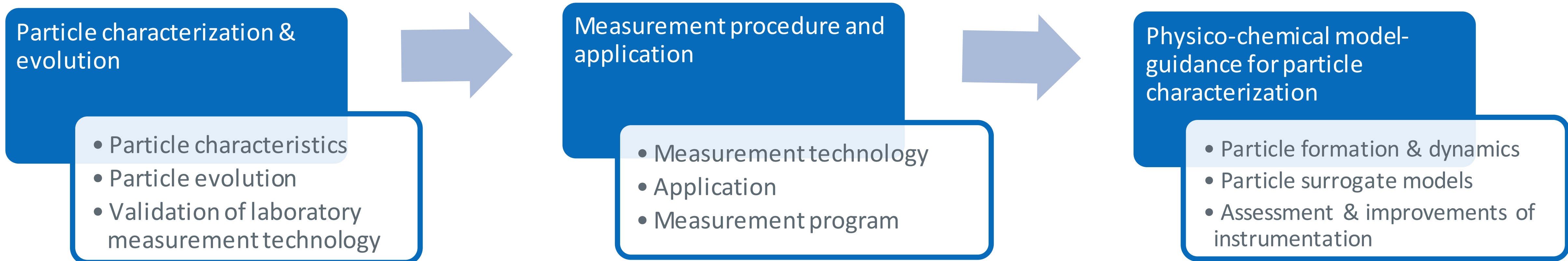


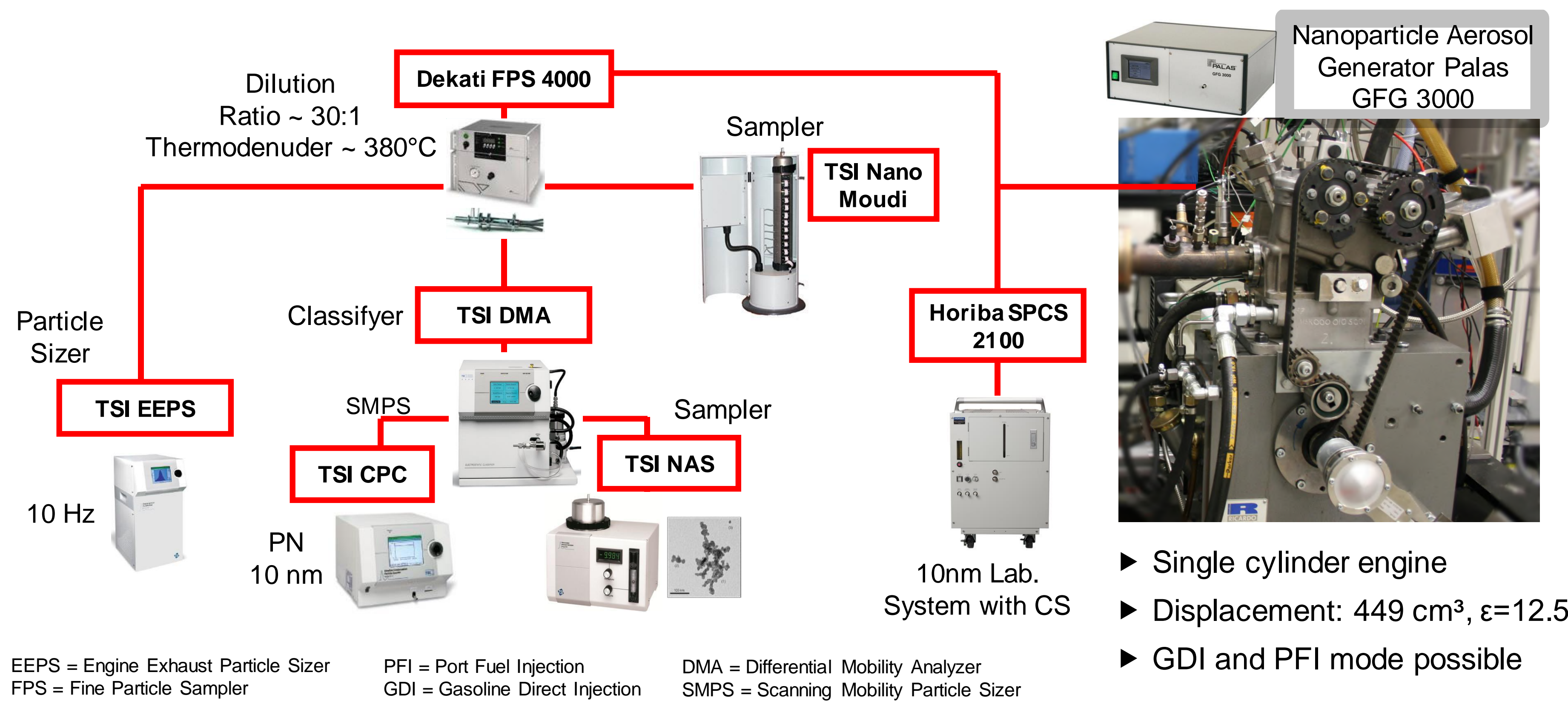
Single Cylinder Engine

Aim & Objectives

1. Particle characterization in exhaust line & validation of laboratory measurement technology
2. Development of a PN >10 nm meas. procedure for the application on a multi-cylinder engine test bench and vehicle on roller test bench
