

- **Advantages**

- ⊗ large size range
- ⊗ low cost
- ⊗ fractionation
- ⊗ simple handling
- ⊗ sieving tower with up to 16 sieves

- **Disadvantages**

- ⊗ careful cleaning
- ⊗ errors caused by needle shaped particles
- ⊗ errors get larger with low sample weight
- ⊗ sieving losses

Particle Size Analysis

Sieve Shaker „analysette 3“ PRO

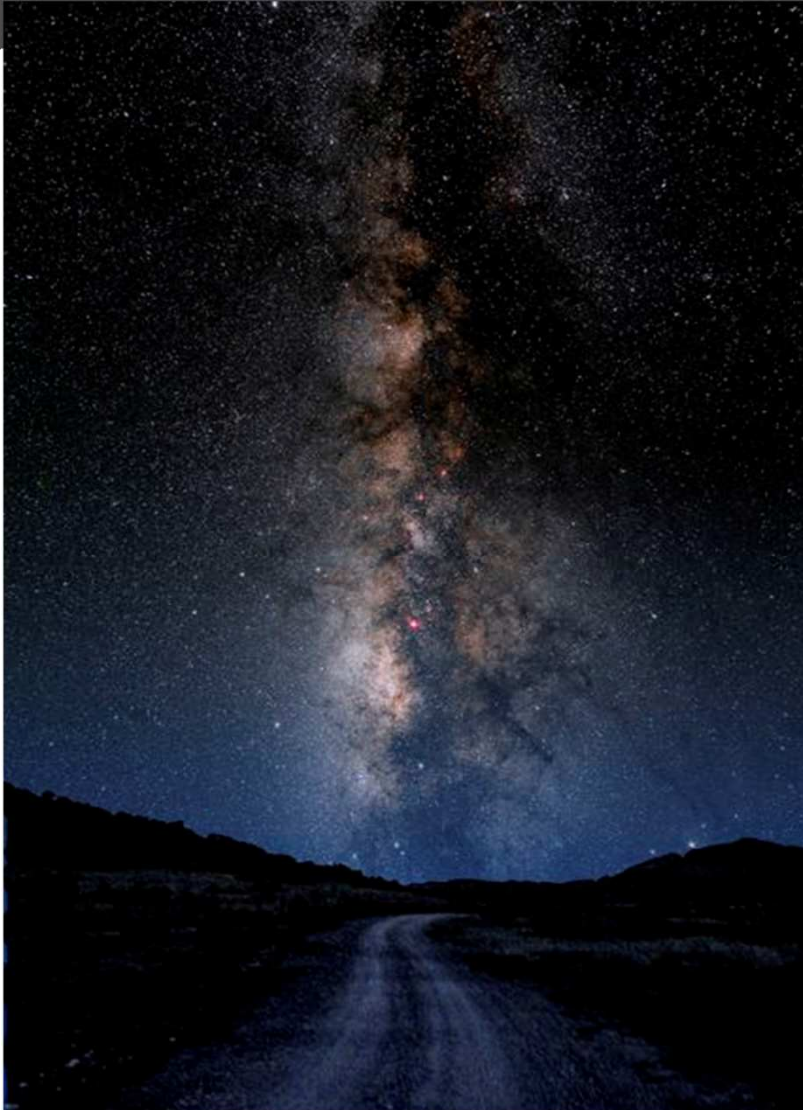


- **AMPCONTROL - rated amplitude**
- **Digital display of actual amplitude and sieve vibrations per second**
- **Up to 9 sieve programmes which can be saved and recalled**
- **Test equipment inspection in accordance with ISO 9001 (Sieve shaker can be calibrated as a testing instrument)**
- **Auto-validation of the sieving process via RS232 and AUTOSIEVE for Windows**

Heavy Duty Sieve Shaker ANALYSETTE 18



- large sieve material throughput
- sieve diameter up to 450mm can be used
- sieves with mesh widths of 63 μm to 125 mm
- material quantity up to 6 kg
- smooth and stable operation
- low noise output
- continuous operation possible



