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Validation of PN-instruments for low idle PTI-measurements

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Issues addressed during testing

- Instruments performance at:
 - Low idle
 - High idle
- Evaluation of plausible limit
 - The limit should not be more stringent than type-approval (6×10^{11} #/km)

Instruments used

- TSI 3795 (NPET)
- Testo PEPA
- TSI p-Track
- Naneos Partector
- Naneos Automotive Partector

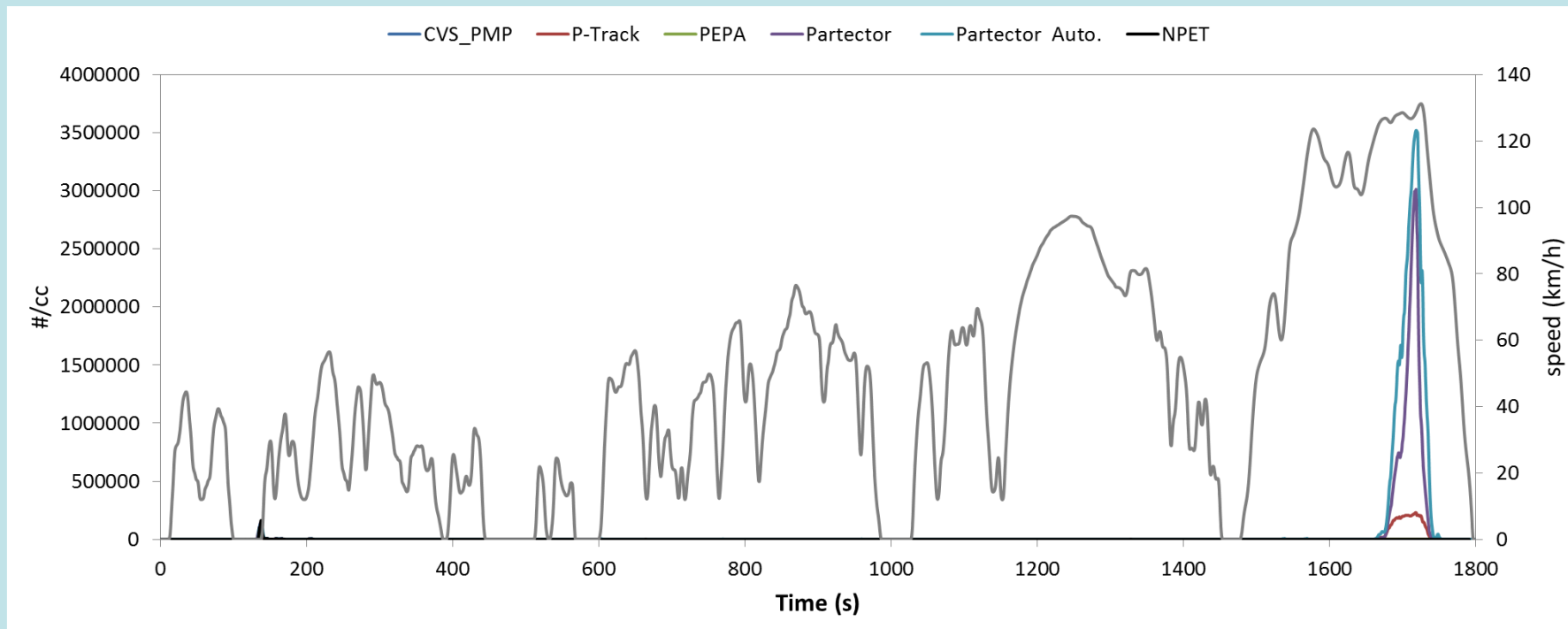
Test sequence

- **WLTP**
 - Instruments measured at CVS
- **Low idle**
 - Ambient air (60''), followed by raw exhaust at low idle (60'')
- **High idle**
 - Raw exhaust at low idle (60''), follow by high idle (60'' at 2000 rpm)

