

Ultra Violet Germicidal Irradiation (UVGI) and Bipolar Ionisation

Reduce risk of transmissibility of COVID-19



INTRODUCTION

COVID-19 has spread at an alarming rate, reaching nearly every part of the world. At present, there are more than 5 million infections and over 300,000 deaths worldwide, with numbers only expecting to rise. This has caused governments worldwide to furiously battle against the spread. COVID-19 has the ability to be transmitted by respiratory and airborne droplets. Furthermore, asymptomatic patients can also infect others. These present significant resistance to eradicating the virus.



TECHNOLOGIES TO KILL VIRUSES AND OTHER AIRBORNE MICROBES

An effective way to proactively manage the spread of COVID-19 is using air conditioning systems to kill aerosolised viruses.

Depending on the temperature, humidity and type of surface it is on, the COVID-19's survivability ranges from several hours to days. While there are actions that can be taken by individuals (e.g. safe distancing, wearing of masks and staying home), further mitigation is required on the community level.

Our conventional Heating Ventilating and Air Conditioning (HVAC) system draws in air, heats or cools it and sends it back out into the environment. However, by simply installing **UvLux UVGI** and/or **Plasma Air Bipolar Ionisation Devices** into the HVAC, you can add one vital step to this process – **killing airborne viruses and reducing the risks of transmission of infectious aerosols.**

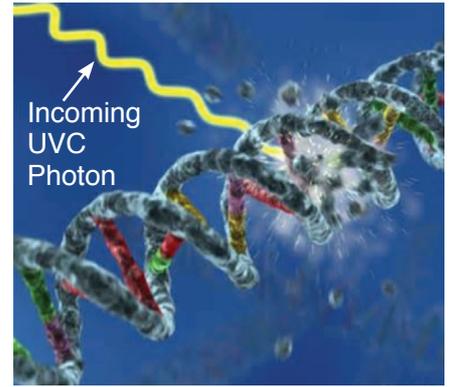
These can be used in enclosed facilities where people gather to work, play or relax.

1.UV-Lux UVGI

The use of UVGI in HVAC is widely recognised as an effective measure to reduce the risk of dissemination of infectious aerosols in enclosed areas¹.

UVGI inactivates microorganisms by damaging the structure of nucleic acids and proteins. Its effectiveness depends on the UV dose and susceptibility of the microorganism².

¹ASHRAE Society's Position Document on Infectious Aerosols of 14 April 2020
²2020 ASHRAE Handbook



UVGI'S EFFECTS ON CORONAVIRUS:

Table 1 summarises the results of studies performed under UV light exposure, with specific species indicated in each case.

Microbe	D ₉₀ Dose J/M ²	UV km ² /J	Base Pairs kb	Source
Coronavirus	7	0.35120	30741	Walker 2007 ^a
Berne Virus (Coronaviridae)	7	0.32100	28480	Weiss 1986
Murine Coronavirus (MHV)	15	0.15351	31335	Hirano 1978
Canine Coronavirus (CCV)	29	0.08079	29278	Saknimit 1988 ^b
Murine Coronavirus (MHV)	29	0.08079	31335	Saknimit 1988 ^b
SARS Coronavirus CoV-P9	40	0.05750	29829	Duan 2003 ^c
Murine Coronavirus (MHV)	103	0.02240	31335	Liu 2003
SARS Coronavirus (Hanoi)	134	0.01720	29751	Kariwa 2004 ^d
SARS Coronavirus (Urbani)	241	0.00955	28751	Darnell 2004
Average	67	0.03433		

^a(Jingwen 2020) ^b(estimated) ^c(mean estimate) ^d(at 3 logs)

Source: Kowalski, Wladyslaw & Walsh, Thomas & Petraitis, Vidmantas. (2020). 2020 COVID-19 Coronavirus Ultraviolet Susceptibility. 10.13140/RG.2.2.22803.22566.

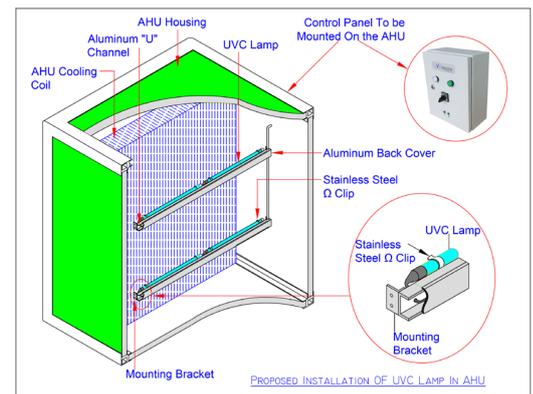
The D₉₀ dose: UV dose required for 90% inactivation of coronavirus

Range : 7 to 241 J/m²
Mean : 67 J/m² (6700microwatt S/cm²)

This should adequately represent the ultraviolet susceptibility of SARS-CoV-2 (COVID-19) virus.

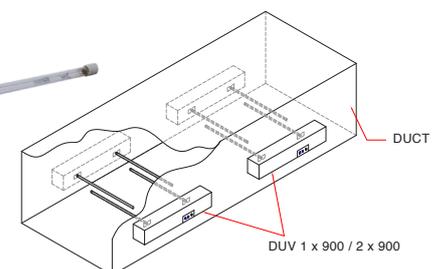
A. UVGI INSIDE AHU

- UVC lamps installed inside AHU.
- UVC Control Panel (outside AHU) houses all electrical & electronic components, including ballasts.
- Safety door switch disables UVC System to prevent accidental UVC exposure.



