




MILOO-ELECTRONICS Sp. z o.o.
Stary Wiśnicz 289, 32-720 Nowy Wiśnicz
tel./fax: +48 14 662 19 55

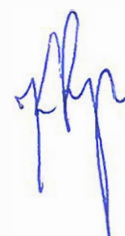
Photometry Laboratory

PRODUCT TEST REPORT
PN-EN 62471
Photobiological safety of lamps and lamps systems
and
Leakage of UV-C radiation beyond the air disinfection device

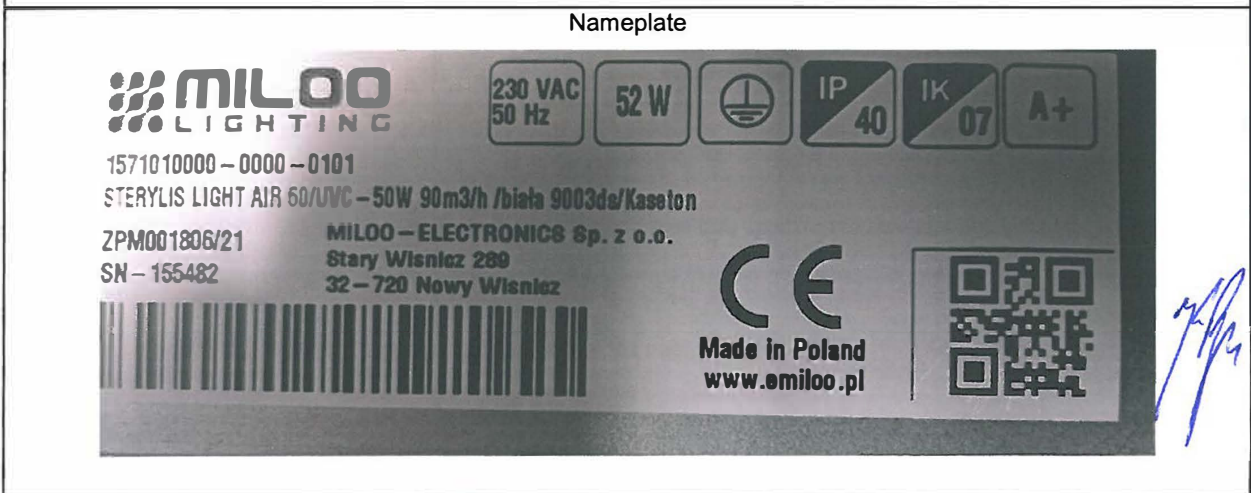
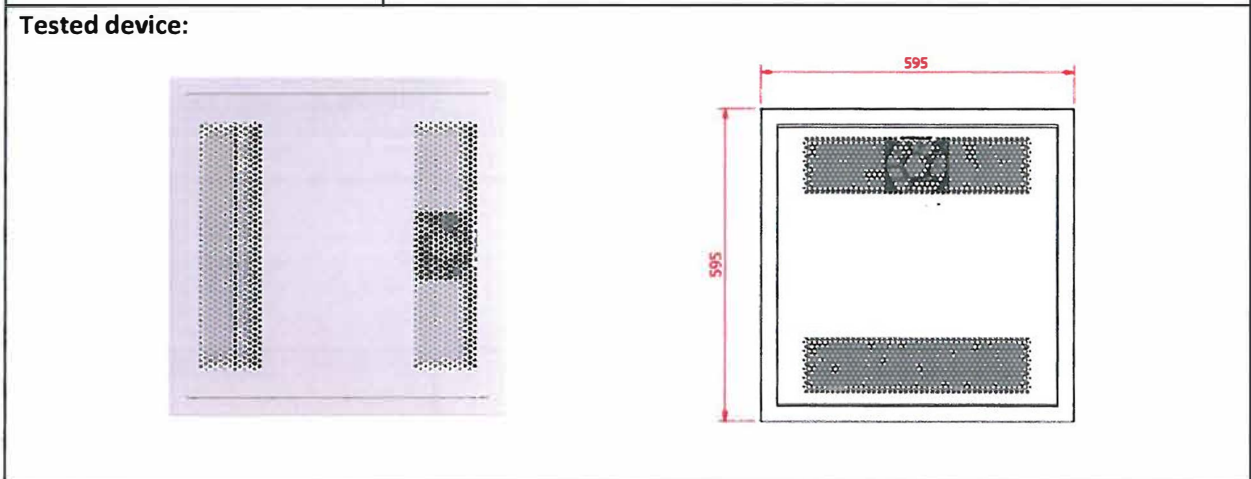
Report number	RAD_01.03.21_X1
Date of execution	01.03.2021
Total number of pages	16
The research was conducted by	Konrad Ryncarz Justyna Waśniowska
Report authorized by	Łukasz Kołaszewski
Standards / procedures	<input checked="" type="checkbox"/> PN-EN 62471:2010 partial examination
Non-standardized test methods	Measurement of the intensity of UV + VIS radiation emitted outside the device Measurement of the spectrum of UV + VIS radiation emitted outside the device
Non-accredited test methods	N/A
Applicant	MILOO-ELECTRONICS Sp. z o.o.
Address	Stary Wiśnicz 289, 32-720 Nowy Wiśnicz
Description of the research object	Device for disinfecting rooms / Air purifier
Trademark	
Manufacturer	MILOO-ELECTRONICS Sp. z o.o.
Model/Type	STERYLIS LIGHT AIR 60
Rated data	230 VAC, 50 Hz, kl. I, 52 W, 0,23 A

