

Clean air in vehicle cabins - results of a Swiss Project

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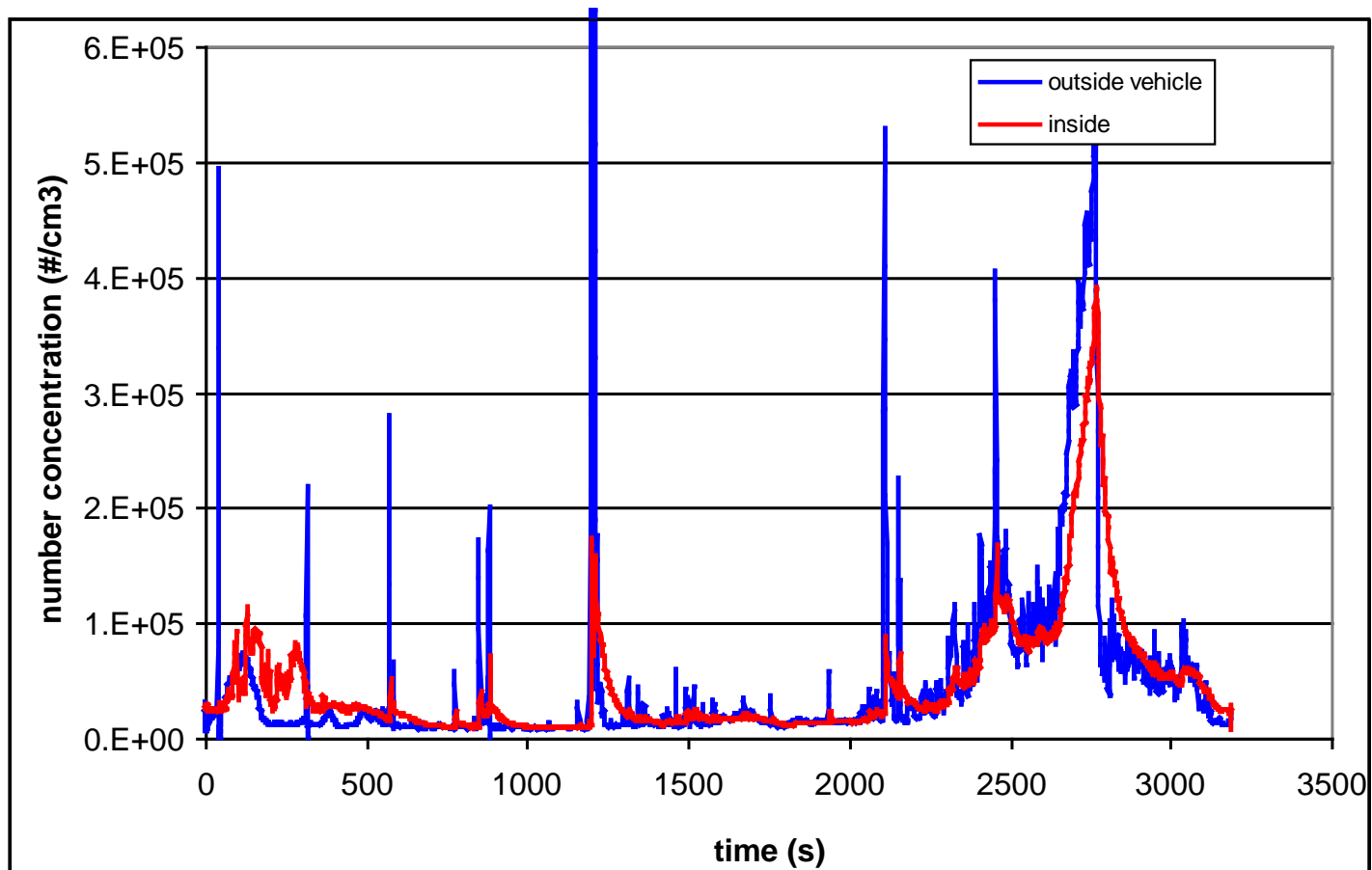
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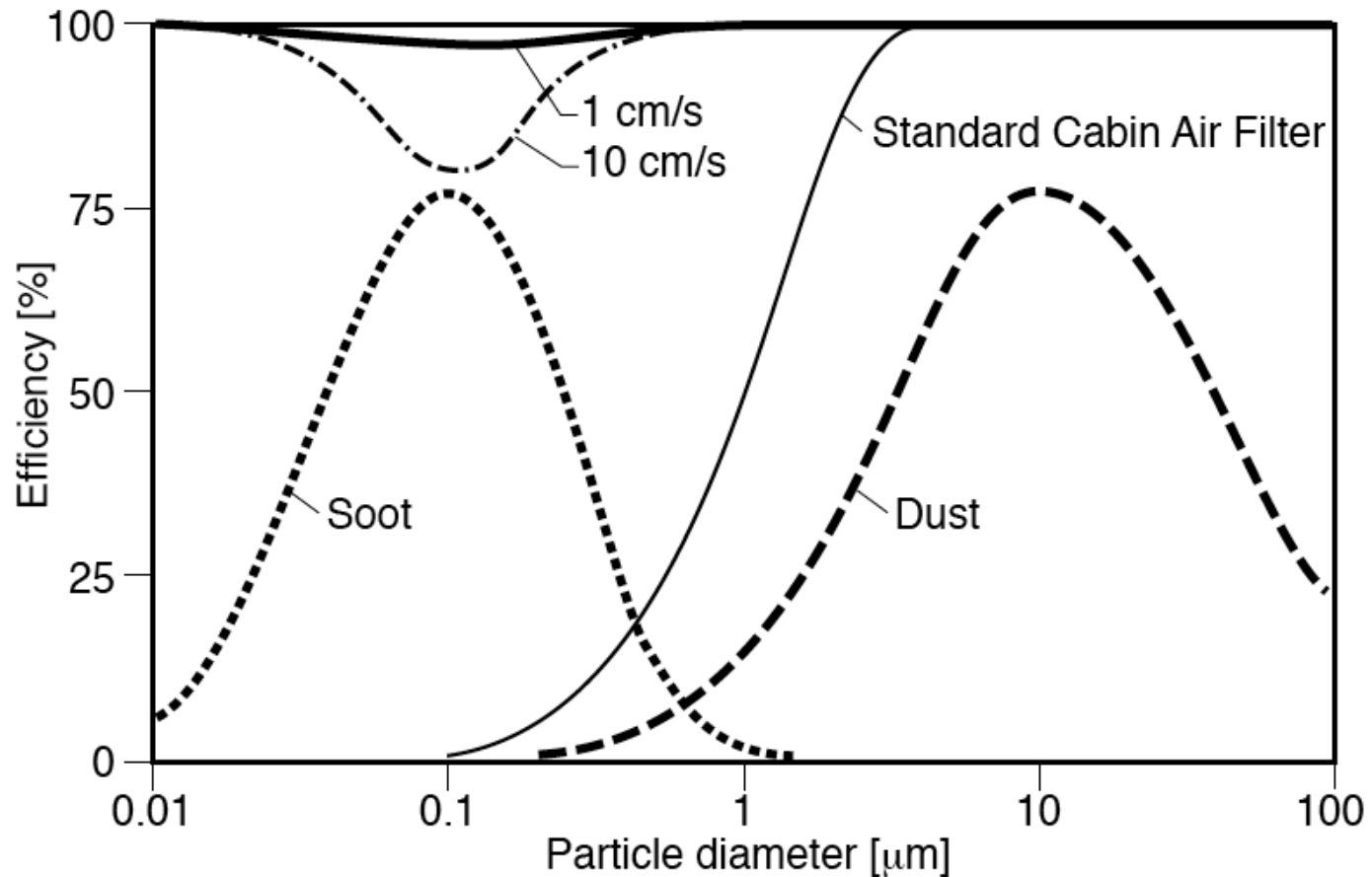
Existing Cabin Air Filtration

