



Title: Nanomonitor station prototype

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Event name: NanoMONITOR – 4th Stakeholders' Day Lancaster 2018

NanoMONITOR is partly funded by the European Commission Life+ with grant agreement LIFE14 ENV/ES/000662





Outline

- 1 Prototype main components
- 2 Peripheral components
- 3 Control Software



Event name : NanoMONITOR – 4rd Stakeholders' Day Lancaster 2018

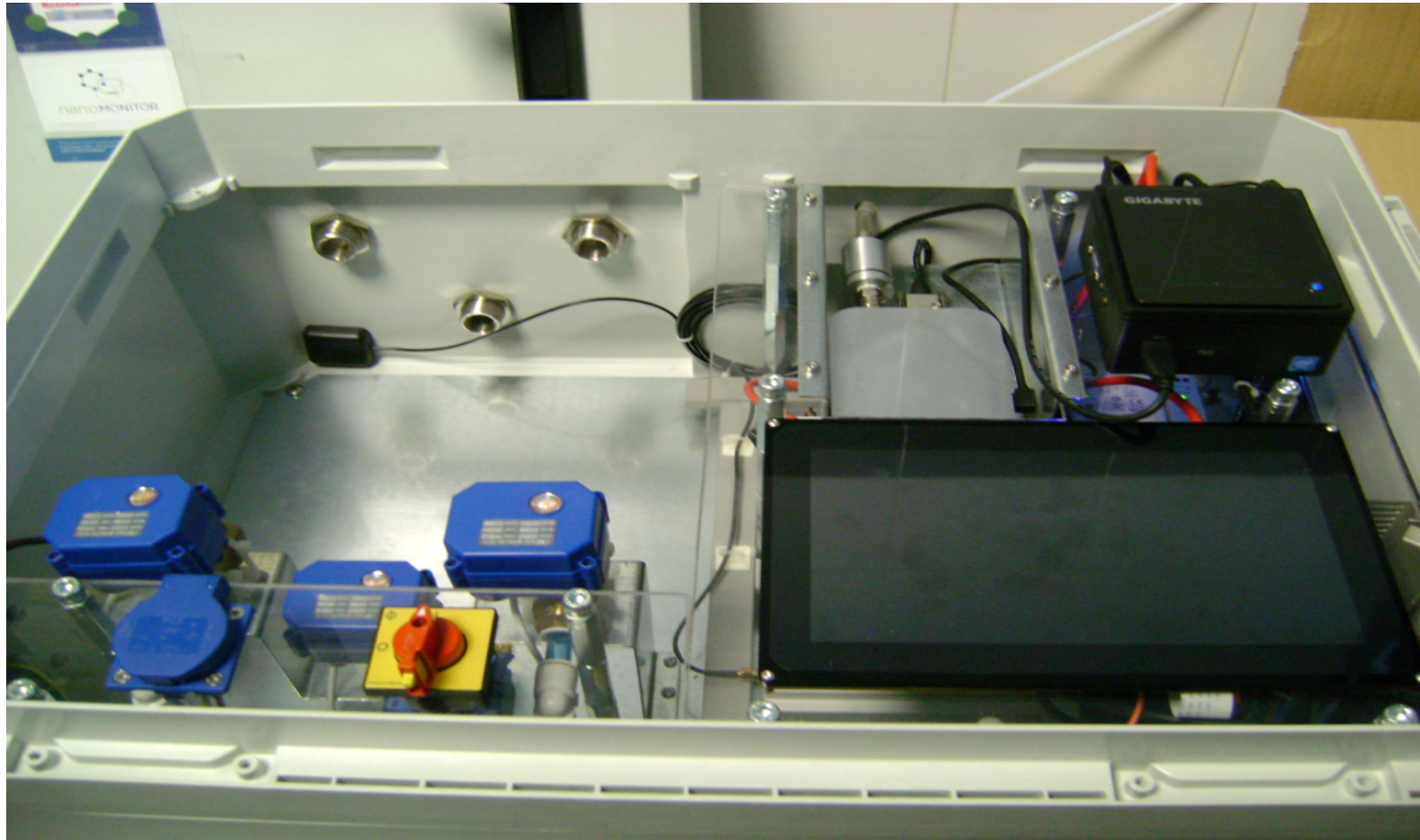
NanoMONITOR is partly funded by the European Commission Life+ with grant agreement LIFE14 ENV/ES/000662



Prototype main components

Prototype main components

General view



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Prototype main components

Real time measuring device



Our real time measuring device is based on the DiSCmini monitor by TESTO®, but a non-commercial version has been used

Prototype main components

Real time measuring device



- ☐ Screen and buttons for a local control and visualization have been removed
- ☐ The signals measured by the device have been integrated into the control software
- ☐ The monitor can be switched on/off remotely using the control software

