

CabinAir

Dynamic and stationary measurement of in-vehicle PM_{2.5} and the filtration

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CabinAir Sweden AB

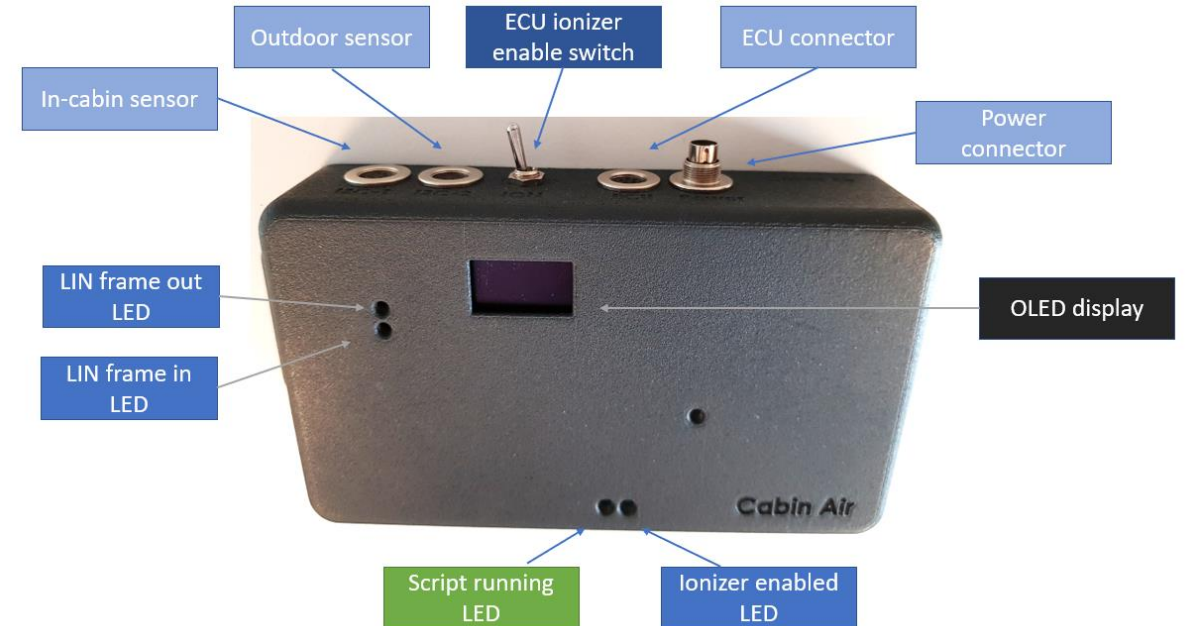
Outline

- **Airflow and noise measurement – Engine on vs. Engine off**
- **PM2.5 removal efficiency measurement – stationary vs. driving**
- **Long-term test on PM2.5 removal efficiency of cabin air filter on a driving car**

Data logger and sensors

CabinAir Data logger is a device to power and control sensor measurement, to collect, display and upload data

- Internal sensor module (PM, CO₂, tVOC, temperature & humidity)
- External sensor module (PM, temperature & humidity)



- Linux based embedded system
- Single Core 1GHz CPU
- 1GB RAM
- 2 Channel I2C
- 1 Channel LIN
- WIFI
- Bluetooth 4.1 & BLE
- 4G modem
- GPS (USB, optional)
- Amazon web services

