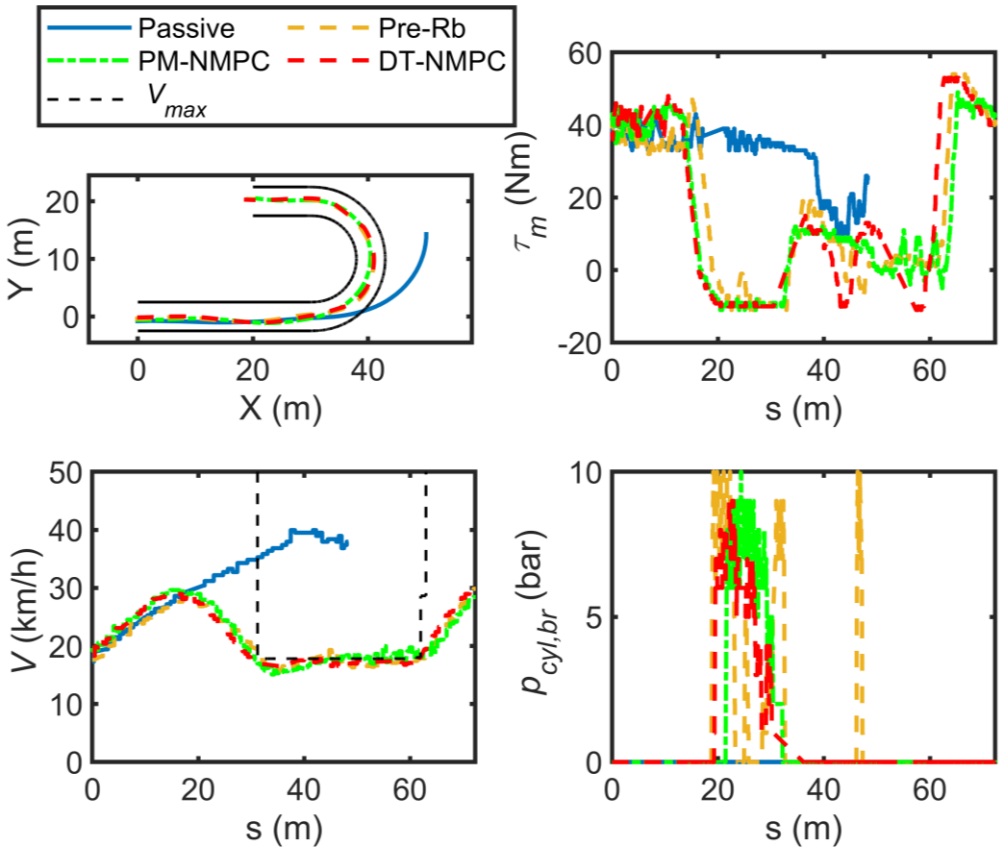
- **Pre-emptive trail braking control**: implementation

Obstacle avoidance test



Novel paradigm: controlling the lateral and yaw dynamics only through the predictive control of the longitudinal dynamics

