



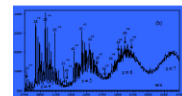
Understanding, Measuring and Regulating Sub-23 nm Particle Emissions from Direct Injection Engines Including Real Driving Conditions

Project status

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SEADM



n|w



Size classification

- Advanced DMA (1-30nm, High temp.)
- Drift DMA (High resolution in the Sub-23 region)

PN measurement

- Diffusion charger for sub-23nm (>10nm, High temp.)
- Sizing CPC (PN + Size distribution, Low particle losses)

Composition analysis

- Multi-wavelength photoacoustic spectroscopy.
- UV photoelectric ionization.



Project overview

Focus

The SUREAL-23 project focuses on the particles emitted from Light Duty engines (Diesel and gasoline), smaller than the current regulation cut-off limit of 23 nm).

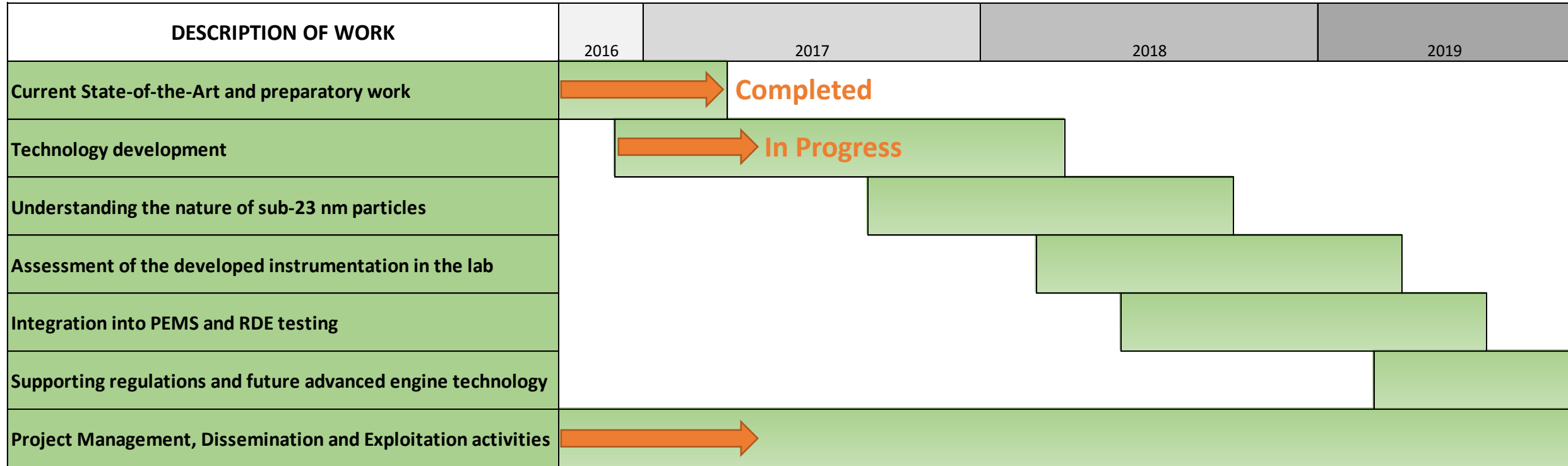
Objectives

- **Complement and extend** existing instrumentation by introducing size distribution and composition characterization of the exhaust aerosol, especially for particles below 23 nm.
- **Characterize** in detail the nature of the particulate emissions which potentially evade current emission control technology and regulations.
- **Support** future emissions compliance through technical developments in real driving emissions measurement.