3. Development of surrogate models for particle size distribution and composition
4. Assessment & improvements of instrumentation models associated with measurement technologies & procedures



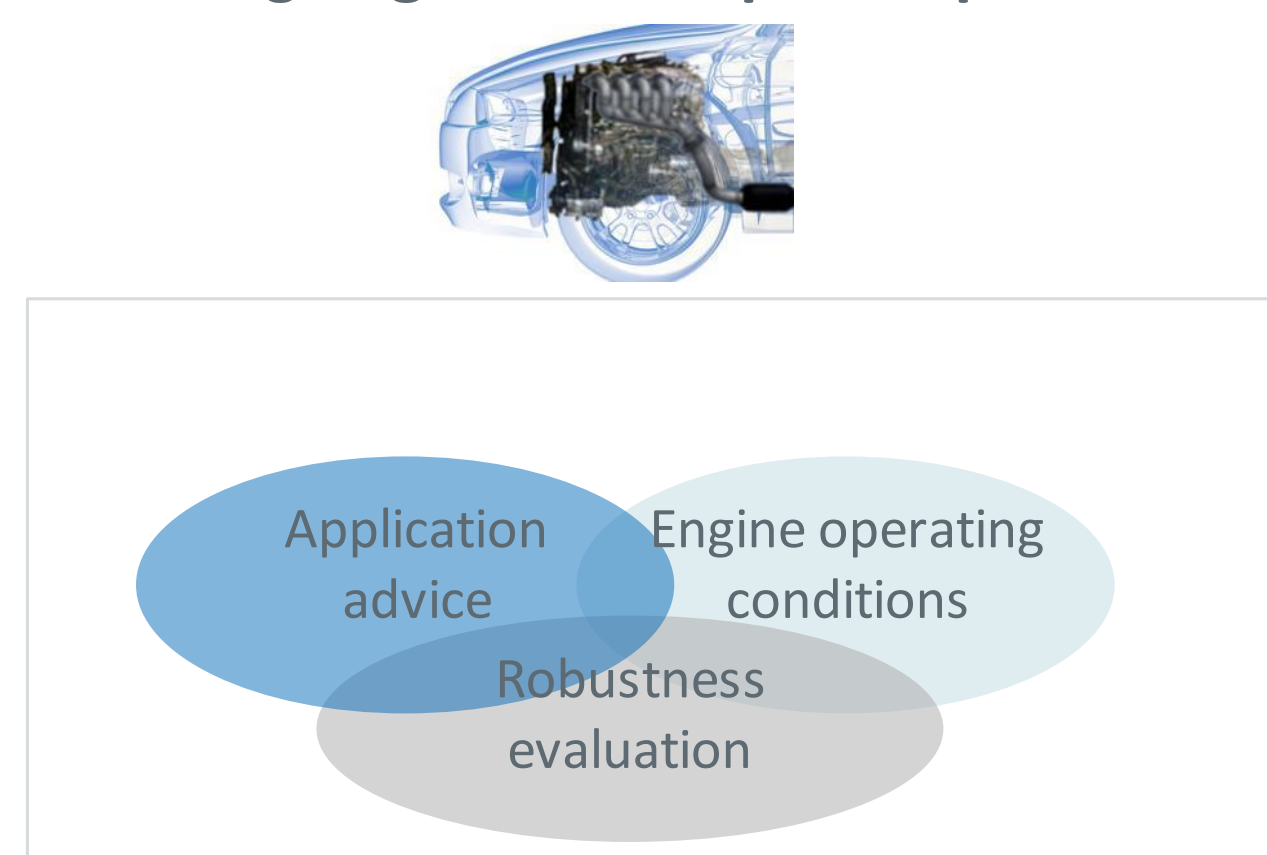
Understanding - particle characterization (Single cylinder engine)



