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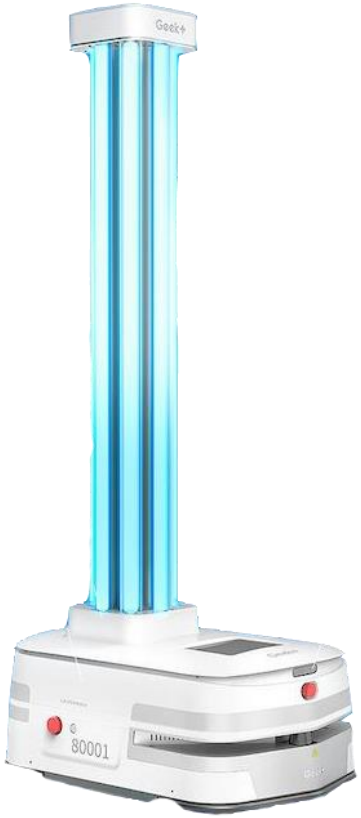
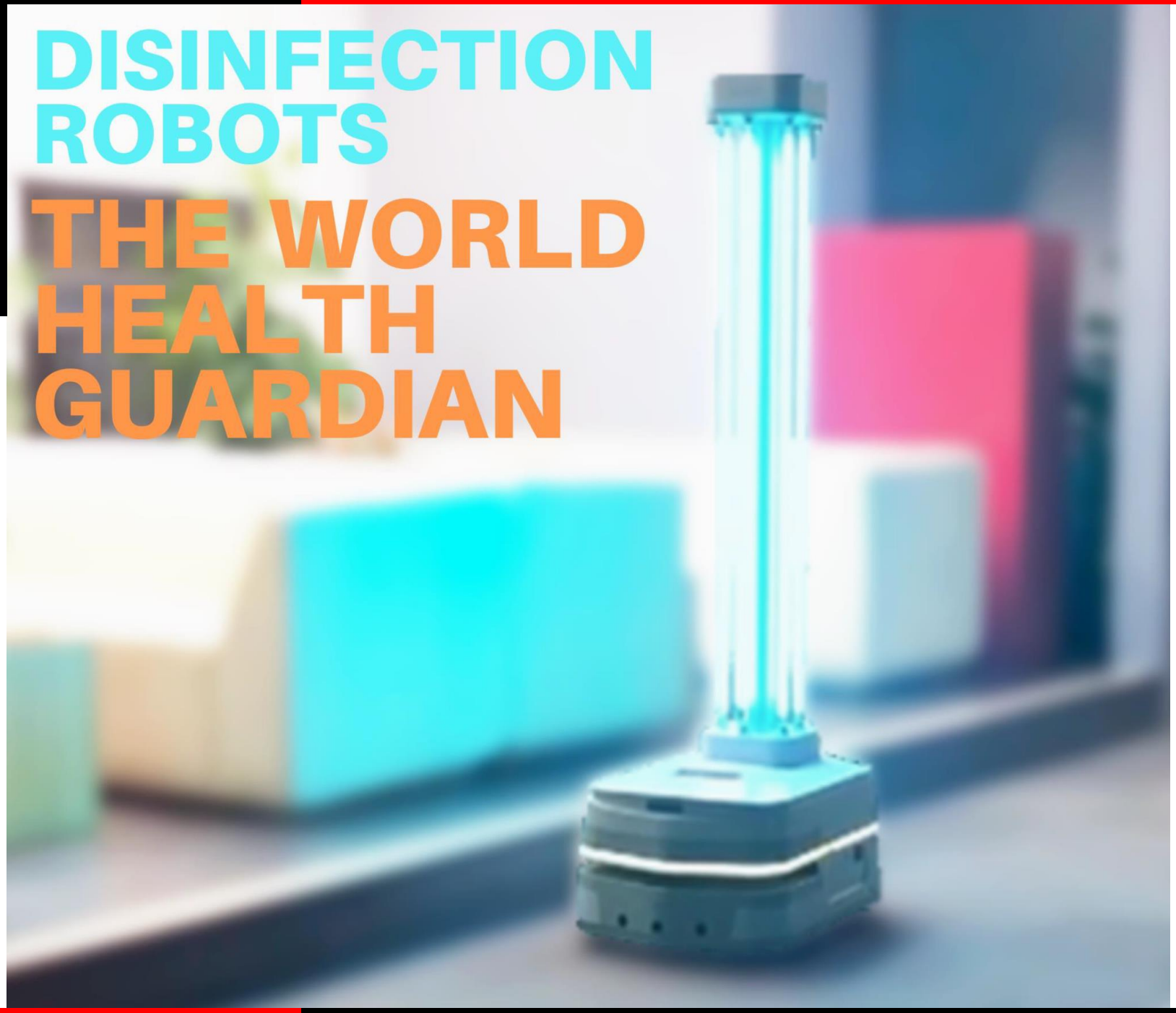


