



## The Consortium

### Industry



HORIBA Europe GmbH is a leading supplier of test systems for engines, drivelines and emissions.



Bosch is a leading global supplier of technology and services.



CMCL Innovations offers digital engineering solutions for energy, automotive and chemical industries.



HORIBA Scientific is world leader in particle characterization, spectroscopy and fluorescence.



TSI is a leading company in designing and producing precision measurement instruments.

### Universities



The University of Cambridge: Computational Modelling Group (Chemical Engineering & Biotechnology) Aerosol Technology (Engineering)



The Université de Lille is the largest University in Northern Europe. Two labs are involved in the project, PhLAM and PC2A.

### Service suppliers



Applus+ IDIADA offers testing, engineering, and homologation services to the automotive industry.



UNIRESEARCH is a leading project management company for European research and innovation projects.



## Facts and figures

PEMs4Nano has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement no. 724145.

The partners in PEMs4Nano will develop a portable device that can detect particles that are emitted by internal combustion engines, down to sizes as small as 10 nm.

Start date: 1<sup>st</sup> October 2016  
End date: 30<sup>th</sup> September 2019  
Duration: 36 Months  
EC funding: 3.5 M€



Horizon 2020 (H2020) stimulates excellent science, industrial leadership and tackles societal challenges.

H2020 is funded by the European Commission and has a budget of nearly €80 billion for 7 years (2014 to 2020). Part of the H2020 programme is the Green Vehicles action (call GV-02-2016). It focuses on road transport research and innovation and addresses (among others) improvements in energy efficiency and advanced power-train technologies.



## Contact

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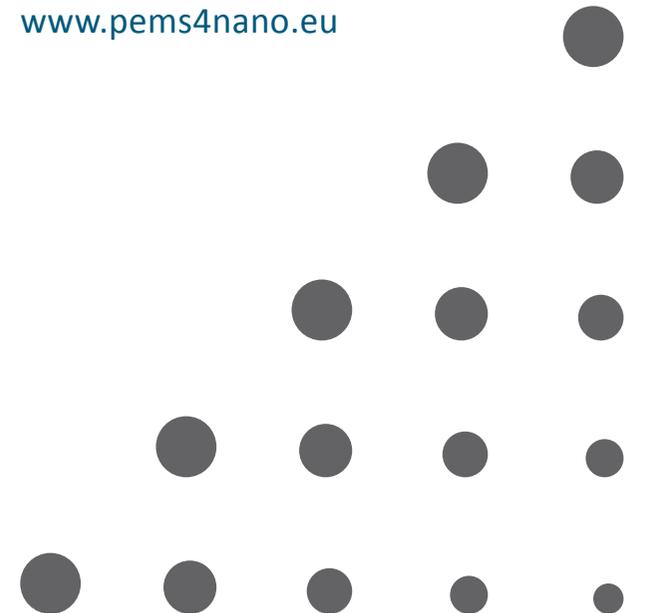
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Project website: [www.pems4nano.eu](http://www.pems4nano.eu)



## Portable Emissions Measurement Systems for Nano-Particles

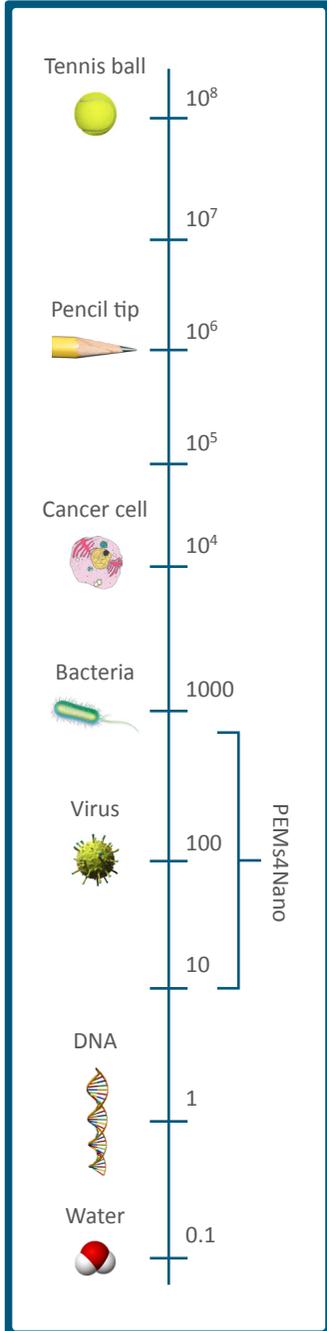
[www.pems4nano.eu](http://www.pems4nano.eu)