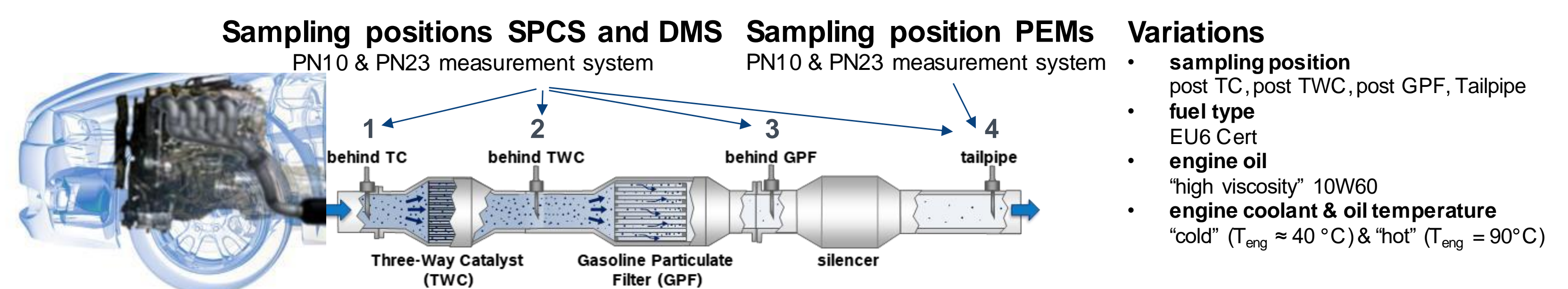
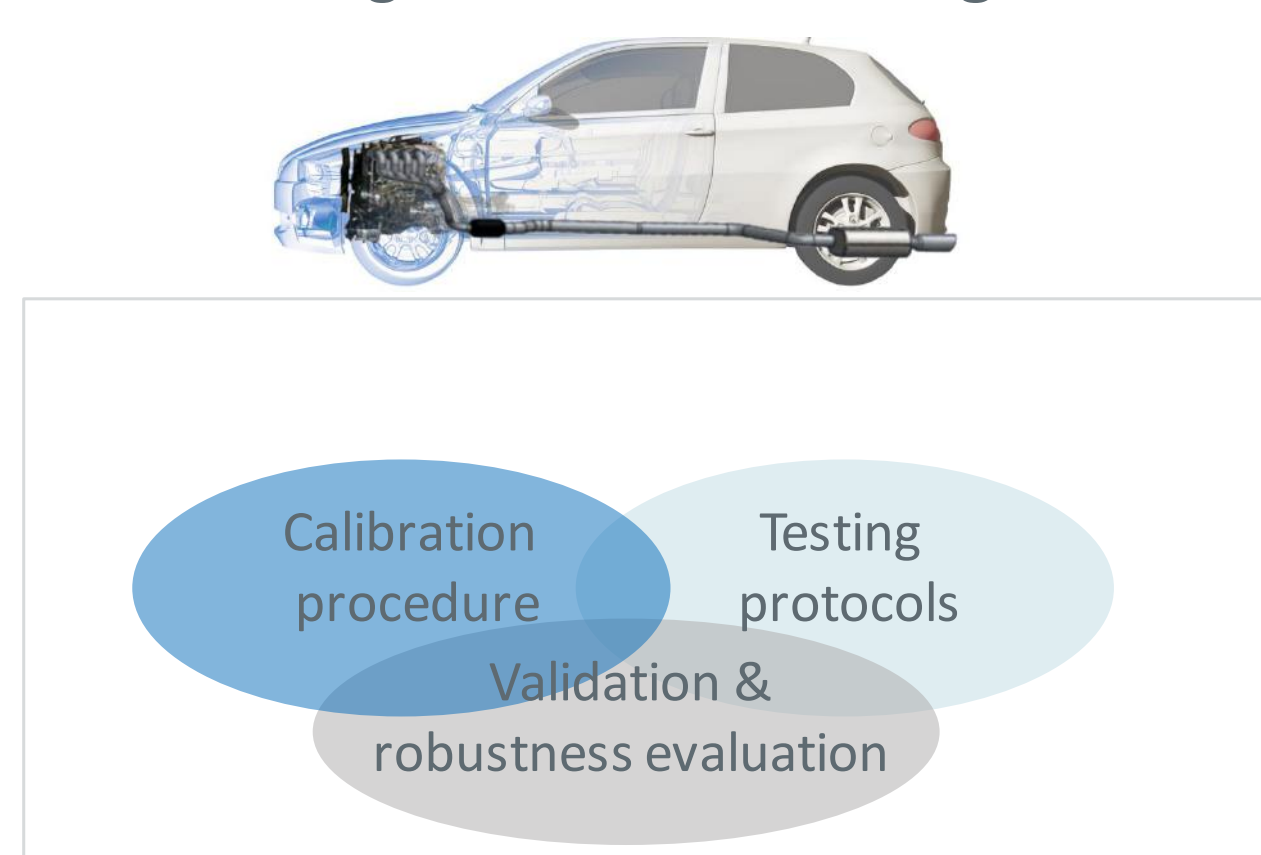
- Thorough physico-chemical characterization of the smallest particles ... needed for better understanding their influence on the particle measurement through the model guided application ... optimization of the newly developed PEMS
- Use of a single cylinder engine as particle generator ... generate a wide variety of particles by testing various engine regimes
- Build an extensive database on size-dependent particle structure, morphology, chemical composition ... possible further use in engine optimization through the MGA ... interest for other GV projects

