

LAPAZ - A New Approach to a Primary Standard for Particle Number Concentration



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Latex Aerosol Generator

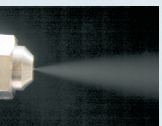
- Dispersion of certified Latex spheres
- Spheres diameters: 100 nm to 900 nm (to be enlarged)
- Concentration defined by dilution and liquid supply
- Homogenisation of an aerosol flow up to 50 l/min



Homogeniser: Diameter 30 cm; Length 5 m



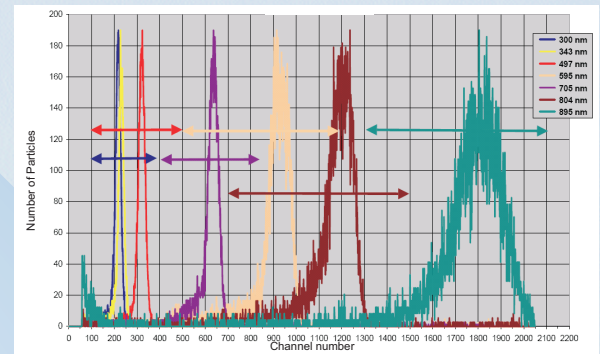
Supply of diluted suspension with Latex spheres to atomizer



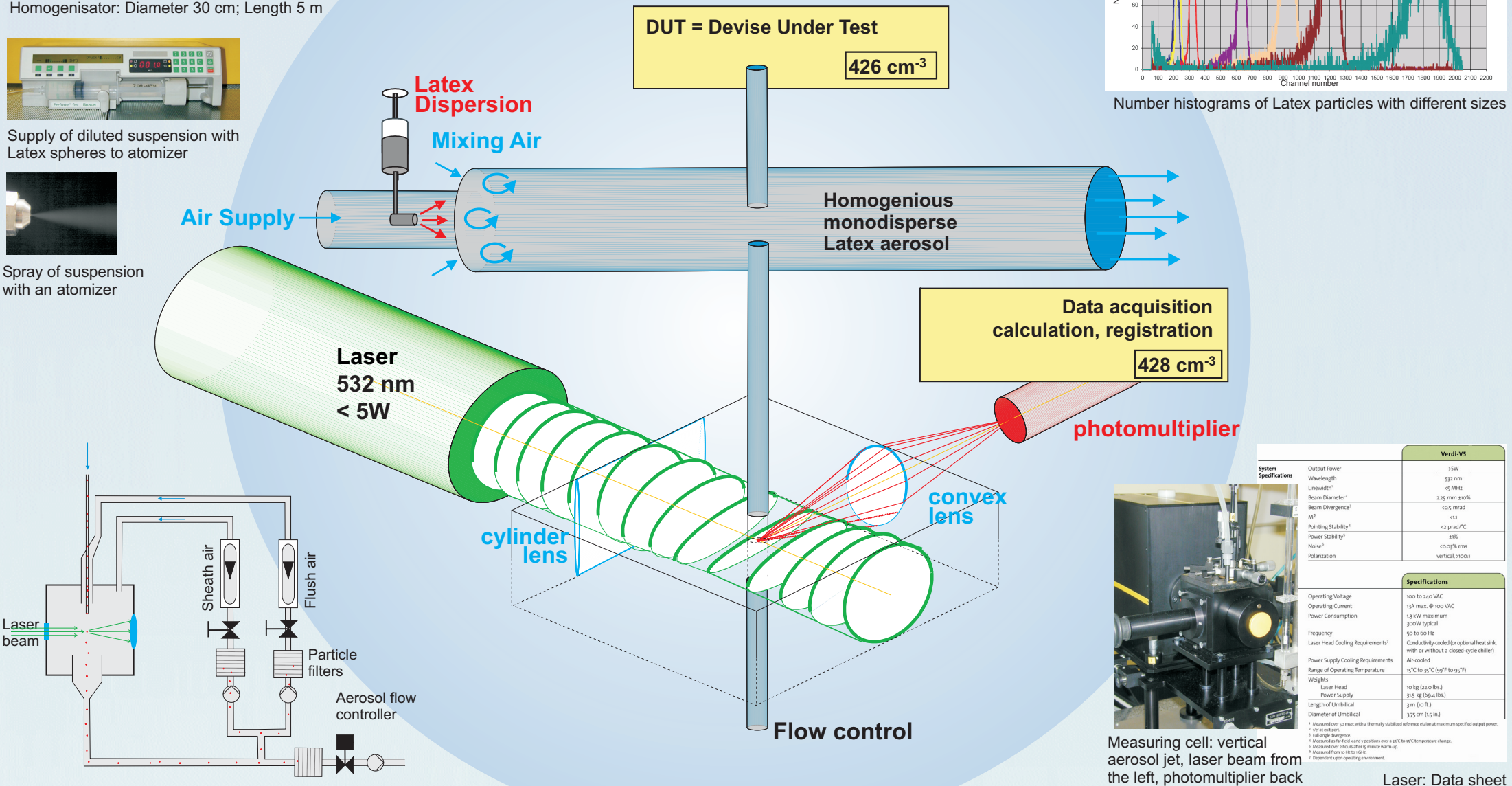
Spray of suspension with an atomizer

Generator control and data analysis

- A/D converter: 100 MHz digitizer, 8 MByte memory
- control and registration with LabView application
 - peak detection with peak duration 3 μs
 - peak analysis due to amplitude
 - amplitude histogram



Number histograms of Latex particles with different sizes



Gas flows in the measuring cell

- Aerosol flow: 16 ml/h (controlled with mass flow controller)
- Sheath air flow: 3 l/min (controlled with needle valve)
- Flush air flow: 6 l/min (controlled with needle valve)
- Free aerosol jet: diameter 0.1 mm, length ca. 10 mm

Calibration of following applications:

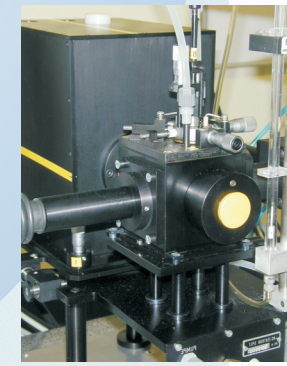
- Clean room particles
