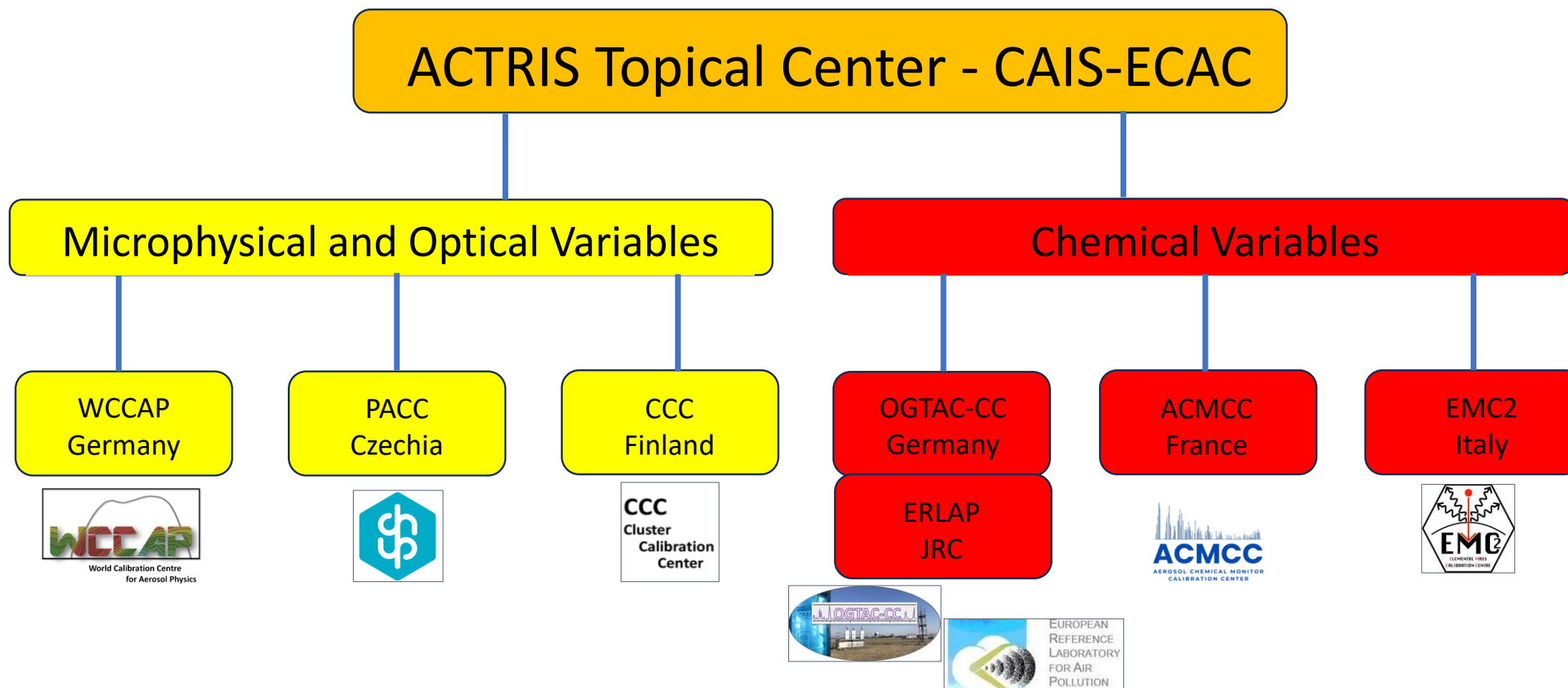


Quality Assurance and Control for New AQ Aerosol Pollutants

Alfred Wiedensohler
Director ACTRIS –CAIS-ECAC

ACTRIS - Center for Aerosol In-Situ Measurements – European Center for Aerosol Calibration & Characterization



ACTRIS - Aerosol In-Situ Variables

Microphysical:

Particle Number Concentration > 10nm

→ EU Air Quality Directive

Nano Particle Number Concentration < 10nm

Particle Number Size Distribution 10-800nm (mobility diameter)

→ EU Air Quality Directive

Nano Particle Number Size Distribution < 10nm

Particle Number Size Distribution > 800nm (aerodynamic diameter)

Cloud Condensation Nuclei Number Concentration

Optical:

Multi-Wavelength Particle Light Scattering and Backscattering Coefficient

Particle Light Absorption Coefficient & equivalent Black carbon

→ EU Air Quality Directive

Chemical:

