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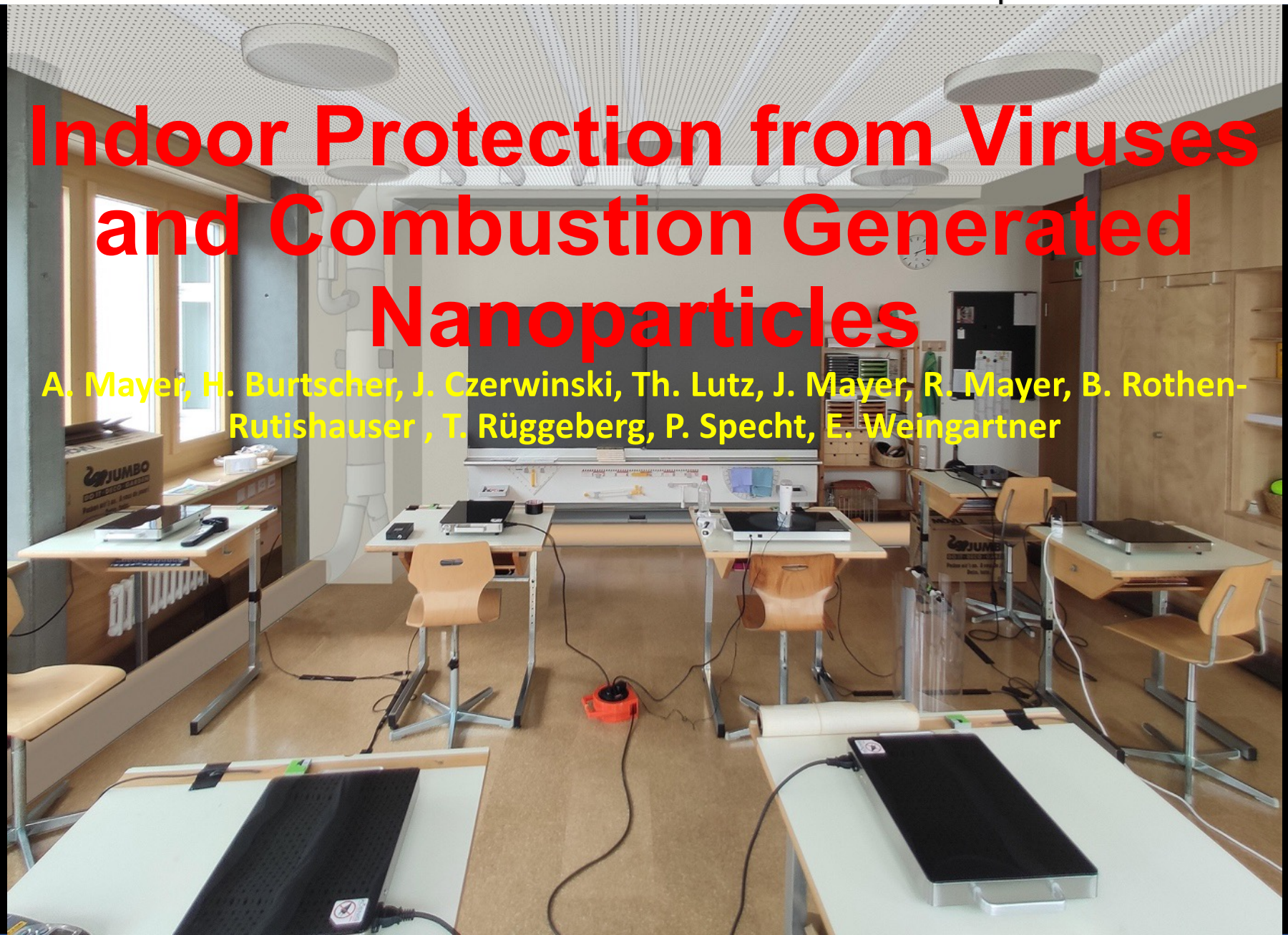
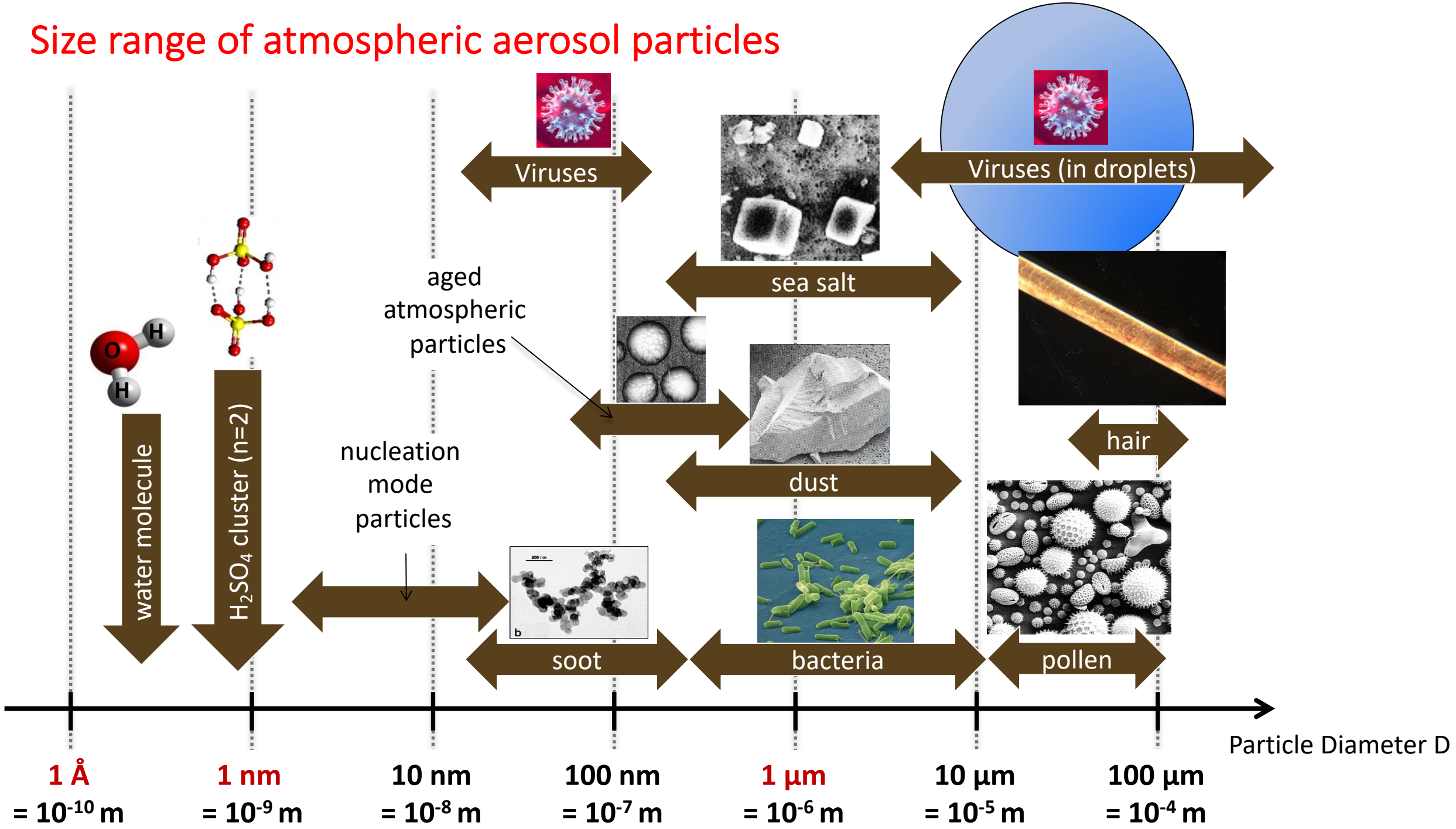