MILOO-ELECTRONICS Sp. z o.o.
32-720 NOWY WIŚNICZ
STARY WIŚNICZ 289
NIP 75 23 42 23

<p>List of attachments to the report: Appendix A: List of research equipment and software</p>	
<p>Research Summary:</p>	
<p>Tests performed:</p>	<p>N/A</p>
<p>Date of receipt of the sample: Date of the test:</p>	<p>01.03.2021 01.03.2021</p>
<p>Summary of product research</p>	<p>W The product meets the requirements of the PN-EN 62471: 2010 standard for the RG0 risk group. The maximum radiation intensity in the UV range emitted outside the device measured from a distance of 0,2 m does not exceed the value of 0,000 W / m².</p> 
<p>Summary of compliance with national differences (if applicable):</p>	<p>N/A</p>
<p>Opinions and interpretations when appropriate and needed:</p>	<p>N/A</p>
<p>Other additional information (as requested by the customer):</p>	<p>N/A</p>
<p>General conditions relating to the report:</p> <ol style="list-style-type: none"> 1. The test results presented in this report relate only to the tested object. 2. This report will not be reproduced otherwise than in full without the written approval of the issuing laboratory. 3. "(See Annex #)" refers to additional information attached to the report. 4. "(See attached table)" refers to the table attached to the report. 5. The comma is used as the decimal separator throughout the report. 6. The list of test devices must be kept on file and available for review. 	



General information about the product	
Designation of the research object:	STERYLIS LIGHT AIR 60
Production place:	MILOO-ELECTRONICS Sp. z o.o. Stary Wiśnicz 289, 32-720 Nowy Wiśnicz
Modes of operation:	Air disinfection in the chamber with UV radiation 253,7 nm
Test sample:	<p>Device for disinfecting rooms STERYLIS LIGHT AIR 60</p> <p>Power : 230 VAC, 50 Hz Device rated power : 52 W Type of UV lamps : 25 W/ G13 Number of UV lamps : 2 Electric power of UV lamps : 50 W The power of UV radiation emitted by the lamps : 16,4 W External communication : LACK</p> <p>Operation mode when taking measurements:</p> <p>Air disinfection in the chamber with UV-C radiation $\lambda = 253,7$ nm</p> <p style="text-align: right;">YES</p>