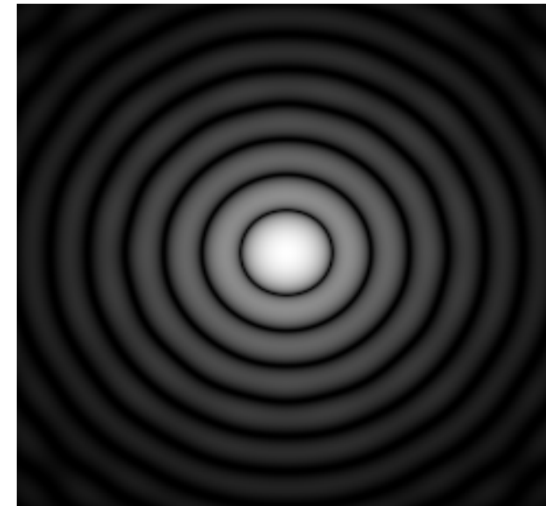
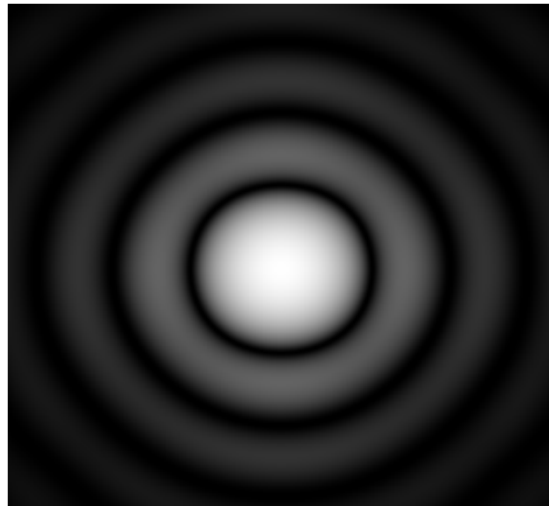
ANALYSETTE 22

Laser Particle Sizer

Since 25 Years

➤ Illuminating particles with light produces diffraction rings.

➤ The size of the rings correspond with size of particle.



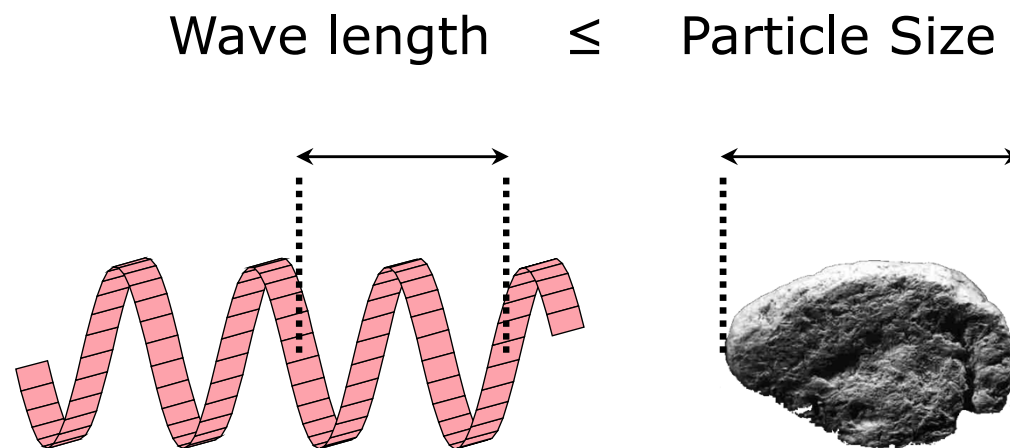
Small particles → wide rings
Large particles → narrow rings

Two different theories:

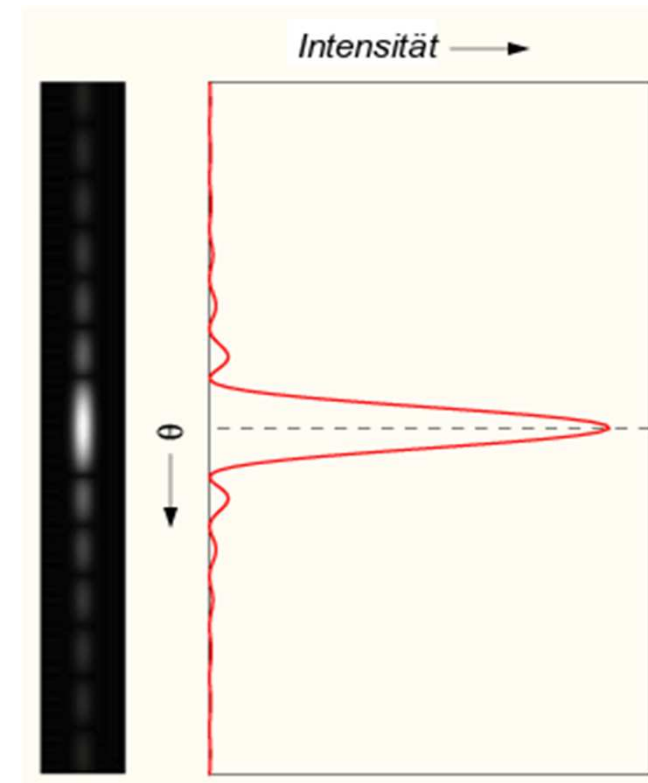
- ① Fraunhofer Diffraction (**large particles**)
- ① Mie Scattering (**large and small particles**)



If light wave hits a **large** particle **diffraction** is observed

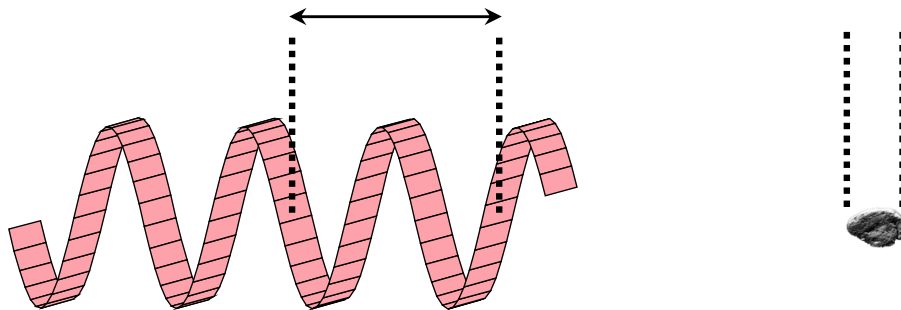


Fraunhofer Theory

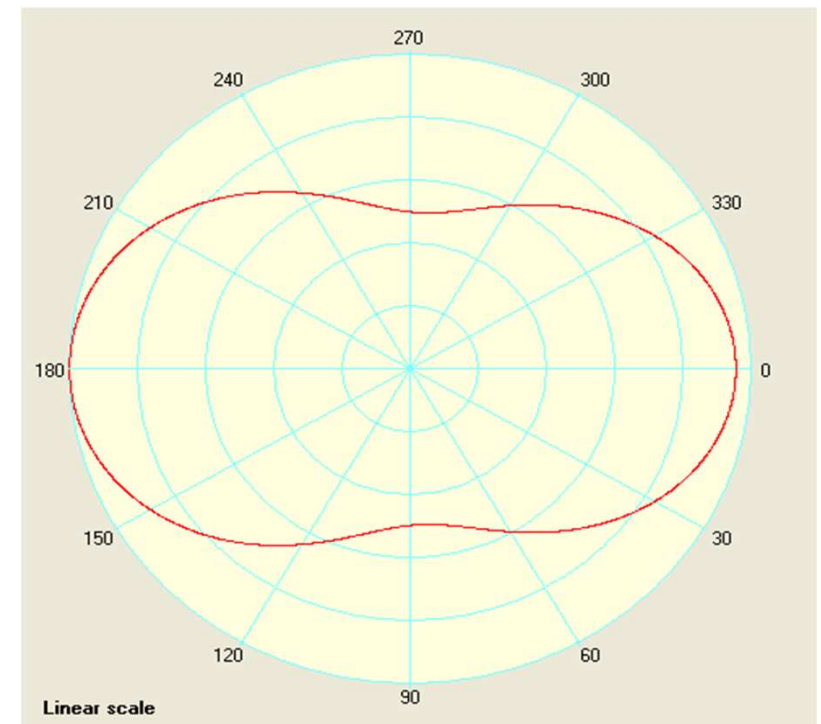


If light wave hits a **small** particle **scattering** is observed

Wave length \geq Particle Size



Mie Theory



More light is scattered in the backward direction than in the forward direction

Fraunhofer Diffraction

- ④ Valid only for larger Particles
(Diameter $> 0.1 \dots \approx 2 \mu\text{m}$, depending on Particle Material)
- ④ Does not require Optical Constants of Material

