Plair

Identify Invisible Threats

Intelligent Real-Time Bioaerosol Sensing

Real-Time Monitoring

Advanced Laser Analysis

Machine Learning Ready

Identifying threats with the most advanced laser analysis

Rapid-E+

Real-Time Airborne Particle Identifier with the most efficient laser analysis and embedded intelligence

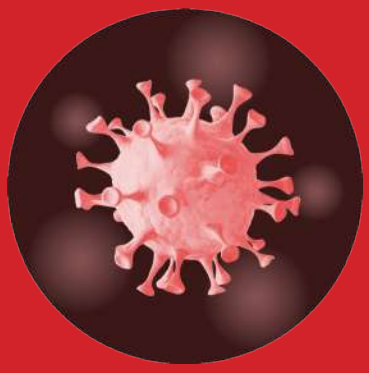
Rapid-E+ is an intelligent bioaerosol sensor that analyzes single aerosol particles in real time using patented, proprietary laser technology. The updated version of the popular Rapid-E instrument has improved optical measurements and more efficient sampling. Its newly developed air sampling head provides increased air flow with much less loss, outperforming all existing alternatives.

Rapid-E+ is also the only instrument with integrated intelligence through GPU (graphics processing unit) acceleration. It allows much faster data acquisition and processing, bringing game-changing performance to aerosol tracking and identification in complex environments.

Rapid-E+ continuously measures and characterizes any airborne particle ranging between 0.3 and 100 micrometers, including bacteria, fungal spores, viruses, pollen, and other aerosols. Proven by years of uninterrupted measurements, Plair's technology, which is based on a unique combination of scattered light pattern analysis and fluorescence spectroscopy, enables researchers to reliably monitor ambient air in real time. Rapid-E+ operates autonomously and remotely, allowing access to data anywhere and anytime.

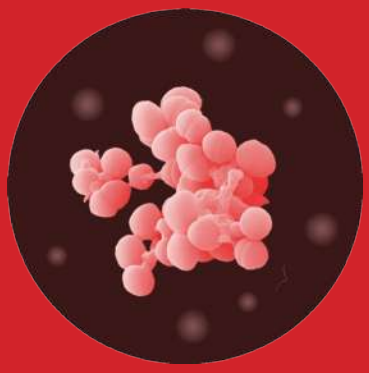
PARTICLE SIZE RANGE

0.3 – 100 µm

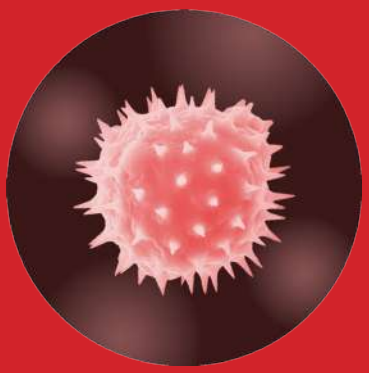


Virus aerosol

Bacteria



Fungal spore



Pollen

Inorganic particles
and pollutants

- Real-time pollen counting
- Particulate matter monitoring
- Bacteria and fungal spore detection
- Virus aerosol research

©PLAIR SA

Rapid-E+
Plair

Plair
Plair

Technical specifications

Parameter	Value	Comment
Particle size range, micrometers (µm)	0.3 - 100	
UV laser wavelength, nanometers (nm)	337	
Scattering laser wavelength, nm	445	
Imaging laser wavelength, nm	637	
Number of pixels to measure light scattering	14 + 14	14 pixels of unpolarized raw 14 pixels of parallel polarized raw
Fluorescence spectral range, nm	390-570	12 nm per pixel
Fluorescence spectral ranges of lifetime module, nm	375-397 415-450 467-487	1 photodetector per spectral range
Fluorescence decay resolution, nanoseconds (ns)	1	For each spectral range
Number of imaging pixels	16	8 pixels parallel polarization 8 pixels perpendicular polarization
Sample air flow, litters per minute (LPM)	5	
Maximum counts (scattering only), Maximum counts (fully analyzed)	1.000.000 4.800	Particles per minute
Power supply Volts AC	90-240	
Power consumption, watts	less than 200	
Size (H x W x D), centimetres	40 x 34 x 55	
Operating temperature, Celsius	-10 to +40	Temperature range can be extended with an outdoor box
Humidity, %	0-95	Without condensation
Weight, kilograms	25	

