

Investigation of Particle Emissions with a Light Duty Diesel Vehicle Challenges by 3rd RDE Regulatory Package

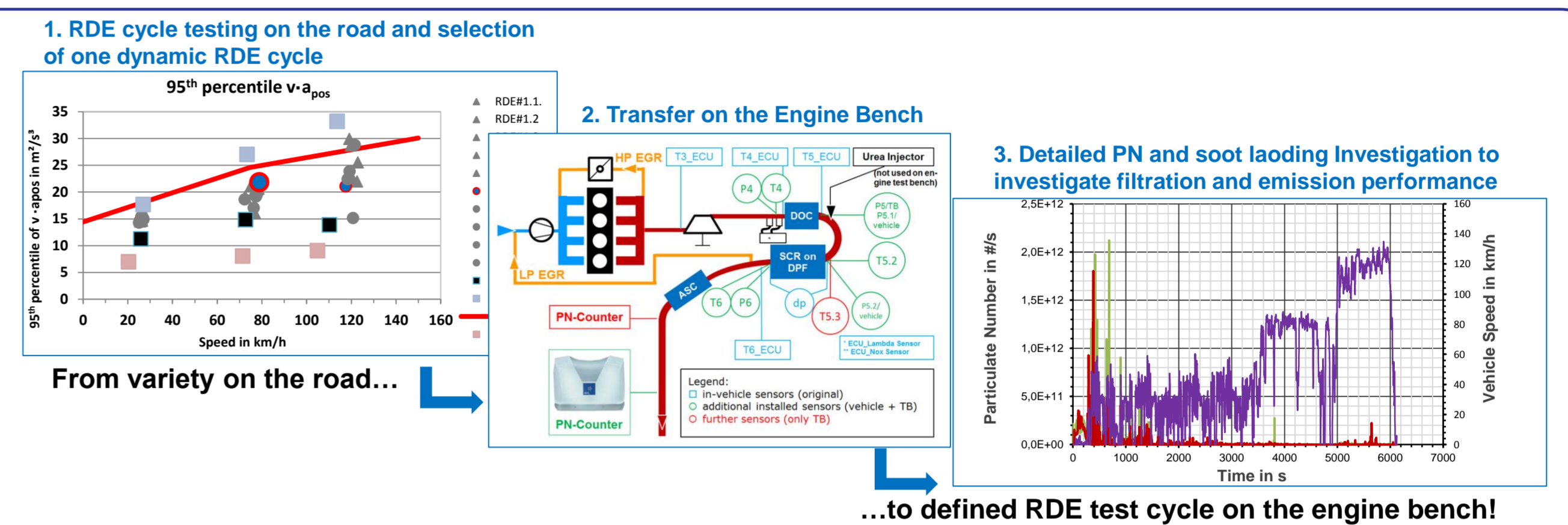
Dr. Niels Heutz, F. Krüger, H. Jahnke, Y. Uesaka, C. Vogt, M. Yamashita; NGK Europe GmbH

- ❖ Tightening emission targets within Euro 6d legislation and implementation of RDE requirements since September 2017 are creating challenges for future Diesel powertrains. Especially the validation of vehicle emissions under real driving conditions enforces exhaust after treatment systems to operate efficiently under various conditions.
- ❖ This study focuses on the investigation of particle emissions for a light duty Diesel vehicle under consideration of the latest legislative package. In a first step RDE test were performed on the road. In a second step one RDE cycle from the road testing was transferred to the engine bench to investigate particle emissions more in detail. All tests were performed with state of the art SiC DPFs by NGK.