The device measures, at the same time:

- **Particle Number Concentration - 10^3 - 10^6 particles/cm³**
- **Average Particle Size Range - 10-300 nm**
- **Particle Mass Concentration - mg/m³**
- **Lung Deposited Surface Area - $\mu\text{m}^2/\text{cm}^3$**

All of them with a resolution of 1Hz

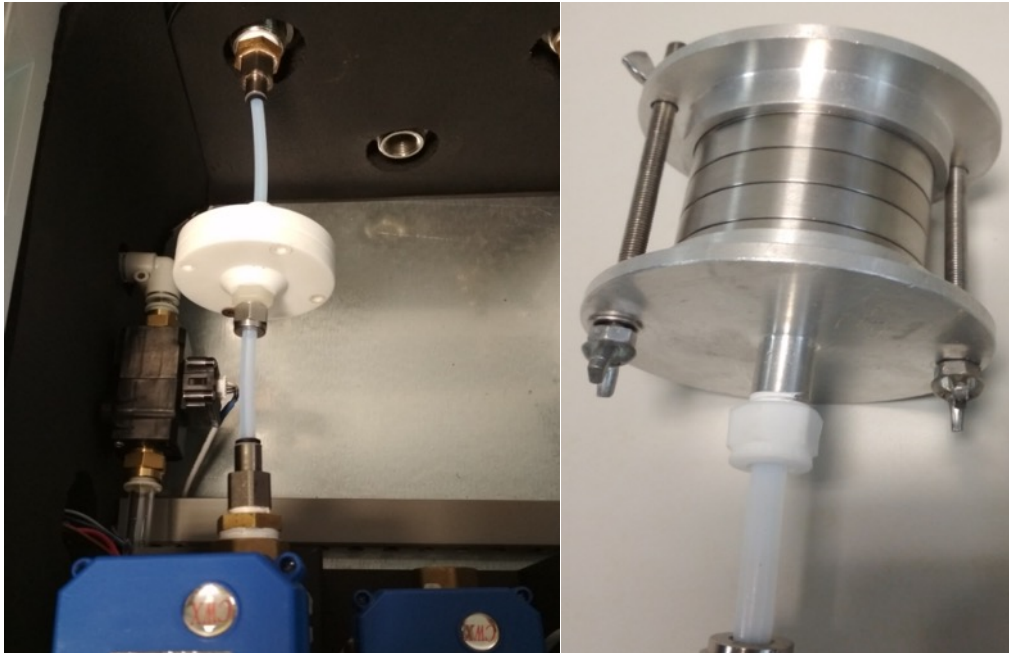
The station allows the identification of chemical species through the collection of air samples in a physical support



- ❑ Three independent air sampling lines
- ❑ Each controlled by a regulation valve
- ❑ The output of every valve converge in a unique line, where an external pump can be connected to aspire the air through the filters

Prototype main components

Pneumatic module



Different holders for filters, as well as impactors or cartridges can be placed in the station. By offline techniques, the chemical components collected in the samples can be identified

❑ Every data measured by the station is stored in the local PC, but every 10 seconds a string of data is sent in real time to an external server

❑ It is necessary to have 3G signal in the measurement location. If there is not, the strings of data remain in the memory of the PC. When the router connects again to the network, these strings are sent to the server

Peripheral components

Measuring stations include other sensors:



- **An electronic external module which includes sensors for relevant meteorological variables (T, P, RH)**
- **A GPS to locate the exact position of the station**
- **A cooling system (Peltier cell) to keep the internal temperature of the box in safe levels**

- ❑ The components have been assembled in a waterproof box to be used in outdoor, even in adverse meteorological conditions



- ❑ A Labview program manages the signals from the sensors and the real time measuring device, as well as the outputs to the regulation valves, and the data strings sent to the external server

