

CONFIDENTIAL TEST REPORT No. VL-2b August 27, 2020

Violux Ultraviolet

Antimicrobial Evaluation of Violux UV Treated Articles

Test Method Details

Test Method	Modified ASTM E2197
Test Organism	OC43 Human Coronavirus
Test Solution	Eagle's Modified Medium with 2% Fetal Bovine Serum
Test Discs	20mm diameter magnetic stainless steel discs
Inoculum Applied to Test Disc	0.010 mL applied to each disc and spread to within 1 mm of edges, then dried at room temperature
Recovery Solution	10 mL modified SCDLP Buffer
Measuring Method of Number of Viable Virus	Dilution Plate Method onto Rhabdomyosarcoma cells, viral particles were determined using an anti-OC43 monoclonal antibody. Foci were then counted giving Foci Forming Units (FFU).

Results – OC43 disc testing

Modified ASTM E2197: Standard Quantitative Disk Carrier Test Method				
Number of Replicate Experim	ents	1	1	
Number of Replicate Discs pe	er Experiment	2		
Exposure Device and Time	Average Viral Burden (FFU/disc)	Average Log Viral Burden (FFU/disc)	Log Reduction (vs Control)	Percent Reduction (vs Control)
Control	1.89E+05	5.28		
Luma (16W)- 1.5 minutes	0.00E+00	0.00	5.28	100.00%
Luma Pro (32W)- 1 minute	0.00E+00	0.00	5.28	100.00%



CONFIDENTIAL TEST REPORT No. VL-1a August 24, 2020

Violux Ultraviolet

Antimicrobial Evaluation of Violux UV Treated Articles

Test Method Details

Test Method	Modified ASTM E2197
Test Organism	Methicillan-Resistant <i>Staphylococcus aureus</i> (ATCC #33591) (MRSA)
Test Solution	Phosphate Buffered Saline (1x) with Serum (5%)
Test Discs	20mm diameter magnetic stainless steel discs
Inoculum Applied to Test Disc	0.010 mL applied to each disc and spread to within 1 mm of edges, then dried
Recovery Solution	5 mL Phosphate Buffered Saline (1x) with Triton X-100 surfactant (0.1%)
Measuring Method of Number of Viable Bacteria	Dilution Plate Method onto nutritive Tryptic Soy Agar (1x)

Results – MRSA disc testing

Modified ASTM E2197: Standard Quantitative Disk Carrier Test Method					
Number of Replicate Experiments		2	2		
Number of Replicate Discs pe	er Experiment	3	3		
Exposure Device and Time	Average Bacterial Burden (CFU/disc)	Average Log Bacterial Burden (CFU/disc)	Log Reduction (vs Control)	Percent Reduction (vs Control)	
Control	2.66E+06	6.42			
Luma (16W)- 2 minutes	6.33E+02	2.80	3.62	99.98%	
Luma (16W)- 3 minutes	1.25E+02	2.10	4.33	>99.99%	
Luma Pro (32W)- 1 minute	6.33E+02	2.80	3.62	99.98%	
Luma Pro (32W)- 2 minutes	1.67E+02	2.22	4.20	99.99%	



CONFIDENTIAL TEST REPORT No. VL-5a September 8, 2020

Violux Ultraviolet

Antimicrobial Evaluation of Violux UV Treated Articles

Test Method Details

Test Method	Modified ASTM E2197
Test Organism	Escherichia coli (ATCC #25922) (E.coli)
Test Solution	Phosphate Buffered Saline (1x) with Serum (5%)
Test Discs	20mm diameter magnetic stainless steel discs with 0.10 mL Tryptic Soy Agar overlay
Inoculum Applied to Test Disc	0.010 mL applied to each disc and spread to within 1 mm of edges, then dried
Recovery Solution	5 mL Phosphate Buffered Saline (1x) with Triton X-100 surfactant (0.1%)
Measuring Method of Number of Viable Bacteria	Dilution Plate Method onto nutritive Tryptic Soy Agar (1x)

