

VentilatorPAL Pro, EMC pre-compliance evaluation report. EN/IEC 60601-1-2.

Report No. 8042020

Product: VentilatorPAL Pro

Model:

CONTENTS:

EMCpre-compliance evaluation report according to:

EN-IEC 60601-1-2:2016+A:12013: Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral Standard: Electromagnetic disturbances – Requirements.

EN-IEC 60601-1-2:2016; Common technical requirements; Harmonized Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU.

Title VentilatorPAL Pro Pre-compliance EMC evaluation report

Keywords EMC; SRD

Abstract This report describes the EMC pre-compliance evaluations which were performed for the VentilatorPAL Pro according to:
NEN-EN-IEC 60601-1-2:2016+A:12013.

The Stogger B.V.; VentilatorPAL Pro complies with the requirements of the NEN-EN-IEC 60601-1-2:2016+A:12013

Number of Pages 69

Applicant : Stogger B.V.

Evaluation Date : 07-04-2020

Evaluated by : R. Brett / W. Ophelders
(Canon production printing)

Date : 09-04-2020

Signature :



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1 Introduction

This report describes the EMC measurements which are performed for the VentilatorPAL according to the 2014/30/EU Directive. This apparatus is from now on called the EUT (Equipment Under Test).



Figure 1: Photo of the VentilatorPAL Pro

FreeBreathing started with the mission to provide a high-quality, low-cost and open-source solution to the shortage of medical ventilators during the coronavirus pandemic.

The VentilatorPAL Pro was developed to meet the requirements of healthcare workers at the forefront of the COVID-19 crisis. The device makes it possible to treat patients when conventional ventilators are not available.

1.1 Equipment classification

Equipment for use in professional healthcare facilities or home healthcare environments.

2 Evaluation Report Information

Equipment Under Test (EUT):

Equipment:	VentilatorPAL Pro		
Model #:	1032-455-00	Serial #:	M0056200
Software & Firmware #:	N/A	Mains configuration	N/A
Supply voltage	24V d.c.		D.C.
AC/DC power cords are:	Adapter	N/A	N/A
Equipment is:	Medical and Wireless (WiFi/Bluetooth)		
Wireless Class	Class 1		

Company:

Company name:	Stogger B.V. B.V.		
Address:	Haagveld 1a	Zip:	5981PK
City:	Panningen	Country:	Netherlands

Optional Equipment (OE): AC/DC adapter

Model #:	MeanWell GSM25E24-P1J	Compliance test report
Input voltage:	80-264Vac, 47 - 63Hz; 0.35A (230V)	Report No. S4C-M020-1304-409
Output voltage	24V 1.04A	

NOTE:

The above option was included during the EMC evaluations.

3 Applied standards

The following EMC standards were used:

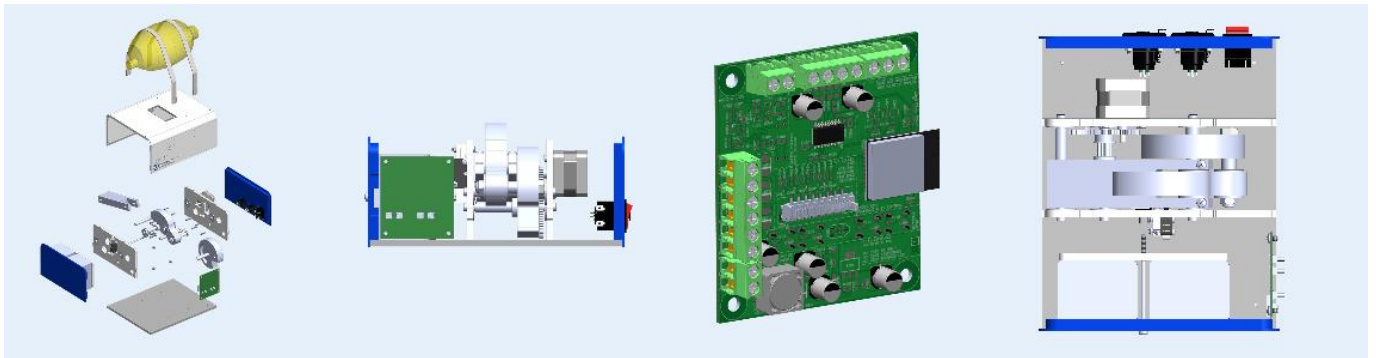
[1]	NEN-EN-IEC 60601-1-2:2016 Medical electrical equipment - Part 1-2: General requirements for basic safety and
EN61000-4-2:2009	Electrostatic Discharge Immunity test
EN61000-4-3:2006	Radiated, radio-frequency electromagnetic field immunity test
EN 61000-4-4:2004	AC/DC adapter configuration
EN 61000-4-5:2006	AC/DC adapter configuration
EN 61000-4-6:2009	AC/DC adapter configuration
EN 61000-4-8:2010	Power frequency magnetic field immunity test
EN 61000-4-11:2004	AC/DC adapter configuration
EN/IEC 61000-3-2:2014	Harmonic current emissions
EN 61000-3-3 :2013	Voltage fluctuations and Flicker

4 Applied performance criteria

Reference: Annex A of EN-IEC 60601-1-2:2016+ A:12013:.

If it is required that during or after the test the equipment continue to operate as intended, the test should be included in an EMC IMMUNITY standard (or clause) of a product (product family).

5 SPECIFICATIONS



Size (LxWxH): 250x200x110

Operating voltage: 18-24 Vdc

Power options:

Mains Power supply -and/or- External battery -and- Internal emergency battery

Human interface: Machine -and/or- mobile app

Control, Machine:

- Tidal Volume (TV)
- Inhale/Exhale ratio (I/E)
- Respiratory Rate (RR)

Aux port I/O:

- 4x digital I/O
- 2x Analog inputs

Control, Mobile app:

- Tidal Volume (TV) ml/kg
- Inhale/Exhale ratio (I/E)
- Respiratory Rate (RR)
- Automatic calculation of tidal volume by Gender and length

Future optional features:

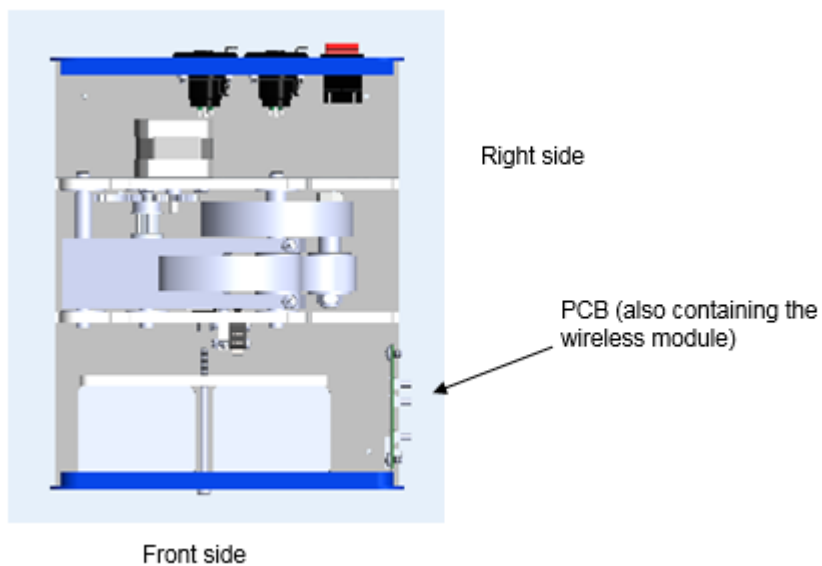
- Air pressure sensor
- SPo2 sensor
- O2 Inlet valve

6 Evaluation:

A test plan was drawn up taking into account the EUT (Equipment Under Test) which is the VentilatorPAL Pro and its external Power Supply.

The external Power Supply (type: MeanWell GSM25E24-P1J) was tested according to the standard EN 60601-1-1-2 as documented in the Compliance test report (see par. 2).

In general, there is a desire to avoid unnecessarily repeating the performance assessment at the final product level, if compliance can be justified on the basis of technical analysis, test data and information provided power supply manufacturer. However, if the assessment indicates that a measurement is required, then this must be performed to demonstrate compliance.



For the purpose of the radiated emissions and immunity evaluations/testing, the above figure shows what is meant by “Front side”, and “Right side”.

Some Radiated Immunity measurements were only performed on these two sides due to fact that these sides are considered as the most sensitive sides due to the PCB location.

6.1 Test plan

EMC- phenomena	<u>VentelatorPAL</u>		
	DC-power port (note 1)	Enclosure port	AC-power port (note 2)
Conducted emission	N/A	N/A	(note 1)
Radiated emission	Complete construction (including cables and Power supply)		
Radiated immunity	Complete construction (including cables and Power supply)		
Conducted immunity	(note 1)	N/A	NOTE 3
EFT	(note 1)	N/A	NOTE 3
Surge	(note 1)	N/A	(note 2)
Voltage sags/dips	(note 1)	N/A	(note 2)
ESD	N/A	Enclosure	(note 2)
PFMF	N/A	N/A	(note 2)
Harmonics	(note 1)	N/A	(note 2)
Flicker	(note 1)	N/A	(note 2)

Highlighted EMC phenomena indicates that an EMC measurement is required for the evaluation

N/A = Not Applicable

Note 1: Evaluation may not need to be proven by measurement (the DC cable is <3m)

Note 2: : Evaluation may not need to be proven by measurement (see compliance report No. S4C-M020-1304-409)

Note 3: Due to the HF content of this phenomena, some noise could be conducted to the VentilatorPAL due to parasitic effects.

The external Power Supply (type: Mean Well GSM25E24-P1J) was tested according to the standard EN 60601-1-1-2 as documented in the Compliance test report (see par. 2).

Therefore for some EM-phenomena there is no need to repeat the performance assessment at the final product level with the knowledge that compliance can be justified on the basis of technical analysis and test data which is documented in the Power Supply test report (see paragraph 2).

7 Used equipment and calibration dates

Table 1: List of used equipment

Used equipment and calibration dates					
Reg. No.	Equipment	manufacturer	Type	cal. Date	due
EMC measurement software					
	For tests according to EN55032/EN55024	D.A.R.E.!!	Radimation 2018.2.6	N.A.	N.A.
	For test according to EN61000- 3-2 & 3-3	EM test	DPA control 5.4.9.0	N.A.	N.A.
	For test according to EN61000- 4-4, 4-5 & 4-8	EM test	iec.control 5.2.3	N.A.	N.A.
	For test according to EN61000- 4-11 3ph	Spitzenberger+Spies	SPS EMC 1.72	N.A.	N.A.
	For test according to EN61000- 4-11 1ph	EM test	iec.control 5.2.3	N.A.	N.A.
Voltage dips & interruptions/ Voltage fluctuations & flicker/ harmonics equipment					
21533	Configurable mains system 2	Spitzenberger+Spies	PAS5000	N.A.	N.A.
21532	Configurable mains system 3	Spitzenberger+Spies	PAS15000	N.A.	N.A.
24345	Configurable mains system 4	Spitzenberger+Spies	PAS5000	N.A.	N.A.
24924	3ph harmonics & flicker analyser	EM test	DPA503N	18-04-2018	18-04-2021
24925	3ph flicker impedance 16A	EM test	AIF503N	18-04-2018	18-04-2021
24987	Current clamp L1	Universal Technic	M1.U	18-04-2018	18-04-2021
24988	Current clamp L2	Universal Technic	M1.U	18-04-2018	18-04-2021
24989	Current clamp L3	Universal Technic	M1.U	18-04-2018	18-04-2021
ESD equipment					
24191	ESD pistol	Teseq	NSG 435	06-09-2018	07-09-2021
24298	ESD pistol	Teseq	NSG 435	02-03-2018	07-03-2021
24898	ESD pistol	EM Test	P-30N	15-06-2018	15-06-2021
	Vertical Coupling Plane	Océ		N.A.	N.A.
Conducted immunity equipment emclab					
21162	50Ohm Attenuator, 300W fixed 0-1GHz	JFW Industries	50FH-006-300-N	N.A.	N.A.
21155	50Ohm Attenuator, 20dB/10W	JFW Industries	50FH-020-10N	N.A.	N.A.
21156	50Ohm Termination, 10W	JFW Industries	50T-172	N.A.	N.A.
21152	Bulk current injection probe 100kHz-1GHz	FCC	F-140A	N.A.	N.A.
21153	Current sensor probe 10kHz-500MHz	FCC	F-51	N.A.	N.A.
21154	Calibration JIG 10kHz-400MHz	FCC	BCICF-1	N.A.	N.A.
21182	CDN 1-phase L+N+PE 0.15 – 230MHz	Lüthi	L801-M3	N.A.	N.A.
21183	CDN 1-phase L+N+PE 0.15 – 230MHz	Lüthi	L801-M3	N.A.	N.A.
23049	CDN 1-phase L+N+PE 0.15-230MHz / DC power	Lüthi	L801-M2/ M3	N.A.	N.A.
21184	CDN 3-phase L1+L2+L3+N+PE 0.15 - 230MHz	Lüthi	L801-M5	N.A.	N.A.
22880	CDN telecom ports 0.15 – 230MHz	Lüthi	L801-T8	N.A.	N.A.
25049	CDM 3-phase L1+L2+L3+N+PE(75A) 0.15 - 80MHz	EM-test	CDN M5 75A	N.A.	N.A.
24120	Signal generator 9kHz – 1.1GHz	Rohde & Schwarz	SMB 100A	12-02-2018	12-02-2021
21157	Power meter 150kHz – 80MHz	Rohde & Schwarz	URV5	09-02-2018	09-02-2021
21158	10V insertion unit 50 Ohm 9kHz-3GHz	Rohde & Schwarz	URV5-Z2	09-02-2018	09-02-2021
21159	10V insertion unit 50 Ohm 9kHz-3GHz	Rohde & Schwarz	URV5-Z2	09-02-2018	09-02-2021
21160	RF coupler 10kHz – 250MHz	Amplifier Research	DC2600	N.A.	N.A.
22763	RF amplifier 150kHz – 100MHz	Amplifier research	500A100M3	N.A.	N.A.
EFT, PFME, Dips 1ph & surge equipment					
21211	Magnetic field coil 100A	EM-test	MS100	N.A.	N.A.
24513	Current transformer	EM-test	MV2616	21-03-2018	21-03-2021
21211	Immunity simulator 6kV	EM-test	UCS500-M6	21-03-2018	21-03-2021

25048	CDN 7kV/ 63A	EM-test	CNI-503-A9/ 63A	21-03-2018	21-03-2021
21211	PFMF Antenna	REO transformatoren	RFTVS BV 113-97	N.A.	N.A.
21211	PFMF amplifier	REO transformatoren	RFTVS BV 113-97	N.A.	N.A.
20975	Current Clamp	FLUKE	T5-600	N.A.	N.A.
18195	Coupling Clamp	Schaffner	CDN 125	N.A.	N.A.
Radiated immunity equipment					
22776	Signal generator 9kHz – 3.3GHz	Rohde & Schwarz	SML03	12-06-2019	12-06-2022
25924	Signal generator 9kHz – 6GHz	Rohde & Schwarz	SMB 100A	02-03-2018	02-03-2021
22774	Power meter 80MHz – 1GHz	Rohde & Schwarz	NRVD	23-07-2018	23-07-2021
23050	RF coupler 80MHz – 1GHz	Amplifier Research	DC6080	N.A.	N.A.
22799	10V insertion unit 50 Ohm 9kHz-3GHz	Rohde & Schwarz	URV5-Z2	23-07-2018	23-07-2021
23001	10V insertion unit 50 Ohm 9kHz-3GHz	Rohde & Schwarz	URV5-Z2	23-07-2018	23-07-2021
26211	RF amplifier 80MHz – 1GHz	Amplifier research	500W1000B3	N.A.	N.A.
25597	Field probe DC- 6GHz	D.A.R.E.	RSS1006A	12-03-2019	06-03-2022
25736	Controller DC-6GHz	D.A.R.E.	CTR1009B	12-03-2019	12-03-2022
25737	RadiField DC-6GHz	D.A.R.E.	RFS1006B	N.A.	N.A.
Used antennae					
19949	Biconilog antenna 26MHz-2GHz	EMCO	3141	17-06-2019	17-06-2022
22576	Biconilog antenna 26MHz-2GHz	EMCO	3142C	06-05-2019	06-05-2022
21528	Biconilog antenna 26MHz-2GHz	Schaffner	CBL 6141A	11-09-2018	11-09-2021
17596	Biconical antenna 20MHz – 200MHz	EMCO	3104C	07-09-2018	07-09-2021
17598	Log-per antenna 200MHz – 2GHz	EMCO	3146	11-09-2018	11-09-2021
22759	Log-per antenna 1GHz-20GHz	Schwarzbeck	STLP9148	12-06-2019	12-06-2022
24441	Double-Ridged Waveguide Horn antenna	EMCO	3115	01-03-2019	01-03-2022
18658	Biconical antenna 20MHz – 200MHz	EMCO	3104C	19-02-2018	19-02-2021
18657	Log-per antenna 200MHz – 2GHz	EMCO	3146	20-02-2018	20-02-2021
25448	Double-Ridge Horn antenna	ETS-Lindgren	3116C-PA	13-02-2017	13-02-2020
25005	Log-per antenna 80MHz – 6GHz	Amplifier Research	ATR80M6G	N.A.	N.A.
Conducted emission equipment					
21720	3-phase LISN 200A 150kHz-30MHz	Rohde & Schwarz	ENV4200	09-02-2018	14-02-2021
24187	2/4/8 wire ISN for Telecomports	Teseq (Accelonix)	ISN T800	07-03-2018	07-03-2021
Radiated emission equipment					
22637	EMI test receiver 1	Rohde & Schwarz	ESIB 7	13-06-2019	13-06-2022
24270	EMI test receiver 3	Narda	PMM9010	01-02-2019	01-02-2022
24442	EMI test receiver 4	Rohde & Schwarz	ESU26	01-03-2019	01-03-2022
22540	Spectrum analyser	Rohde & Schwarz	FSP 3	05-05-2017	05-05-2020
General Facilities					
21566	Full Anechoic Room (lxwxh = 10mx6mx3m) - Verification NSA - Calibration for Radiated Immunity (80MHz-1GHz) - Calibration for Radiated Immunity (1GHz-6GHz)	Rainford	30MHz – 18GHz	13-07-2018 24-01-2019 07-02-2019	13-07-2021 24-01-2022 07-02-2022
22966	OATS - Verification NSA	Canon	30MHz – 1GHz	17-04-2018	17-04-2021