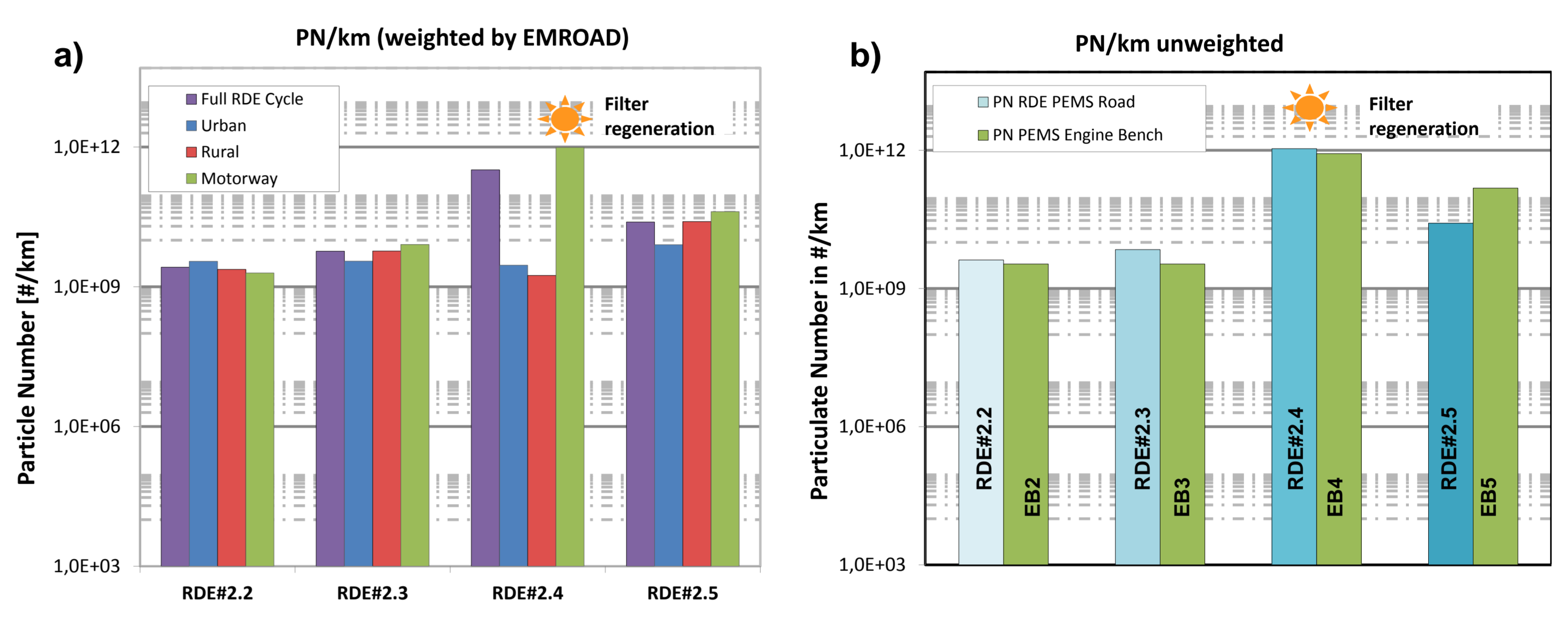
