UFP monitoring at airports

Aircraft engine emissions

Pegasor solutions for

AVIATION EMISSION MONITORING

pegasor

Aviation, airports and ultrafine particles (UFP)

Ultrafine particle (UFP) emissions have become a critical focus in the aviation industry due to their potential health impacts and regulatory importance. While UFPs are emitted at high altitudes during flight, they are also released in substantial quantities during takeoff and landing, leading to elevated concentrations in and around airports. These emissions pose significant risks to nearby communities, as UFPs can penetrate deep into the respiratory system and have been linked to serious health issues, including respiratory and cardiovascular diseases.

The updated **EU Air Quality Directive (EU 2024/2881**) highlights the need to monitor ultrafine particles as part of stricter air quality standards. Accurate monitoring of these emissions plays a key role in addressing regulatory requirements and improving air quality in and around airport environments.

Pegasor: Advance Solutions for UFP monitoring

Pegasor provides cutting-edge technologies specifically designed to address the challenges of ultrafine particle monitoring in the aviation industry. Our instruments provide real-time, accurate data on ultrafine particle emissions, offering a level of precision that traditional particle measurement methods cannot match.

- **Versatile Applications**: Pegasor solutions are built to operate in demanding environments, capable of measuring emissions directly from aircraft engines as well as monitoring ambient air quality both outdoors and within airport terminals.
- **Actionable insights:** By focusing on UFP emissions, Pegasor enables airports, airlines, and regulatory authorities to gain a comprehensive understanding of the impact of aviation activities on air quality and public health.

Commitment to Air Quality and Public Health

Incorporating ultrafine particle measurements into standard practices is not just about regulatory compliance—it is a crucial step toward enhancing air quality and safeguarding the health of the millions who live and work near airports. Pegasor is at the forefront of this effort, providing the expertise and innovative tools necessary to monitor, manage, and mitigate UFP emissions at their source and throughout the surrounding environment.

Pegasor solutions

One technology for all measurement needs

Outdoor UFP monitoring

For outdoor UFP monitoring, Pegasor offers the Pegasor Airam—a versatile and weatherproof ultrafine particle monitor suitable for various environments, including industrial sites, urban settings, and airports.

- Monitors particle number (PN), lung-deposited surface area (LDSA), particle mass (PM) concentrations, and particle size in real-time.
- Built for reliability, the Airam operates seamlessly in outdoor conditions, providing accurate data for effective air quality management.
- Cost-Effectiveness: Minimal maintenance requirements and long operational lifespans reduce total cost of ownership.

Core Technology:

- At its heart is the Pegasor PPS-G2 sensor, a patented technology widely recognized as the industry standard for emission monitoring applications.

Indoor UFP monitoring

For indoor environments, Pegasor offers the compact and standalone Pegasor Airin, a reliable solution for real-time ultrafine particle detection. The Airin unit uses the same technology as the Pegasor Airam for particle detection— the Pegasor PPS-G2 sensor. The Airin is ideal for anyone concerned about indoor air quality, from airport terminal managers to health and safety officers. It provides actionable data to maintain healthy, safe indoor environments by tracking ultrafine particle concentrations.

Engine Emissions Monitoring

The Pegasor PPS-G2 sensor is also highly effective for monitoring engine emissions directly from the source, where conditions demand durability and precision.

- Designed to handle high-concentration samples at elevated temperatures.
- The sensor itself can be heated, allowing hot exhaust to flow directly into the unit for real-time measurements.
- An integrated volatile particle remover (VPR) option ensures efficient removal of volatile components, enhancing measurement accuracy in challenging conditions.

Pegasor's PPS-G2 sensor is the trusted solution for emission monitoring applications, offering reliability and precision in even the harshest conditions.