4	EXPOSURE LIMITS		
4.1	General		-
	The exposure limits in this standard is not less than 0,01 ms and not more than any 8-hour period and should be used as guides in the control of exposure		P
	Detailed spectral data of a light source are generally required only if the luminance of the source exceeds 10^4 cd m^{-2}		P
4.3	Hazard exposure limits		-
4.3.1	Actinic UV hazard exposure limit for the skin and eye		P
	The exposure limit for effective radiant exposure is 30 J m^{-2} within any 8-hour period		P
	To protect against injury of the eye or skin from ultraviolet radiation exposure produced by a broadband source, the effective integrated spectral irradiance, E_s , of the light source shall not exceed the levels defined by:	$E_s = 0,0001978 \text{ W/m}^2$	P
	$E_s \cdot t = \sum_{200}^{400} \sum_{\tau} E_{\lambda}(\lambda, t) \cdot S_{UV}(\lambda) \cdot \Delta t \cdot \Delta \lambda \leq 30 \text{ J} \cdot \text{m}^{-2}$		P
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye or skin shall be computed by:		P
	$t_{\max} = 30/E_s \text{ s}$	$t_{\max} = 30/(0,0001978) = 151668,35 \text{ s} = 42,13 \text{ h}$	P
4.3.2	Near-UV hazard exposure limit for eye		-
	For the spectral region 315 nm to 400 nm (UV-A) the total radiant exposure to the eye shall not exceed 10000 J m^{-2} for exposure times less than 1000s. For exposure times greater than 1000 s (approximately 16 minutes) the UV-A irradiance for the unprotected eye, E_{UVA} , shall not exceed 10 W m^{-2}		N/A
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye for time less than 1000 s, shall be computed by:		N/A
	$t_{\max} \leq 10000/E_{UVA} \text{ s}$		N/A
4.3.3	Retinal blue light hazard exposure limit		-
	To protect against retinal photochemical injury from chronic blue-light exposure, the integrated spectral radiance of the light source weighted against the blue-light hazard function $B(\lambda)$, i.e., the blue-light weighted radlance , L_B , shall not exceed the levels defined by:		N/A
	$L_b \cdot t = \sum_{300}^{700} \sum_{\tau} L_{\lambda}(\lambda, t) \cdot B(\lambda) \cdot \Delta t \cdot \Delta \lambda \leq 10^6 \text{ J} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$ (for $t \leq 10^4 \text{ s}$)		N/A

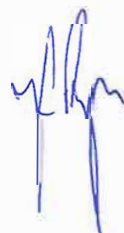


	$L_B = \sum_{300}^{700} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \quad W \cdot m^{-2} \cdot sr^{-1}$ <p style="text-align: center;">(for $t > 10^4 s$)</p>		N/A
4.3.4	Retinal blue light hazard exposure limit - small source		-
	Thus the spectral irradiance at the eye E_λ , weighted against the blue-light hazard function $B(\lambda)$ shall not exceed the levels defined by: see table 4.2		N/A
	$E_B \cdot t = \sum_{300}^{700} \sum_t E_\lambda(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \quad J \cdot m^{-2}$ <p style="text-align: center;">(for $t \leq 100 s$)</p>		N/A
	$E_B = \sum_{300}^{700} E_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 1 \quad W \cdot m^{-2}$ <p style="text-align: center;">(for $t > 100 s$)</p>		N/A
4.3.5	Retinal thermal hazard exposure limit		-
	To protect against retinal thermal injury, the integrated spectral radiance of the light source L_λ weighted by the burn hazard weighting function $R(\lambda)$ (from Figure 4.2 and Table 4.2), i.e., the burn hazard weighted radiance, shall not exceed the levels defined by:		N/A
	$L_R = \sum_{380}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{50000}{\alpha \cdot t^{0.25}} \quad W \cdot m^{-2} \cdot sr^{-1}$ <p style="text-align: center;">$10 \mu s \leq t \leq 10 s$</p>		N/A
4.3.6	Retinal thermal hazard exposure limit – weak visual stimulus		-
	For an infrared heat lamp or any near-infrared source where a weak visual stimulus is inadequate to activate the aversion response, the near infrared (780 nm to 1400 nm) radiance, L _{IR} , as viewed by the eye for exposure times greater than 10 s shall be limited to:		N/A
	$L_{IR} = \sum_{780}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{6000}{\alpha} \quad W \cdot m^{-2} \cdot sr^{-1}$ <p style="text-align: center;">$t > 10 s$</p>		N/A
4.3.7	Infrared radiation hazard exposure limits for the eye		-
	The avoid thermal injury of the cornea and Possible delayed effects upon the lens of the eye (cataractogenesis),ocular exposure to infrared radiation, E _{IR} ,over the wavelength range 780 nm to 3000 nm, for times less than 1000 s, shall not exceed:		N/A
	$E_{IR} = \sum_{780}^{3000} E_\lambda \cdot \Delta\lambda \leq 18000 \cdot t^{-0.75} \quad W \cdot m^{-2}$ <p style="text-align: center;">$t \leq 1000 s$</p>		N/A



