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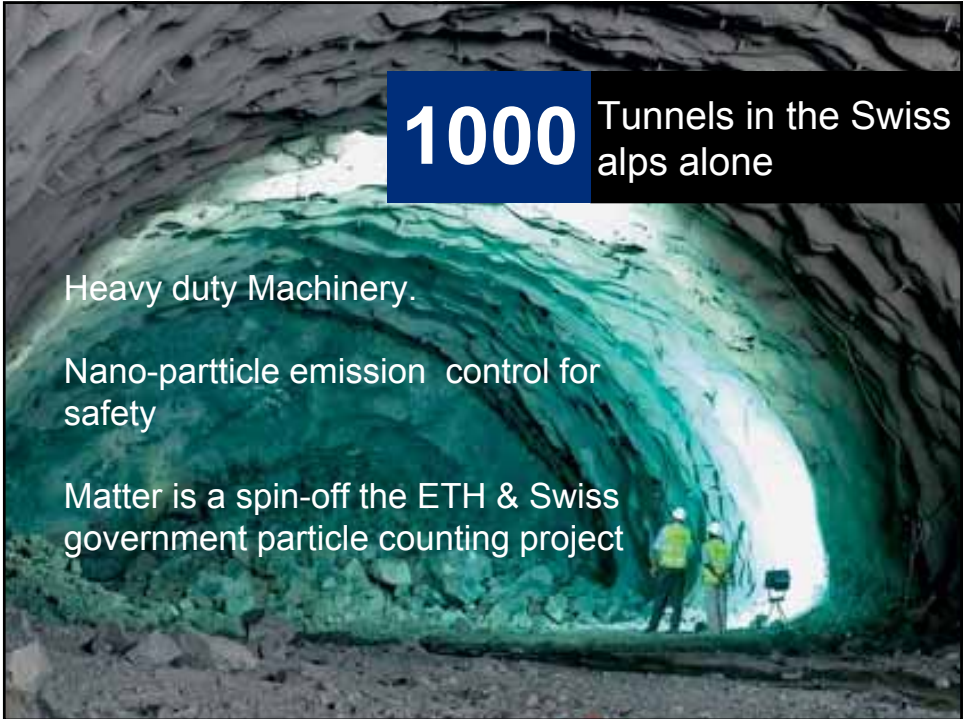
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Since **1995** nothing than nano-particles



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**1000** Tunnels in the Swiss alps alone

Heavy duty Machinery.