LAVENDER

UV Disinfection Robot

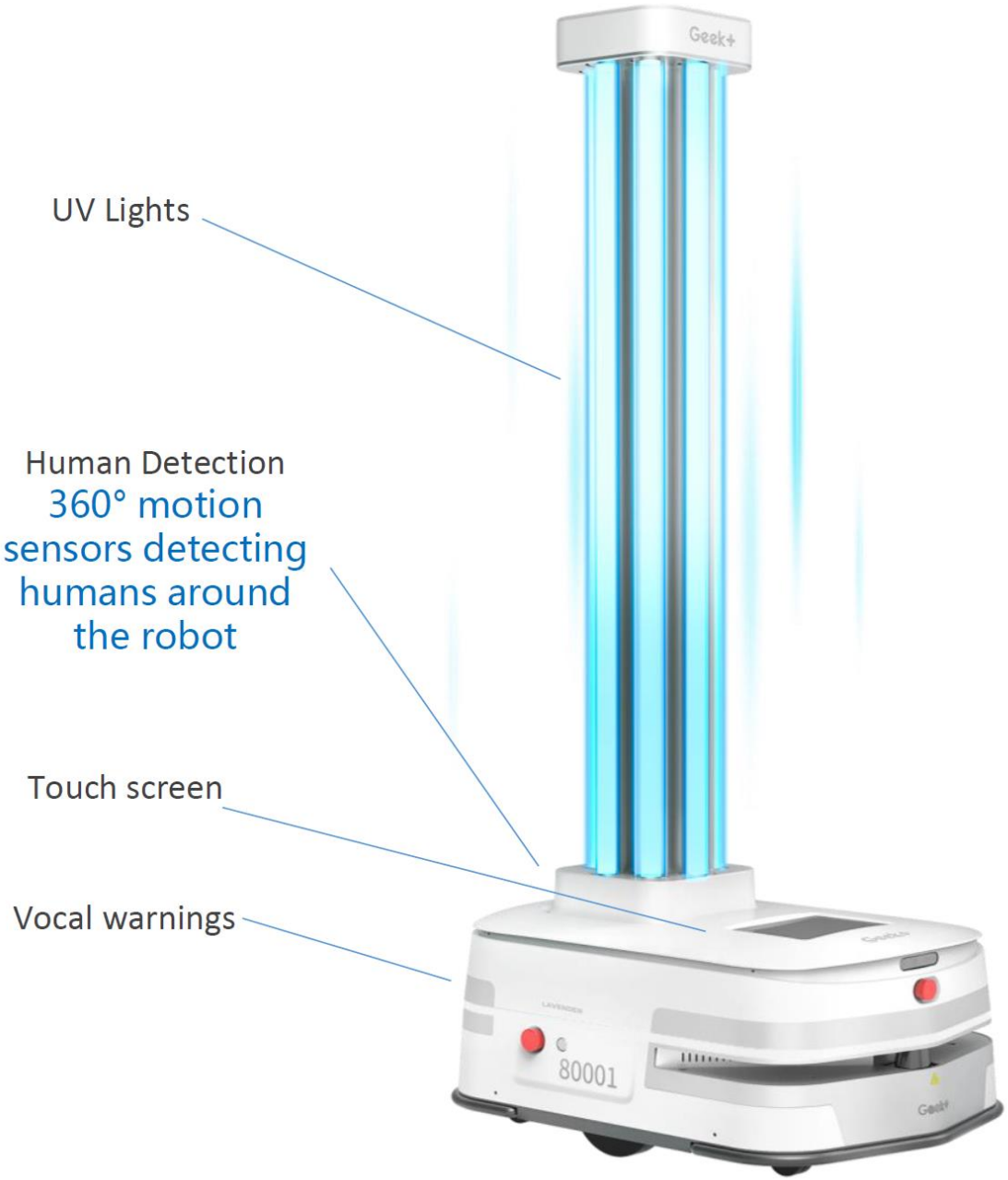


Product Introduction:
Intelligent Disinfection Robot

Elegant • Intelligent -
Public Health Guardian of Infection Prevention and Control of Epidemic

Product Features :

- Kills 99.99% of germs
- 24/7 Automated operations
- Regular and systematic disinfection
- Comprehensive scanning guarantees thoroughness
- Can operate in complex environments
- Multi-sensors detection of objects for safe operations



Specifications

- 6 High output UVC lamps

  6 x1.2m UVC lamps, each has power density 145μW/cm^2
- 99% Disinfection rate
- Germicidal radiation: UVC wavelength of 253.7 nm

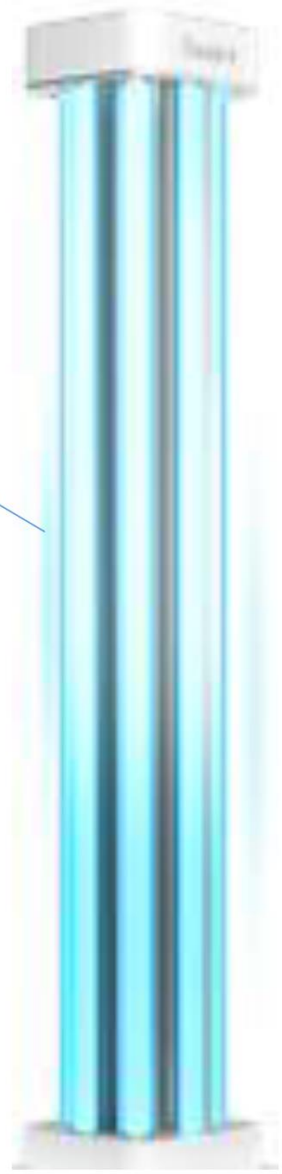
  Disinfection dosage = Power density * Time
- Areas of high risk: Assisting workers with minimum risk of picking up the infection from surfaces.

Other features:

1) Autonomous navigation, obstacle avoidance and self-charging
2) Integration of visual, 3D and laser sensors of the robot
3) Warning and reminder: Sound and multi-colour LEDs
4) Remote control: PAD; PC
5) 3 hours of operation per charge
6) Dimensions: 740*500*1800mm

Lavender UV Lamps

UV Lamp
TUV (Philips)



CE certified UV lamps

Philips Lighting

PHILIPS

EU Declaration of Conformity

Internal Ref. Nr.: BMS-BLFL-QUA-865-OT-0
Year in which CE Mark was first affixed: '06

We, Philips Lighting
I.B.R.S./C.C.R.I. /Numéro 10461
5600 VB Eindhoven, The Netherlands

Declare under our responsibility for the product(s):

Product Range:	**Tubular Fluorescent Double Ended Lamps**
Product Code:	Unique product ID number or name (e.g. EAN or 12NC) of all products under the family described above are in the appendix to this declaration

The designated product(s) is (are) in conformity with the essential requirements of the following European Directives and harmonized standards:

Low Voltage Directive (LVD), 2014/35/EU

List of applicable Standards :
- EN 61195: 1999 + amendment A1:2013

Restriction of the use of certain Hazardous Substances in electrical and electronic equipment Directive (RoHS), 2011/65/EU

- EN 50581:2012

and are produced under a quality scheme at least in conformity with ISO 9001, ISO 14001 and OHSAS 18001.