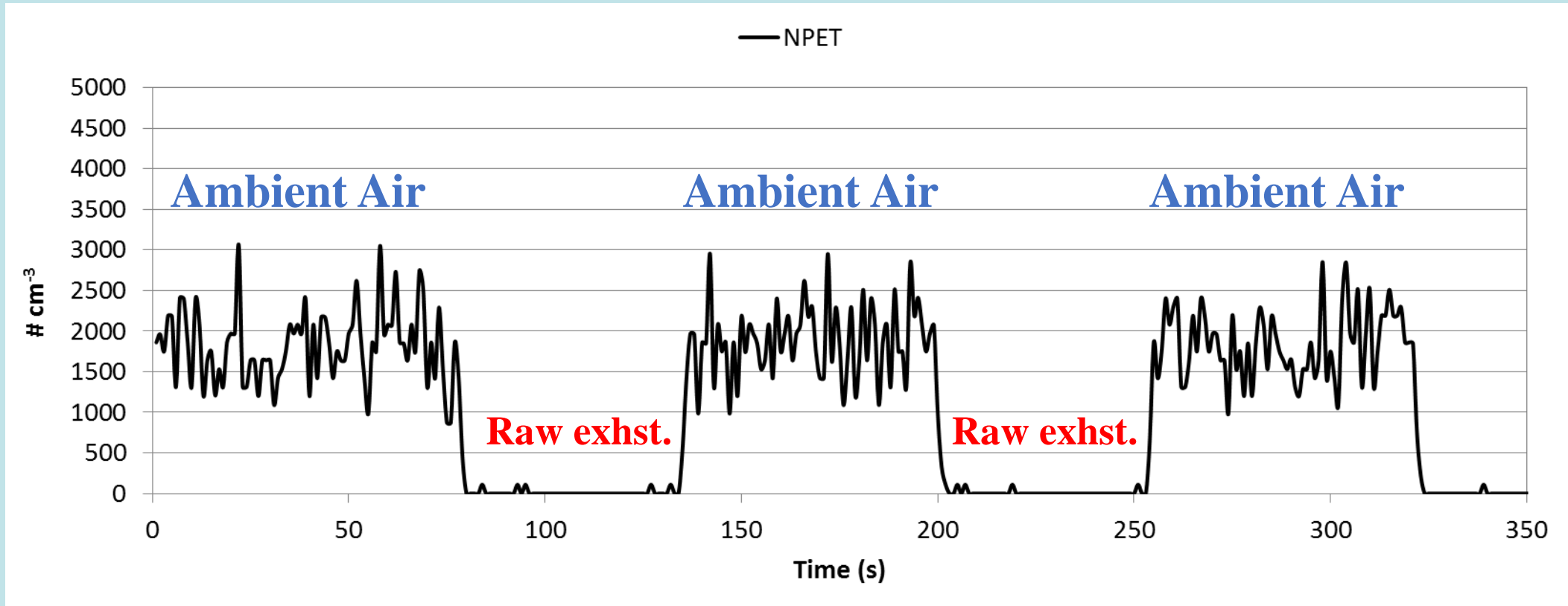
Bypass levels and emission factors

- Different levels of bypass were used leading to different emission factors (EF) during the WLTP
 - No bypass EF $2-8 \times 10^9$ #/km
 - Near Euro 6 limit $5-7 \times 10^{11}$ #/km
 - Wide opened $2-4 \times 10^{12}$ #/km