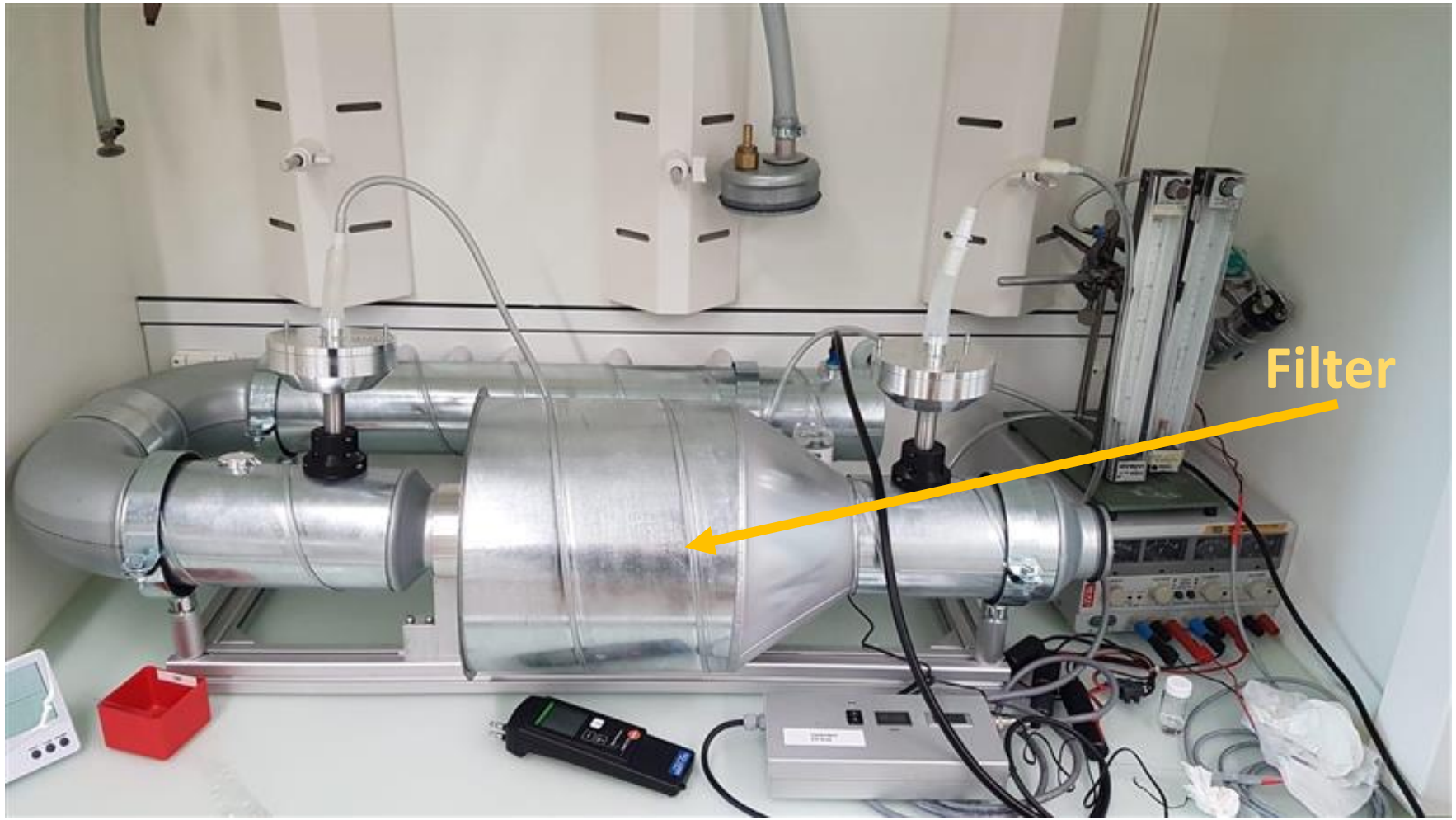
Indoor Protection from Viruses and Combustion Generated Nanoparticles

A. Mayer, H. Burtscher, J. Czerwinski, Th. Lutz, J. Mayer, R. Mayer, B. Rothen-Rutishauser , T. Rüggeberg, P. Specht, E. Weingartner

Size range of atmospheric aerosol particles



Filter test system @ AMI



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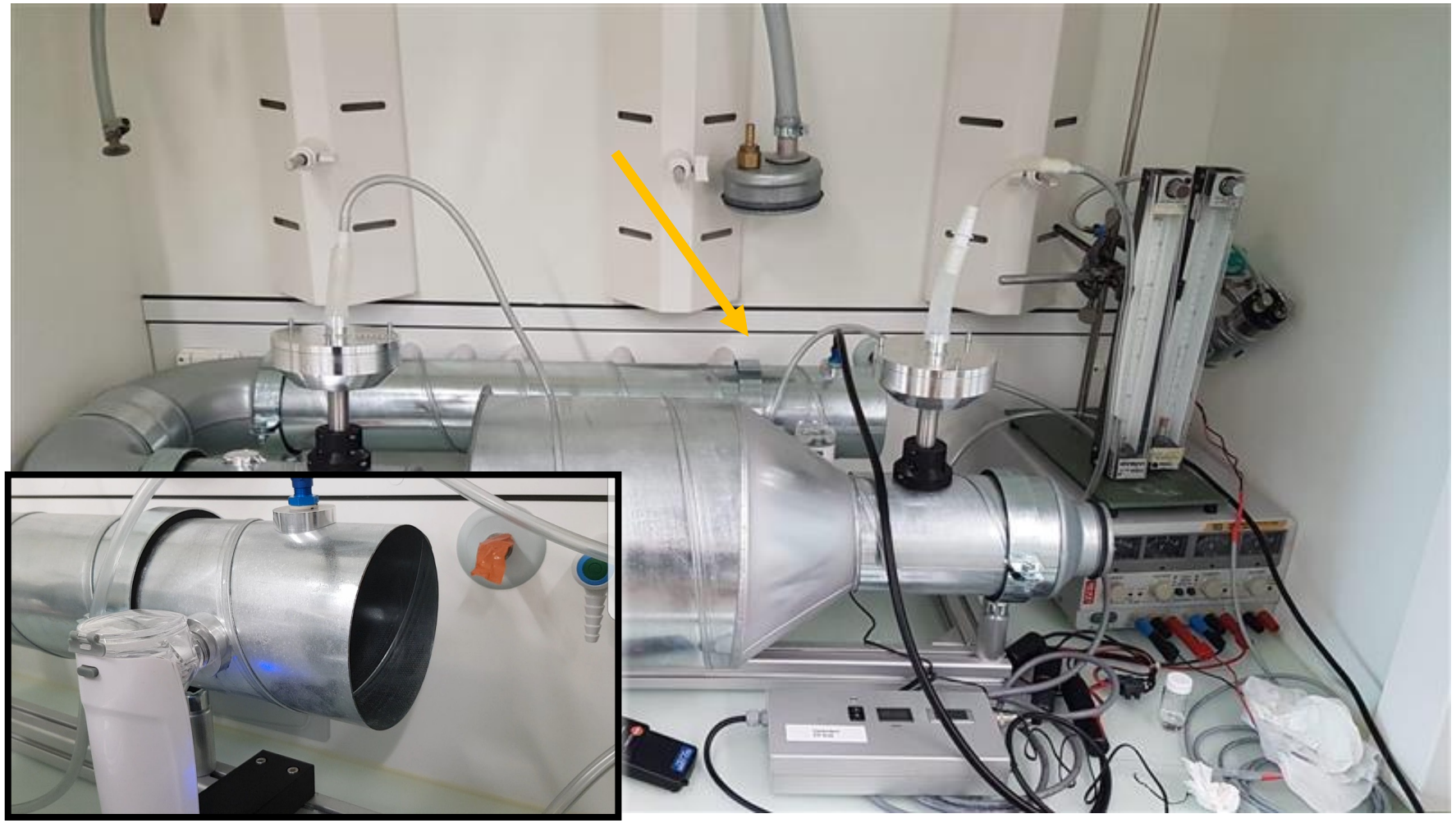
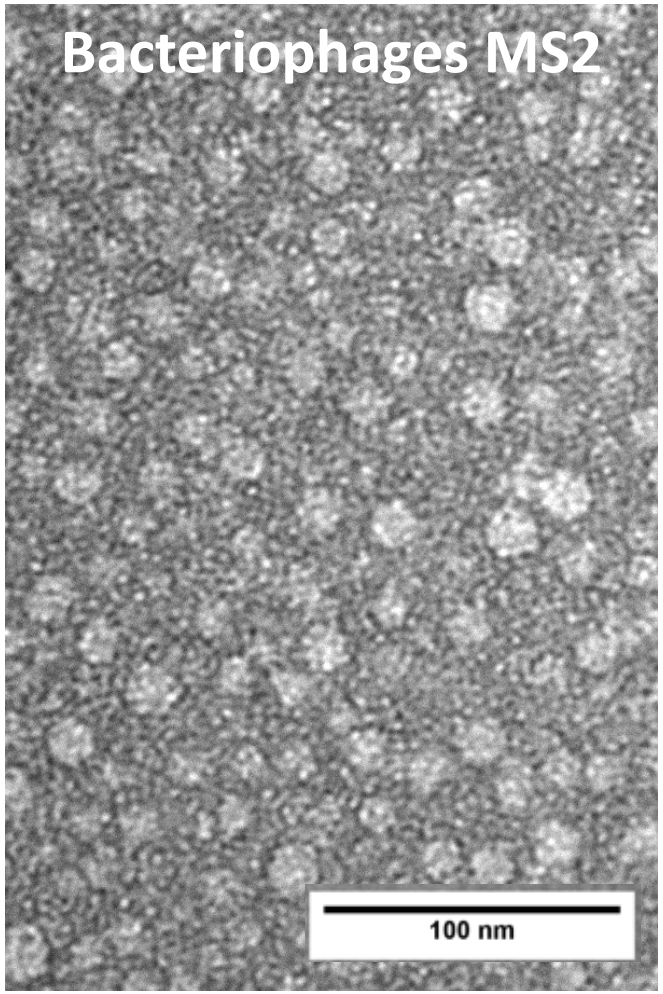
Filter test system @ AMI