Results – E.coli disc testing

Modified ASTM E2197: Standard Quantitative Disk Carrier Test Method					
Number of Replicate Experiments		2	2		
Number of Replicate Discs pe	er Experiment	3	3		
Exposure Device and Time	Average Bacterial Burden (CFU/disc)	Average Log Bacterial Burden (CFU/disc)	Log Reduction (vs Control)	Percent Reduction (vs Control)	
Control	1.58E+07	7.20			
Luma (16W)- 2 minutes	2.95E+04	4.47	2.73	99.81%	
Luma (16W)- 3 minutes	1.95E+04	4.29	2.91	99.88%	
Luma Pro (32W)- 1 minute	3.06E+04	4.49	2.71	99.81%	
Luma Pro (32W)- 2 minutes	1.70E+04	4.23	2.97	99.89%	



CONFIDENTIAL TEST REPORT No. VL-4a September 8, 2020

Violux Ultraviolet

Antimicrobial Evaluation of Violux UV Treated Articles

Test Method Details

Test Method	Modified ASTM E2197			
Test Organism	<i>Klebsiella pneumoniae</i> (ATCC #BAA-1705) (KPC)			
Test Solution	Phosphate Buffered Saline (1x) with Serum (5%)			
Test Discs	20mm diameter magnetic stainless steel discs with 0.10 mL Tryptic Soy Agar overlay			
Inoculum Applied to Test Disc	0.010 mL applied to each disc and spread to within 1 mm of edges, then dried			
Recovery Solution	5 mL Phosphate Buffered Saline (1x) with Triton X-100 surfactant (0.1%)			
Measuring Method of Number of Viable Bacteria	Dilution Plate Method onto nutritive Tryptic Soy Agar (1x)			

Results – KPC disc testing

Modified ASTM E2197: Standard Quantitative Disk Carrier Test Method					
Number of Replicate Experiments		2	2		
Number of Replicate Discs pe	er Experiment	3	3		
Exposure Device and Time	Average Bacterial Burden (CFU/disc)	Average Log Bacterial Burden (CFU/disc)	Log Reduction (vs Control)	Percent Reduction (vs Control)	
Control	2.92E+07	7.47			
Luma (16W)- 2 minutes	5.00E+01	1.70	5.77	>99.99%	
Luma (16W)- 3 minutes	1.04E+02	2.02	5.45	>99.99%	
Luma Pro (32W)- 1 minute	1.38E+03	3.14	4.33	>99.99%	
Luma Pro (32W)- 2 minutes	3.50E+02	2.54	4.92	>99.99%	

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CONFIDENTIAL TEST REPORT No. VL-3a September 8, 2020

Violux Ultraviolet

Antimicrobial Evaluation of Violux UV Treated Articles

Test Method Details

Test Method	Modified ASTM E2197
Test Organism	Staphylococcus aureus (ATCC #6538) (MSSA)
Test Solution	Phosphate Buffered Saline (1x) with Serum (5%)
Test Discs	20mm diameter magnetic stainless steel discs
Inoculum Applied to Test Disc	0.010 mL applied to each disc and spread to within 1 mm of edges, then dried
Recovery Solution	5 mL Phosphate Buffered Saline (1x) with Triton X-100 surfactant (0.1%)
Measuring Method of Number of Viable Bacteria	Dilution Plate Method onto nutritive Tryptic Soy Agar (1x)

Results – MSSA disc testing

Modified ASTM E2197: Standard Quantitative Disk Carrier Test Method					
Number of Replicate Experiments		2	2		
Number of Replicate Discs pe	er Experiment	3	3		
Exposure Device and Time	Average Bacterial Burden (CFU/disc)	Average Log Bacterial Burden (CFU/disc)	Log Reduction (vs Control)	Percent Reduction (vs Control)	
Control	1.24E+06	6.09			
Luma (16W)- 2 minutes	2.00E+02	2.30	3.79	99.98%	
Luma (16W)- 3 minutes	0.00E+00	0.00	6.09	100.00%	
Luma Pro (32W)- 1 minute	0.00E+00	0.00	6.09	100.00%	
Luma Pro (32W)- 2 minutes	0.00E+00	0.00	6.09	100.00%	



CONFIDENTIAL TEST REPORT No. VL-6a September 8, 2020

Violux Ultraviolet

Antimicrobial Evaluation of Violux UV Treated Articles

Test Method Details

Test Method	Modified ASTM E2197
Test Organism	Pseudomonas aeruginosa (ATCC #27853)
Test Solution	Phosphate Buffered Saline (1x) with Serum (5%)
Test Discs	20mm diameter magnetic stainless steel discs with 0.10 mL Tryptic Soy Agar overlay
Inoculum Applied to Test Disc	0.010 mL applied to each disc and spread to within 1 mm of edges, then dried
Recovery Solution	5 mL Phosphate Buffered Saline (1x) with Triton X-100 surfactant (0.1%)
Measuring Method of Number of Viable Bacteria	Dilution Plate Method onto nutritive Tryptic Soy Agar (1x)