Stationary measurement

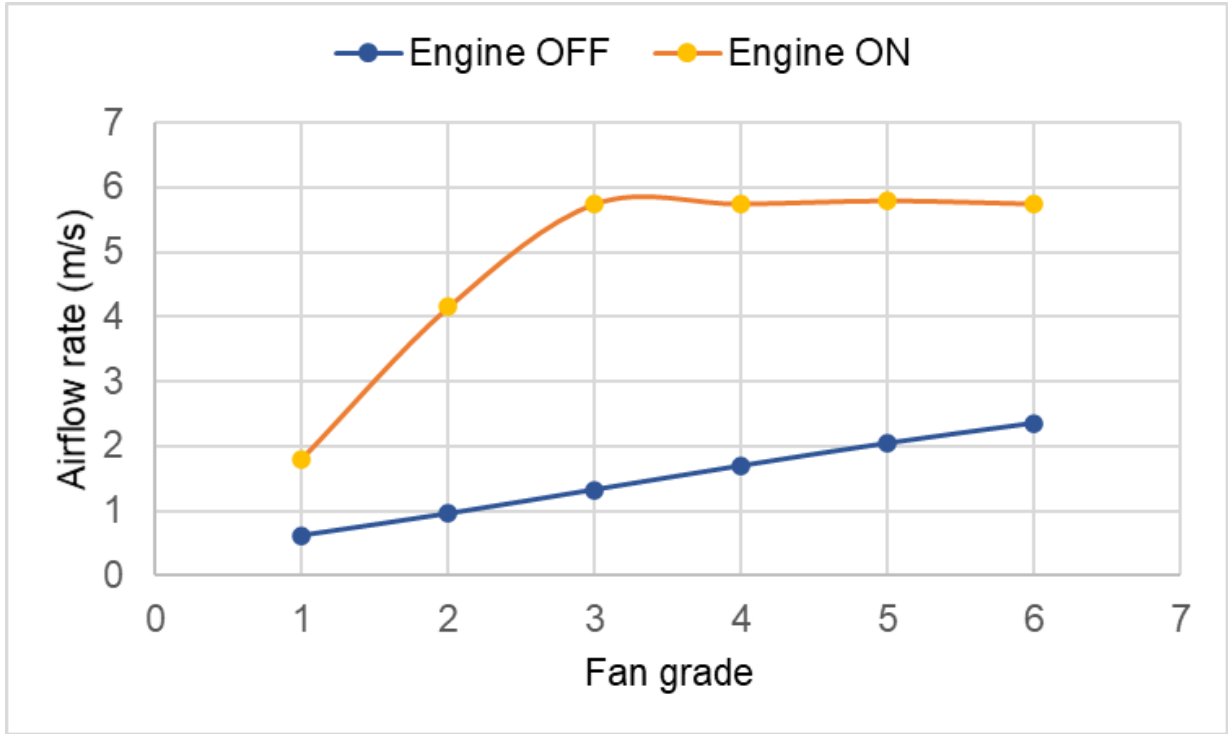
Airflow measurement



Airflow meter

Noise meter

Test condition: parking in the garage
Cabin air filter: original OEM filter



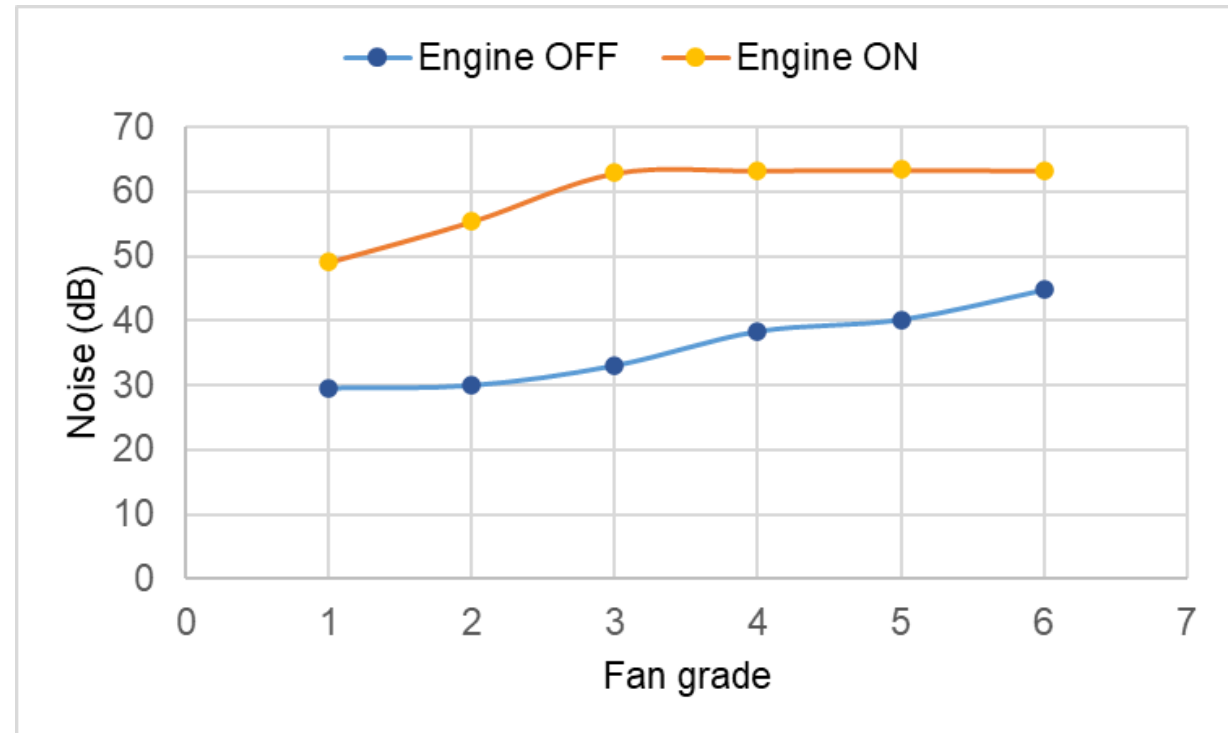
