m e t a s

metrology and accreditation switzerland

LAPAZ – A Laser Particle Counter as a Primary Number Concentration Standard

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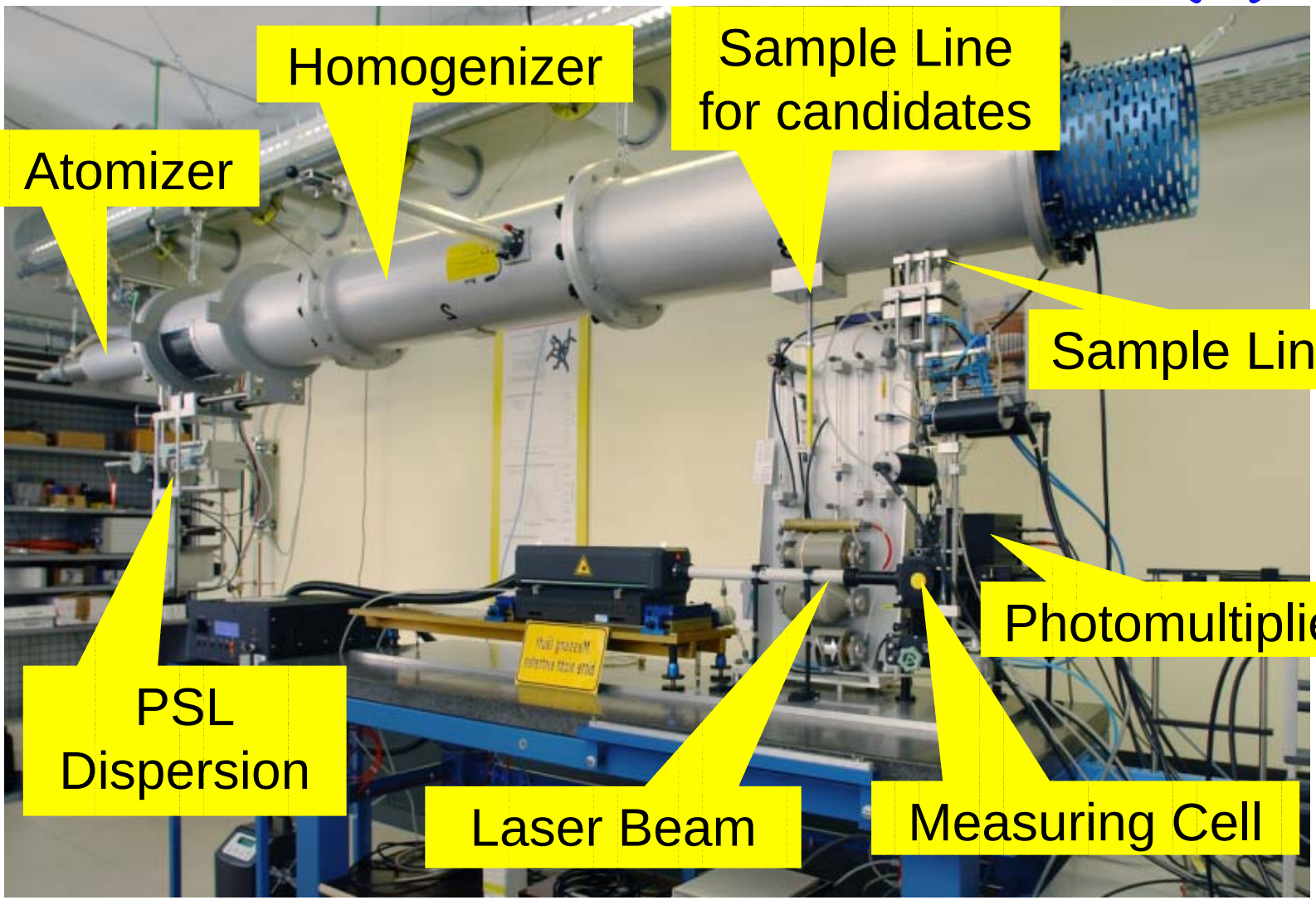
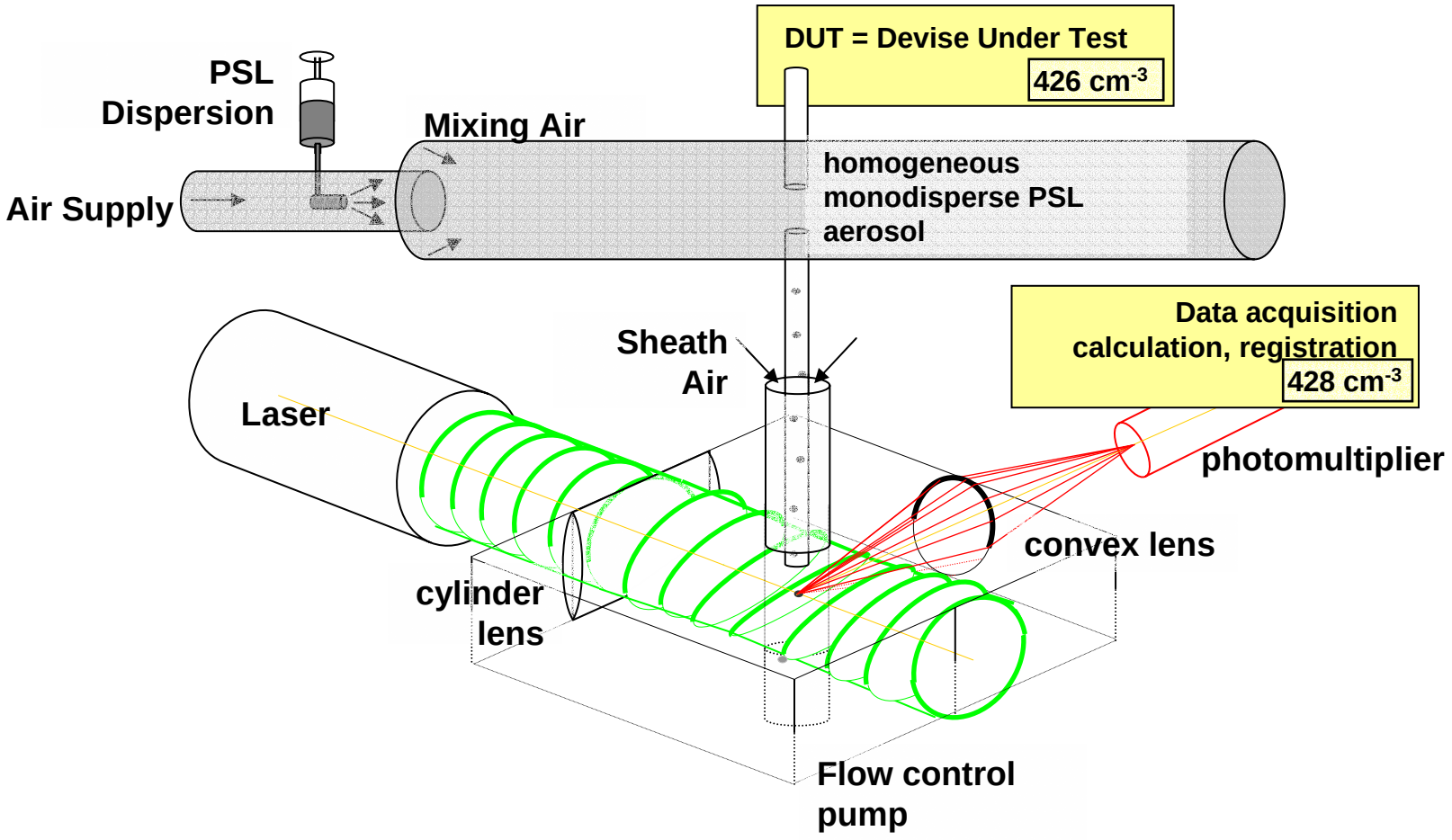
METAS - Main Fields of Activity