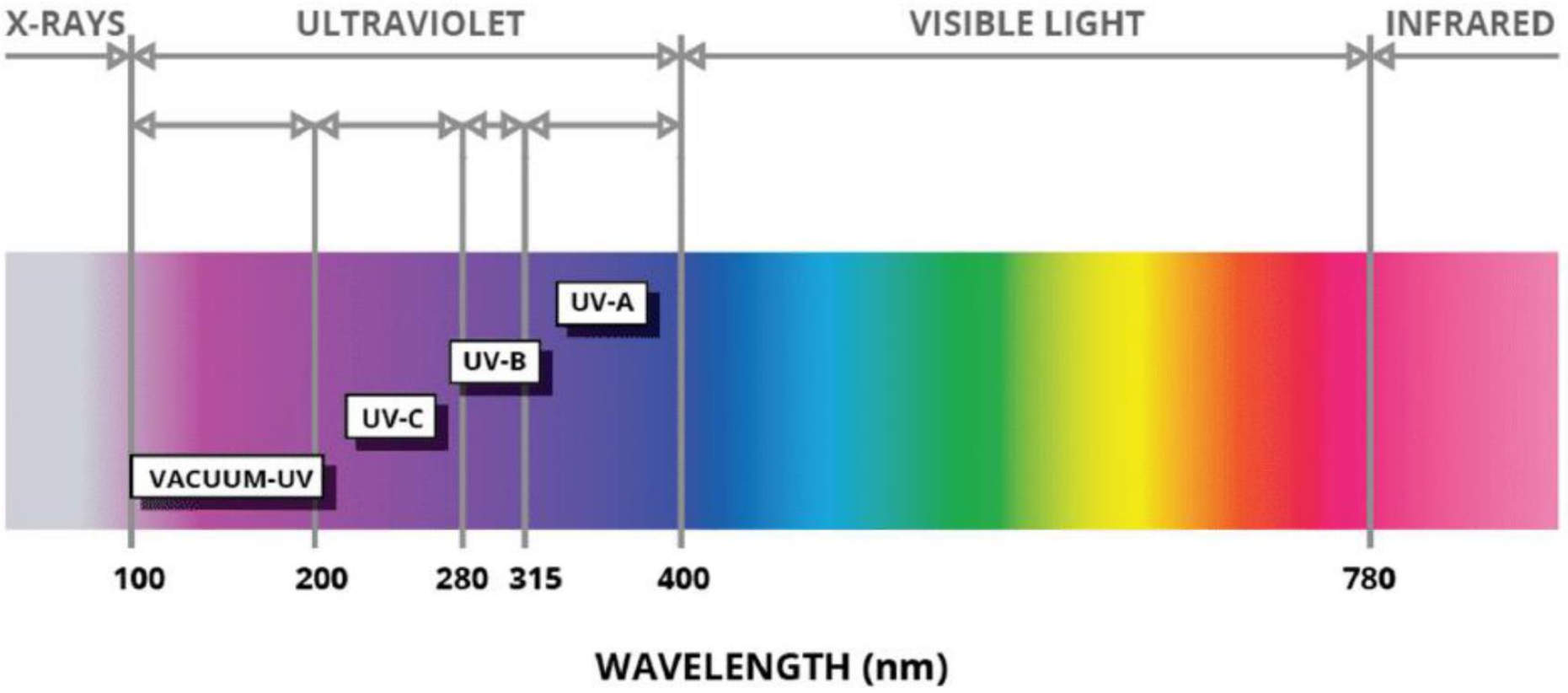
20 January 2017

Hans Bruneel
Head of Product Quality, Business Professional Lamps

BMS-PSLI-QUA-257-TP V3.0

EC Declaration of Conformity, EC DoC

UV Light and disinfection



- **Ultraviolet light:** Scientists divided Ultraviolet radiation into three different bands: UVA, UVB and UVC (types of UV light)
- **Disinfection:** Ultraviolet light mangles the genetic material in pathogens — DNA in bacteria and fungi, RNA in viruses — preventing them from reproducing.。
- **UVC can kill coronavirus:** all belong to single-stranded positive-strand RNA viruses.

Effectiveness of UV-C Disinfection – Certificates

- **Average intensity of UV light is 205 $\mu W/cm^2$ within 10 minutes**

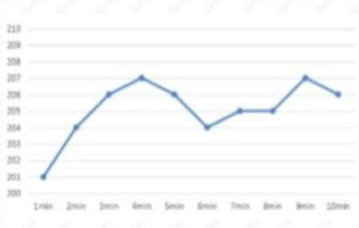
广微测 Gmicro Testing

广东省微生物分析检测中心
GUANGDONG DETECTION CENTER OF MICROBIOLOGY
分析检测结果
ANALYSIS AND TEST RESULT

报告编号（Report No.）：2020FM03012R03

试验结果：

序号	时间	紫外线辐照强度 ($\mu W/cm^2$)
1	1min	201
2	2min	204
3	3min	206
4	4min	207
5	5min	206
6	6min	204
7	7min	205
8	8min	205
9	9min	207
10	10min	206
平均值		205



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广微测 Gmicro Testing

广东省微生物分析检测中心
GUANGDONG DETECTION CENTER OF MICROBIOLOGY
分析检测报告
REPORT FOR ANALYSIS

报告编号 Report No.	2020FM03012R03
样品名称 Name of Sample	飞利浦品牌紫外线灯
委托单位 Applicant	昕诺飞（中国）投资有限公司
检测类型 Test Type	委托检测

单位地址：广州市先烈中路 100 号大院 66 号楼
Address: Building 66, No.100 Central Xian Lie Road, Guangzhou, China
邮政编码：510070
Postcode:
电话号码：(020)87137666
Tel:
传真号码：(020)87137668
Fax:
网　　址：www.gddcm.com
Website:

广微测 Gmicro Testing

报告编号（Report No.）：2020FM03012R03

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广微测 Gmicro Testing

广东省微生物分析检测中心
GUANGDONG DETECTION CENTER OF MICROBIOLOGY
分析检测报告
REPORT FOR ANALYSIS

报告编号（Report No.）2020FM03012R03 校验码（Verification Code）：02781345

样品名称 Name of Sample	飞利浦品牌紫外线灯	检测类型 Test Type	委托检测
委托单位 Applicant	昕诺飞（中国）投资有限公司	地　址 Address	上海市闵行区田林路 888 弄 9 号楼
样品来源 Sample Source	委托方送检	样品数量 Sample Quantity	2 套
样品规格和批号 Spec and Lot № of Sample	TUV 36W	样品状态和特性 State and Characteristic	器械
收样日期 Sample Received Date	2020-02-26	检测完成日期 Completion Date	2020-03-25
检测依据和方法 Test Standard and Method	GB 15981-1995 消毒与灭菌效果的评价方法与标准		
检测项目 Item Tested	紫外线辐照强度		
检测结论 Test Conclusion	该样品所检项目的实测数据见本检测报告续页。 签发日期 Issue Date：2020-04-02 （机构盖章 Official Seal）		
备注 Remarks	生产厂家：昕诺飞波兰工厂。（由委托方提供）		

制 表 Editor　　审 核 Verifier　　批 准 Approver

Effectiveness of UV-C Disinfection – Certificates

- Escherichia coli (大腸桿菌) be killed 99.9% in 1 hour
- Streptococcus pneumoniae (肺炎鏈球菌) be killed 99.9% in 1 hour

广微测 Gmicro Testing

广东省微生物分析检测中心

GUANGDONG DETECTION CENTER OF MICROBIOLOGY

分析检测报告

REPORT FOR ANALYSIS

报告编号 Report №. 2020FM03012R02

样品名称 Name of Sample 飞利浦品牌紫外线灯

委托单位 Applicant 昕诺飞（中国）投资有限公司

检测类型 Test Type 委托检测

单位地址：广州市先烈中路 100 号大院 66 号楼
Address: Building 66, No.100 Central Xian Lie Road, Guangzhou, China

邮政编码：510070
Postcode:

电话号码：(020)87137666
Tel:

传真号码：(020)87137668
Fax:

网　址：www.gddcm.com
Website:

广微测 Gmicro Testing

广东省微生物分析检测中心

GUANGDONG DETECTION CENTER OF MICROBIOLOGY

分析检测报告

REPORT FOR ANALYSIS

报告编号（Report №.）2020FM03012R02 校验码（Verification Code）：71832659

样品名称 Name of Sample	飞利浦品牌紫外线灯	检测类型 Test Type	委托检测
委托单位 Applicant	昕诺飞（中国）投资有限公司	地　址 Address	上海市闵行区田林路 888 弄 9 号楼
样品来源 Sample Source	委托方送检	样品数量 Sample Quantity	2 套
样品规格和批号 Spec and Lot № of Sample	TUV 36W	样品状态和特性 State and Characteristic	器械
接样日期 Sample Received Date	2020-02-26	检测完成日期 Completion Date	2020-03-14
检测依据和方法 Test Standard and Method	参照《消毒技术规范》2002 年版-2.1.3.4 空气消毒效果模拟现场试验		
检测项目 Item Tested	空气消毒效果鉴定试验		
检测结论 Test Conclusion	该样品所检项目的实测数据见本检测报告续页。		
备注 Remarks	生产厂家：昕诺飞波兰工厂。（由委托方提供）		

签发日期 Issue Date: 2020-04-02

（机构盖章 Official Seal）

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广微测 Gmicro Testing

广东省微生物分析检测中心

GUANGDONG DETECTION CENTER OF MICROBIOLOGY

分析检测结果

ANALYSIS AND TEST RESULT

报告编号（Report №.）：2020FM03012R02

作用时间	测试微生物	序号	空气中细菌总数 (cfu/m³)	杀灭率 (%)
0（CK）	大肠杆菌 (*Escherichia coli*) 8099	1	7.2×10^4	
		2	7.1×10^4	
		3	6.6×10^4	
1h	大肠杆菌 (*Escherichia coli*) 8099	1	<7	>99.98
		2	<7	>99.98
		3	<7	>99.98
0（CK）	肺炎链球菌 (*Streptococcus pneumoniae*) ATCC 49619	1	5.7×10^4	
		2	5.8×10^4	
		3	5.7×10^4	
1h	肺炎链球菌 (*Streptococcus pneumoniae*) ATCC 49619	1	21	99.94
		2	14	99.96
		3	14	99.96

（以下空白）

备注 Remarks	1.方法简述：样机在实验舱内正常运行 1h 后，用狭孔撞击式六级空气微生物采样器 JWL-6 以 28.3 升/分钟的抽风量进行采样，处理对照组采样时间为 30s，处理试验组采样时间为 5min，实验舱空间大小为 10m³。 2.杀灭率试验结果已消除微生物在空气中自然消亡因素的影响。