Rüggeberg et al. *Aerosol and Air Quality Research* (2021, Vol. 21, 210224)

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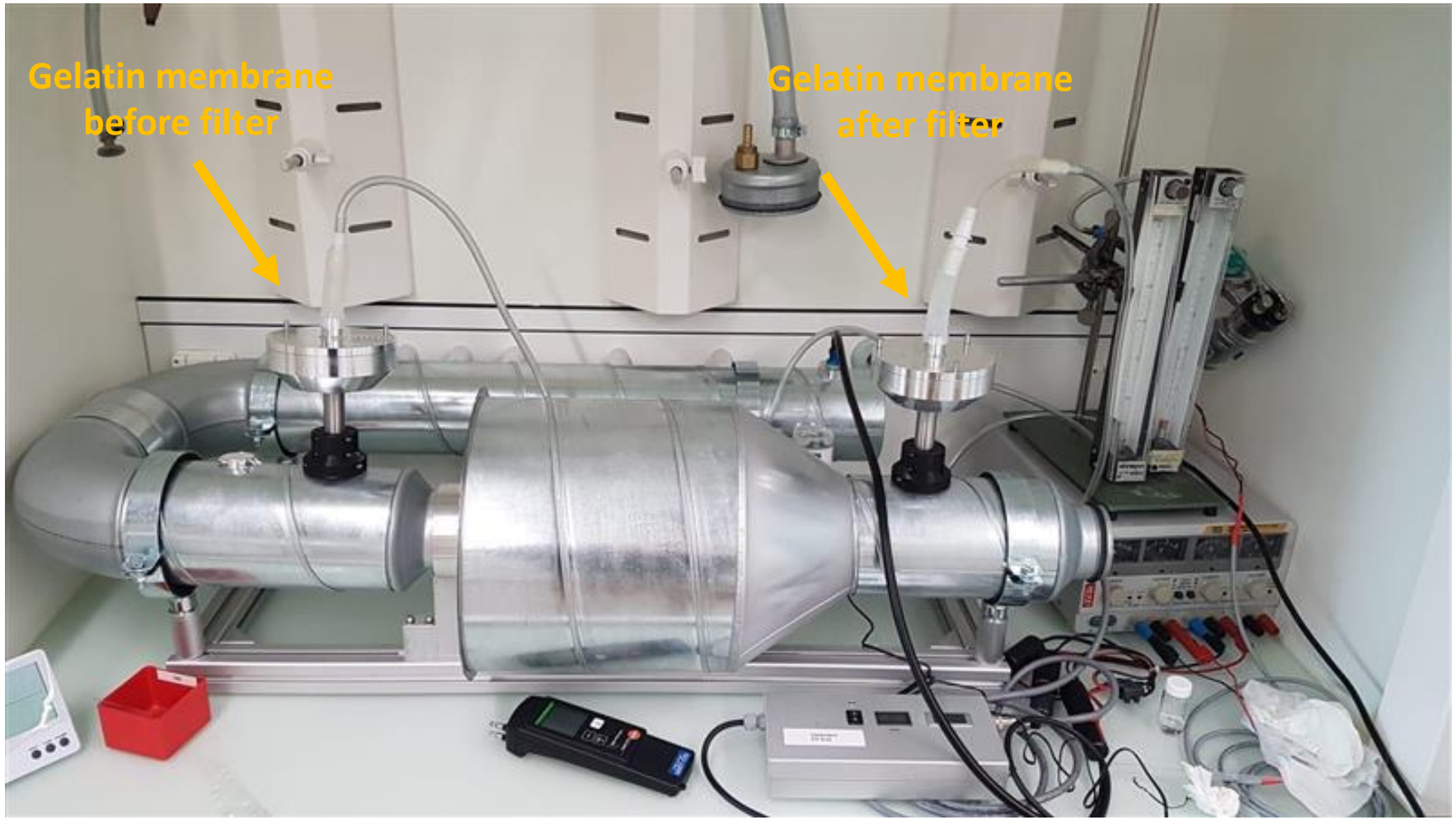
Filter test system @ AMI