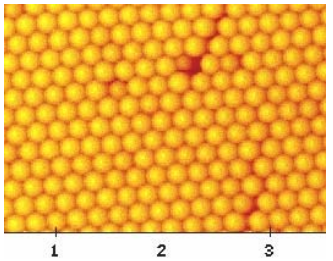
LAPAZ – Laser Particle Counter (1)



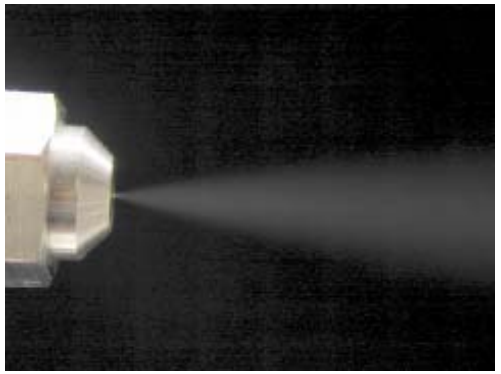
LAPAZ – Laser Particle Counter (2)



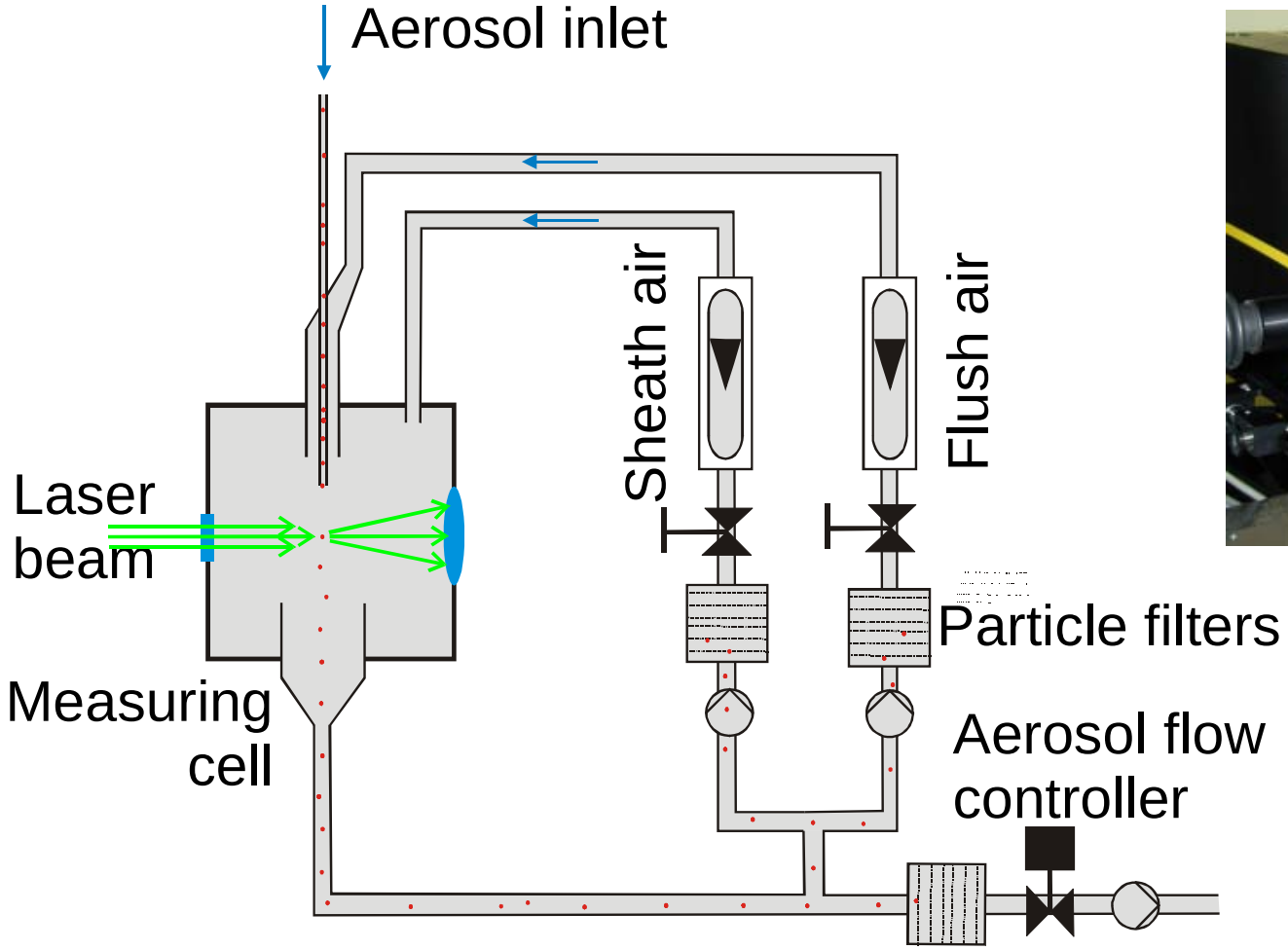
LAPAZ – Details: Generator



- Certified PSL: 100 to 900 nm
- Feed for suspension: 1 to 50 ml/h
- Concentration controlled by dilution and feed
- Concentration up to 100 Particles / cm^3
- Aerosol flow: 50 l/min

