

Hammerholmen 45A
2650 Hvidovre
Denmark
+45 7070 1499
info@ektos.net

Accredited by DANAK under registration number 563 to testing.
TEST: Testing laboratory (DS/EN ISO/IEC 17025)
FCC reg. no.: DK0003

Date	Reference	Page
2022-05-23	P21-0064-2 rev. 1	1 (15)

FCC and ISED Test Report

of

Airofit Medical E-Unit V2

according to

FCC 47 CFR, Part 15 Subpart B, Class B
ICES-003, Issue 6:2016, Class B

Performed by



Volodymyr Hraivoronskyi

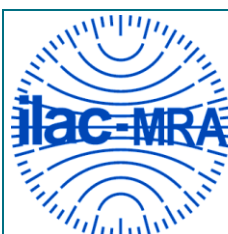
Test Engineer, M. Sc. EE.

Examined by



David Busk

Lab. Manager, M. Sc. EE.



DANAK is the national accreditation body in Denmark in compliance with EU regulation No. 765/2008.

DANAK participates in the multilateral agreements for testing and calibration under European co-operation for Accreditation (EA) and under International Laboratory Accreditation Cooperation (ILAC) based on peer-evaluation. Accredited test reports issued by laboratories accredited by DANAK are recognized cross border by members of EA and ILAC equal to test reports issued by these members' accredited laboratories.

The use of the accreditation mark on test reports, documents that the service is provided as an accredited service under the company's DANAK accreditation.

Date	Reference	Page
2022-05-23	P21-0064-2 rev. 1	2 (15)

Report no.:	P21-0064-2 rev. 1	Report date:	2022-05-23
Test started:	2021-05-03	Test ended:	2021-05-05
Test laboratory:	EKTOS TRS A/S Peter Bangs Vej 17 7600 Struer Denmark	Client:	Airofit A/S Teglværksgade 37, 5. 2100 København Denmark
Contact person:	David Busk	Contact person:	Christoffer Dupont
Facility reg. no.	FCC registration number: DK0003		
Test specimens:	Model: Airofit Medical E-Unit V2 Part no.: AF003		
Test specifications:	FCC 47 CFR Part 15 Subpart B ICES-003, Issue 6:2016 The tests relevant for the test specimens are listed in <i>section 1.1</i>.		
Documentation:	P21-0064-2 rev.1 supersedes P21-0064-2 issued 2021-05-06. Changes: Photos are moved to Appendix 1. Added comment about test software for test specimen. This test report shall not be reproduced except in full, without written approval of the laboratory. The complete test documentation is archived for 10 years at the testing laboratory.		
Test results:	The test specimen complies with relevant parts of the test specifications. The test results relate only to the specimen tested.		
Test personnel:	Peter Baastrup		

CONTENTS

1	SUMMARY	4
1.1	Test plan.....	4
1.2	Test specimen	5
1.3	Auxiliary Equipment.....	6
1.1	I/O ports to test specimens	7
1.2	Test set-up	7
2	TESTS	8
2.1	Radiated emission.....	8
2.2	Conducted emission.....	12
3	MEASURING UNCERTAINTIES	15
3.1	EMC.....	15

Appendices

Appendix 1: Photos

1 SUMMARY

1.1 Test plan

Test method	Name of the test	Results
FCC 47 CFR Part 15 Subpart B, Class B ICES-003, Issue 6:2016, Class B	Radiated emission	PASSED
FCC 47 CFR Part 15 Subpart B, Class B ICES-003, Issue 6:2016, Class B	Conducted emission	PASSED

PASSED	The test was performed and the test specimen complies with the essential requirements in the standard.
FAILED	The test was performed and the test specimen does not comply with the essential requirements in the standard.
REF	The test is covered by a test in another report and/or on a similar test specimen.
NR	The test is not relevant for the test specimen or has been waived by the manufacturer.

Note 1: Radiated emission is performed in a combined charging and operational mode. Conducted emission test is possible in a charge mode only.

1.2 Test specimen

1.2.1 Airofit Medical E-Unit V2

Manufacturer	GPV Asia
Model	Airofit Medical E-Unit V2
Serial no.	2211400014
Part no.	AF003
Details	Special test software was used for testing which enabled the BLE transmitter during operation. Test software allows the test specimen to operate with established BLE link during the charging. Under normal charging conditions, the BLE transmitter would be disabled via software.
Supply voltage	5V 1A
Radio device	Bluetooth Low Energy operating in the 2400 – 2483.5 MHz band
Internal Operating Frequency	2483.5 MHz (Bluetooth)
Operational mode	Combined charging + operational mode

See photo in Appendix 1.