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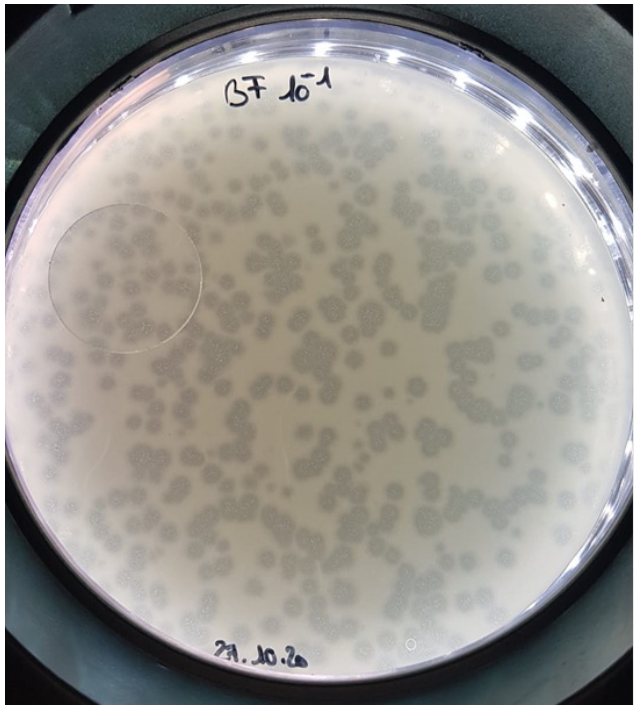
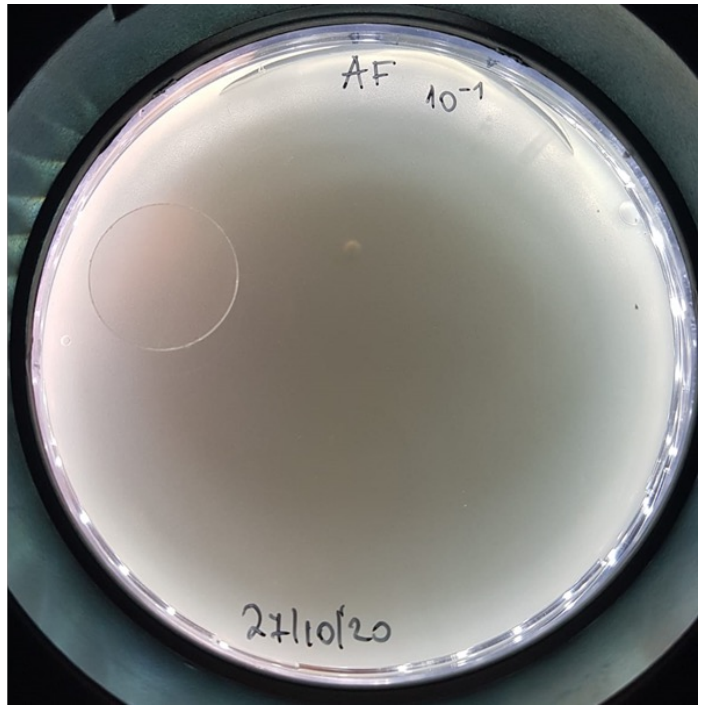
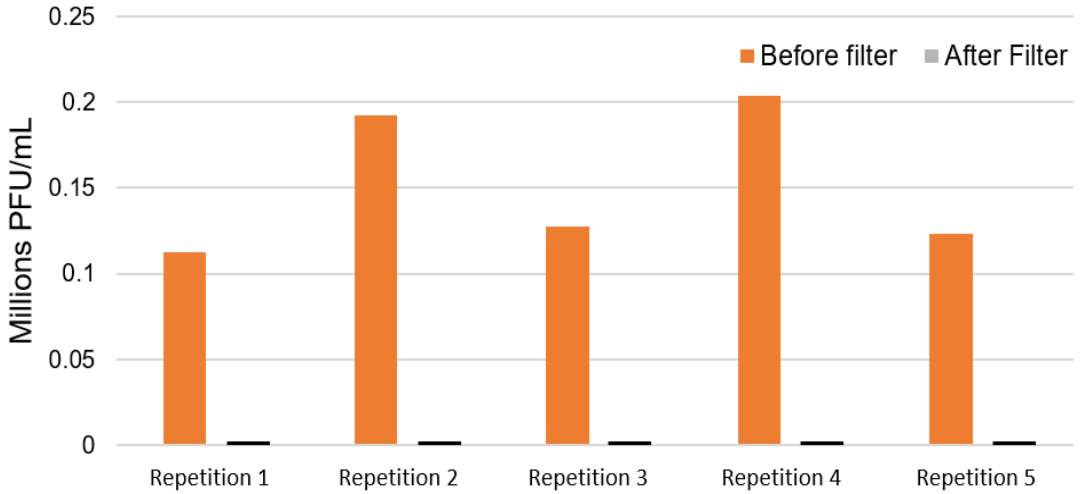
Plaque forming units

Before filter



After filter





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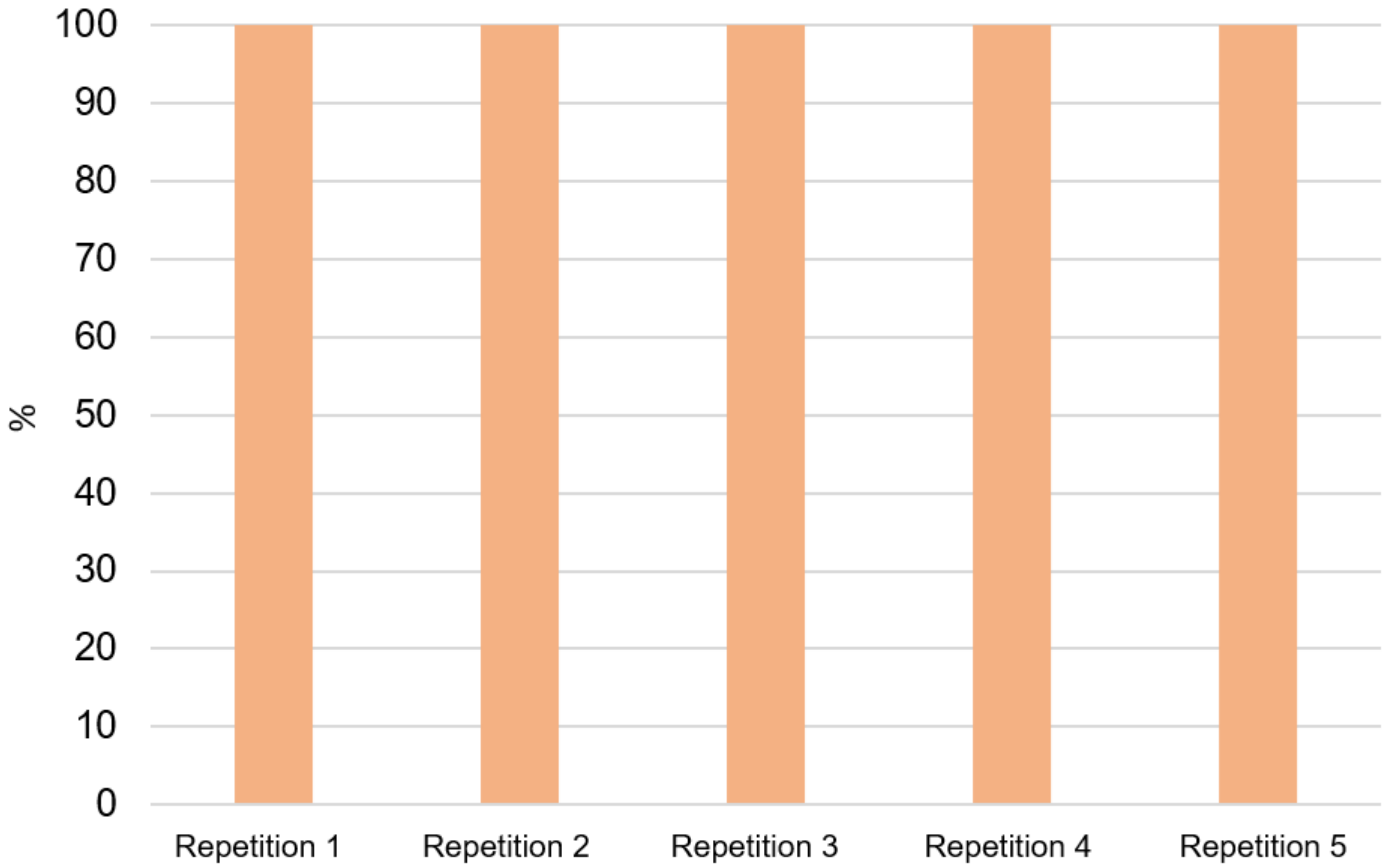
Filter efficiency > 99%



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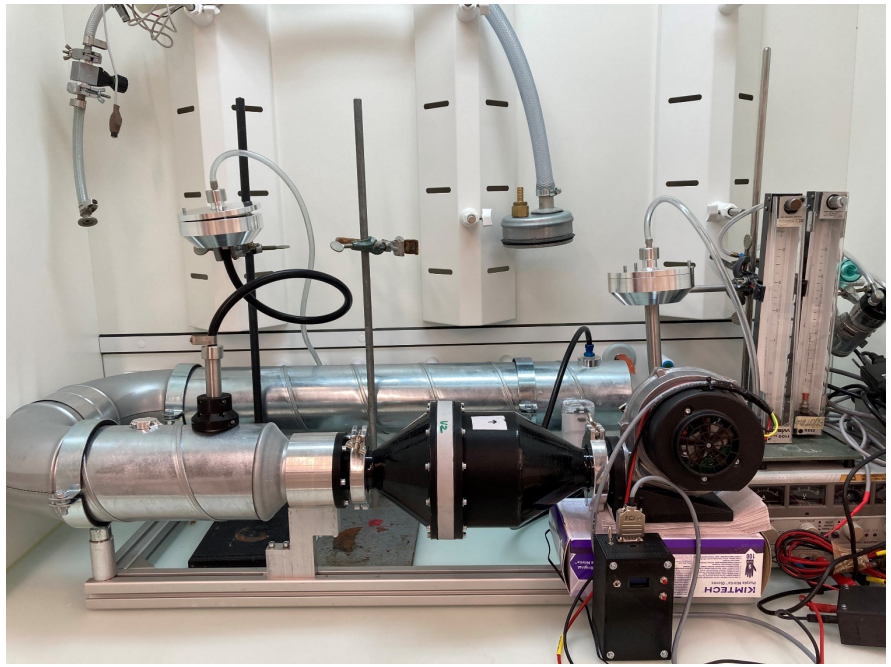
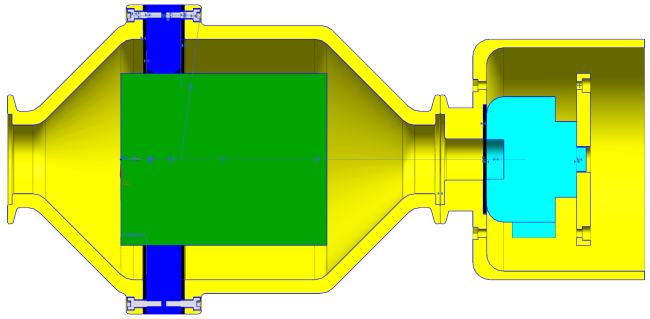
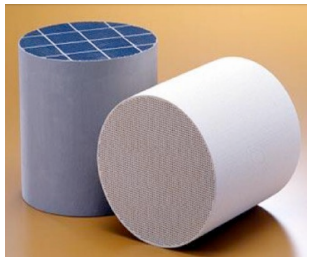
Tested Filters