Innovation

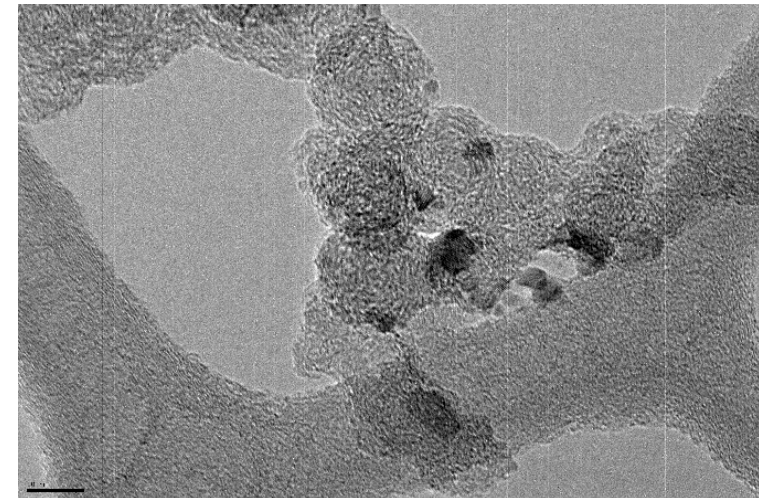
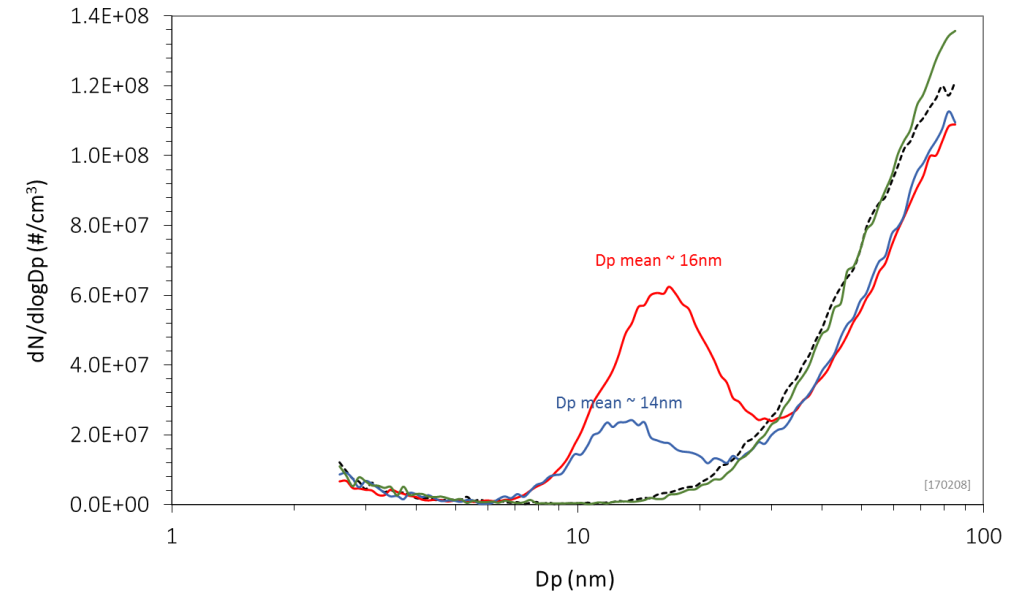
- **Size and composition** analysis methods suitable for transient engine emissions.
- **Novel instrumentation** for measuring aerosol particles below 23 nm, providing backward compatibility with established PN measurement technology.
- **Enhancement** of instrument specifications to allow operation with less demanding sample conditioning requirements.
- **Integration** of the most suitable components of the extended sub-23 nm measurement toolset into PEMS and verification of their measurement capability in real driving conditions.

