

Overview of the measurement campaigns

Three city measurement campaigns in 2024

- Leuven (May)
 - ≈ 250 LV measurements
 - 165 LVs inspected at the roadside



- Paris region - Rueil Malmaison & Dampierre-en-Yvelines (September)

- ≈ 950 LV measurements
- No roadside inspections

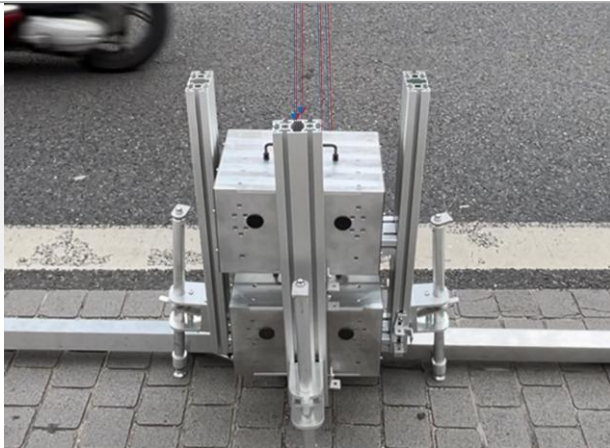


- Barcelona (October)
 - ≈ 1100 LV emission measurements
 - ≈ 920 LV noise measurements
 - 95 LVs inspected at the roadside



Measurement instruments

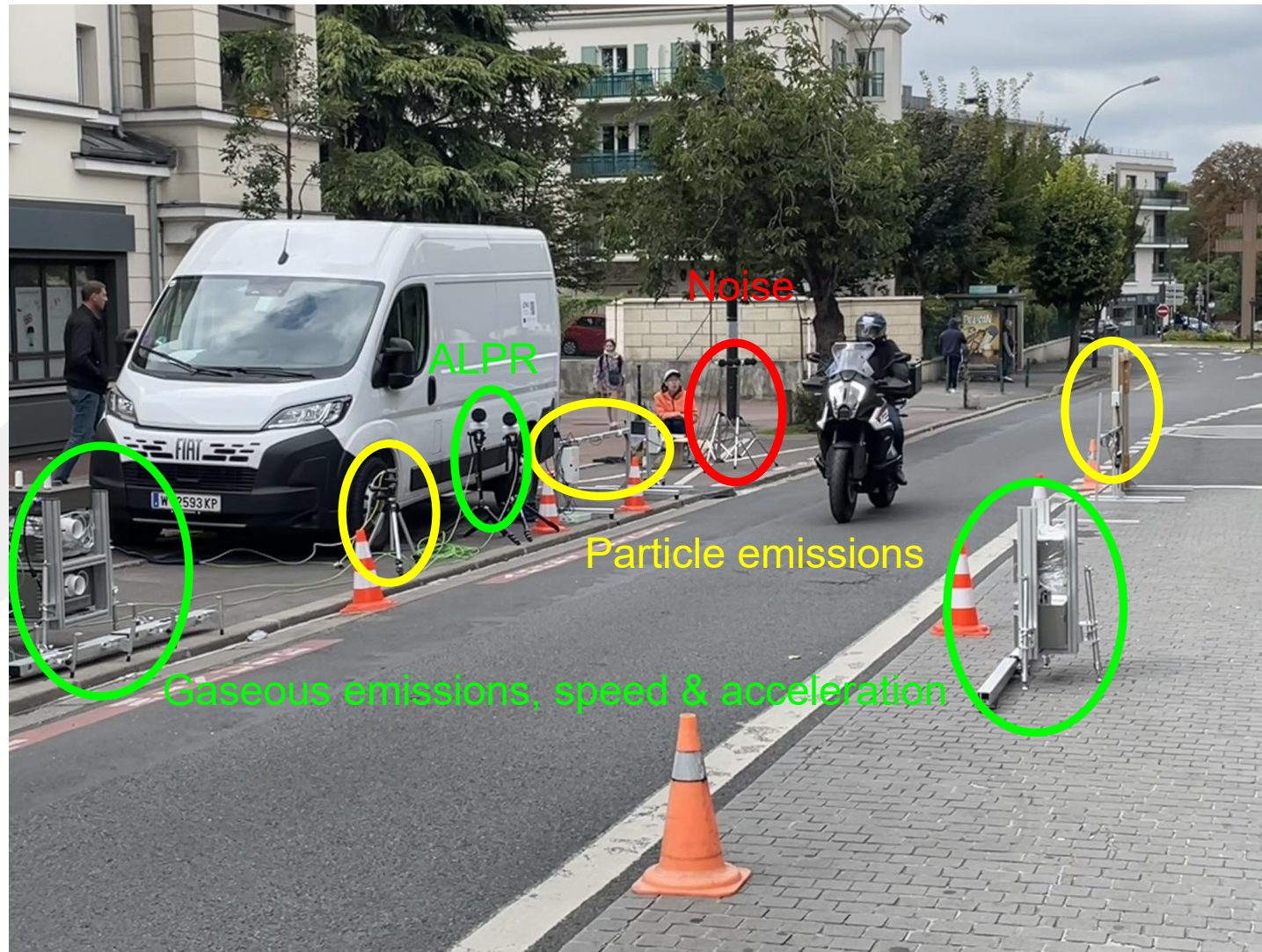
- All emission measurement instruments measure concentrations of **pollutants and CO₂** in the exhaust plume 0-3 seconds immediately after a vehicle has passed
- The measured **concentration ratios of pollutant to CO₂** is used to derive instantaneous **emission factors** in the unit **g/kg fuel burnt**
- **Fuel consumption factors** corresponding to the driving conditions are model calculated and used to derive LV **emission factors in g/vehkm**