WLTP -Euro 6b diesel- No bypass

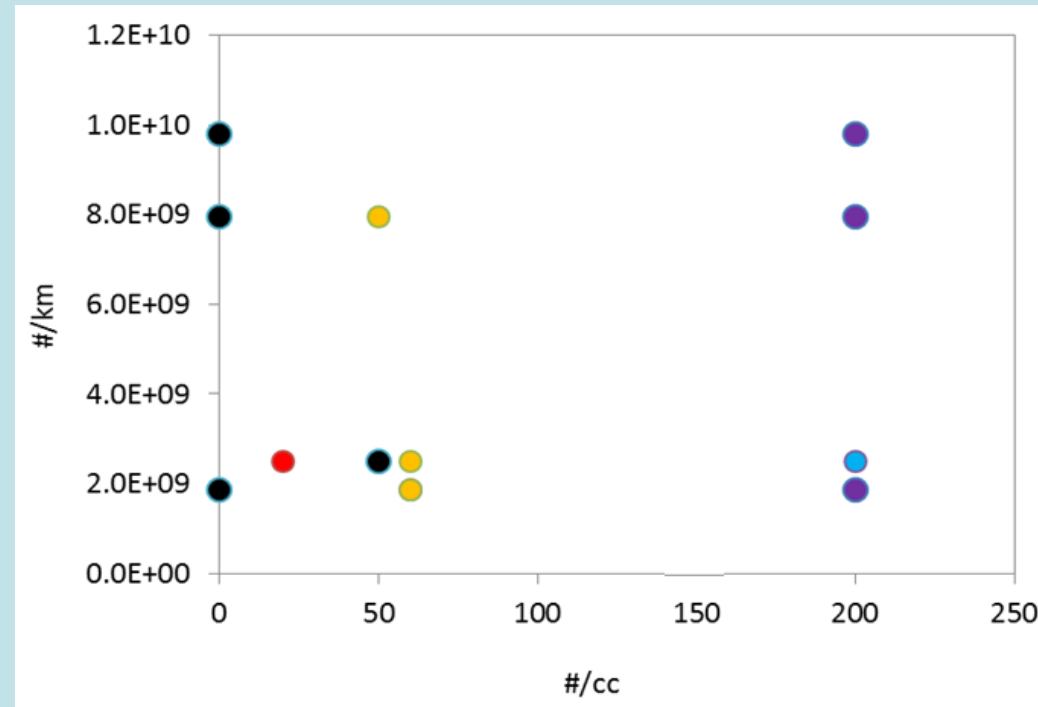


Raw emissions - Euro 6b diesel- No bypass

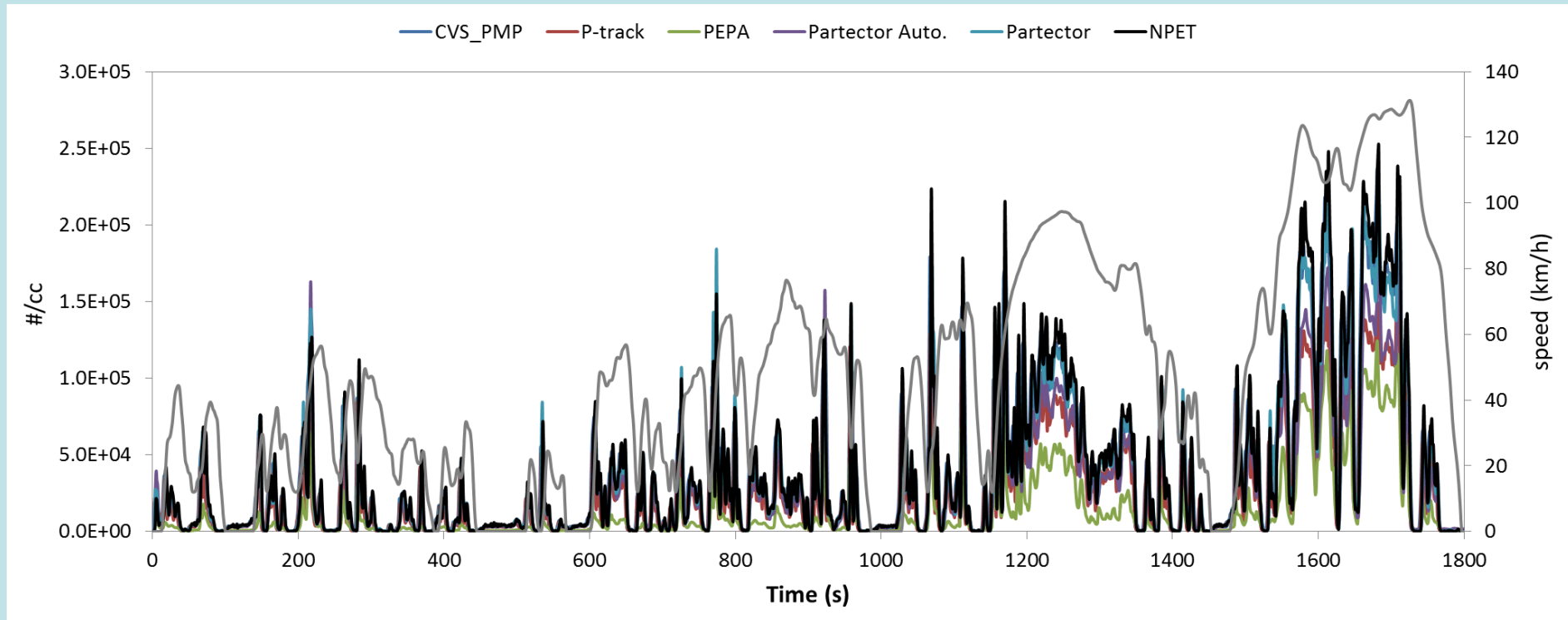


Bypass closed. PN emission factor: $\sim 10^9$ #/km

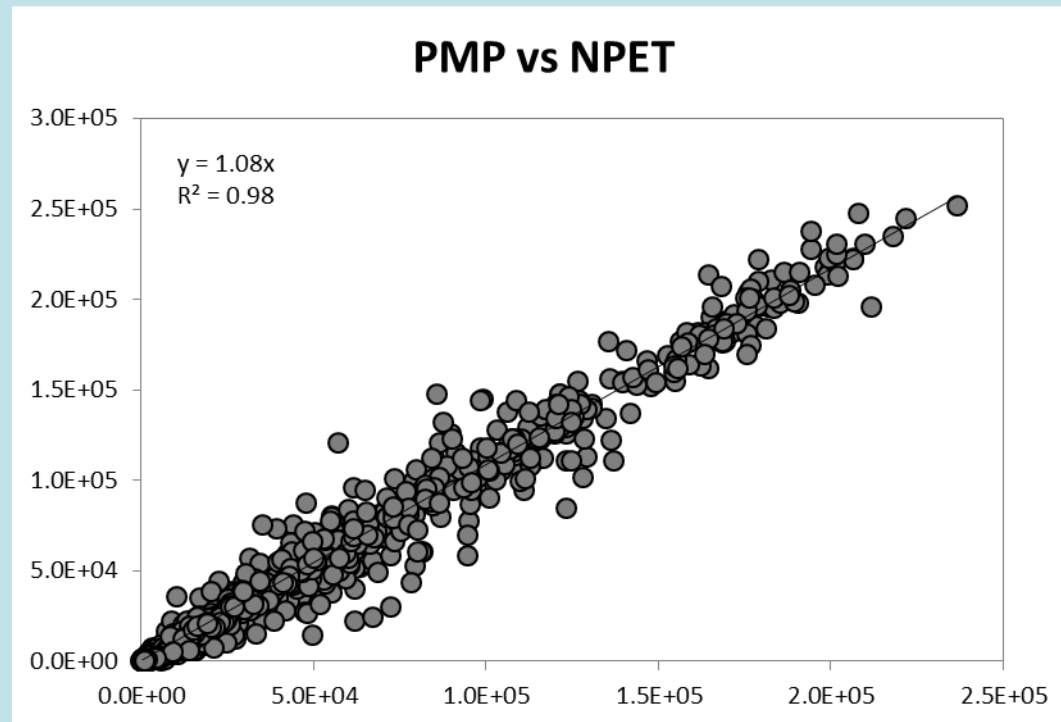
NPET P-Track PEPA Partector Automotive Partector



