INDEPENDENT LABORATORY TEST RESULTS

Pathogens

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GPS®

Reducing the Spread of Disease

GPS clears the air of particles faster

Particulate matter includes pollutants, dust, allergens, mold, bacteria – and viruses. GPS' technology constantly generates a high concentration of positively and negatively charged ions. These ions travel through the air continuously seeking out and attaching to particles. Larger by virtue of combination, these particles are removed from the air more rapidly.

GPS Inactivates Pathogens

When ions come into contact with pathogens, their microbicidal effects reduce the infectivity of the virus.

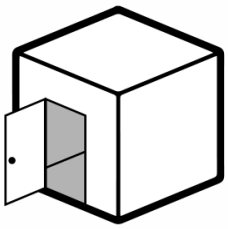
GPS is Safe

Our needlepoint bipolar ionization is OZONE free and safe to use across commercial, industrial and residential buildings. Traditional bipolar ionization systems produce harmful ozone as a byproduct.

Performance Validation*

SENSITIVITY TESTING

A petri dish containing a pathogen is placed underneath a laboratory hood, then monitored to assess the pathogen's reactivity to NPBI™ over time. This controlled environment allows for comparison across different types of pathogens.



SIMULATION TESTING

Counts of airborne pathogens are taken before and after aerosolizing them into a sealed, unoccupied laboratory environmental room installed with NPBI™ technology. The larger space more closely resembles a real-world environment.

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*Global Plasma Solutions (GPS) uses multiple data points to formulate performance validation statements. GPS technology is used in a wide range of applications across diverse environmental conditions. Since locations will vary, clients should evaluate their individual application and environmental conditions when making an assessment regarding the technology's potential benefits.

SARS-CoV-2

Laboratory Name: Innovative Bioanalysis
Cap Lic No: 9501843
Date: 5/27/2020
Pathogen Tested: SARS-CoV-2

INNOVATIVE BIOANALYSIS
creating solutions | getting results

SENSITIVITY TEST

Objective:

Aviation Clean Air commissioned testing on Global Plasma Solutions' GPS-DM48-AC model to assess its ability to neutralize SARS-CoV-2 in high-ion concentration specialty applications.

Methodology:

Single RE22 control chambers were set on a stainless steel table with pressure verification seals. The chambers had an internal working dimension of 16.5"W x 9"H x 12"D for a total cubic footage of 1.031. Under initial observation it was determined to seal the unit completely with no intake or exhaust port. Testing and control were conducted in an average ambient temperature of 72.6 degrees Fahrenheit.

A singular fan unit was set up at a 45-degree angle and affixed to the testing chamber. The initial control fan speed was measured at an average of 870 Ft/m. Under the original control section, the primary fan was set 10 inches away from ion production unit A and the average air flow speed past the ion producing nodes was 250Ft/m.

Experimental Results:

SARS-CoV-2 was exposed to needlepoint biploar ionization for a period of 10, 15, and 30 minutes. Based on viral titrations it was determined that at 10 minutes 84.2% of the viral particles became inactive, at 15 minutes 92.6% of the viral particles became inactive, and at 30 minutes 99.4% of the viral particles became inactive.

TIME IN CHAMBER	RATE OF REDUCTION
30 MINUTES	99.4%

Norovirus

Laboratory Name: ATS Labs
Project No: A14991
Date: 5/28/2013
Pathogen Tested: Feline Calicivirus

ATS LABS
EXCELLENCE IN ANTIMICROBIAL TESTING

SIMULATION TEST

Objective:

The testing was conducted on the GPS-2400-1 model for its ability to inactivate Feline Calicivirus bacteria in the air.

Methodology:

The middle support bracket was attached to the bar containing one GPS-2400-1 Cold Plasma Generator at each end of the bar. The generators were placed with the carbon fiber brushes pointing down, in the back of a hood with the hood sash closed. Minimum Essential Medium (MEM) was supplemented with 5% heat-inactivated fetal bovine serum, 100 units/mL penicillin, 10 ~g/mL gentamicin, and 2.5 ~g/mL amphotericin B.

Experimental Results:

A 93.5% average reduction in viral titer was demonstrated following a 30 minutes of exposure time, as compared to the average titer of the dried virus control. The average log reduction in viral titler was 1.19 log.