Mass Concentration of Non-Refractive Particulate Organics and Inorganics

Mass Concentration of Organic Tracers

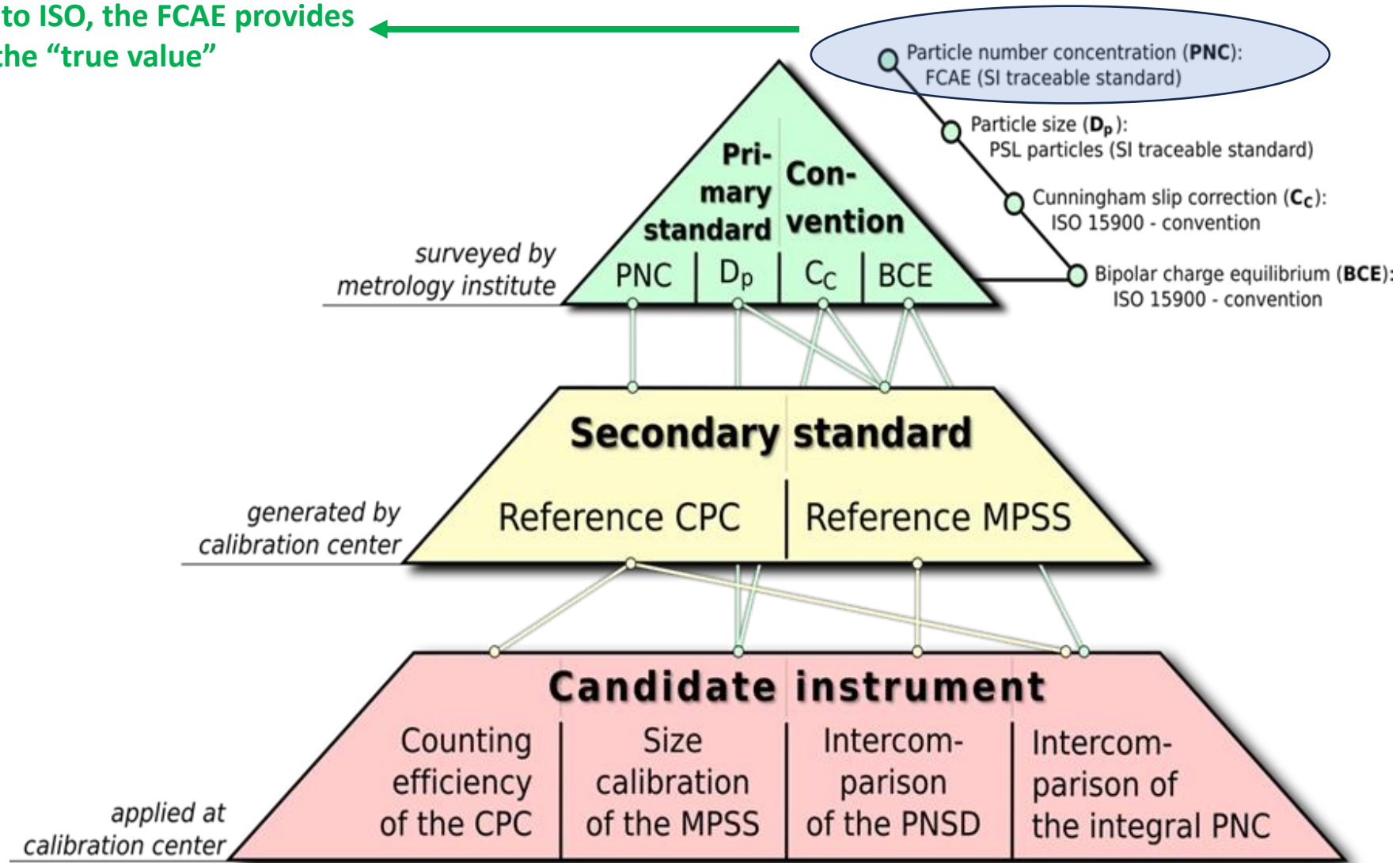
Mass Concentration of Organic and Elemental Carbon