KU Leuven microphone array
noise measurement system



Typical measurement set-up



All the pollutant
emission
measurement

Roadside inspections

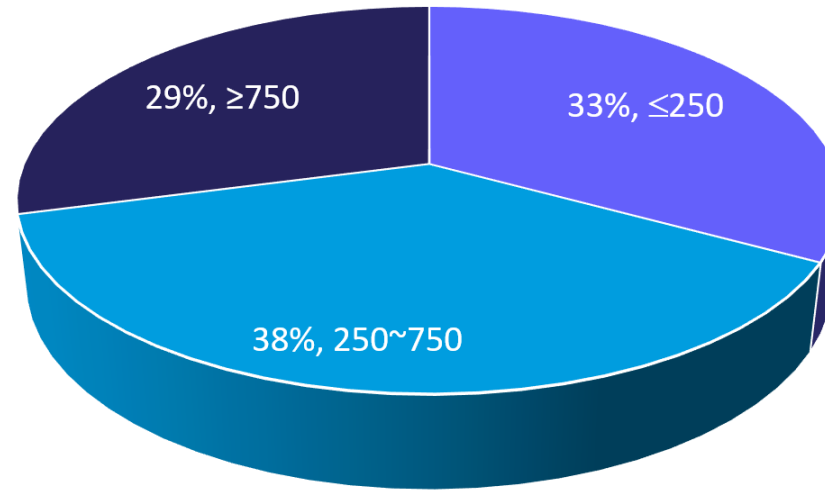


- Check of vehicle documents
- CO and HC idle emission test



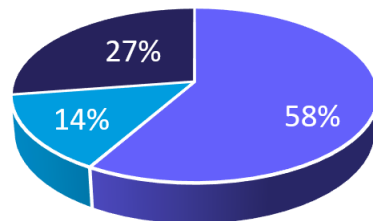
- Stationary noise test
- Visual inspection

