



Aerosol mobility spectrometry based on diffusion charging

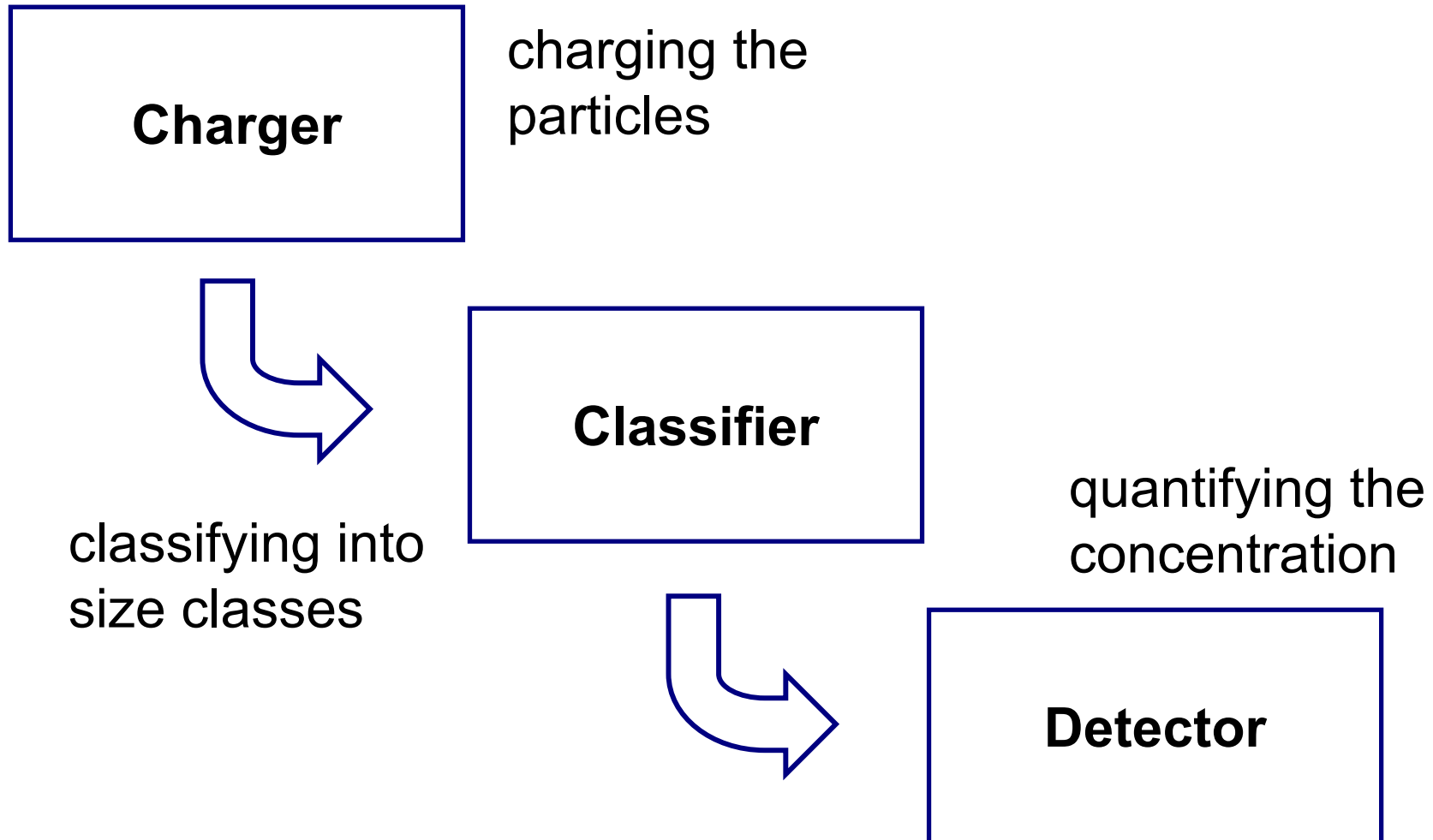
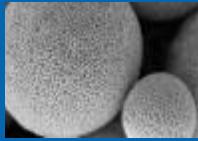
Lars Hillemann

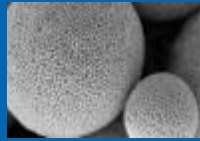
Andreas Zschoppe

Rob Caldow



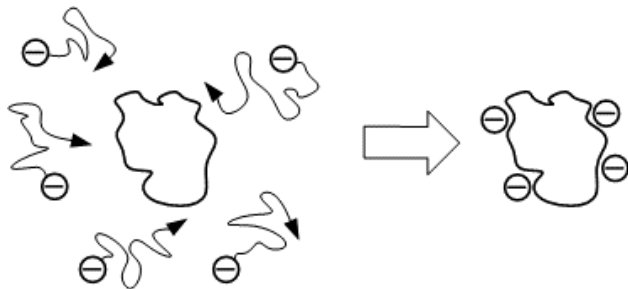
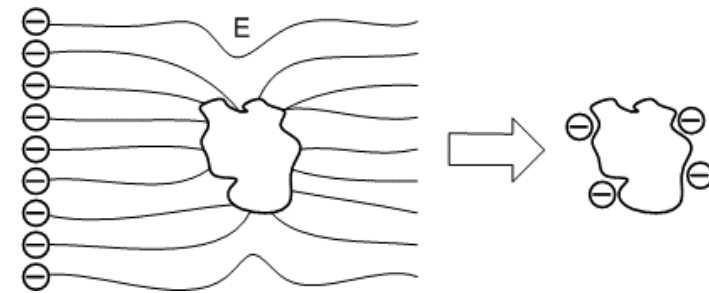
- Motivation
- Charging mechanisms
- Diffusion charging
Modeling - Measurement
- Application: New aerosol spectrometer UFP
- Comparison to reference
- Summary