8 Conclusions

The EUT complies with the requirements in EN-IEC 60601-1-2:2016

Standard	Test type	Test interface	Tested against limit	Result	Appendix
EN55032: 2016	Conducted emission	AC power port (1-Phase)	Class B limit	Pass	9.3
	Radiated emission	Enclosure port	Class B limit	Pass	9.4 & 9.5
EN/IEC 61000-3-2	Harmonics	AC power port (1-Phase)	Class A	Compliance by assessment	9.14
EN/IEC 61000-3-3	Flicker	AC power port (1-Phase)	Plt (0.65) ; Pst (1), dmax, dc	Compliance by assessment	9.15

Standard	Test type	Test interface	Minimum test level	Minimum performance criterion	Applied test level	Observed performance criterion	remarks	Appendix
EN 301 489-1 V2.2.0	EN6100 0-4-3 (RI)	Enclosure port	10V/m; 80MHz-2.7GHz	A	10V/m 80MHz-2.7GHz	A	Pass	9.6 9.7
	EN6100 0-4-3 (RI)	Enclosure port	EN 60601-1-2; Table 9	A	EN 60601-1-2; Table 9	A	Pass	9.8
	EN6100 0-4-6 (CI)	AC power port	3Vrms (6V/m at ISM frequencies)	A	6Vrms	A	Pass	9.9
	EN6100 0-4-5 (Surge)	AC power port	L-PE; 2kV	B	Compliance by assessment	N.A.	N.A. (ungrounded equipment)	9.10
		AC power port	L-L; 1kV	B	L-L 1kV	Compliance by assessment	Pass	
	EN6100 0-4-4 (EFT)	AC power port	2kV	B	2kV	A	Pass	9.11
	EN6100 0-4-8 (PFMF)	Enclosure port	30A/m	A	30A/m	Compliance by assessment	Pass	9.12
	EN6100 0-4-11 (dips and interruptions)	1-Phase AC power port	>95% 1 period; 30% 25 periods 60% 10 periods >95% 250 periods	B C C C	>95% 0.5 period; >95% 1 period; 30% 25 periods >95% 250 periods	Compliance by assessment	Pass	9.13
	EN6100 0-4-2 (ESD)	Enclosure port	+/-8kV contact discharge	B	+/- 8kV	A	Pass	9.16
			+/-15kV air discharge	B	+/- 15kV	A	Pass	

9 Arrangements for test signals at the RF output

Since the apparatus has an integral antenna, the wanted RF output signal to establish a communication link was delivered from the EUT to the receive mobile telephone located within the test environment. The level of the wanted RF output signal in transmit mode of operation is limited to 20dBm due to the maximum transmission power of the wireless module.



Figure 2: Photo showing the VentilatorPAL in the FAR (the mobile telephone is not visible).

9.1 Performance assessment.

The method used to verify that a communication link is established and maintained during and after the testing was to establish communication with the device. Since the settings from the mobile are downloaded once, the device operates without any dependency on the mobile device.

During the testing, the device was monitored by observing the movement of the artificial hand.

9.2 Evaluation results

The following chapters give the evaluation results of all of the measured EMC phenomena which are described in the conclusion.

9.3 : Conducted emission 1-Phase AC power: EN-IEC 60601-1-2:2016+ A:12013

Report title:	EN 60601-1-2
Company Name:	Canon production Printing
Date of test:	07 April 2020
Testers:	R. Brett; W. Ophelders
Standard used:	EN-IEC 60601-1-2:2016
Customer:	Stogger B.V.
Mains supply voltage:	AC/DC adapter (230V)
Ambient Temperature:	22.7°C
Humidity:	44%RH
E. U. T.:	VentilatorPAL

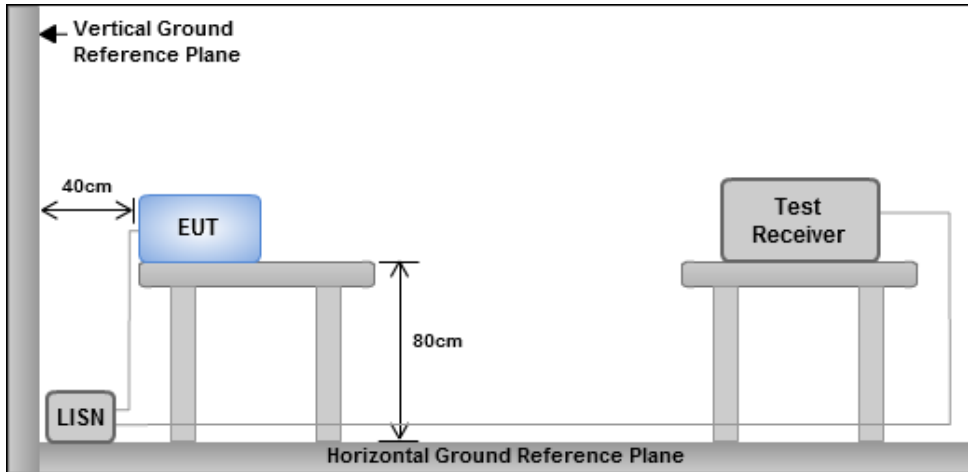
Test Result	
Result:	The EUT complies with the Class B conducted limits
Notes:	AC/DC Adaptor used as described in chapter 2

Used equipment

Used equipment. For calibration dates see Chapter 6.

Reg. No.	Equipment	Manufacturer	Type	Used in this test
21720	3-phase LISN 200A 150kHz-30MHz	Rohde & Schwarz	ENV4200	
24270	EMI test receiver	PMM	9010	Y
22876	Faraday Cage	Comtest		Y

Measurement method



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

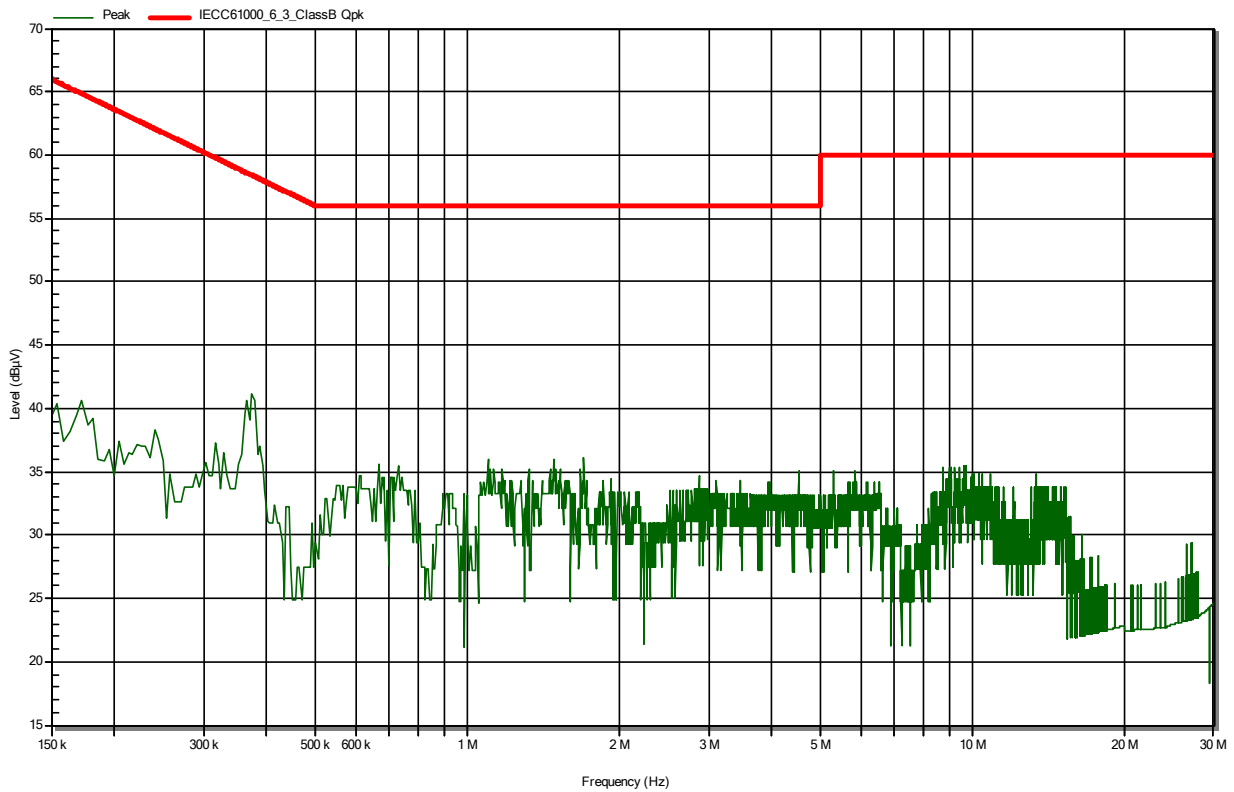
Equipment information:

Overview of receiver settings	
Attenuator	0 dB
RBW	9 kHz
Step frequency	4,5 kHz
Measure time	10 ms
Reference level	100 dB μ V
Internal Preamp.	used

Applied limits:

The AC power port is used for power supply only as described in chapter 8.4.3.2 of EN-IEC 60601-1-2:2016.

Since the equipment is intended to be used in an industrial environment, the class A limits given in EN-IEC 60601-1-2:2016, Table 6 were used.

230V/50Hz*Line 1 (Peak)***Max hold peak Graph****RadiMation****Notes**

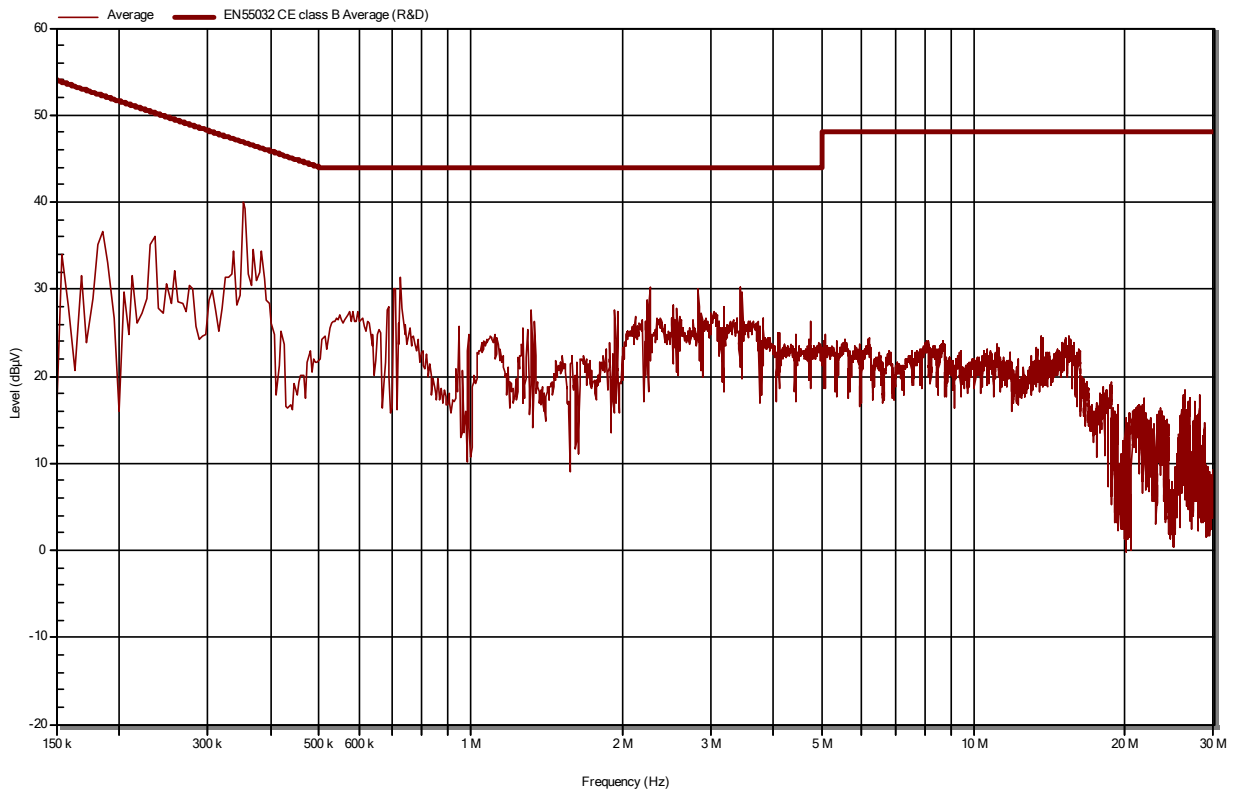
Conducted emission; L1 (Pk)

Emission Table

None

*Line 1 (Average)***Max hold peak Graph**

RadiMation

**Notes**

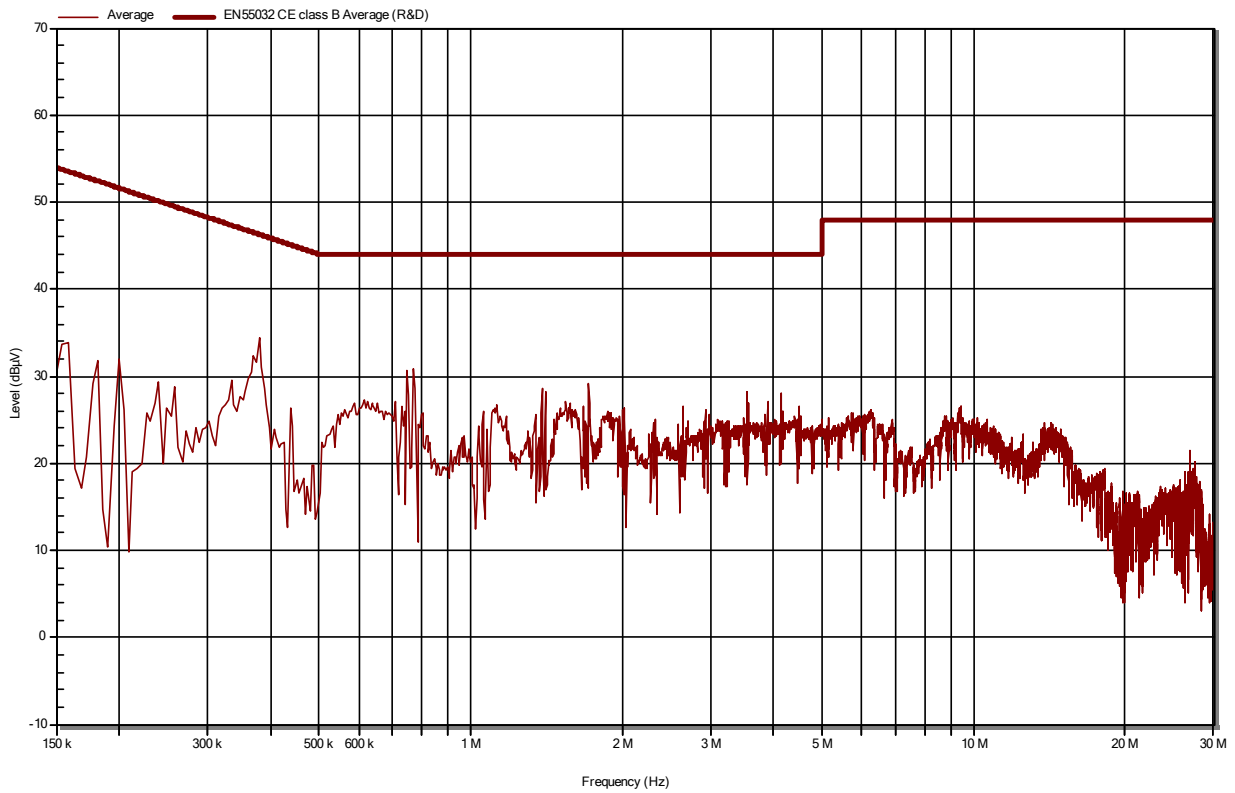
Conducted emission; L1 (Avg)