Nano-particle emission control for safety

Matter is a spin-off the ETH & Swiss government particle counting project

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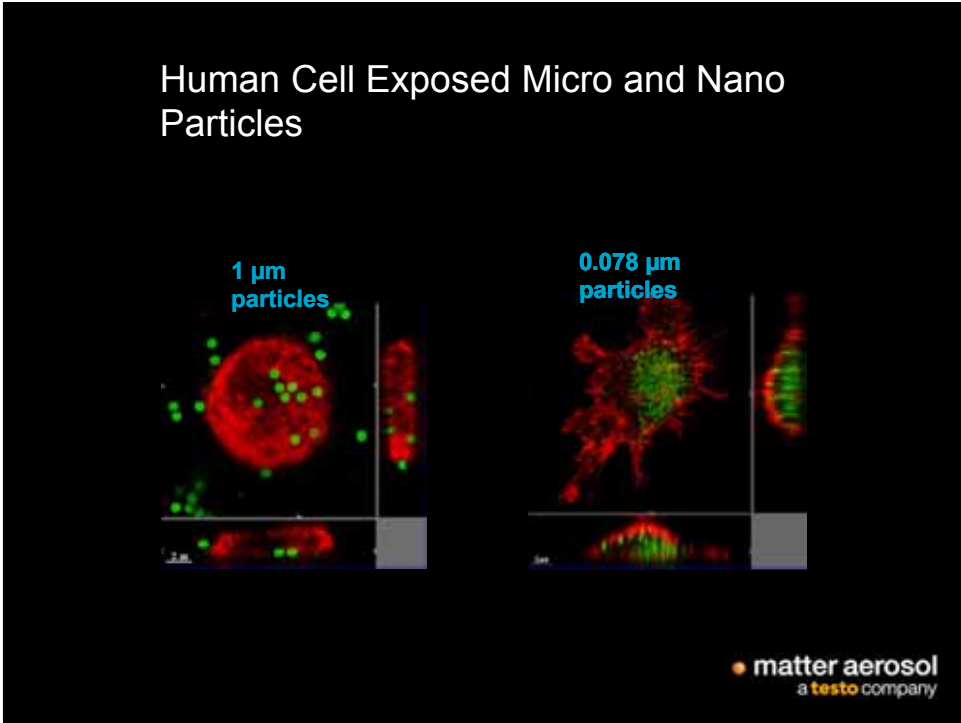