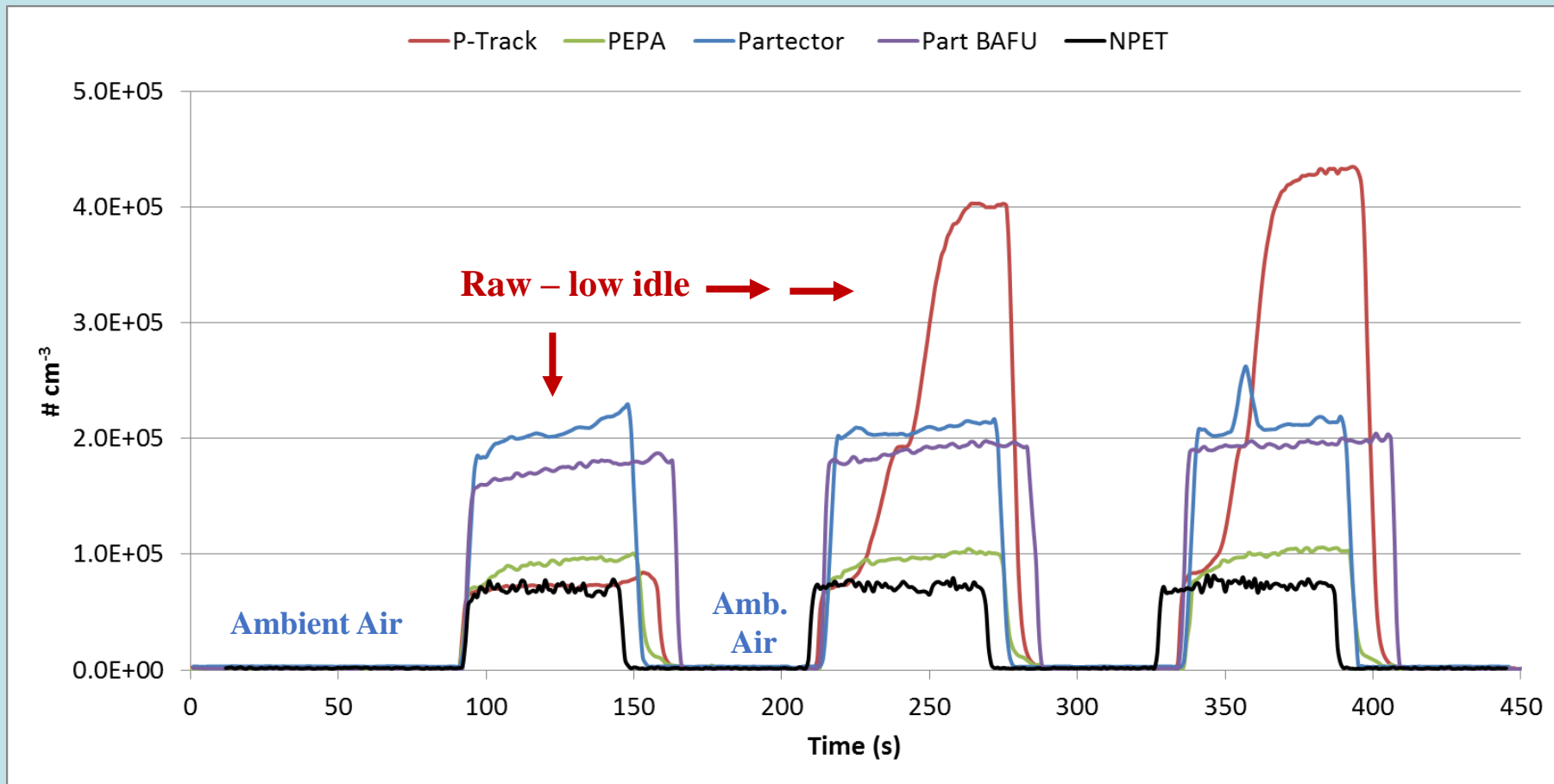
WLTP -Euro 6b diesel- Bypass opened



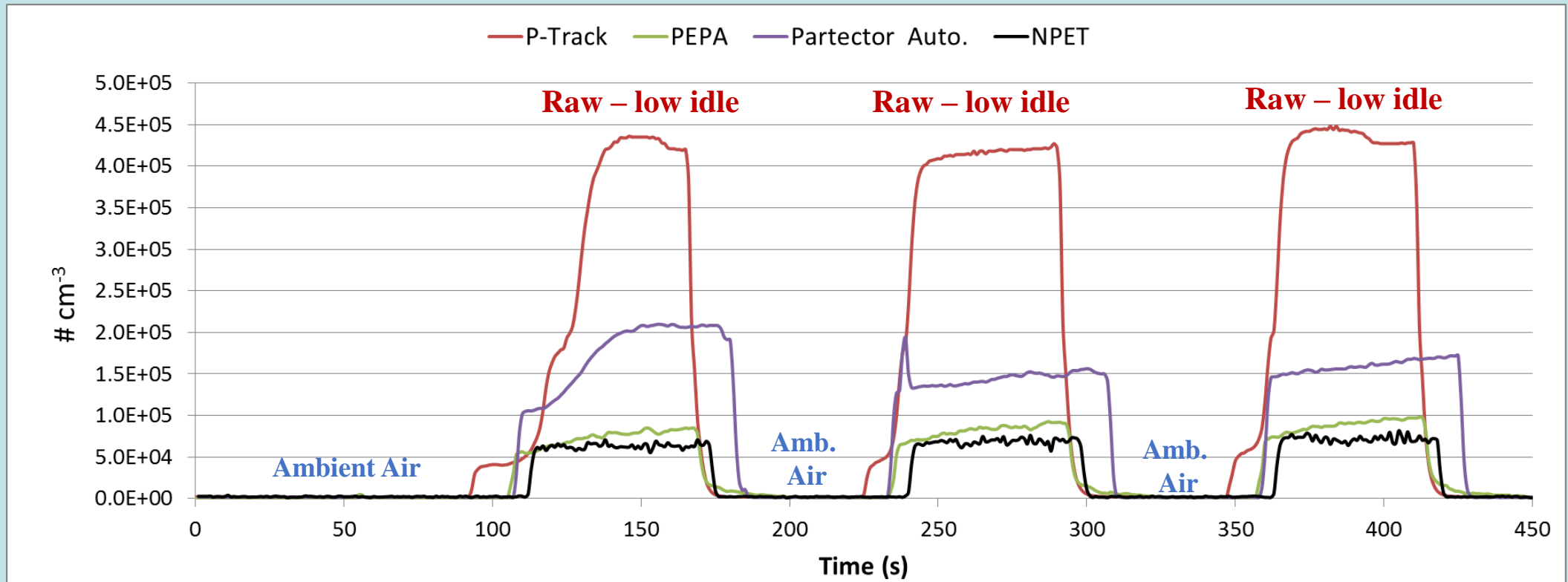
WLTP -Euro 6b diesel



