

Particle Emissions Measurements on CNG Vehicle

focusing on Sub-23nm

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DOWN
TO
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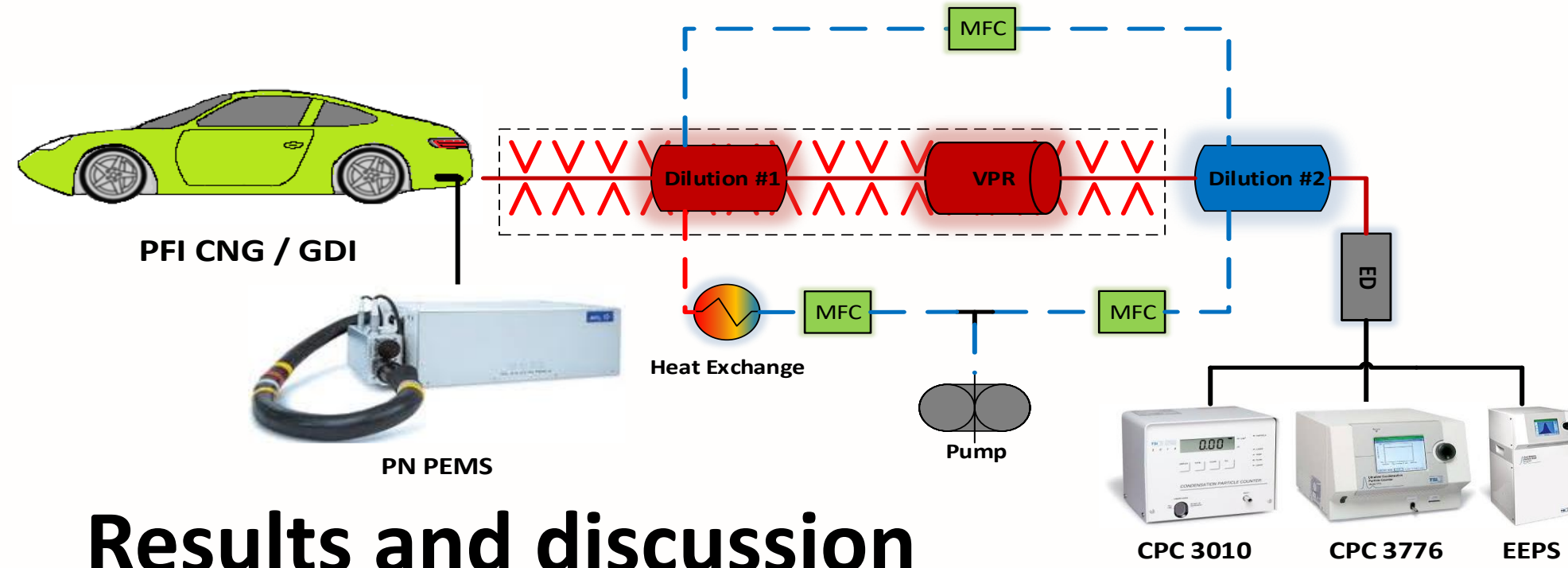
Introduction & main targets

The purpose of this study was to investigate a commercially available CNG equipped passenger car in terms of sub-23nm non-volatile particle emissions. Measurements performed using E.U. Horizon 2020 DownToTen sampling system that allows tailpipe testing using different particle detection devices. Analysis lies upon chassis dyno measurements that comprised of:

- Several WLTC and NEDC cycles
- Steady state points

Methodology

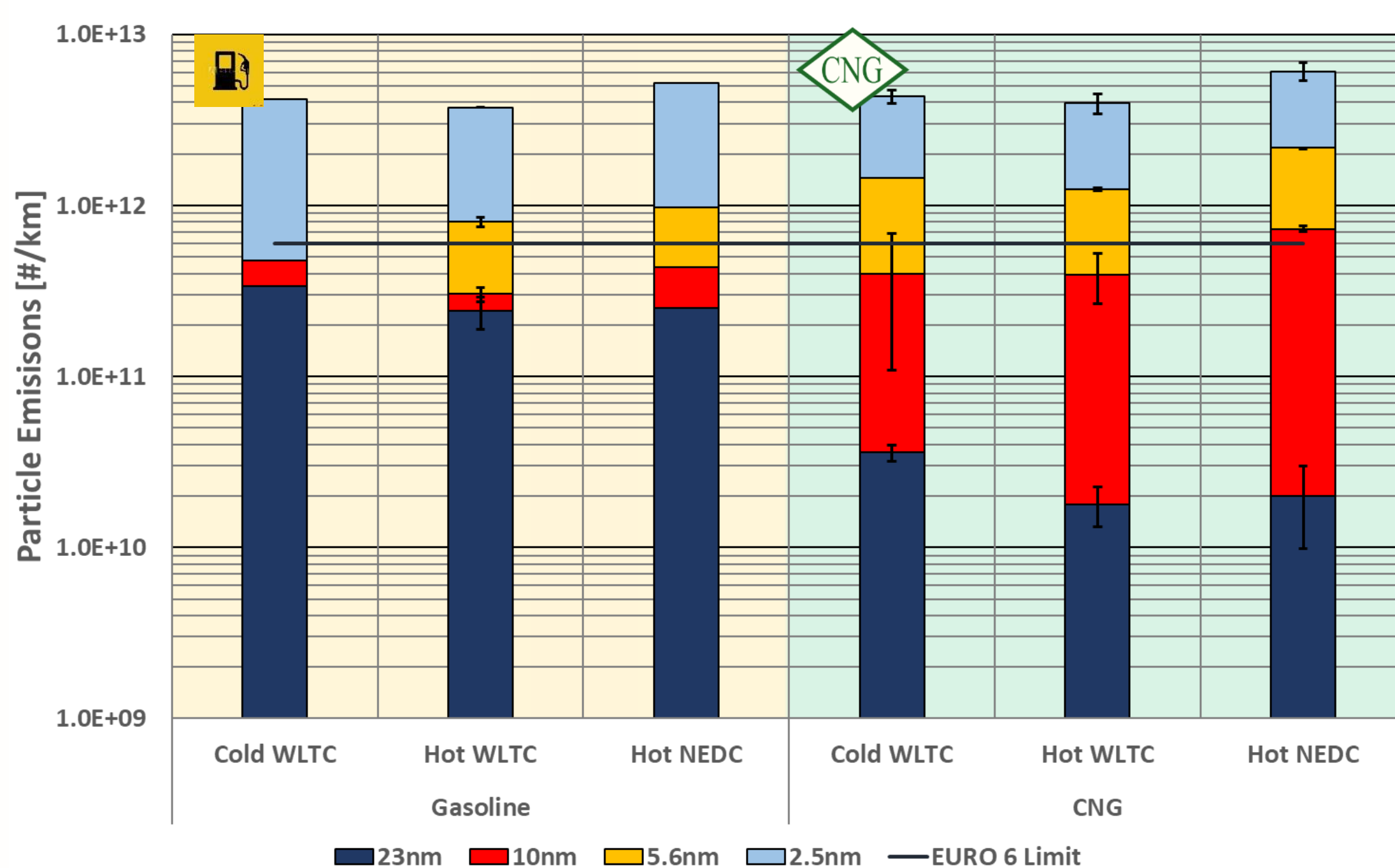
Engine specifications	
Cylinders	4 in line
Engine size [cm ³]	1395
Power [kW]	81 @ 4800 rpm
Torque [Nm]	200 @ 1500 rpm
Injection	GDI / PFI CNG
EURO Standard	EURO 6b
Aftertreatment	3WC



Results and discussion

- CNG yields lower particle emission levels in the 23nm cut off size (blue bars)
- Same particle emission levels for both fuels below 10nm cut off size, high levels of sub 23nm particle emissions can be attributed to lube oil
- Results indicating that particle emissions of CNG are shifted towards nucleation mode

Gasoline & CNG Solid Particle Emissions



PROJECT PARTNERS



In collaboration with:

The University of California at Riverside

National Traffic Safety and Environmental Lab (Japan)

National Metrology Institute (Japan)

