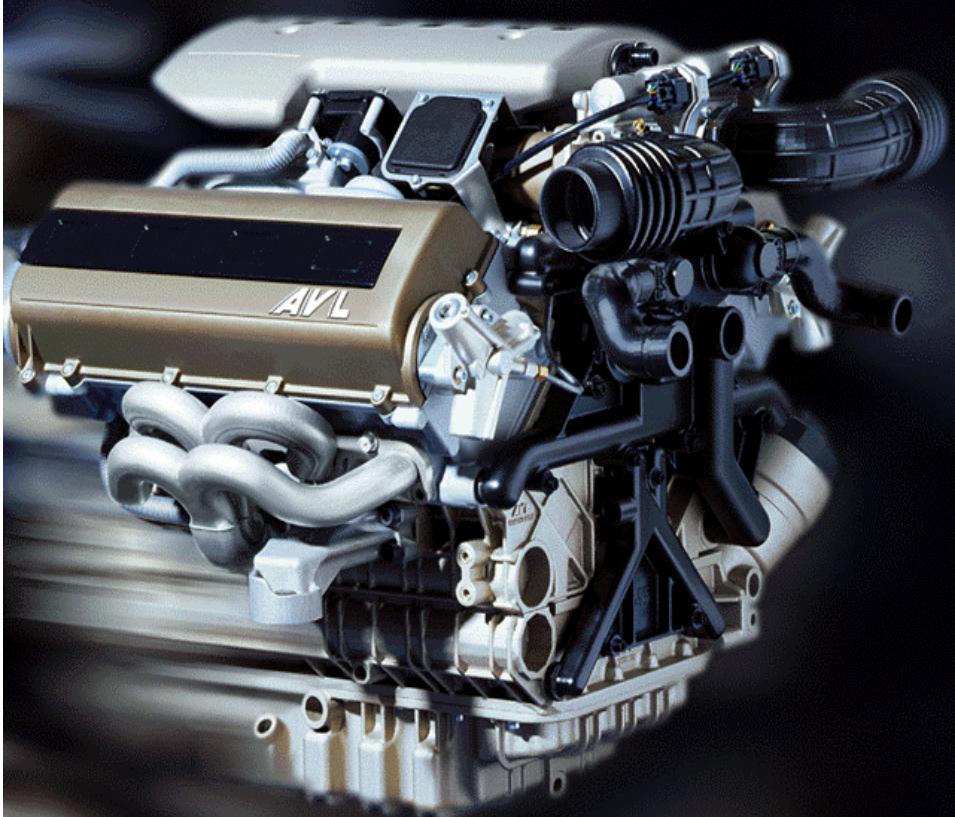


Diesel particle morphology depending on particle size



'Diesel particle morphology depending on particle size'

Franz Dorfer, Thomas Cartus
AVL List GmbH, Austria

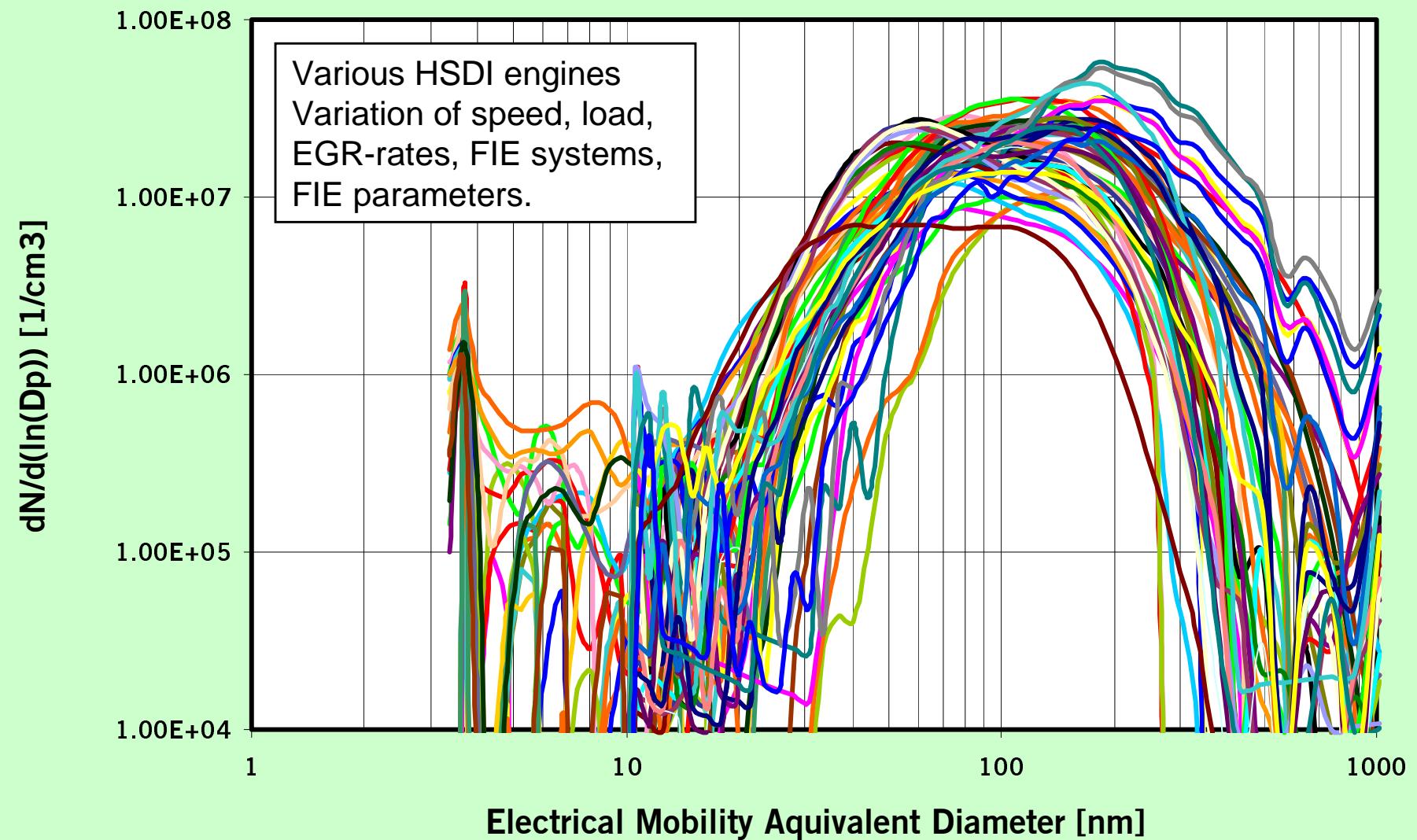
4th ETH Conference on
Nanoparticle Measurement
Zürich, 7th of August 2000

Objectives

1. Finding correlation's between...
 - Nanoparticle size distribution and conventional particulate measurement results
 - Particle Morphology and Electro Mobility Diameter
2. Finding an equation for calculating particulate mass from particle size distribution

