

## MITIGATION - SCIENCE AND TECHNOLOGY ADVANCES FOR CHEMICAL AND BIOLOGICAL HAZARD MITIGATION

# How KillViD, A Pulse Powered Plasma Solution Achieves 100% Biological Air Contaminate Destruction: Bench Testing And Live Environment Testing Results

Jeff Canning Gamma Pulse Carmen Dumitrescu Gamma Pulse

Reducing the exposure to airborne contaminants, including bioaerosols containing viruses, is a key challenge in the context of both general indoor air quality and mitigating the risks posed by highly contagious pathogens such as COVID-19 and weaponized biocontaminates delivered via an aerosolized infectious agent. The study explains what KillViD technology is and aims to assess the effectiveness of its innovative patented Pulse Power Plasma Reactor (P3R) capabilities through experimental tests conducted by INSERM. An initial experimental setup was developed in order to aerosolize a high concentration of virus suspension directly into KillViD, containing 3 or 6 modules of 215 atmospheric plasma micro-reactors. As a virus surrogate, INSERM used the phi11 bacteriophage which was aerosolized using a vibrating mesh nebulizer. The viability of airborne viruses after a single pass through the air cleaner was assessed by quantifying the lysis of a specific *Staphylococcus aureus* host strain. INSERM's initial test demonstrated robust virucidal results showing a 5-log reduction (99.999%) in terms of virucidal activity for the 3-module configuration, and observed at least a 6-log reduction (from an initial viral load of  $9.25 \times 10^5$  PFU to 0) for the 6-module configuration. Additional testing on a standalone air decontamination system which used KillViD produced similar reduction rates under testing conditions which included the continuous injection of viral contaminants into a confined space with measurements demonstrating that the KillViD system was destroying more airborne pathogens than could be generated by the nebulizers despite their continuous operation. Based on both measured performance and the demonstrated flexibility for implementing and scaling the technology, KillViD's P3Rs can be modified and configured for use in a variety of industries and a range of use cases where airborne biological threat elimination or airborne infection risk reduction is required.

Gamma Pulse would like to acknowledge the efforts and gracious support of Dr. Jérémie Pourchez and his team of researchers at INSERM who have made testing KillViD possible. There are very few facilities within Europe which have the ability to test a capabilities against an aerosolized pathogen, INSERM and specifically the facilities under Dr. Pourchez's control are one of those location where this kind of work can be conducted. Without their professional support and willingness to recognize KillViD's potential, the deficiencies with existing solutions, and the nuances of how industry currently evaluates existing technologies which are used to address biological pathogen threats the work required to test and evaluate KillViD would never have happened.

A portion of what will be presented within the above abstract has been published in the journal Buildings:

Pourchez J, Peyron A, Sarry G, Leclerc L, Verhoeven PO, Choi P, Pierson C, Petit O, Hernández F, Dumitrescu C. Antimicrobial Performance of an Innovative Technology of Atmospheric Plasma Reactors against Bioaerosols: Effectiveness in Removing Airborne Viable Viruses. *Buildings*. 2022; 12 (10):1587. <https://doi.org/10.3390/buildings12101587>

The abstract provided here expands on what has been published and can be provided through a formal presentation or as a poster. Additional testing of KillViD is on going at INSERM now so additional findings not included in the abstract may be available for presentation at the time of DTRA's December conference.