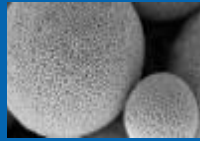
Particle charging

- Field charging
- UV-radiation
- Diffusion charging

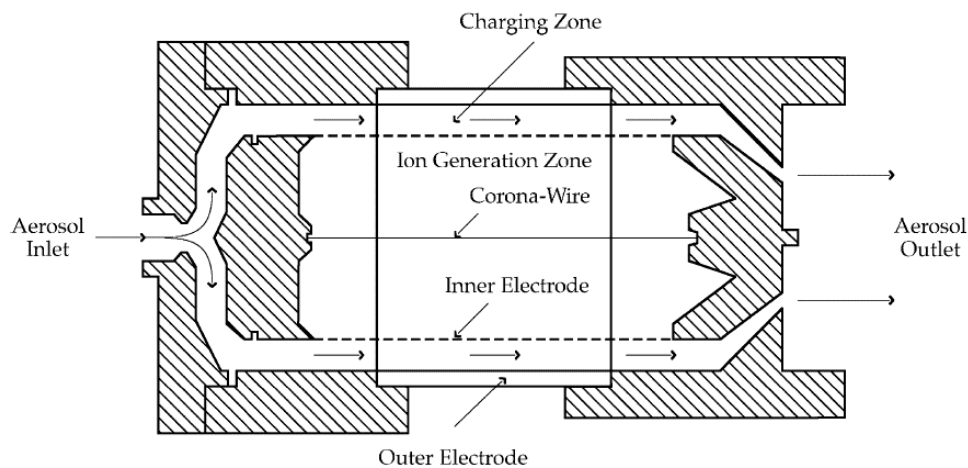


Ion generation

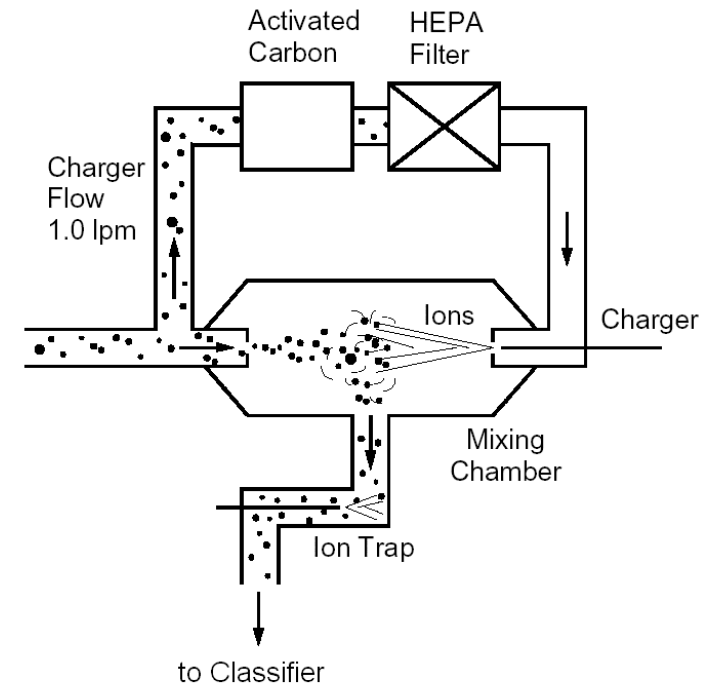
- Radioactive material
- Corona-discharge



Hewitt-type charger



Corona-jet-charger

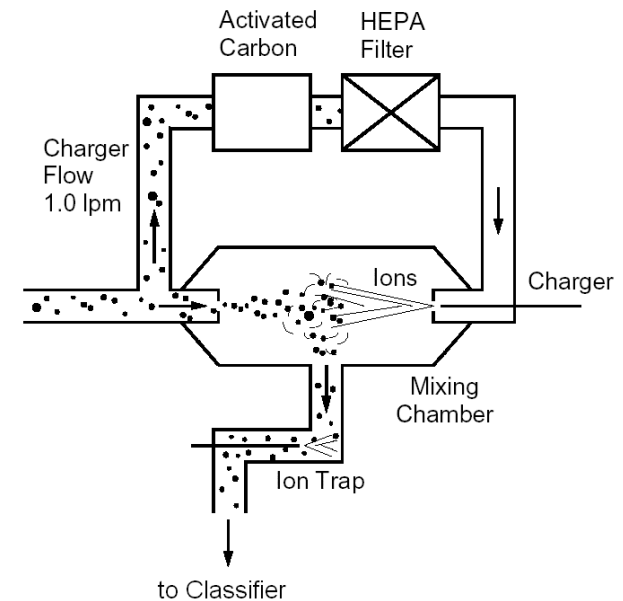
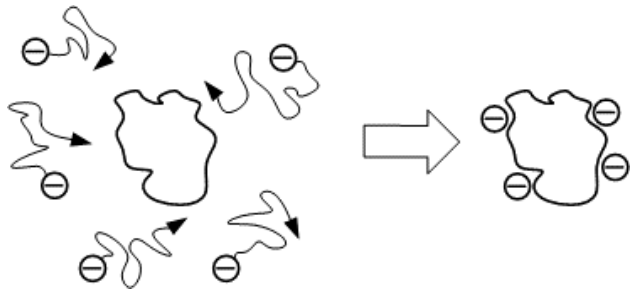




Modeling

Transition regime:

- limiting-sphere-theory
- Model from Marlow&Brock



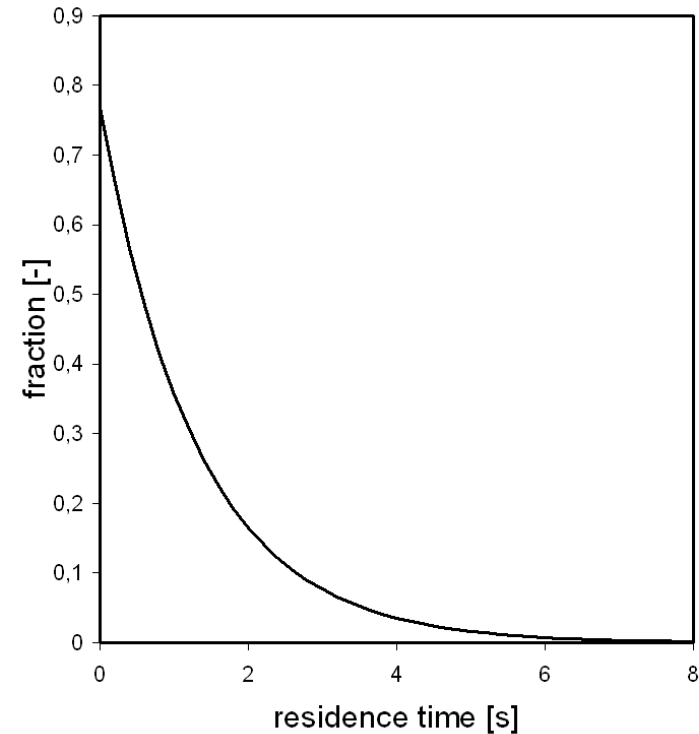


Modeling

limiting-sphere-theory

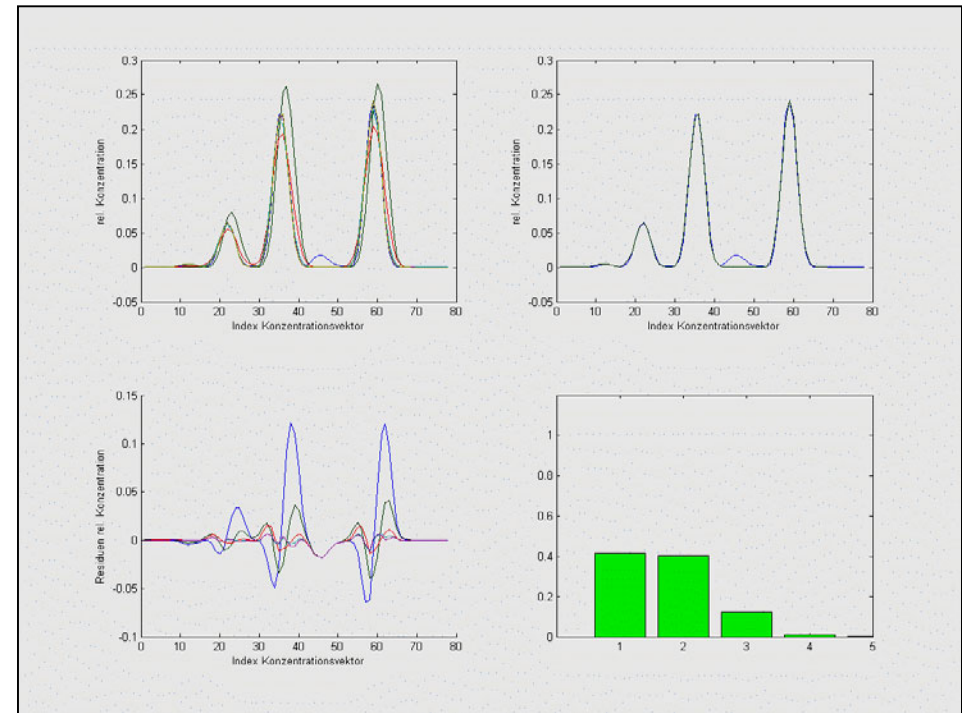
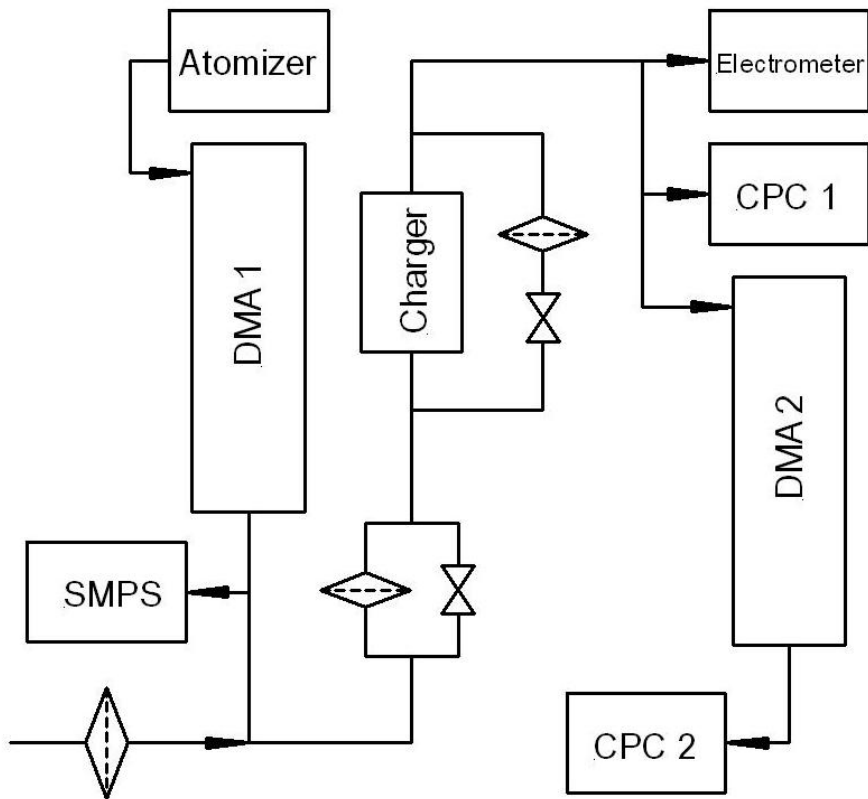
+