Emission Table

None

*Line Neutral (Average)***Max hold peak Graph**

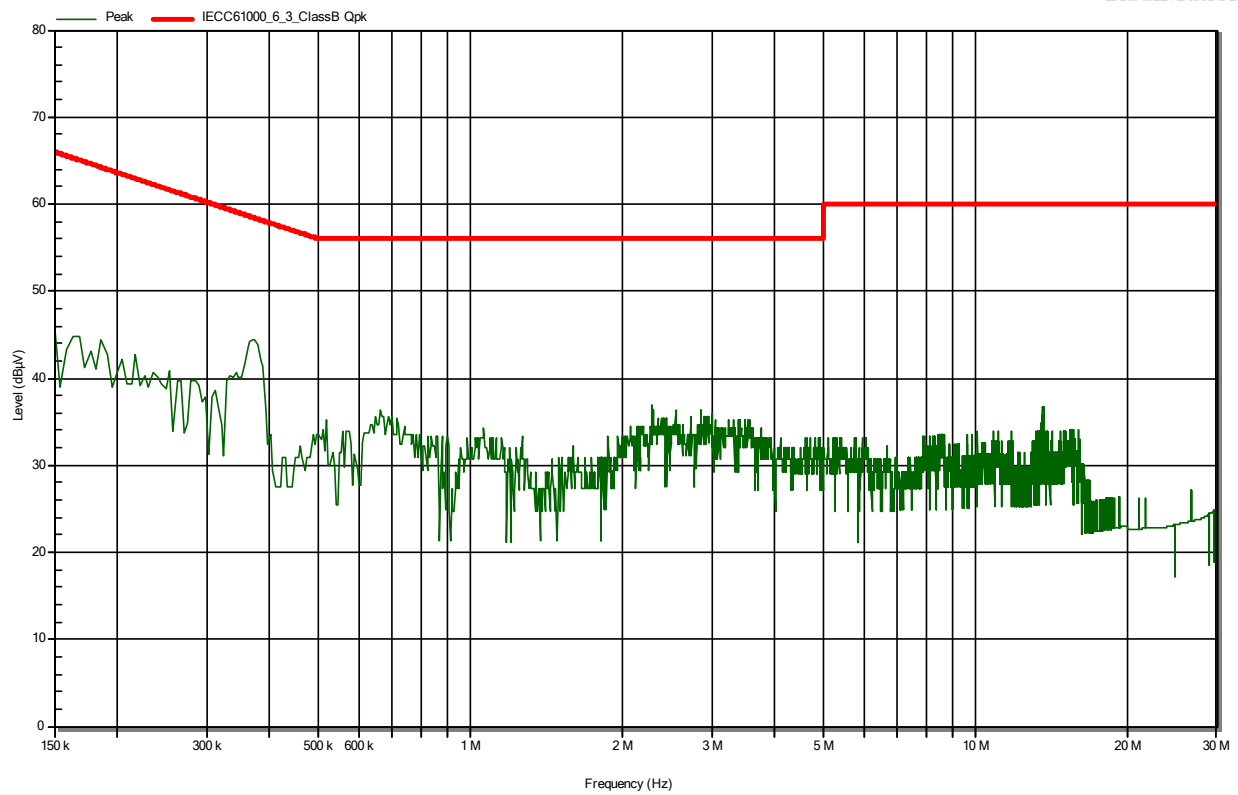
RadiMation

**Notes**

Conducted emission; Neutral (Avg)

Emission Table

None

*Line Neutral (Peak)***Max hold peak Graph****RadiMation****Notes**

Conducted emission; Neutral (Pk)

Emission Table

None

9.4 : Radiated emission 30MHz – 1Ghz ; EN-IEC 60601-1-2:2016+ A:12013

Report title:	EN 60601-1-2
Company Name:	Canon production Printing
Date of test:	07 April 2020
Testers:	R. Brett; W. Ophelders
Standard used:	EN-IEC 60601-1-2:2016
Customer:	Stogger B.V.
Mains supply voltage:	AC/DC adapter (230V)
Ambient Temperature:	22.7°C
Humidity:	44%RH
E. U. T.:	VentilatorPAL



Test Result

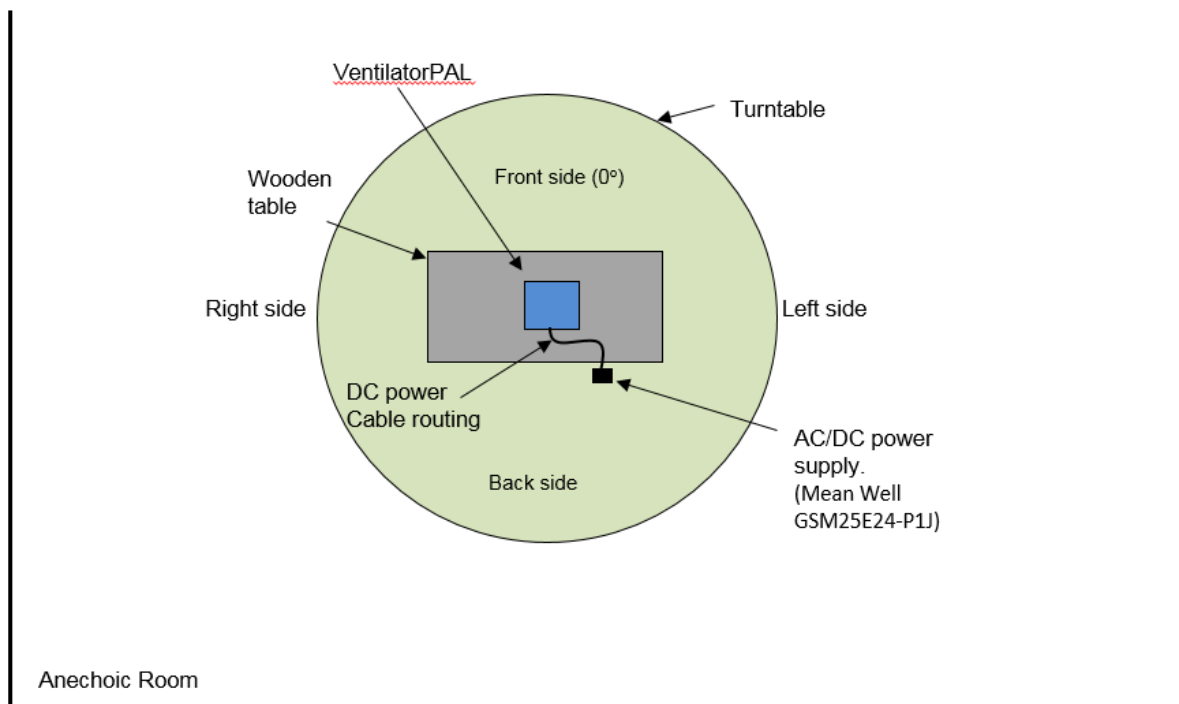
Result:	The EUT Passes the EN 55032 standard Class B limits for radiated emission (30MHz – 1GHz).
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Used equipment

Used equipment. For calibration dates see Chapter 6.

Reg. No.	Equipment	manufacturer	Type	Used in this test
22637	EMI test receiver 1	Rohde & Schwarz	ESIB 7	
22879	EMI test receiver 2	Rohde & Schwarz	ESPI 7	
24442	EMI test receiver 4	Rohde & Schwarz	ESU 26	Y
22540	Spectrum analyser	Rohde & Schwarz	FSP 3	
19949	Biconilog antenna 26MHz-2GHz	EMCO	3141	
22576	Biconilog antenna 26MHz-2GHz	EMCO	3142C	Y
21528	Biconilog antenna 26MHz-2GHz	Schaffner	CBL 6141A	
17596	Biconical antenna 20MHz – 200MHz	EMCO	3104	
17598	Log-per antenna 200MHz – 2GHz	EMCO	3146	
22759	Log-per antenna 1GHz-20GHz	Schwarzbeck	STLP9148	
21566	Full Anechoic Room (lxwxh = 10mx6mx3m)	Rainford	30MHz – 18GHz	Y
22966	OATS	Océ		Y

Measurement method



The EUT was placed on a wooden table 0.8, height as shown in the figure. The turntable was rotated so that all 4 sided were measured. The critical frequencies were investigated by rotating the turntable to the worst-case angle.

Equipment information:

Overview of receiver settings	
Attenuator	Auto [10 dB]
RBW	120 kHz
Step frequency	50 kHz
Measure time	1 ms
Reference level	100 dB μ V
Internal Preamp.	20 dB

Measurement uncertainty

The uncertainty for radiated emission (enclosure port - FAR) in the frequency band 30-200MHz is 5.26dB. In the frequency band 200MHz-1GHz this comes down to 5.09dB. These values lie below the CISPR_{FAR} requirement of 5.3dB.

The uncertainty for radiated emission (enclosure port - OATS) in the frequency band 30-200MHz is 4.66dB. In the frequency band 200MHz-1GHz this comes down to 4.64dB. These values lie below the CISPR_{OATS} requirement of 6.3dB

Report 1010261850_01 describes the complete analysis.

Applied limits

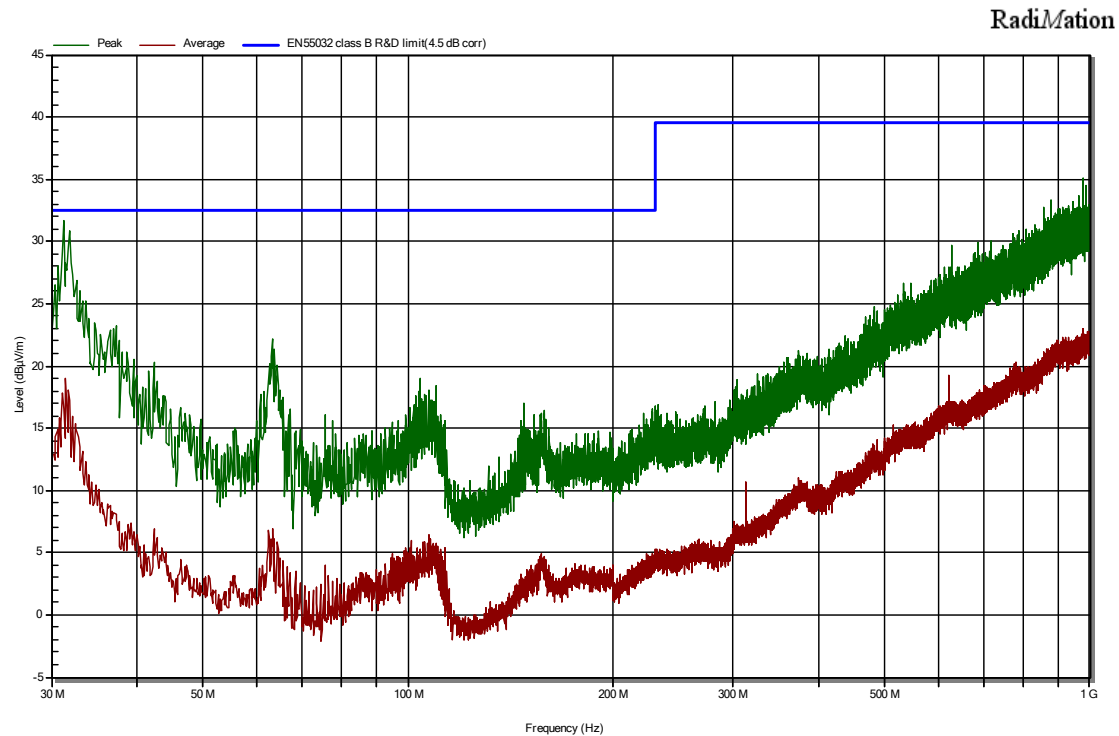
The applied limits for a 3m. FAR are derived from the limits of the standard by applying the following procedure:

Applied limit	=	standard limit
	+	conversion factor 10m to 3m (+10.5dB)
	-	ground plane reflection (-6dB)
	-	extra margin (-2.5dB)

The Class B emission limits were used.

A.1 Vertical, front 0°

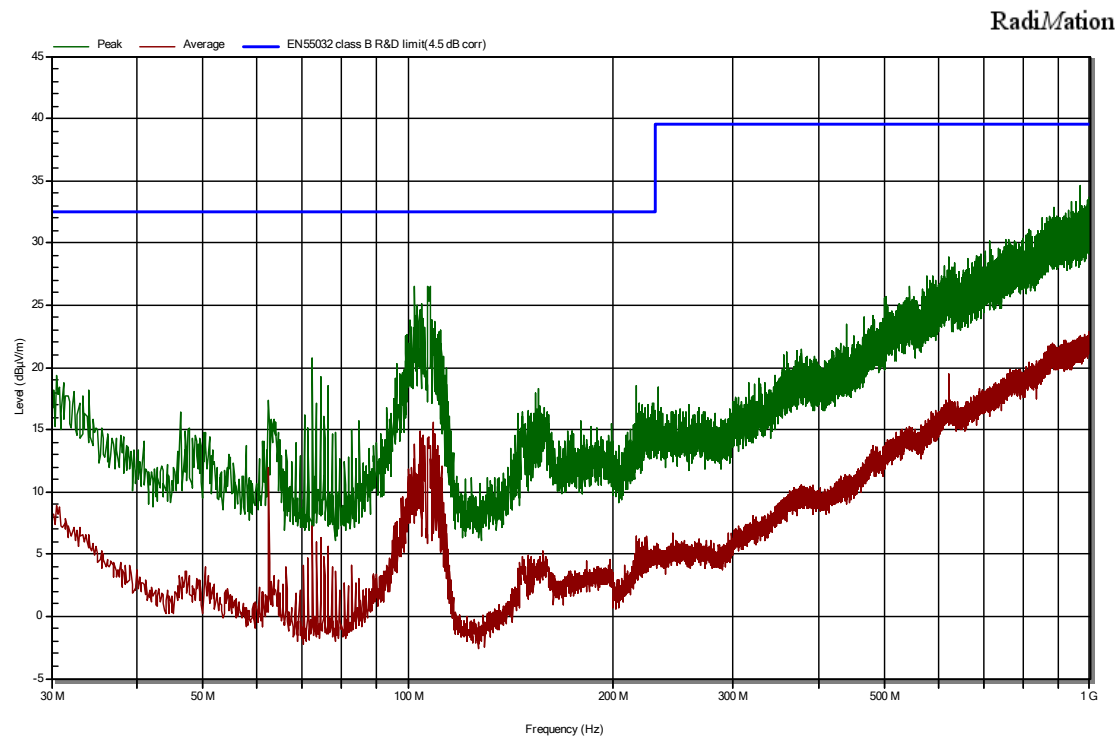
VentilatorPAL Pro: Class B; Vertical antenna, Front site.
Operational



Nr	Frequency (MHz)	PK MaxHold (dBμV/m)	QP Value (dBμV/m)	QP Limit (dBμV/m)	Result	Angle (degrees)	Height (m)	H/V
1	31,35	31,681	26,518	32,5	Pass	0	1,5	V
2	31,95	30,903	25,187	32,5	Pass	0	1,5	V

A.2 Horizontal, front 0°

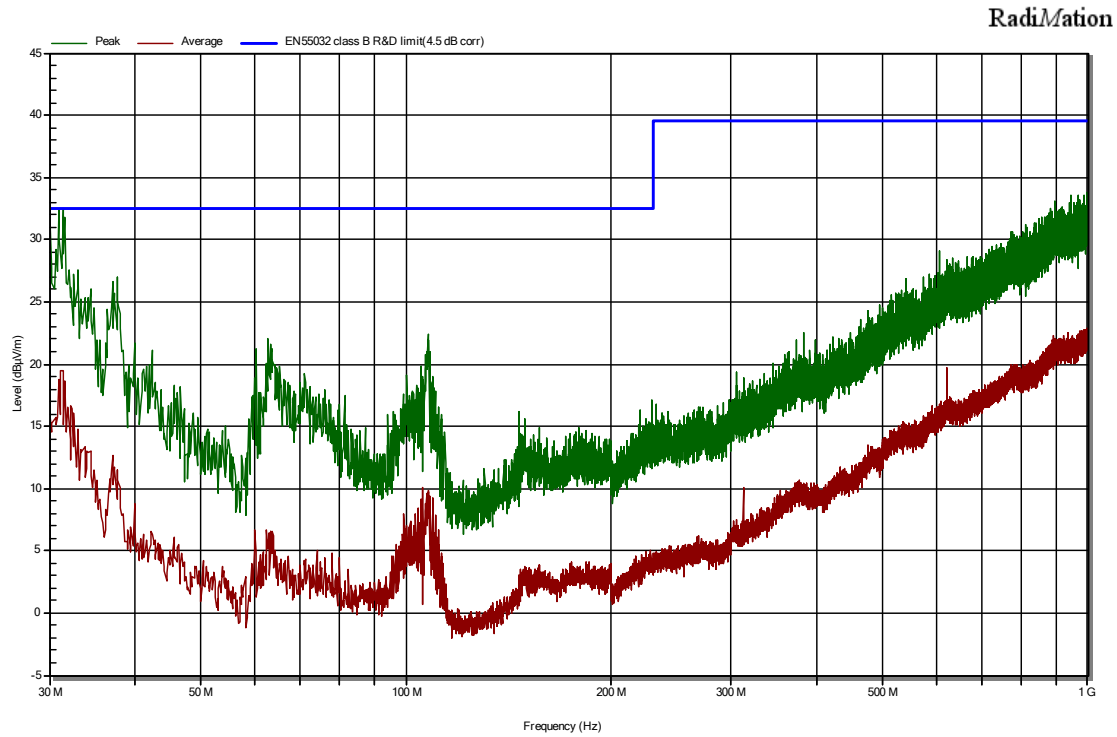
VentilatorPAL Pro: Class B; Horizontal antenna, Front site.
Operational



