



Title: Gather Real time information of the concentration of ENMs in outdoor areas

Presenter:

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Event name: 2nd Nanomonitor Stakeholders' Day





Outline

Nanomonitor prototype

2

1

Outdoor measurement scenarios



Event name :2nd Nanomonitor Stakeholders' Day







Nanomonitor prototype





1 - Modular Design

Module 1- Particle measurement

- An autonomous system is desired, able to measure PNC covering the range nano
- With remote and local access to configure the settings of the monitoring station as well as to the information stored
- Programmable configuration for sampling measure interval(s)
- Measurements will be stored in a local device and sent, in real-time, to an external server





Nanomonitor prototype **General Requirements**

1 - Modular Design

Module 2 - Particle collection

- **Remote and local control** \geq
- Three air sampling channels available to >install inlet heads, connected to a filter substrate or cascade impactor
- Flexibility to program sampling \succ intervals as well as choosing the active channel









- 2 The instrument must be suitable for both indoor and outdoor use
- It should be contained in a weatherproof box
- It should include a cooling system to avoid damages in the electronic components when measuring in hot environments





How does the first prototype look now?







What can be controlled at the collection module?



- The active electro valve (only one per cycle)
- SP for the flow through the collection plate or filter
- Scheduling a series of sampling events: in advance, at the moment, locally or remotely



Nanomonitor prototype Particle collection module

What is recorded per sample at the information file?







How are we going to measure nano particles?







What variables can be measured?

- Particle Number Concentration 10³-10⁶ particles/cm³
- Average Particle Size Range 10-300 nm
- Particle Mass Concentration mg/m³
- Lung Deposited Surface Area μm²/cm³

All of them with a resolution of 1Hz





Additional relevant information is integrated by the control software:

- Thermodynamic variables at the sampling point
 - > Temperature
 - Humidity
 - Dew Point
 - Atmospheric Pressure
- Coordinates and altitude of the sampling location (GPS)
- Temperature inside the box, regulated by a cooling system (Peltier cell)





Potential future improvements

- It might be interesting to add wind speed and wind direction sensors
- In the same way, the addition of miniaturized sensors to measure the most relevant atmospheric pollutants (O₃, NO_x, CO, CO₂...) could be useful to obtain the whole picture of the state in an specific outdoor environment









Outdoor measurements scenarios Classification



Four main scenarios intended to be checked

- I. Traffic Environment
- **II. Industrial Environment**
- **III. Background**
- **IV. Suburban Environment**



Outdoor measurement scenarios Outdoor Sampling Locations (in Spain)









- In order to evaluate the effect of human activity, measurements will cover periods including working days, weekends and public holidays
- Seasonal behavior should be taken into account, so measurements must be performed in summer and winter time
- Meteorological variables (wind speed, wind direction, temperature or solar radiation) play an important role in the amount of particles detected





Characteristics of the cabin





Scenario 1 - Traffic Environment - Typical winter profile





Monthly average values for January (typical winter situation) in the Air Quality cabin of Pista de Silla



Scenario 1 - Traffic Environment - Typical summer profile





Weekly average values for July (typical summer situation) in the Air Quality cabin of Pista de Silla



Outdoor measurement scenarios Scenario 2 - Industrial Environment



Characteristics of the cabin



- Several industrial areas nearby, as well as the city of L' Alcora
- Their main activity is fabrication of ceramics: high concentration of particulate matter
- Air Quality cabin locates downwind the industry or the city, depending on wind conditions



Outdoor measurement scenarios Scenario 2 - Industrial Environment







Scenario 2 - Industrial Environment - Typical winter profile





Weekly average values for January (typical winter situation) in the Air Quality cabin of L'Alcora



Scenario 2 - Industrial Environment - Typical summer profile





Weekly average values for July (typical summer situation) in the Air Quality cabin of L'Alcora



Outdoor measurement scenarios Scenario 3 - Rural Environment







Scenario 3 - Rural Environment - Typical winter profile





Weekly average values for January (typical winter situation) in the Air Quality cabin of Coratxar



Scenario 3 - Rural Environment - Typical summer profile





Weekly average values for July (typical summer situation) in the Air Quality cabin of Coratxar





	2017				2018													
PROTOTYPE 1	1st half NOV	2nd half NOV	1st half DEC	2nd half DEC	1st half JAN	2nd half JAN	1st half FEB	2nd half FEB	1st half MAR	2nd half MAI	1st half APR	2nd half APR	1st half MAY	2nd half MAY	1st half JUN	2nd half JUN	1st half JUL	2nd half JUL
Suburban (Paterna, Spain)																		
Traffic Environment (Valencia, Spain)																		
End User (Alfafar, Spain)																		
Metro (Valencia, Spain)																		
Industrial Area (Alcora, Spain)																		
Background (Coratxar, Spain)																		

* This measurement plan applies only to the first prototype

* More stations can be used in parallel in other locations as they become available





Thanks for your attention!