Distribution of measured LVs by engine size

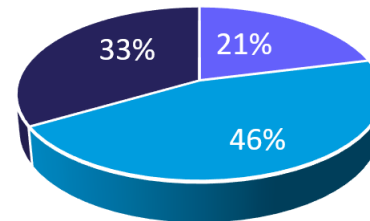


■ ≤250 ■ 250~750 ■ ≥750

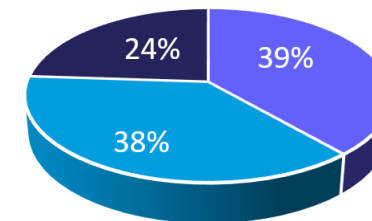
a) Leuven



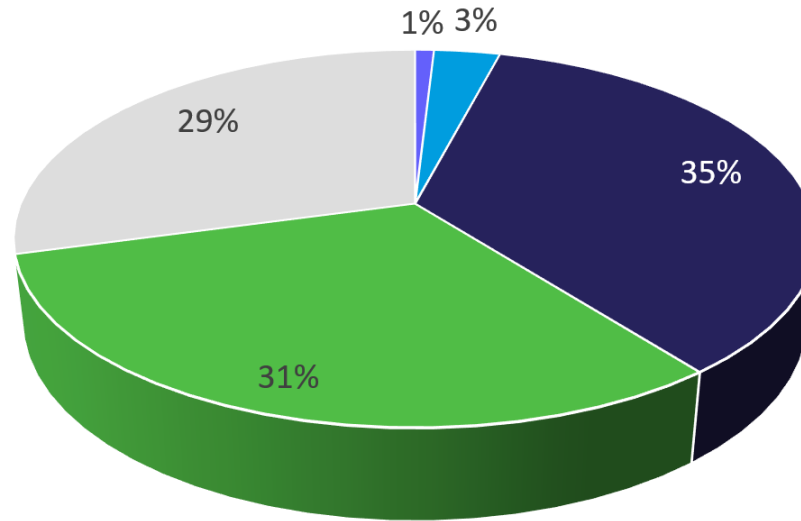
b) Paris



c) Barcelona

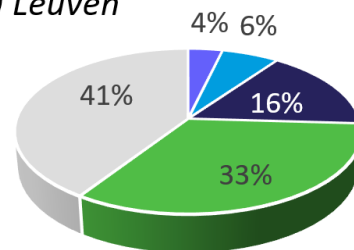


Distribution of measured LVs by Euro class

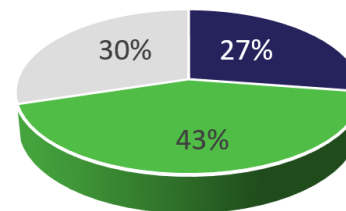


■ Euro 1 ■ Euro 2 ■ Euro 3 ■ Euro 4 ■ Euro 5

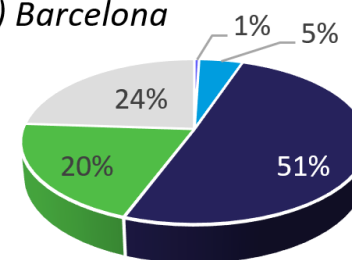
a) Leuven



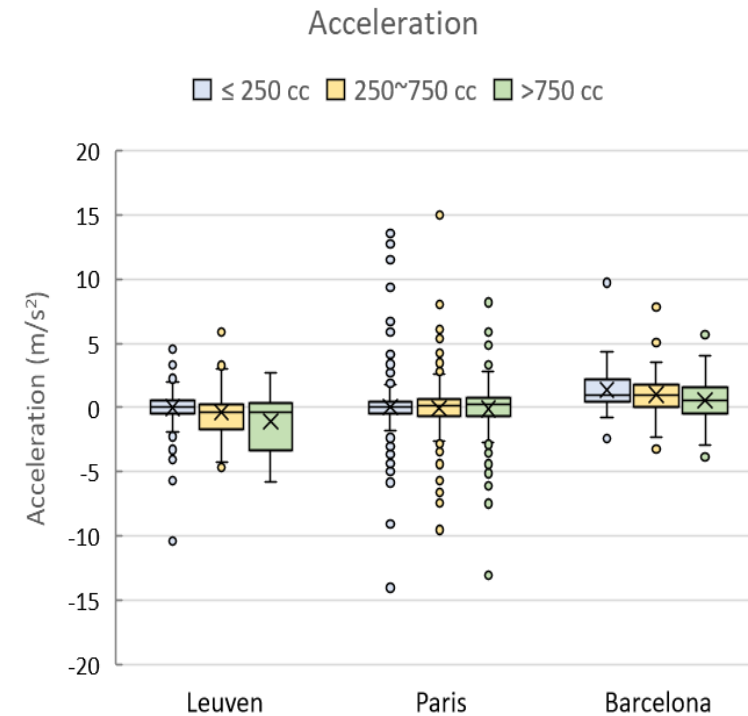
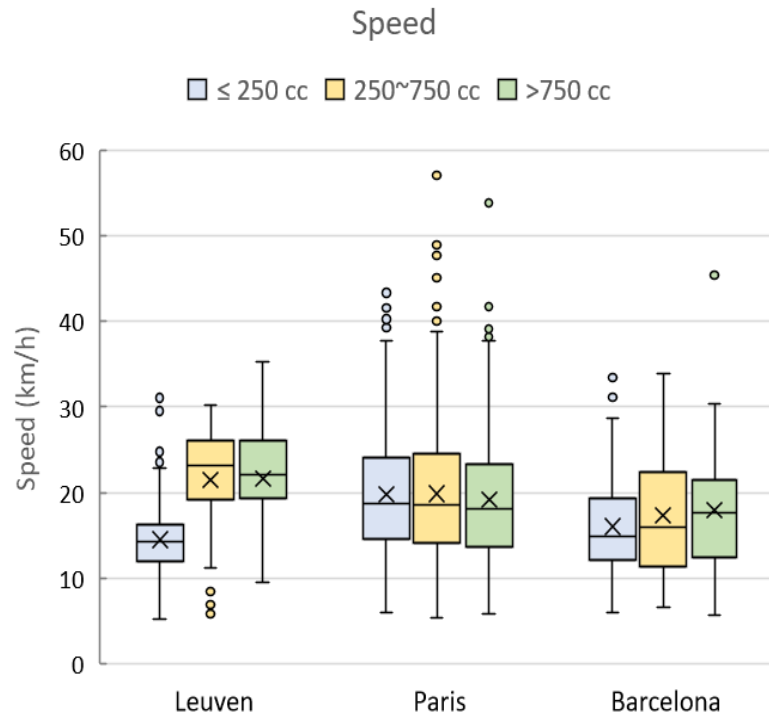
b) Paris