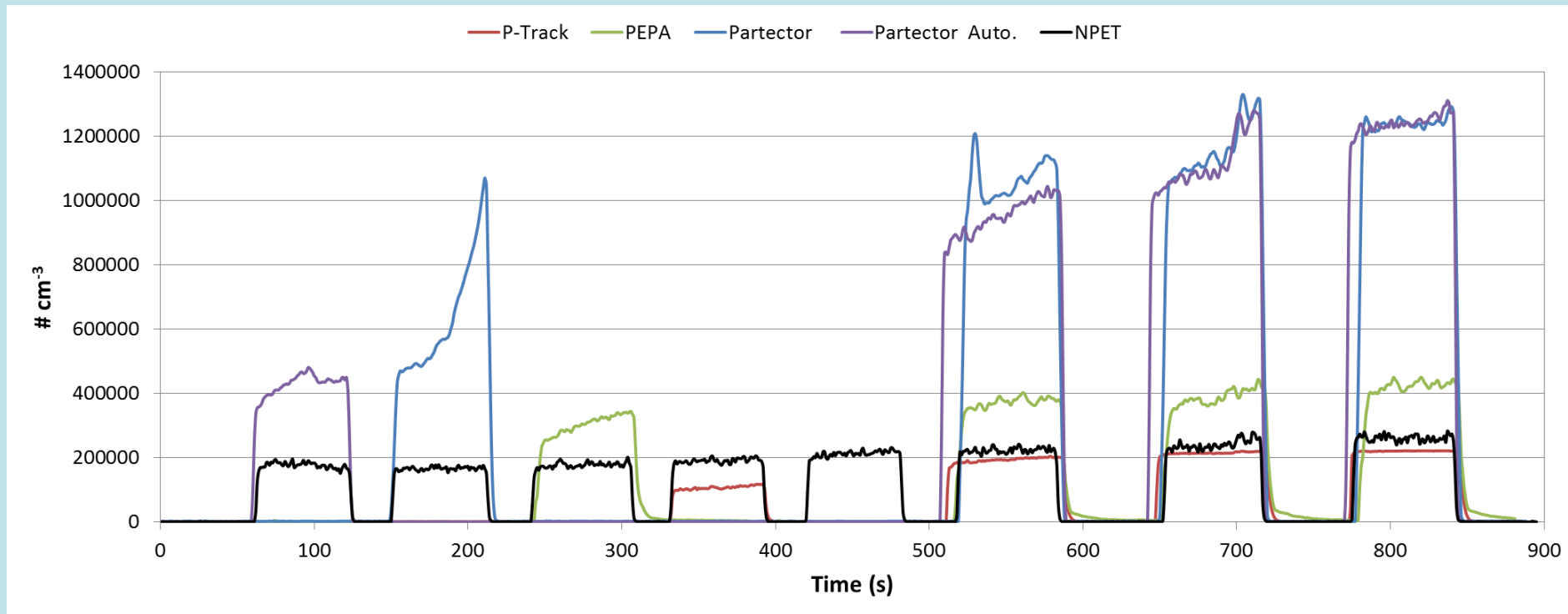
Low idle- Bypass opened



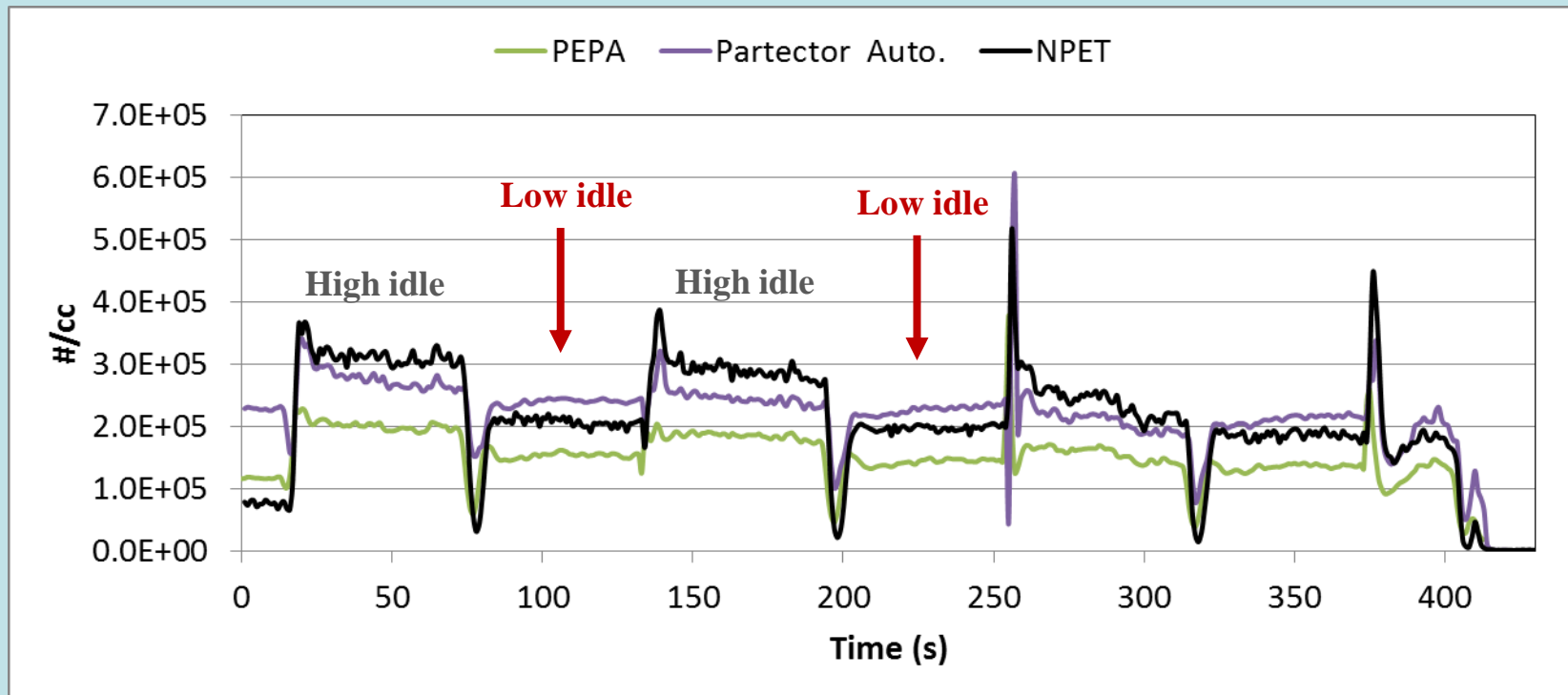
Low idle- Bypass opened