TIME IN CHAMBER	RATE OF REDUCTION
30 MINUTES	93.5%

Human Coronavirus

Laboratory Name: ALG Labs
Project No: A29381
Date: 4/14/2020
Pathogen Tested: Human Coronavirus, ATCC VR-740, Strain 229E

SENSITIVITY TEST

Objective:

Testing was conducted on GPS' technology to assess its ability to inactivate Human Coronavirus on a glass surface.

Methodology:

A glass carrier with the pathogen was placed 1" from the carbon fiber brushes of the GPS technology. The petri dish carriers were exposed to GPS' needlepoint bipolar ionization device for 1 minutes, 5 minutes, 15 minutes, 30 minutes and 60 minutes at room temperature and relative humidity. Following the exposure time, the carrier was removed and an aliquot of test medium was added to the petri dish.

Experimental Results:

A 90.0% average reduction in viral titer was demonstrated following a 60 minutes of exposure time, as compared to the average titer of the dried virus control. The reduction in viral titler was 1.00 log.

TIME IN CHAMBER	RATE OF REDUCTION
60 MINUTES	90.0%

Legionella

Laboratory Name: EMSL Analytical, Inc.
EMSL No: 151508127
Date: 10/14/2015
Pathogen Tested: Legionella pneumophila

SENSITIVITY TEST

Objective:

Testing was conducted on the GPS-2400 model to assess its ability to inactivate bacteria on a solid surface.

Methodology:

Legionella pneumonphila (L. pneumophila) was inoculated onto buffered charcoal yeast extract agar (BCYE) and incubated at 35°C for 48 hours. Colonies were harvested, suspended in phosphate buffer water, and vortexed for 1 minute to ensure homogenization. This suspension was then used to inoculate the test carriers.

Experimental Results:

The GPS-2400 system demonstrated the strongest efficacy after 30 minutes of exposure by inactivating 99.71% of the L. pneumophilae bacteria.

TIME IN CHAMBER	RATE OF REDUCTION
30 MINUTES	99.7%

Clostridium Difficile

Laboratory Name: EMSL Analytical, Inc.
EMSL No: 371208933
Date: 6/26/2011
Pathogen Tested: Clostridium difficile ATCC 70057

SENSITIVITY TEST

Objective:

Objective: Testing was conducted on the GPS-iBAR-36 model to evaluate its effectiveness in disinfecting solid surfaces contaminated with C. Difficile.

Methodology:

The GPS-iBAR-36, needlepoint bipolar ionization system, was first set up facing down with 5 cm of clearance from the surface. The test carriers in their respective Petri-dishes were then placed under the GPS-IBAR-36 and the system was turned on. The control was not exposing to the ionizer and instead placed directly into 10 mL of PBS. Serial dilutions were then created for each carrier by taking 1mL out and placing it into the 9 mL of PBS. For each dilution 100µL was plated onto a TSAB plate. The inoculated plates were then incubated in anaerobic conditions at 37°C for 48 – 72 h. The colonies were counted and recorded.

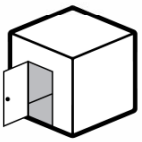
Experimental Results:

In conclusion, the GPS-IBAR-36 demonstrated the ability to disinfect C. difficile on a solid surface with an observed percent reduction of 86.87% in 30 minutes.

TIME IN CHAMBER	RATE OF REDUCTION
30 MINUTES	86.8%

Turberculosis

Laboratory Name: EMSL Analytical, Inc.
EMSL No: 371106420
Date: 7/15/2011
Pathogen Tested: Mycobacterium terrae ATCC 15755



SIMULATION TEST

Objective:

Testing was conducted on the GPS-iBAR-36 model to determine its ability to inactivate the bacteria in the air.

Methodology:

M. terrae first was innoculated on Tryptic Soy agar + 5% sheep blood (TSAB) and incubated at 35°C for 5 days under carbon dioxide conditions. A sterile inoculation loop was then used to collect colonies and place them into 5 mL of normal saline solution. Once testing was ready to begin, 60 psi of compressed air was pumped through the nebulizer, creating the release of 10.8 mL/h of aerosolized solution. This was run for 28 minutes, allowing for a total of 5 mL of solution being aerosolized into the test chamber.