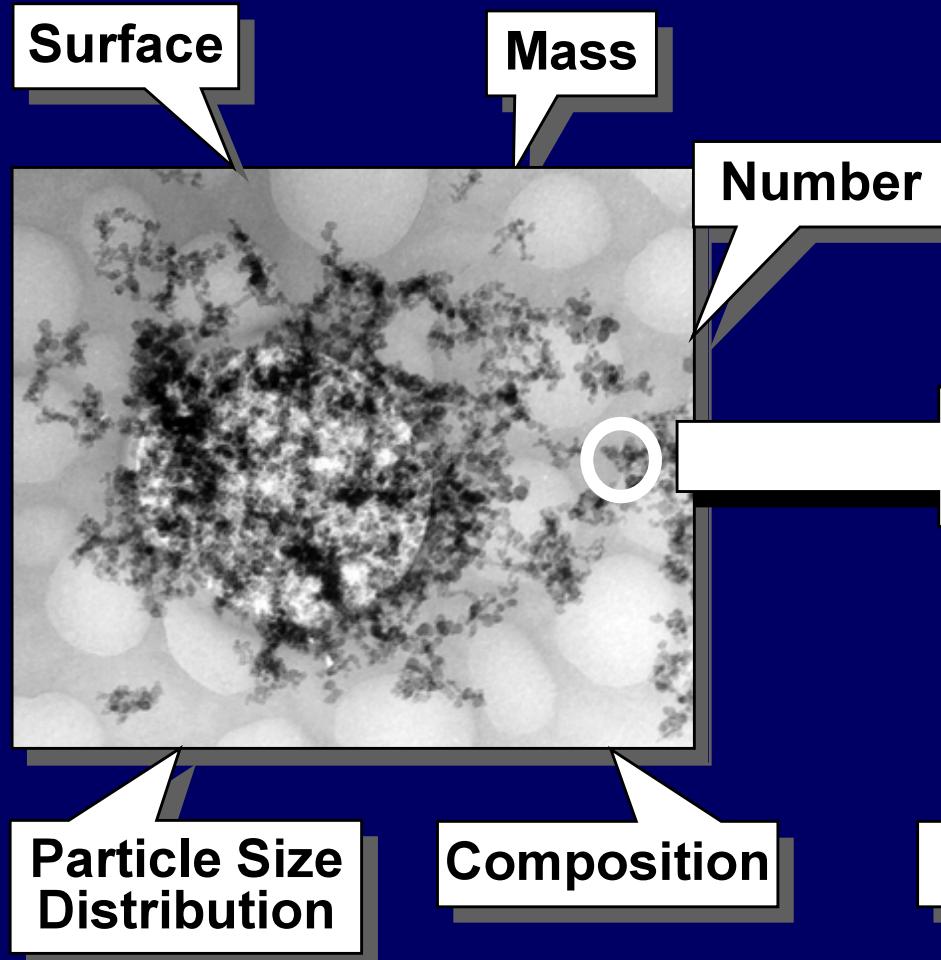
HSDI Feedgas Nanoparticle Spectrum

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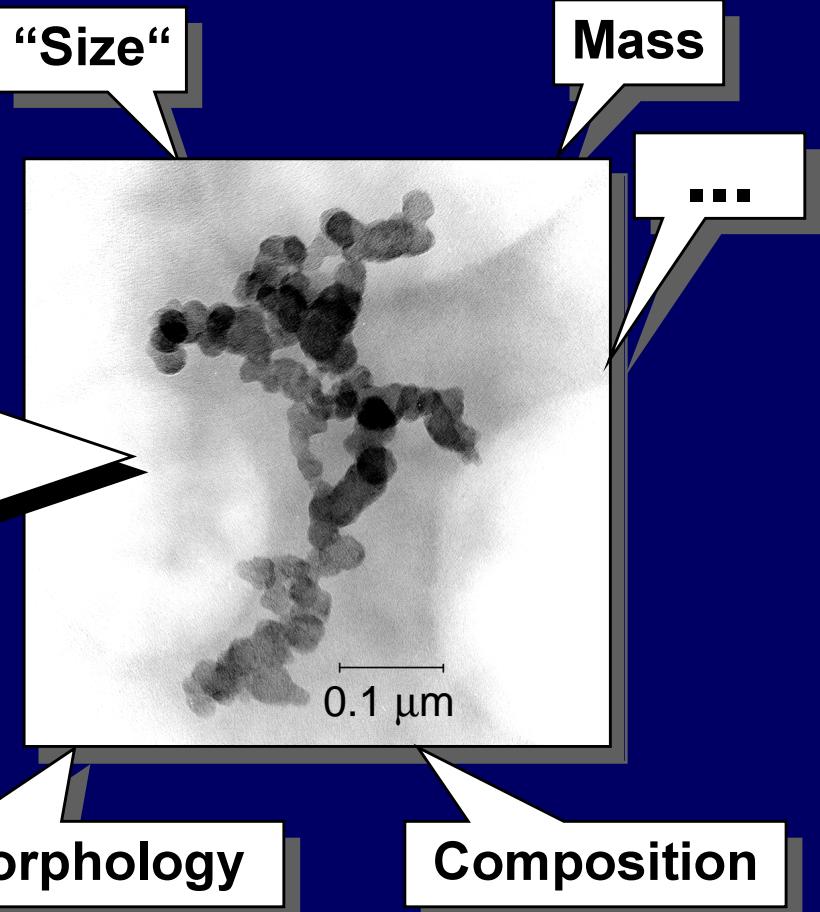