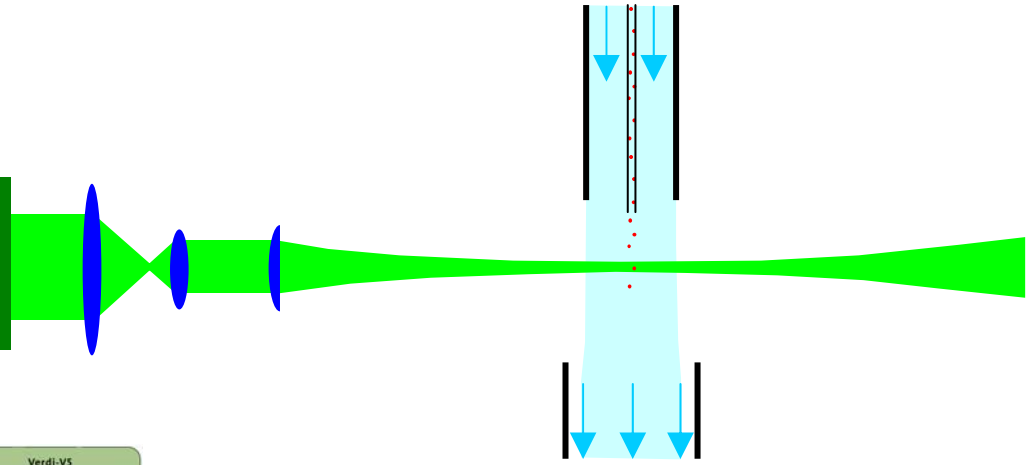


LAPAZ – Details: Flows



LAPAZ – Details: Optics

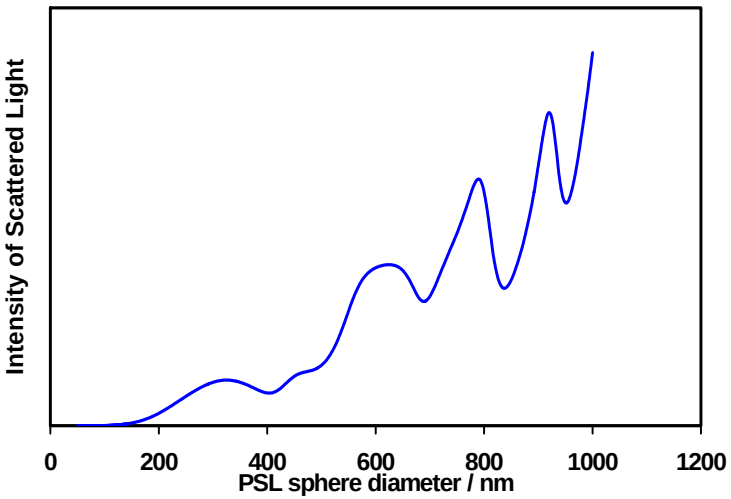
LASER
532 nm 5 W



		Verdi-V5
System Specifications	Output Power	>5W
	Wavelength	532 nm
	Linewidth[1]	<5 MHz
	Beam Diameter[2]	2.25 mm ±10%
	Beam Divergence[3]	<0.5 mrad
	M^2	<1.1
	Pointing Stability[4]	<2 µrad/°C
	Power Stability[5]	±1%
	Noise[6]	<0.03% rms
	Polarization	vertical, >100:1

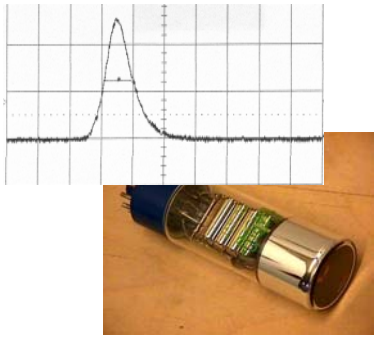
		Specifications
Utility and Environmental Requirements	Operating Voltage	100 to 240 VAC
	Operating Current	13A max. @ 100 VAC
	Power Consumption	1.3 kW maximum 300W typical
	Frequency	50 to 60 Hz
	Laser Head Cooling Requirements[7]	Conductivity-cooled (or optional heat sink, with or without a closed-cycle chiller)
	Power Supply Cooling Requirements	Air-cooled
	Range of Operating Temperature	15°C to 35°C (59°F to 95°F)
	Weights Laser Head Power Supply	 10 kg (22.0 lbs.) 31.5 kg (69.4 lbs.)
	Length of Umbilical	3 m (10 ft.)
	Diameter of Umbilical	3.75 cm (1.5 in.)

[1] Measured over 50 msec with a thermally stabilized reference etalon at maximum specified output power.
[2] 1/e² at exit port.
[3] Full-angle divergence.
[4] Measured as far field x and y positions over a 25°C to 35°C temperature change.
[5] Measured over 2 hours after 15 minute warm-up.
[6] Measured from 10 Hz to 1 GHz.
[7] Dependent upon operating environment.