flow model in mixing chamber



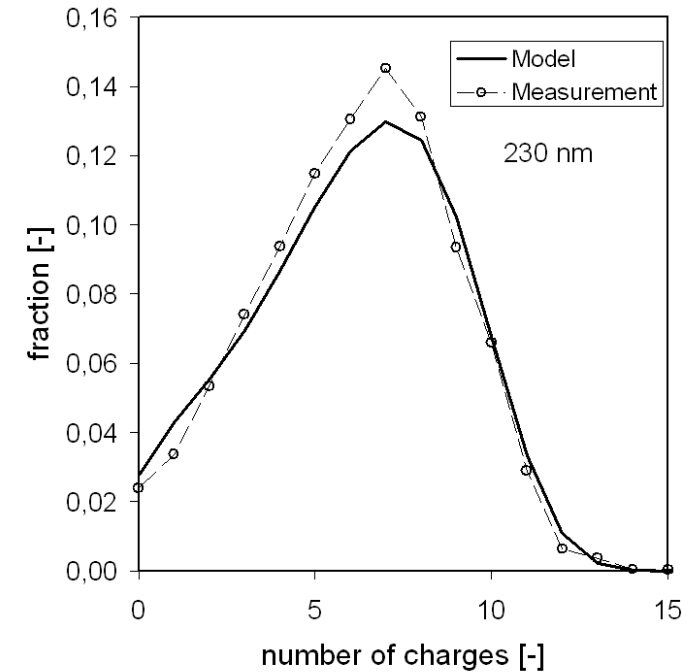
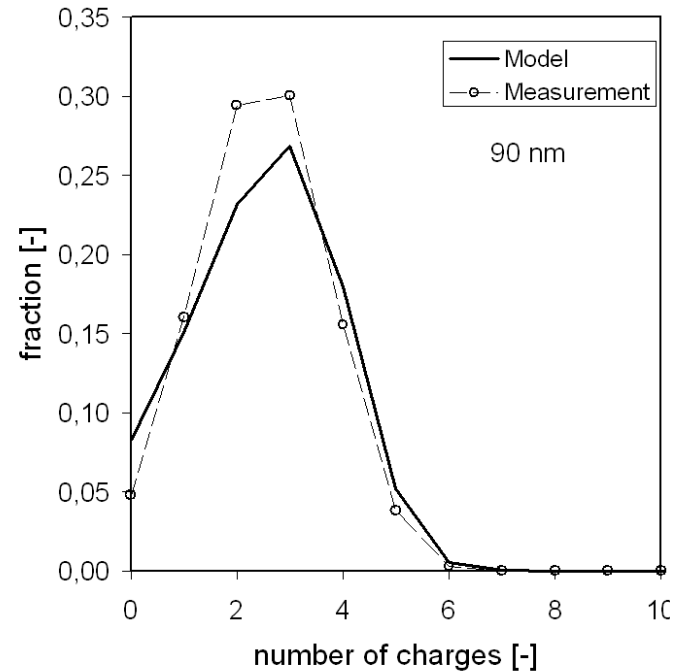
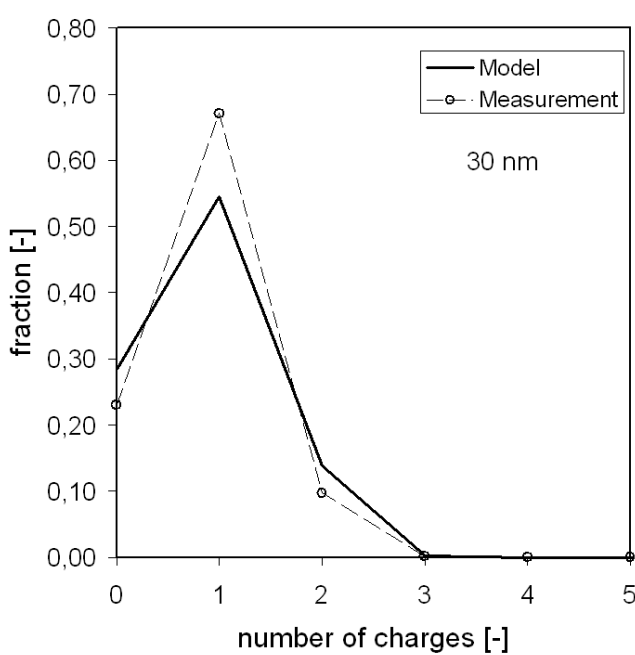