Mass Concentration of Particulate Elements

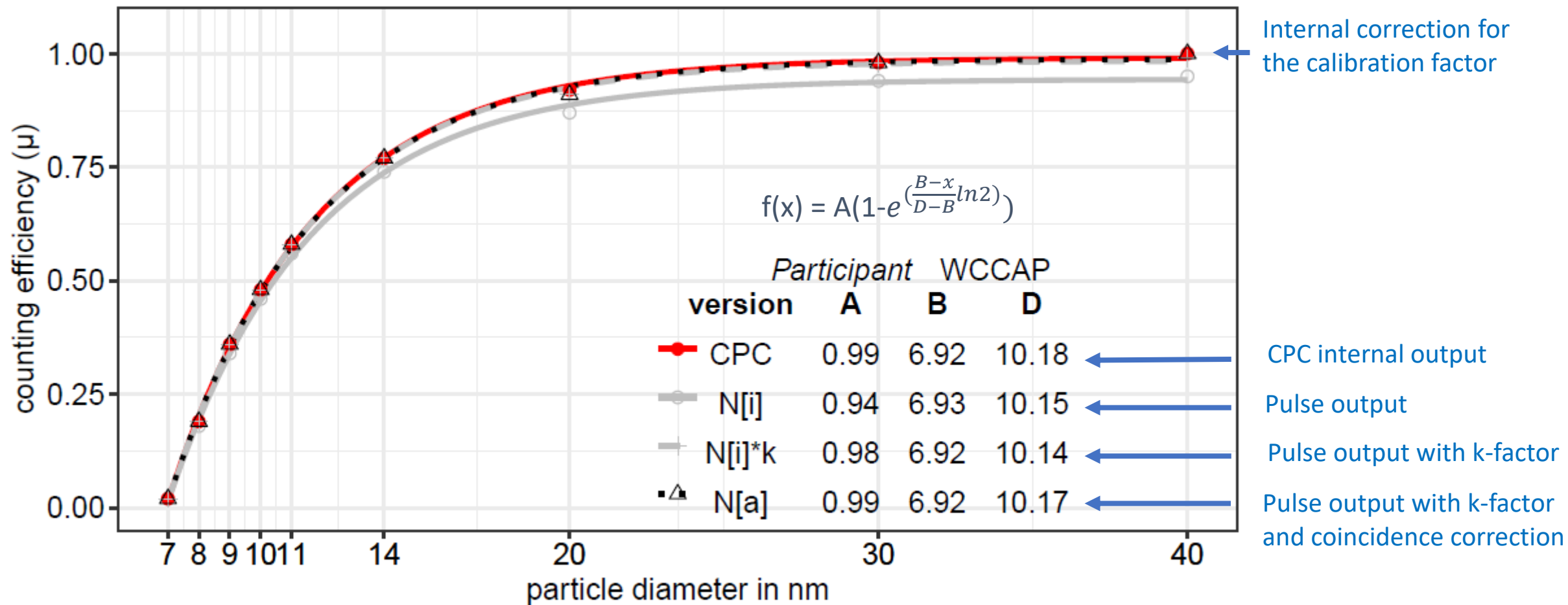
Minimum five variables: The four obligatory variables (green) + at least one additional variable

Traceability Scheme for Particle Number Concentration

According to ISO, the FCAE provides the “true value”

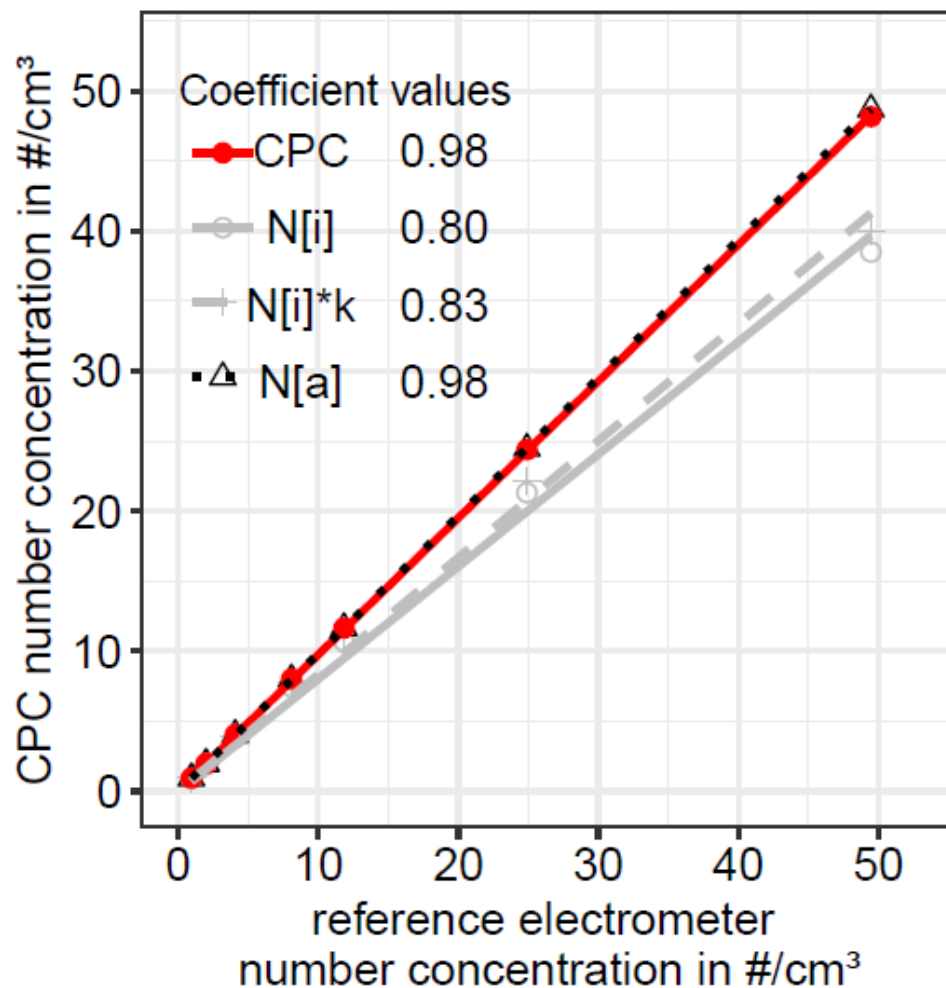


CPC Calibration – Detection Efficiency Curve



Example of a CPC Calibration – Linearity

Example TSI CPC 3750-10



$$N_a = k \left(\frac{1}{c^2} \left(\frac{1}{N_i} - c \right) - \sqrt{\left(\frac{1}{c^2} \left(\frac{1}{N_i} - c \right) \right)^2 - \frac{2}{c^2}} \right)$$