	For times greater than 1000 s the limit becomes:		N/A
	$E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 100 \text{ W} \cdot \text{m}^{-2}$ $t > 1000 \text{ s}$		N/A
4.3.8	Thermal hazard exposure limit for the skin		-
	Visible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to:		N/A
	$E_H \cdot t = \sum_{300}^{3000} \sum_t E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta\lambda \leq 20000 \cdot t^{0.25} \text{ J} \cdot \text{m}^{-2}$ $(t \leq 10 \text{ s})$		N/A

5	MEASUREMENT OF LAMPS AND LAMP SYSTEMS		
5.1	Measurement conditions		-
	Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.		P
5.1.1	Lamp ageing (seasoning)		-
	Seasoning of lamps shall be done as stated in the Appropriate EN lamp standard		N/A
5.1.2	Test environment		-
	For specific test conditions, see the appropriate EN lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations		N/A
5.1.3	Extraneous radiation		-
	Careful checks should be made to ensure that extraneous sources of radiation and reflections do not add significantly to the measurement results.		P
5.1.4	Lamp operation		-
	Operation of the test lamp shall be provided in accordance with:		-
	- the appropriate EN lamp standard, or		N/A
	- the manufacturer' s recommendation		P
5.1.5	Lamp system operation		-
	The power source for operation of the test lamp shall be provided in accordance with:		-
	- the appropriate EN standard, or		N/A
	- the manufacturer' s recommendation		N/A
5.2	Measurement procedure		-
5.2.1	Irradiance measurements		-
	Minimum aperture diameter 7mm.		P



	Maximum aperture diameter 50 mm.		P
	The measurement shall be made in that position of the beam giving the maximum reading.		P
	The measurement instrument is adequate calibrated		P
5.2.2	Pomiary luminancji energetycznej		-
5.2.2.1	Radiance measurements		-
	The measurements made with an optical system		P
	The instrument shall be calibrated to read in absolute radiant power per unit receiving area and per unit solid angle to acceptance averaged over the field of view of the instrument		P
5.2.2.2	Alternative method		-
	Alternatively to an imaging radiance set-up, an irradiance measurement set-up with a circular field stop placed at the source can be used to perform radiance measurements.		N/A
5.2.3	Measurement of source size		-
	The determination of α , the angle subtended by a source, requires the determination of the 50% emission points of the source.		P
5.2.4	Pulse width measurement for pulsed sources		-
	The determination of Δt , the nominal pulse duration of a source, requires the determination of the time during which the emission is > 50% of its peak value.		N/A
5.3	Analysis methods		-
5.3.1	Weighting curve interpolations		-
	To standardize interpolated values, use linear interpolation on the log of given values to obtain intermediate points at the wavelength intervals desired.	Patrz tabela 4.1	N/A
5.3.2	Calculations		-
	The calculation of source hazard values shall be performed by weighting the spectral scan by the appropriate function and calculating the total weighted energy.		P
5.3.3	Measurement uncertainty		-
	The quality of all measurement results must be quantified by an analysis of the uncertainty.		P