Fibre-filters

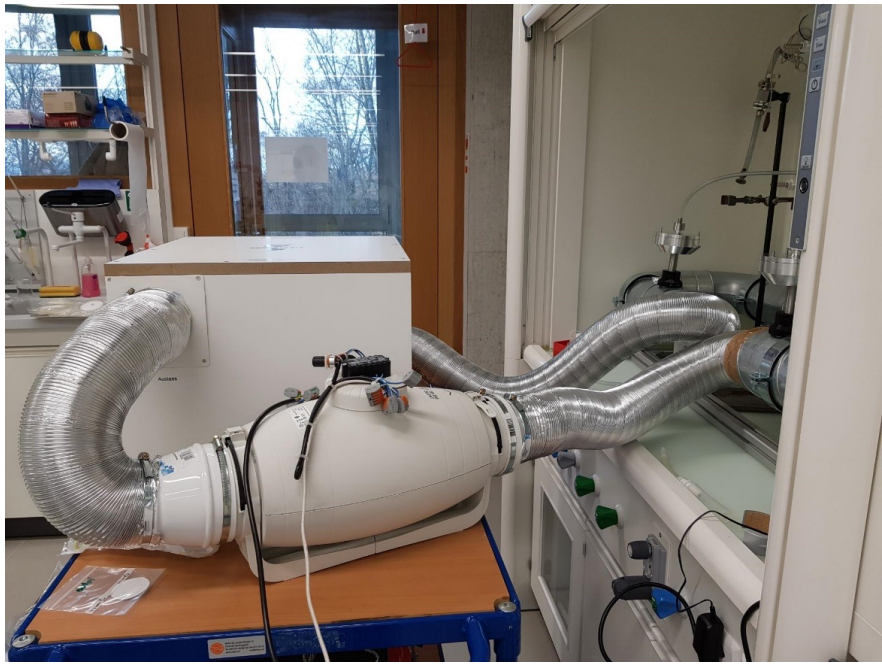
several ceramic-filter



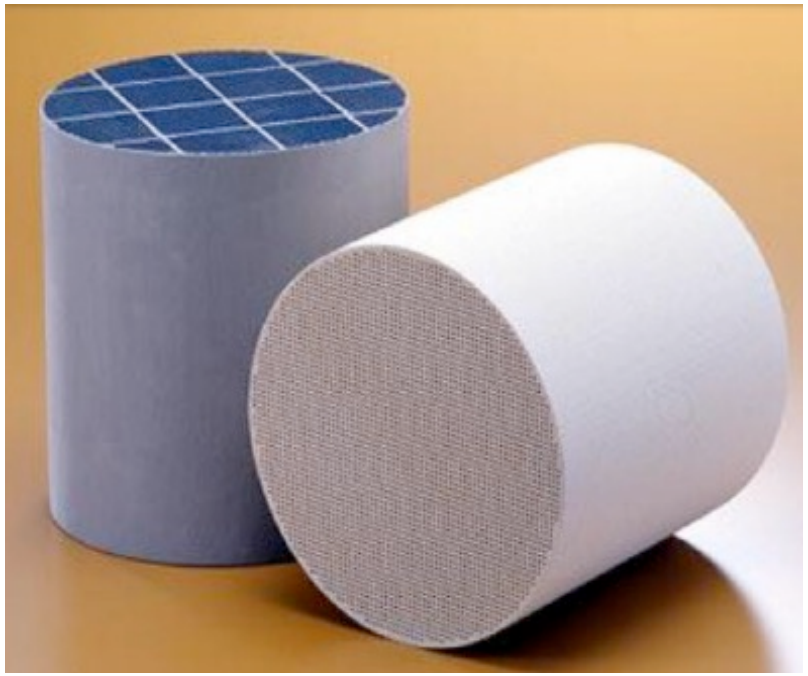




UV-devices



The ceramic wall flow filter



- High efficiency
- compact
- easy to clean
- can be heated
- mass product (GPF)

Results of filter-tests

- The filters behave the same for viruses as for aerosol particles
- Efficiencies up to almost 100% are achieved
- Pressure drop typically a few 100Pa

With existing filter technology, efficient cleaning is possible when particles/viruses reach the filter before they reach others

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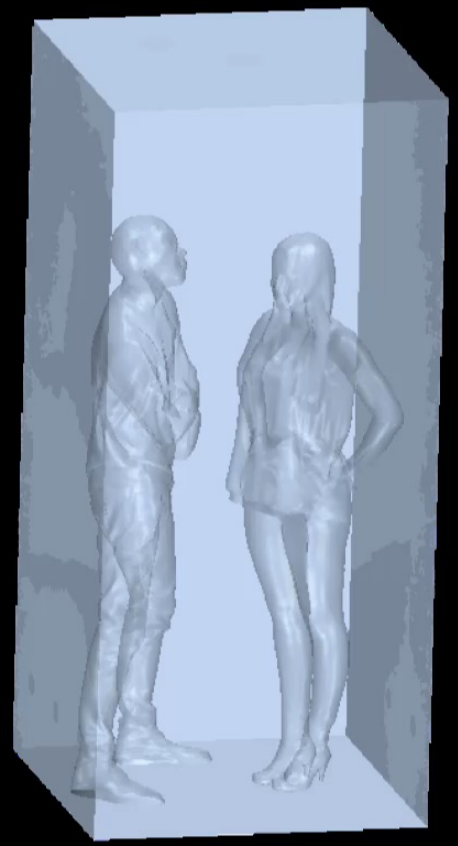
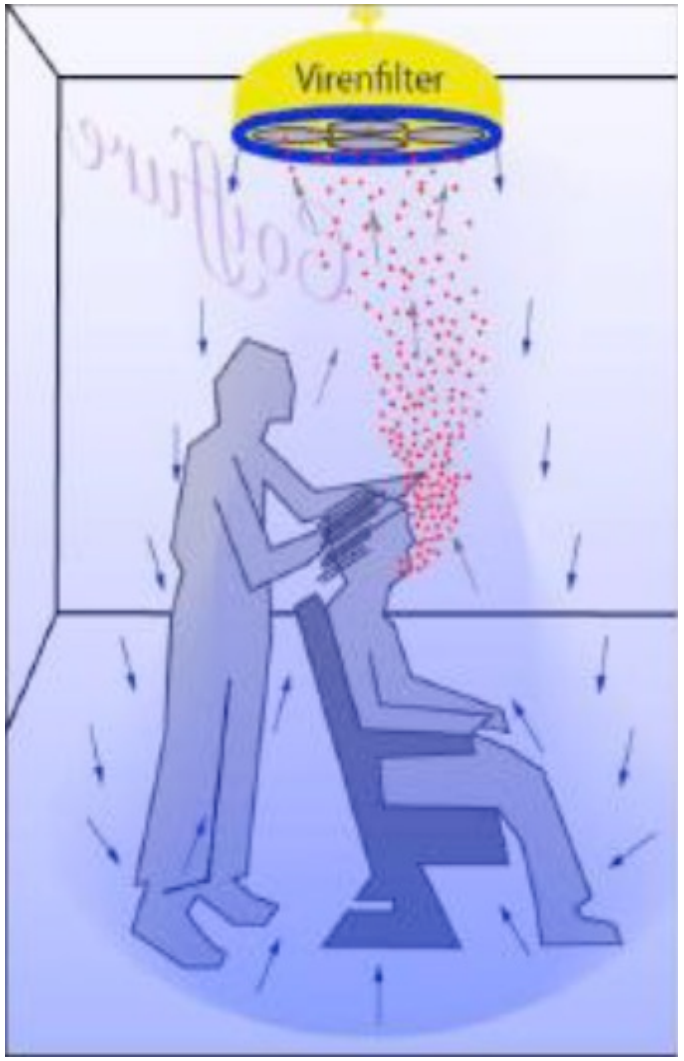
Solution Time 2 (s)