c) Barcelona



Driving conditions of the measured LVs



Roadside emission measurements results

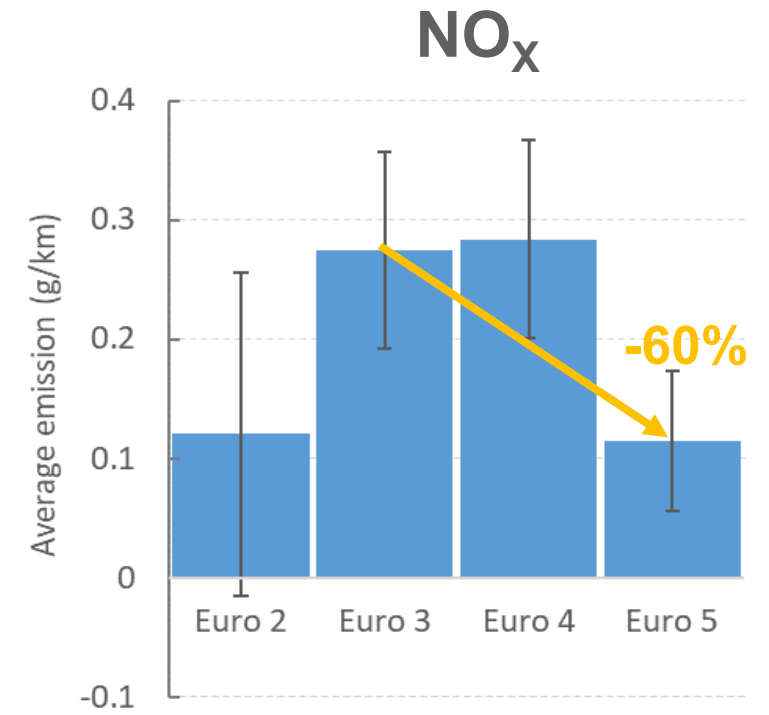
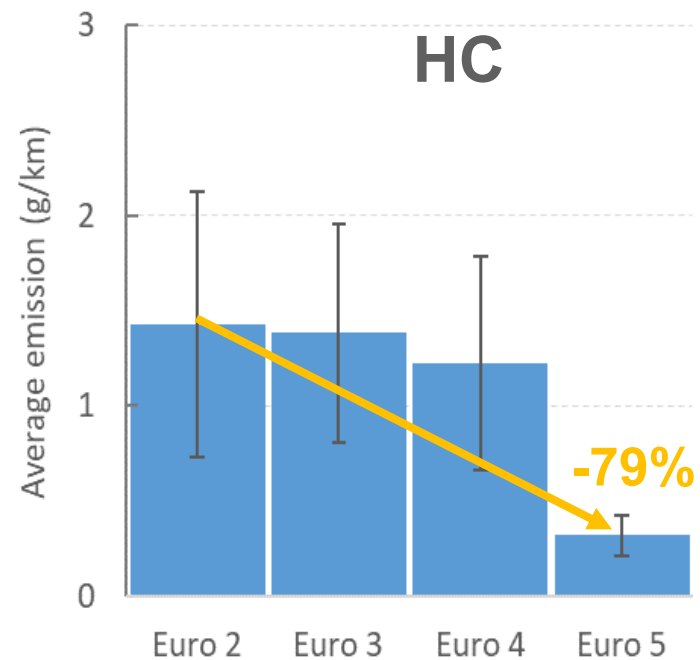
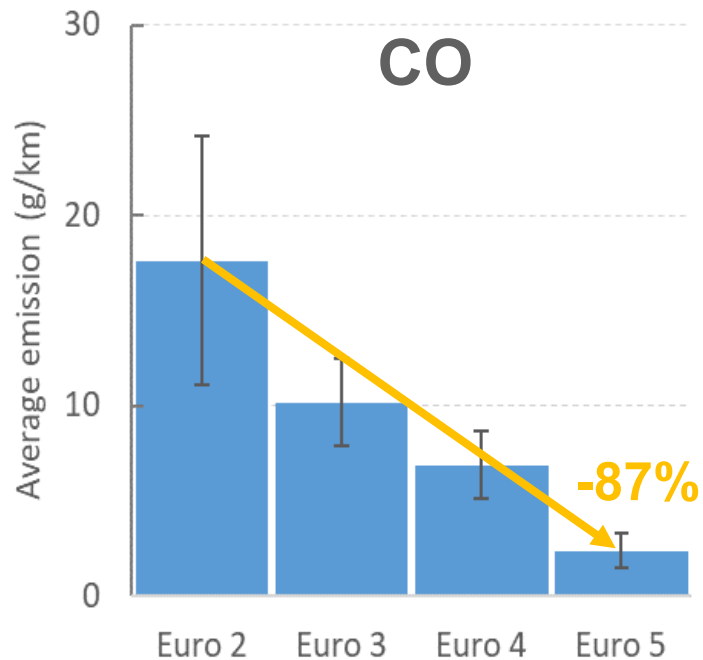
Newer LVs have much lower on-road emissions than older ones (1)