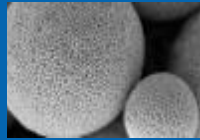
Measurement



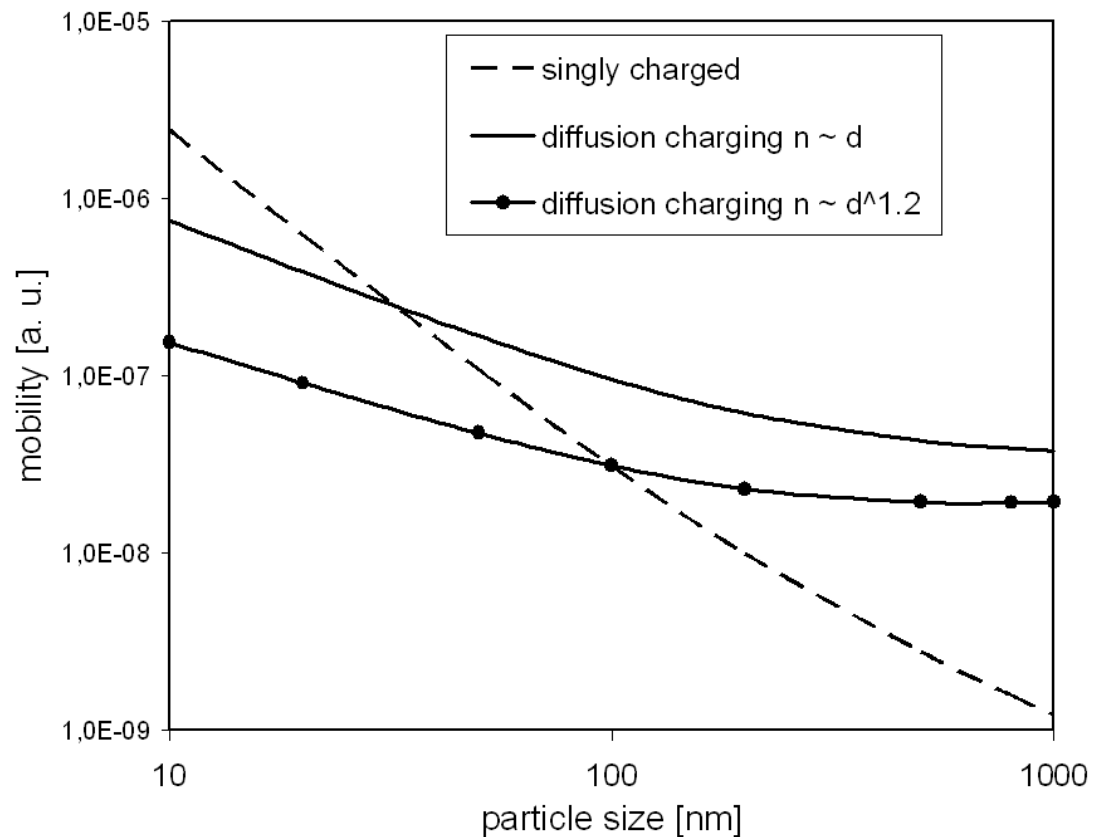


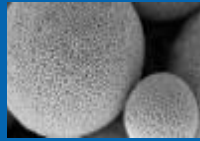
Comparing Measurement - Model





Inversion

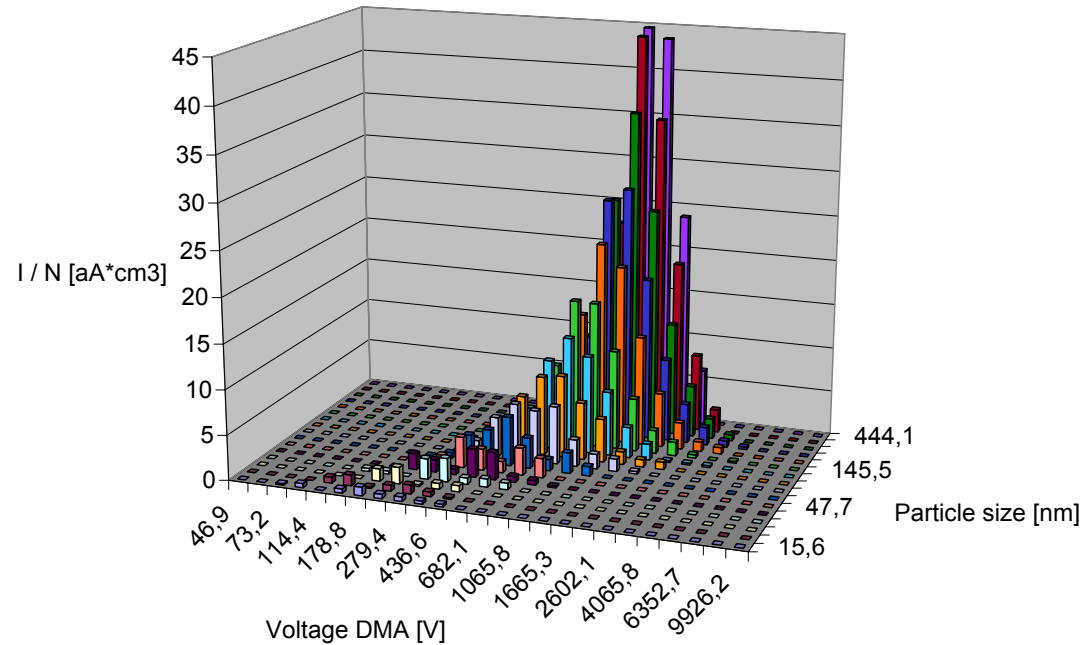


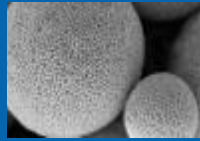


Inversion

$$g(y) = \int_a^b K(x, y) f(x) dx$$

$$\vec{g} = K \cdot \vec{f}$$



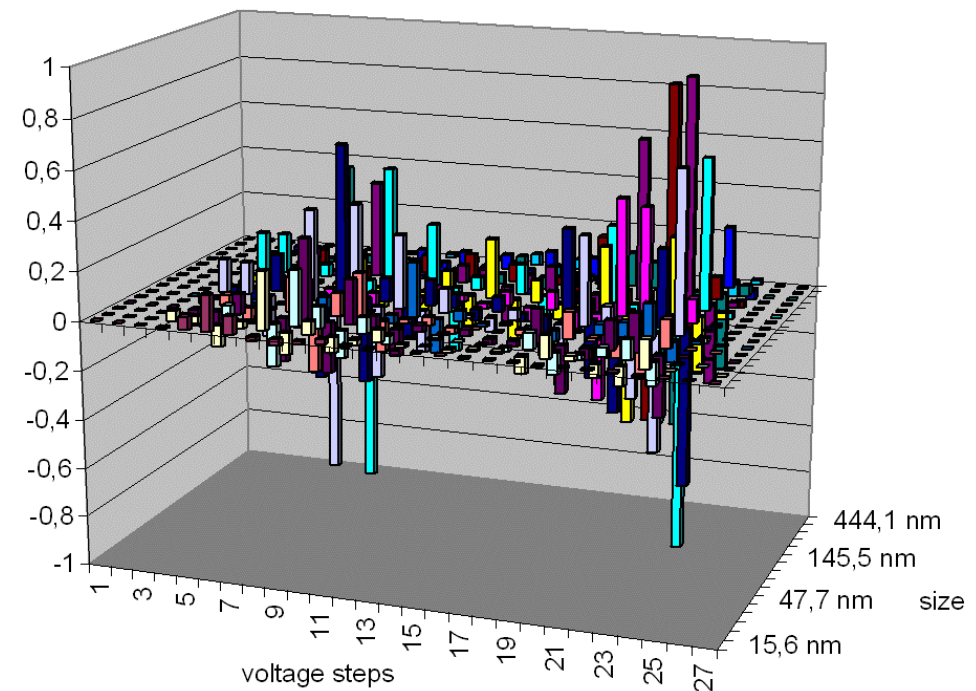