B. UVGI AIR STREAM DISINFECTION (IN SUPPLY DUCT)

- UV-C lamps are inserted along subsidiary supply duct
- Provide intense UVC Irradiation for specific facilities
- UVC intensity or dosage can be increased by using more UV-C lamps



Typical Installation of DUV 1 x 900, DUV 2 x 900



2. PLASMA AIR BIPOLAR IONISATION - ACTIVE AIR DISINFECTION

- Plasma Air Bipolar Ionisation is installed within the HVAC supply duct.
- Produces positive and negative ions that are emitted into the supply duct and working & living spaces.
- Bipolar Ions actively oxidises viruses, VOC and other airborne organisms in the air stream.
- Efficiency up to 97.4% after 45 minutes.³

Application of corona discharge-generated ions for filtration of aerosolized virus & inactivation of filtered virus of filtered virus showed³:

When the ioniser was operated in a bipolar mode, the number concentrations of positive and negative ions were 6.6×10^6 ; $3.4 \times 10^6/\text{cm}^3$, and the antiviral efficiency were 64.3%, 89.1%, and 97.4% with exposure times of 15 min, 30 min and 45 min, respectively.

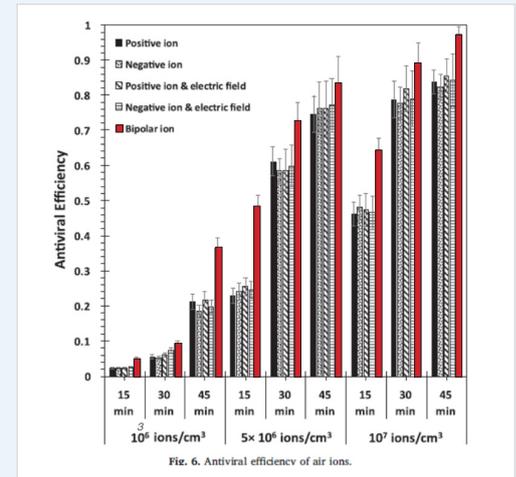
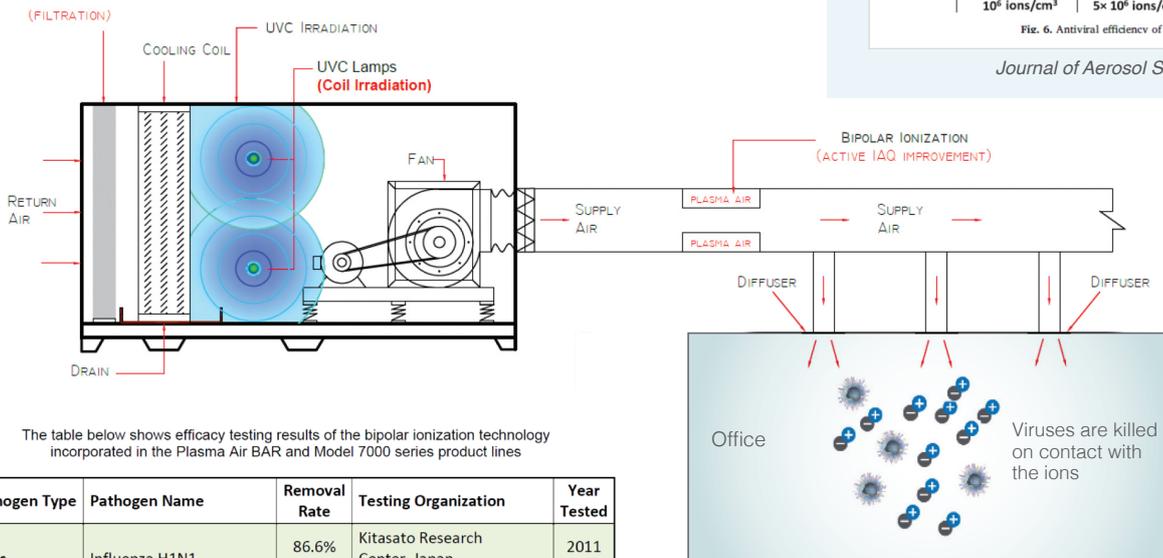


Fig. 6. Antiviral efficiency of air ions. *Journal of Aerosol Science 107 (2017) 31-49*



The table below shows efficacy testing results of the bipolar ionization technology incorporated in the Plasma Air BAR and Model 7000 series product lines

Pathogen Type	Pathogen Name	Removal Rate	Testing Organization	Year Tested
Virus	Influenza H1N1	86.6%	Kitasato Research Center, Japan	2011
Bacteria	Escherichia Coli	99.43%	EMSL Analytical, USA	2011
	Staphylococcus Aureus	91.5%	EMSL Analytical, USA	2011
	MRSA	99.47%	EMSL Analytical, USA	2011
	Pseudomonas Aeruginosa	99.9%	Istanbul University, Turkey	2011
Mold/Fungus	Cladosporium Cladosporioides	97.69%	EMSL Analytical, USA	2011
	Dichobotrys Abundans	90%	Professor Joseph F. Boatman, USA	2006
	Penicillium	95%	Professor Joseph F. Boatman, USA	2006
	Aspergillus Niger	97.14%	EMSL Analytical, USA	2011
	Candida Albicans	36.27%	EMSL Analytical, USA	2011
	Spore	Bacillus Subtilis var Niger	89.3%	Istanbul University, Turkey

PA 604 for smaller FCU, up to 2400 CFM

For large AHU with high air volume, multiple units may be required