built-in ventilation switched on



Existing Cabin Air Filtration

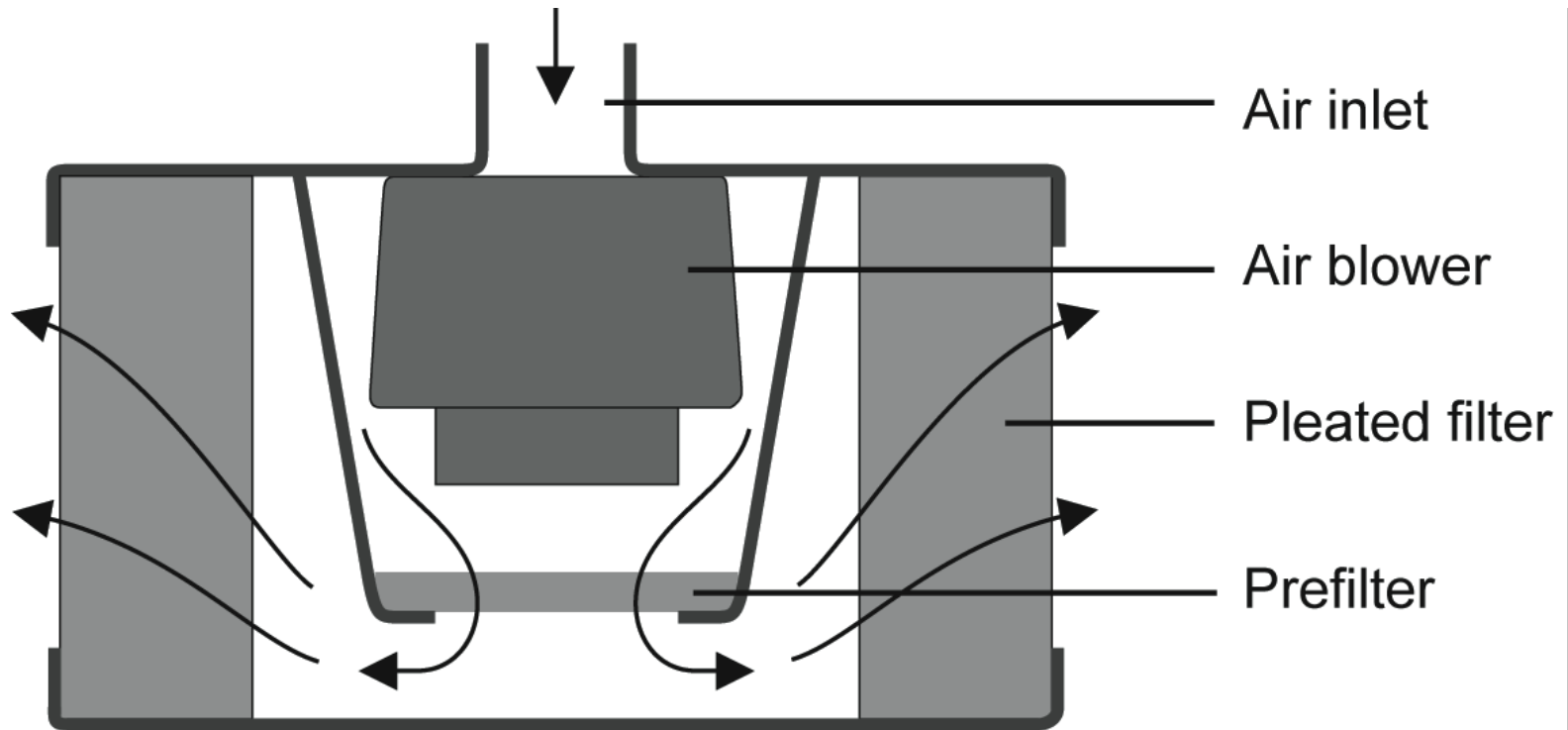
built-in ventilation switched on



Possible Approaches for existing cars, trucks, buses

- set ventilation to recirculation?
 - à **no fresh air - CO₂ may reach dangerous levels**
- Nanofiltration material in existing AC system ?
 - à **ventilators cannot cope with high backpressure**
- Additional clean air supply while existing AC is on recirculation
 - à **our approach**