Inversion

- Least square solution

$$S = (A * A)^{-1} A$$

- Nonlinear minimization



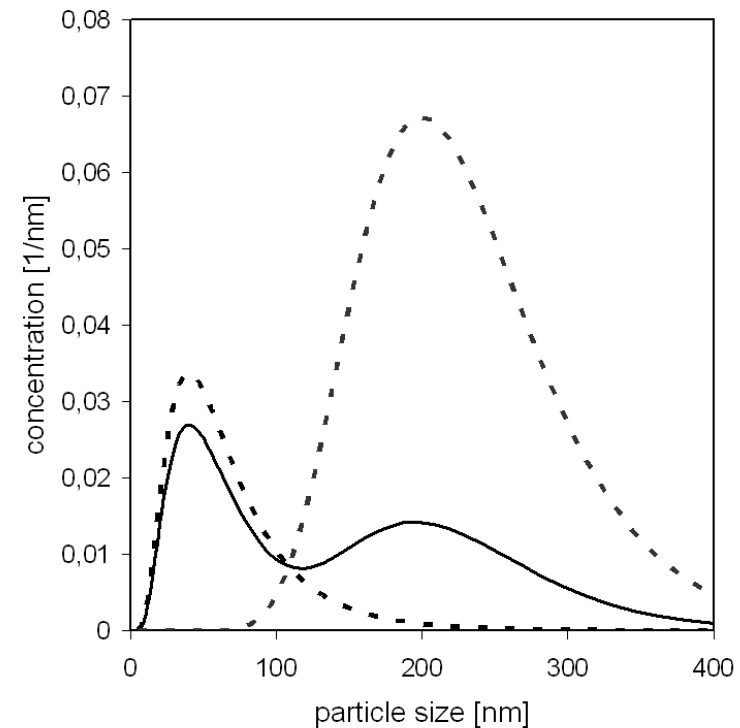


Inversion

- Least square solution

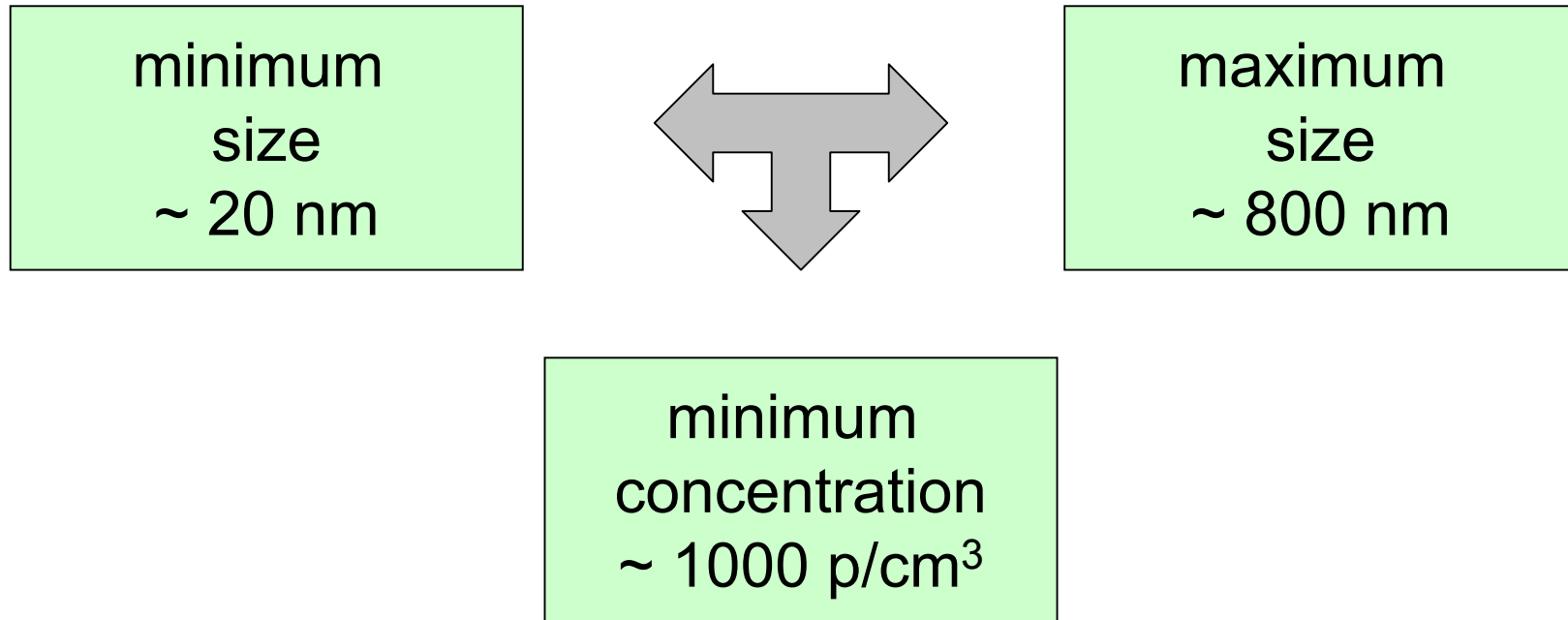
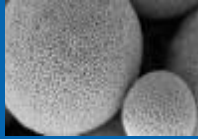
$$S = (A * A)^{-1} A$$

- Nonlinear minimization



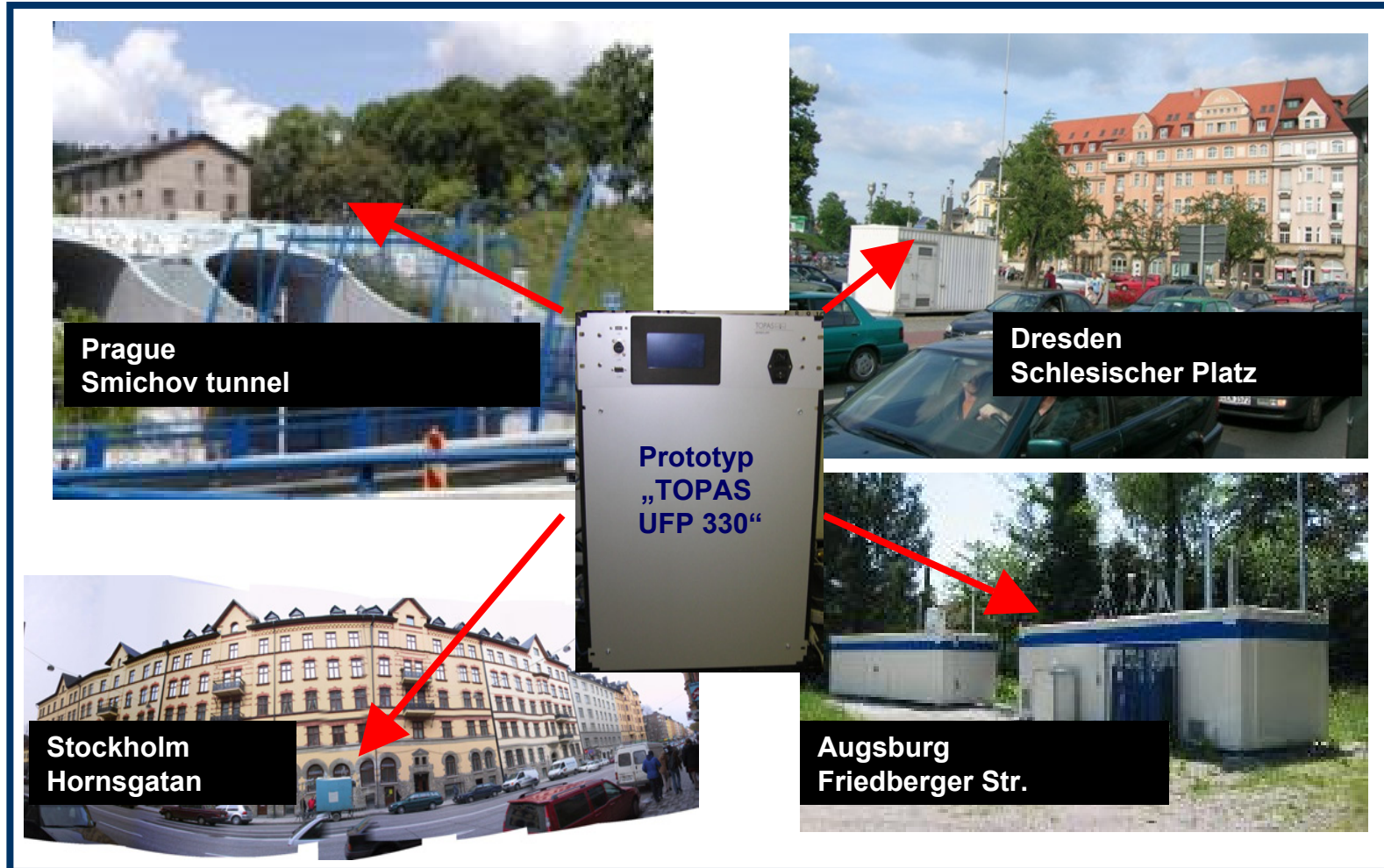
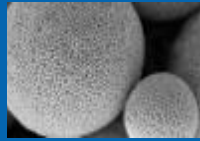