Measurement Procedures (Multi-Cylinder Engine, Vehicle)

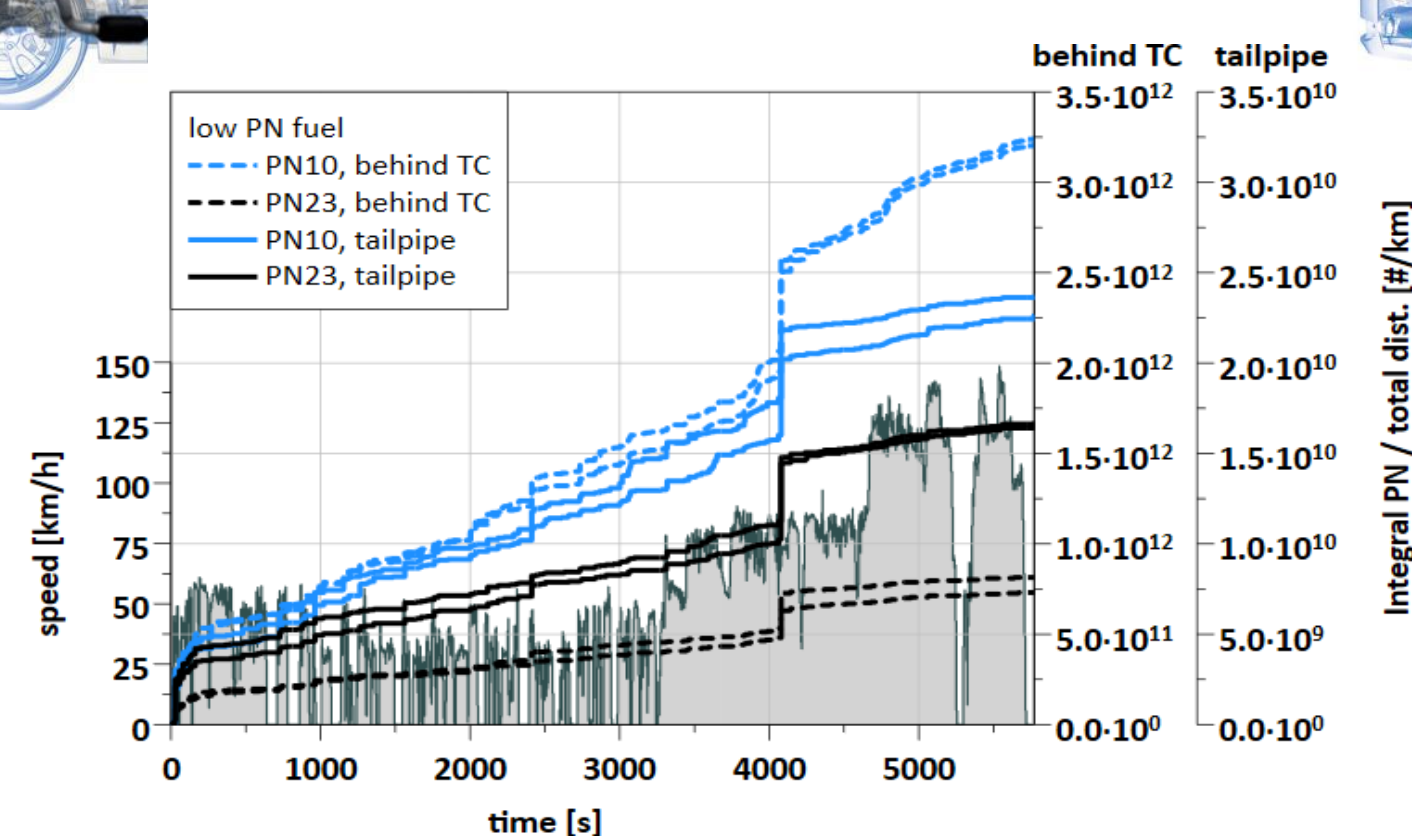
Recommendation for PN > 10 nm assessment...
... during engine development process