Noise measurement



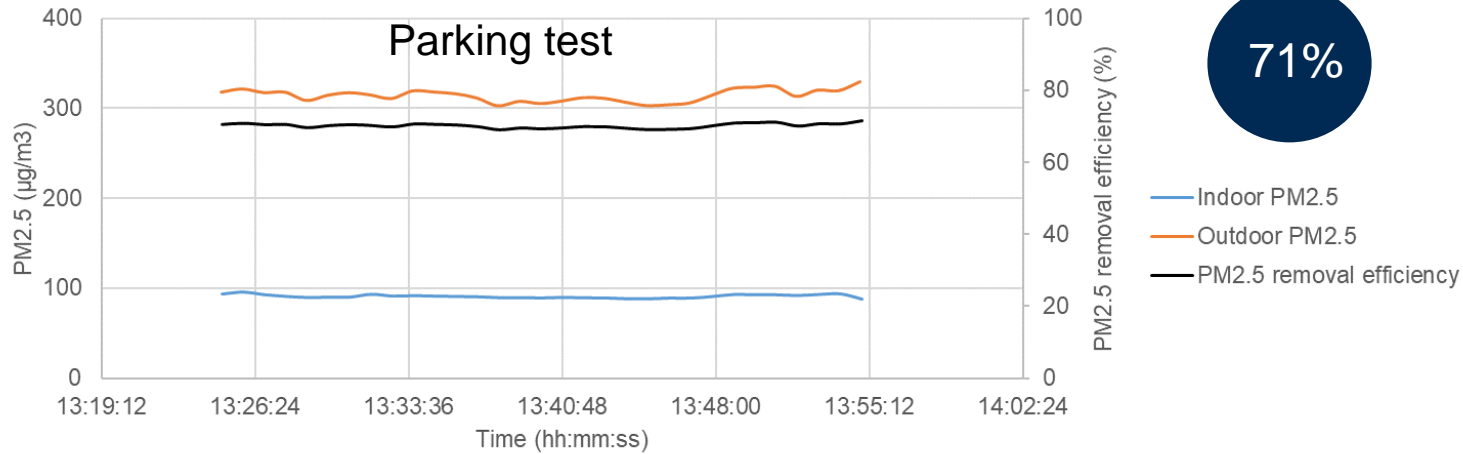
Airflow meter

Noise meter

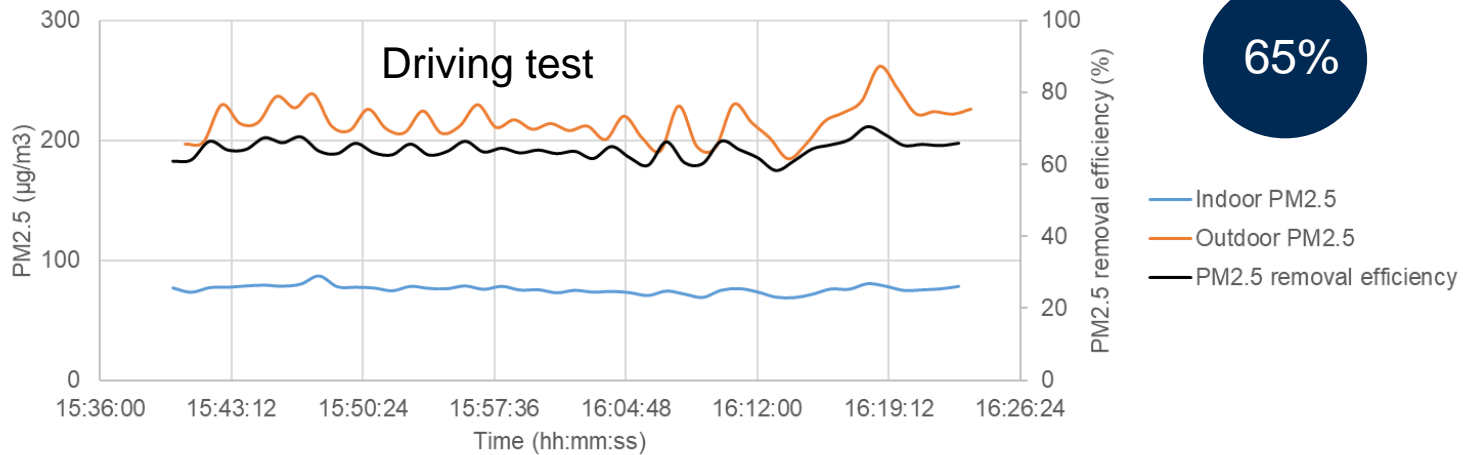
Test condition: parking in the garage
Cabin air filter: original OEM filter