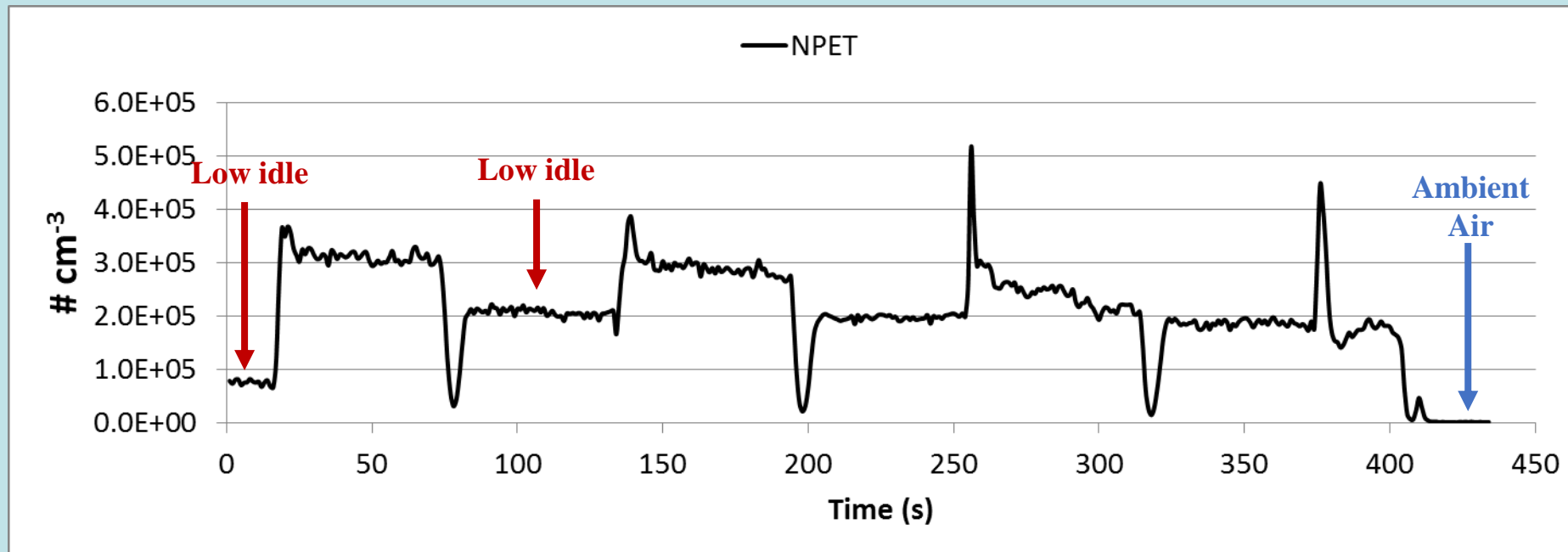
Low idle- Bypass opened



High idle- Bypass opened



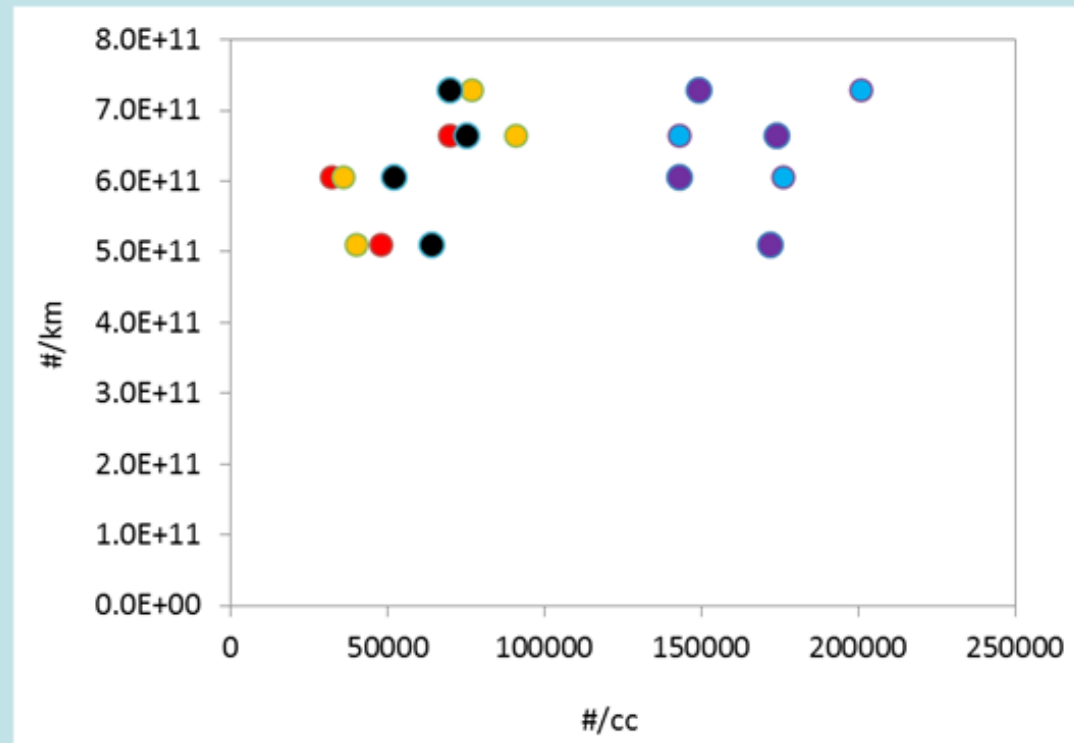