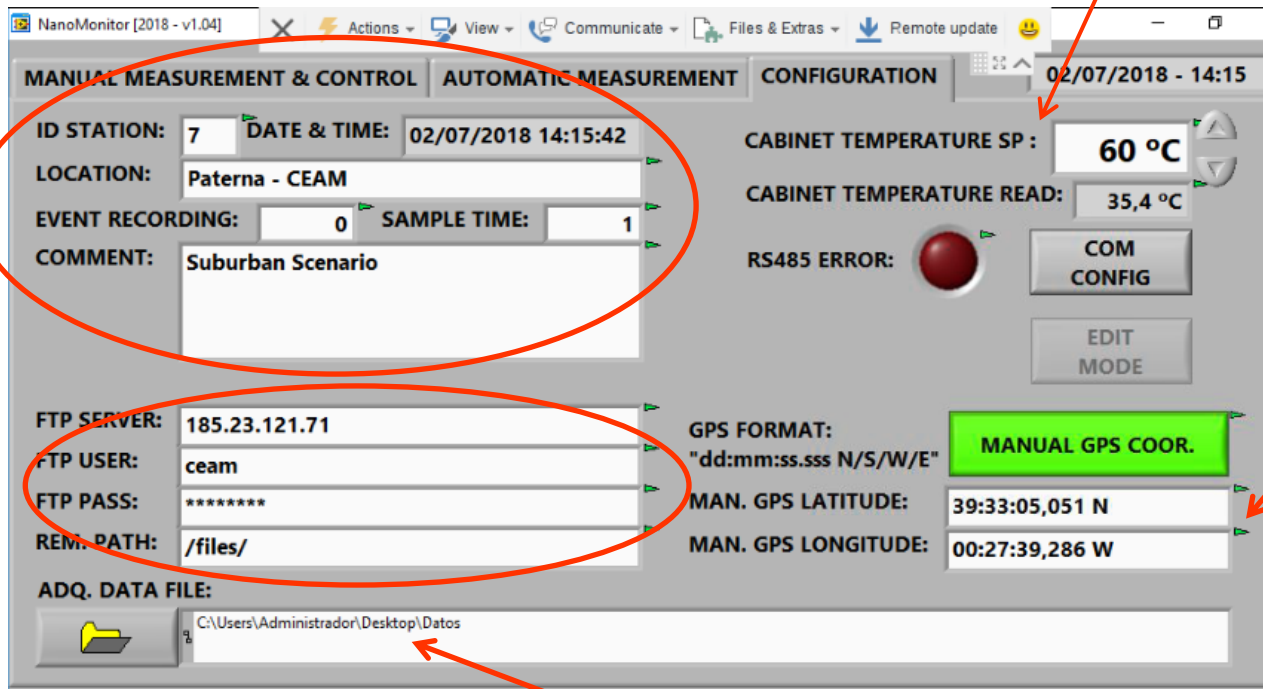
Control software

To modify the fields in this tab, it must be selected first the option “EDIT MODE”

Information needed by the web application
to display in real time the data sent to the server

Cabinet temperature control

Configuration
of the ftp
protocol for
server-station
communication



The screenshot shows the 'CONFIGURATION' tab of the NanoMonitor software. The interface is divided into several sections. On the left, there are fields for 'ID STATION' (7), 'DATE & TIME' (02/07/2018 14:15:42), 'LOCATION' (Paterna - CEAM), 'EVENT RECORDING' (0), 'SAMPLE TIME' (1), and 'COMMENT' (Suburban Scenario). Below these are fields for 'FTP SERVER' (185.23.121.71), 'FTP USER' (ceam), 'FTP PASS' (*****), 'REM. PATH' (/files/), and 'ADQ. DATA FILE' (C:\Users\Administrador\Desktop\Datos). On the right, there are fields for 'CABINET TEMPERATURE SP' (60 °C), 'CABINET TEMPERATURE READ' (35,4 °C), and 'RS485 ERROR' (indicated by a red light). Below these are buttons for 'COM CONFIG' and 'EDIT MODE'. At the bottom right, there is a green button labeled 'MANUAL GPS COOR.' and fields for 'MAN. GPS LATITUDE' (39:33:05,051 N) and 'MAN. GPS LONGITUDE' (00:27:39,286 W). The 'EDIT MODE' button is highlighted with a red circle, and the 'MANUAL GPS COOR.' button is highlighted with a red circle. Red arrows point from the text labels to the corresponding fields in the software interface.

Manual GPS coordinates

Acquisition data file path

Control software

Tab 'MANUAL MEASUREMENT AND CONTROL'

MANUAL MEASUREMENT & CONTROL**AUTOMATIC MEASUREMENT****CONFIGURATION**

DiscMINI
PN: 0 p/ccm
Diam.: 0,00 nm
PM: 0,000000 mg/m3
LDSA: 0,00 um/ccm
Filter: 0,00 fA
Diff.: 0,000 fA
T.: 0,00 °C
Idiff.: 0,000 nA
Ucor.: 0,000 KV
Flow: 0,000 IN/m
Batt.: 0,000 V
DiscM OFF
PUMP
CORONA
HEATING

EXTERNAL SENSORS
GPS COOR.: NO GPS
GPS ALTITUDE: 0 m
EXTERNAL TEMP.: 17,4 °C
EXTERNAL HUMIDITY: 48 %
EXTERNAL DEW POINT: 6,4 °C
ATM. PRESSURE: 1004 hPa

FLOW CONTROL
FLOW SELECT: 10,0 l/m
FLOW READ: 0,0 l/m
VALVE SELECT: EV OFF
PUMP OFF
ADQ RUN
MANUAL CONTROL
EXIT

CURRENT DATE&TIME
10/01/2018 - 10:04

Control software

Tab 'MANUAL MEASUREMENT AND CONTROL'