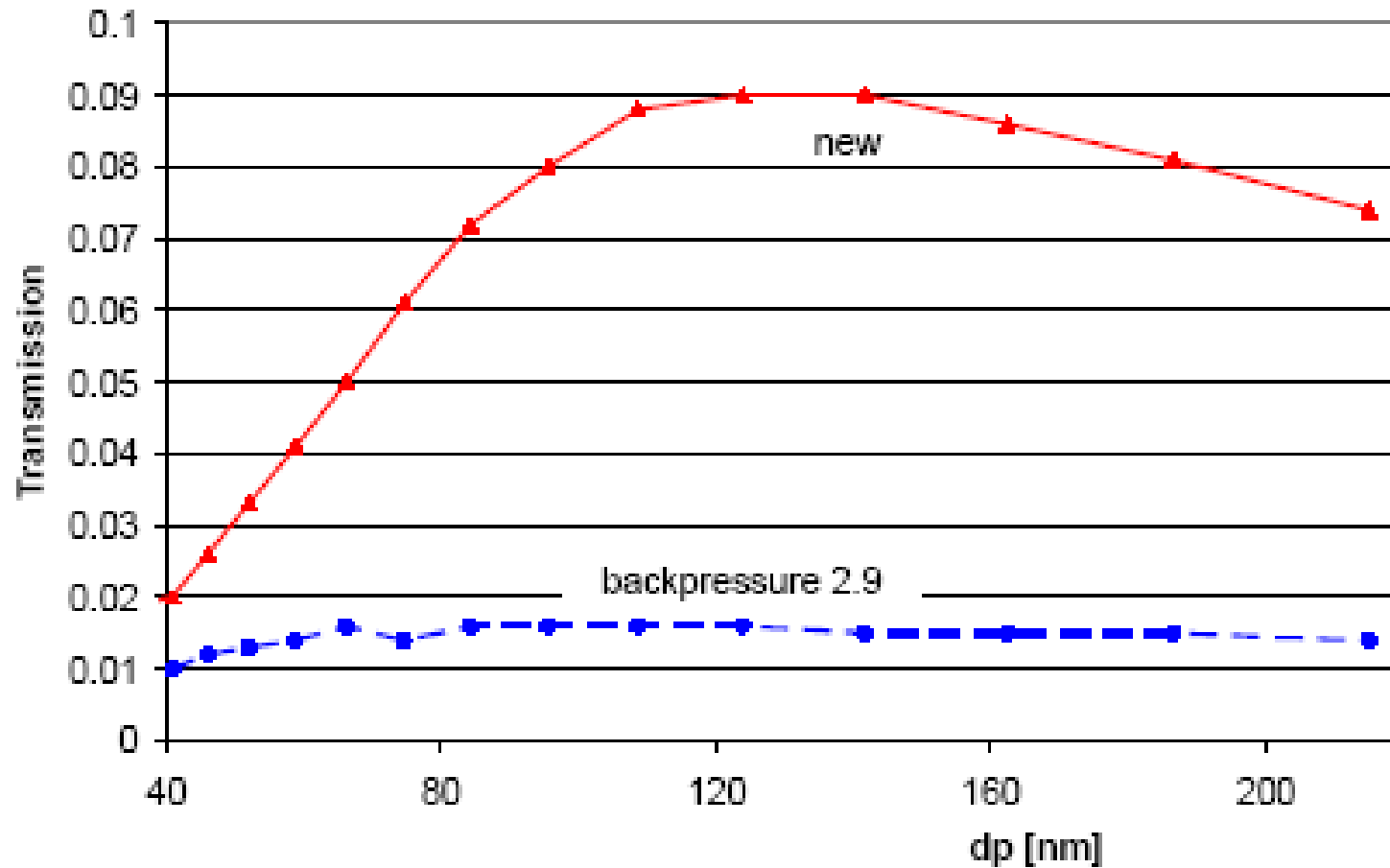
Cabin Filter: Working Principle



Cabin Filter: "NanoCleaner" Prototype



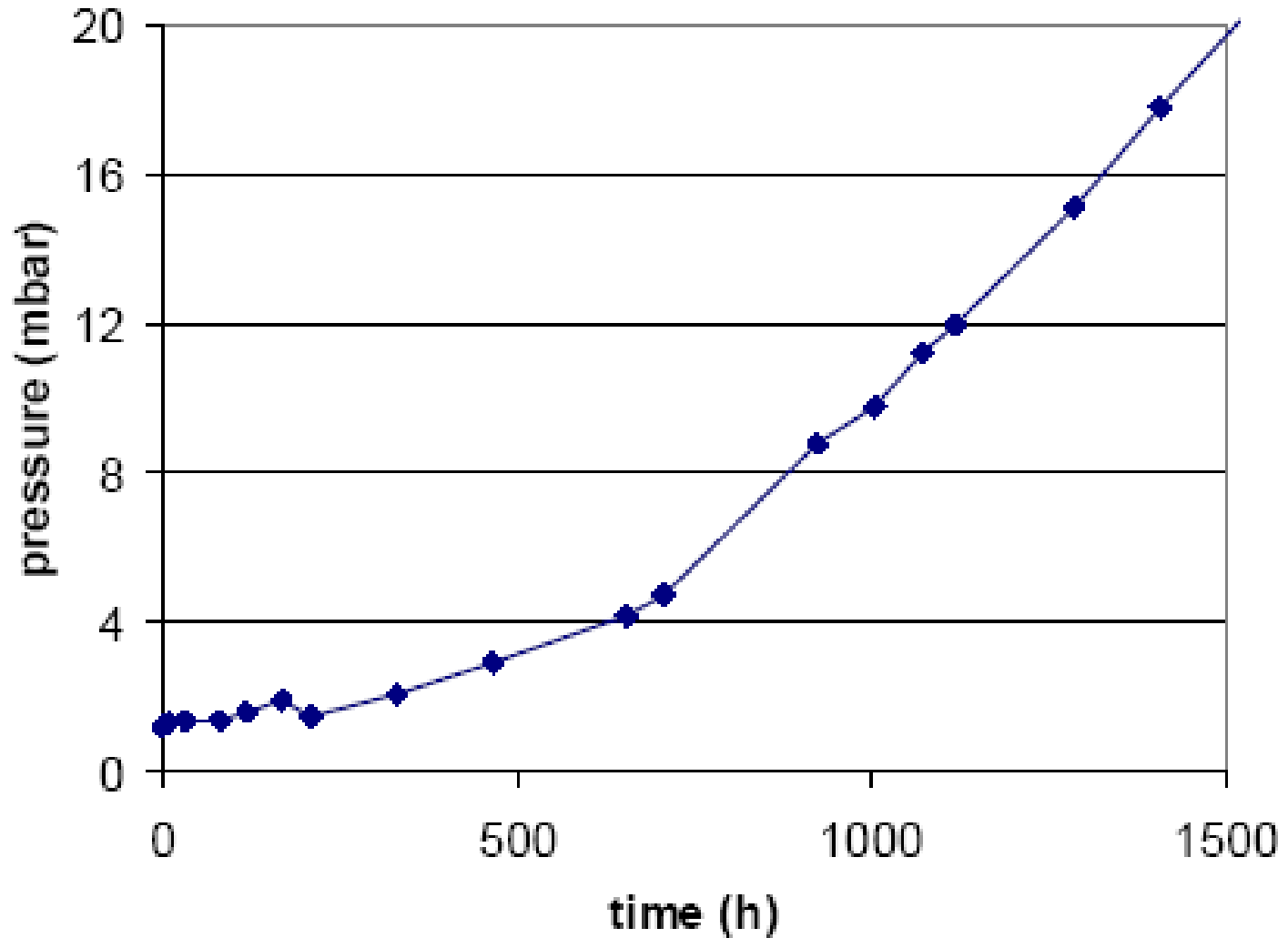