Particle Characterization

Total Particulates



Single Particle



Particle Size Distribution

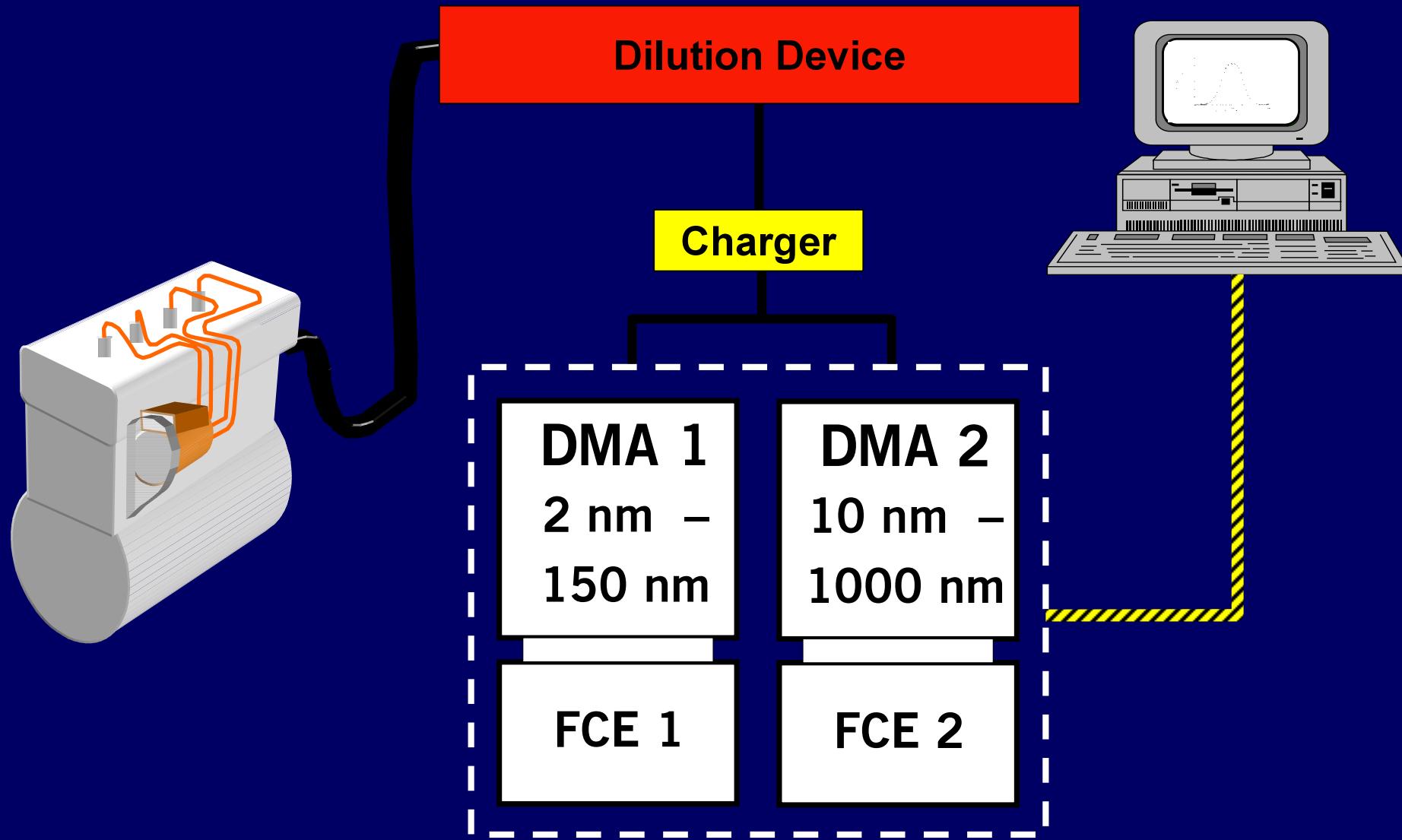
Composition

Morphology

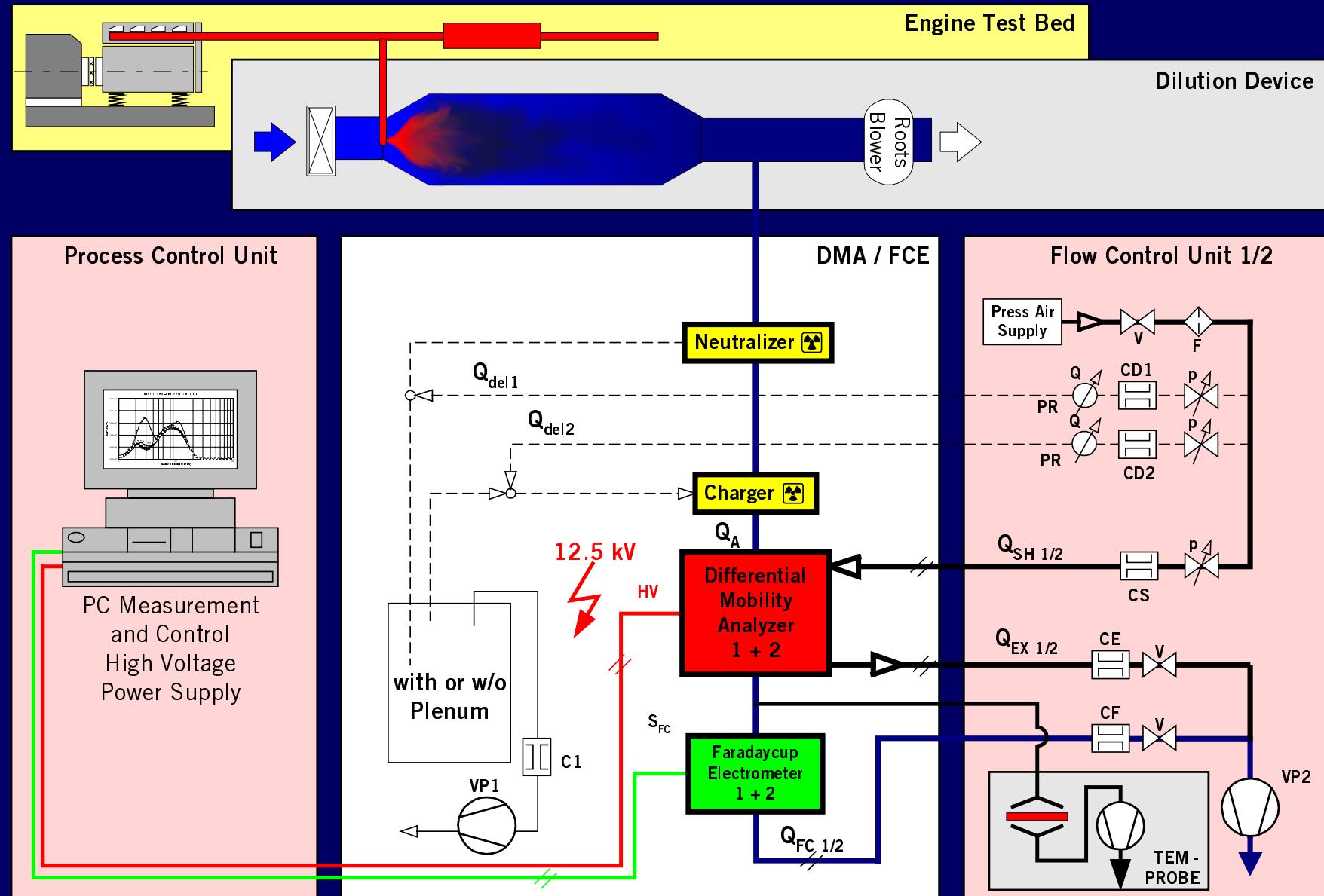