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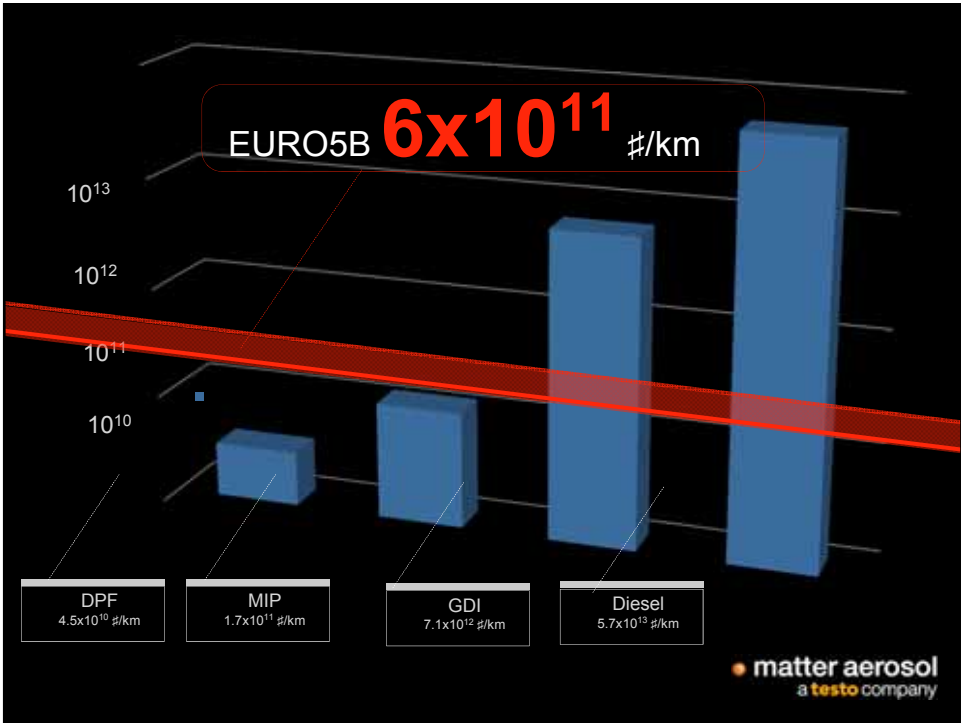
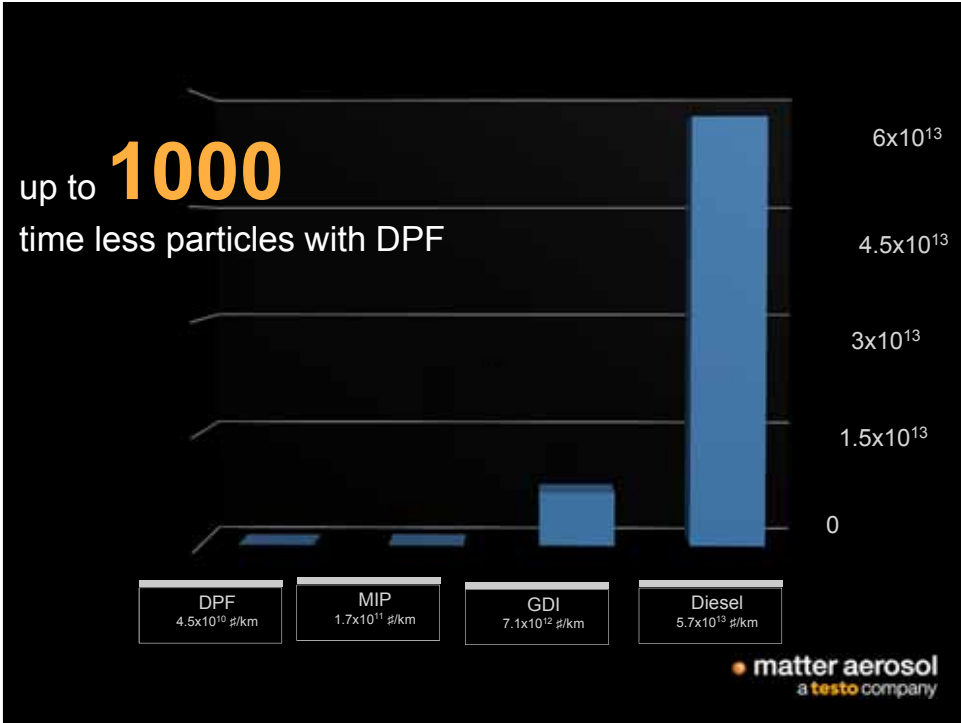
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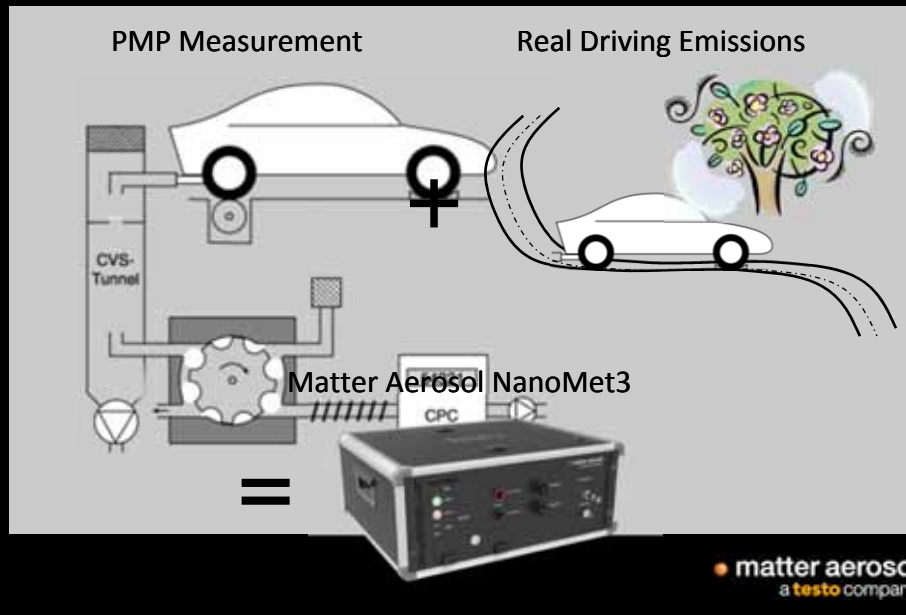
## Why are Nano Particle dangerous