None

A.3 Vertical, right 90°

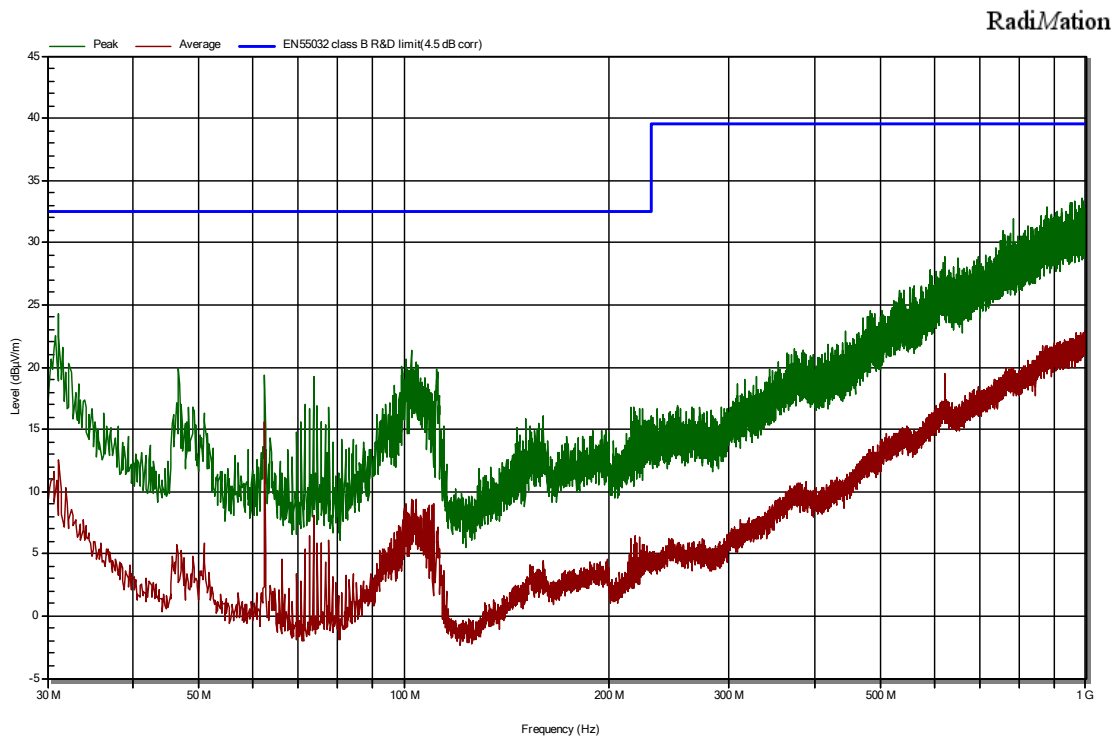
VentilatorPAL Pro: Class B; Vertical antenna, Right side.
Operational



Nr	Frequency (MHz)	PK MaxHold (dBμV/m)	QP Value (dBμV/m)	QP Limit (dBμV/m)	Result	Angle (degrees)	Height (m)	H/V
1	30	31,04	24,809	32,5	Pass	0	1,5	V
2	30,35	29,709	25,747	32,5	Pass	0	1,5	V
3	31	32,335	27,67	32,5	Pass	0	1,5	V
4	31,4	32,557	27,479	32,5	Pass	0	1,5	V
5	31,9	29,427	26,351	32,5	Pass	0	1,5	V

A.4 Horizontal, right 90°

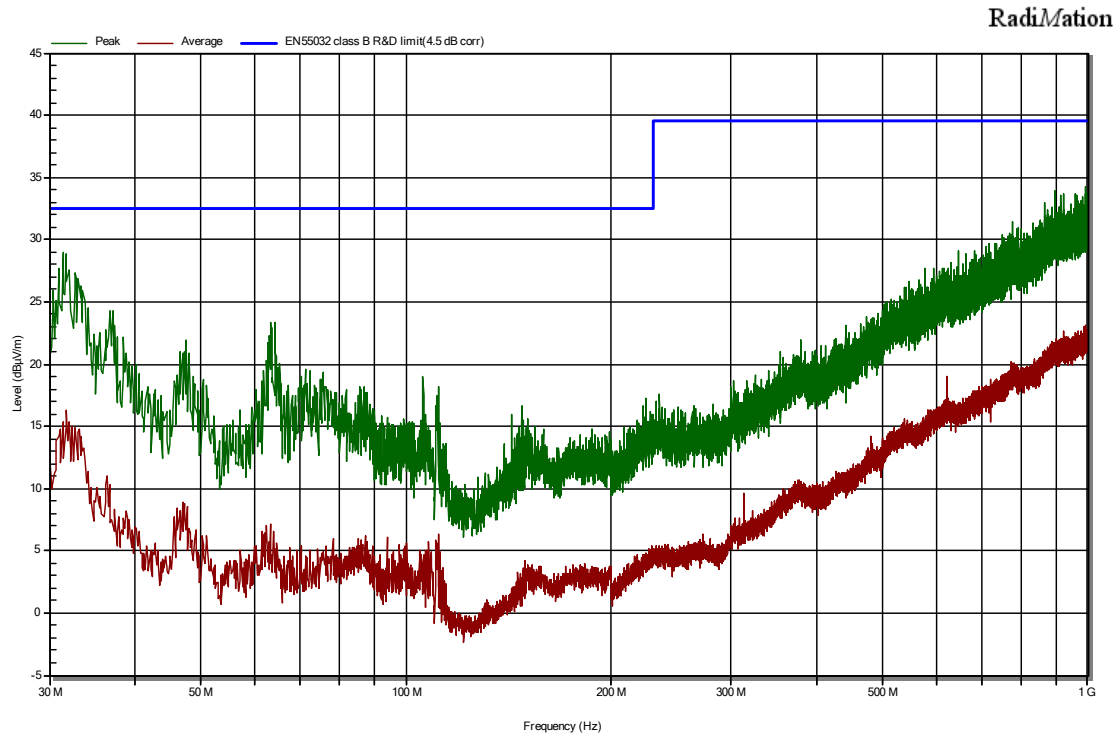
VentilatorPAL Pro: Class B; Horizontal antenna, Right side.
Operational



None

A.5 Vertical, back 180°

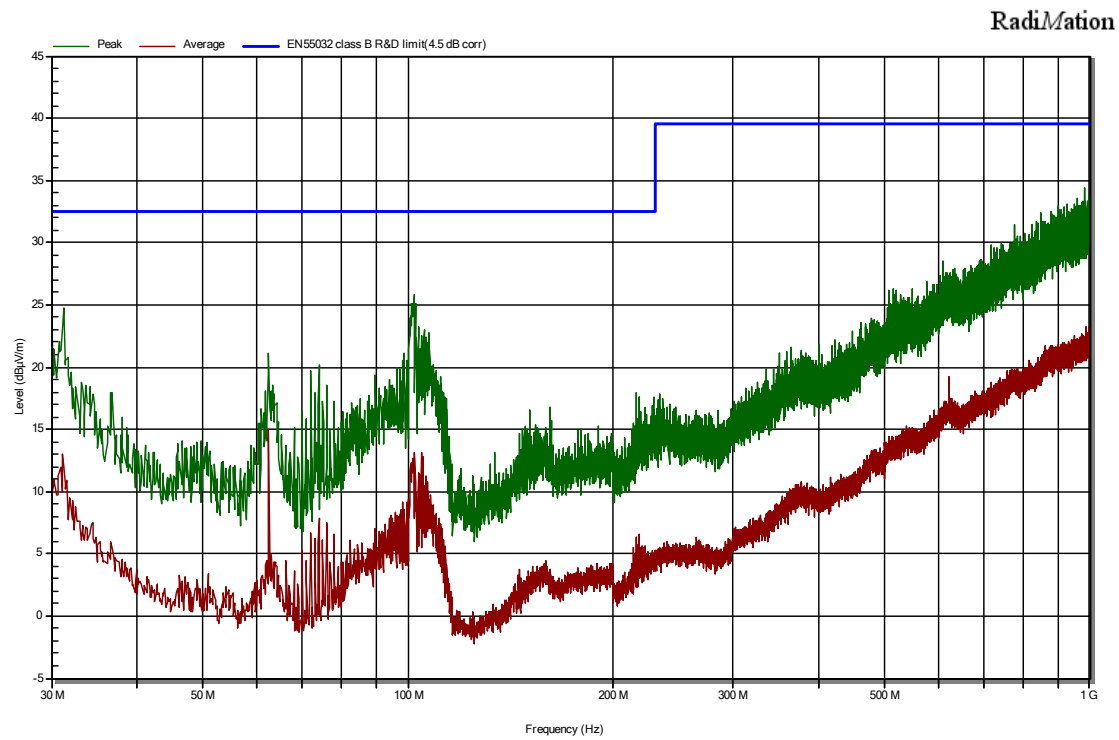
VentilatorPAL Pro: Class B; Vertical antenna, Back side.
Operational



Nr	Frequency (MHz)	PK MaxHold (dBμV/m)	QP Value (dBμV/m)	QP Limit (dBμV/m)	Result	Angle (degrees)	Height (m)	H/V
1	31,4	28,947	24,461	32,5	Pass	0	1,5	V
2	31,7	28,892	24,205	32,5	Pass	0	1,5	V

A.6 Horizontal, back 180°

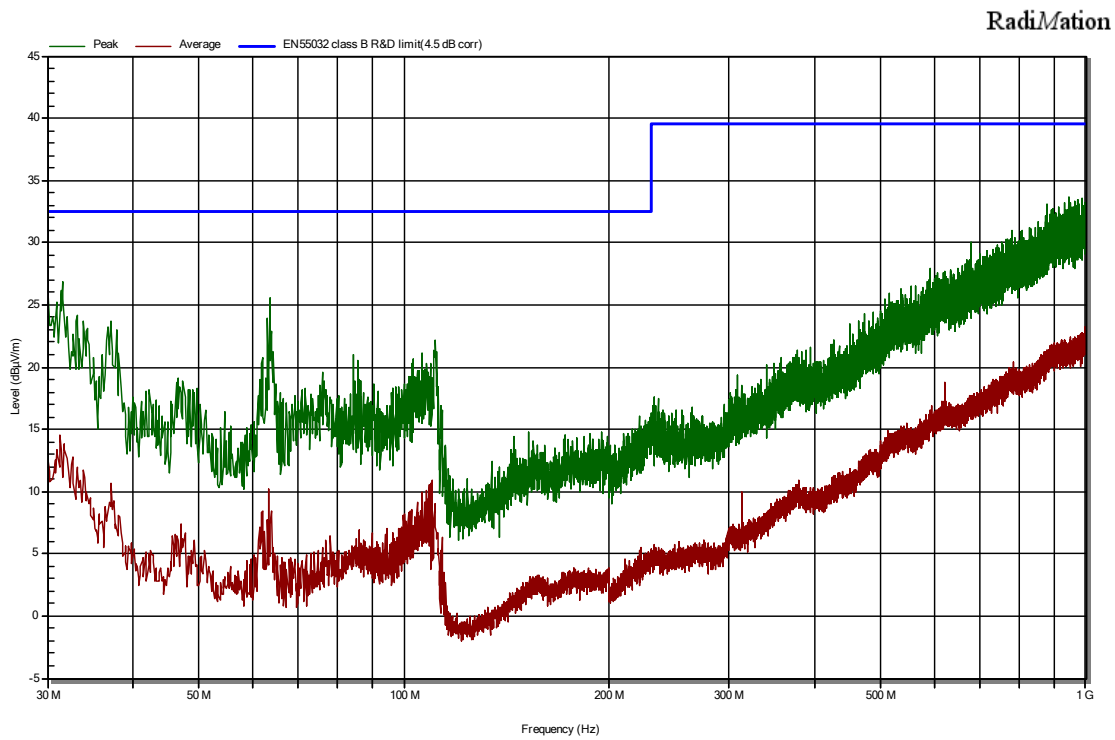
VentilatorPAL Pro: Class B; Horizontal antenna, Back side.
Operational



None

A.7 Vertical, left 270°

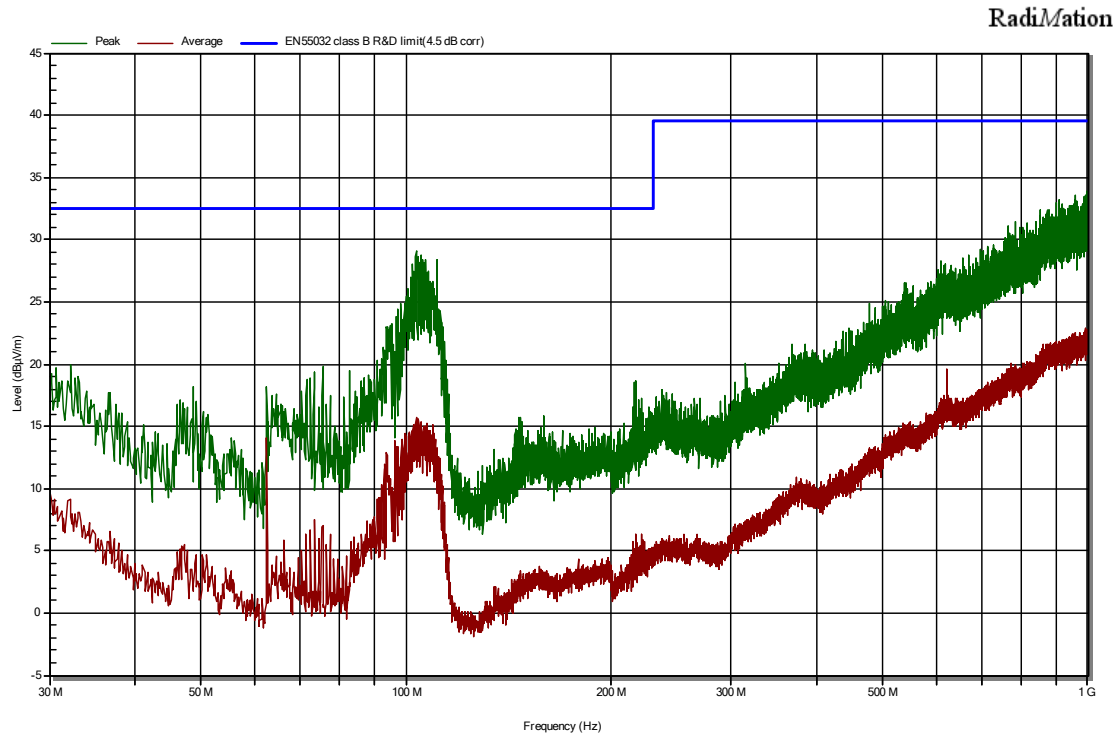
VentilatorPAL Pro: Class B; Vertical antenna, Left side.
Operational



None

A.8 Horizontal, left 270°

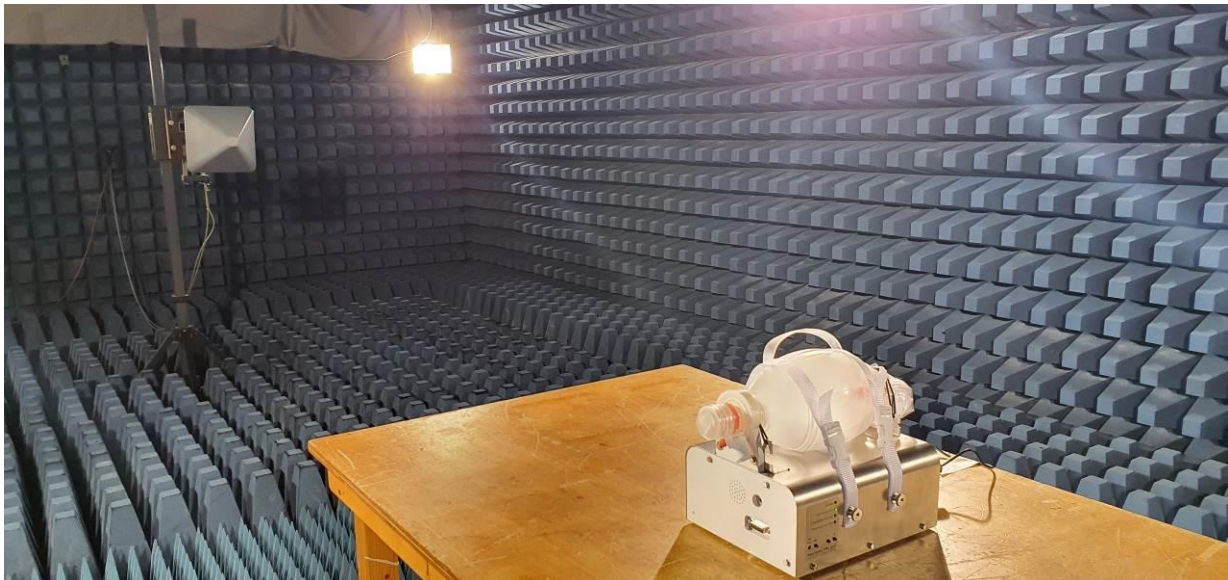
VentilatorPAL Pro: Class B; Horizontal antenna, Left side.
Operational



Nr	Frequency (MHz)	PK MaxHold (dBµV/m)	QP Value (dBµV/m)	QP Limit (dBµV/m)	Result	Angle (degrees)	Height (m)	H/V
1	103,65	29,154	24,766	32,5	Pass	0	1,5	H
2	103,9	29,026	24,628	32,5	Pass	0	1,5	H
3	104,3	28,599	24,937	32,5	Pass	0	1,5	H
4	105,25	28,798	24,787	32,5	Pass	0	1,5	H

9.5 Radiated emission 1 – 6GHz

Report title:	EN 60601-1-2
Company Name:	Canon production Printing
Date of test:	07 April 2020
Testers:	R. Brett; W. Ophelders
Standard used:	EN-IEC 60601-1-2:2016
Customer:	Stogger B.V.
Mains supply voltage:	AC/DC adapter (230V)
Ambient Temperature:	22.7°C
Humidity:	44%RH
E. U. T.:	VentilatorPAL