High idle- Bypass opened



Bypass partially opened

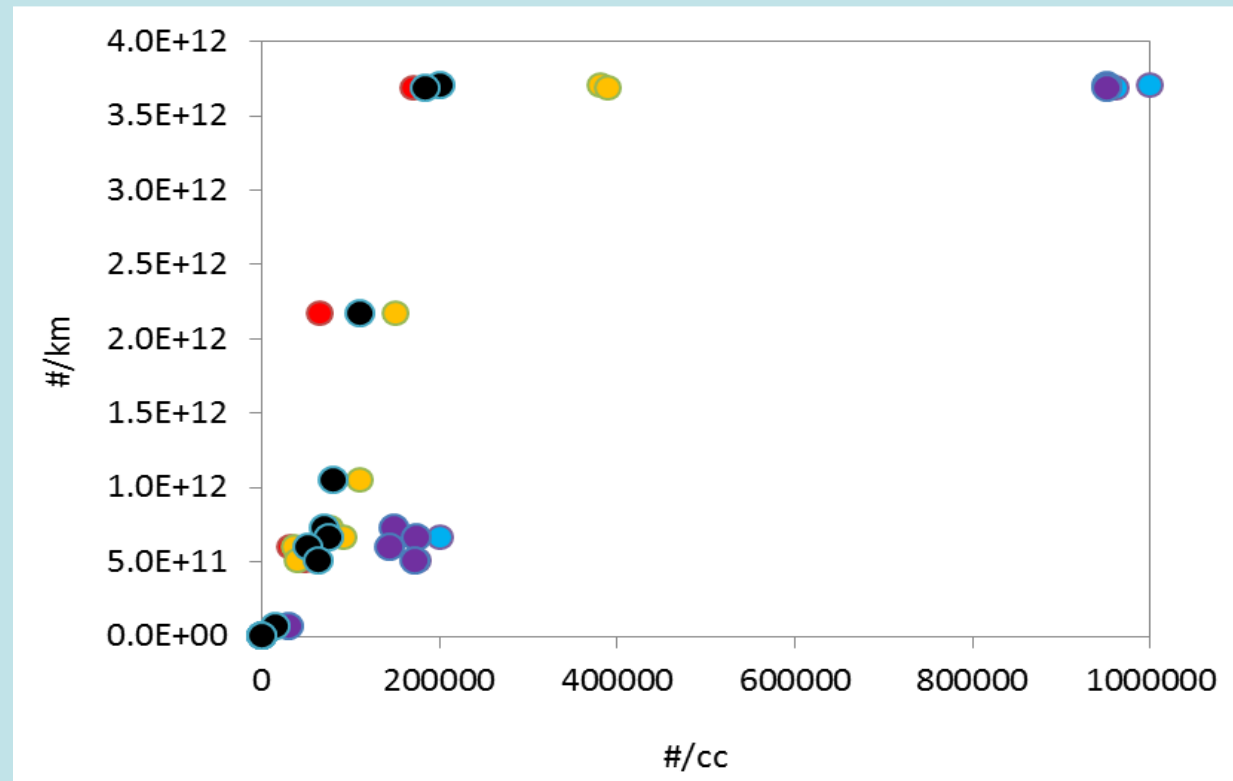
PN emission factor: $\sim 5-7 \cdot 10^{11}$ #/km