LAPAZ – Details: Detection Principle

Photodetector: Signal of scattered light

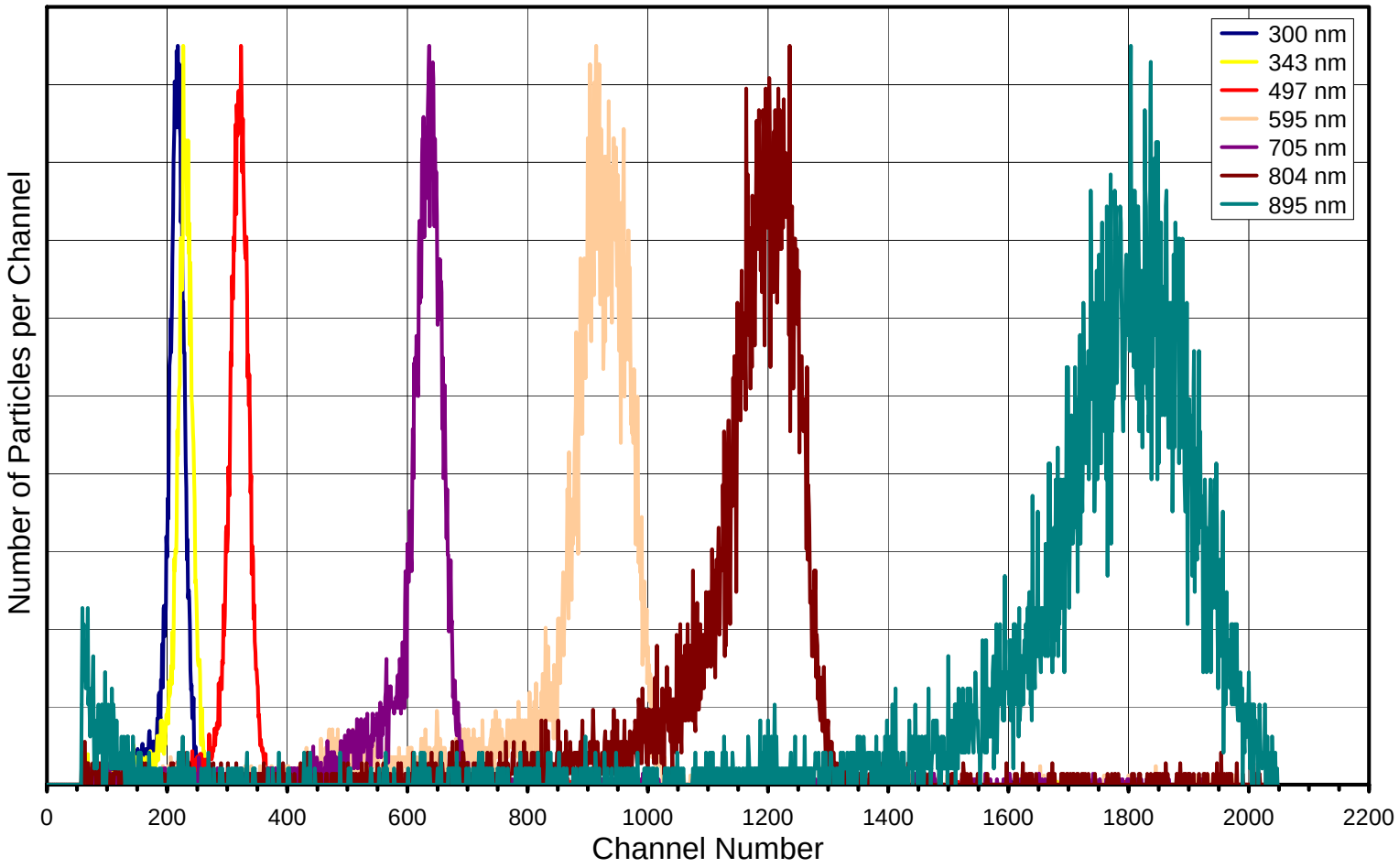


Digitizer: 100 MHz registration

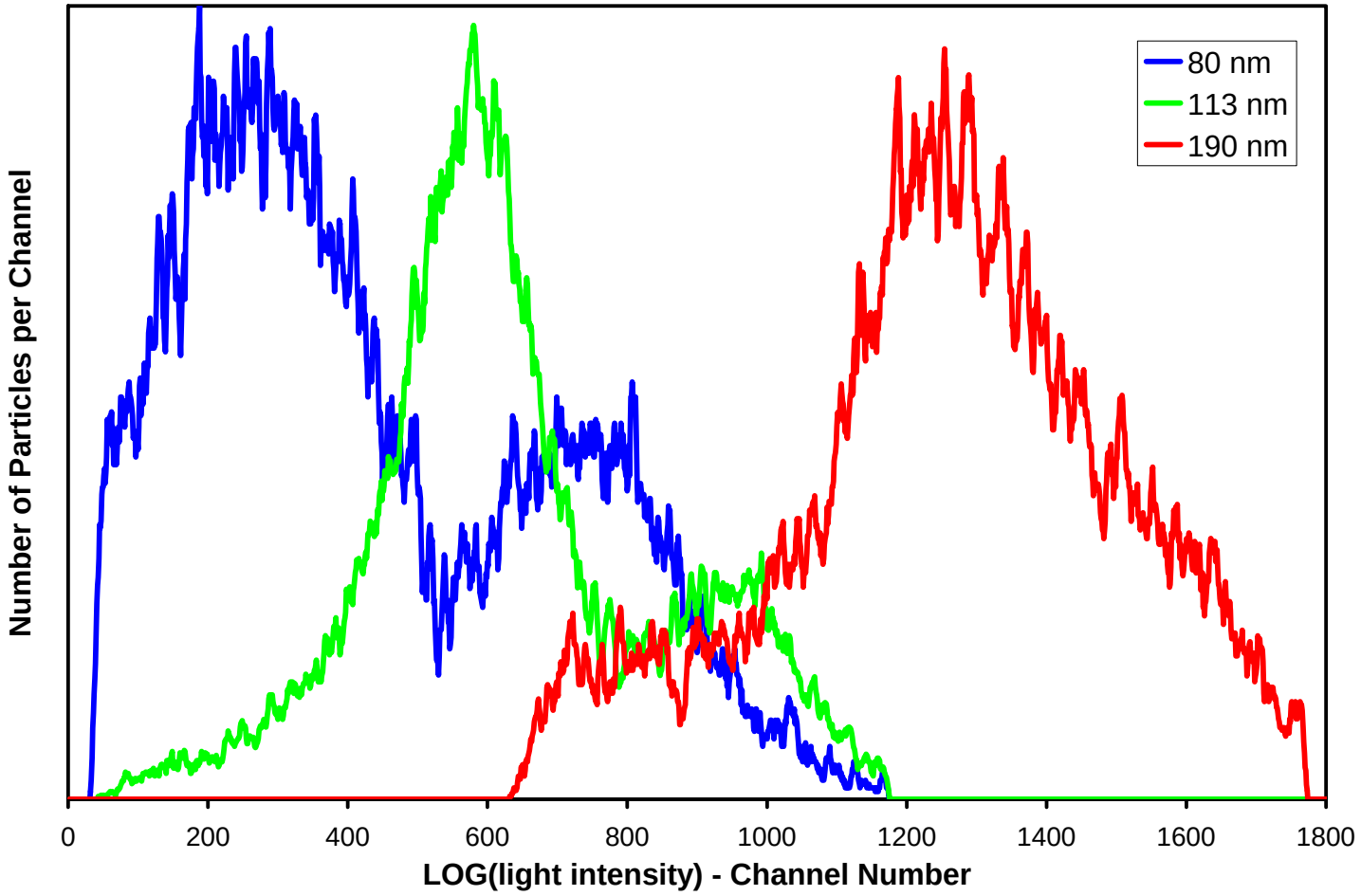
Controller: particle rate flow rate

Analyser: Histogram of amplitudes

Analysis (PSL)



Analysis (Combustion Particles)



Uncertainties (coverage factor k = 2)

Particle measurement of PSL particles:

- < 10 % for diameters 100 to 900 nm
- < 15 % for concentrations < 1000 cm^{-3}

Particle measurement of combustion particles:

- No information of size
- Counting not yet validated

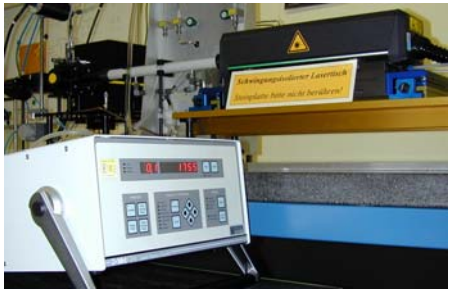
Applications of LAPAZ

Calibration of instruments for:

- Clean room particles
- Ambient air particles
- Exhaust particles

Validation of other particle number counters:

- Condensation Particle Counters



Primary Standard (Definition)

standard that is designated or widely acknowledged as having the highest metrological qualities and whose value is accepted without reference to other standards of the same quality.

International Vocabulary of Basics and Terms in Metrology (VIM)
Section 6.4

Calibration for Particle Concentration