Composition

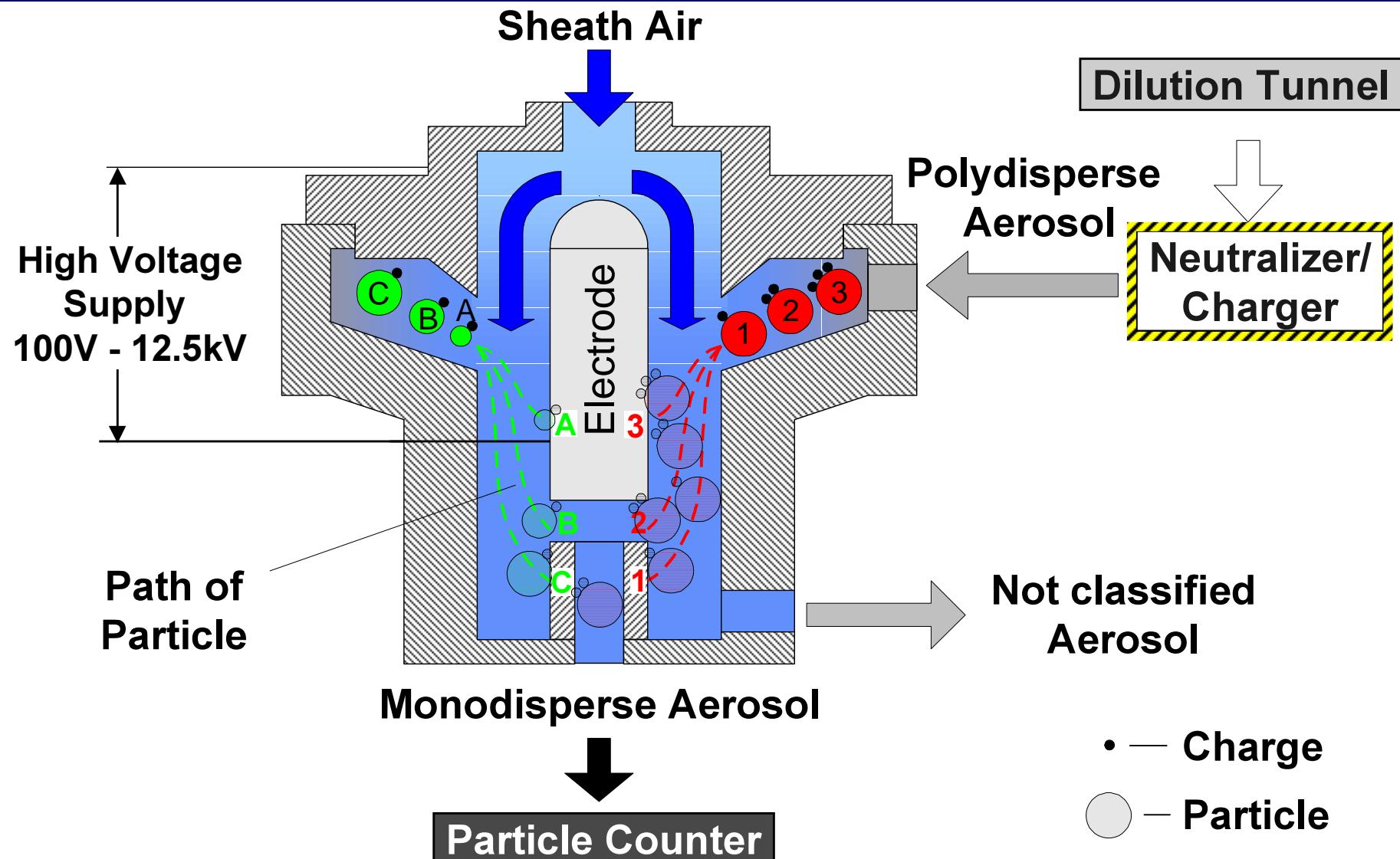
Double Differential Mobility Spectrometer

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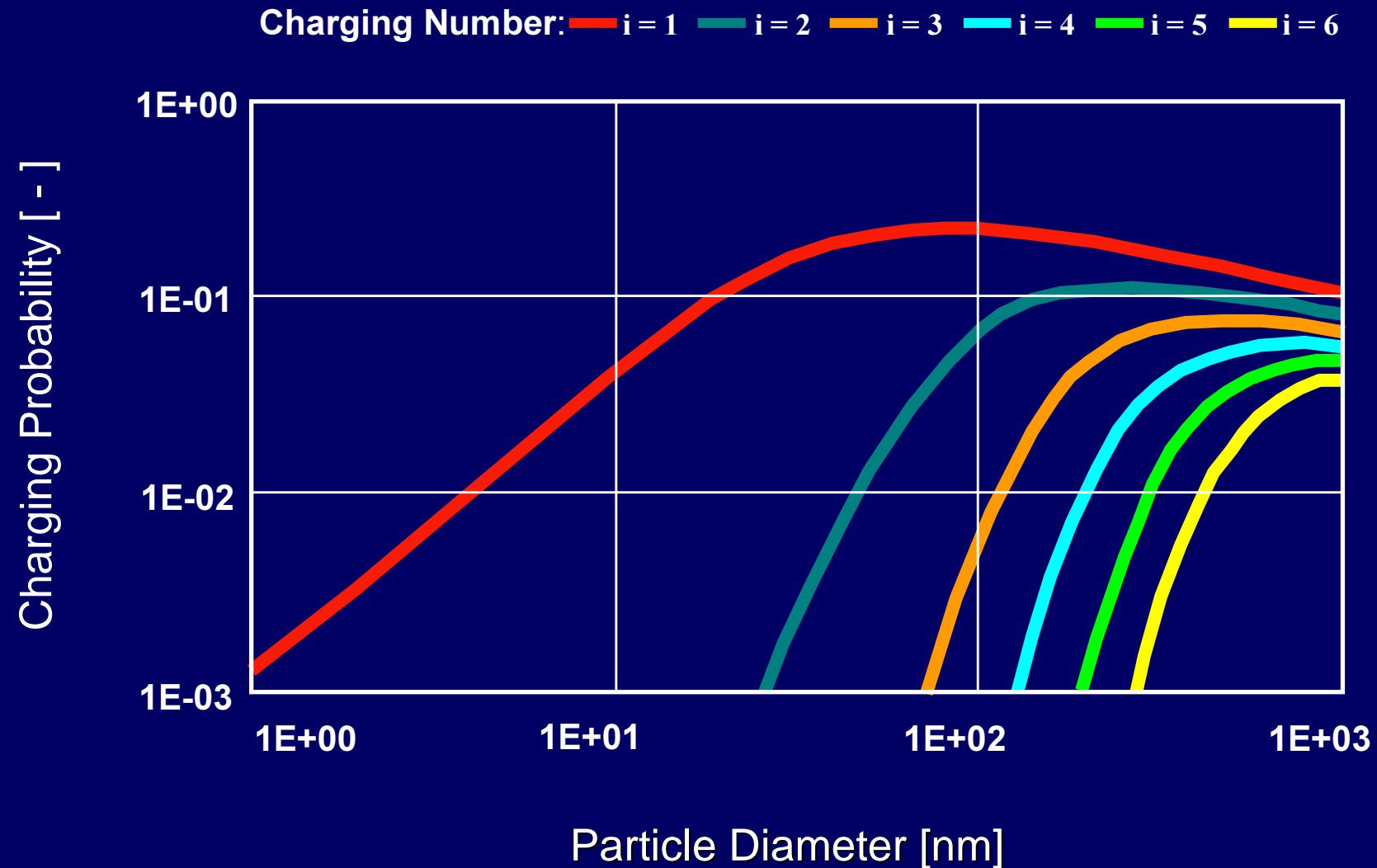