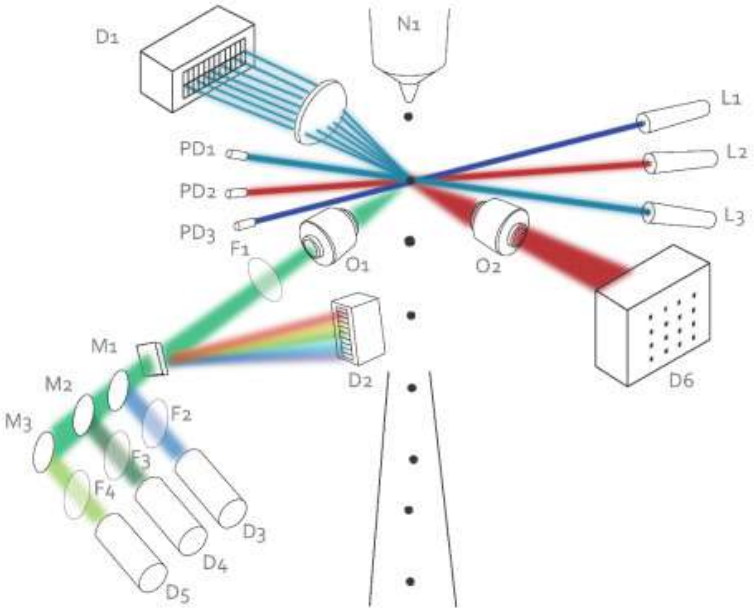
Technology

LIGHT SCATTERING AND FLUORESCENCE SPECTROSCOPY

Each individual particle drawn into Rapid-E+ first undergoes a morphological analysis with a unique method of timely resolved, polarization and angle depended Mie pattern acquisition.

The particle is then exposed to intense ultraviolet (UWV) light to induce a fluorescence response. This response is captured by a 16-channel spectrometer and 3-channel ultrafast detector to obtain the fluorescence spectrum and decay simultaneously.

The last stage of analysis employs additional Mie scattering imaging realized in 2D, resolved in time, and in both polarizations. The laser wavelength is different from the one used in the first stage in order to investigate particle morphology in greater detail.



WORKING PRINCIPLE OF RAPID-E+

Schematic representation. Abbreviations: N1 - Nozzle, L1-L2 - lasers, D1 – scattering detector, D2 – spectrum detector, PD1-PD2 – photodetectors for lasers, O1-O2 collimating lenses

PlairGrid

ACCELERATE YOUR DATA PROCESSING
FROM PARTICLE DATA EXPLORATION TO MODEL CREATION

*PlairGrid is a free tool that comes with Rapid-E+ that enables users to explore the data of a single particle, create a model using AI that is capable of classifying any particles in real-time, and many more.

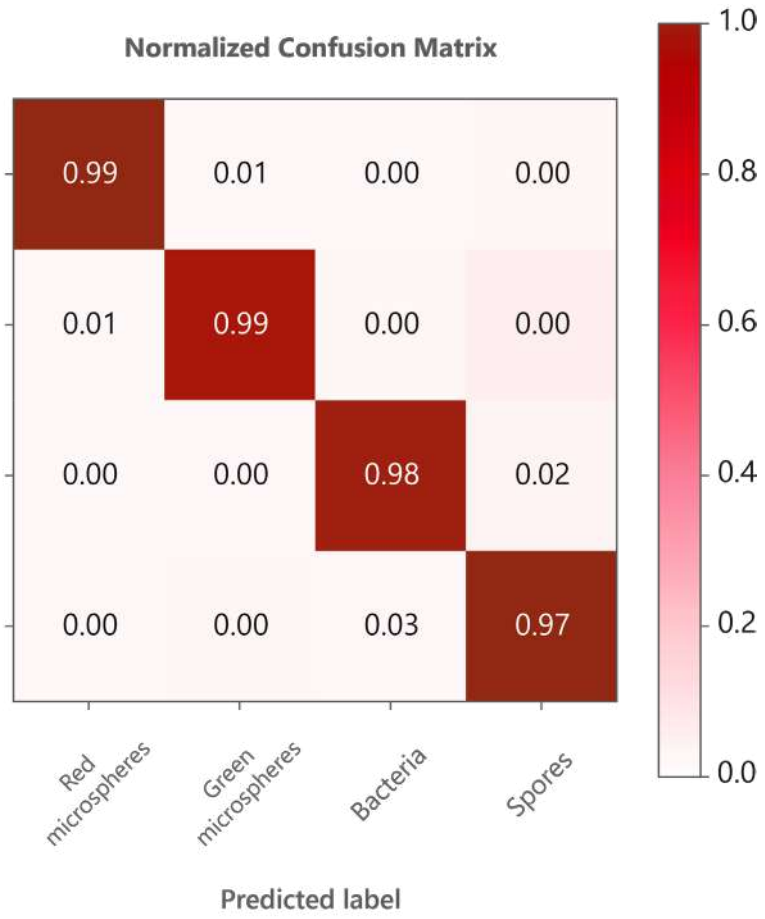
These tools are available to help users accelerate their data work and take full control of their experiments and projects allowing users to work with their data immediately and in with ease.