PM2.5 removal efficiency



71%



65%

Location of test: Shijiazhuang, China

Time of test: Jan 2020

Test vehicle: Audi

Cabin air filter: Original OEM filter

No. of passengers: 4

Vehicle settings

HVAC fan speed: low

A/C on

Ventilation: fresh air

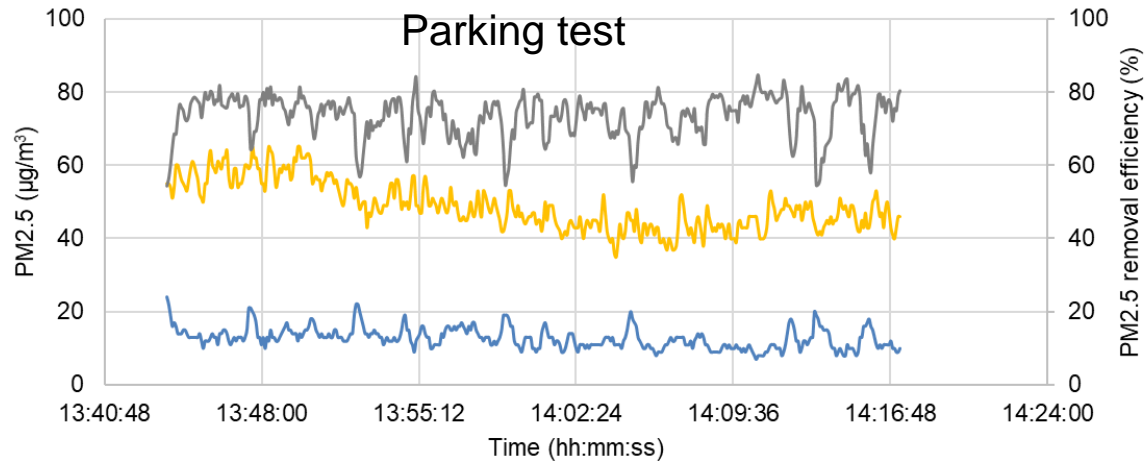
Particle measurement

Grimm MiniWRAS (one to measure indoor air and one to measure ambient air)

Test duration: 30 min (parking), 40 min (driving test)