N_a = corrected concentrations (particles/cm³)

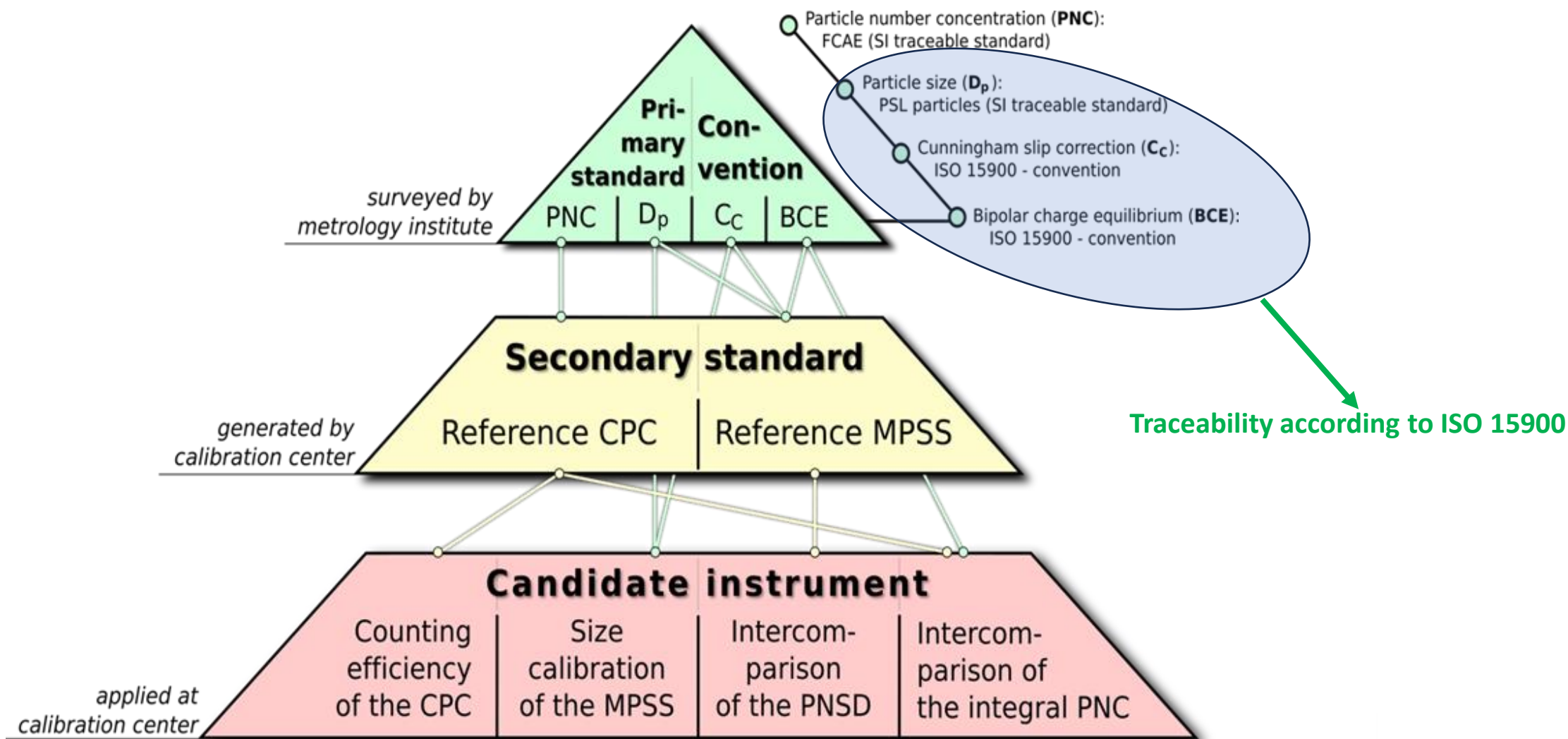
N_i = pulse concentrations (particles/cm³)

