

## Independent laboratory testing of Ultraviolet germicidal irradiation (UV-C) technology used in AI powered Whiz robots

GERMii is an Australian headquartered science and technology company, specializing in the manufacturing, design, and application of proven UV-C sanitization technology. The patented UV-C technology is very efficient against microbes killing them in just seconds. GERMii's collaboration with SoftBank Robotics Whiz, aims at enabling the robotic device to capture and kill pathogens on the floor by harnessing the UV-C technology. The 'GERMii-Whiz' solution contains a UV-C Floor Plate and UV-C Air Capture resulting in the floor and the air being irradiated while vacuuming with the WHIZ. This objective of the experiment is to determine the efficacy of the GERMii's UV-C technology combined with the Whiz vacuum cleaning process for microbial sanitization. It also provides details on the use of UV-C technology to enhance the process of vacuum cleaning (environmental clean). The experiment was conducted independently by Analytical Laboratories (Singapore) PTE LTD (ANALABS). The microbiologists at Analytical Laboratories prepared a culture media using different bacterial, yeast and mould strains (Table 1). Surface swabs of hospitality, tufted carpets were taken to conduct a microbial analysis of bacteria, yeast, and mould (Figure 1). The samples were collected for the Whiz vacuum cleaning process with and without using the GERMii's UV-C technology (Figure 2,3).

*Figure 2: Whiz without the UV-C Attachments*



*Figure 3: WHIZ with UV-C Attachments*



The sampling was performed at three different sampling points along three sets of 10 meters cleaning routes of the Whiz Robot at three different levels (L)- L1, L2 and L3. At each level, the carpet was swabbed at three points. A run of the Whiz vacuum cleaning operation was performed, and the sampling points were swabbed for microbial analysis. After sampling, a run of the Whiz vacuum cleaning operation with the UV-C technology was performed and the sampling points were again swabbed for microbial analysis. This combination of runs was performed two more times resulting in data obtained from three runs of the vacuum cleaning process at each level.

The results were considered by measuring the reduction in CFU (colony-forming unit) count from pre- to post treatment using WHIZ robots. It is evident from the data recorded, that the UV-C technology coupled with the WHIZ vacuum robots, is an effective method for microbial sanitization of carpeted surfaces (Table 2). After three runs, the bacterial count was reduced by five folds, frequently resulting in yeast and mould count of 0 CFU/swab. After three runs using the UV-C technology, on all levels the microbial count was  $\leq 10$  CFU/swab.

*Table 2: Microbial analysis results for the surface swab tests comparing the efficiency of Whiz vacuum cleaning operation with and without the GERMii's UV-C Technology*

Swab Location	Vacuum Cleaning Operation Runs	Swab Condition	Swab Test Results (CFU/swab)	
			Total Bacteria Count	Total Yeast & Mold Count
Level 1	Baseline	Before Vacuum	65	5
	Run 1	After Vacuum	40	5
		After Vacuum and UV	20	5
	Run 2	After Vacuum	25	5
		After Vacuum and UV	20	0
	Run 3	After Vacuum	20	0
After Vacuum and UV		10	0	
Level 2	Baseline	Before Vacuum	30	20
	Run 1	After Vacuum	20	20
		After Vacuum and UV	0	5
	Run 2	After Vacuum	25	5
		After Vacuum and UV	10	0
	Run 3	After Vacuum	10	5
After Vacuum and UV		10	5	
Level 3	Baseline	Before Vacuum	25	15
	Run 1	After Vacuum	30	5
		After Vacuum and UV	10	0
	Run 2	After Vacuum	10	0
		After Vacuum and UV	10	10
	Run 3	After Vacuum	5	0
After Vacuum and UV		0	0	

GERMii's UV-C adaptors have profoundly changed the use of a robotic vacuum cleaner (WHIZ) to navigate and sterilize areas by the application of UV-C light. The second and most significant change in conventional cleaning is to use the fundamental premise of a vacuum as an air pump to draw air

into chambers and filter dust and volatile organic compounds up to 3.5 microns and then sterilize the exhausted air in a secondary chamber.

The experiment demonstrates the effectiveness of UV-C technology for reducing the surface bioburden on carpeted surfaces. It can be concluded that the GERMii's UV-C Technology coupled with the Whiz robots can effectively perform microbial sanitization of carpeted surfaces (Figure 4).

Figure 4: Whiz Vacuum with GERMii's UV-C Technology



A key benefit to the customers is that they can now, not only automate the strenuous task of manual vacuuming but also can enable the automatic sterilisation of air and surface using Germii's UV-C Technology.