广微测 Gmicro Testing

报告编号（Report №.）：2020FM03012R02

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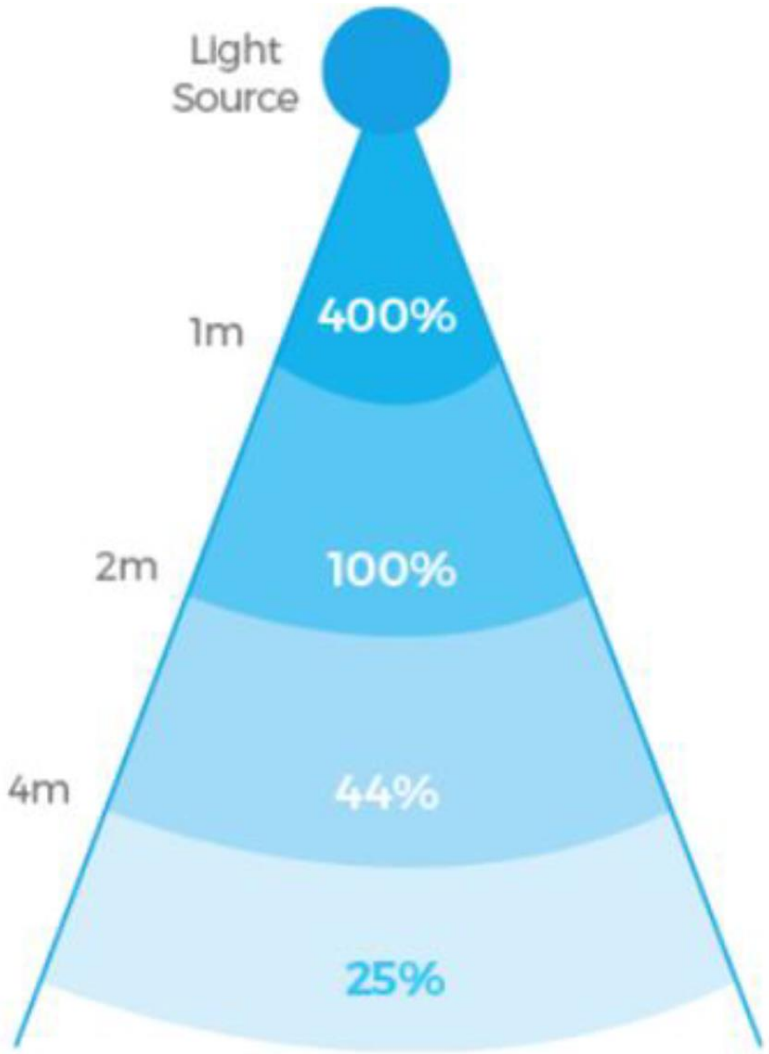
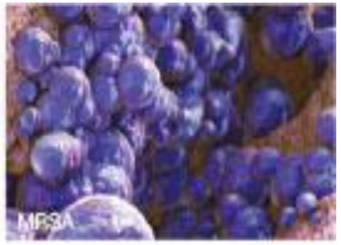
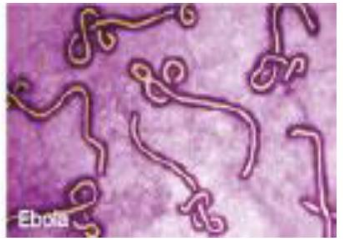


UVC dosage: Power intensity and efficiency

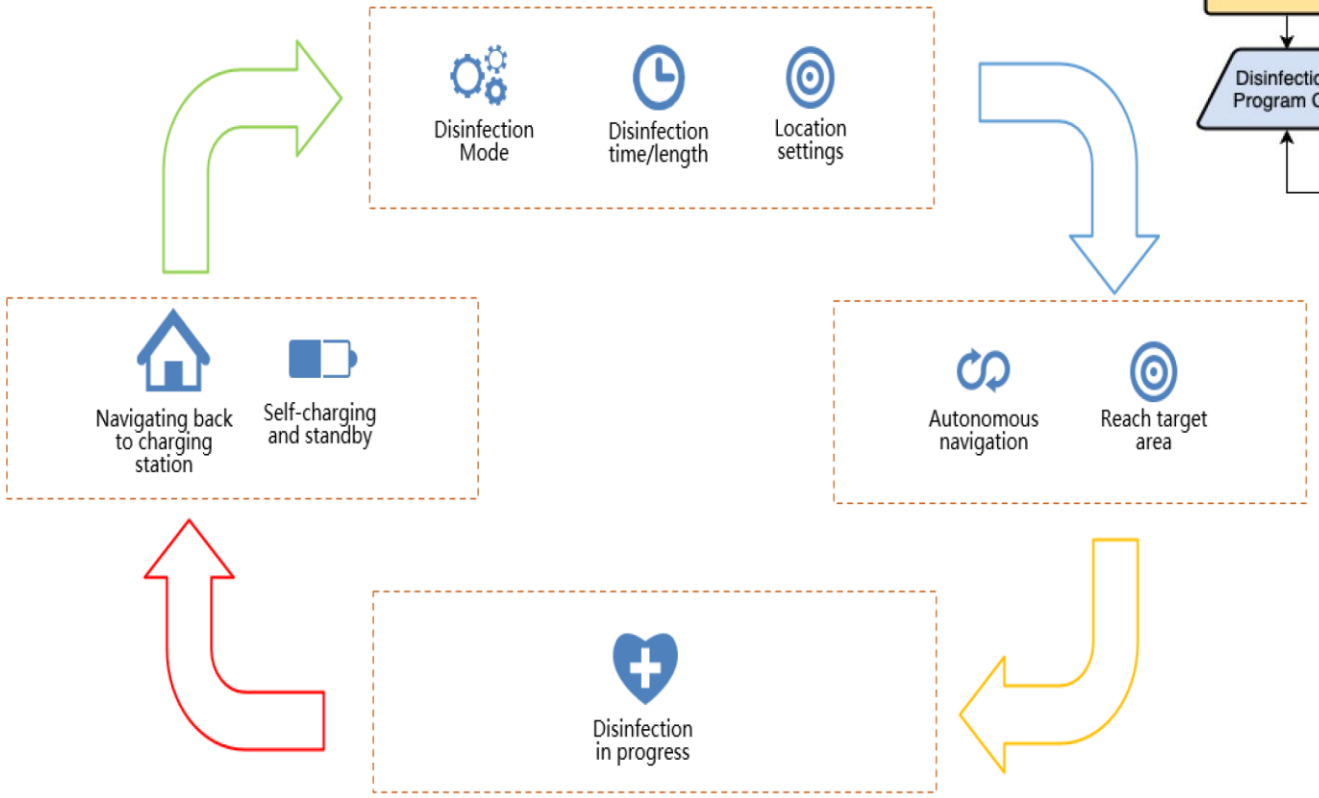
- UVC is proven to kill all known pathogens at 253.7nm. Lavender can destroy some very infectious pathogens, including Coronavirus, Enterococcus, MRSA, C. difficile and Ebola, over a rapid disinfection cycle.
- Lavender’ s high level of mobility provides most effective at reaching darker shadowed areas, killing pathogens over a wider area in a single charge.