NPET P-Track PEPA Partector Automotive Partector

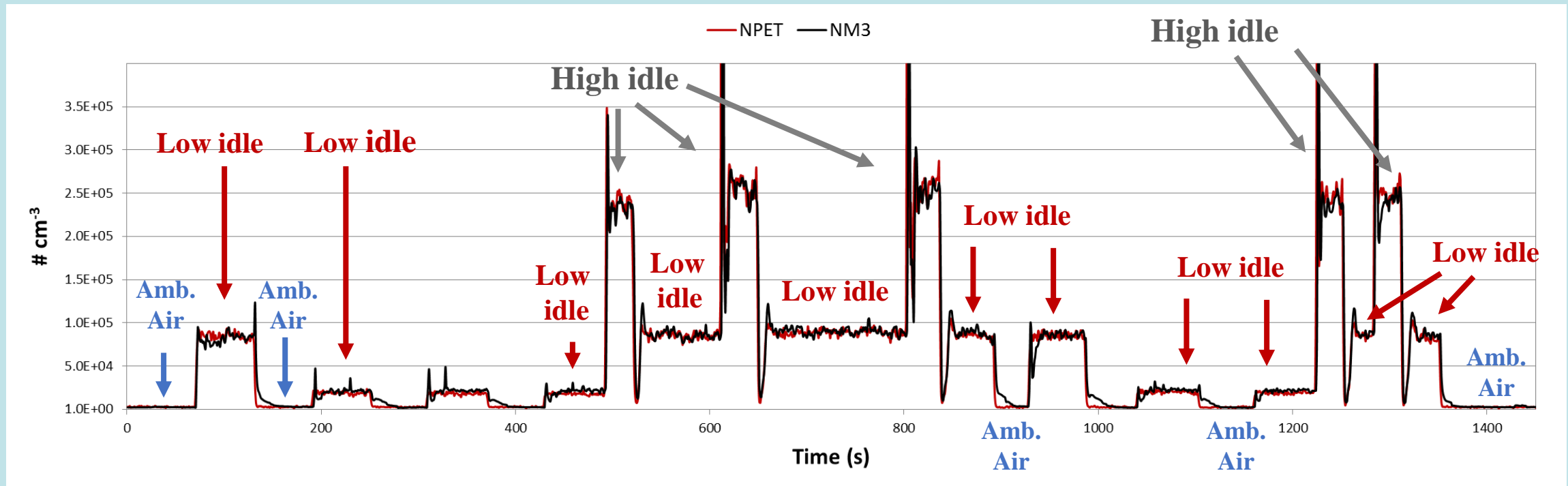


Euro 6b diesel all instruments

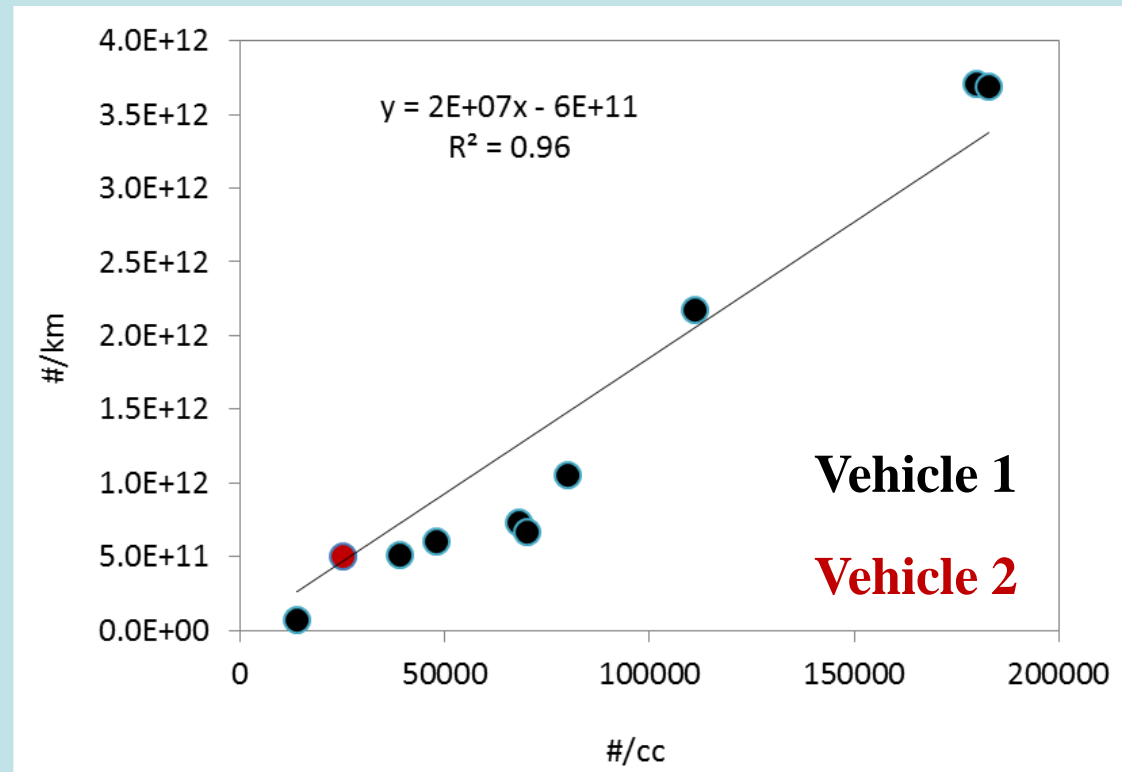
NPET P-Track PEPA Partector Automotive Partector



Vehicle 2- Euro 6b diesel



Emission factor and low idle concentration



Next steps

- Upgraded and new instruments will be used on a second campaign
- Low idle procedure fine-tuning
- More data is needed to be able to provide a general pass/fail limit
- Petrol vehicles Euro 6b onwards will also be studied



Thank you

Any questions?

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