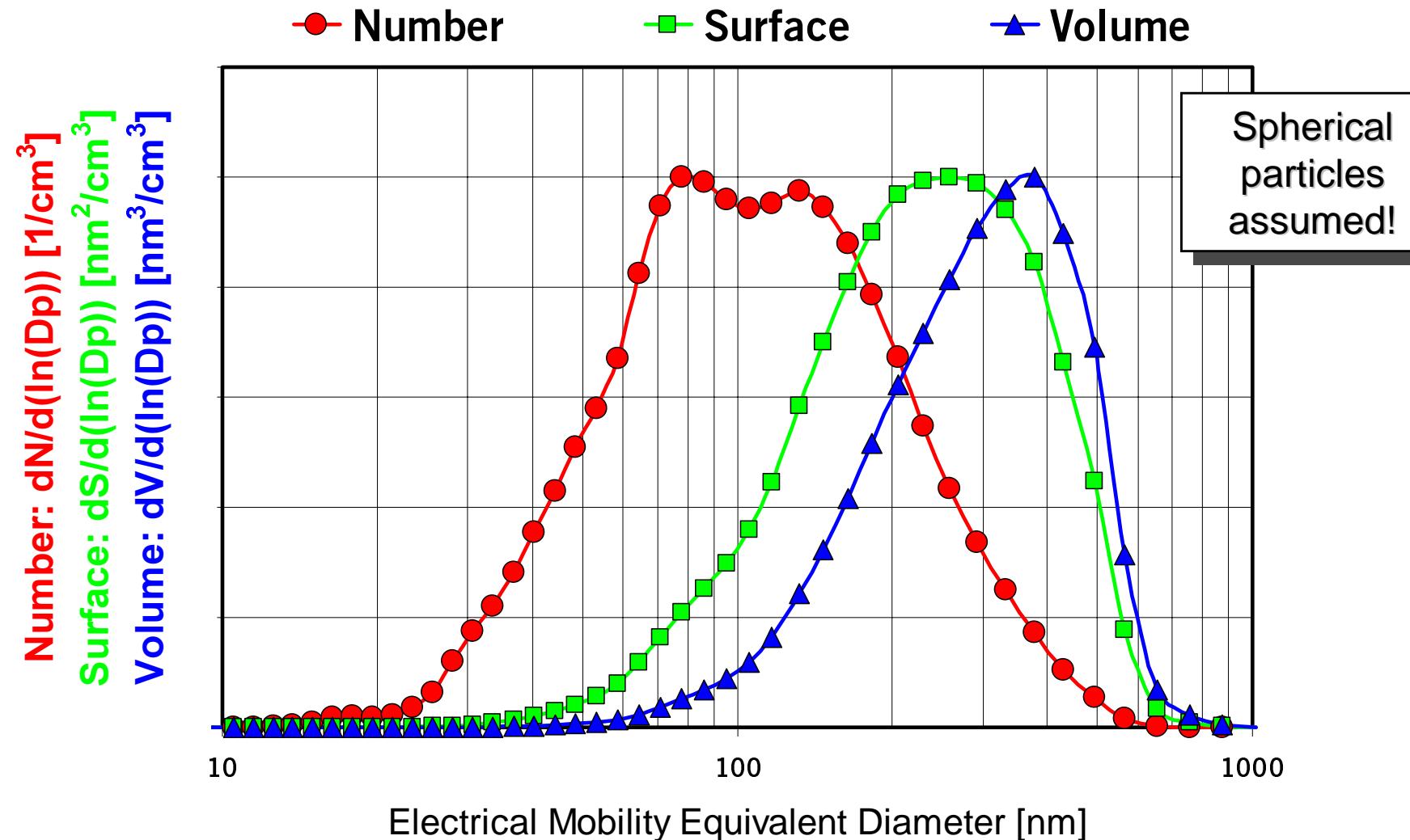
Measurement Set-Up





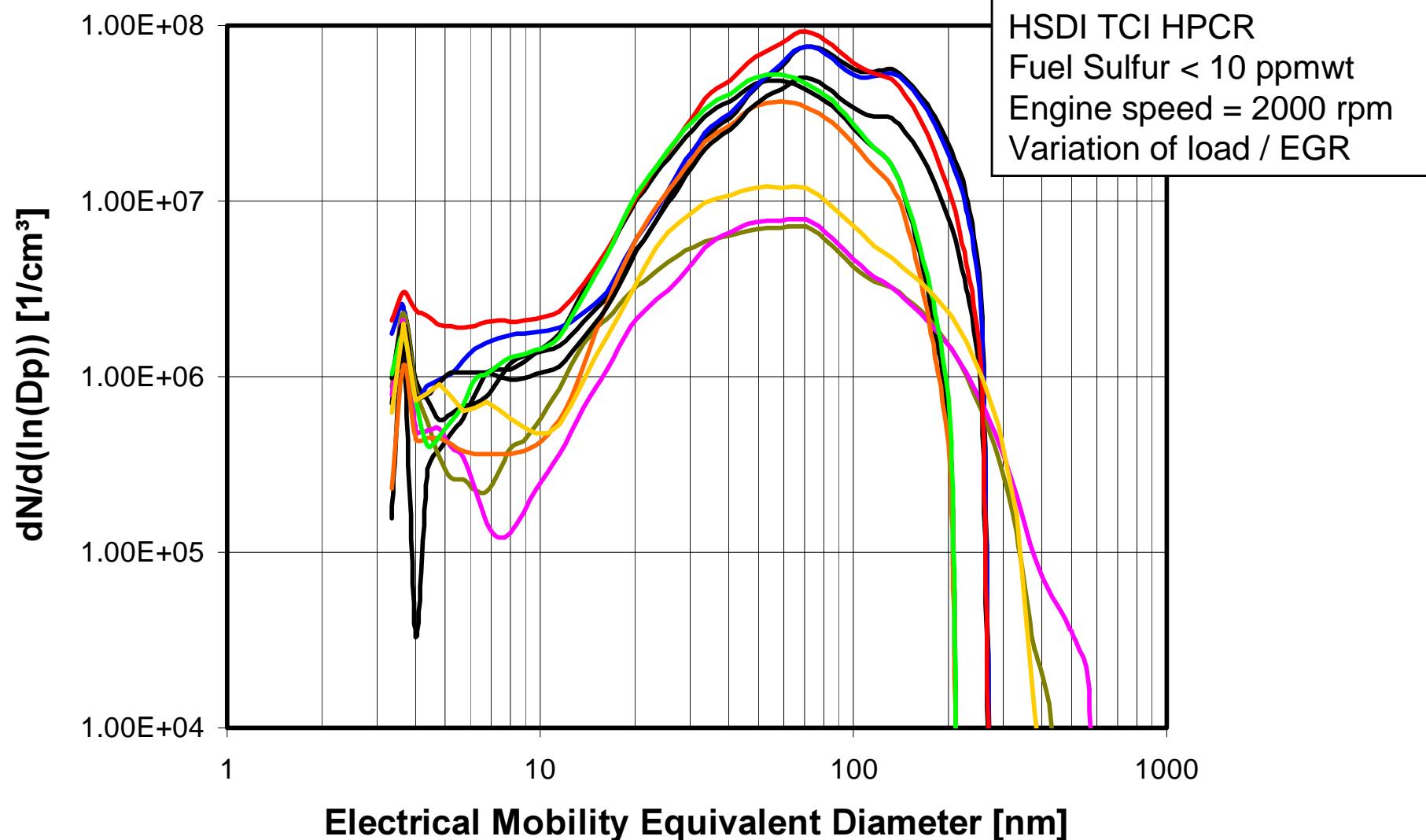
Charging Probability





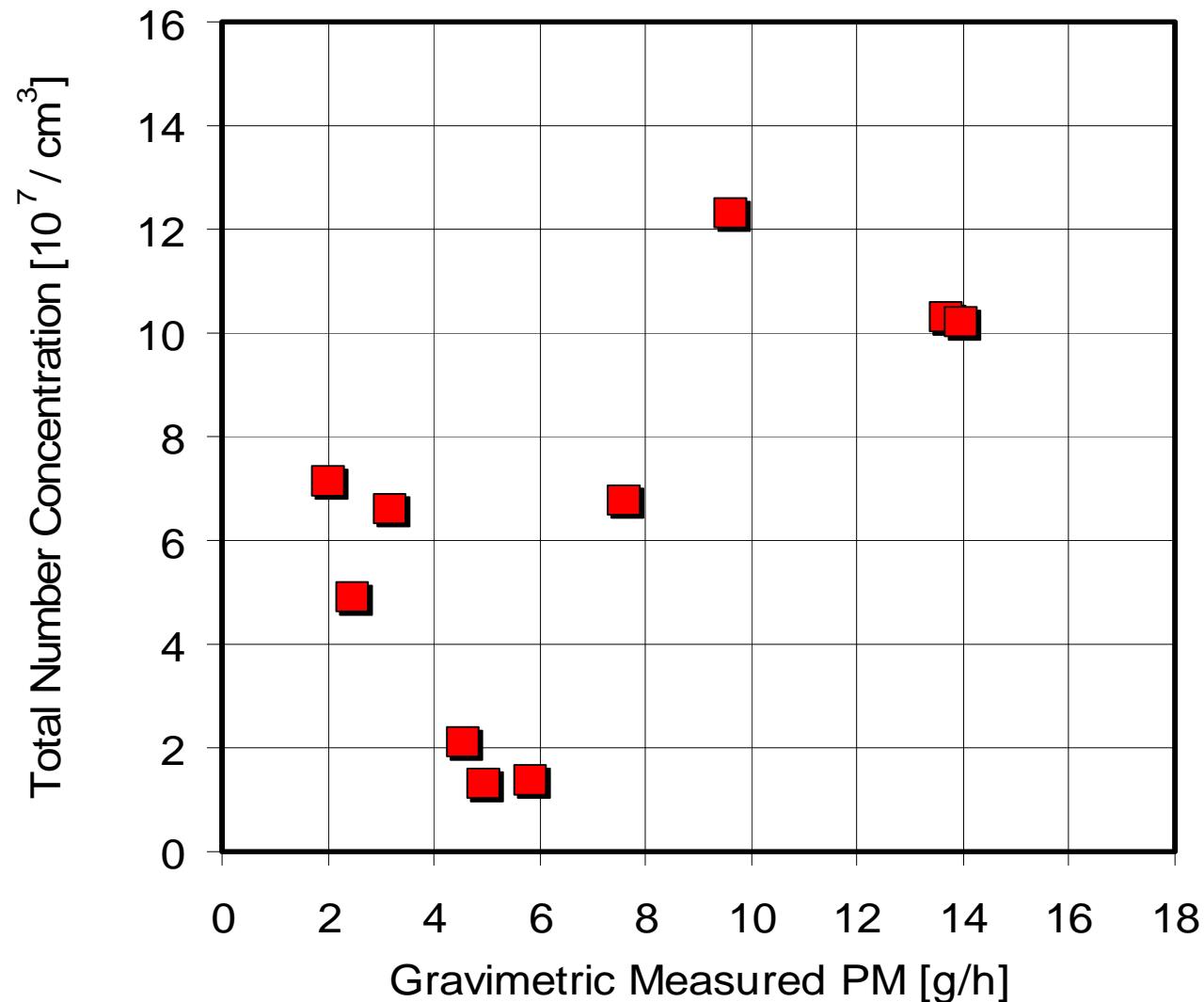