Good efficiency from beginning



High particle storage capacity

backpressure limit 40 mbar

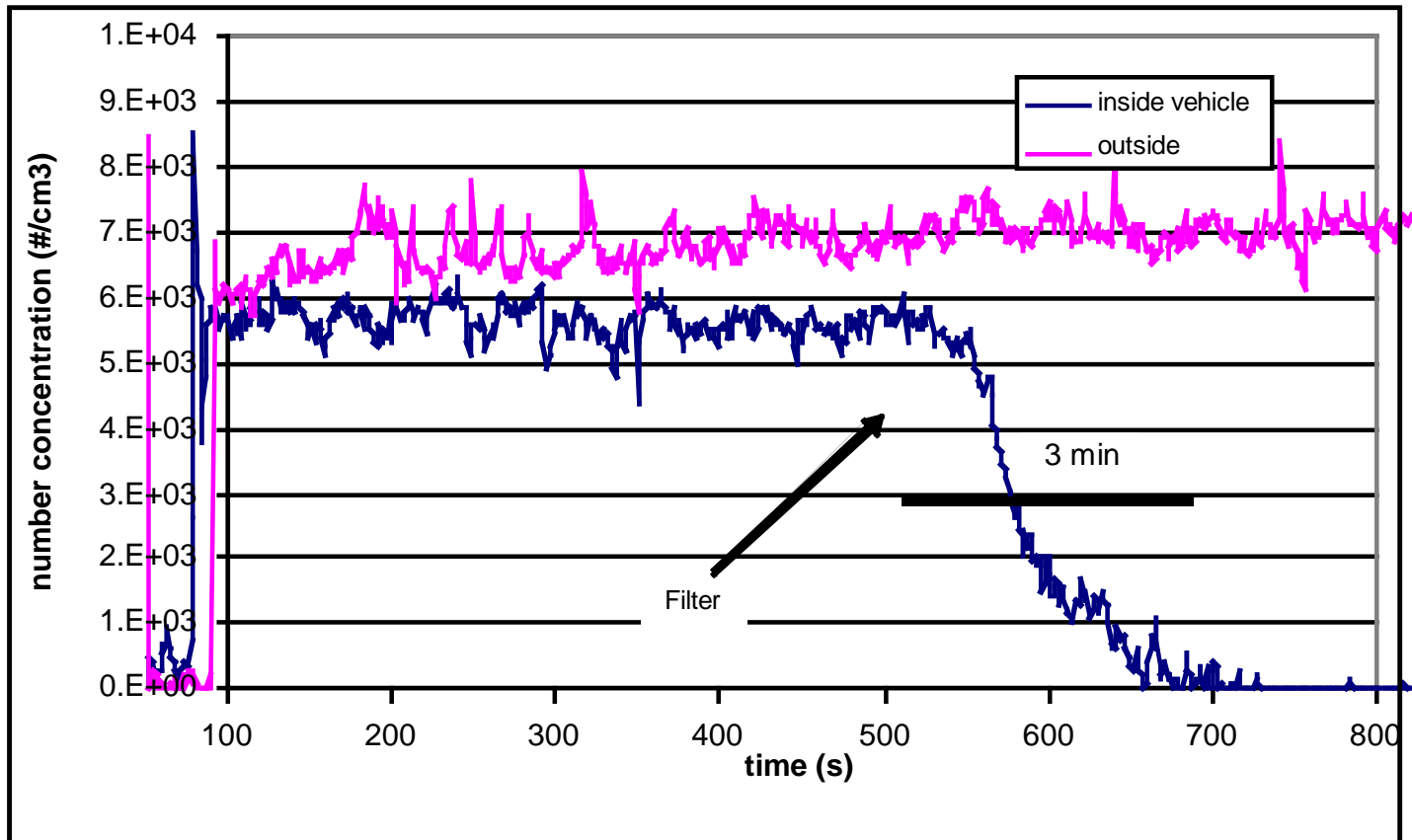
(ca. 150'000 km for a passenger car)