6	LAMP CLASSIFICATION		
	For the purposes of this standard it was decided that the values shall be reported as follows:		-
	– for lamps intended for general lighting service, the hazard values shall be reported as either irradiance or radiance values at a distance which produces an illuminance of 500 lux, but not at a distance less than 200 mm		N/A



	-for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm		P
6.1	Continuous wave lamps		-
6.1.1	Exempt Group		-
	In the exempt group are lamps, which does not pose any photobiological hazard. The requirement is met by any lamp that does not pose:		-
	- an actinic ultraviolet hazard (ES) within 8-hours exposure (30000 s), nor		P
	- a near-UV hazard (EUVA) within 1000 s, (about 16 min), nor		N/A
	- a retinal blue-light hazard (LB) within 10000 s (about 2,8 h), nor		N/A
	- a retinal thermal hazard (LR) within 10 s, nor		N/A
	- an infrared radiation hazard for the eye (EIR) within 1000 s		N/A
6.1.2	Risk Group 1 (Low-Risk)		-
	In this group are lamps, which exceeds the limits for the exempt group but that does not pose:		N/A
	- a near ultraviolet hazard (EUVA) within 300 s, nor		N/A
	- a retinal blue-light hazard (LB) within 100 s, nor		N/A
	- a retinal thermal hazard (LR) within 10 s, nor		N/A
	- zagrożenia termicznego siatkówki (L _R) w ciągu 10 s, ani		N/A
	- an infrared radiation hazard for the eye (EIR) within 100 s		N/A
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard (LIR), within 100 s are in Risk Group		N/A
6.1.3	Risk Group 2 (Moderate-Risk)		-
	This requirement is met by any lamp that exceeds the limits for Risk Group 1, but that does not pose:		N/A
	- an actinic ultraviolet hazard (ES) within 1000 s exposure, nor		N/A
	- a near ultraviolet hazard (EUVA) within 100 s, nor		N/A
	- a retinal blue-light hazard (LB) within 0,25 s (aversion response), nor		N/A
	- a retinal thermal hazard (LR) within 0,25 s (aversion response), nor		N/A
	- an infrared radiation hazard for the eye (EIR) within 10 s		N/A
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard (LIR), within 10 s are in Risk Group 2		N/A
6.1.4	Risk Group 3 (High-Risk)		-



	Lamps which exceed the limits for Risk Group 2 are in Group 3		N/A
6.2	Pulsed lamps		-
	Pulse lamp criteria shall apply to a single pulse and to any group of pulses within 0,25 s.		N/A
	A pulsed lamp shall be evaluated at the highest nominal energy loading as specified by the manufacturer.		N/A
	The risk group determination of the lamp being tested shall be made as follows:		N/A
	- a lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (High- Risk)		N/A
	- for single pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance does is below the EL shall be classified as belonging to the Exempt Group		N/A
	- for repetitively pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance dose is below the EL, shall be evaluated using the continuous wave risk criteria discussed in clause 6.1, using time averaged values of the pulsed emission		N/A



Tabela 4.1		Spectral efficiency function for the assessment of skin and eye hazards from ultraviolet		-
Wavelength ¹ λ , nm	UV hazard function $S_{uv}(\lambda)$	Wavelength λ , nm	UV hazard function $S_{uv}(\lambda)$	
200	0,030	313*	0,006	
205	0,051	315	0,003	
210	0,075	316	0,0024	
215	0,095	317	0,0020	
220	0,120	318	0,0016	
225	0,150	319	0,0012	
230	0,190	320	0,0010	
235	0,240	322	0,00067	
240	0,300	323	0,00054	
245	0,360	325	0,00050	
250	0,430	328	0,00044	
254*	0,500	330	0,00041	
255	0,520	333*	0,00037	
260	0,650	335	0,00034	
265	0,810	340	0,00028	
270	1,000	345	0,00024	
275	0,960	350	0,00020	
280*	0,880	355	0,00016	
285	0,770	360	0,00013	
290	0,640	365*	0,00011	
295	0,540	370	0,000093	
297*	0,460	375	0,000077	
300	0,300	380	0,000064	
303*	0,120	385	0,000053	
305	0,060	390	0,000044	
308	0,026	395	0,000036	
310	0,015	400	0,000030	

¹ Wavelengths chosen are representative: other values should be obtained by logarithmic interpolation at intermediate wavelengths.
* Mercury discharge spectrum emission lines.