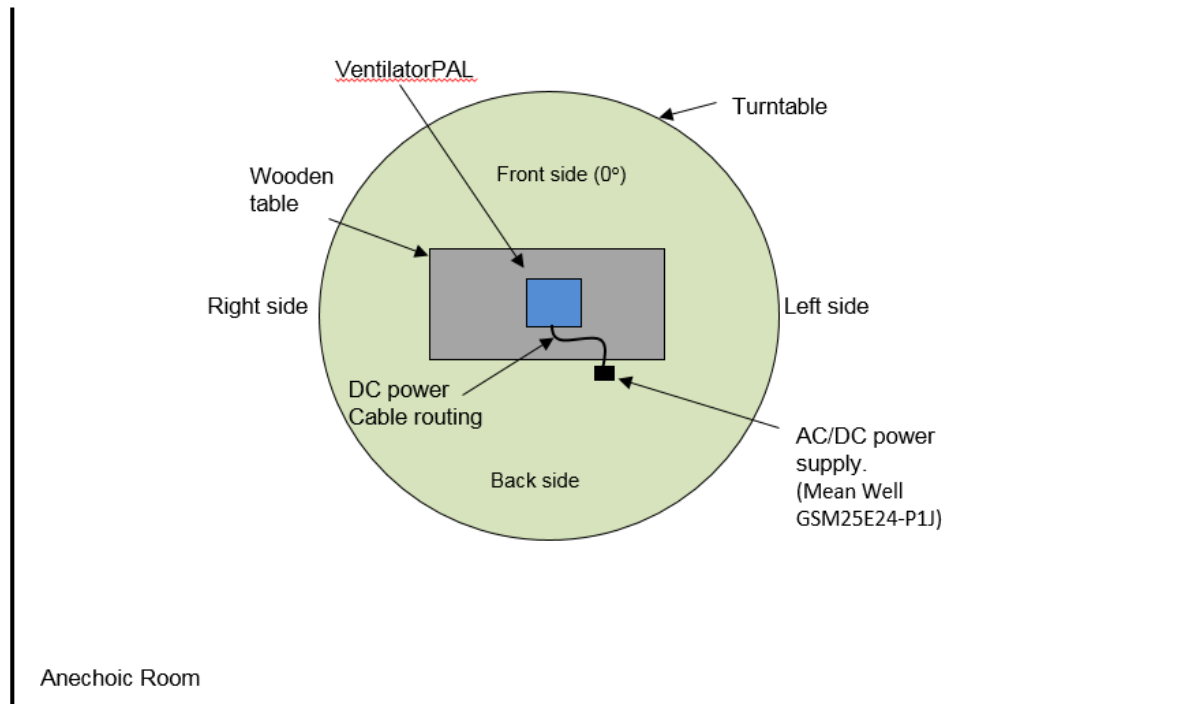
Test Result

Result:	The EUT Passes the EN 55032 standard Class B limits for radiated emission (30MHz – 1GHz).
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A.9 Used equipment

Used equipment. For calibration dates see Chapter 6.				
Reg. No.	Equipment	manufacturer	Type	Used in this test
22637	EMI test receiver 1	Rohde & Schwarz	ESIB 7	Y
22879	EMI test receiver 2	Rohde & Schwarz	ESPI 7	
24442	EMI test receiver 4	Rohde & Schwarz	ESU 26	
22540	Spectrum analyser	Rohde & Schwarz	FSP 3	
19949	Biconilog antenna 26MHz-2GHz	EMCO	3141	
22576	Biconilog antenna 26MHz-2GHz	EMCO	3142C	
21528	Biconilog antenna 26MHz-2GHz	Schaffner	CBL 6141A	
17596	Biconical antenna 20MHz – 200MHz	EMCO	3104	
17598	Log-per antenna 200MHz – 2GHz	EMCO	3146	
22759	Log-per antenna 1GHz-20GHz	Schwarzbeck	STLP9148	Y
21566	Full Anechoic Room (l _x w _x h = 10mx6mx3m)	Rainford	30MHz – 18GHz	Y
22966	OATS	Océ		

A.10 Measurement method



The EUT was placed on a wooden table 0.8, height as shown in the figure. The turntable was rotated so that all 4 sided were measured. The critical frequencies were investigated by rotating the turntable to the worst-case angle.

Equipment information:

Overview of receiver settings	
Attenuator	0 dB
RBW	1 MHz
Step frequency	500 kHz
Measure time	1 ms
Reference level	100 dB μ V
Internal Preamp.	20 dB

A.1 Measurement uncertainty

The uncertainty for radiated emission (enclosure port) 1 - 6GHz is 4.31dB. . This value lies beneath the CISPR requirement of 5.2dB. Report 1010261850_01 describes the complete analysis.

A.2 Applied limits

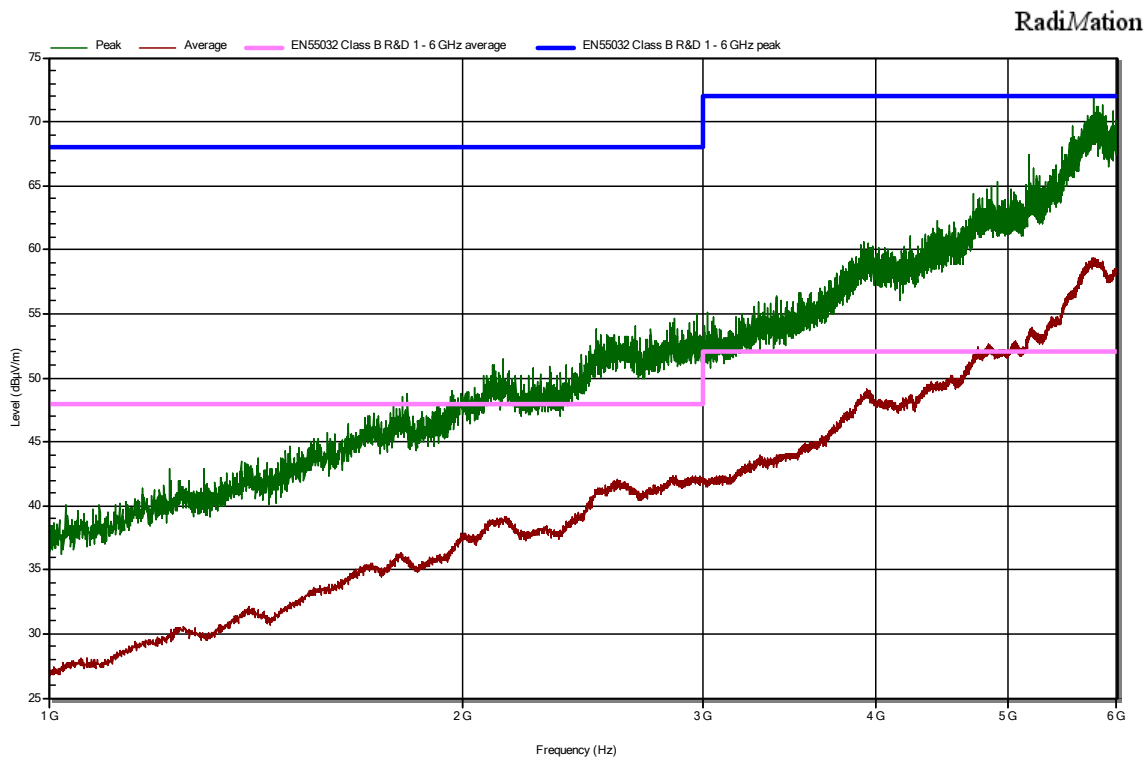
For extra margin the applied limits are 2dB below limits in standard.

A.3 Antenna correction factor and cable loss correction factors

Due to the antenna correction factor, the Anechoic room factor and cable loss correction factor, the EMI noise floor exceeds the average limits near 6GHz using the vertical antenna correction factor.

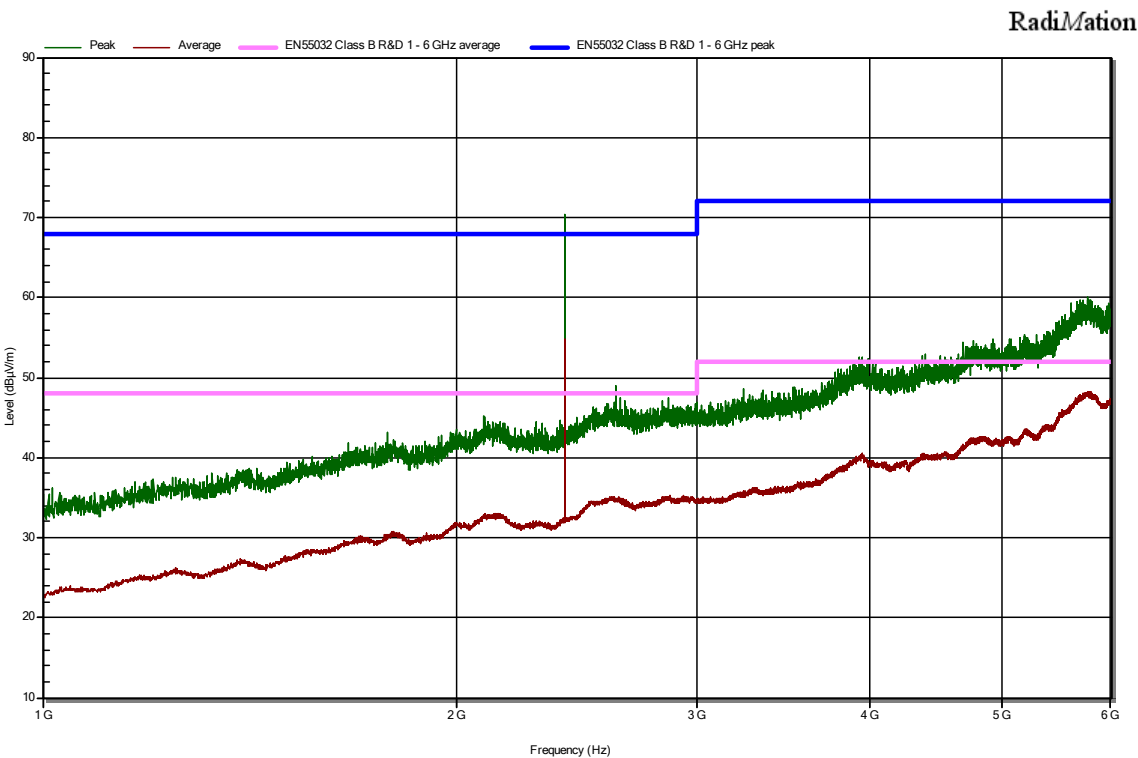
A.4 Vertical, front 0°

VentilatorPAL Pro: Class B; Vertical antenna, Front side.
Operational



A.5 Horizontal, front 0°

VentilatorPAL Pro: Class B; Horizontal antenna, Front side.
Operational

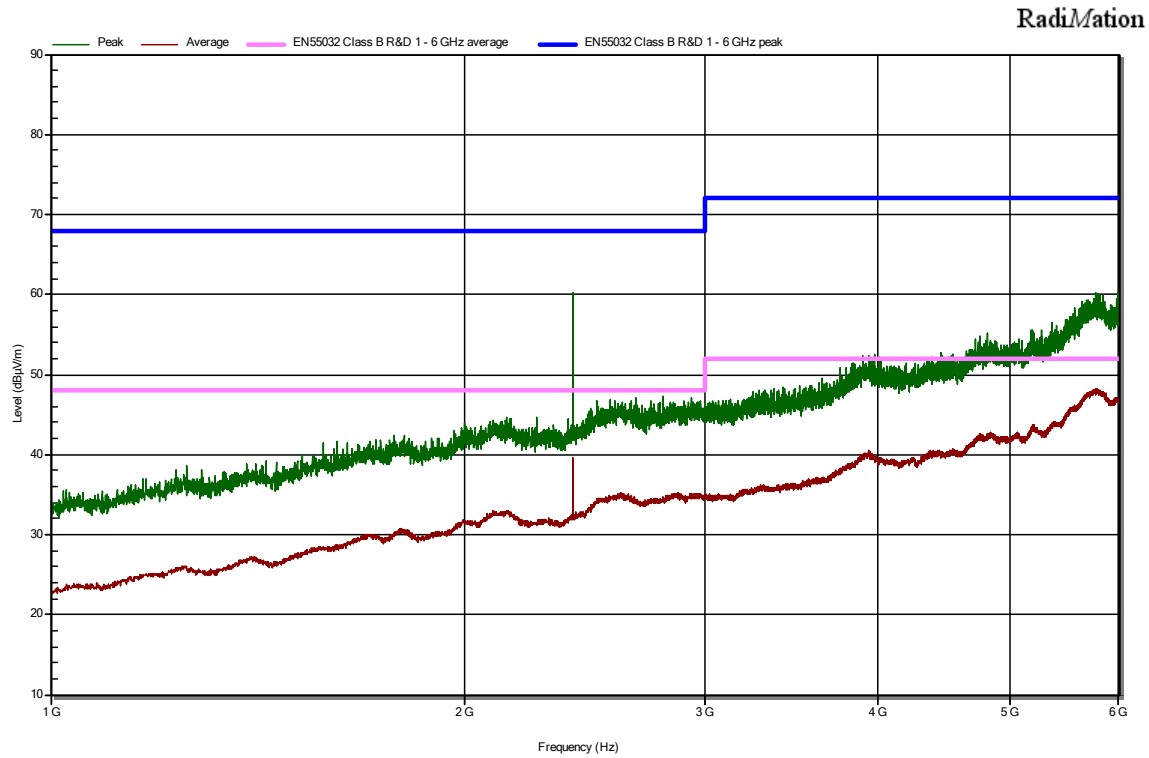


Nr	Frequency (MHz)	PK Value (dBµV/m)	AVG Value (dBµV/m)	PK Limit (dBµV/m)	AVG Limit (dBµV/m)	Result	Angle (degrees)	Height (m)	H/V
1	2403	69,752	33,493	68	48	NOTE	0	1,5	H

NOTE: This is the WiFi frequency

A.6 Horizontal, left 270°

VentilatorPAL Pro: Class B; Horizontal antenna, Left side.
Operational

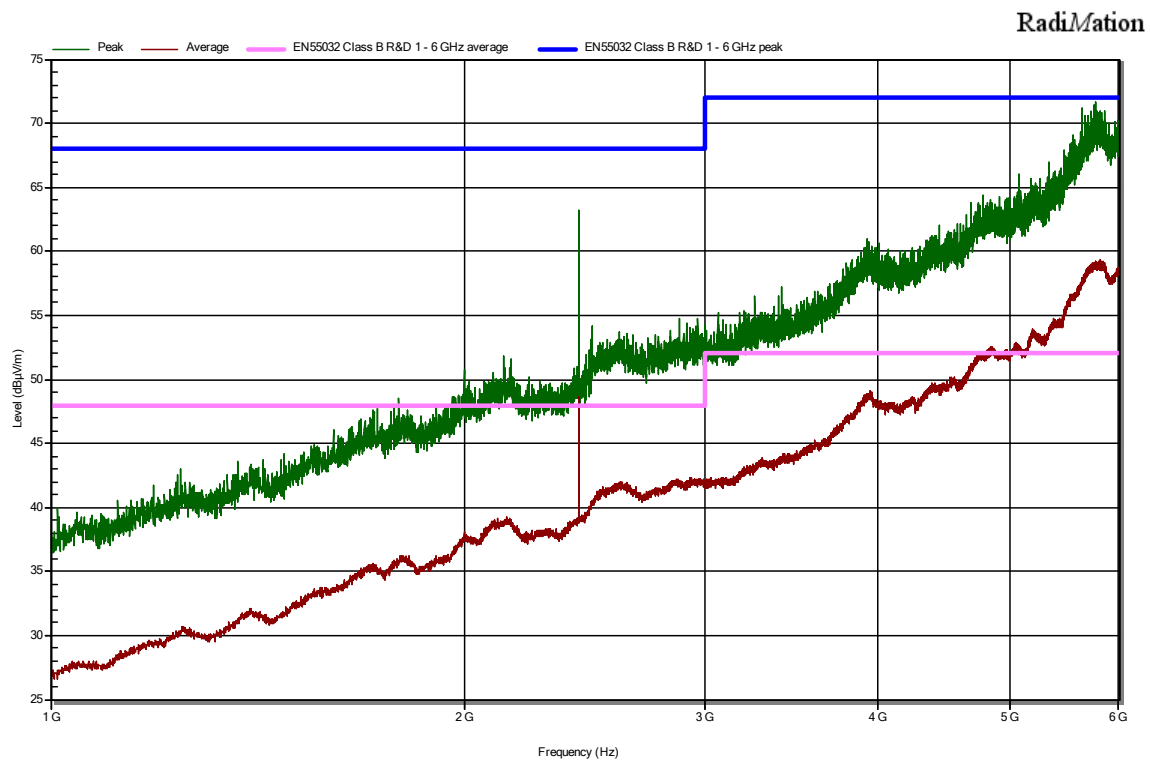


Nr	Frequency (MHz)	PK Value (dBµV/m)	AVG Value (dBµV/m)	PK Limit (dBµV/m)	AVG Limit (dBµV/m)	Result	Angle (degrees)	Height (m)	H/V
1	2403	59,534	32,484	68	48	NOTE	0	1,5	H