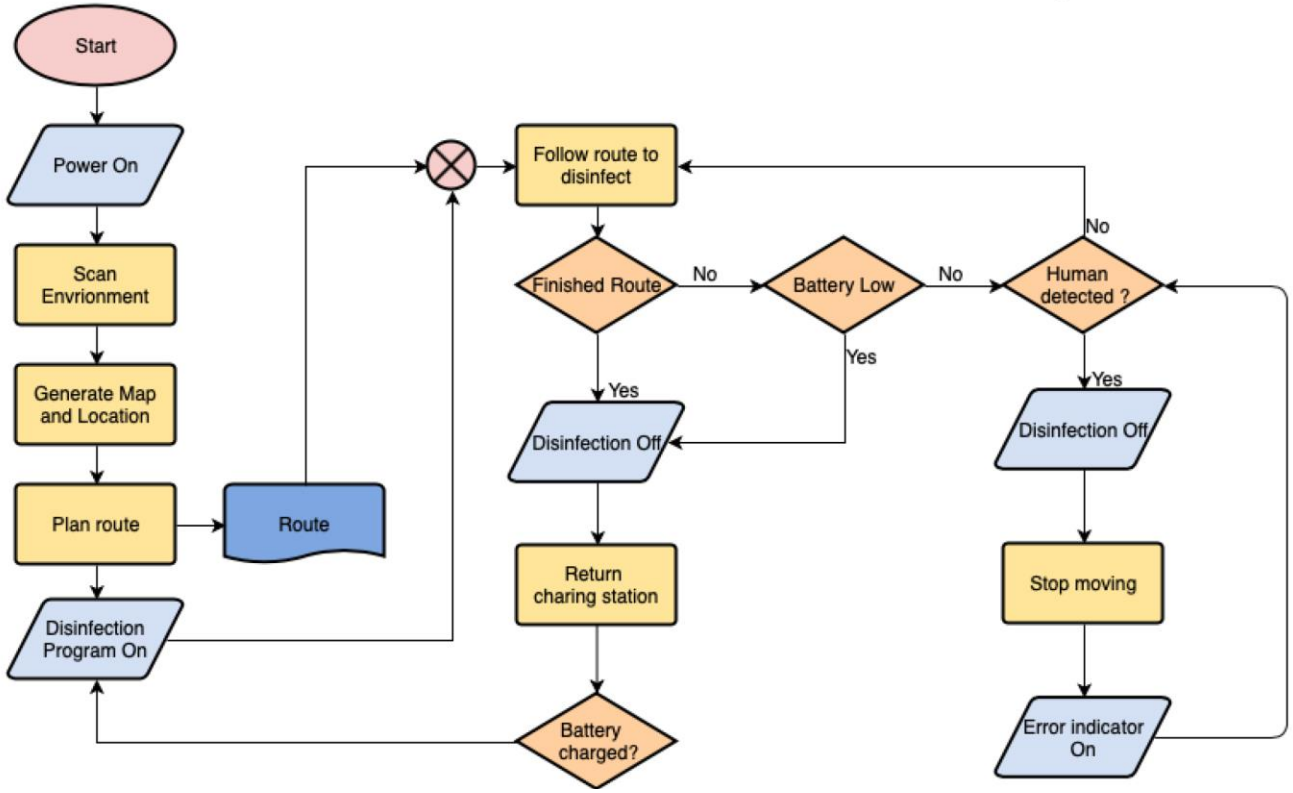




Intelligent Disinfection Robot

Operation Routine





Intelligent Disinfection Robot

Operation Flowchart

Intelligent Disinfection Robot

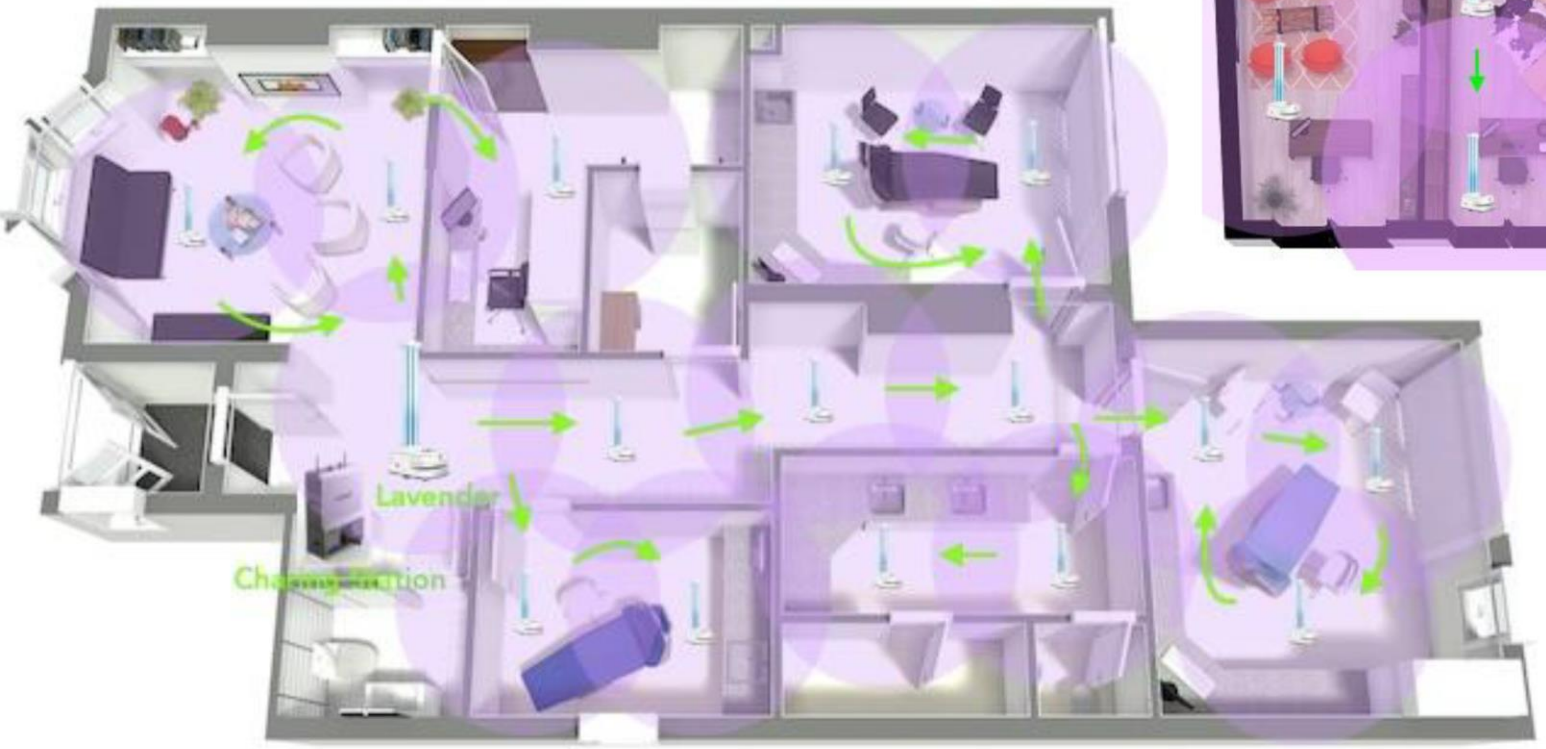
Operation Time

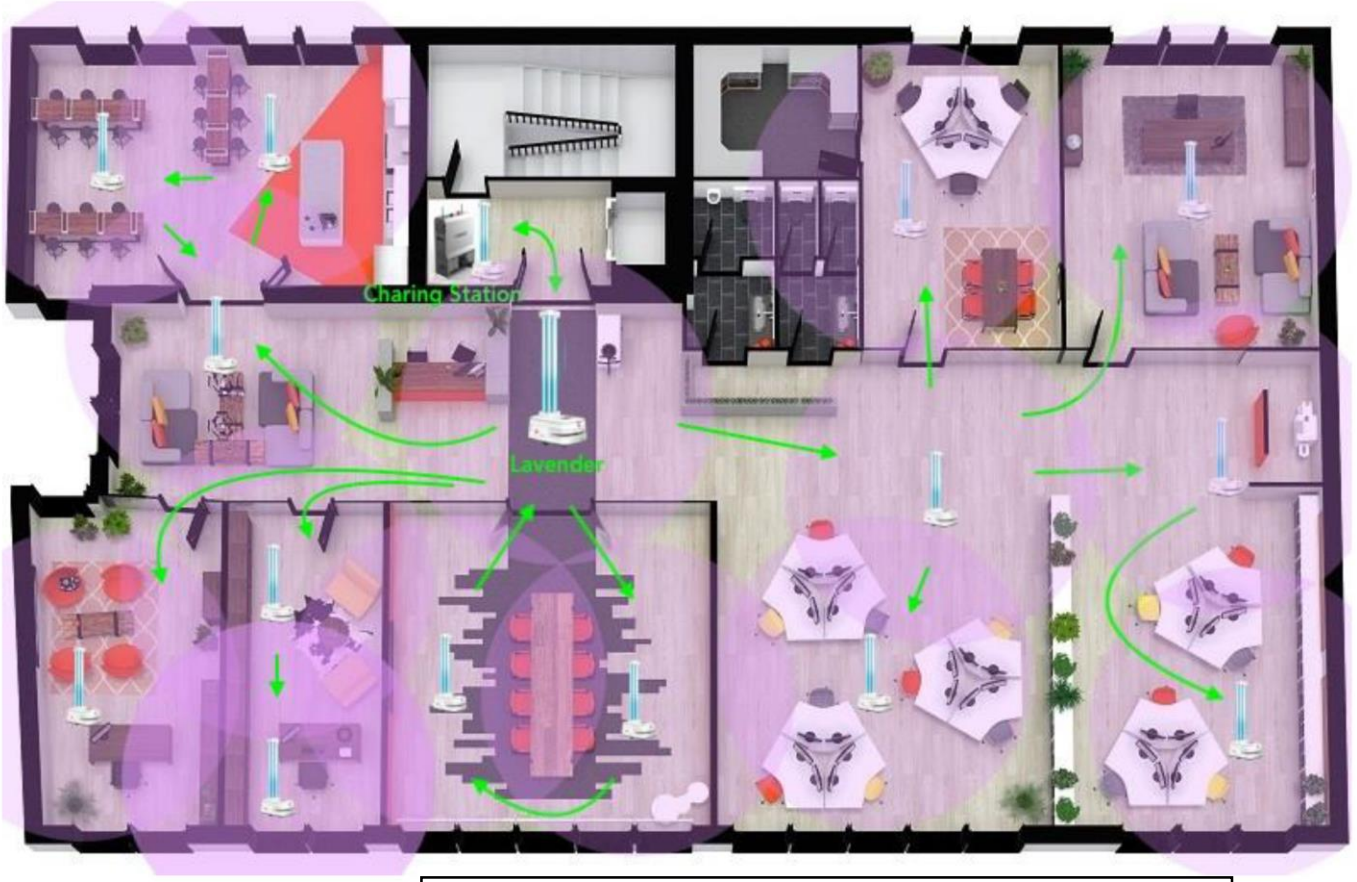
Disinfection time for specific area with Lavender (hour)				
Area (sqft) / No. of AGV	6,000	10,000	15,500	20,000
1	0.84 *(1 hr)*	1.54	2.27	3.13
2	0.42 *(1/2 hr)*	0.77	1.13	1.57
3	0.28 *(1/4 hr)*	0.51	0.75	1.04
4	0.21 *(1/4 hr)*	0.38	0.57	0.78
- 120s of disinfection at each stop point				
- Charging time is not considered				
- Analysis based on blank field				

Application of Disinfection Robot on different scenario

Disinfection Robot
Working Environment

Autonomous Navigation and UVC
disinfection in Clinic Environment





Autonomous Navigation and UVC
Disinfection in Office Environment

Disinfection Robot

Precautions

●Not to illuminate the human body, UV light is suitable for working in unmanned scenes. Do not use sterilization lamps as lighting lamps.