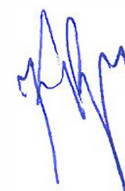


Tabela 5.4		Summary of exposure limits at the skin surface or cornea of the eye (values based on the irradiance)			
Name threats	Corresponding equation	Wavelength range [nm]	Duration of exposure [s]	Limiting aperture radian (degree)	Exposure limit expressed as constant irradiance [W/m ²]
Danger of skin and eye from UV actinic radiation	$E_S = \sum E_\lambda \cdot S(\lambda) \cdot \Delta\lambda$	200 - 400	< 30000	1,4 (80)	30/t
Eye hazard from UV-A radiation	$E_{UVA} = \sum E_\lambda \cdot \Delta\lambda$	315 - 400	≤1000 >1000	1,4 (80)	10000/t 10
Blue light eye hazard - small source	$E_B = \sum E_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300 - 700	≤100 >100	<0,011	100/t 1,0
Infrared eye hazard	$E_{IR} = \sum E_\lambda \cdot \Delta\lambda$	780 - 3000	≤1000 >1000	1,4 (80)	18000/t ^{0,75} 100
Thermal skin hazard	$E_H = \sum E_\lambda \cdot \Delta\lambda$	380 - 3000	< 10	2 π sr	20000/t ^{0,75}



Tabela 6.1		Exposure limits for the risk groups of continuous lamps based on the Directive (2006/25 / EC)										P
Risk	The spectrum of action	Units	Symbol	Risk-free group		Risk group 1 (low risk)		Risk group 2 (moderate risk)		Score	Limit	Score
				Limit	Score measurement	Limit	Score	Limit	Score			
Danger of skin and eye from UV actinic radiation	Suv(λ)	W·m ⁻²	Es	0,001	0,0001978	-	-	-	-	-	-	-
Eye hazard from UV-A radiation		W·m ⁻²	EuVA	10	-	-	-	-	-	-	-	-
Blue light hazard	B(λ)	W·m ⁻² ·sr ⁻¹	Lb	100	-	10000	-	4000000	-	-	-	-
Blue light eye hazard - small source *	B(λ)	W·m ⁻²	Eb	1,0	-	1,0	-	400	-	-	-	-
Thermal hazard of the retina	R(λ)	W·m ⁻² ·sr ⁻¹	Lr	28000/ α	-	28000/ α	-	71000/ α	-	-	-	-
Thermal hazard to the retina (poor visual stimulus)	R(λ)	W·m ⁻² ·sr ⁻¹	Lir	-	-	6000/ α	-	28000/ α	-	-	-	-
Infrared eye hazard		W·m ⁻²	Eir	100	-	570	-	3200	-	-	-	-

* A small source defined as one of $\alpha < 0,011$ radians. Averaged field of view at 10,000 sec. is 0.1 radians.
NOTE Operation functions: see Table 4.1 and Table 4.2