PLAIRGRID IS FREE OF CHARGE AND FREE FROM WARRENTY

Clients are accepting PlairGrid "as is" and Plair SA is not liable for the loss of any data or records necessary for the performance of the instrument , where such loss is due to the error or negligence of the user, subcontractors, or agents.

Demonstrated performance

IDENTIFICATION PERFORMANCE
DISCRIMINATION OF FLUORESCENT MICROSPHERES AS SUBSTITUTES FOR MICROORGANISMS

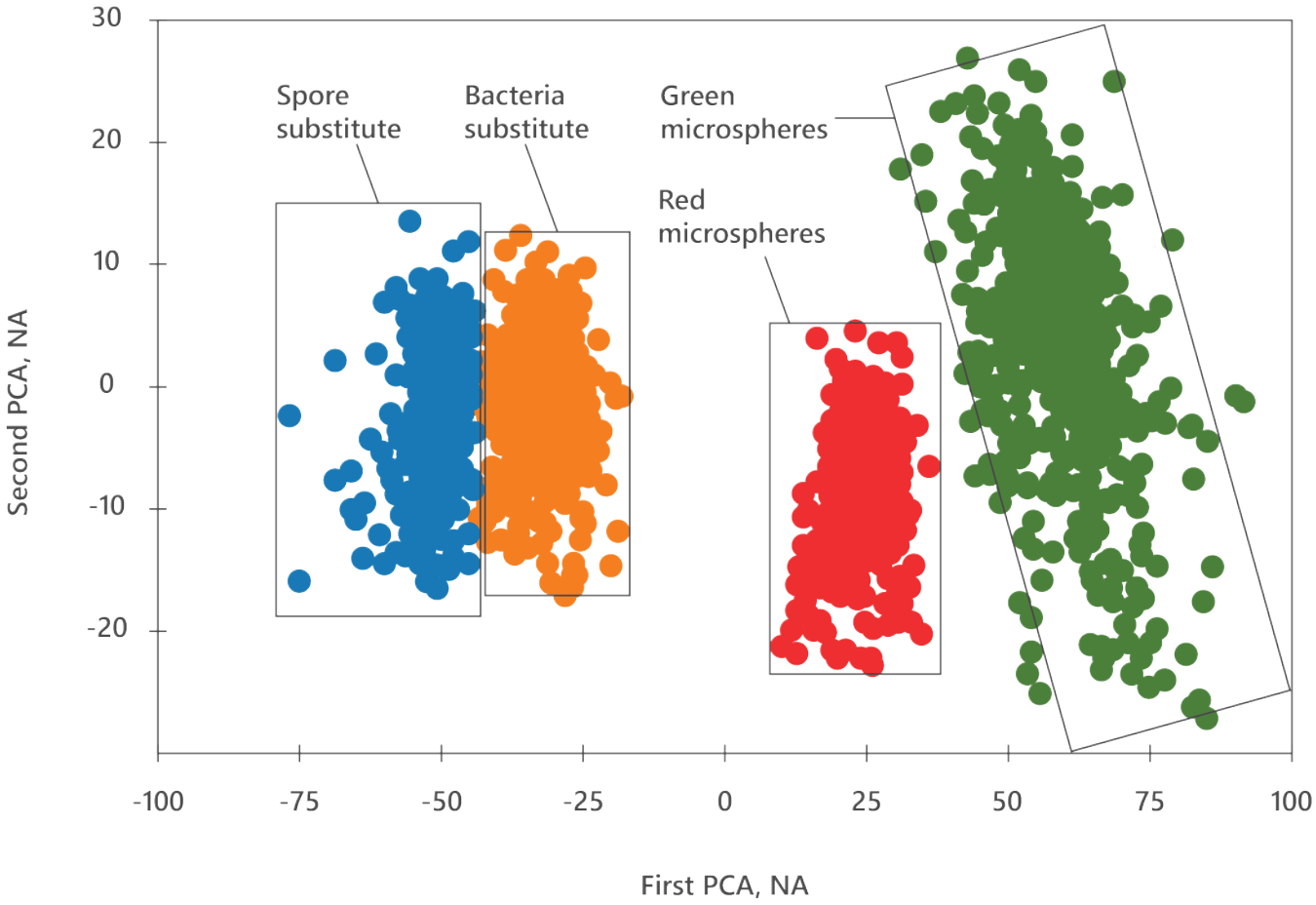


The figure shows an example of Rapid-E+'s performance in identifying microorganisms in the presence of background (interfering particles). Fluorescent microspheres within the same range of 1-5 µm are used as substitutes for bacteria, spores, and other contaminants.