New aerosol spectrometer



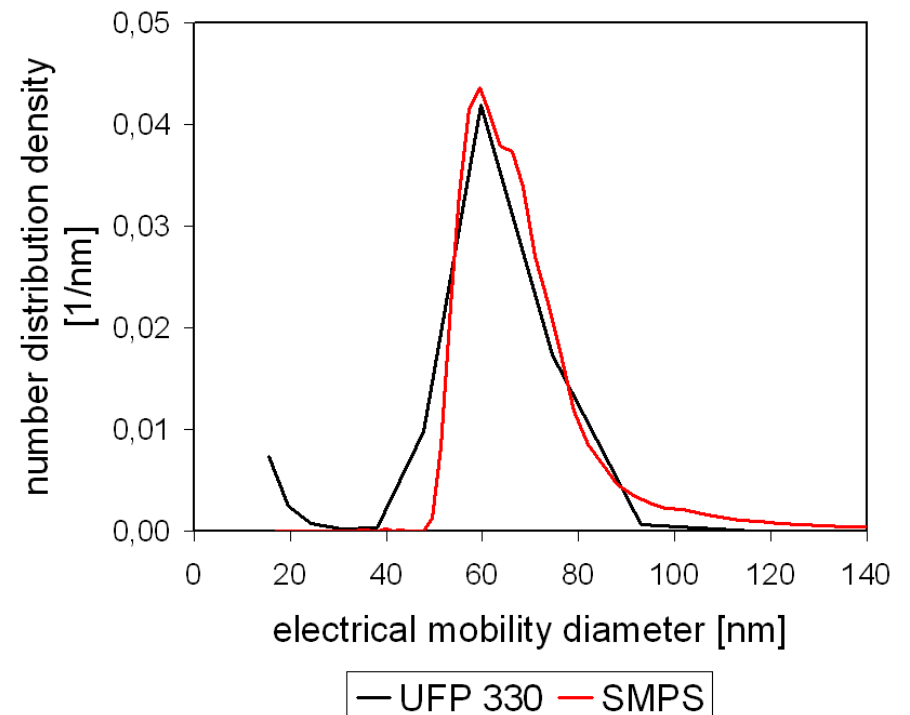
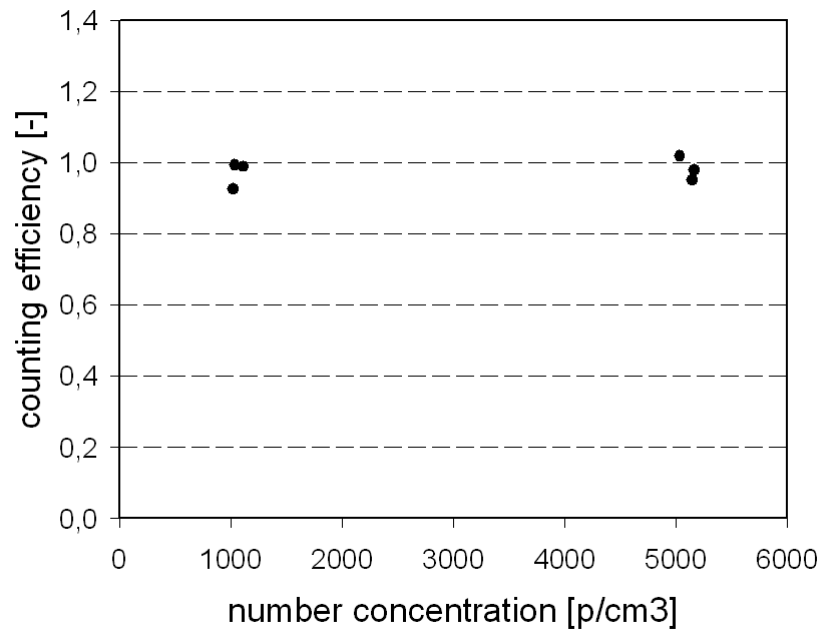


New aerosol spectrometer





Validation – test aerosols





Validation – in the field

■ IFT Leipzig

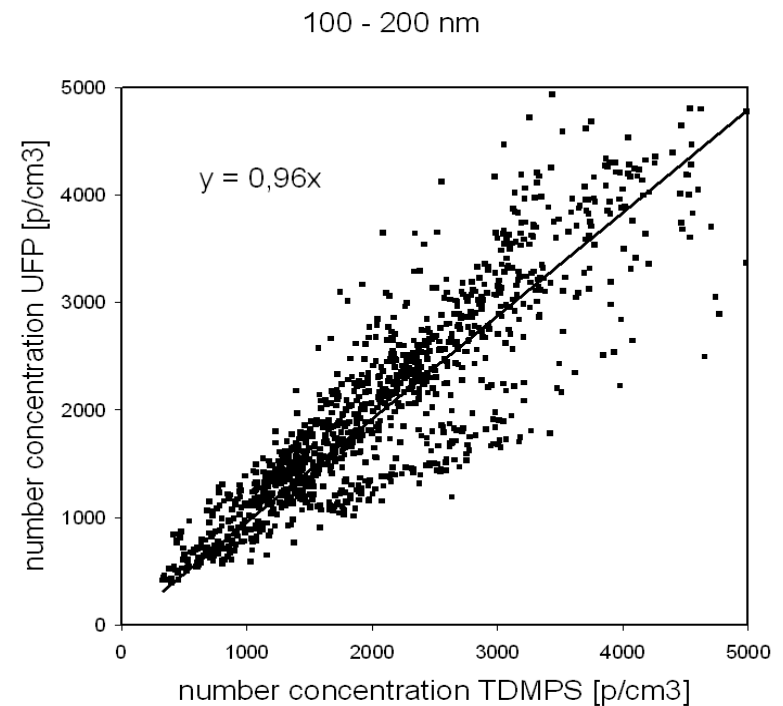
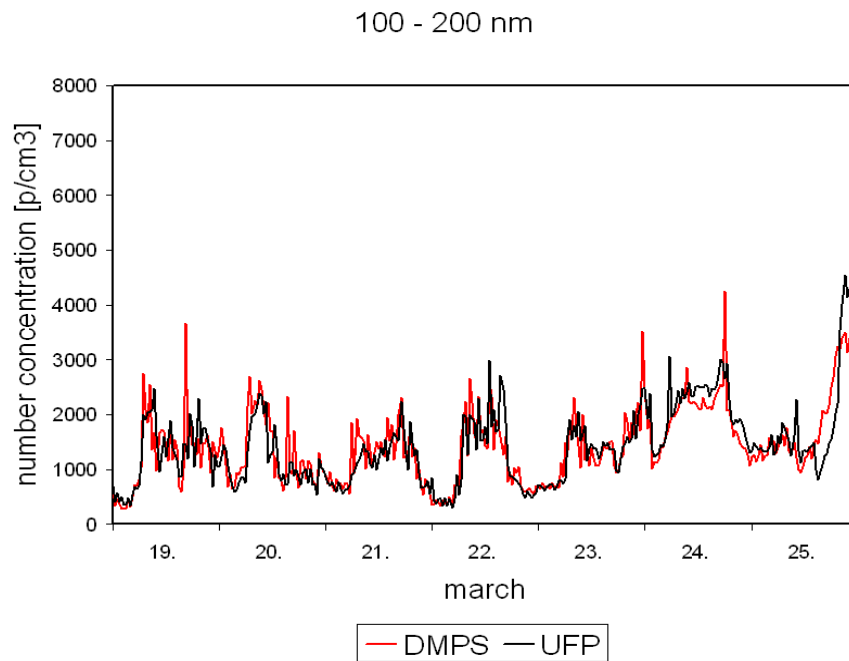