k = k-factor: 1.04 for TSI CPC model 3750-10

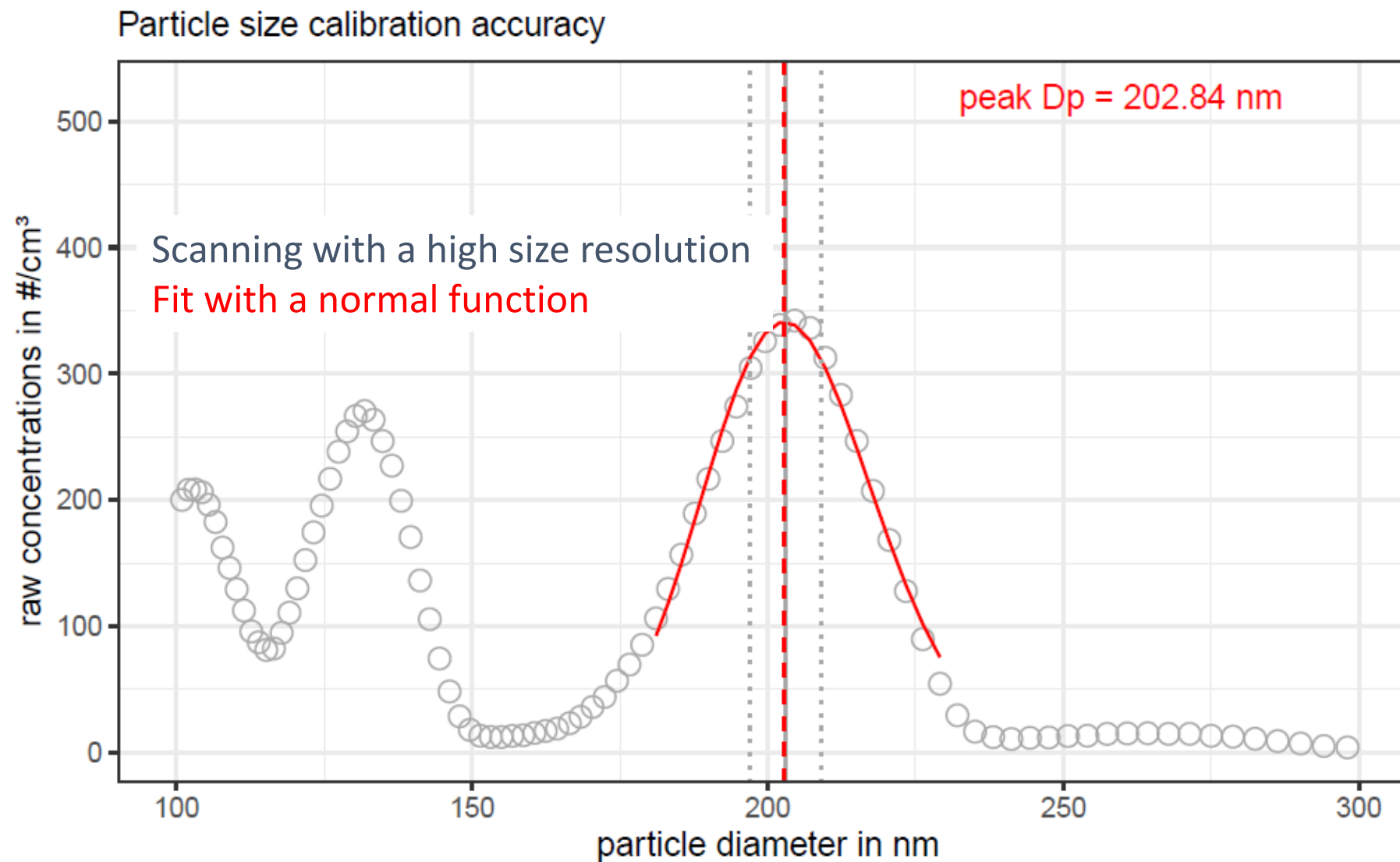
c = coincidence parameter: $4.2e^{-06}$

Example: TSI CPC model-specific parameter

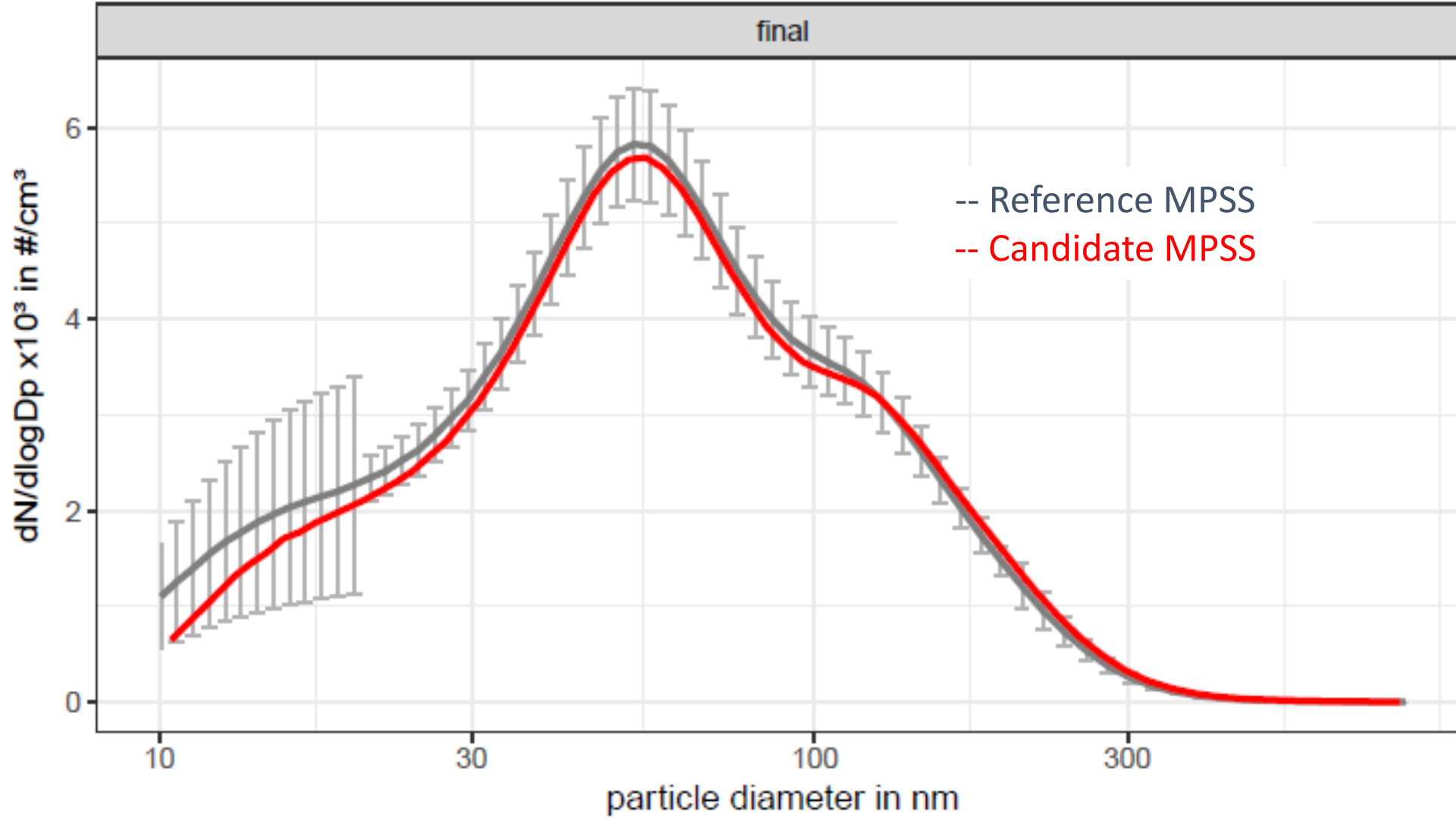
Traceability Scheme for Particle Number Size Distribution