NOTE: This is the WiFi frequency

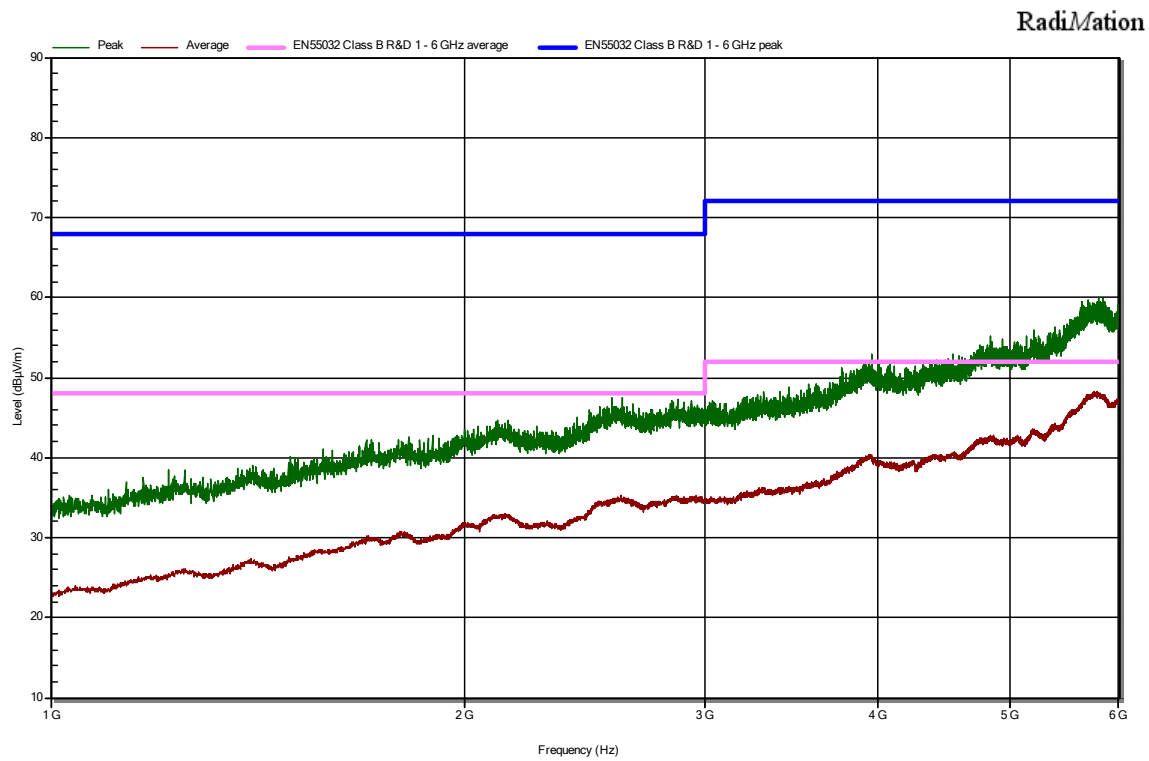
A.7 Vertical, left 270°

VentilatorPAL Pro: Class B; Vertical antenna, Left side.
Operational



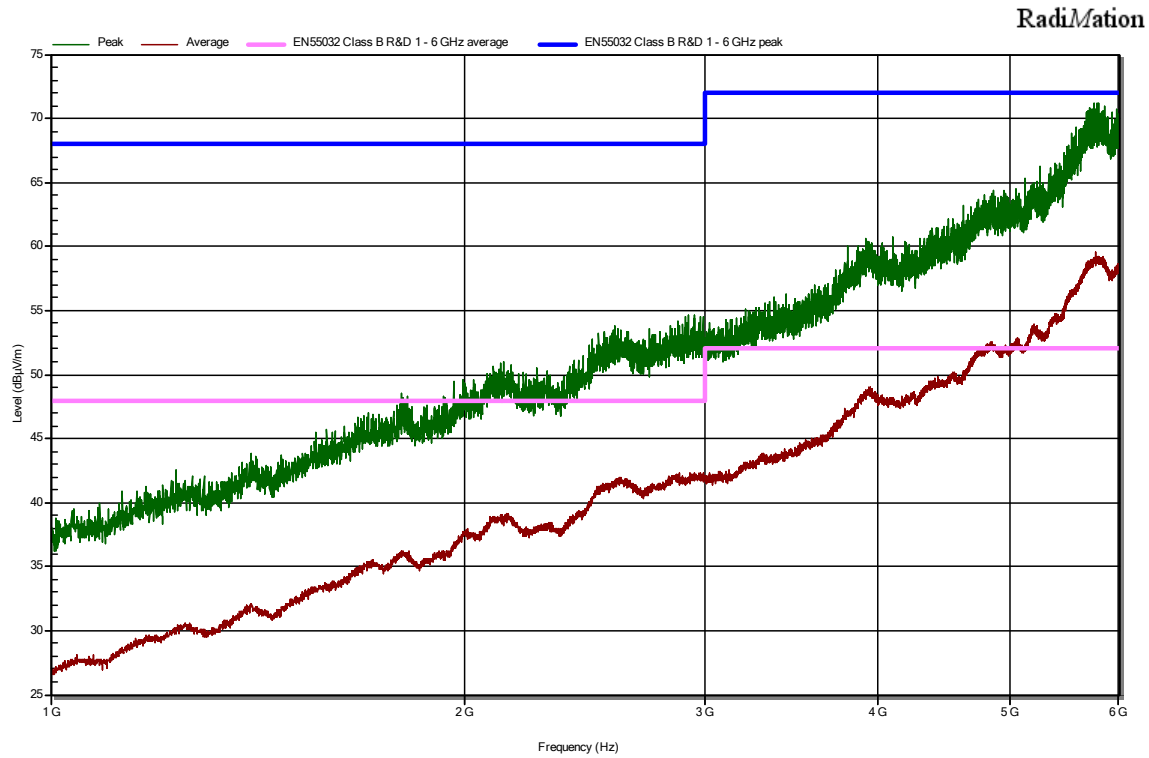
A.8 Horizontal, back 180°

VentilatorPAL Pro: Class B; Horizontal antenna, Back side.
Operational



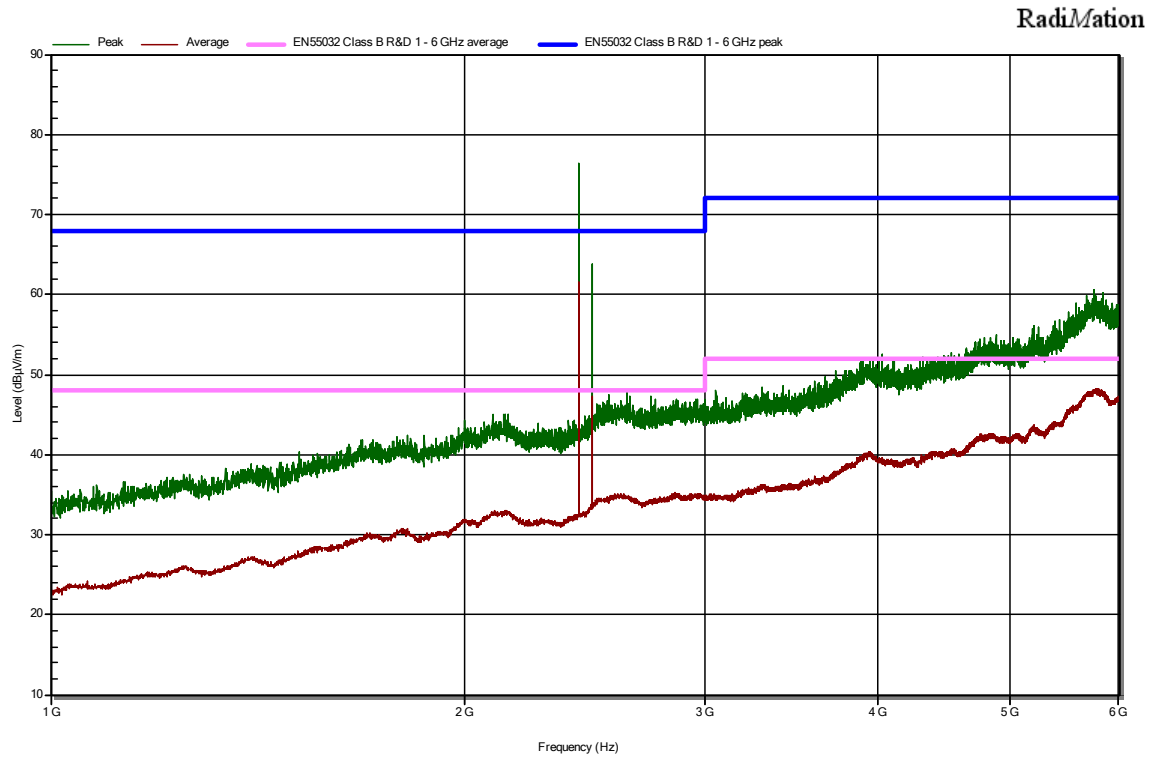
A.9 Vertical, back 180°

VentilatorPAL Pro: Class B; Vertical antenna, Back side.
Operational



A.10 Horizontal, right 90°

VentilatorPAL Pro: Class B; Horizontal antenna, right side.
Operational

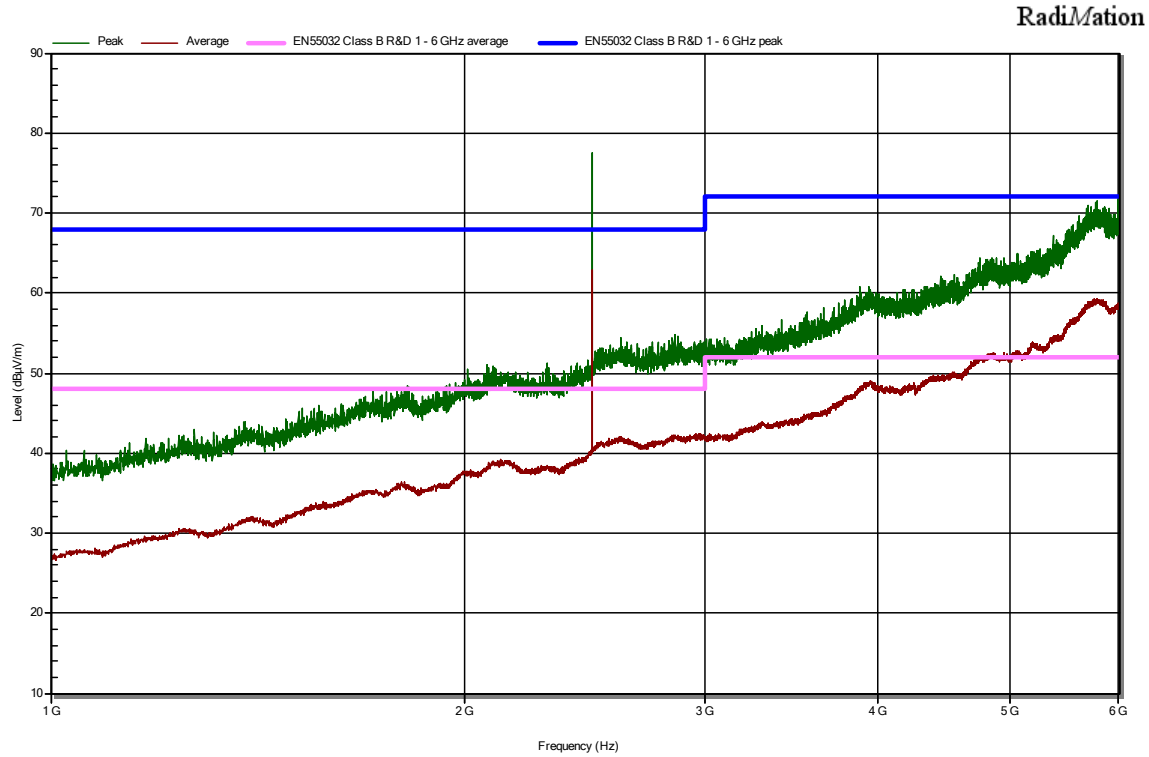


Nr	Frequency (MHz)	PK Value (dBµV/m)	AVG Value (dBµV/m)	PK Limit (dBµV/m)	AVG Limit (dBµV/m)	Result	Angle (degrees)	Height (m)	H/V
1	2426,5	76,504	35,4	68	48	NOTE	0	1,5	H
2	2481	63,958	34,145	68	48	NOTE	0	1,5	H

NOTE: Thiese are the WiFi frequencies

Vertical, right 90°

VentilatorPAL Pro: Class B; Vertical antenna, right side.
Operational



Nr	Frequency (MHz)	PK Value (dBμV/m)	AVG Value (dBμV/m)	PK Limit (dBμV/m)	AVG Limit (dBμV/m)	Result	Angle (degree s)	Height (m)	H/V
1	2479,5	78,848	41,877	68	48	NOTE	0	1,5	V

NOTE: This is the WiFi frequency

9.6 : Radiated immunity, (IEC61000-4-3; 80MHz – 1GHz)

Report title:	EN 60601-1-2
Company Name:	Canon production Printing
Date of test:	07 April 2020
Testers:	R. Brett; W. Ophelders
Standard used:	EN-IEC 60601-1-2:2016
Customer:	Stogger B.V.
Mains supply voltage:	AC/DC adapter (230V)
Ambient Temperature:	22.7°C
Humidity:	44%RH
E. U. T.:	VentilatorPAL



Figure 3: Photo showing the VentilatorPAL Pro set-up

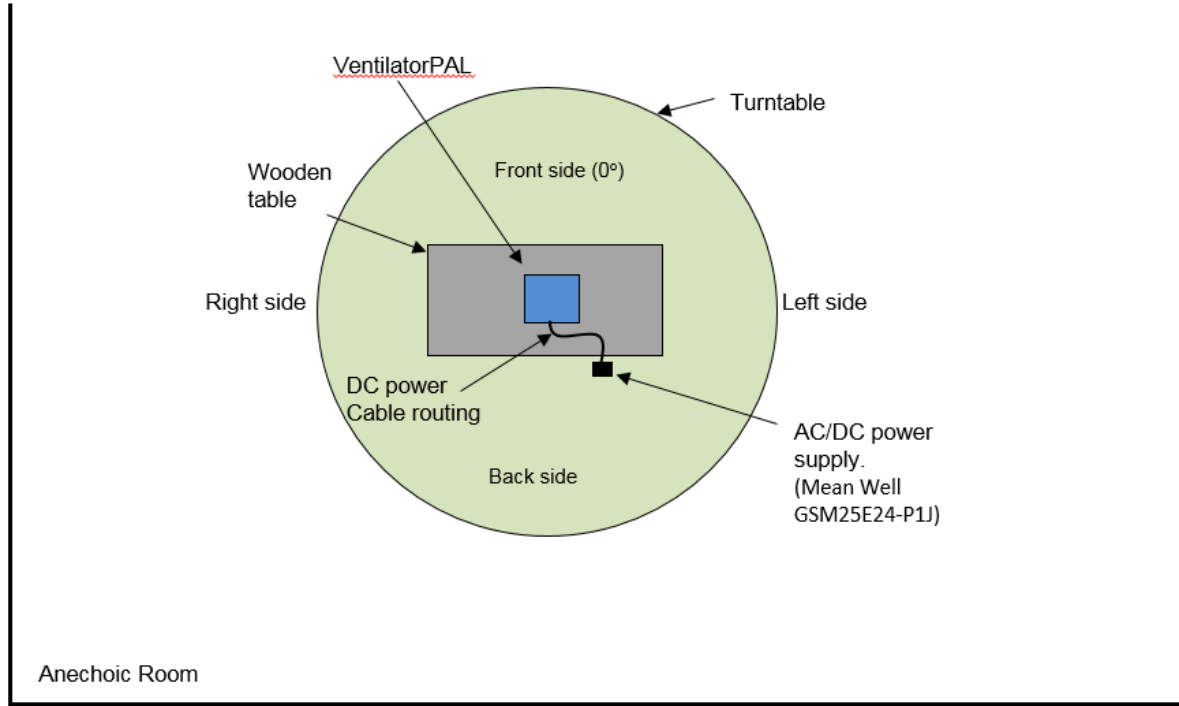
Test Result

Result: The EUT meets the performance criteria (no loss of performance).

A.11 Used equipment

Used equipment. For calibration dates see Chapter 6.				
Reg. No.	Equipment	manufacturer	Type	Used in this test
22776	Signal generator 9kHz – 3.3GHz	Rohde & Schwarz	SML03	Y
22774	Power meter 80MHz – 1GHz	Rohde & Schwarz	NRVD	Y
22775	Power meter 1GHz – 3GHz	Rohde & Schwarz	NRVD	
23050	RF coupler 80MHz – 1GHz	Amplifier Research	DC6080	Y
23051	RF coupler 1GHz – 4GHz	Amplifier Research	DC7144	
22799	10V insertion unit 50 Ohm 9kHz-3GHz	Rohde & Schwarz	URV5-Z2	Y
23001	10V insertion unit 50 Ohm 9kHz-3GHz	Rohde & Schwarz	URV5-Z2	Y
23004	insertion unit 50 Ohm DC-40GHz	Rohde & Schwarz	URV5-Z4	
23005	insertion unit 50 Ohm DC-40GHz	Rohde & Schwarz	URV5-Z4	
23003	RF amplifier 80MHz – 1GHz	Amplifier research	150W1000AM3	Y
23002	RF amplifier 800MHz – 4.2GHz	Amplifier research	10S1G4AM3	
25597	Field probe Radisense DC- 6GHz	D.A.R.E.	Radisense VI	Y
19949	Biconilog antenna 26MHz-2GHz	EMCO	3141	
22576	Biconilog antenna 26MHz-2GHz	EMCO	3142C	
21528	Biconilog antenna 26MHz-2GHz	Schaffner	CBL 6141A	
17596	Biconical antenna 20MHz – 200MHz	EMCO	3104	
17598	Log-per antenna 200MHz – 2GHz	EMCO	3148	
22759	Log-per antenna 1GHz-20GHz	Schwarzbeck	STLP9148	
25005	Log-per antenna 80MHz-6GHz	Amplifier research	ATR80M6G	Y
21566	Full Anechoic Room (lxwxh = 10mx6mx3m)	Rainford	30MHz – 18GHz	Y
20976	Full Anechoic Room (lxwxh = 8mx5mx3m)	Euroshield	30MHz – 1GHz	

A.12 Measurement method



The EUT was placed on a wooden table 0.8, height as shown in the figure.
 The turntable was rotated so that all 4 sided were illuminated.
 The method used was the substitution method as described in IEC 61000-4-3.
 The 3m pre-calibrated field at the EUT measurement position is 10V/m

Settings	
Distance	3 m
Field strength	10 V/m
Frequency range	80 MHz - 1 GHz
Logarithmic Step	1%
Modulation	1000 Hz. 80% AM, 80, 1000
Dwell time	1 s

A.13 Monitoring

During the **measurements** the EUT was constantly monitored using a camera system.