Euro limit drop

$2 \rightarrow 5$	$3 \rightarrow 5$
-91%	-75%

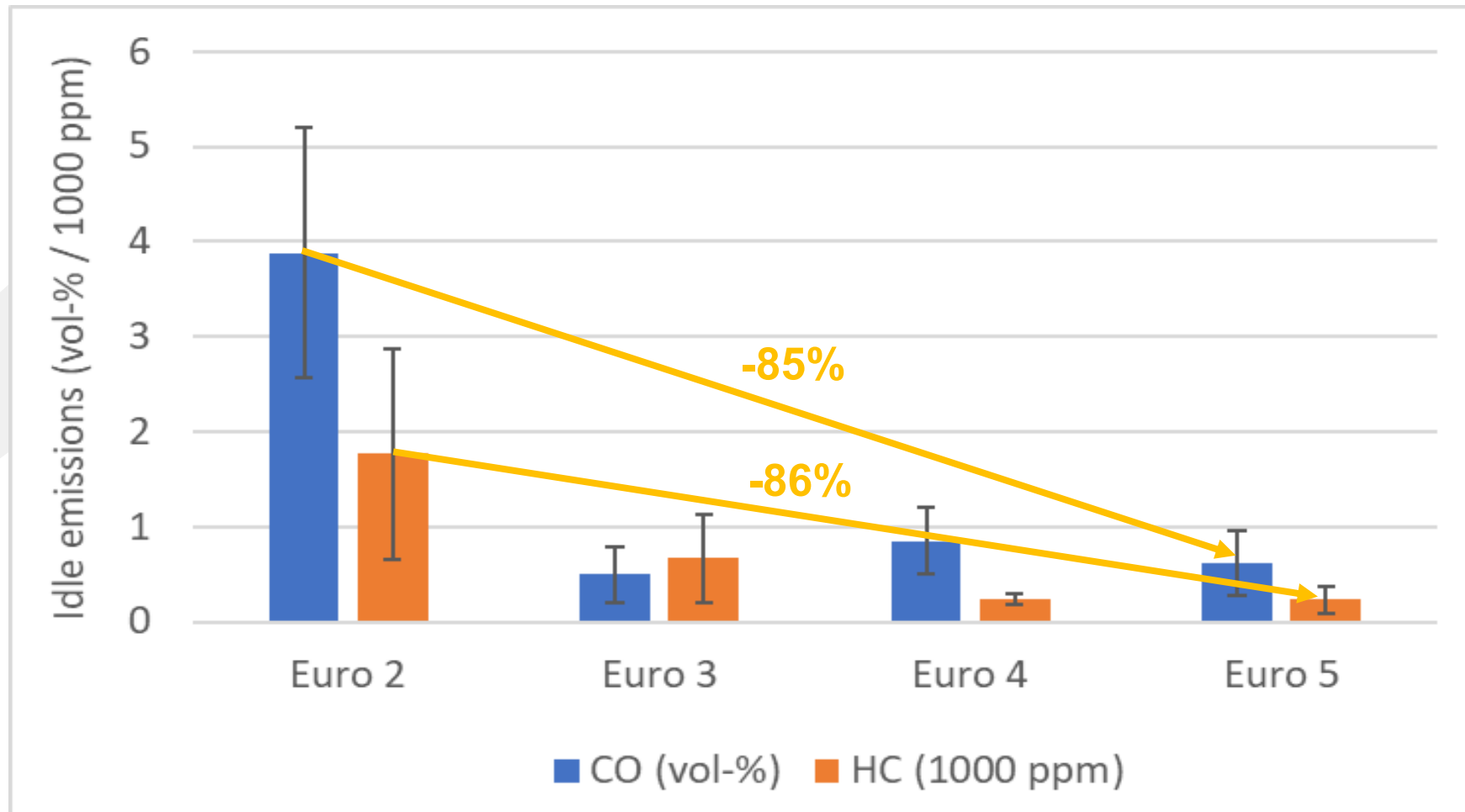
$2 \rightarrow 5$	$3 \rightarrow 5$
-93%	-77%