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## 2017 European Commission's PEMS-PN approach



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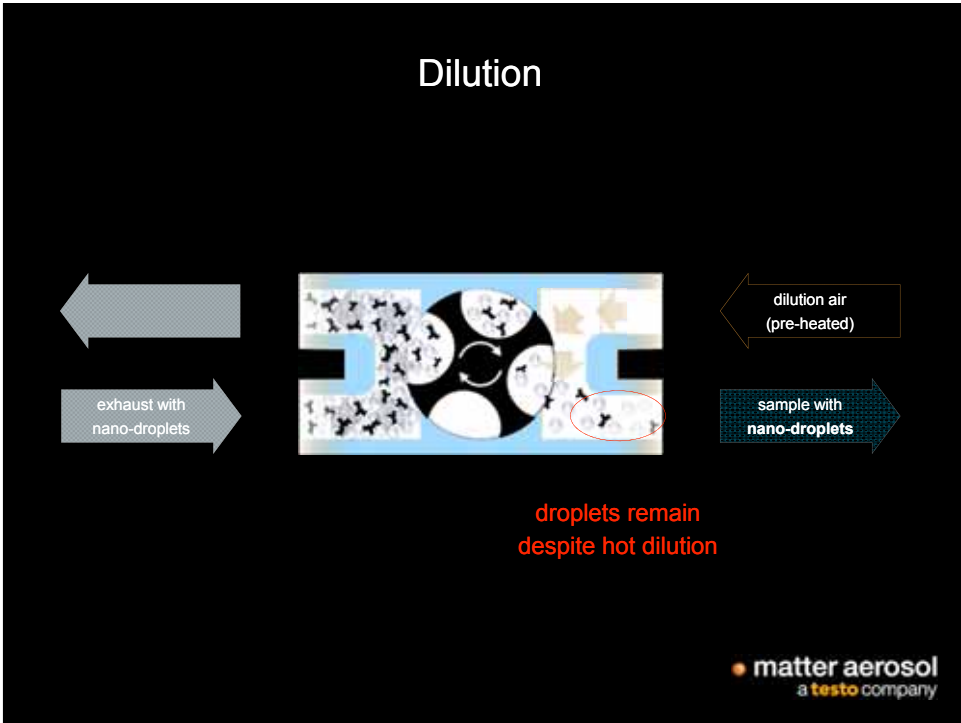
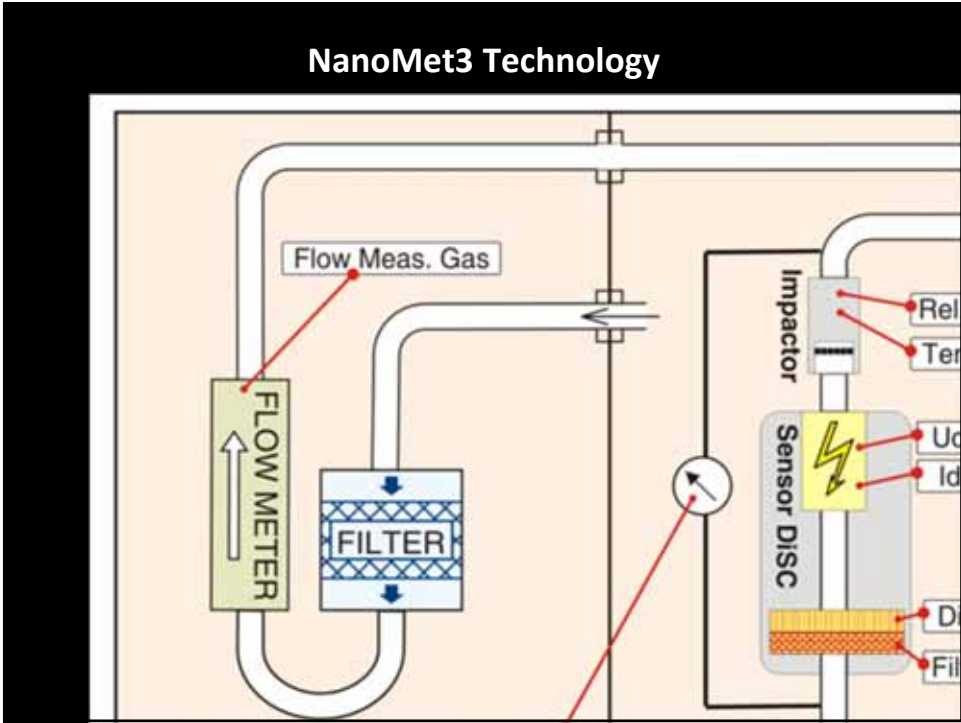
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### Combine Diluter+Heater to Remove Droplets from Aerosol Sample




The diagram shows a cross-section of a device. On the left, a chamber contains a mixture of large and small particles. A blue arrow labeled 'dilute' points to a central chamber where the particles are more dispersed. A yellow arrow labeled 'evaporate' points to a final chamber on the right where only the smallest particles remain, and larger droplets have been removed.

exhaust with nano-droplets → dilute → sample with nano-droplets → evaporate → only solid particles left

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### Particle Counting: Diffusion Size Classifier



The schematic shows a flow of particles through a series of stages: a flow inlet, a diffusion classifier, a detector, and an exhaust. Below the schematic is a graph with 'Particle concentration (1/cm³)' on the y-axis and 'Size (µm)' on the x-axis. The x-axis has markers at 0.1, 1.0, 10, and 1000. The graph shows a curve that peaks at approximately 0.1 µm and then decays as size increases. To the right is a handheld device labeled 'DSC1' with a screen and buttons.