(1) (424 289 346) - TeamViewer - Licencia gratuita (solo uso no comercial)

Nanomonitor.vi

Acciones Ver Audio/Video Transferencia de archivos Extras

MANUAL MEASUREMENT & CONTROL

DiscMINI

PN:	22319 p/ccm
Diam.:	53,94 nm
PM:	0,003735 mg/m3
LDSA:	81,11 um/ccm
Filter:	67,92 fA
Diff.:	36,070 fA
T.:	31,50 °C
Idiff.:	9,845 nA
Ucor.:	3,486 KV
Flow:	1,032 IN/m
Batt.:	7,290 V

DiscM ON

PUMP

CORONA

HEATING

EXTERNAL SENSORS

GPS COOR.:	NO GPS
GPS ALTITUDE:	0 m
EXTERNAL TEMP.:	23,2 °C
EXTERNAL HUMIDITY:	39 %
EXTERNAL DEW POINT:	8,8 °C
ATM. PRESSURE:	1011 hPa

FLOW CONTROL

FLOW SELECT: **9,0 l/m**

FLOW READ: **0,0 l/m**

VALVE SELECT: **EV1**

PUMP OFF

ADQ RUN

MANUAL CONTROL

EXIT

CURRENT DATE&TIME
26/02/2018 - 7:22

Control software

Tab 'MANUAL MEASUREMENT AND CONTROL'

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Nanomonitor.vi

Acciones Ver Audio/Video Transferencia de archivos Extras

MANUAL MEASUREMENT & CONTROL

DiscMINI

PN: 23666 p/ccm
Diam.: 52,65 nm
PM: 0,003746 mg/m3
LDSA: 83,71 um/ccm
Filter: 69,42 fA
Diff.: 37,897 fA
T.: 31,50 °C
ldiff.: 9,839 nA
Ucor.: 3,484 KV
Flow: 1,032 IN/m
Batt.: 7,288 V

DiscM ON

PUMP

CORONA

HEATING

EXTERNAL SENSORS

GPS COOR.: NO GPS
GPS ALTITUDE: 0 m
EXTERNAL TEMP.: 22,8 °C
EXTERNAL HUMIDITY: 40 %
EXTERNAL DEW POINT: 8,6 °C
ATM. PRESSURE: 1010 hPa

FLOW CONTROL

FLOW SELECT: 9,0 l/m
FLOW READ: EV OFF
VALVE SELECT: ☒ EV1
EV2
EV3

ADQ RUN

MANUAL CONTROL

EXIT

CURRENT DATE&TIME
26/02/2018 - 7:26

MANUAL MEASUREMENT & CONTROL | **AUTOMATIC MEASUREMENT** | **CONFIGURATION**

DiscMINI

PN:	14932 p/ccm	DiscM ON
Diam.:	51,27 nm	
PM:	0,002223 mg/m3	
LDSA:	51,26 um/ccm	PUMP
Filter:	42,05 fA	
Diff.:	23,673 fA	
T.:	31,50 °C	CORONA
ldiff.:	9,852 nA	
Ucor.:	3,573 KV	
Flow:	1,033 lN/m	HEATING
Batt.:	7,249 V	

EXTERNAL SENSORS

GPS COOR.:	NO GPS
GPS ALTITUDE:	0 m
EXTERNAL TEMP.:	23,1 °C
EXTERNAL HUMIDITY:	41 %
EXTERNAL DEW POINT:	9,4 °C
ATM. PRESSURE:	1009 hPa

FLOW CONTROL

FLOW SELECT:	9,0 l/m
FLOW READ:	18,7 l/m
VALVE SELECT:	EV1
PUMP ON	

ADQ RUN

CURRENT DATE&TIME
26/02/2018 - 12:06

MANUAL CONTROL | **EXIT**

MANUAL MEASUREMENT & CONTROL | **AUTOMATIC MEASUREMENT** | CONFIGURATION

CHANNEL 1 FLOW CONTROL

START: 21:00 STOP: 05:00

FLOW: 10,0 l/m **ENABLE**

CHANNEL 2 FLOW CONTROL

START: 06:00 STOP: 10:00

FLOW: 10,0 l/m **ENABLE**

CHANNEL 3 FLOW CONTROL

START: 16:00 STOP: 20:00

FLOW: 10,0 l/m **ENABLE**

DISCmini CONTROL

START: 22:00 STOP: 00:00

ADQ. FREQUENCY: 0 min

ADQ. TIME: 0 min **ENABLE**

ADQ RUN

CURRENT DATE&TIME
26/02/2018 - 13:24

AUTOMATIC CONTROL

EXIT

Thanks for your attention!