Particle Velocity: Magnitude (m/s)

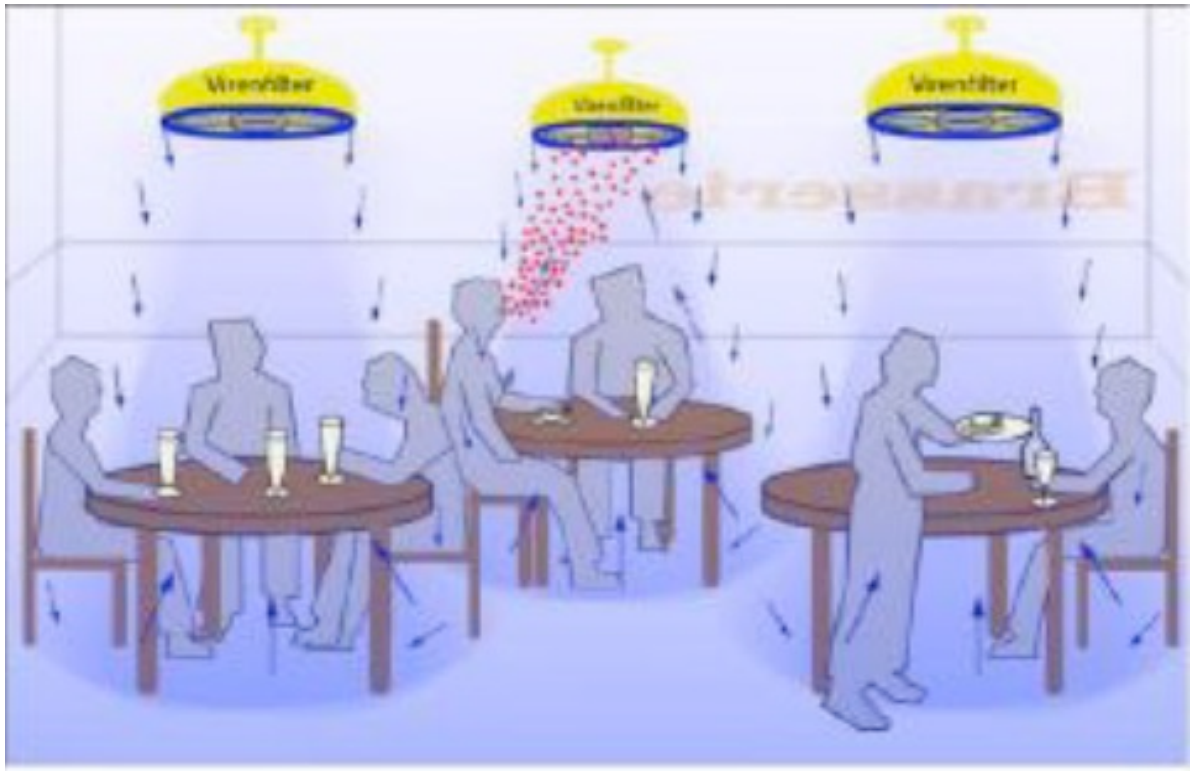


Solution Time 2 (s)

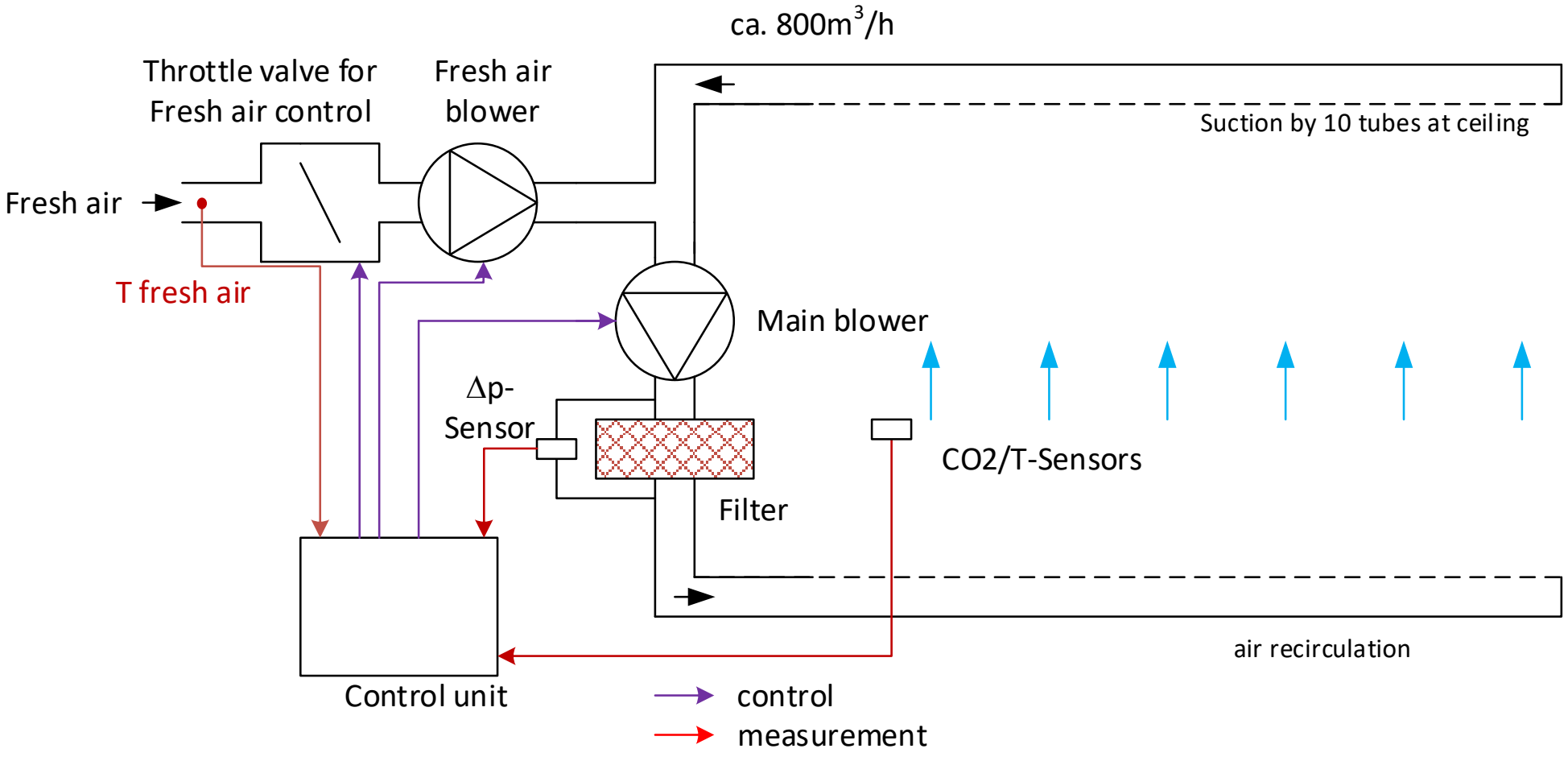
Particle Velocity: Magnitude (m/s)