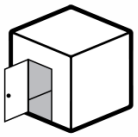
Experimental Results:

After correcting for the natural rate of decay it was observed that there was a 0.38 log reduction after 30 minutes of exposure and a 0.51 log reduction after 60 minutes of exposure. In conclusion, the GPS-IBAR-36 was observed to reduce M. Terrae by 69.09%

TIME IN CHAMBER	RATE OF REDUCTION
60 MINUTES	69.0%

MRSA

Laboratory Name: EMSL Analytical, Inc.
EMSL No: 371106420
Date: 6/13/2011
Pathogen Tested: Methicillin Resistant Staphylococcus aureus (MRSA) ATCC 33591



SIMULATION TEST

Objective:

Testing was conducted on the GPS-iBAR-36 model to determine its ability to inactivate the bacteria in the air.

Methodology:

The nebulizer was connected to an air compressor with 1⁄4 inch plastic tubing and to the environmental test chamber through one of the testing openings created. The fan was turned on to create an air flow in the chamber but the ionizers were not turned on until after the initial sampling. Once testing was ready to begin, 60 psi of compressed air was pumped through the nebulizer creating the release of 10.8 mL/h of aerosolized solution. This was run for 28 minutes, allowing for a total of 5 mL of solution to be aerosolized into the test chamber.

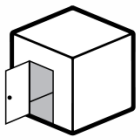
Experimental Results:

In conclusion, the GPS-IBAR-36 demonstrated the ability to disinfect MRSA from the air with a 96.24% reduction after 30 minutes of exposure.

TIME IN CHAMBER	RATE OF REDUCTION
30 MINUTES	92.2%

E. Coli

Laboratory Name: EMSL Analytical, Inc.
EMSL No: 371106420
Date: 7/21/2011
Pathogen Tested: Escherichia coli ATCC 8739



SIMULATION TEST

Objective:

Testing was conducted on the GPS-iBAR-36 model to determine its ability to inactivate the bacteria in the air.

Methodology:

The nebulizer was connected to an air compressor with 1⁄4 inch plastic tubing and to the environmental test chamber through one of the testing openings created. The fan was turned on to create an air flow in the chamber but the ionizers were not turned on until after the initial sampling. Once testing was ready to begin, 60 psi of compressed air was pumped through the nebulizer creating the release of 10.8 mL/h of aerosolized solution. This was run for 28 minutes allowing for a total of 5 mL of solution to be aerosolized into the test chamber.

Experimental Results:

In conclusion, the GPS-IBAR-36 demonstrated the ability to disinfect E. coli from the air with a 99.54% reduction after 30 minutes of exposure and a 99.23% reduction after 60 minutes of exposure.

Furthermore, these results demonstrate that the needlepoint bipolar ionization system tested does not require direct line of sight to produce inactivation rates comparable to those of ultraviolet light. The needlepoint bipolar ionization system's inactivation rates are indicative of those in the entire space.

TIME IN CHAMBER	RATE OF REDUCTION
15 MINUTES	99.6%

Independent Laboratory Testing Results Summary

GPS®

PATHOGEN	TIME IN CHAMBER	RATE OF REDUCTION	TESTING LAB
SARS-CoV-2	30 MINUTES	99.4%	INNOVATIVE BIOANALYSIS creating solutions | getting results
Norovirus*	30 MINUTES	93.5%	ATS LABS EXCELLENCE IN ANTIMICROBIAL TESTING
Human Coronavirus**	60 MINUTES	90.0%	ALG ANALYTICAL LAB GROUP
Legionella	30 MINUTES	99.7%	EMSL
Clostridium Difficile	30 MINUTES	86.8%	EMSL
Tuberculosis	60 MINUTES	69.0%	EMSL
MRSA	30 MINUTES	96.2%	EMSL
Staphylococcus	30 MINUTES	96.2%	EMSL
E. Coli	15 MINUTES	99.6%	EMSL

* Surrogate for Norovirus, actual strain tested was Feline Calicivirus, ATCC VR-782, Strain F-9
** Surrogate for Human Coronavirus SARS-CoV-2, actual strain tested was Human Coronavirus 229E

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