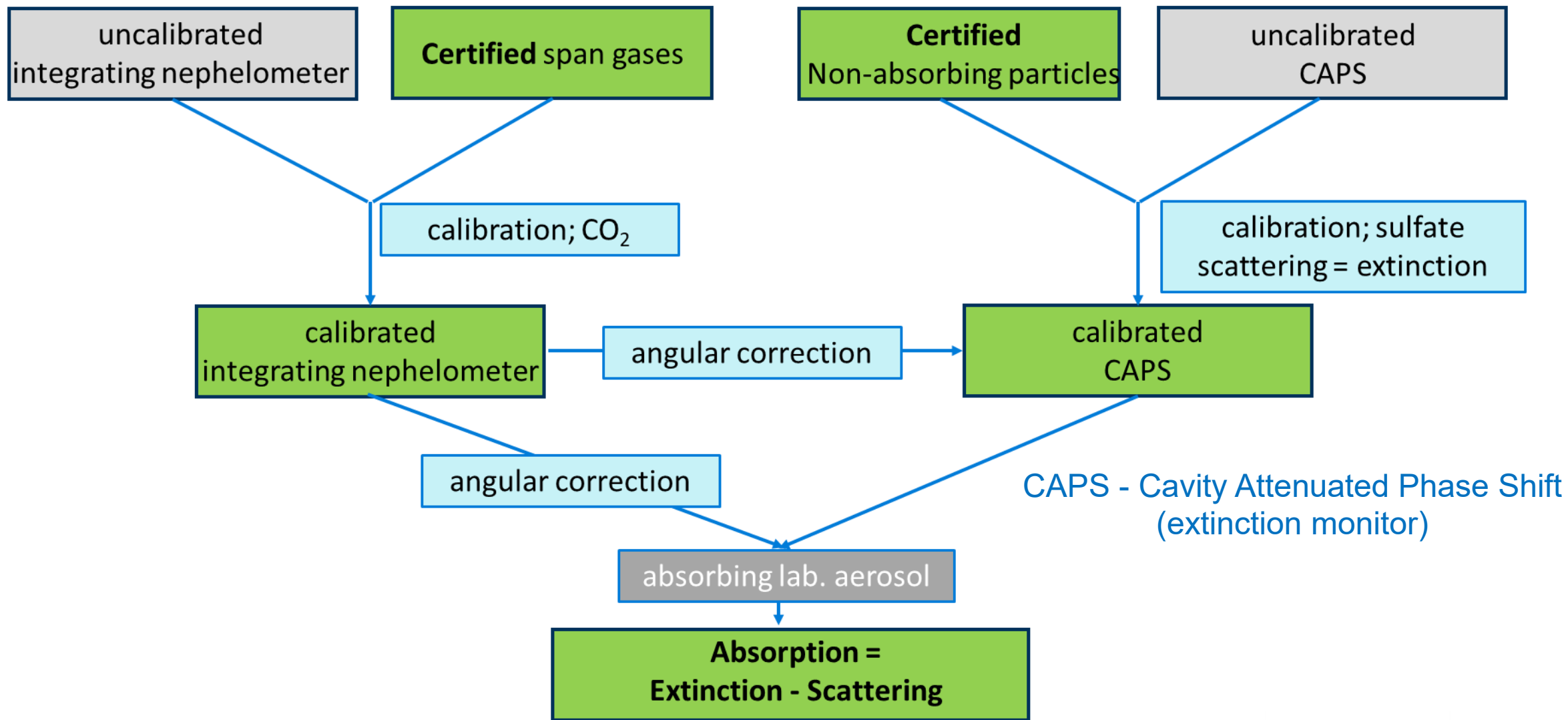
MPSS Calibration – PSL Sizing - 203 nm



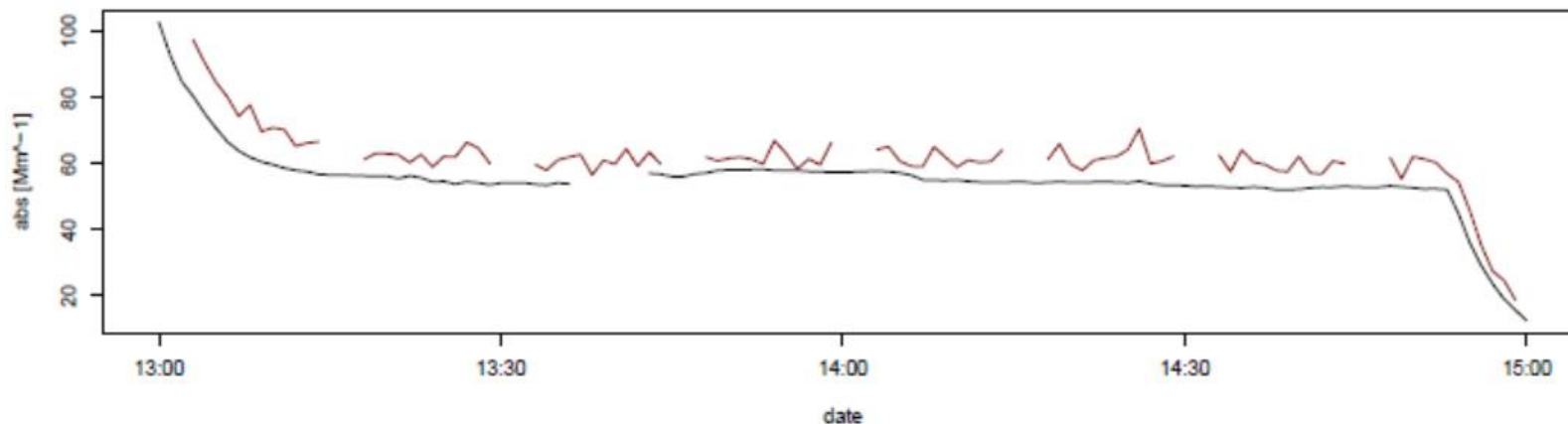
MPSS Calibration – Final Calibration – Number Size Distribution