Mie Scattering

- ④ Valid also for very small Particles
(below $0.1 \mu\text{m}$, depending on Particle Material)
- ④ Does require Optical Constants of Material
(Refractive Index and Absorption Index)
- ④ Wrong Optical Constants will influence Result dramatically
- ④ Valid only for spherical Particles
(other Particle Shapes will influence Result significantly)

NanoTec



0.01 – 1000 (2000) μm
Up to more than 500 detector channels

MicroTec plus



0.08 – 2000 μm
Up to 108 detector channels

- **Wet Dispersion Unit:**

- ⊗ Suitable for water and most other liquids like isopropanol ...
- ⊗ Variable volume, selectable by software:
 - ⊗ 300ml, 400ml, 500ml
- ⊗ Measurement Cell in Cartridge-like design -> easy to change!
- ⊗ Measurement Cell has same glasses as Cell of A22 NanoTec
- ⊗ Variable Ultrasonic
- ⊗ No Stirrer
- ⊗ Very powerful Pump, Motor above US bath

- **Measurement Unit**

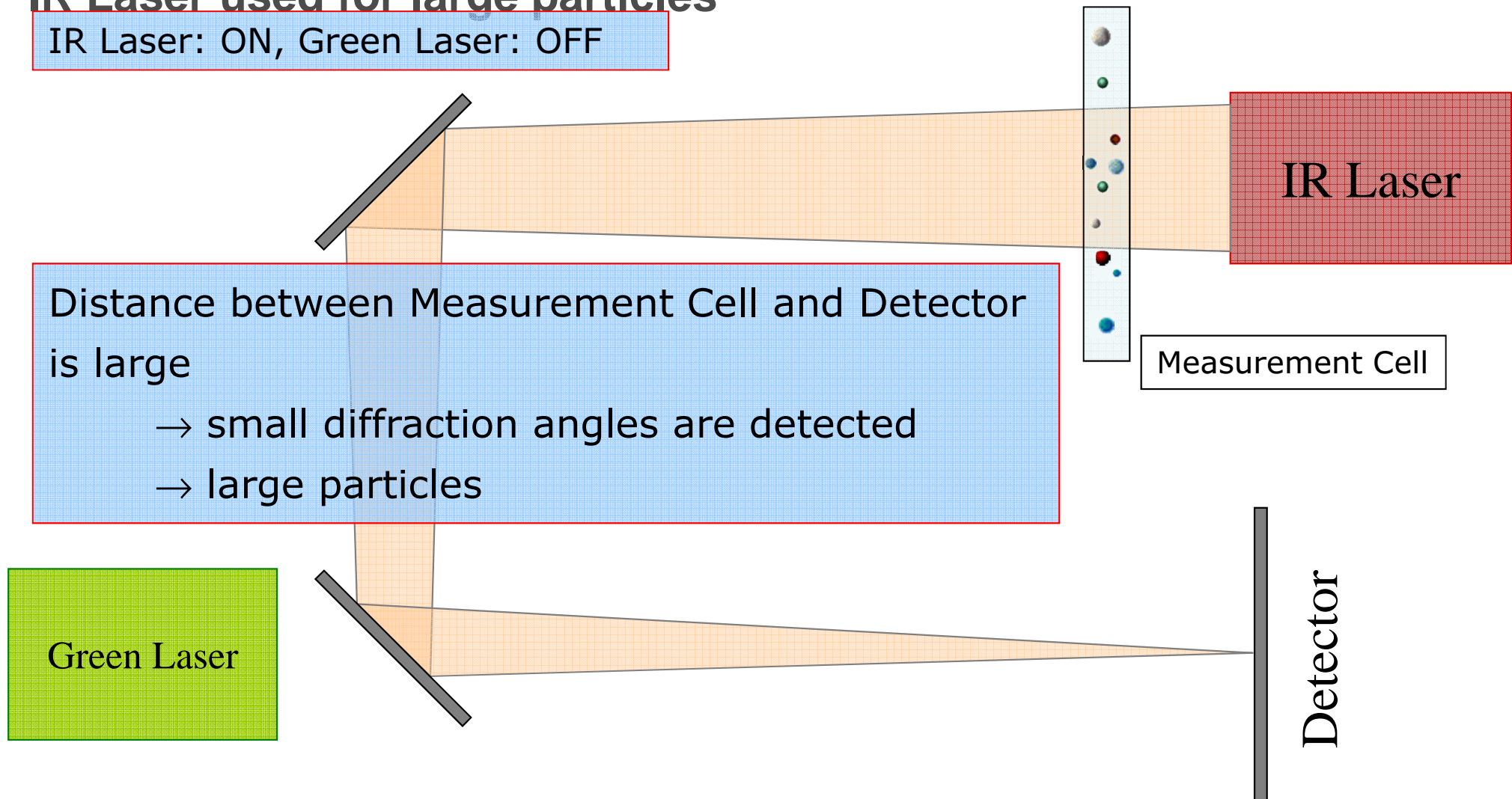
- ⊗ Two Lasers: Green (532nm) and Infrared (ca. 940nm)
- ⊗ Bended Optical System
- ⊗ Only 2 Measurement Positions
- ⊗ Same Detector as NanoTec
- ⊗ Time between Meas.Positions
ca. 10 sec.
- ⊗ Very fast automatic
beam alignment