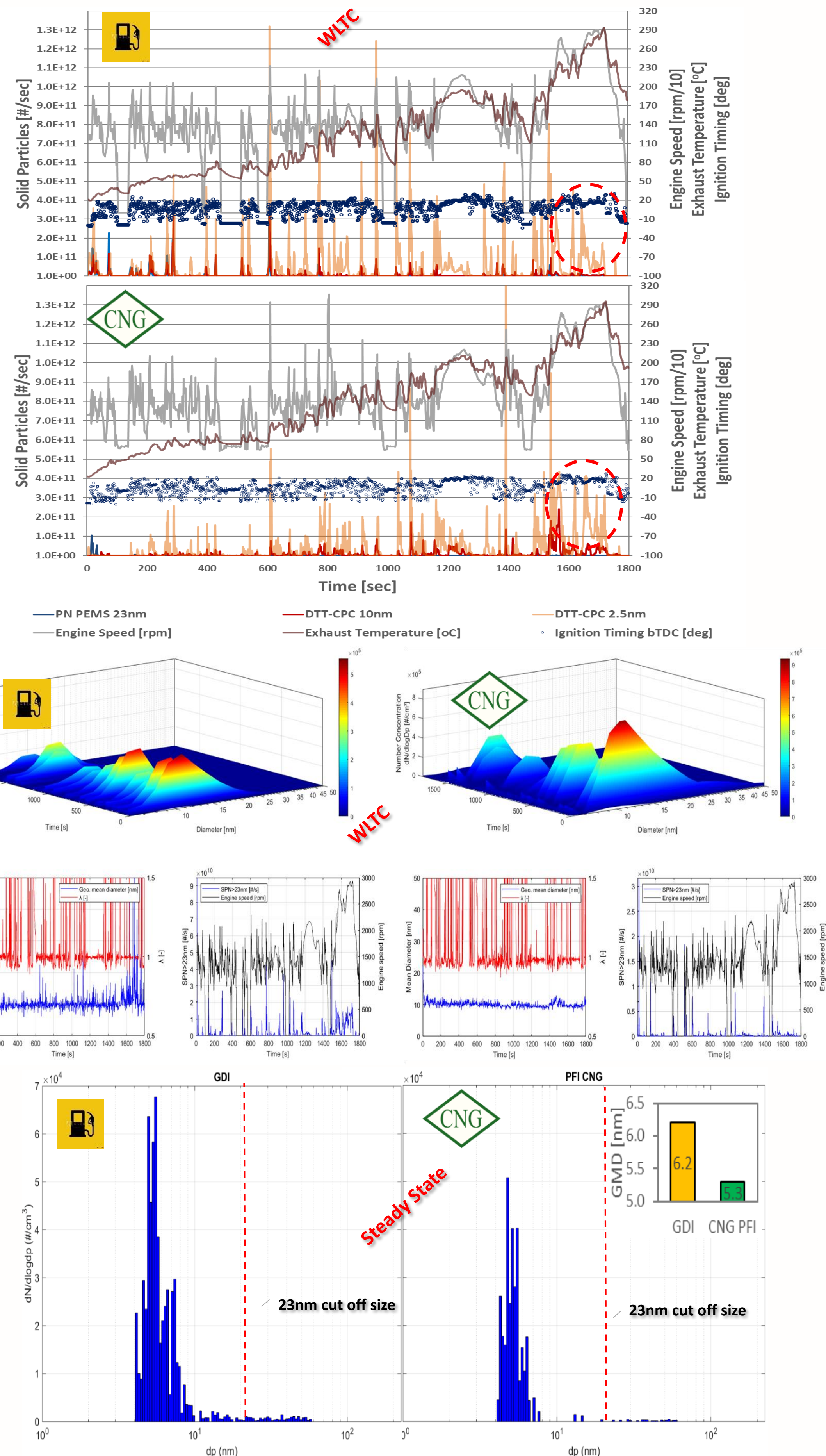


HORIZON 2020

Call: H2020-GV-2016-2017
Technologies for low emission light duty powertrains

Action:

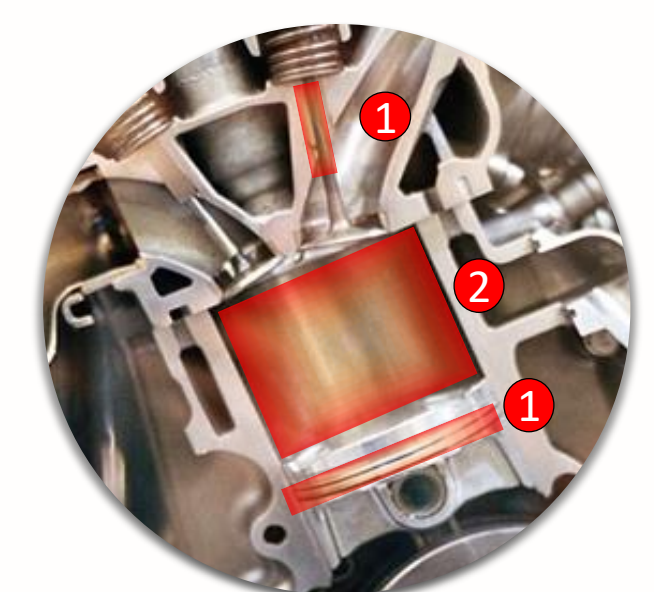
“Measuring automotive exhaust particles down to 10 nanometres – DownToTen”



Conclusion

Lube oil contribution on particle emissions

Valve Stems & Piston Rings (1)	+
Exposed lube oil (2)	+++



- CNG PFI operation has the same particle performance with GDI in the sub 23nm level
- GMD is getting smaller for CNG in contrast to Gasoline operation
- Lube oil contribution to sub 23nm particle emissions
- GPF installation to control high sub 23nm particle emissions.