Basis for Correlation Calculations

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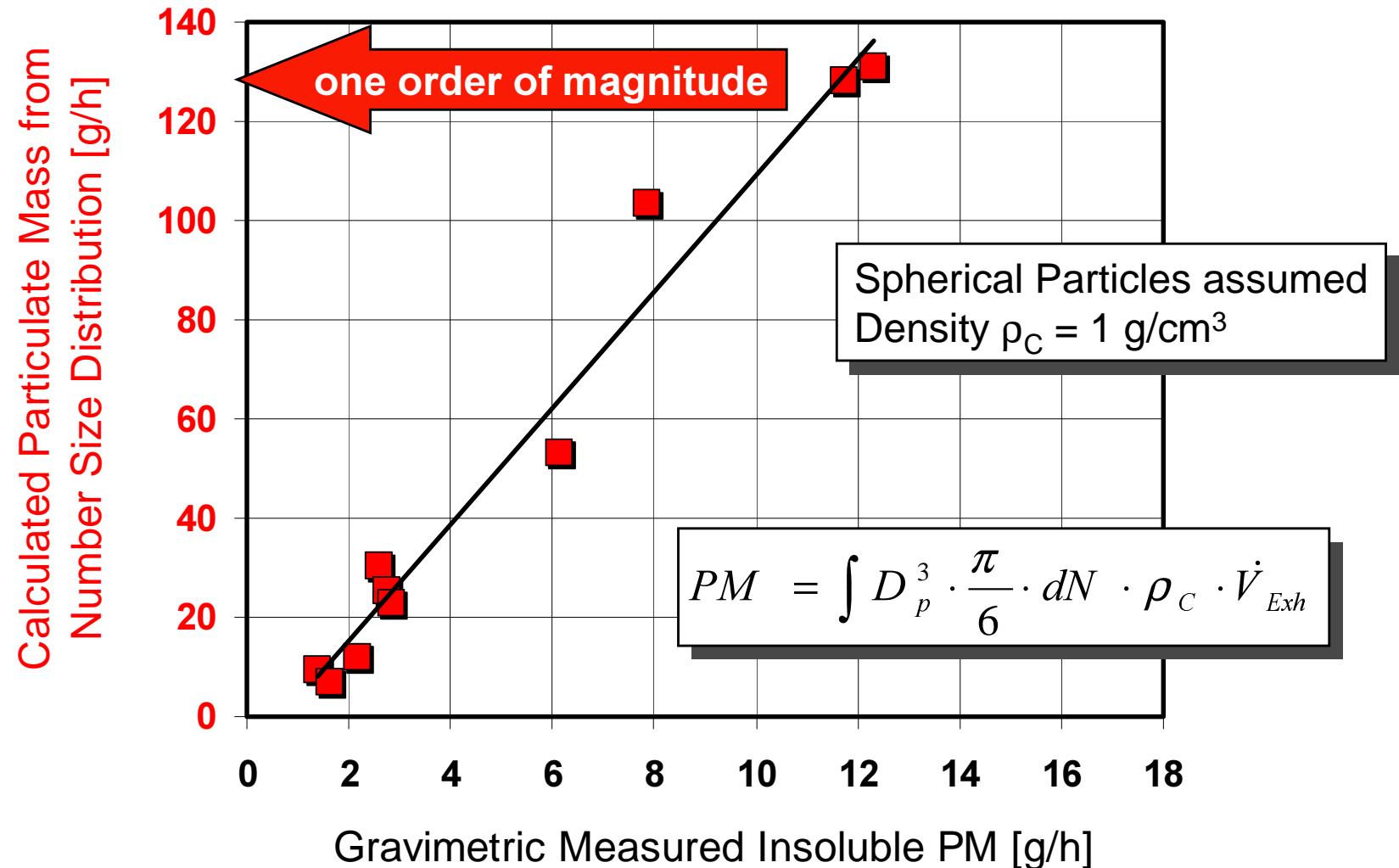
Number Concentration vs. PM