MicroTec plus optical setup



IR Laser used for large particles

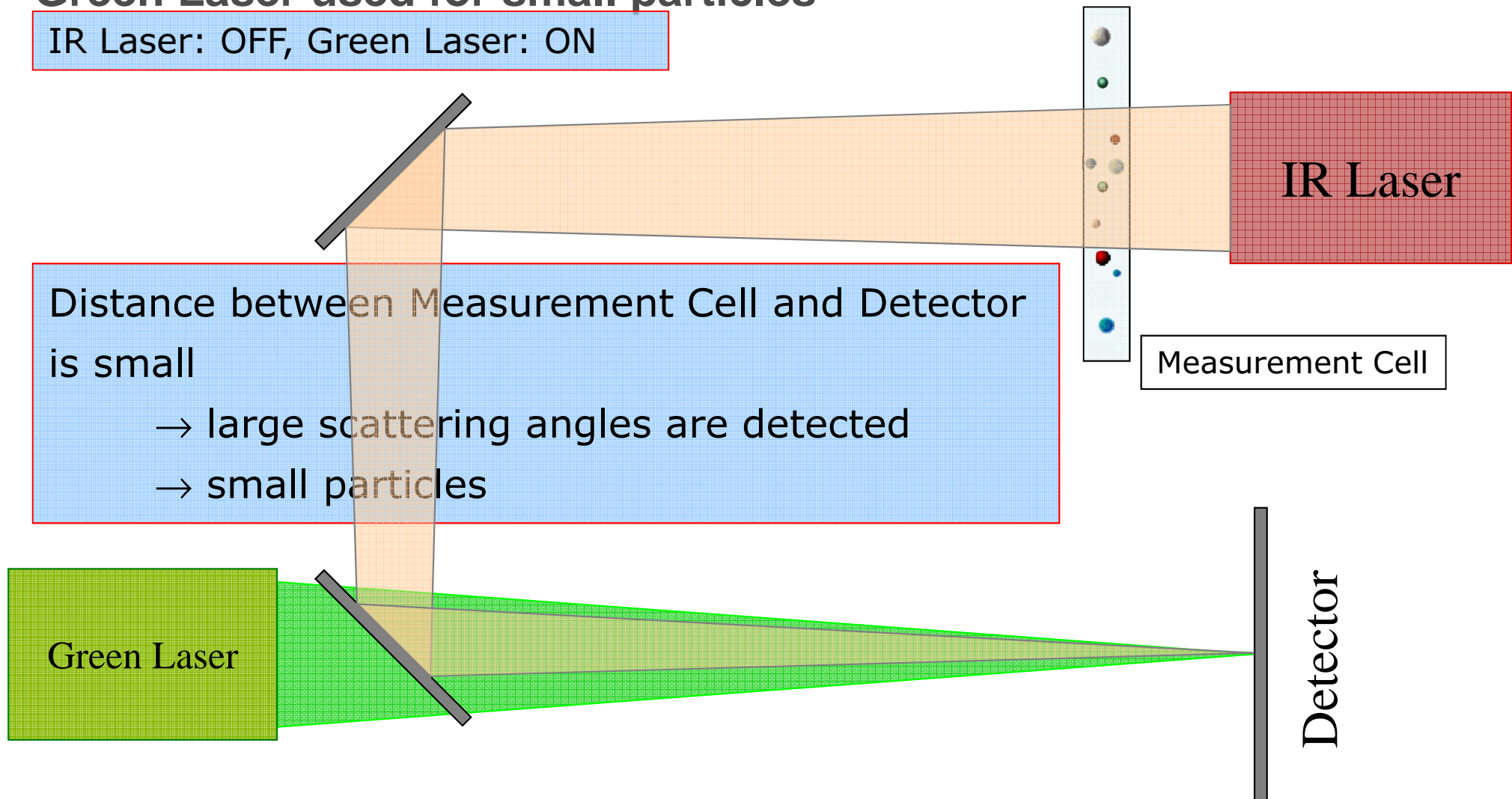
IR Laser: ON, Green Laser: OFF



MicroTec plus optical setup

Green Laser used for small particles

IR Laser: OFF, Green Laser: ON



Dyna Sizer Analysette-12

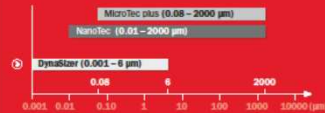


ACCURATE TO THE NANOMETER!

Discover the new dimension of the FRITSCH Laser Particle Size Measurement. The particle size measurement based on Dynamic Light Scattering (DLS) with the new ANALYSETTE 12 DynaSizer is effective, user-friendly and accurate to the nanometer.

ANALYSETTE 12 DynaSizer

with Dynamic Light Scattering



A direct comparison of the measuring ranges of the ANALYSETTE 12 DynaSizer, ANALYSETTE 22 NanoTec and the new ANALYSETTE 22 MicroTec plus.