Approach:
vertical suction upwards



our approach in a classroom



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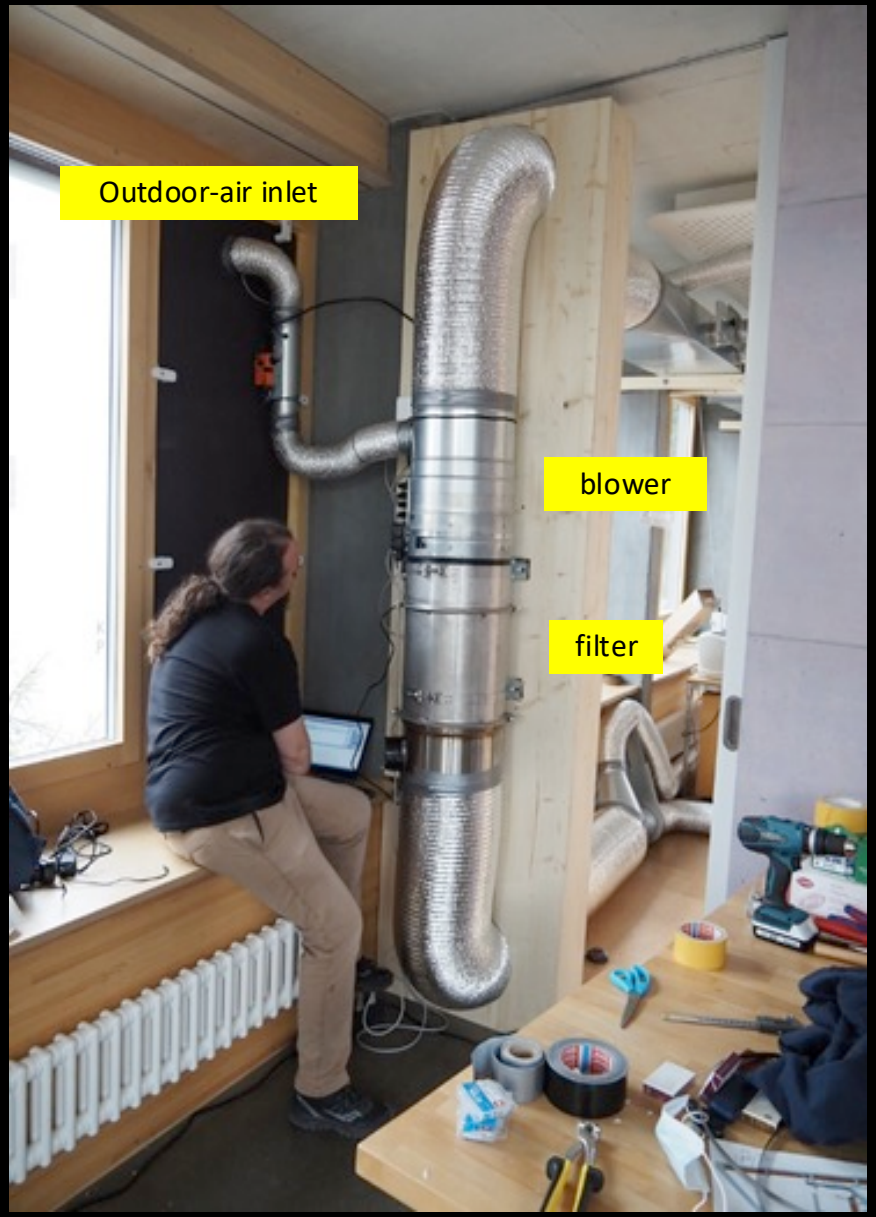
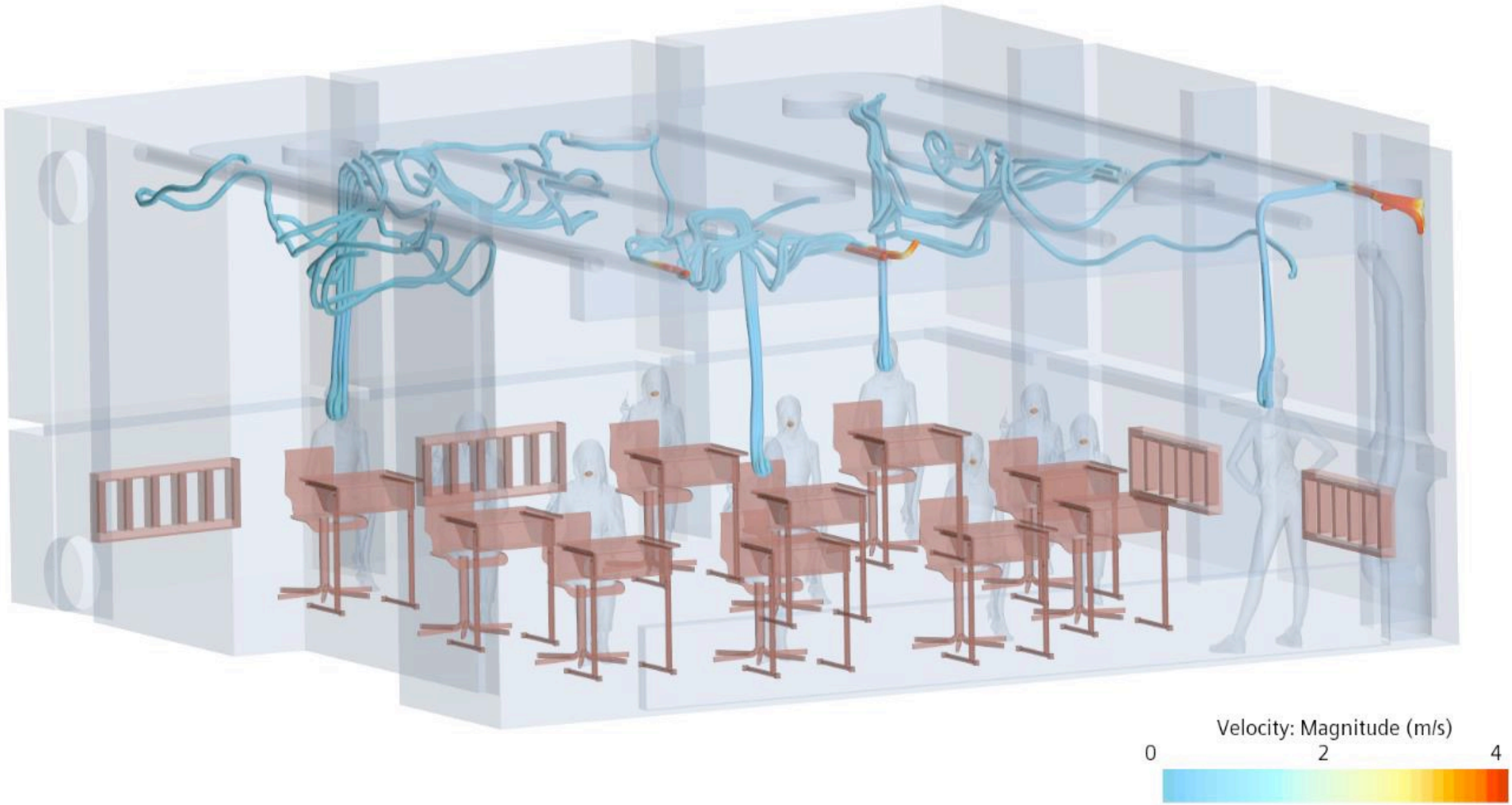
Ceiling suction with 10 fabric tubes