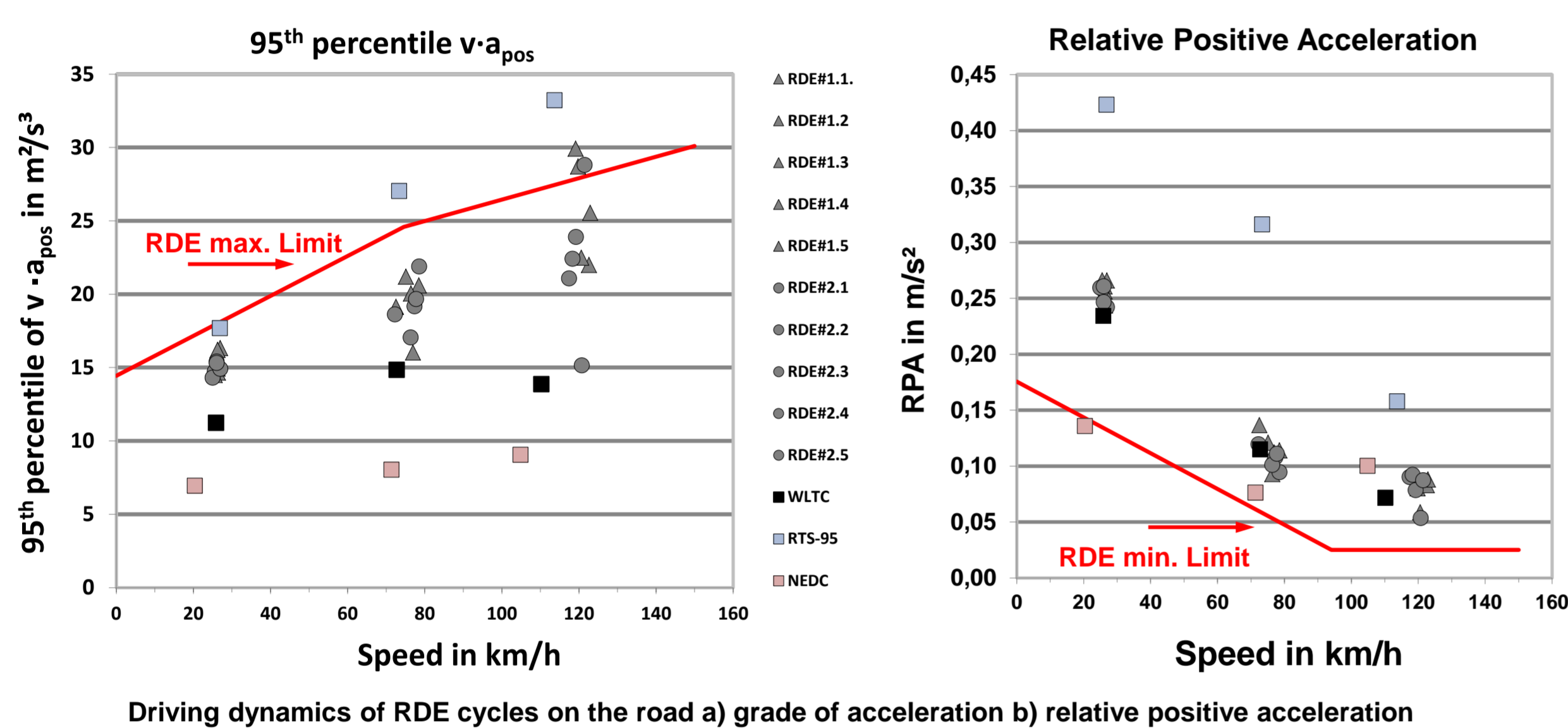
Motivation & Concept