UFP monitoring

Pegasor Airam

Airam Features

- **PN, LDSA, PM concentration and particle size** measurement
- **Real—Time Response**: With a response time of 0.2 seconds, the Airam captures even sudden spikes in particle concentrations.
- **Wide dynamic range:** Perfectly suited for measuring both low and high concentrations typical of airports.
- **Durable Design:** Simple, robust structure with no moving parts and no need for working fluids, ensuring reliability in harsh conditions.
- **Low Maintenance:** Flow-through design enables exceptionally long maintenance interval
- **Versatile Connectivity:** Includes multiple data communication options such as Wi-Fi with an integrated modem and Ethernet.
- **Self-Diagnostic System:** An advanced diagnostic system improves reliability and reduces downtime.

Pegasor Airam— Advanced Outdoor UFP Monitoring

Pegasor Airam is a standalone monitor for measuring ultrafine particles in ambient, outdoor air. This UFP monitor is specifically engineered for airport environments, where ultrafine particle concentrations can change rapidly due to air traffic and ground vehicle emissions.

The Pegasor Airam not only provides exceptional performance but is also designed with durability and ease of use in mind. Its robust, low-maintenance design minimizes downtime and operating costs, making it a cost-effective solution for long-term deployment. The Airam's scalability and compatibility with existing systems ensure seamless integration, whether for a single location or a network of monitoring sites.

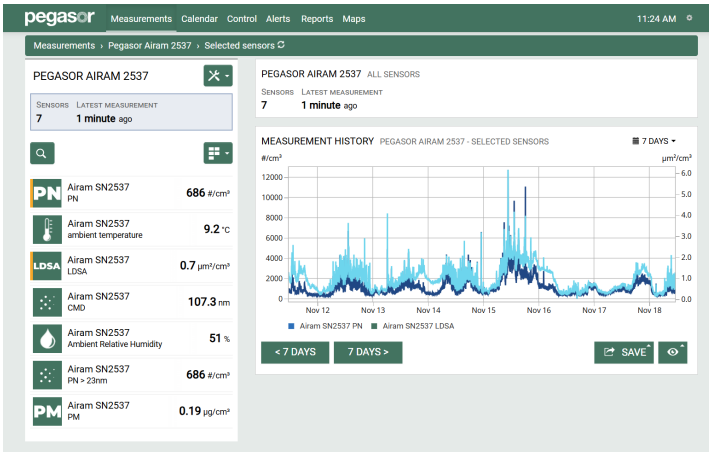
Pegasor Cloud Portal

Remote Monitoring Made Easy with the Pegasor Cloud Portal

The Pegasor Cloud Portal is an online platform that enhances the functionality of the Pegasor Airam. It enables:

- **Remote Data Monitoring**: Access data from one or multiple Pegasor Airam or Airin units in real time.
- **Automated Reporting**: Create detailed reports for in-depth analysis.
- **Remote Diagnostics**: Monitor instrument health, perform diagnostics, and deploy firmware updates remotely.
- **Scalable Integration:** Connect and manage multiple units simultaneously for comprehensive monitoring across locations.

The Pegasor Airam, paired with the Pegasor Cloud Portal, offers a complete solution for monitoring ultrafine particles outdoors, ensuring accurate data collection, reliable performance, and streamlined operations for airports and other demanding environments.