Blower, filter, control unit

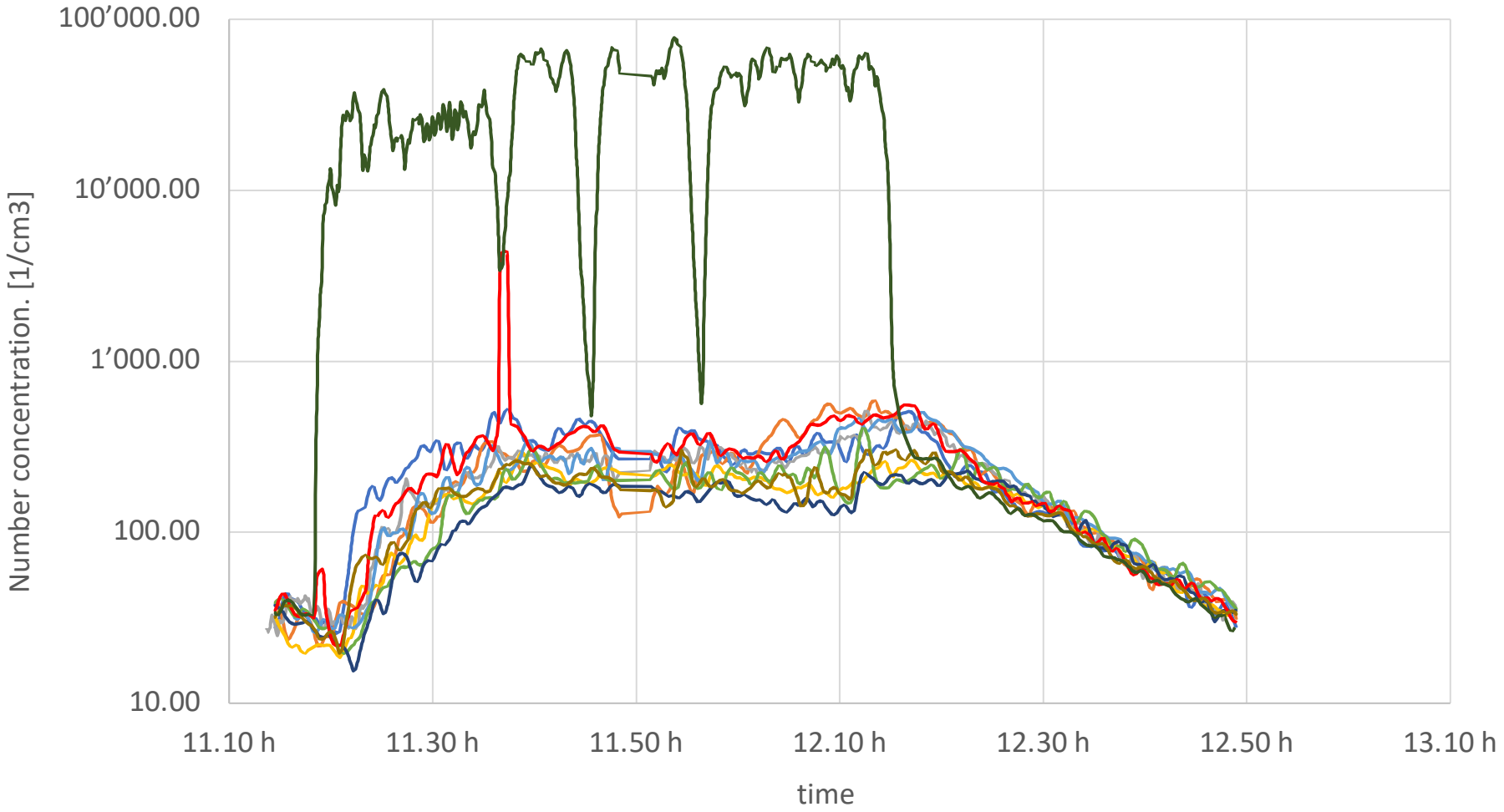


Flow recirculation by fabric-tubes

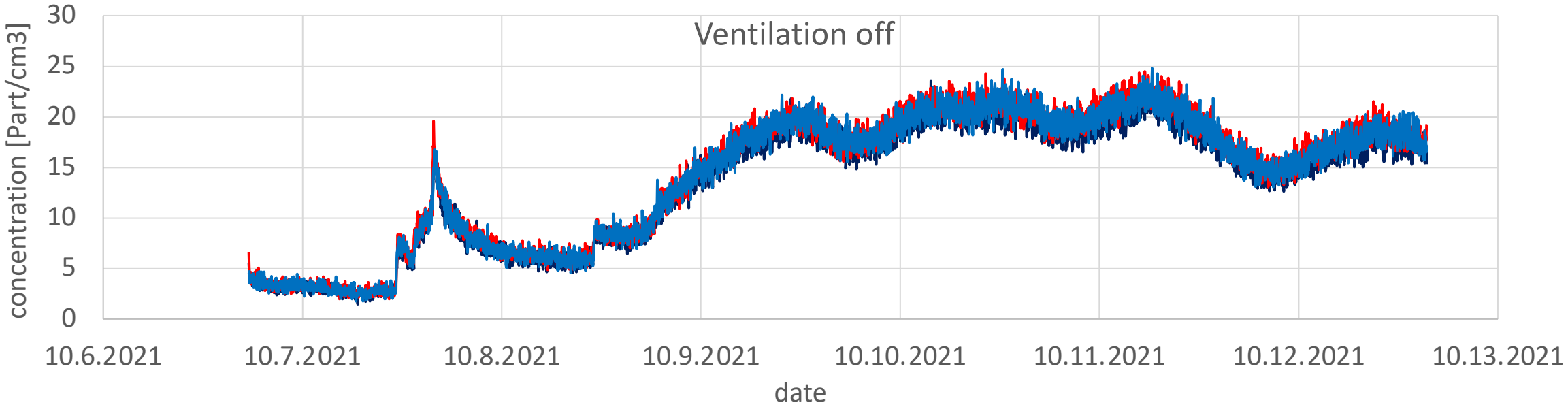

Velocity: Magnitude (m/s)
0
2
4

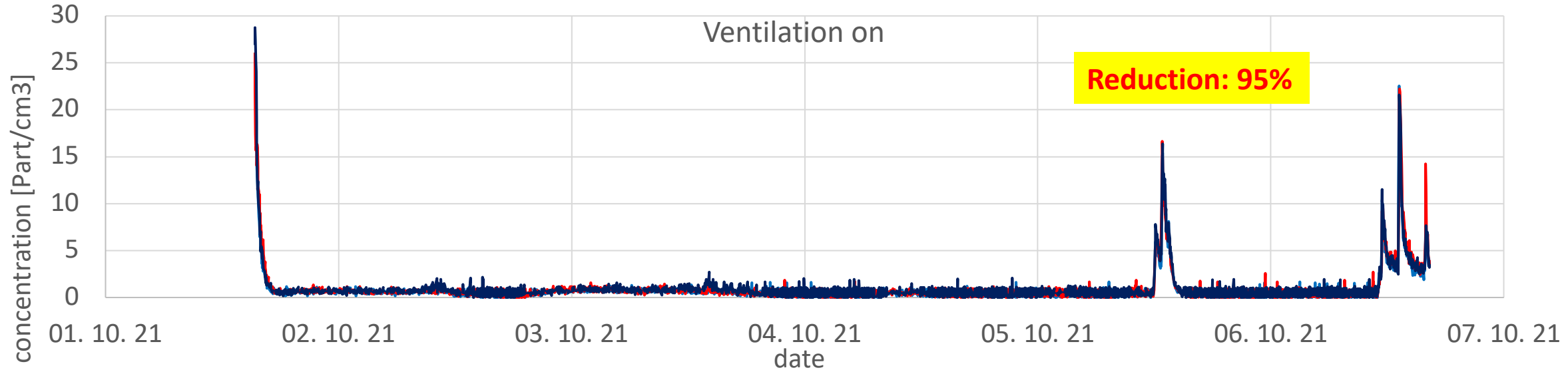
setup

Concentration as function of time



Ambient air filtration





Conclusions

- Effective filtration possible
- Main problem: flow control
- Approach: laminar flow, vertically upwards
- Important: keep noise level low
- Topic also after 'corona' of importance:
  - other infectious diseases
  - reduce particulate pollution from outside

Next steps

- **Develop modular system for extraction and recirculation, scalable to room size**
- **New applications:**
  ⇒ Elevator cabin: pilot installation planned
  ⇒ Hospital: installation allowing multiple occupancy with infectious patients

Many thanks
The Rudolf Steiner School for their great support

the BAFU environmental technology promotion for the financial support