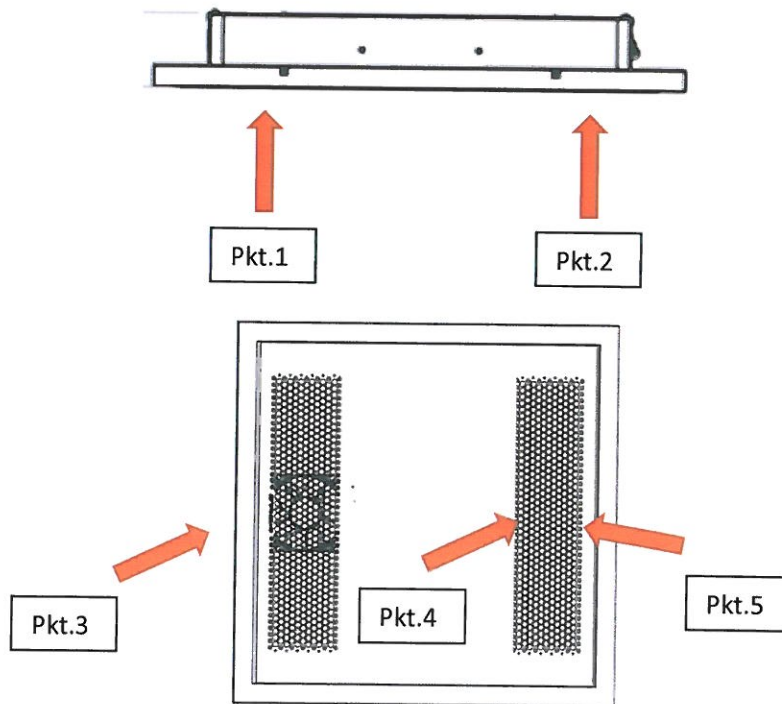
THE COURSE OF THE TEST

1. Methodology for measuring the leakage of UV-C radiation outside the device.

METODOLOGY	
Measuring device	Spectroradiometer GL SPECTIS 5.0 Touch
Number of points for which the radiation intensity was determined	5
Location of points for which the values of radiation intensity were determined	Measurements were made within a radius of 0.2 m from the device at half the width of the device. The location of the measurement points is shown in Figures 1 and 2.
Measurement of the radiation intensity	The radiation intensity was measured for each point marked in the graphic in 1. and 2 The radiation power in the range of 200-400 nm was then determined. Measurements were made in a photometric darkroom.

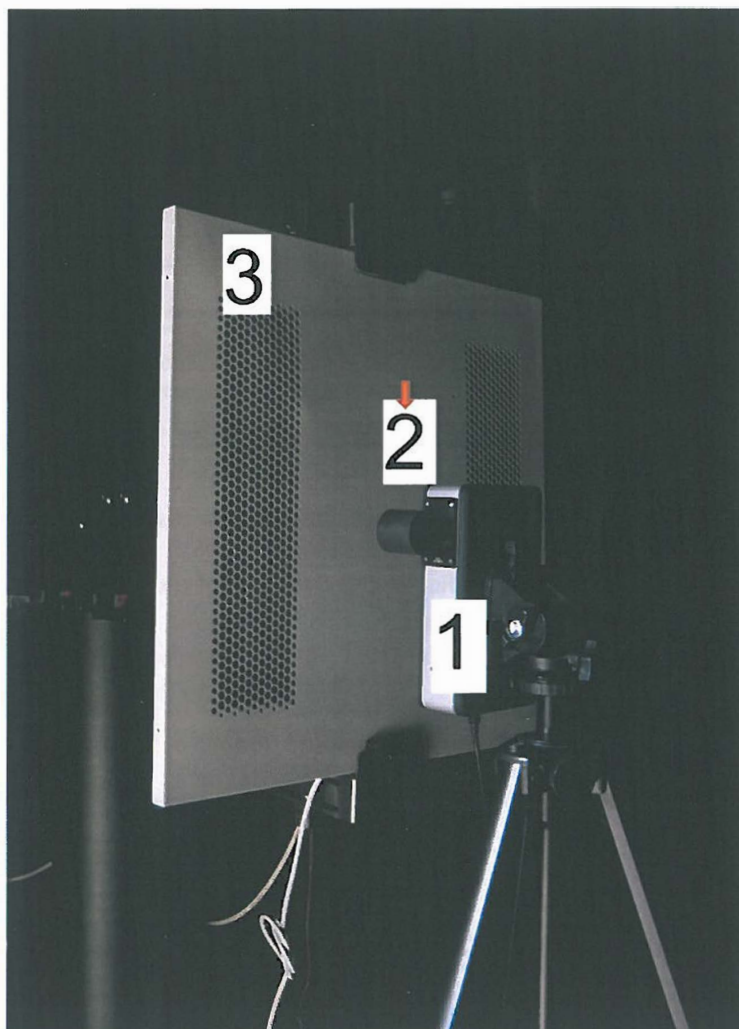
1.1 A demonstrative view of the points in the space where the measurements were taken.