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Measuring Data

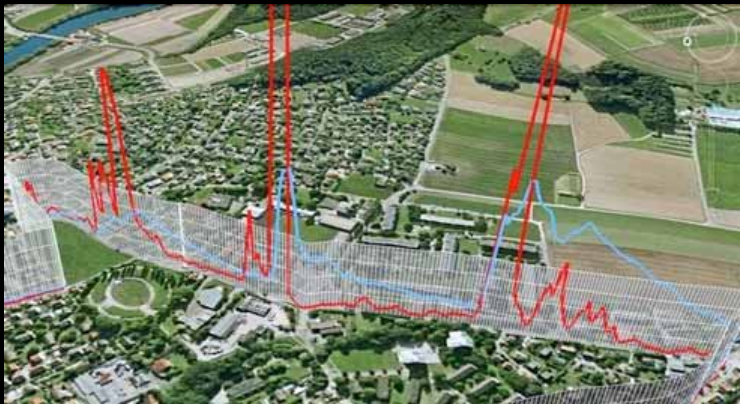
- Particle number concentration or [#s] with flow meter
- Average particle diameter [nm]
- Calculated particle mass [mg/m<sup>3</sup>]
- Lung deposition surface area [μm<sup>2</sup>/c]

NanoMet3



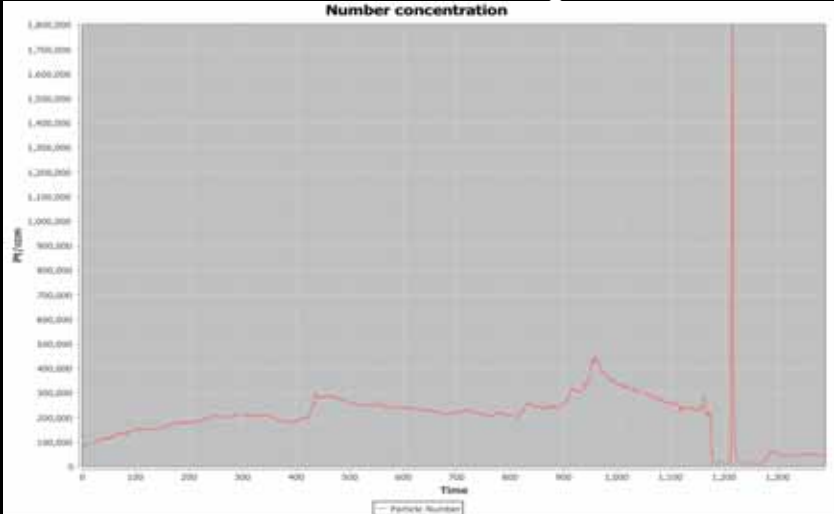


### On Road Particle Counting



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### Cabine Counting



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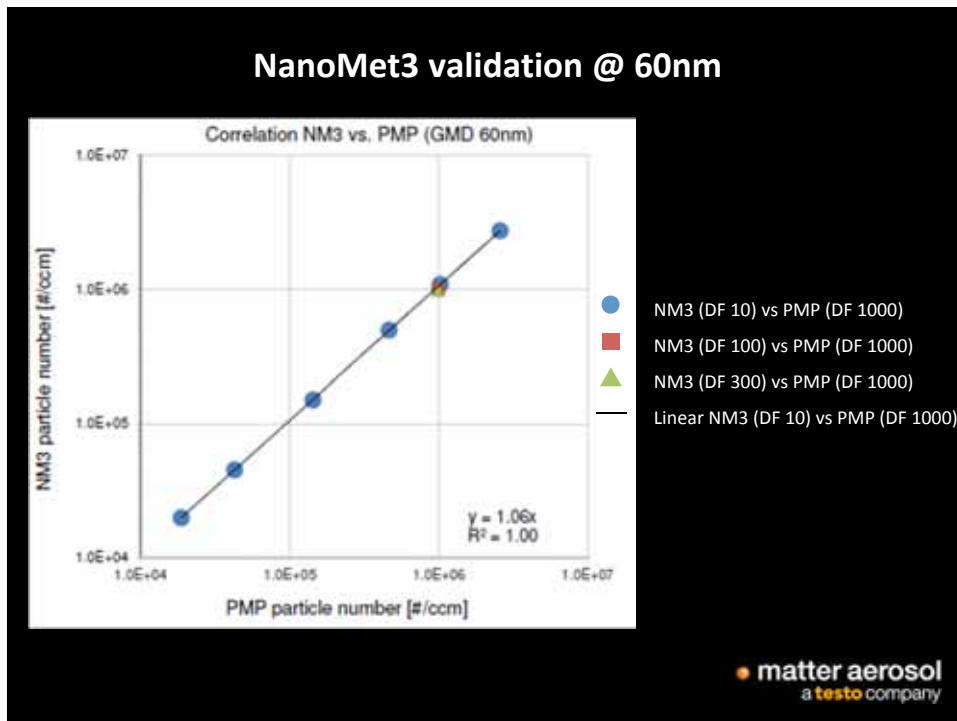
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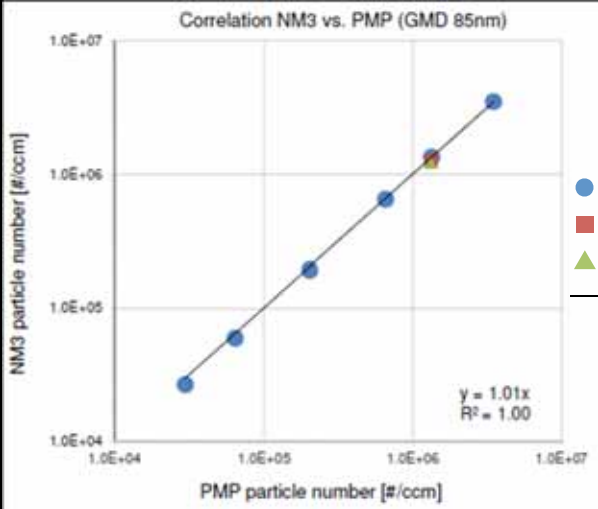