A.14 Results

VentilatorPAL Pro: 10V/m; 80MHz – 1GHz

Angle	Field Strength (V/m)	Observation
Vertical measurement Front 0°	10	Pass
Horizontal measurement Front 0°	10	Pass
Vertical measurement Right 90°	10	Pass
Horizontal measurement Right 90°	10	Pass
Vertical measurement Back 180°	10	Pass
Horizontal measurement Back 180°	10	Pass
Vertical measurement Left 270°	10	Pass
Horizontal measurement Left 270°	10	Pass

Pass:

During and after applying the RF interference the EUT remained functional without any loss of performance.

9.7 Radiated immunity, (IEC61000-4-3; 1- 2.7GHz)

Report title:	EN 60601-1-2
Company Name:	Canon production Printing
Date of test:	07 April 2020
Testers:	R. Brett; W. Ophelders
Standard used:	EN-IEC 60601-1-2:2016
Customer:	Stogger B.V.
Mains supply voltage:	AC/DC adapter (230V)
Ambient Temperature:	22.7°C
Humidity:	44%RH
E. U. T.:	VentilatorPAL



Figure 4: Photo showing the VentilatorPAL test set-up

Test Result

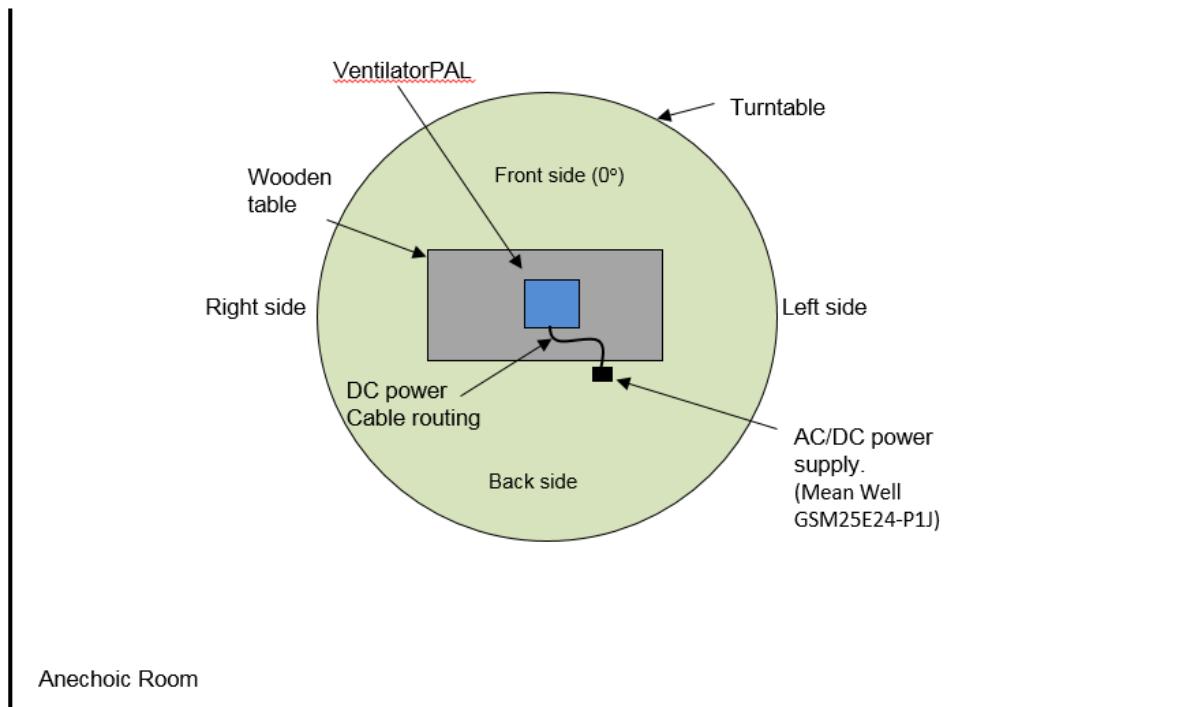
Result:	The EUT meets the performance criteria (no loss of performance).
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Used equipment

Used equipment. For calibration dates see Chapter 6.

Reg. No.	Equipment	manufacturer	Type	Used in this test
22776	Signal generator 9kHz – 3.3GHz	Rohde & Schwarz	SML03	Y
22774	Power meter 80MHz – 1GHz	Rohde & Schwarz	NRVD	Y
22775	Power meter 1GHz – 3GHz	Rohde & Schwarz	NRVD	
23050	RF coupler 80MHz – 1GHz	Amplifier Research	DC6080	Y
23051	RF coupler 1GHz – 4GHz	Amplifier Research	DC7144	
22799	10V insertion unit 50 Ohm 9kHz-3GHz	Rohde & Schwarz	URV5-Z2	Y
23001	10V insertion unit 50 Ohm 9kHz-3GHz	Rohde & Schwarz	URV5-Z2	Y
23004	insertion unit 50 Ohm DC-40GHz	Rohde & Schwarz	URV5-Z4	
23005	insertion unit 50 Ohm DC-40GHz	Rohde & Schwarz	URV5-Z4	
26211	RF amplifier 80MHz – 1GHz	Amplifier research	500W1000B3	
23002	RF amplifier 800MHz – 4.2GHz	Amplifier research	10S1G4AM3	
25597	Field probe Radisense DC- 6GHz	D.A.R.E.	Radisense VI	Y
19949	Biconilog antenna 26MHz-2GHz	EMCO	3141	
25736	Controller DC-6GHz	D.A.R.E.	CTR1009B	Y
25737	RadiField DC-6GHz	D.A.R.E.	RFS1006B	Y
22576	Biconilog antenna 26MHz-2GHz	EMCO	3142C	
21528	Biconilog antenna 26MHz-2GHz	Schaffner	CBL 6141A	
17596	Biconical antenna 20MHz – 200MHz	EMCO	3104	
17598	Log-per antenna 200MHz – 2GHz	EMCO	3148	
22759	Log-per antenna 1GHz-20GHz	Schwarzbeck	STLP9148	
25737	RadiField 1GHz – 6GHz	D.A.R.E.	RFS2006B	Y
21566	Full Anechoic Room (lxwxh = 10mx6mx3m)	Rainford	30MHz – 18GHz	Y
20976	Full Anechoic Room (lxwxh = 8mx5mx3m)	Euroshield	30MHz – 1GHz	

A.15 Measurement method



The EUT was placed on a wooden table 0.8, height as shown in the figure. The turntable was rotated so that all 4 sided were illuminated.

Settings	
Distance	3 m
Field strength	10 V/m
Frequency range	1 GHz – 2.7 GHz
Logarithmic Step	1%
Modulation	1000 Hz. 80% AM, 80, 1000
Dwell time	1 s

A.16 Monitoring

During the measurements the EUT was constantly monitored using a camera system.

A.17 Results

VentilatorPAL Pro: 10V/m; 1 – 2.7GHz

Angle	Field Strength (V/m)	Observation
Vertical measurement Front 0°	10	Pass
Horizontal measurement Front 0°	10	Pass
Vertical measurement Right 90°	10	Pass
Horizontal measurement Right 90°	10	Pass
Vertical measurement Back 180°	10	Pass
Horizontal measurement Back 180°	10	Pass
Vertical measurement Left 270°	10	Pass
Horizontal measurement Left 270°	10	Pass

Pass:

During and after applying the RF interference the EUT remained functional without any loss of performance.

9.8 Radiated immunity, (EN 60601-1-2; Table 9; Immunity to RF wireless Communications equipment.

Report title:	EN 60601-1-2; Table 9
Company Name:	Canon production Printing
Date of test:	07 April 2020
Testers:	R. Brett; W. Ophelders
Standard used:	EN-IEC 60601-1-2:2016
Customer:	Stogger B.V.
Mains supply voltage:	AC/DC adapter (230V)
Ambient Temperature:	22.7°C
Humidity:	44%RH
E. U. T.:	VentilatorPAL

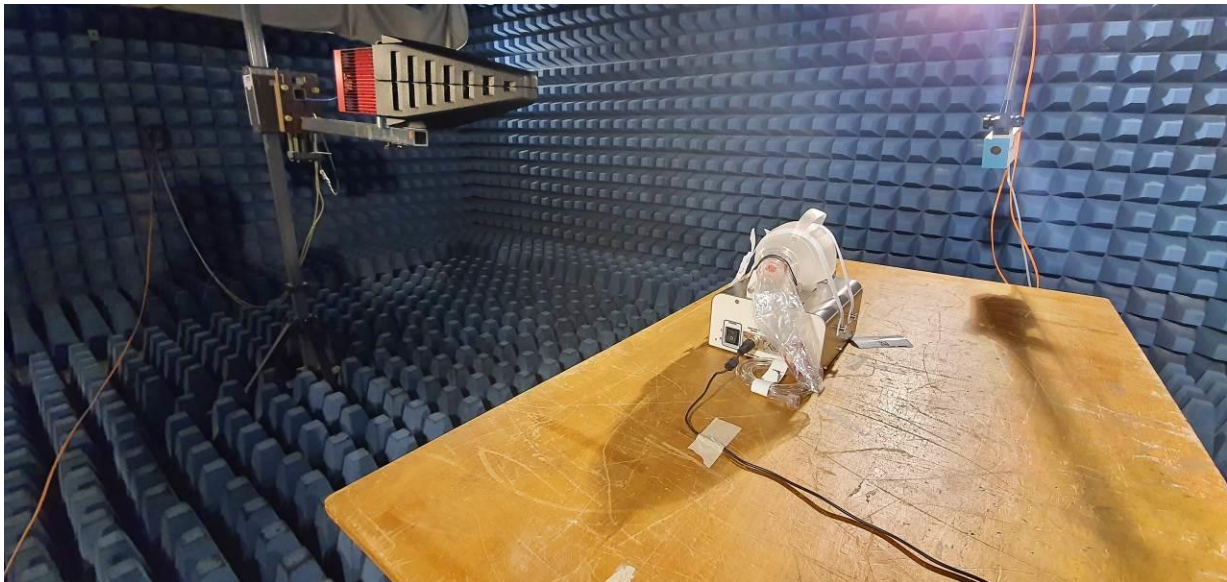


Figure 5: Photo showing the VentilatorPAL test set-up (1 m antenna distance)

Test Result

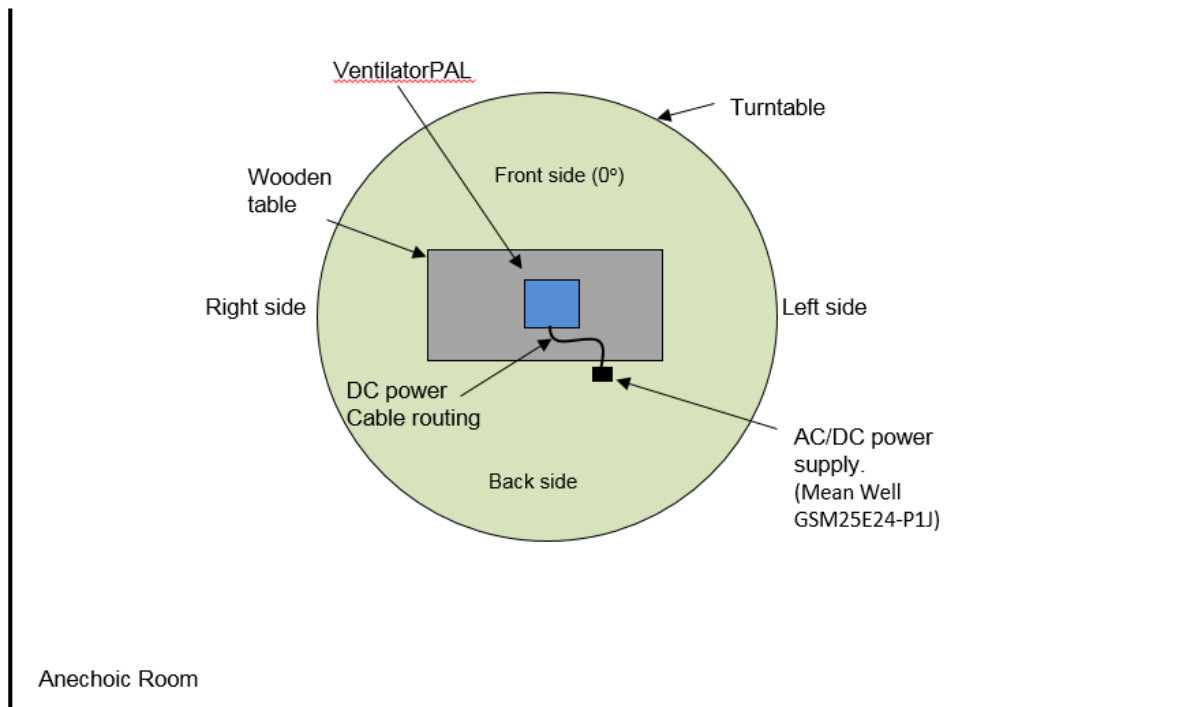
Result:	<p>The EUT complies with EN-IEC 60601-1-2:2016+ A:12013, Table 9: Test specifications for ENCLOSURE PORT IMMUNITY to RF wireless communications equipment.</p> <p>The EUT meets the performance criteria (no loss of performance).</p>
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Used equipment

Used equipment. For calibration dates see Chapter 6.

Reg. No.	Equipment	manufacturer	Type	Used in this test
22776	Signal generator 9kHz – 3.3GHz	Rohde & Schwarz	SML03	Y
22774	Power meter 80MHz – 1GHz	Rohde & Schwarz	NRVD	Y
22775	Power meter 1GHz – 3GHz	Rohde & Schwarz	NRVD	
23050	RF coupler 80MHz – 1GHz	Amplifier Research	DC6080	Y
23051	RF coupler 1GHz – 4GHz	Amplifier Research	DC7144	
22799	10V insertion unit 50 Ohm 9kHz-3GHz	Rohde & Schwarz	URV5-Z2	Y
23001	10V insertion unit 50 Ohm 9kHz-3GHz	Rohde & Schwarz	URV5-Z2	Y
23004	insertion unit 50 Ohm DC-40GHz	Rohde & Schwarz	URV5-Z4	
23005	insertion unit 50 Ohm DC-40GHz	Rohde & Schwarz	URV5-Z4	
26211	RF amplifier 80MHz – 1GHz	Amplifier research	500W1000B3	
23002	RF amplifier 800MHz – 4.2GHz	Amplifier research	10S1G4AM3	
25597	Field probe Radisense DC- 6GHz	D.A.R.E.	Radisense VI	Y
19949	Biconilog antenna 26MHz-2GHz	EMCO	3141	
25736	Controller DC-6GHz	D.A.R.E.	CTR1009B	Y
25737	RadiField DC-6GHz	D.A.R.E.	RFS1006B	Y
22576	Biconilog antenna 26MHz-2GHz	EMCO	3142C	
21528	Biconilog antenna 26MHz-2GHz	Schaffner	CBL 6141A	
17596	Biconical antenna 20MHz – 200MHz	EMCO	3104	
17598	Log-per antenna 200MHz – 2GHz	EMCO	3148	
22759	Log-per antenna 1GHz-20GHz	Schwarzbeck	STLP9148	
25737	RadiField 1GHz – 6GHz	D.A.R.E.	RFS2006B	Y
21566	Full Anechoic Room (lxwxh = 10mx6mx3m)	Rainford	30MHz – 18GHz	Y
20976	Full Anechoic Room (lxwxh = 8mx5mx3m)	Euroshield	30MHz – 1GHz	

A.18 Measurement method



The EUT was placed on a wooden table 0.8, height as shown in the figure. The table (EUT) was moved to a closer distance of 1m from the antenna to ensure the required field strength could be reached as documented in chapter 8.10 of EN 60601-1-2.

Settings	
Distance	1 m
Field strength	Various (see Table 9 of EN-IEC 60601-1-2:2016+ A:12013)
Frequency range	Various (see Table 9 of EN-IEC 60601-1-2:2016+ A:12013)
Logarithmic Step	1%
Modulation	Various (see Table 9 of EN-IEC 60601-1-2:2016+ A:12013)
Dwell time	1 s

A.19 Monitoring

During and after the **measurements** the EUT was constantly monitored using a camera system to ensure the basic and essential performance remained functional without any failures/errors.

VentilatorPAL Pro: Immunity to RF wireless Communications equipment.