$2 \rightarrow 5$	$3 \rightarrow 5$
-80%	-60%

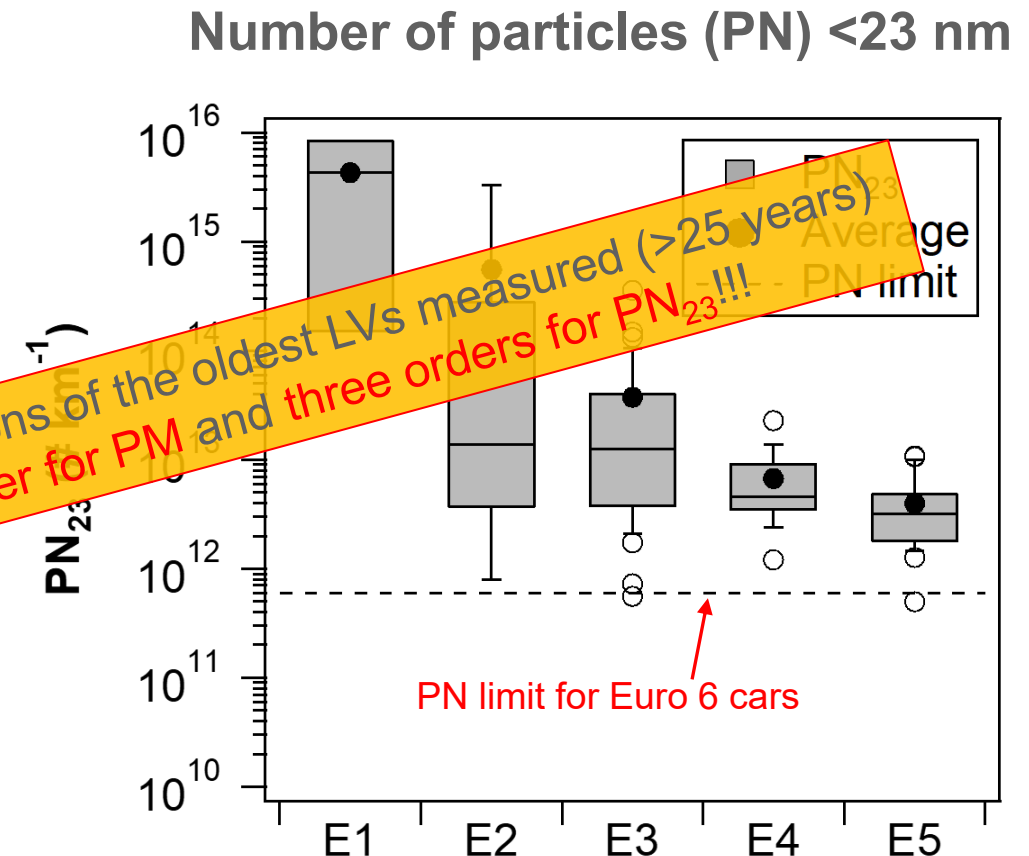
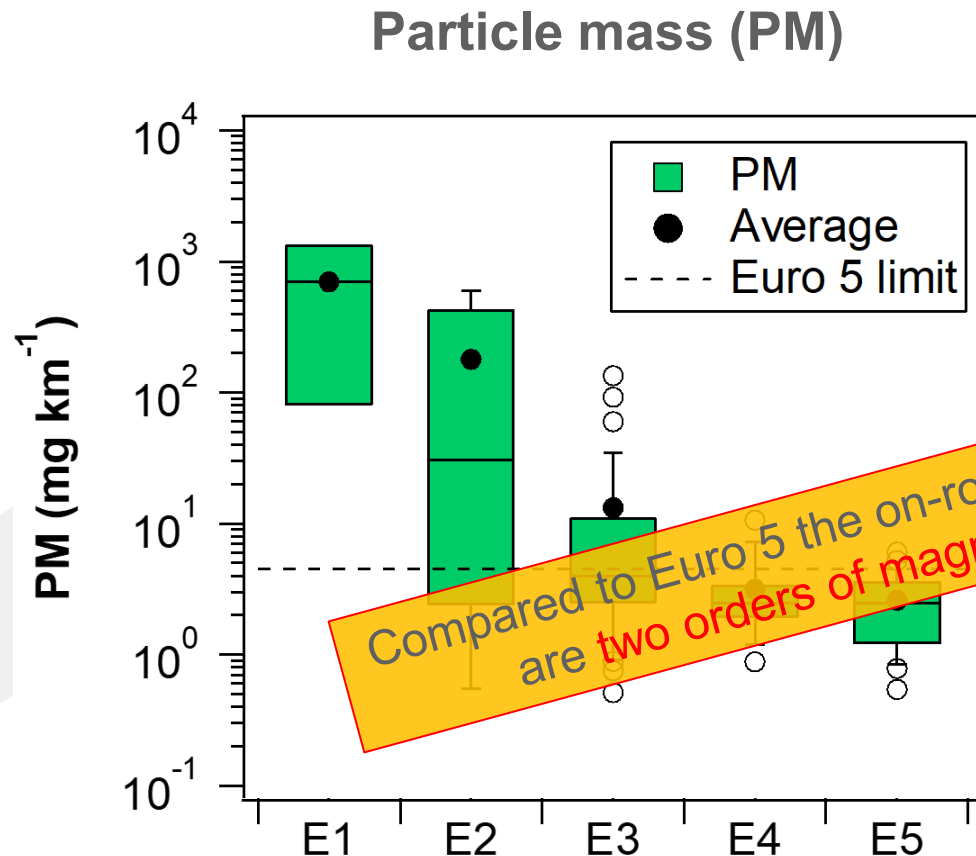


Newer LVs have much lower on-road emissions than older ones (1)

... and idle test emissions (CO and HC) show the same trend....