■ Monitoring station
Dresden Nord



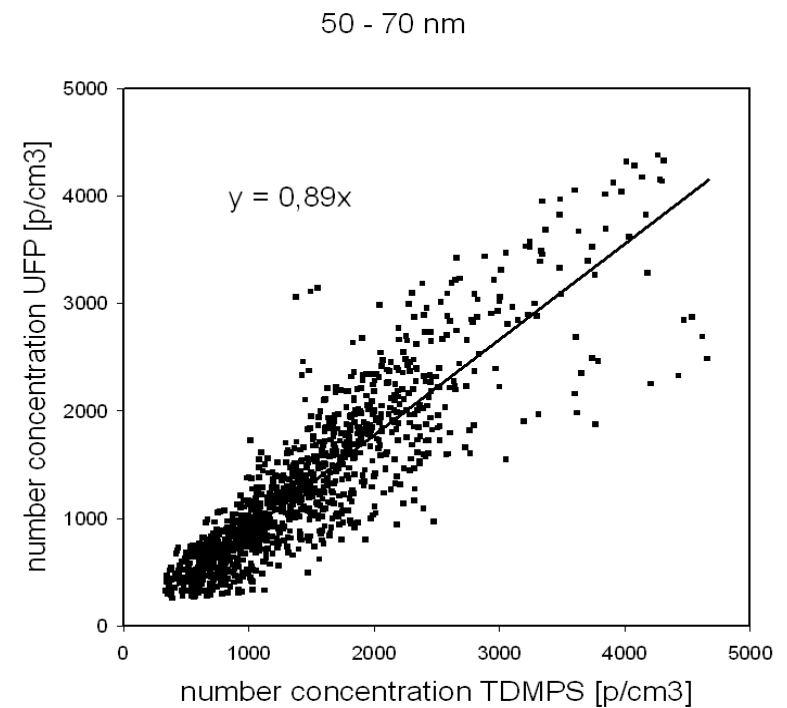
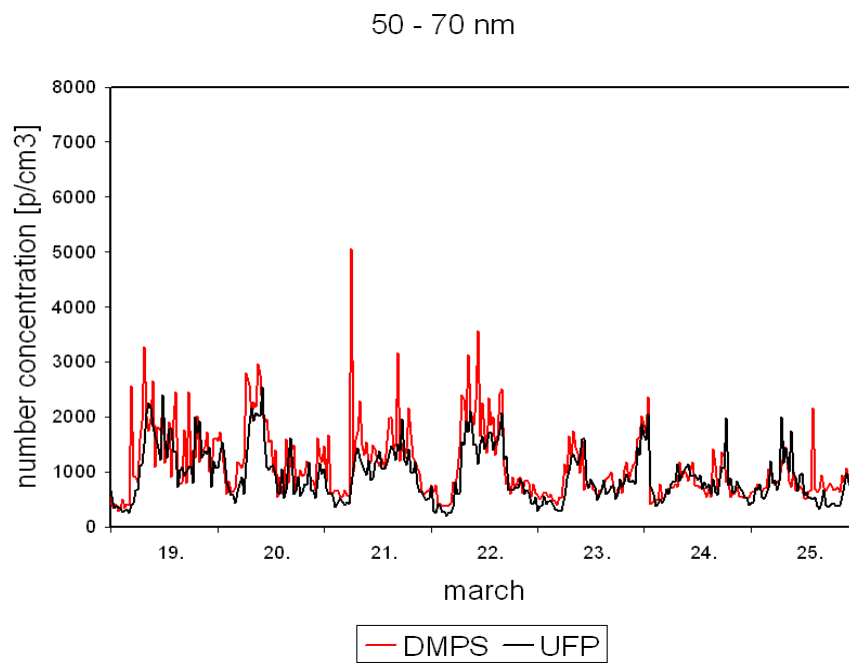


- TDMPS versus UFP
- size channel 100 – 200 nm



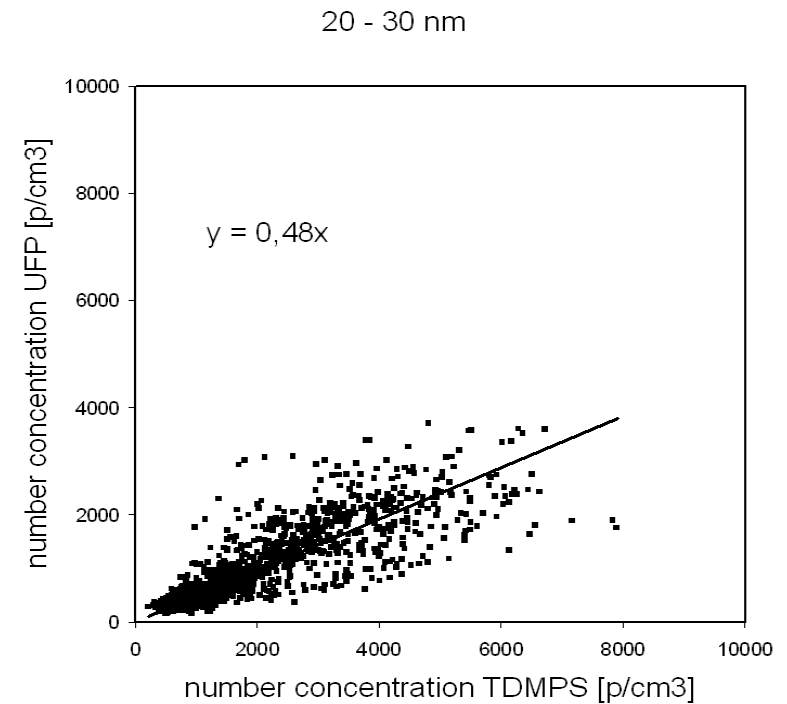
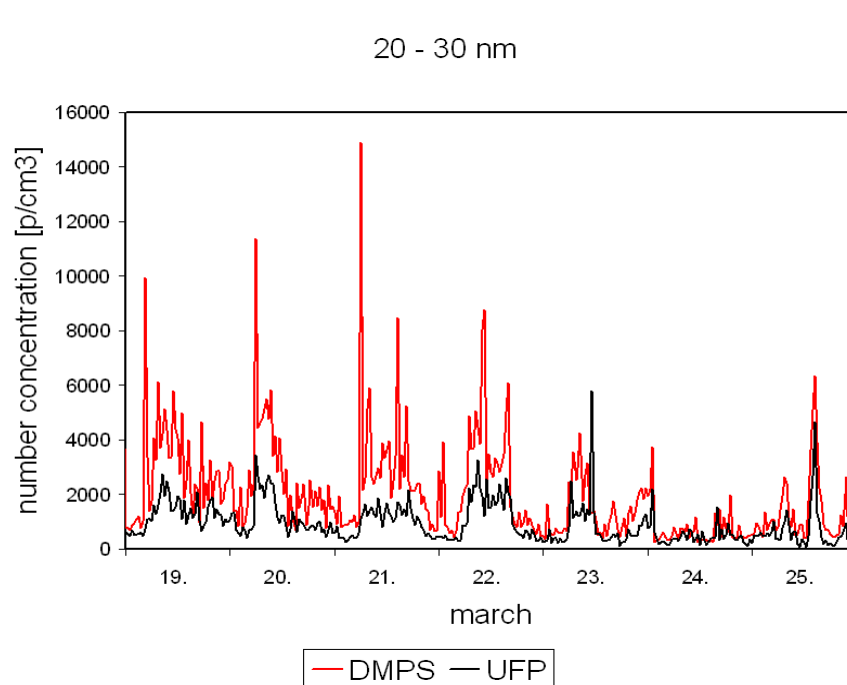