Results – Pseudomonas disc testing

Modified ASTM E2197: Standard Quantitative Disk Carrier Test Method					
Number of Replicate Experiments		2	2		
Number of Replicate Discs pe	er Experiment	3	3		
Exposure Device and Time	Average Bacterial Burden (CFU/disc)	Average Log Bacterial Burden (CFU/disc)	Log Reduction (vs Control)	Percent Reduction (vs Control)	
Control	7.38E+06	6.87			
Luma (16W)- 2 minutes	2.62E+03	3.42	3.45	99.96%	
Luma (16W)- 3 minutes	4.85E+03	3.69	3.18	99.93%	
Luma Pro (32W)- 1 minute	8.93E+03	3.95	2.92	99.88%	
Luma Pro (32W)- 2 minutes	9.58E+01	1.98	4.89	>99.99%	



CONFIDENTIAL TEST REPORT No. VL-7a September 17, 2020

Violux Ultraviolet

Antimicrobial Evaluation of Violux UV Treated Articles

Test Method Details

Test Method	Modified ASTM E2197		
Test Organism	Salmonella typhimurium (ATCC #14028)		
Test Solution	Phosphate Buffered Saline (1x) with Serum (5%)		
Test Discs	20mm diameter magnetic stainless steel discs		
Inoculum Applied to Test Disc	0.010 mL applied to each disc and spread to within 1 mm of edges, then dried		
Recovery Solution	5 mL Phosphate Buffered Saline (1x) with Triton X-100 surfactant (0.1%)		
Measuring Method of Number of Viable Bacteria	Dilution Plate Method onto nutritive Tryptic Soy Agar (1x)		

Results – Salmonella disc testing

Modified ASTM E2197: Standard Quantitative Disk Carrier Test Method							
Number of Replicate Experiments		2	2				
Number of Replicate Discs per Experiment		3	3				
Exposure Device and Time	Average Bacterial Burden (CFU/disc)	Average Log Bacterial Burden (CFU/disc)	Log Reduction (vs Control)	Percent Reduction (vs Control)			
Control	1.14E+06	6.06					
Luma (16W)- 2 minutes	5.00E+01	1.70	4.36	>99.99%			
Luma (16W)- 3 minutes	3.50E+02	2.54	3.51	99.97%			
Luma Pro (32W)- 1 minute	0.00E+00	0.00	6.06	100.00%			
Luma Pro (32W)- 2 minutes	2.50E+01	1.40	4.66	>99.99%			



CONFIDENTIAL TEST REPORT No. VL-8b October 27, 2020

Violux Ultraviolet

Antimicrobial Evaluation of Violux UV Treated Articles

Test Method Details

Test Method	Modified ASTM E2197		
Test Organism	H1N1 Influenza		
Test Solution	Eagle's Modified Medium		
Test Discs	20mm diameter magnetic stainless steel discs		
Inoculum Applied to Test Disc	0.010 mL applied to each disc and spread to within 1 mm of edges, then dried at room temperature		
Recovery Solution	10 mL modified SCDLP Buffer		
Measuring Method of Number of Viable Virus	Dilution Plate Method onto Madin-Darby Canine Kidney (MDCK) cells, viral particles were determined using an anti-H1N1 monoclonal antibody. Foci were then counted giving Foci Forming Units (FFU).		

Results – H1N1 disc testing

Modified ASTM E2197: Standard Quantitative Disk Carrier Test Method							
Number of Replicate Experiments		1	1				
Number of Replicate Discs per Experiment		2	2				
Exposure Device and Time	Average Viral Burden (FFU/disc)	Average Log Viral Burden (FFU/disc)	Log Reduction (vs Control)	Percent Reduction (vs Control)			
Control	4.90E+04	4.69					
Luma (16W)- 2 minutes	0.00E+00	0.00	4.69	100.00%			
Luma (16W)- 3 minutes	5.00E+01	1.70	2.99	99.90%			
Luma Pro (32W)- 1 minute	5.00E+01	1.70	2.99	99.90%			
Luma Pro (32W)- 2 minutes	0.00E+00	0.00	4.69	100.00%			

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