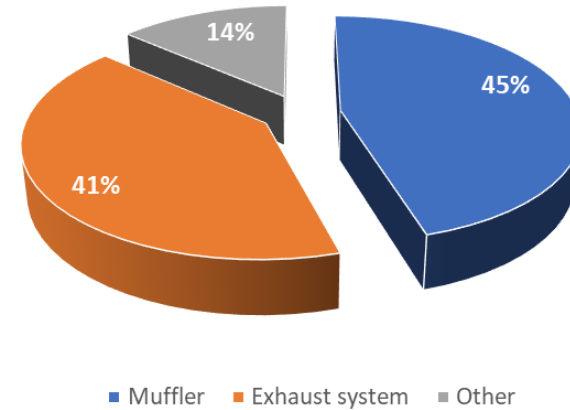
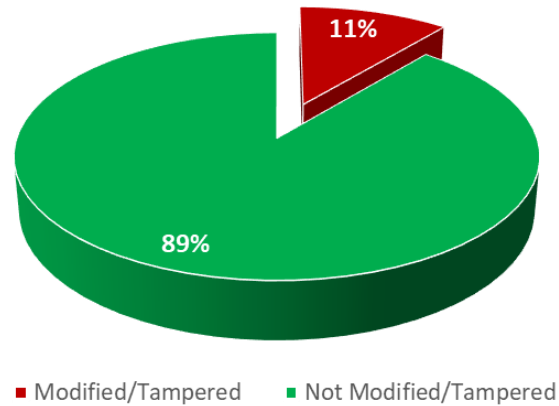
Newer LVs have much lower on-road emissions than older ones (2)



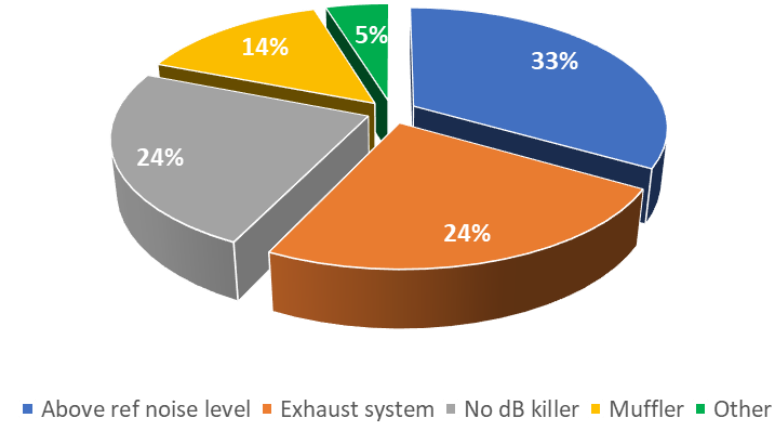
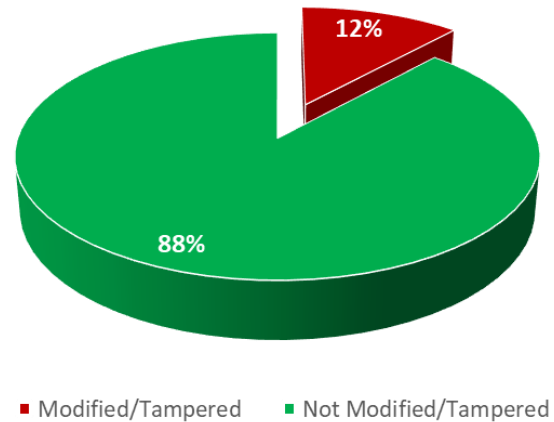
Compared to Euro 5 the on-road emissions of the oldest LVs measured (>25 years) are two orders of magnitude higher for PM and three orders for PN₂₃!!!