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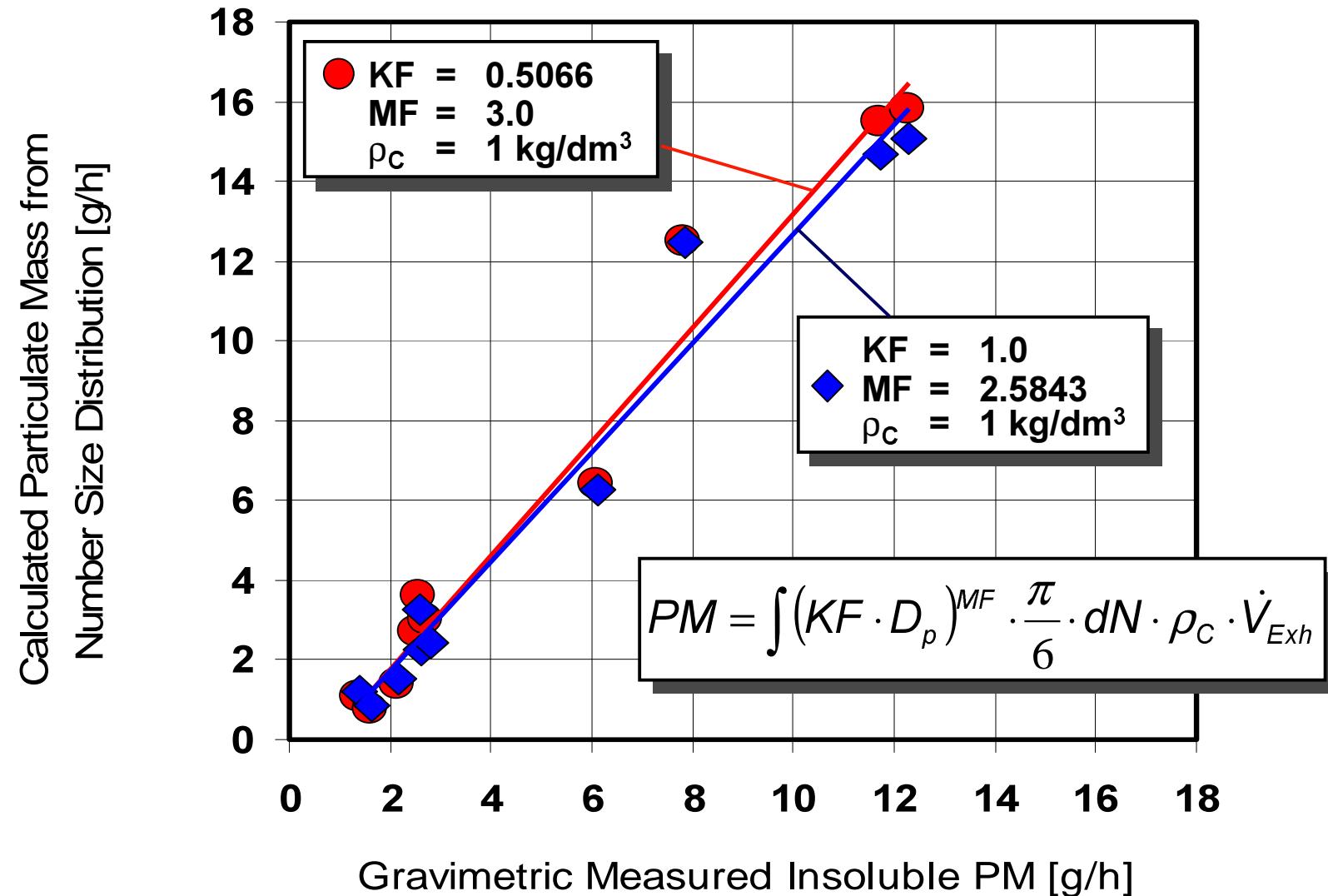