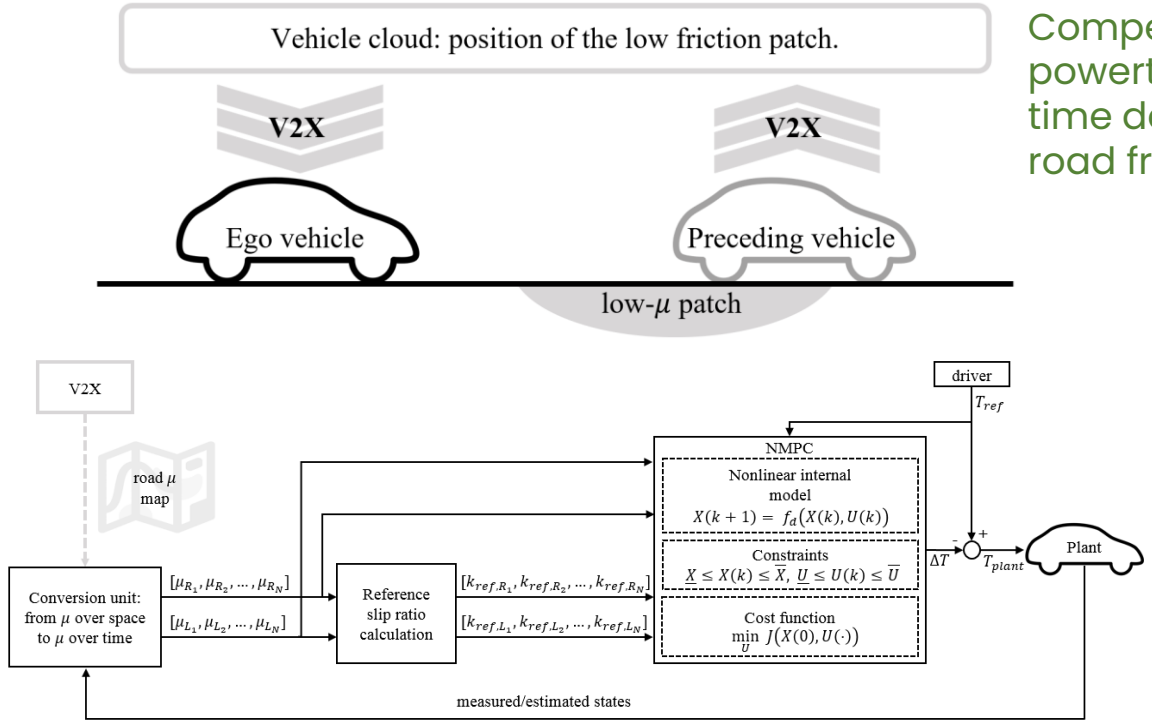
Follow-up of the H2020 project STEVE



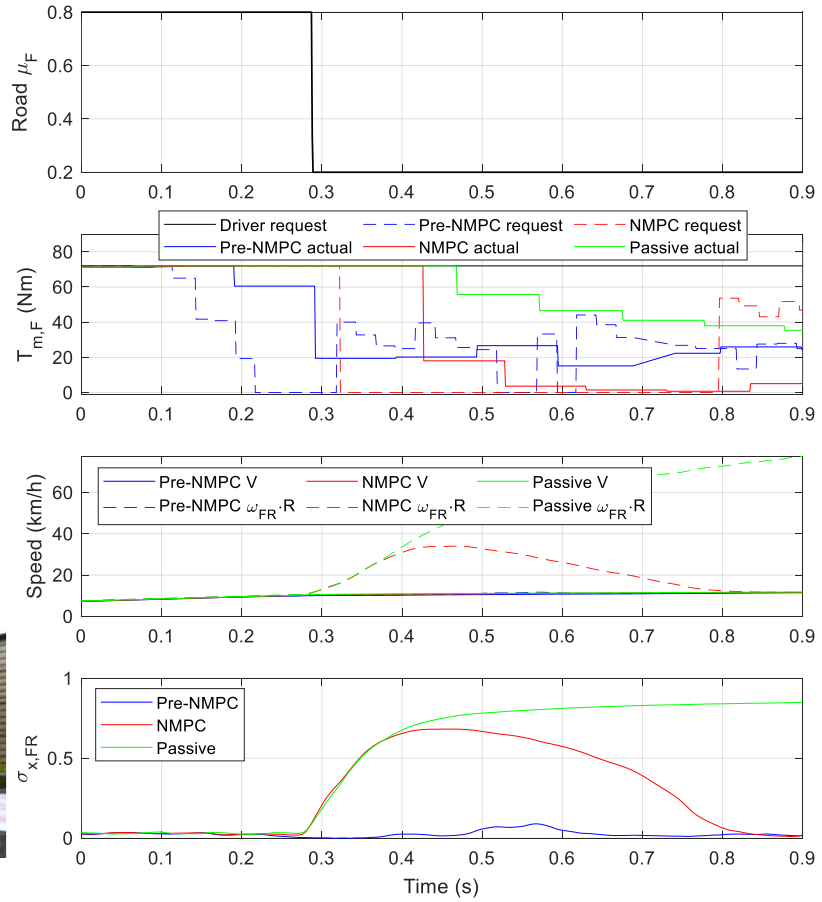
U-turn test

Active safety

- **Traction control** based on tyre-road friction preview



Compensation of the effect of the powertrain dynamics and pure time delays in high-to-low tyre-road friction transitions



Follow-up of the H2020 project TELL

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Mid to long term expected impact of Multi-Moby

Industrial impact

- Advanced active safety features in light electric vehicles, including forms of driving automation
- Energy-efficient electric powertrains with limited content of rare earth materials
- Hybrid energy storage systems for light electric vehicle applications
- Fully electric vehicles with best-in-class energy consumption (<100 Wh/km)
- Micro-factory concept for low-investment production

Mid to long term expected impact of Multi-Moby

Academic impact

- A. Scamarcio et al., “Predictive anti-jerk and traction control for V2X connected electric vehicles with central motor and open differential,” *IEEE Transactions on Vehicular Technology*, 2022 (in press)
- G. Guastadisegni et al., “Vehicle stability control through pre-emptive braking,” *International Journal of Automotive Technology* (under review)
- C. Caponio et al., “Nonlinear model predictive control for front-to-rear torque-vectoring and stability control,” *IEEE Access* (ready for submission)

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Thank you

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