### What's the challenge?

The challenge is to develop detectors and robust procedures, in order to reliably measure the particle number concentration (PNC) down to 10 nm in the exhaust gas.

### Sizes and dimensions (nm)



### Engine

Combustion engines provide the power to move the vehicle by burning fuel in the cylinders.

### Exhaust

Emissions resulting from the combustion contain CO, CO<sub>2</sub>, water, unburnt hydrocarbons, particles and NO<sub>x</sub>.

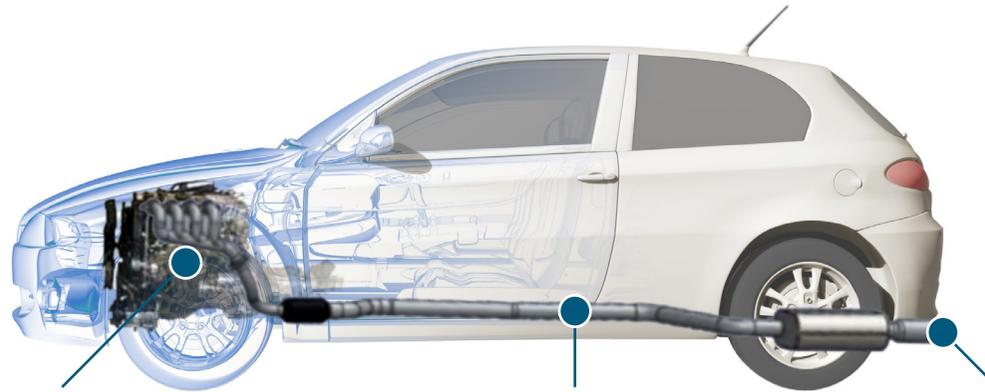
### Aftertreatment

After-treatment systems are used to reduce emissions. They include, among others, three-way catalysts and particle filters.

### Detection

Currently, exhaust particle measurements are designed to detect the number of particles larger than 23 nm.

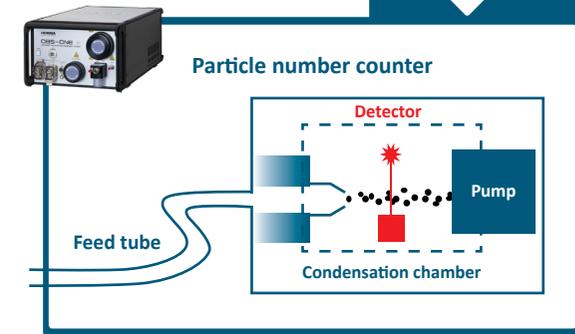
The partners in PEMs4Nano will develop a portable device and a robust procedure to detect particles down to sizes as small as 10 nm.



Particles form in the engine ...

... travel down the exhaust line ...

... and are detected at the tailpipe.



### How do we address that challenge?

A system will be developed to detect particles down to 10 nm. Computer models will be used to support design of the test procedures, and ensure that the particle counter measures accurately and reproducibly in the lab and under RDE (real driving emission) conditions.

### Lab measurements

Hot gases are extracted and analyzed along the exhaust line to support the development of future technologies for internal combustion engines.

### Particle behavior

Physics-based numerical models are developed to see how particles evolve from the engine to the detector. Understanding particle losses along the entire line supports achieving accurate measurements.

### Correlation

Accurately linking the measurements at the tailpipe to the particles measured along the exhaust line helps to support the correlation between the laboratory and mobile applications.

### Device & procedure

The goal is to develop a portable device and a robust procedure for testing in real driving conditions.

### Benefits:

Achieving robust and reliable measurement technology and procedures supports the automotive industry to reduce vehicle emissions.