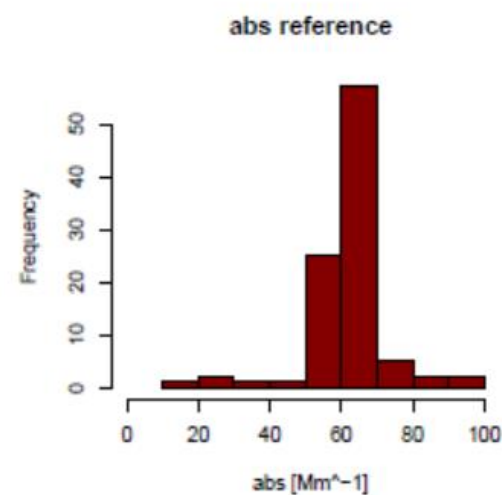
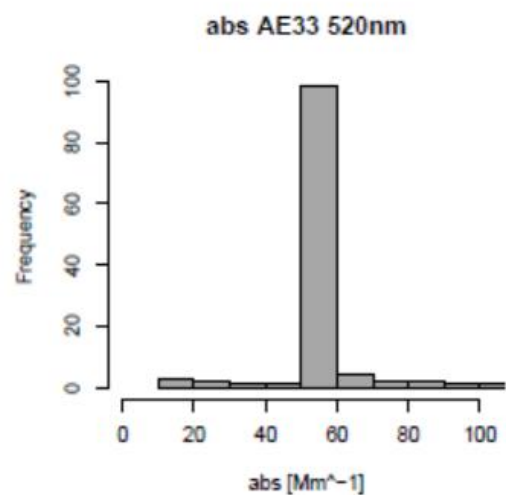
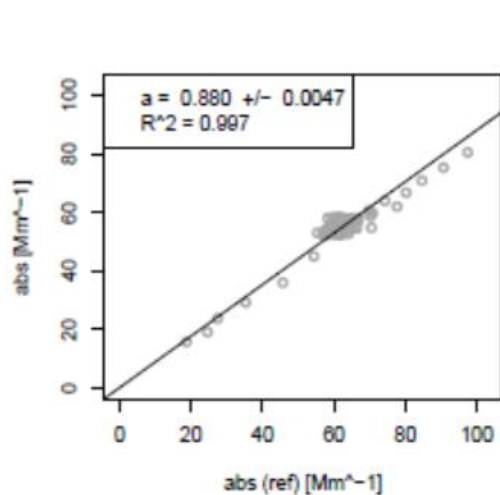
Traceability Scheme for Particle Absorption & Black Carbon