Calculated vs. Measured INS PM

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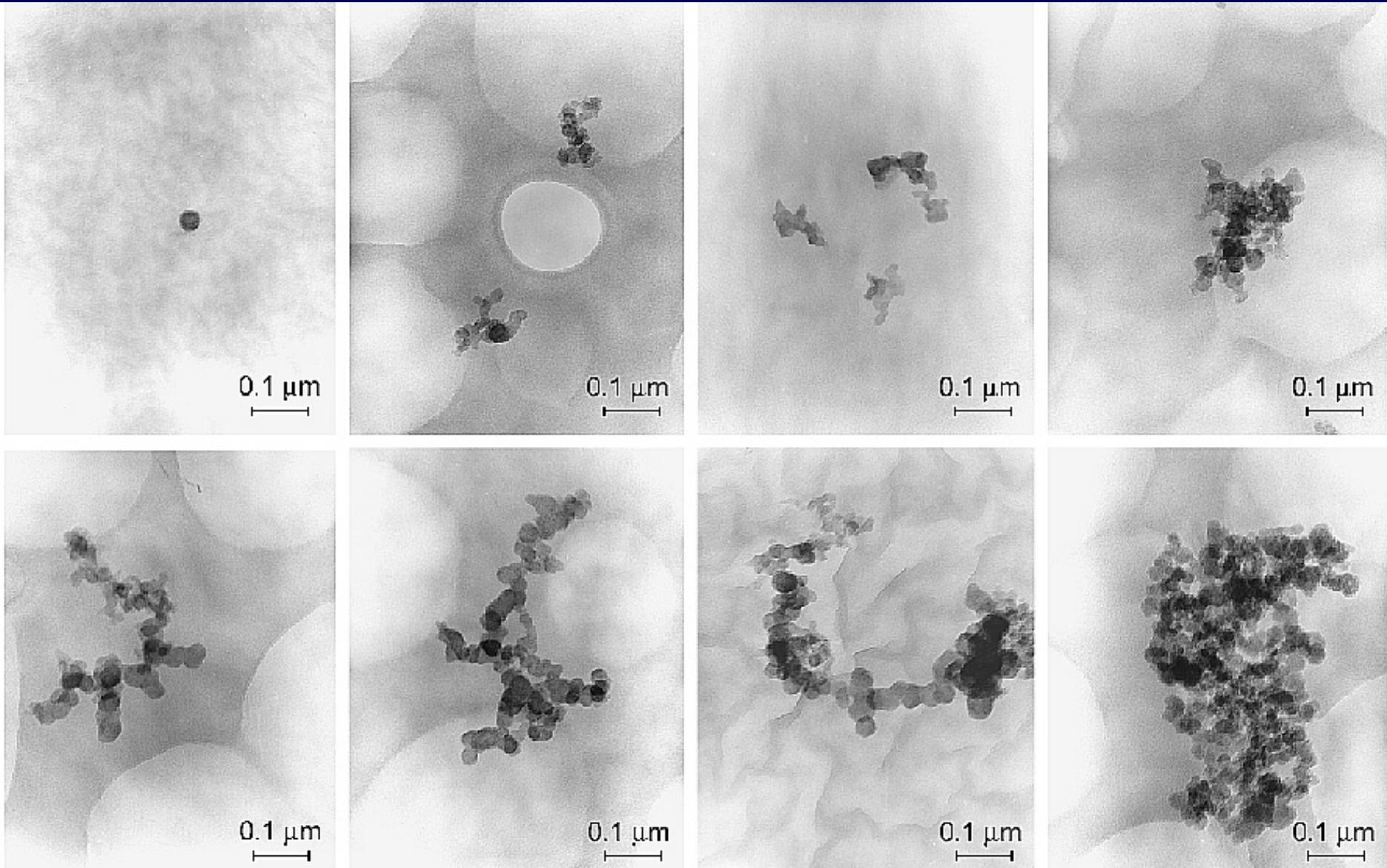


Calculation of PM using KF and MF



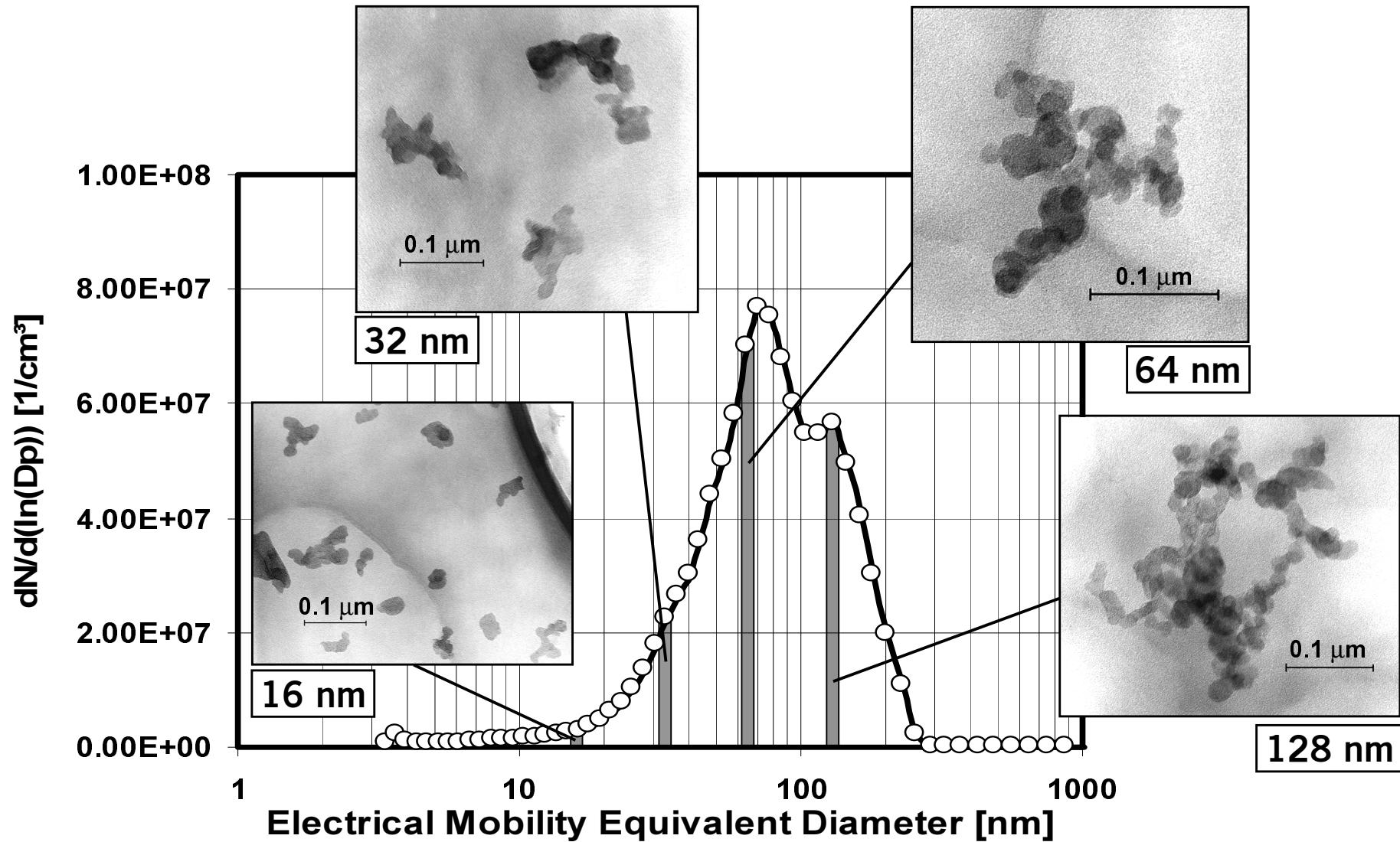
TEM Analysis of Diesel Particulates

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Morphology depending on particle size

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1. In general no correlation between total number concentration N and total PM exists.
2. Diesel particles are complex agglomerates consisting of single primary clusters units (10 to 30 nm).
3. In general the calculation of the particle mass out from the size distribution is not possible, since of
 - the restricted size range (3 to 1000nm) of the current measurement technology
 - the unknown density of the particulate
 - the unknown particulate shape
4. By means of a linear diameter correction factor ($KF < 1$) or an adjusted power factor ($MF < 3$) the calculated volume distribution can be corrected to the results of the insoluble PM.

The factors may change for aerosols with significant different characteristic of size distribution or particle morphology.