Angle	Frequency	Modulation	Field strength	Observation
Vertical Front 0°	380 - 390MHz	Puls modulation 18Hz	27V/m	Pass
Horizontal Front 0°	380 - 390MHz	Puls modulation 18Hz	27V/m	Pass
Vertical Right 0°	380 - 390MHz	Puls modulation 18Hz	27V/m	Pass
Horizontal Right 0°	380 - 390MHz	Puls modulation 18Hz	27V/m	Pass
Vertical Front 0°	430 - 470MHz	Sine wave 1kHz	27V/m	Pass
Horizontal Front 0°	430 - 470MHz	Sine wave 1kHz	27V/m	Pass
Vertical Right 0°	430 - 470MHz	Sine wave 1kHz	27V/m	Pass
Horizontal Right 0°	430 - 470MHz	Sine wave 1kHz	27V/m	Pass
Vertical Front 0°	704 - 787MHz	Puls modulation 217Hz	10V/m	Pass
Horizontal Front 0°	704 - 787MHz	Puls modulation 217Hz	10V/m	Pass
Vertical Right 0°	704 - 787MHz	Puls modulation 217Hz	10V/m	Pass
Horizontal Right 0°	704 - 787MHz	Puls modulation 217Hz	10V/m	Pass
Vertical Front 0°	800 - 960MHz	Pulse Modulation 18Hz	27V/m	Pass
Horizontal Front 0°	800 - 960MHz	Pulse Modulation 18Hz	27V/m	Pass
Vertical Right 0°	800 - 960MHz	Pulse Modulation 18Hz	27V/m	Pass
Horizontal Right 0°	800 - 960MHz	Pulse Modulation 18Hz	27V/m	Pass
Vertical Front 0°	2400 - 5800MHz	Puls modulation 217Hz	28V/m	Pass
Horizontal Front 0°	2400 - 5800MHz	Puls modulation 217Hz	28V/m	Pass
Vertical Right 0°	2400 - 5800MHz	Puls modulation 217Hz	28V/m	Pass
Horizontal Right 0°	2400 - 5800MHz	Puls modulation 217Hz	28V/m	Pass

Pass:

During and after applying the RF interference the EUT remained functional without any loss of performance.

9.9 Conducted immunity, (IEC61000-4-6; 0.15 – 80MHz);

Report title:	EFT immunity
Company Name:	Canon production Printing
Date of test:	07 April 2020
Testers:	R. Brett; W. Ophelders
Standard used:	EN-IEC 60601-1-2:2016
Customer:	Stogger B.V.
Mains supply voltage:	AC/DC adapter (230V)
Ambient Temperature:	22.7°C
Humidity:	44%RH
E. U. T.:	VentilatorPAL
Operating mode:	continuous



Figure 6: Conducted immunity set-up. The insulated floor is 10cm above the ground plane.

Test Result	
Result:	<p>Test passed !</p> <p>AC mains, 6V rms</p> <p>The EUT meets the performance criteria (no loss of performance).</p>

Used equipment

Used equipment. For calibration dates see Chapter 6.

Reg. No.	Equipment	manufacturer	Type	Used in this test
21162	50Ohm Attenuator, 300W fixed 0-1GHz	JFW Industries	50FH-006-300-N	Y
21155	50Ohm Attenuator, 20dB/10W	JFW Industries	50FH-020-10N	Y
21156	50Ohm Termination, 10W	JFW Industries	50T-172	
21152	Bulk current injection probe 100kHz-1GHz	FCC	F-140A	
21153	Current sensor probe 10kHz-500MHz	FCC	F-51	
21154	Calibration JIG 10kHz-400MHz	FCC	BCICF-1	
21182	CDN 1-phase L+N+PE 0.15 – 230MHz	Lüthi	L801-M3	
21183	CDN 1-phase L+N+PE 0.15 – 230MHz	Lüthi	L801-M3	
23049	CDN 1-phase L+N+PE 0.15-230MHz / DC power	Lüthi	L801-M2/ M3	
21184	CDN 3-phase L1+L2+L3+N+PE 0.15 - 230MHz	Lüthi	L801-M5	Y
22880	CDN telecom ports 0.15 – 230MHz	Lüthi	L801-T8	
24120	Signal generator 9kHz – 1.1GHz	Rohde & Schwarz	SMB 100A	Y
21157	Power meter 150kHz – 80MHz	Rohde & Schwarz	URV5	Y
21158	10V insertion unit 50 Ohm 9kHz-3GHz	Rohde & Schwarz	URV5-Z2	Y
21159	10V insertion unit 50 Ohm 9kHz-3GHz	Rohde & Schwarz	URV5-Z2	Y
21160	RF coupler 10kHz – 250MHz	Amplifier Research	DC2600	Y
22763	RF amplifier 150kHz – 100MHz	Amplifier research	500A100M3	Y
22876	Faraday Cage	Comtest		Y

Measurement method

The CDN 801-M5 was used for the test.

CDN information:

Applied voltage: 6 Vrms
 Frequency range: 150 kHz - 80 MHz
 Logarithmic Step: 1%
 Modulation: 1000 Hz. 80% AM

A.20 Monitoring

During and after the **measurements** the EUT was constantly monitored using a camera system to ensure the basic and essential performance remained functional without any failures/errors.

A.21 Conclusion

The EUT complies with the Conducted immunity standard for AC power ports.

9.10 : Surge immunity (EN 61000-4-5 ; mains AC port; L-L) ; EN-IEC 60601-1-2:2016

Report title:	Power Frequency Magnetic Fields
Company Name:	Canon production Printing
Date of test:	7 April 2020
Evaluators:	R. Brett; W. Ophelders
Standard used:	EN-IEC 60601-1-2:2016
Customer:	Stogger B.V.
E. U. T.:	VentilatorPAL
Company Name:	Canon production Printing

Assessment

The Power supply complies with the Surge immunity requirements as reported I the compliance test report (see ch. 2).

Since the EM-phenomena does not contain high frequency phenomena, the risk of this phenomena affecting the VentilatorPAL Pro due to parasitic effects is negligible.

Therefore there is no need to repeat the performance assessment of the final product combination.

Through this assessment the EUT in combination with the power supply is deemed to pass this immunity phenomena.

9.11 : EFT immunity (EN 61000-4-4; mains AC port) ; EN-IEC 60601-1-2:2016

Report title:	EFT immunity
Company Name:	I-E-R-S Compliance Engineering
Date of test:	07 April 2020
Testers:	R. Brett; W. Ophelders
Standard used:	EN-IEC 60601-1-2:2016
Customer:	Stogger B.V.
Mains supply voltage:	AC/DC adapter (230V)
Ambient Temperature:	22.7°C
Humidity:	44%RH
E. U. T.:	VentilatorPAL
Operating mode:	continuous



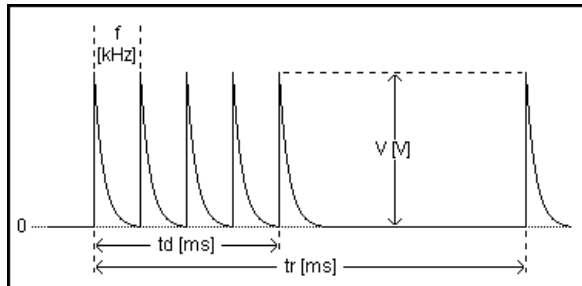
Figure 7: EFT immunity set-up. The insulated floor is 10cm above the ground plane

Test Result	
Result:	<p>Test passed (with 2kV immunity level)</p> <p>The EUT in combination with the power supply meets the performance criteria for this EM-phenomena..</p>

E . U . T	
Name:	VentilatorPAL Pro
Operation Mode:	Continuous
Connection:	230V/50Hz
Description:	

Test Procedure			
Pulse Name:	Pulse Overview : Burst		
Test File:	G:\EMTEST\Testfile\61000-4-4 EFT\ACpowerport\1 Phase\4_4_1ph_2.tst		
Comment:	EFT AC power port level 2 single phase		
Test generator:	UCS500 M6	Software No.:	000028
		Serial No.:	0699-09
Software:	iec.control	Version:	5.2.3
Coupling network:	CNI503	Serial No.:	0200-01

Test Setup			
V:	2000	V	
f:	5	kHz	
td:	15	ms	
tr:	300	ms	
Mode:	Asynchronous		
Polarity:	Alternate		
Coupling:	L1, N, L1+N		
Test duration:	1	min	
Time between Tests:	2	s	



Test Result			
V:	±2000	V	f: 5 kHz
			td: 15 ms
			tr: 300 ms
Coupling:	L1, N, L1+N		
Elapsed Test time:	6 min 12 s		
Result:	Test passed ! No problems found		

9.12 : PFMF (Power Frequency Magnetic Fields)

Report title:	Power Frequency Magnetic Fields
Company Name:	Canon production Printing
Date of test:	7 April 2020
Evaluators:	R. Brett; W. Ophelders
Standard used:	EN-IEC 60601-1-2:2016
Customer:	Stogger B.V.
E. U. T.:	VentilatorPAL

Assessment

The Power supply complies with the Surge immunity requirements as reported in the compliance test report (see ch. 2).

There are no components in the EUT which are sensitive to 50/60Hz magnetic fields.

Through this assessment the EUT in combination with the power supply is deemed to pass this immunity phenomena.

9.13 : Voltage dips ; (EN 61000-4-11; mains AC port) ; EN-IEC 60601-1-2:2016

Report title:	Voltage dips and interruptions
Company Name:	Canon production Printing
Date of test:	7 April 2020
Evaluators:	R. Brett; W. Ophelders
Standard used:	EN-IEC 60601-1-2:2016
Customer:	Stogger B.V.
E. U. T.:	VentilatorPAL

Assessment

The Power supply complies with the Surge immunity requirements as reported in the compliance test report (see ch. 2).

Since the EM-phenomena does not contain high frequency phenomena, the risk of this phenomena affecting the VentilatorPAL Pro due to parasitic effects is negligible.

Therefore there is no need to repeat the performance assessment of the final product combination.

Through this assessment the EUT in combination with the power supply is deemed to pass this immunity phenomena.

9.14 Harmonics emissions

Report title:	Harmonics
Company Name:	Canon production Printing
Date of test:	7 April 2020
Evaluators:	R. Brett; W. Ophelders
Standard used:	EN/IEC 61000-3-2 Ed.4 Short cyclic Equipment class A
Customer:	Stogger B.V.
E. U. T.:	VentilatorPAL

Assessment	
	<p>The Power supply complies with the Surge immunity requirements as reported in the compliance test report (see ch. 2).</p> <p>Since the EM-phenomena does not contain high frequency phenomena, the risk of this phenomena affecting the VentilatorPAL Pro due to parasitic effects is negligible.</p> <p>Therefore there is no need to repeat the performance assessment of the final product combination.</p> <p>Through this assessment the EUT in combination with the power supply is deemed to pass this immunity phenomena.</p>

9.15 Flicker measurement results

Report title:	Flicker
Company Name:	Canon production Printing
Date of test:	7 April 2020
Evaluators:	R. Brett; W. Ophelders
Standard used:	EN/IEC 61000-3-3 Ed.3 Flicker
Flicker Impedance:	Zref (IEC 60725)
Customer:	Stogger B.V.
E. U. T.:	VentilatorPAL

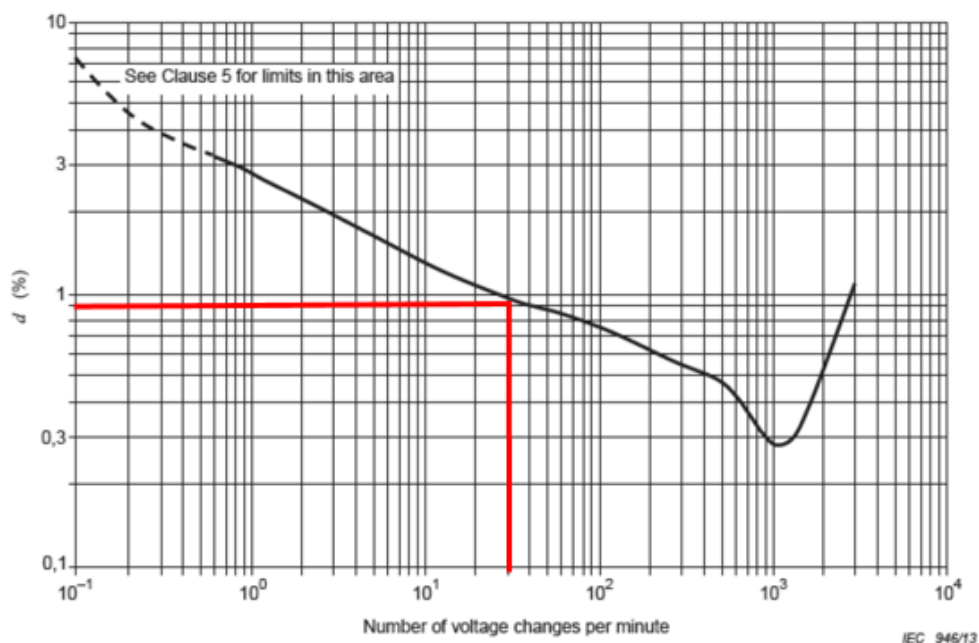
Assessment:

EN 61000-3-3 Reference impedance:

For single phase applications, the Phase and Neutral impedance combine to provide the required single phase Z_{ref} of $Z = 0.40 + j0.25 \Omega$

The modulus of this impedance = 0.472 Ohm

With an AC input supply current of 0.25A (refer to chapter 2), the maximum voltage drop which can occur on the mains due to a max. load change is 0.12V which is approx. 0.06% Unominal (230V). Applying this to the Plt and Pst curves of EN 61000-3-3 using a load change of 120/minute (max. speed) then it's impossible to exceed the flicker limits.



The maximum relative steady state voltage change (dc) will also not be exceeded.

The (dmax) level (i.e. due to inrush effects) has been tested and is documented in the Power Supply test report (see chapter 2).

9.16 ESD immunity test ; (EN 61000-4-2); EN-IEC 60601-1-2:2016.

Test setup

The test setup was prepared as described in the IEC 61000-4-2 ESD standard for ungrounded table-top equipment.

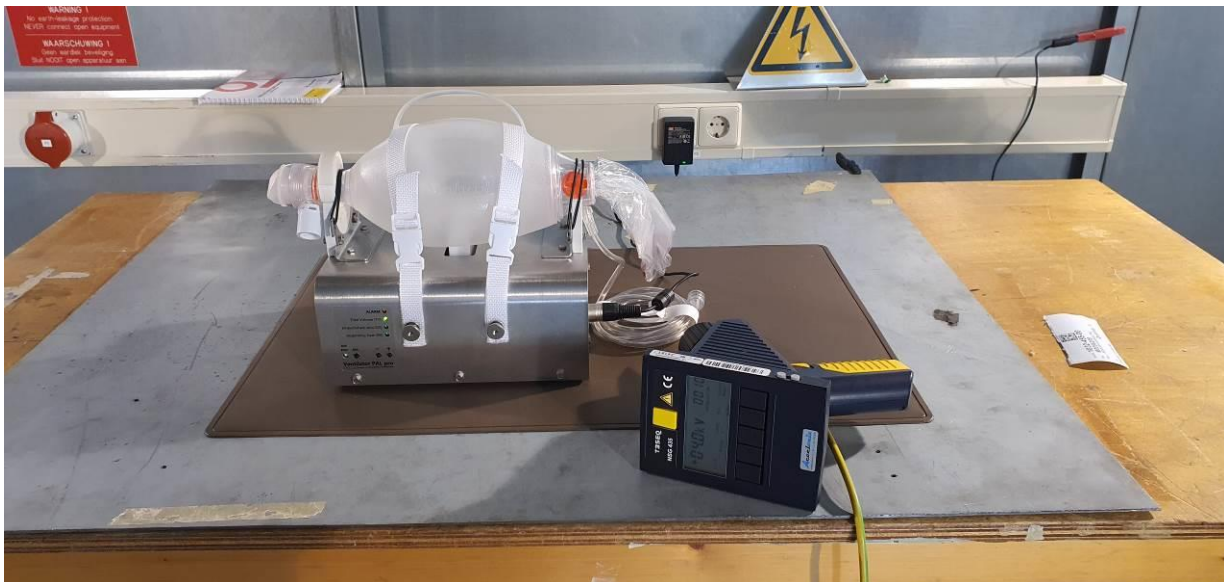
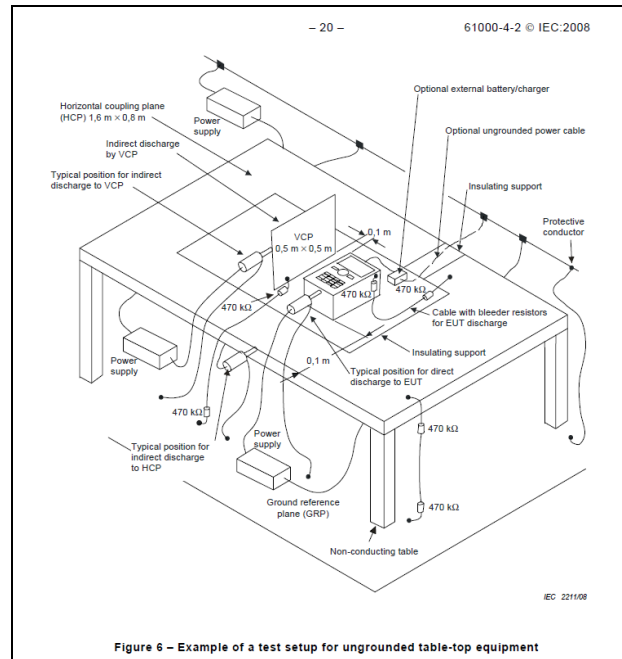


Photo showing the test setup according to the standard IEC 61000-6-2 for ungrounded table-top equipment.

Electrostatic discharges were also applied to the horizontal & vertical coupling planes using the “contact discharge” and “air discharge” functions.

At each discharge point, 10 +ve and 10 -ve discharges were delivered to the EUT.

ESD Test results:

Discharge points	Test levels		Test result
Housing – various discharge points (see photos)	+8kV Contact mode	-8kV Contact mode	No problems observed
Power switch	+2kV; +4kV; +8kV; +15kV Air discharge	-2kV; -4kV; -8kV; -15kV Air discharge	No problems observed
Interface connector shell (see photo)	+8kV Contact mode	-8kV Contact mode	No problems observed
Power supply connector (conductive part) see photo.	+8kV Contact mode	-8kV Contact mode	No problems observed

T e s t R e s u l t

Result: Test passed.
 The EUT meets the performance criteria (no loss of performance).

9.17 Photos

Contact Discharge









Air Discharge