Calibration of the AE33 against the Reference Setup



Wavelength (nm)	Slope	Error	R ²
470	0.881	0.008	0.993
520	0.880	0.005	0.997
660	0.880	0.004	0.998



Implementation of UFP and Black Carbon Monitoring

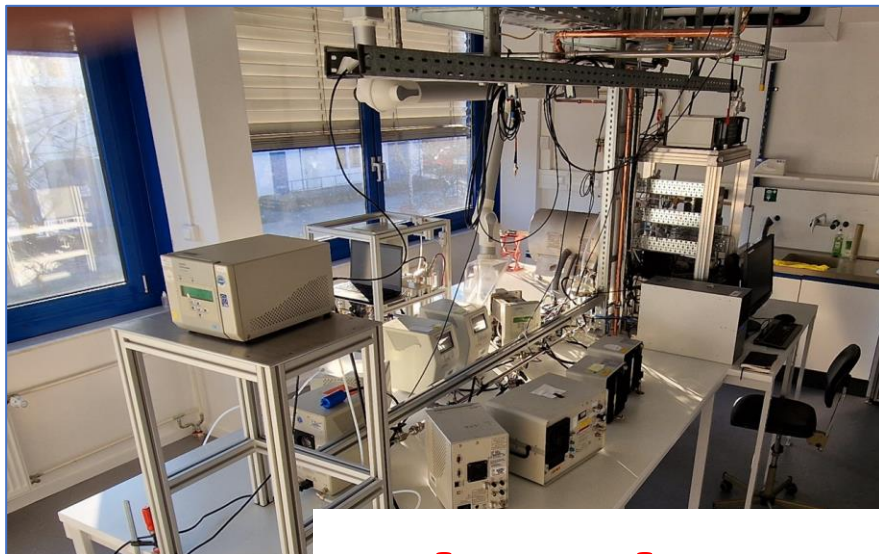
Currently, there are no specific calibration facilities for ultrafine particle and equivalent black carbon in AQUILA.

ACTRIS hosts two calibration laboratories for microphysical (UFP) variables and only one for equivalent black carbon.

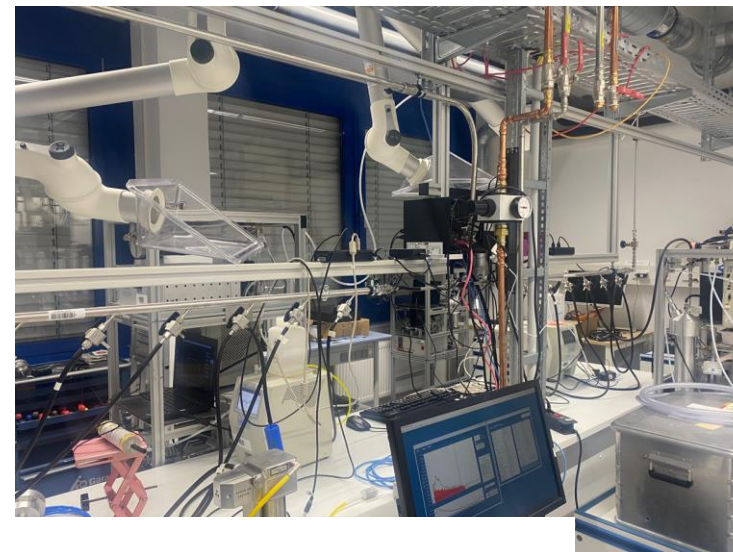
The challenge is to implement additional calibration facilities beside the ones in ACTRIS.

New calibration facilities need large investments and capacity building from ACTRIS across Europe.

ACTRIS Calibration Laboratories – WCCAP & PACC



CPC & CCNC labs



MPSS lab

Thank You for Your Attention



Coarse Particle lab



Optics lab