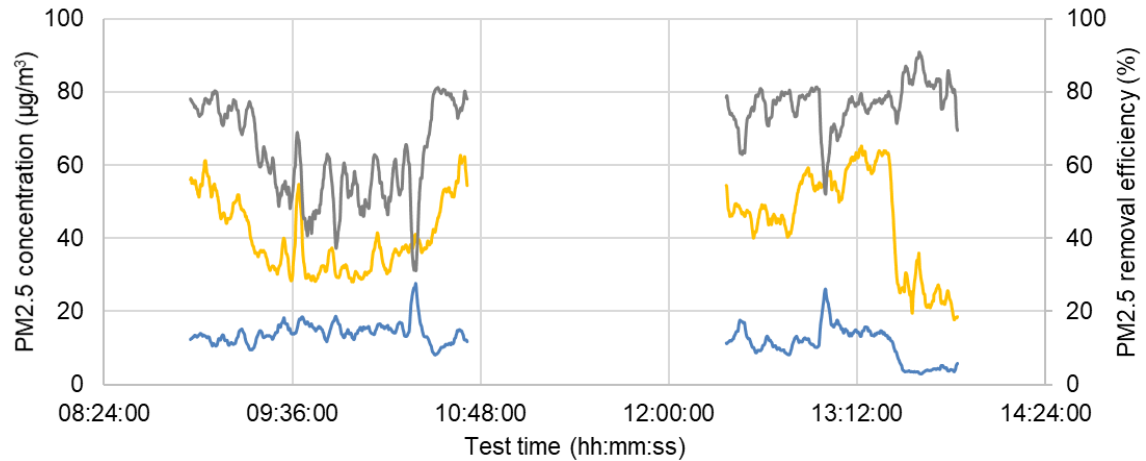
Internal test report: TR2020-362

PM2.5 removal efficiency



74%

— PM2.5_indoor
— PM2.5_outdoor
— PM2.5 removal efficiency



69%

— In-cabin PM2.5
— Outdoor PM2.5
— PM2.5 removal efficiency

Location of test: Shenzhen, China
Time of test: Nov 2020
Test vehicle: Volvo
Cabin air filter: Cabfil filter (CabinAir)
No. of passengers: 1

Vehicle settings
HVAC fan speed: medium
A/C on
Ventilation: fresh air

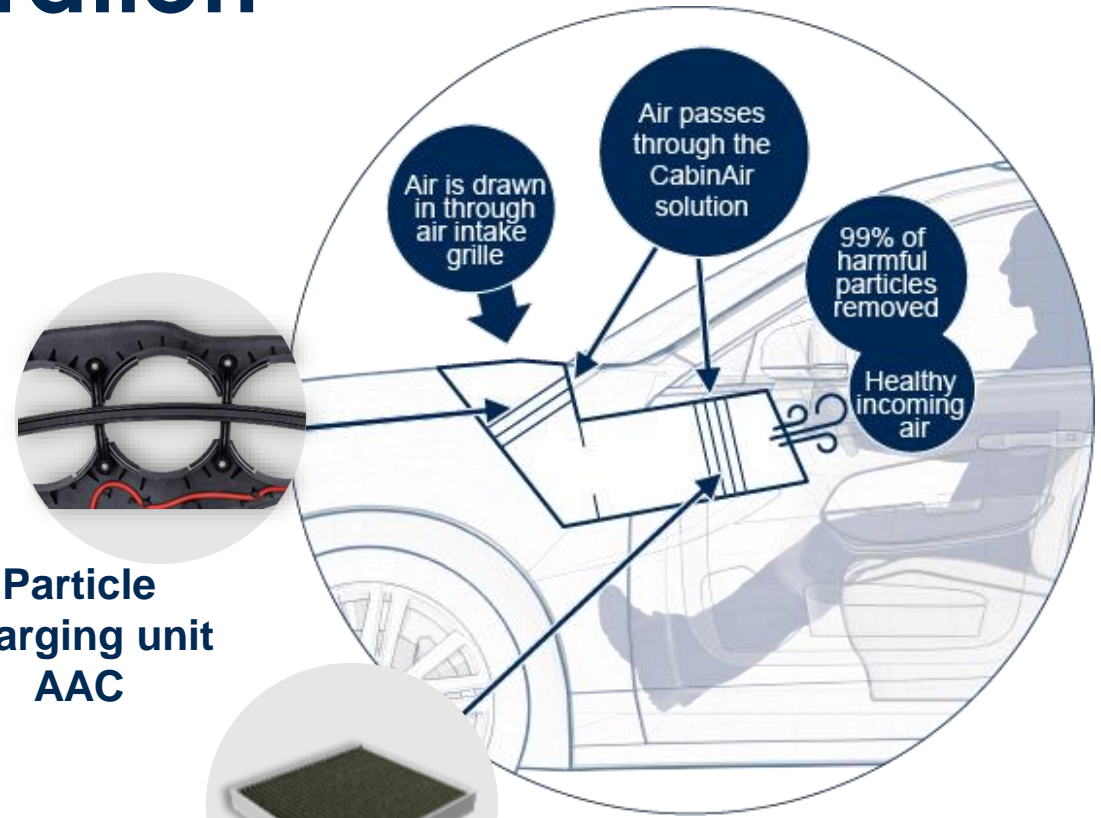
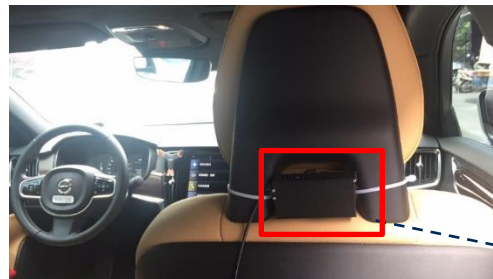
Particle measurement
CabinAir Data logger with sensors

Test duration: 30 min (parking), > 60 min for one trip (driving)