The direction of the arrows in the figure indicates the direction of the measuring head - for each point the head was directed towards the device



1.2 Measuring system.

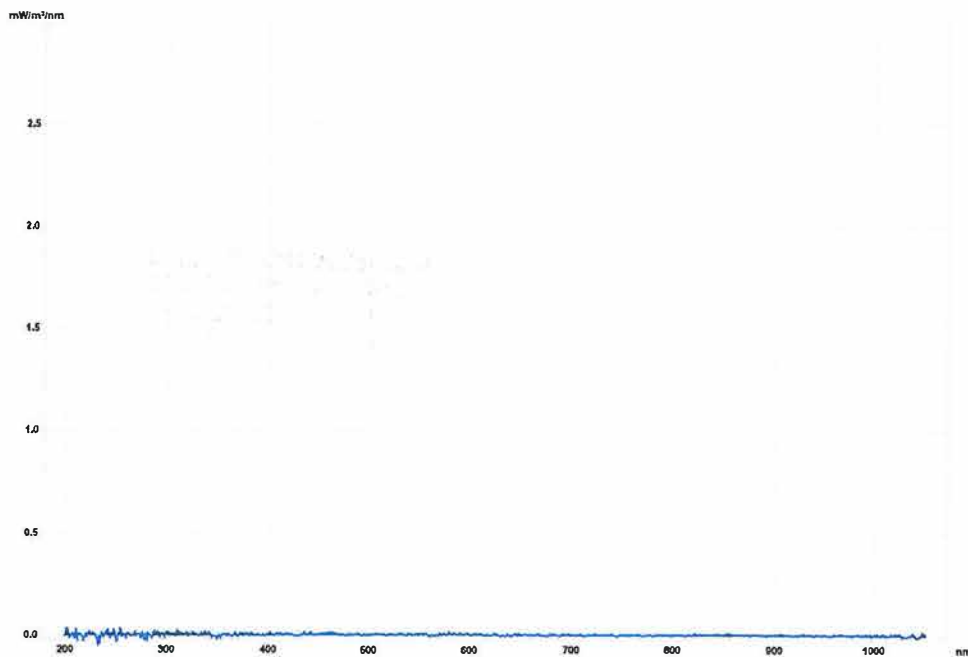
1. Spectroradiometer
2. Measuring head
3. Device STERYLIS LIGHT AIR 60



2. Results of measurements of radiation intensity

H [m]	Point	α [°]	λ [nm]	P [W/m ²]	Es [W/m ²]	λ [nm]	P [W/m ²]
0,3	1	90	UV 200-400	0,00000	0,00000	VIS 400-780	0,00019
	2	90		0,00000	0,00000		0,00077
	3	30		0,00000	0,00000		0,00034
	4	30		0,00014	0,0001978		0,00000
	5	60		0,00013	0,00000		0,00008

3. An example of the measured radiation spectrum




Appendix A

List of research equipment and software

Hardware description	Manufacturer	Model	Serial No.	Calibration date
Optical spectrometer	GL Optic	GL Spectis 5.0 Touch	Xti050264	14.04.2020
Software "GL Spectrosoft"	GL Optic	-	-	-

MILOO-ELECTRONICS Sp. z o.o.
32-720 NOWY WIŚNICZ
STARY WIŚNICZ 289
NIP 679 27 42 423

A handwritten signature in blue ink, appearing to be a stylized name, is written over the company information.