NanoCleaner - Compact Cabin Air Filter

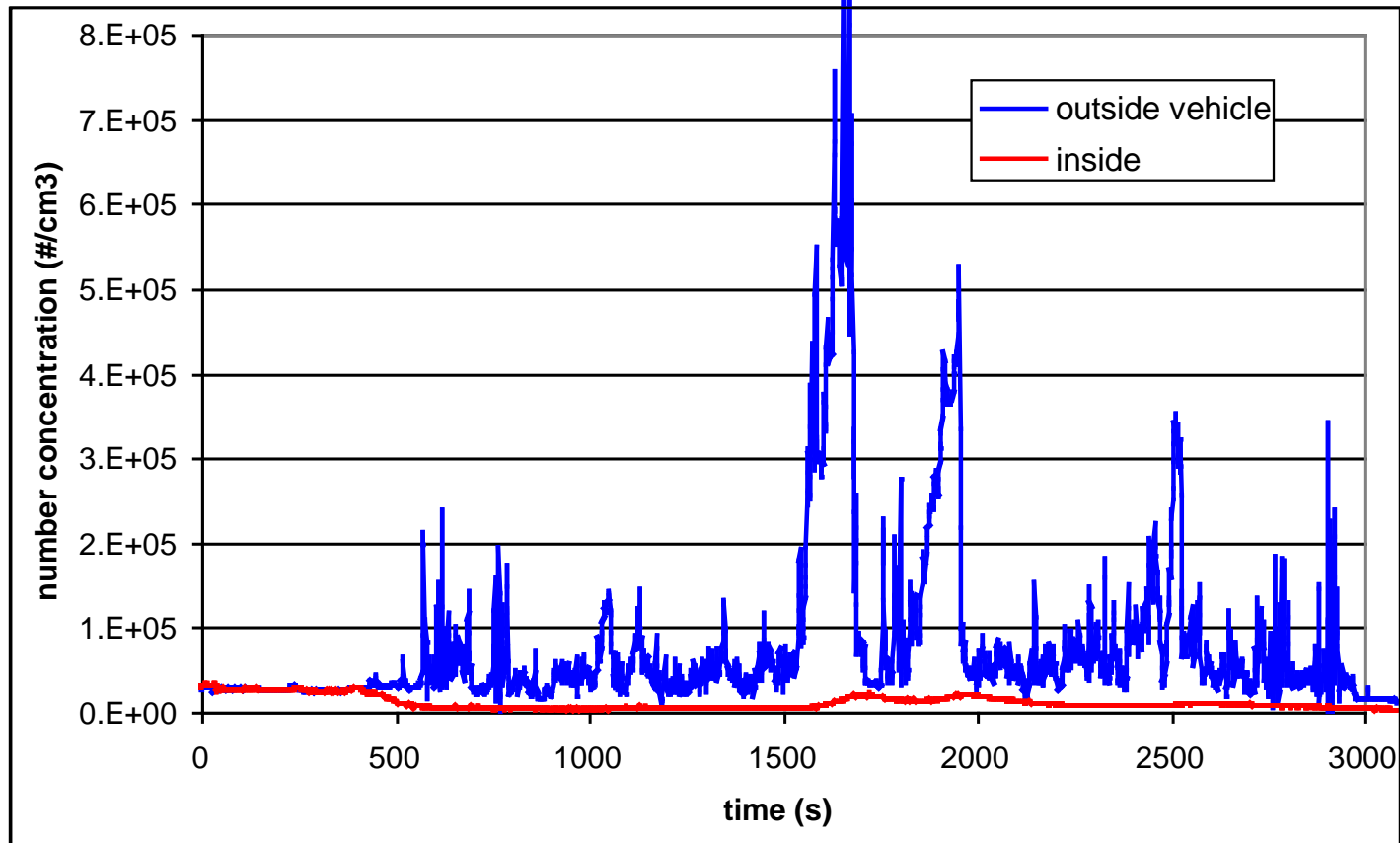


Doors Shut, Filter ON...