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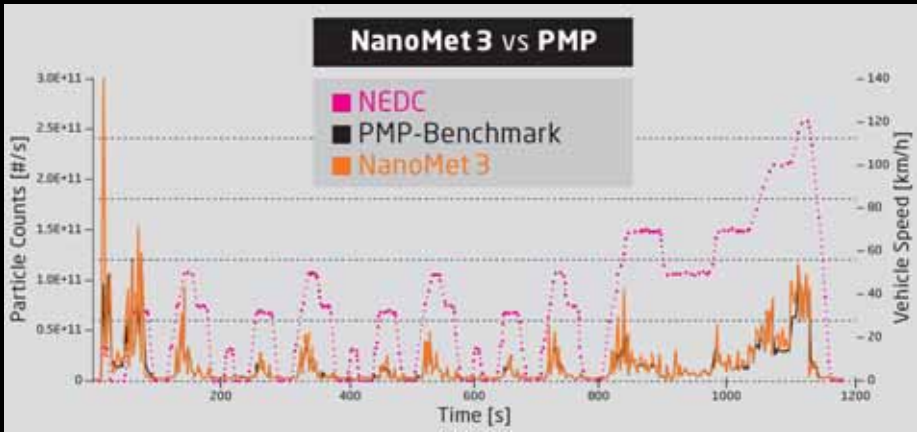


### NanoMet3 validation @ 85nm



- NM3 (DF 10) vs PMP (DF 1000)
- NM3 (DF 100) vs PMP (DF 1000)
- ▲ NM3 (DF 300) vs PMP (DF 1000)
- Linear NM3 (DF 10) vs PMP (DF 1000)

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<b>NanoMet3, DF=300</b>	<b>ECE: PN<sub>avg</sub>: 2 E+12 #/km,</b>	<b>EUDC: PN<sub>avg</sub>: 1.1 E+12 #/km,</b>
<b>Benchmark, DF=300 (20x15)</b>	<b>ECE: PN<sub>avg</sub>: 1,9 E+12 #/km</b>	<b>EUDC: PN<sub>vg</sub>: 1,2 E+12 #/km</b>

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