Challenges by RDE package 3 on particle emissions

- ▶ impact on PN by more severe driving dynamics & cold start
- ▶ fulfillment of NTE limits for urban section of RDE
- ▶ impact of filter condition under RDE incl. regeneration events

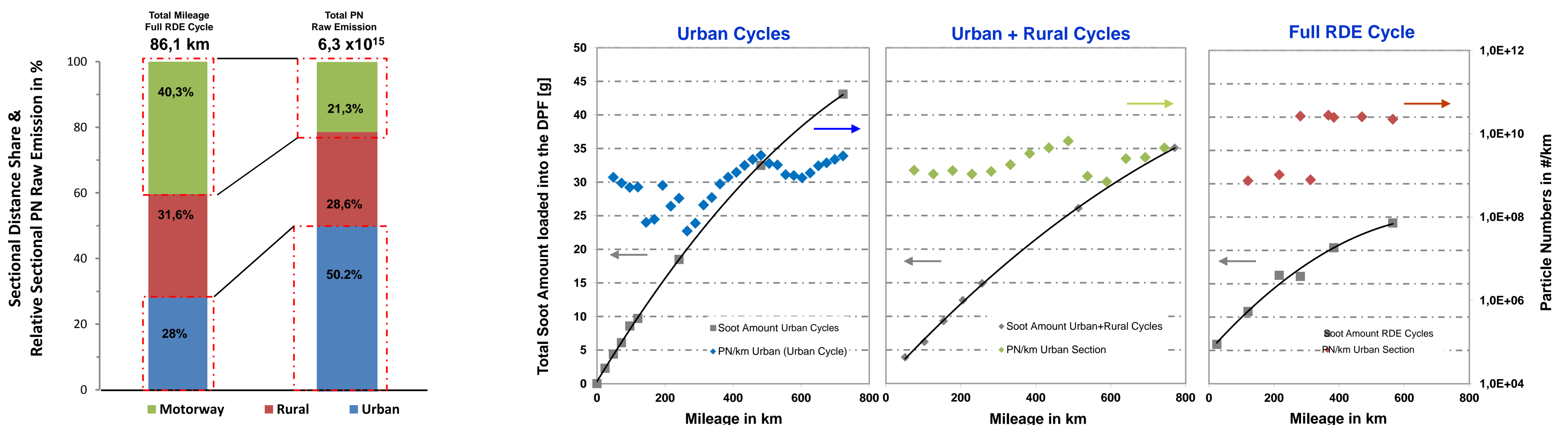


RDE PEMS on the Road and transfer to the Engine Bench

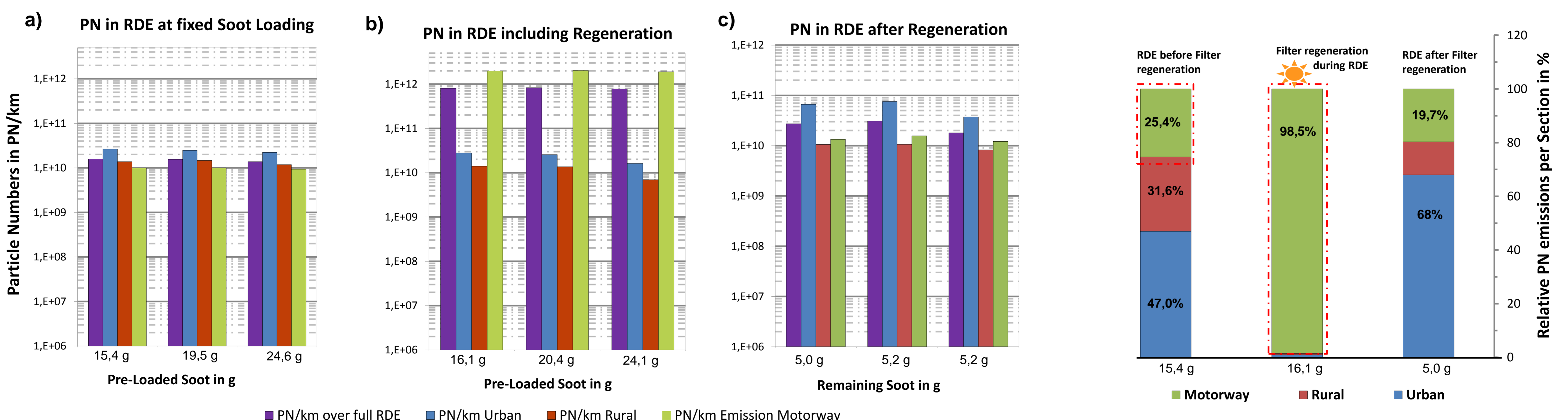


- ❑ Particle emissions under dynamic RDE testing are well below the particle emission limit even when the filter is actively regenerated.
- ❑ Particle emissions behaviour on the engine bench is equivalent to testing on the road.

RDE Particle Emission - Investigation of PN emissions and soot loading on the Engine Bench



Impact by Soot loading on PN emission during RDE



Summary & Conclusions

- ❑ NGK's state of the art High Porosity SiC DPF tested in an existing EU6 serial application fulfills requirements for PN emissions in RDE under latest legislative regulations even with increased soot load in the filter and after filter regeneration
- ❑ Transfer of a RDE test cycle on the engine bench shows reproducible particle emission behavior and allows to investigate PN emissions under different RDE scenarios also including regeneration of the DPF.
- ❑ Particle emission level is affected by soot loading condition of the DPF. Increased soot loading can partially lead to increased particle emissions in the urban sections, whilst staying below the NTE limits, while particle numbers during regeneration remain unaffected.