- Exhaust particles
- Ambient air particles

Uncertainties (coverage factor $k = 2$)

- < 10 % for diameters 100 to 900 nm
- < 15 % for concentrations < 1000 1/ml

System Specifications		Verdi-V5
Output Power		>5W
Wavelength		532 nm
Linearity		<5 MHz
Beam Diameter ¹		2.25 mm ±0.05
Beam Divergence ²		<0.5 mrad
M ²		<1.2
Pointing Stability ³		<2 μrad/°C
Power Stability ⁴		±1%
Noise ⁵		<0.05% rms
Polarization		vertical, >100:1

Specifications	
Operating Voltage	100 to 240 VAC
Operating Current	15A max. @ 100 VAC
Power Consumption	1.3 kW maximum 300W typical
Frequency	50 to 60 Hz
Laser Head Cooling Requirements ⁶	Conductivity cooled (or optional heat sink, with or without a closed-cycle chiller)
Power Supply Cooling Requirements	Air-cooled
Range of Operating Temperature	0°C to 35°C (32°F to 95°F)
Weights	
Laser Head	10 kg (22.0 lbs.)
Power Supply ⁷	35 kg (76.4 lbs.)
Length of Umbilical	3 m (10 ft.)
Diameter of Umbilical	375 cm (15 in.)



Measuring cell: vertical aerosol jet, laser beam from the left, photomultiplier back

Laser: Data sheet

Laser - Optics - Detection

- Light source: Solid state laser Coherent VERDI V5
- Beam collimation: horizontal 0.7 mm, vertical < 0.3 mm
- Detection angle: 90°, Opening ca. 45° (convex lens)
- Photomultiplier: Hamamatsu R1450, with ca. 450 V