... and On the Road

built-in ventilation switched to recirculation

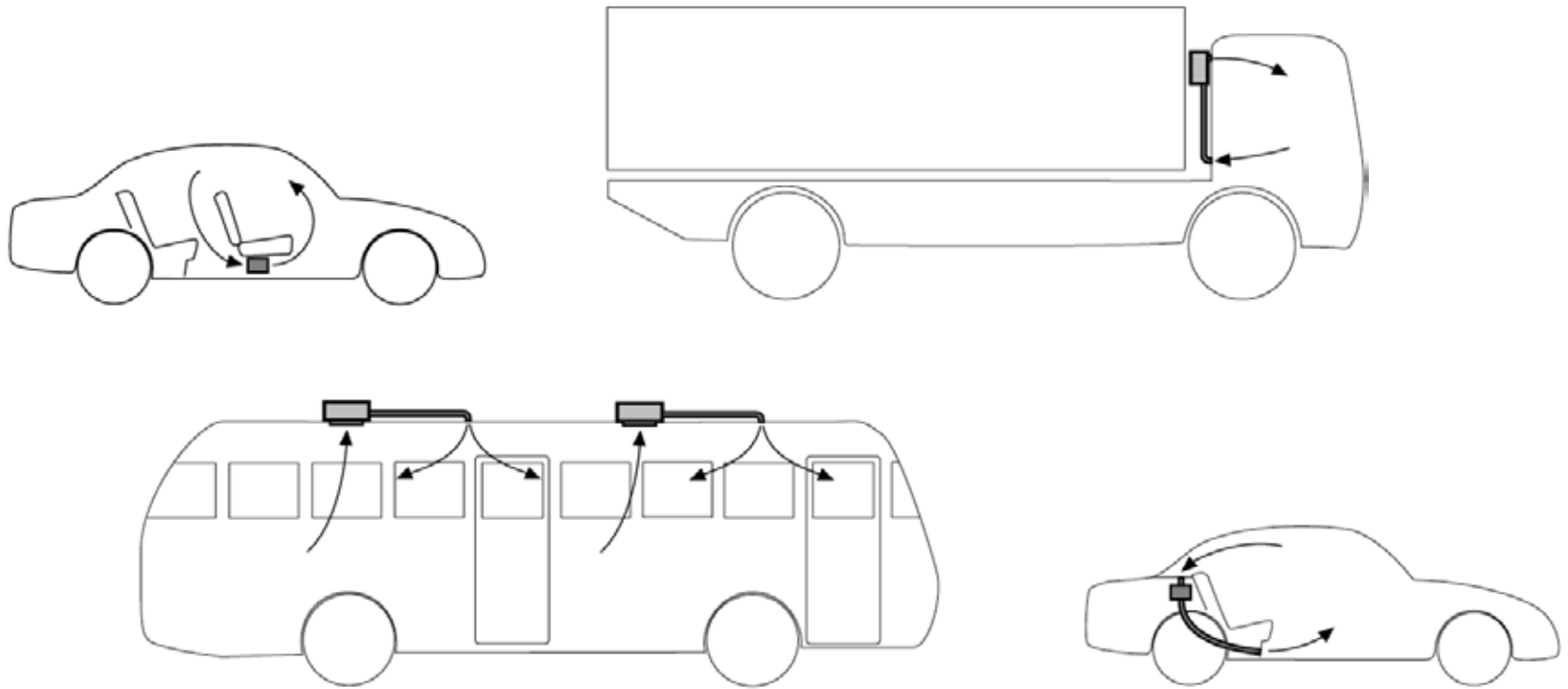


... and On the Road

built-in ventilation switched to recirculation

- cabin air quality $< 5000 \text{ p/cm}^3$
 - woodland or office air quality
 - particle number reduction of up to 98%
- no transmission of peak concentrations
 - peaks occur in dense traffic or in tunnels
 - suspected to cause acute effects, e.g. heart attack (Peters et al.)
- no CO₂ accumulation in cabin
 - stay awake