## Appendix A

*Table 1: Bacterial, Yeast and Mould strains used to prepare the culture media*

<b>Culture Media</b>	<b>Strains</b>
<b>Bacterial Strains</b>	<i>Escherichia coli</i> <i>Staphylococcus aureus</i>
<b>Yeast Strain</b>	<i>Candida albicans</i>
<b>Mould Strain</b>	<i>Aspergillus niger</i>

## Appendix B

*Figure 1: Testing Methodology for Swab Collection*

### 2. SAMPLING PROCEDURE

The following summarized the proposed swab sample collection of microbial in the Whiz operation:

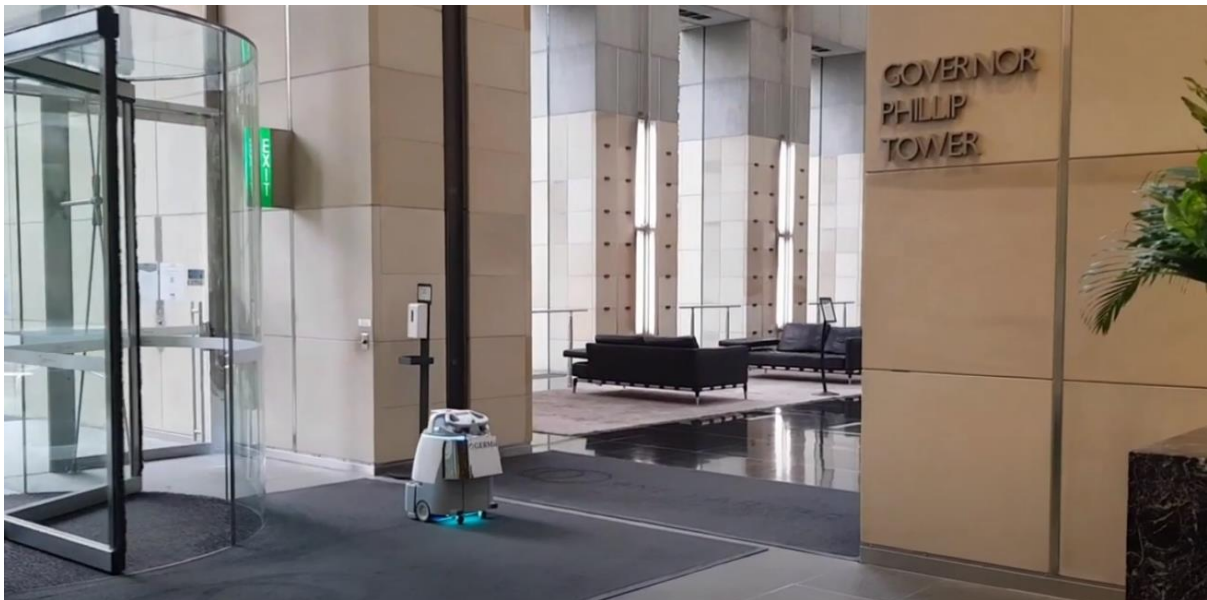
	Sample collection location	Test	Number of Samples	Sampling Media	Total Number of Samples
1	Air chamber and surfaces of Whiz vacuum and Germii UV-C devices	Bacteria count	12	Surface wipe	90
2		Mold & yeast count	12	Surface wipe	
3	Superficial deposition of contaminant on the carpet	Bacteria count	33	Surface wipe	
4		Mold & yeast count	33	Surface wipe	

## Appendix C

### *Features, benefits and return on investment*

GERMii Australia has partnered with SoftBank Robotics to introduce and engineer innovative products and technologies in the field of cleaning and sterilisation to provide best in class pathogen mitigation automatically via the recent integration into Whiz, the world-leading autonomous cleaning robot. The 2-in-1 robotic solution is designed to complement existing protocols, resulting in higher cleaning productivity and efficacy.

GERMii technology fitted to Whiz targets pathogens which may come to rest on surfaces, contaminate moisture or be suspended in air. These pathogens present a real risk to human health and welfare as we move forward past the current pandemic. Methods such as UV-C can be utilised to ensure the ongoing health and safety of the public.



GERMii innovation has led to pathogen mitigation using proven UV-C germicidal irradiation technology, which is an alternative to spraying environmentally dangerous chemicals.

When deployed to a site, the Whiz cleaning robot with UV-C attachments frees up cleaners to focus on more important and less strenuous tasks and can have a return on investment of as little as six months.

Video: <https://youtu.be/TbAemS2F7fw>

For more information, please visit <https://germii.com.au/whiz-uv-c-robotics/>