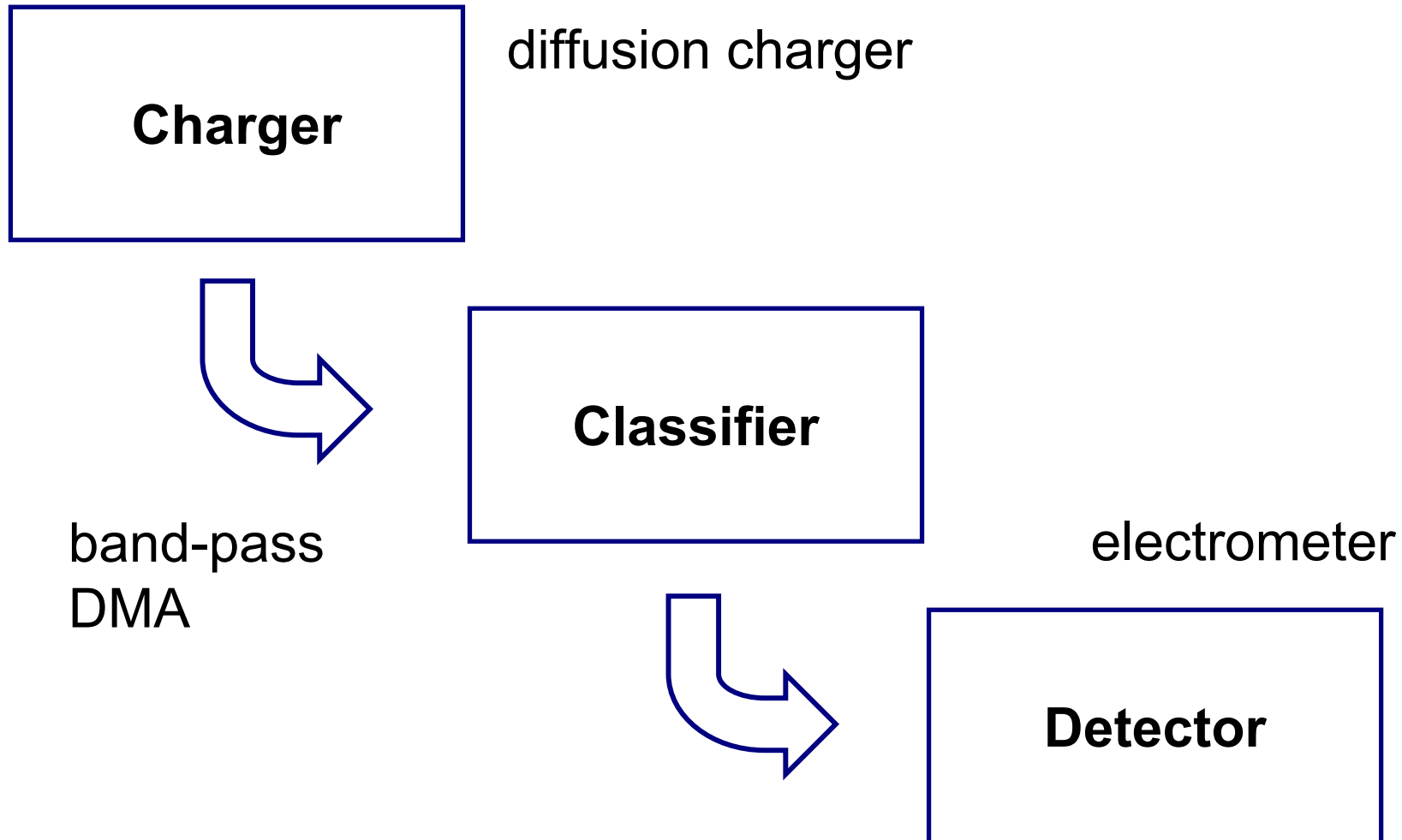
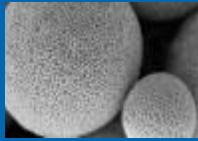
- TDMPS versus UFP
- size channel 50 – 70 nm





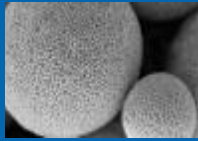
- TDMPS versus UFP
- size channel 20 – 30 nm







Summary



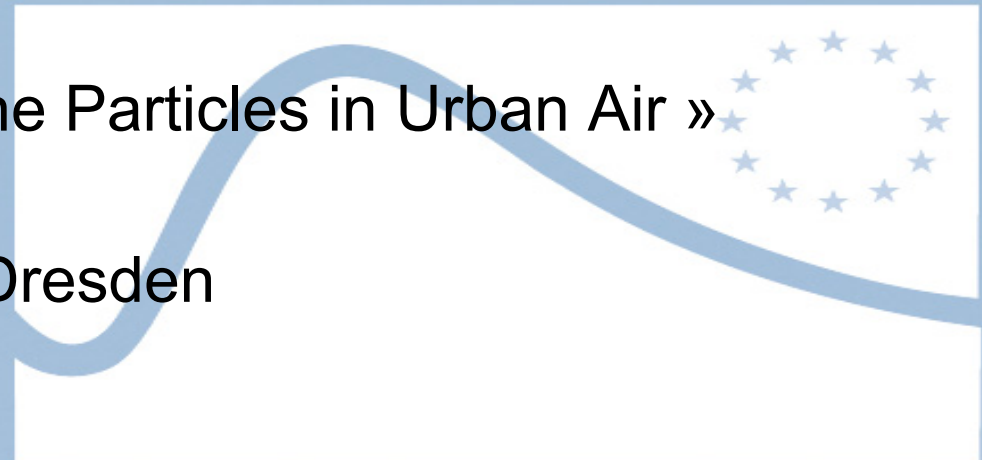
Final Conference « Ultrafine Particles in Urban Air »

■ 23.-24. October 2007 in Dresden

■ german / english

■ measurement of ultrafine particles
legislatory framework
health effects

■ more details at:
www.ufipolnet.eu



UFIPOLNET

Ultrafine Particle Size Distributions
in Air Pollution Monitoring Networks

ULTRAFEINSTAUB IN DER STADT
23. bis 24.10.2007

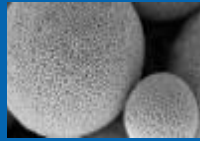


Links

- T02A048 A. Zschoppe
- T13A202 B. Wehner
- T13A162 H. Gerwig



Summary



UFIPOINET (www.ufipolnet.eu) is financed by the LIFE financial instrument of the European Community under No. LIFE04 ENV/D/000054.



UFIPOINET

ultrafine particle size distributions
in air pollution monitoring networks



TOPAS 



GSF – Forschungszentrum
für Umwelt und Gesundheit
in der Helmholtz-Gemeinschaft





Questions ?