Secondary filtration with recirculation

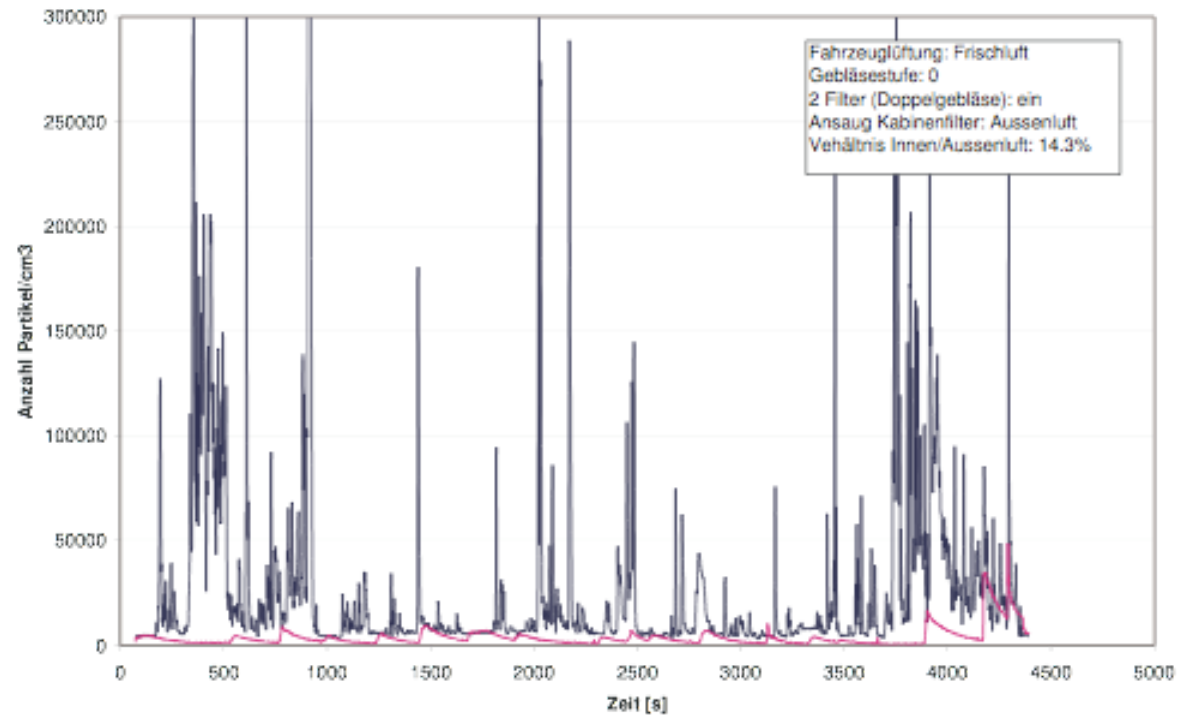




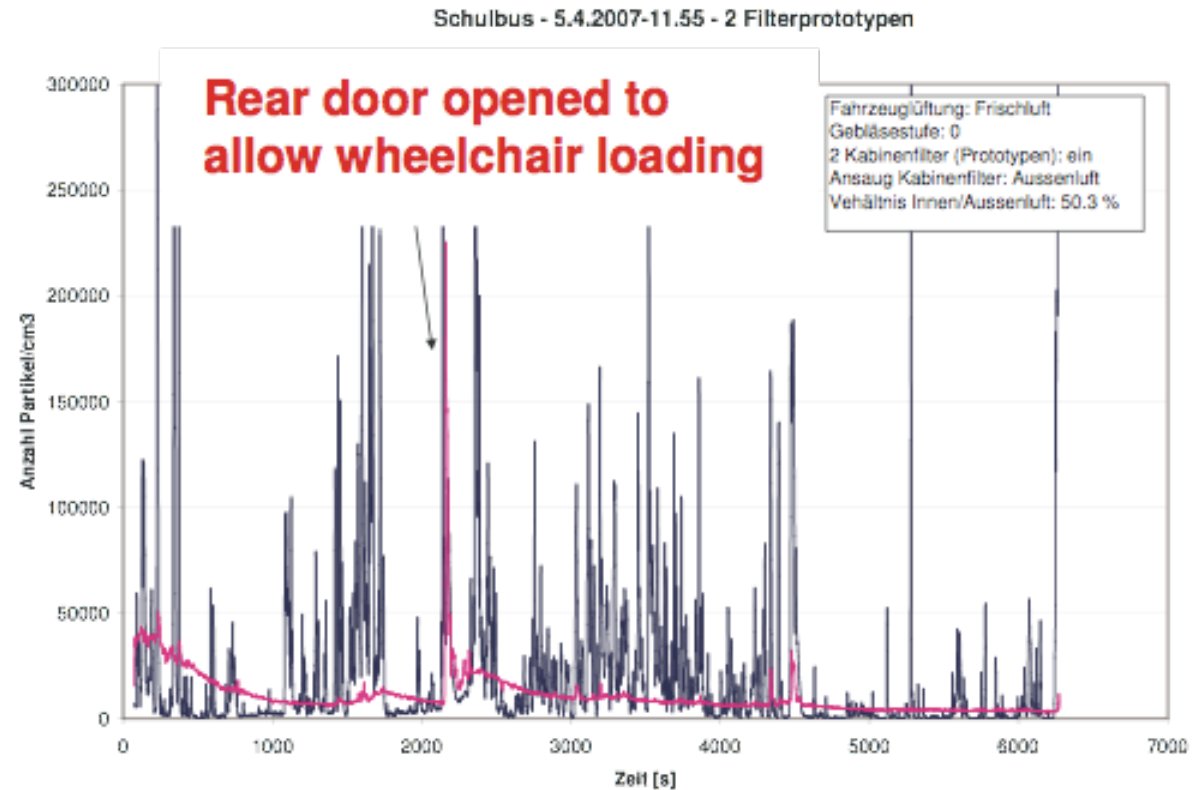
Case Study II: School Bus



Schulbus - 24.4.2007-15.00 - 2 Filter mit Doppelgebläse

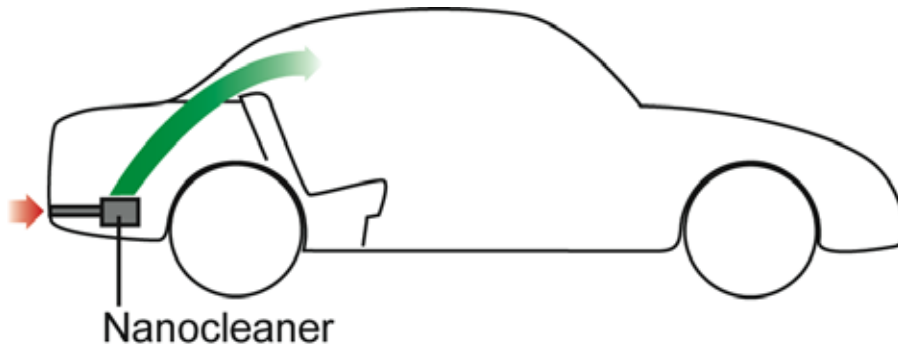


Case Study II: School Bus



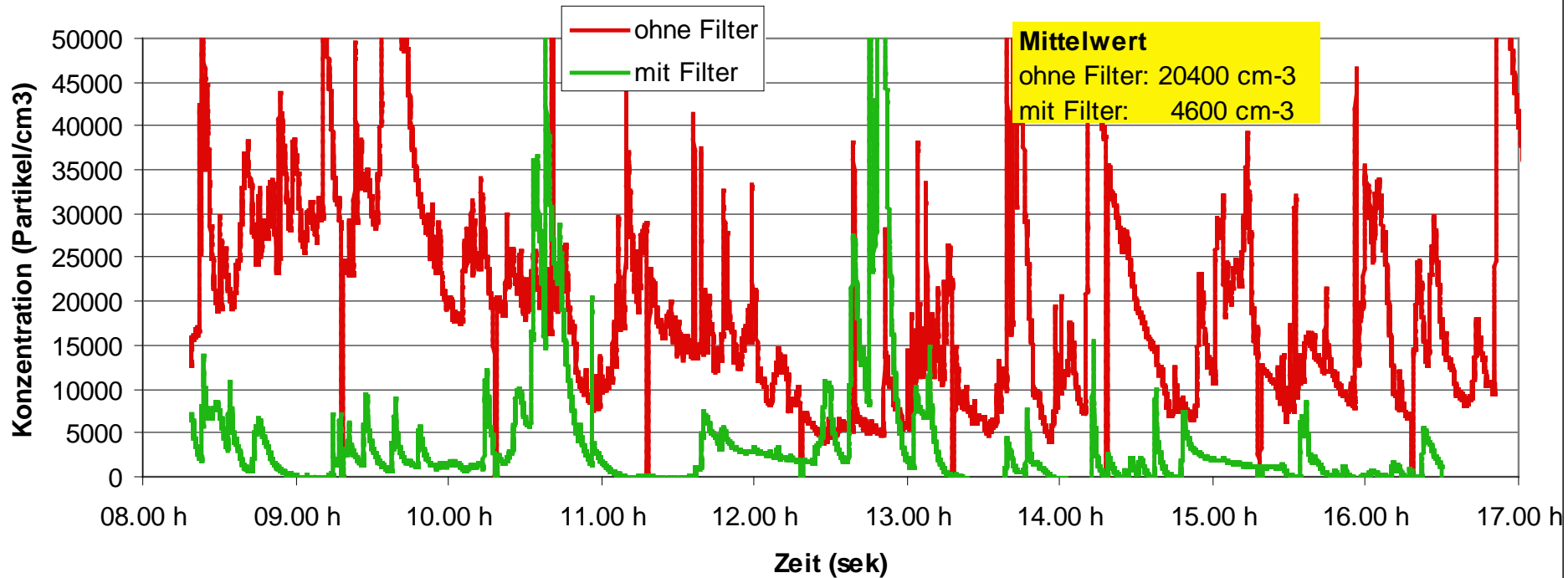
Project with Swiss lung foundation:

Taxi fleet (17 Toyota Prius)
equipped with NanoCleaners



Particle concentration **with** and **without** filter

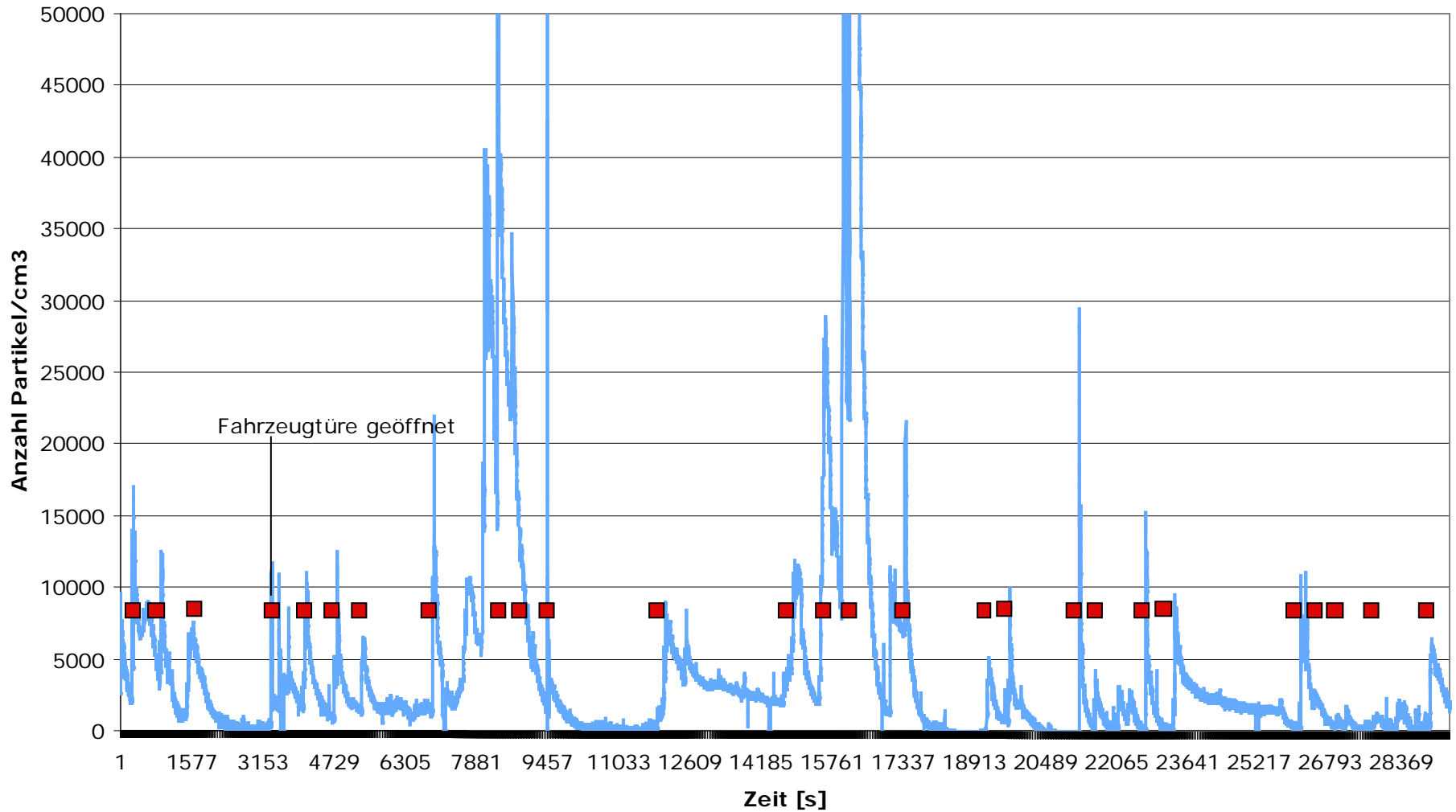
Tag ohne (27.10.2010) und mit (25.10.2010) Filter



Feedback from drivers:
feel better, less headache

Effect of door-opening

2010-10-25-0819



Relevant results:

- Daily average about 22% compared to concentration without filter
- Concentration with Filter almost never above 10'000 /cm³
- Concentration with filter mainly determined by door opening frequency
- 4 minutes after door closing < 1000/cm³)
- Filtration efficiency > 95%

Conclusion:

- Suggested retrofit is a feasible option to reduce nanoparticle concentrations to 'office values'

**Thank you for your
attention**

??questions??