Rapid-E+ provided precise and stable measurements of the fluorescence spectrum, allowing discrimination between artificial microorganisms and other contaminants with 99% precision. The microspheres used are: PSF-003UM (red) from Magsphere Inc. (US), FMB-1.3 1-5 µm, FMOY-1.3 1-5 µm, and FMG-1.3 1-5 µm from Cospheric LLC (US).

Demonstrated performance

CLASSIFICATION PERFORMANCE
CLUSTERING OF FLUORESCENT MICROSPHERES AS SUBSTITUTES FOR MICROORGANISMS



The figure shows particle classification in a clean environment, without knowledge of the pathogen type. Rapid-E+'s measurement parameters can be projected on two axes through a principal component analysis (PCA).

In this case, the area in which a single pathogen is present is projected on two axes. Even without knowing the pathogen type, the instrument can still classify it. Rapid-E+ will rapidly recognize any airborne biocontaminants (spores, bacteria, etc.) that appear.

Available Accessory

Plair's Sampling Head

Plair's sampling head has the advantage over conventional inlets of allowing particle suction with maximum performance. The comparison of sampling efficiency between Rapid-E+ and SIGMA-2 (shown in the figure on the right) is based on computational fluid dynamics simulations (CFD) for the following conditions:

- Speed of particles projected on the sampling head from the side: 2 m/s
- Particle density: 100/cm²
- Particle diameters tested: 10, 50, 100 µm
- Particle mass density: 997 kg/m³

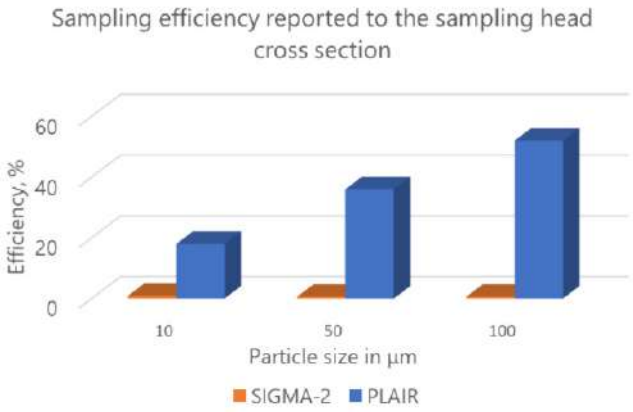
The efficiency is estimated as:

$$\vartheta = \frac{N_{asp}}{N_{in}} \times 100\%$$

where N_{asp} is the number of particles drawn into the sampling head, and N_{in} is the number of particles projected on the sampling head.

The study was performed by the fluid dynamics department of HEPIA (Geneva School of Engineering, Architecture, and Landscape) in Switzerland.

PLAIR'S SAMPLING HEAD



Available Accessory

Outdoor Enclosure

The Rapid-E+ Outdoor Enclosure comes in two version and protects the device from nature and environmental elements.

Light version

Heavy and all-weather version

Available Accessory

E-Catch

Airborne Particle Sampling Unit

E-Catch, or the Airborne Particles Sampling Unit, is specifically designed to be combined with Rapid-E+ to provide a more traditional lab-based analysis of airborne particles. The same air that has been analyzed by Rapid-E+ can be sampled on-demand by the unit.

Bioaerosol chamber

Plair bioaerosol chamber is designed to meet the needs in particle aerosolization, calibration, and testing of Rapid-E+. It is designed to be connected to an aerosol generator and can be integrated within a laboratory for microbiological testing, such as bacteria, fungi, pollen, or any other organic and non-organic materials.

Plair SA

Route de Saint-Julien 275
1258 Perly, Switzerland

info@plair.ch

+41 (0) 22 552-3830

www.plair.ch

About Plair SA

Plair SA is a manufacturer and provider of instruments for high-specificity airborne particle analysis in real time, offering solutions for allergen and pollution monitoring. The analysis includes detection of pollen species, organic particles such as fungal spores, inorganic particles such as soot and Saharan dust or sand, and pollutants such as polycyclic aromatic hydrocarbons.

Disclaimer

This publication's contents are provided as is by Plair SA. Plair makes no representations nor warranties regarding the accuracy or completeness of the contents of this publication and reserves the right to make changes to the specifications at any time without notice. All trademarks are the property of their respective owners.