



Third-Party Test Results Show A Reduction in Coronavirus Surrogate by 99% Airborne and 80% on Surfaces in 10 Minutes

Spanish Ministry of Defense Biological Laboratory Test Plasma Air Ionizers on Coronavirus Surrogate

Testing carried out by Tayra and backed by the Spanish Ministry of Defense Biological Laboratory in Spain on the Plasma Air Ionization technology showed a reduction of MS2 Bacteriophage, a surrogate for SARS-CoV-2 (COVID-19), in indoor environments.

There is mounting research to suggest that clean, disinfected air plays a vital role in preventing the spread of SARS-CoV-2, the virus causing COVID-19. While respiratory droplets are considered the primary transmission route, aerosols are being considered by many health authorities as a possible mode of infection transmission along with surface contact. This suggests that viral particles can remain suspended in the air for long periods and can be inhaled.

The research tests were conducted in a Madrid hotel converted into a residence and confinement center for medical staff during the pandemic. The experiments took place in simulated ICU hospital rooms within the hotel. This environment was explicitly designed to test air ionization on small aerosolized viral particles. The laboratory analysis was carried out at a nearby operations center of the Spanish Ministry of Defense from May 4th to May 14th.

The Plasma Air ionizer was chosen to suit the specific airflow and installed in the fan coil unit supply air duct that delivered air to the test space. The bacteriophage MS2 was then nebulized into the test space. During the first phase of the test, the supply air into the room was untreated. During the second phase, the supply air entering the test room was ionized using Plasma Air's bipolar ionization system. A reduction of approximately 2 log units of the bacteriophage was obtained in the air that was ionized by the Plasma Air system. This corresponds to a **99% reduction after only 10 minutes** of exposure to ionization.



The tests also included using manikins to simulate ICU patients. The manikins were equipped with specialized filters to measure the amount of bacteriophage that was being breathed in with and without air ionization. The levels of MS2 bacteriophage and associated particle counts were measured using Electrical Low-Pressure Impactors, and swabs were taken from walls and surfaces for analysis. The level of airborne MS2 bacteriophage was measured using the Spanish authorities' calibrated equipment for detecting biothreats. Results from this test showed a reduction in the order of 0.70-0.85 log pfu/cm² corresponding to nearly **80% reduction in surface MS2 bacteriophage after 10 minutes** between the test with and without ionization.

The research project was guided and coordinated by Plasma Air's long-term business and technical partner in Spain, Tayra, a specialist in air purification. In addition to the Spanish Government ministries, the experiments also involved academics in the fields of engineering, microbiology, and computational fluid dynamics, along with Spanish Government appointed testing labs.

"Coronavirus is a global crisis and nowhere more so than inside built environments such as transport hubs and work environments," explains Chris Russell, Vice President of Plasma Air. "The effective elimination of airborne virus is a major breakthrough that can make workplaces, transport, entertainment and educational facilities safer for employees, commuters and students."

"We were very motivated to facilitate these critical tests at our laboratories here in Madrid, and we are extremely impressed by the results achieved," stated Lieutenant Coronel Juan Carlos Cabria, the Technical Director of the biosecurity laboratories of the Ministry of Defense. "We are extremely grateful to the team of Scientists, Engineers, Microbiologists and Academics who have worked tirelessly here for the last three weeks voluntarily to achieve this incredible and important result in the battle against coronavirus."

About Air Ionization

Air ionization works through the reaction of negatively and positively charged ions. The ions attach to airborne pathogens, such as viruses causing a chemical reaction on the cell membrane's surface. This deactivates the viruses, rendering them harmless, so they can no longer spread or cause infection.

Plasma Air's ionization system used during the Spanish trials are available commercially on a worldwide basis from a network of distributors and are used in offices, hotels, transport hubs, schools and hospitals, as well as in the Los Angeles Airport (LAX) and the new Doha and Riyadh metro systems.

About Plasma Air

Plasma Air is the leading innovator in indoor air quality by manufacturing HVAC and air purification products that result in healthier, more productive indoor environments in institutional, commercial, residential and industrial applications. The Plasma Air HVAC purification systems use highly efficient bipolar ionization technology to kill harmful airborne viruses and neutralize indoor air pollutants. Plasma Air systems have been proven in thousands of applications to provide the highest level of air quality improvement for airports, train systems, schools, hotels, casinos, arenas, offices and homes.

About Tayra

Tayra is a specialist HVAC company based in Madrid. Founded in 2004, it provides advanced technologies and products to the market. Tayra's technical team brings together more than 30 years of experience in the field of air conditioning installations, both in the design and application of advanced systems of high performance and quality. Tayra has been working closely with Plasma Air and has been successfully deploying ionization to major companies such as Engie and Danone in the region.