UFP monitoring at airports

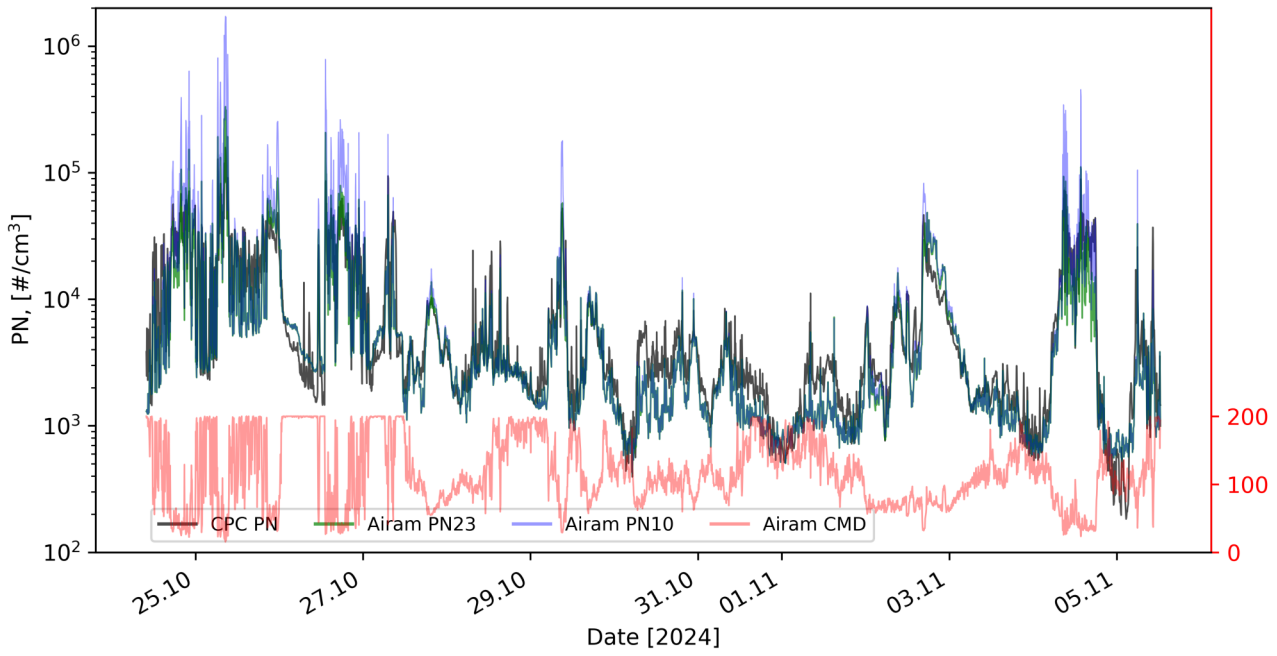
Case Study: Pegasor Airam

Case Study: UFP Monitoring at a Major European airport

Ultrafine particle (UFP) concentrations were measured at one of the large airports in Europe. The campaign utilized the Pegasor Airam alongside a Condensation Particle Counter (CPC) to measure outdoor UFP concentrations within the airport perimeter. The aim was to evaluate the performance of the Pegasor Airam in a dynamic, real-world environment characterized by fluctuating emissions.

The CPC was equipped with a thermal treatment unit to remove volatile particles from the sample, while the Pegasor Airam was operated without additional sample treatment. The CPC was installed inside a measurement container, whereas the Pegasor Airam was placed outdoors for direct exposure to the environmental conditions. Both instruments were installed on the airfield, with their sample inlets positioned less than two meters apart to ensure comparable measurements.

During the monitoring campaign, significant variations in particle concentrations were observed. These fluctuations were closely linked to wind direction and the level of air traffic at the airport. Peaks in particle number concentrations often corresponded with smaller particle sizes, which were typically around 50 nanometers during high-concentration events.



Detected particle number concentrations measured with Pegasor Airam and a CPC. Particle size detection made with Pegasor Airam follows detected concentration peaks.

The site revealed a highly dynamic behavior in both particle concentrations and sizes. These findings underscored the critical need for monitoring instruments with a large dynamic range, high sensitivity, and fast response times in airport environments. Additionally, the ability of the Pegasor Airam to detect variations in particle size provided valuable insights into the potential sources of emissions. Deploying multiple instruments across the facility would further enhance monitoring effectiveness, ensuring comprehensive coverage across all wind conditions.

pegasor

Expertise in ultrafine particle detection technologies.

Pegasor Oy is a Finnish environmental technology company specialized in ultrafine particle detection technologies. We have over 15 years of experience in providing both ready-made devices for standalone particle measurements and particle sensor technologies for our OEM partners. Pegasor products are used globally by thousands of customers in numerous measurement applications and in demanding environments.

Pegasor Oy - Hatanpään valtatie 34C - 33100 Tampere, Finland

www.pegasor.fi - sales@pegasor.fi