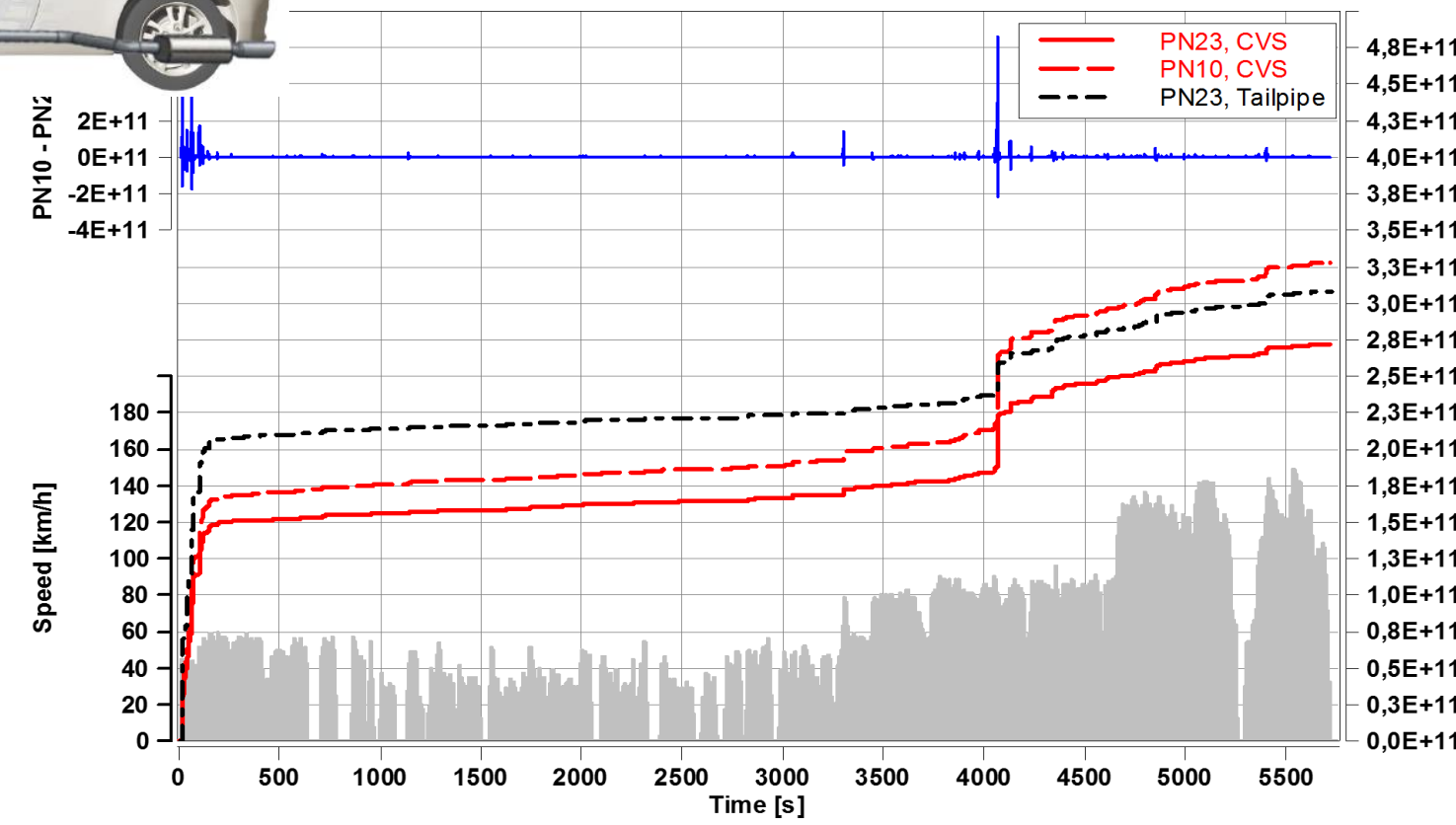
... during vehicle RDE testing



Engine test bench



Roller test bench



- Relative trends observed from engine test bench measurement are transferable to roller test bench
- New measurement system can be applied and handled like an established PN23 nm measurement system

Results & Outcome

1. Report on characteristics (chemistry, size distribution & morphology) of particles down to 10 nm
2. Recommendation for a reliable & robust PN > 10 nm measurement procedure for the application in the engine dev. process
3. More robust instrumentation models associated with measurement technologies & procedures