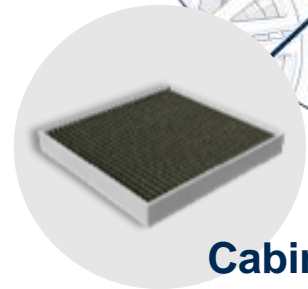
Long-term test of vehicle filtration

CabinAir Advanced Air Cleaner solution:
Based on Blueair HEPASlient™ two-step
technology (ionization + filtration)

Vehicle test in Shenzhen, China



Particle charging unit AAC



Cabin air filter

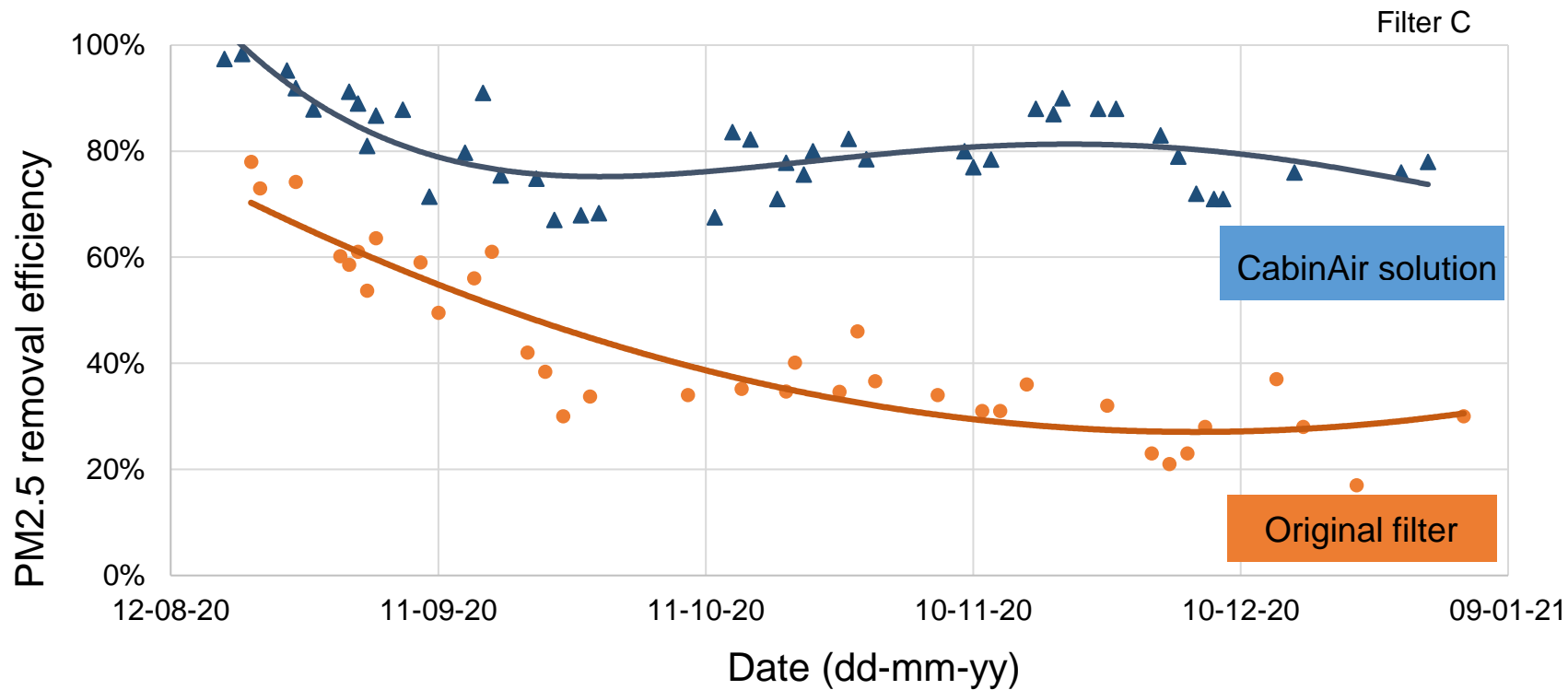
Outdoor sensors

Indoor sensors

CabinAir

Long-term performance

> 4 months of continuous on-road driving test



Location of test: Shenzhen
Driving time per day: > 60 min
No. of days with filter: 36
No. of days with AAC: 43

Original filter: OEM filter
Filter Installed: 2020-08-18
AAC installed: 2019-09-30

Vehicle settings
Ventilation: Fresh air
Fan speed: medium



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