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www.fritsch-laser.com

For all questions regarding FRITSCH laser particle sizing, please feel free to contact our expert Dr. Günther Crolly at
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Technical specifications are subject to change without notice.

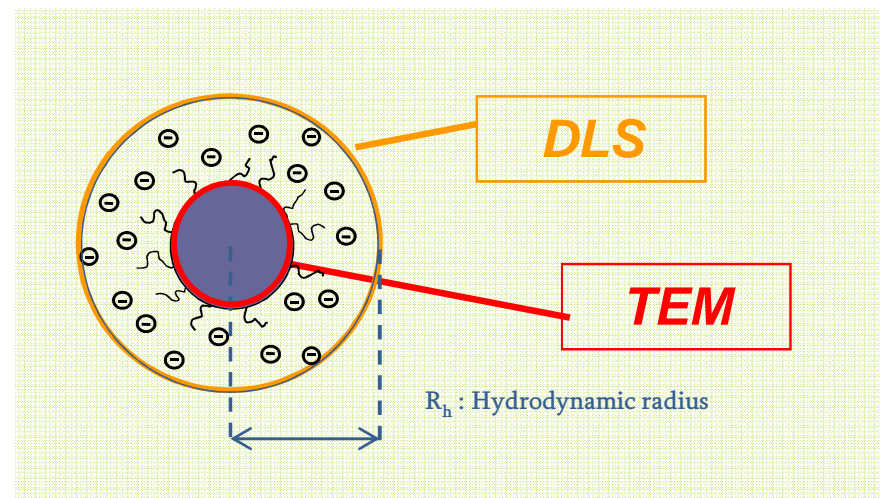
Particle size measurements of
dark and concentrated dispersions
by **dynamic light scattering**



Main benefits of DLS:

- Measurement of the whole nanometric range
- No sample preparation
- Statistical results in few minutes
- “Cheap” in comparison with other techniques

➤ The hydrodynamic radius:



- **Thank you**