Project status



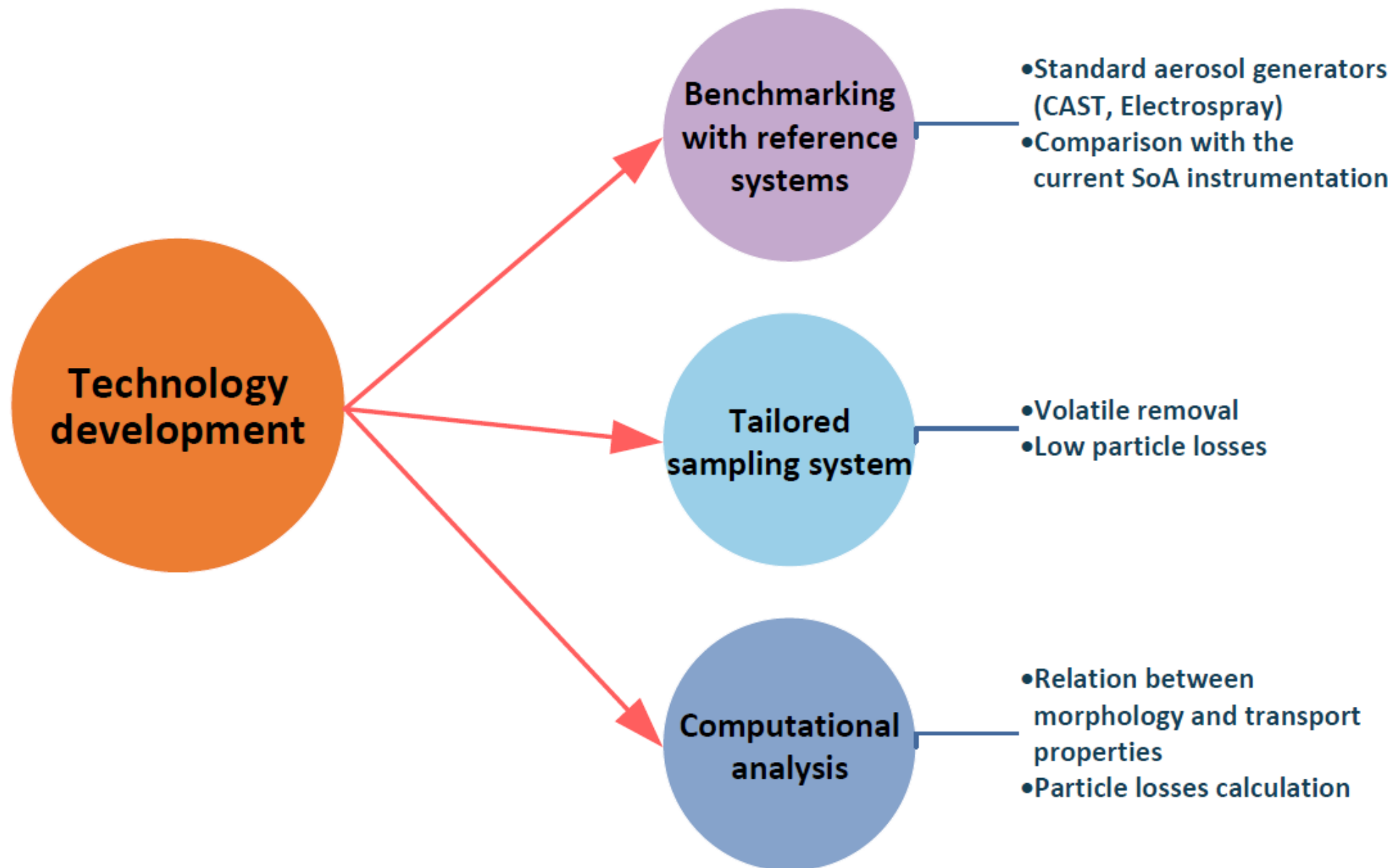
- Deliverables are on schedule.
- Two measuring technologies are in the prototyping phase.
- Project website is online: <http://surreal-23.cperi.certh.gr>.

- State-of-the-art review is completed.
 - Instrumentation
 - Diesel – Gasoline engine emissions
- Particle generation of sub-23 nm particles for instrument benchmarking.
 - Fuel additive particles
 - Lube oil
- Cross-check of current instrumentation.



Fuel additive particles 'attached' to soot particles

Measurement technology development



Next Steps



- Complete instrument development
- Benchmarking in the lab with available particle generation devices:
 - Standard (i.e. CAST, Electrospray, etc.)
 - Engines (Diesel and gasoline)
- Testing of novel instrumentation, taking into account:
 - Cold start and filter regeneration
 - Fuel impact (biofuels, ethanol, S content, etc.)
 - Injection impact (Common Rail, GDI, GDI+PFI)
 - Lube oil and fuel additive impact



Discussion subject

- Disseminate results of all H2020 Sub-23 projects in a **special session** of an upcoming conference (e.g. EAC, ETH Conference).