Roadside inspection tampering results

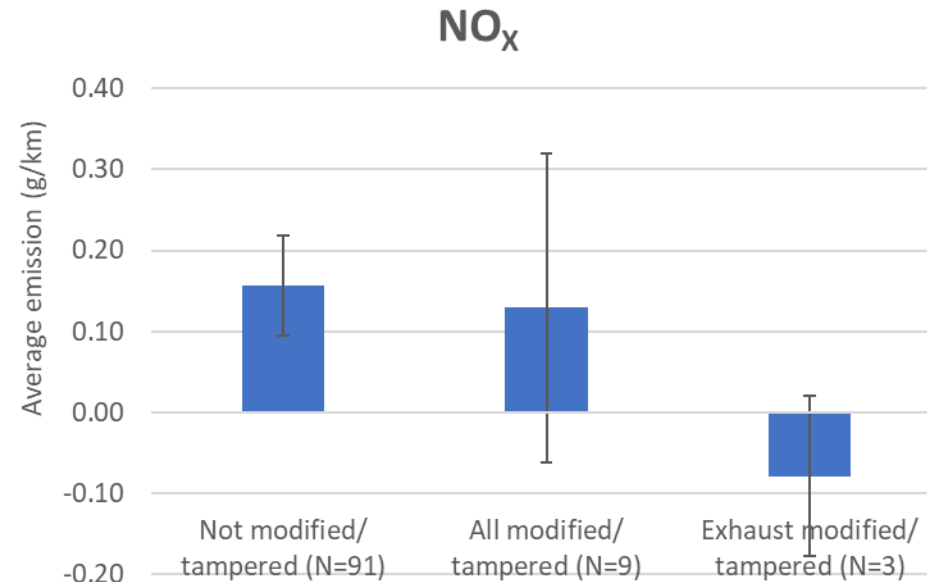
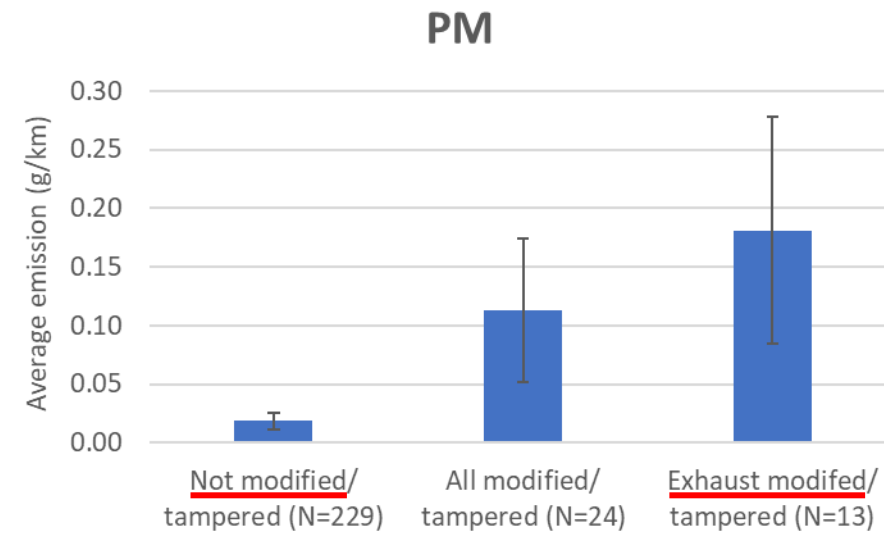
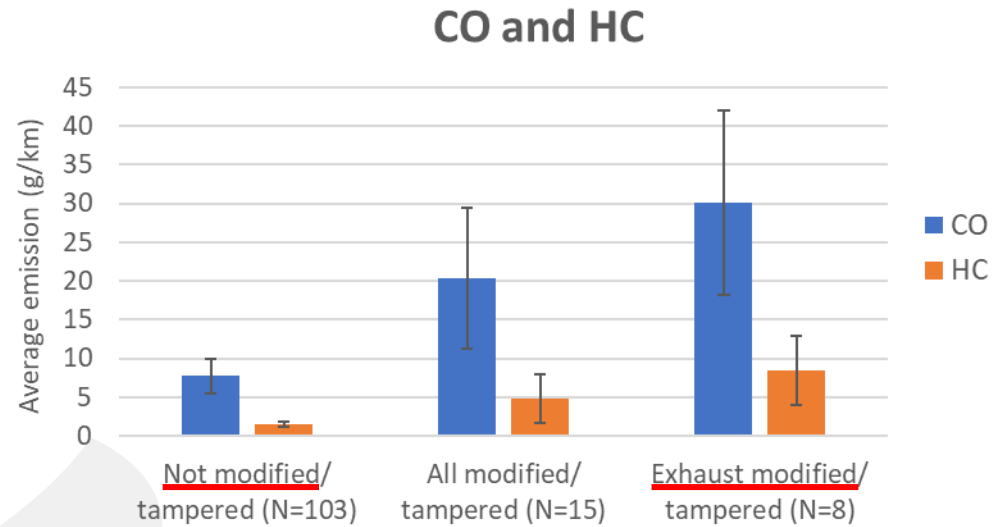
- Leuven



- Barcelona



Modifications/tampering may affect on-road emissions substantially



What characterized the modified/tampered LVs?

Compared to the not modified/tampered LVs:

- They had a higher share of **2-stroke engines**: 23% (vs 3%)
- Their average **engine size** was higher: 446 cm³ (vs 285 cm³)
- Their **average age** was about two years higher
- There were no significant differences in average Euro class or vehicle mileage