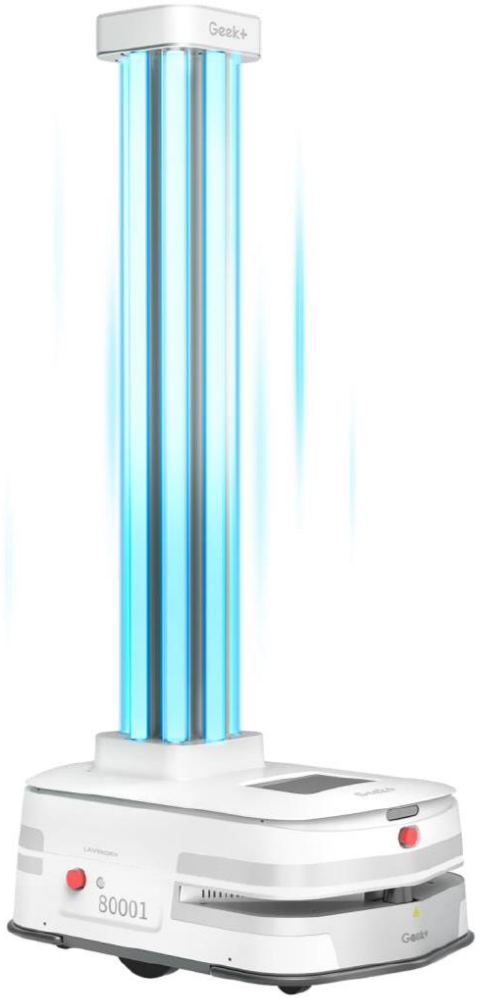
●UVC can irritate skin and eyes, and therefore the robot is for use in unoccupied rooms.

●Should not be used in areas/rooms with flammable and explosive items

●Maintenance:

1) As the use time of UV lamps increases, the disinfection effect will decrease, so it is recommended to replace the lamp once after 8000 hours of use or up to one year.

2) When cleaning the UV lamp, please use a clean soft cloth or alcohol wipes to wipe gently, avoid using organic solutions such as gasoline.



Value of Lavender

•No secondary pollution, no need to add disinfectant;

•Easy replacement and maintenance of UVC lamps;

•Total dosage = power intensity * time: the greater the lamp irradiation, the greater the power, the higher the disinfection efficiency

•Need to be used in unmanned scenes;

•Disinfection efficiency decreases in shadowed areas where the UVC light is blocked;

•The disinfection effect decreases with distance to the surface of objects/environment

Planning and Deployment

Single robot working in the same area

- Configuration: 1 robot + 1 charging station, no server or network required, no elevator support
  If it is a relatively large area, it is recommended to divide the area into fixed small zones
- Only one robot works in the same zone at any given time

Recommendations:

Mapping:

- Best result for stable and unchanged environments on both sides of the path; not suitable for open spaces.
  Changeable feature of 1m area within a 5m long path.

Starting/restarting point:

- Applicable to the environment with fixed unchanged and obvious characteristics

Environment:

- Within the scanned surface by robot' s laser, avoid reflexive, beams and similar objects.

Transparent objects/glass

- Matte effect films attached to surface within the range of 100 ~ 300mm from ground

Effectiveness of UV-C Disinfection – Studies & Literatures

A high-output UV disinfection robot, utilizing unique room mapping technology, to deliver a fast and effective germicidal dose of continuous wave UVC energy can kill germs and pathogens when and where is required.
An intelligent setup of robotic solution can standardize the quality and effectiveness of room sterilization over manual cleaning.

- A recent study found that mercury UV-C resulted in a significantly great reduction of MRSA, VRE, and C difficile spores (Nerandzic,etal., 2015)NerandzicMM, Thota P, Sankar CT, JencsonA, CadnumJL, Ray AJ, et al. Evaluation of a pulsed xenon ultraviolet disinfection system for reduction of healthcare associated pathogens in hospital rooms. Infect Control Hosp Epidemiol 2015;36:192-7.
- The technical report featured on the COVID-19 research community page concluded that UV light can be an effective measure for decontaminating surface that may be contaminated by the COVID-19 virus in 90 seconds.Kowalski, W. COVID-19 Coronavirus Ultraviolet Susceptibility. 10.13140/RG.2.2.22803.22566. 2020.
- Latest new report in U.S. also showed that UV disinfection machine also works to kill the virus that causes COVID-19 (News4SA). Lefko, J., (news4sanantonio.com) Xenex robots get stamp of approval for COVID-19 elimination by Texas Biomed. https://news4sanantonio.com/news/local/xenex-robots-get-stamp-of-approval-for-covid-19-elimination-by-texas-biomed, 30th April 2020.
- Service Robots for disinfection: To solve the hospital disinfection problem, the commercial robot produces UV light in a hospital room and in five minutes it can drastically reduce the germs in room.Rosoff, M.S.: Robotic Doorknob Disinfector. Department of Electrical and Computer Engineering. Cornell University. Ithaca, NY 14850. 2010.
- UVC disinfection may add to the armamentarium against HAI' s without risking the adaptive genetic resistance incurred by pharmaceutical weapons. Implementation including training personnel to operate the device is minimal, and time spent cleaningwas not increased.Begić, A., Application of Service Robots for Disinfection in Medical Institutions, Advanced Technologies, Systems, and Applications II. 2018; 28: 1056–1065