1.3 Auxiliary Equipment

1.3.1 Power supply for test specimen

Manufacturer	XIAOMI
Model	MDY-08
Serial no.	2G318072397277C
Part no.	-
Details	-
Supply voltage	100-240 VAC, 50/60 Hz
Output voltage	5 VDC / 2.0 A
Operational mode	USB Charger

See photo in Appendix 1.

1.3.2 Smartphone

Manufacturer	Xiaomi
Model	Redmi9
Serial no.	-
Part no.	M2004J19AG
Details	Connected to test specimen in "charging mode".
Software	Airofit Study
Supply voltage	From USB-C
Operational mode	Used to establish Bluetooth connection and verify the functionality of the test specimen

1.1 I/O ports to test specimens

I/O Port	Type	Shielding	Max Cable length
AC Power ¹	2 wire	Unshielded	Not available
DC Power port	2 wire	Unshielded	<3 m

Note 1: AC Power port on the dedicated power supply.

1.2 Test set-up

The test specimen is connected wirelessly to the smartphone using BLE 2.4 GHz.

The smartphone is used to control the connection to the test specimen.

Normally the BLE is turned off during charging. The special software is used only for a combined charging + operational mode during the emission tests.

Tested with the setting: "Lung Test".

This test is designed to measure a person's lung volume and inspiratory and expiratory max pressures. During this test the system is measuring pressure over time which is sent via a Bluetooth connection to a phone with the Airofit app.

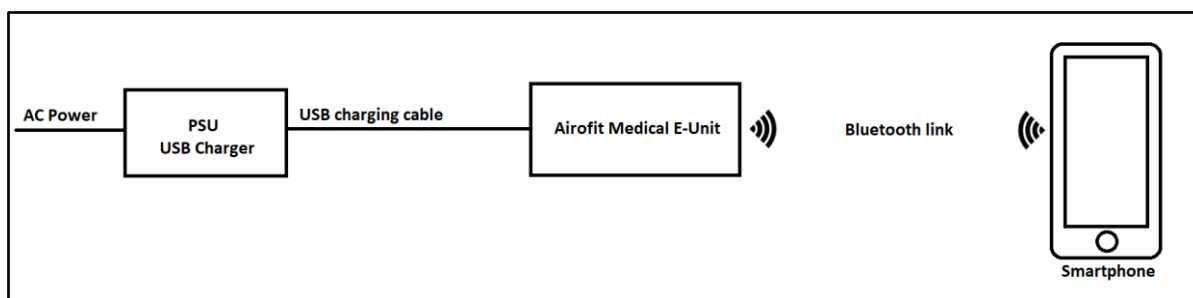


Figure 1. Test setup. Combined charging + operational mode.

2 TESTS

2.1 Radiated emission

Test specimen	Airofit Medical E-Unit V2
Test specification	FCC 47 CFR Part 15 Subpart B ICES-003, Issue 6:2016
Test method	ANSI C63.4:2014
Frequency range	30-18000 MHz
Limits	FCC 47 CFR §15.109 (a), Class B, Distance 3 m
Comments	Maximum internal frequency is 2480 MHz. Tested in charging + operational mode
Temperature / Humidity	23°C / 35%RH, 23°C / 36%RH
Date of measurements	2021-05-04, 2021-05-05
Test personnel	Peter Bastrup

2.1.1 Test setup

A measuring distance of 3 m was used during the tests.

The EUT was placed 80 cm above ground on a non-conductive table.

The auxiliary equipment was positioned on the floor.

Exploratory radiated emission measurements in the frequency range 30 – 1000 MHz with reflective floor were made by rotating the turntable between 0-360° and varying the antenna height between 1-4 m, in both horizontal and vertical antenna polarization.

Exploratory radiated emission measurements in the frequency range 1-18 GHz with absorbers on the floor were made by rotating the turntable between 0-360° and an antenna height of 1 m, in both horizontal and vertical antenna polarization.

Based on the preliminary measurements the frequencies with the highest emissions are selected for final radiated emission measurements. Final measurements were made by rotating the turntable and changing the height of the antenna to maximize the emission level.

See photo of the test setup in Appendix 1.

2.1.2 Test limits Class B

Frequency range [MHz]	Field strength limit [μV/m]	Field strength limit [dBμV/m]
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

Table 1. Radiated emission limits. FCC 47 CFR §15.109 (a), Class B.

The field strength limit in μV/m is converted to limit in dBμV/m.

2.1.3 Test results

The measured test results were below the limits.

The measurement time during final measurements were 15 s.

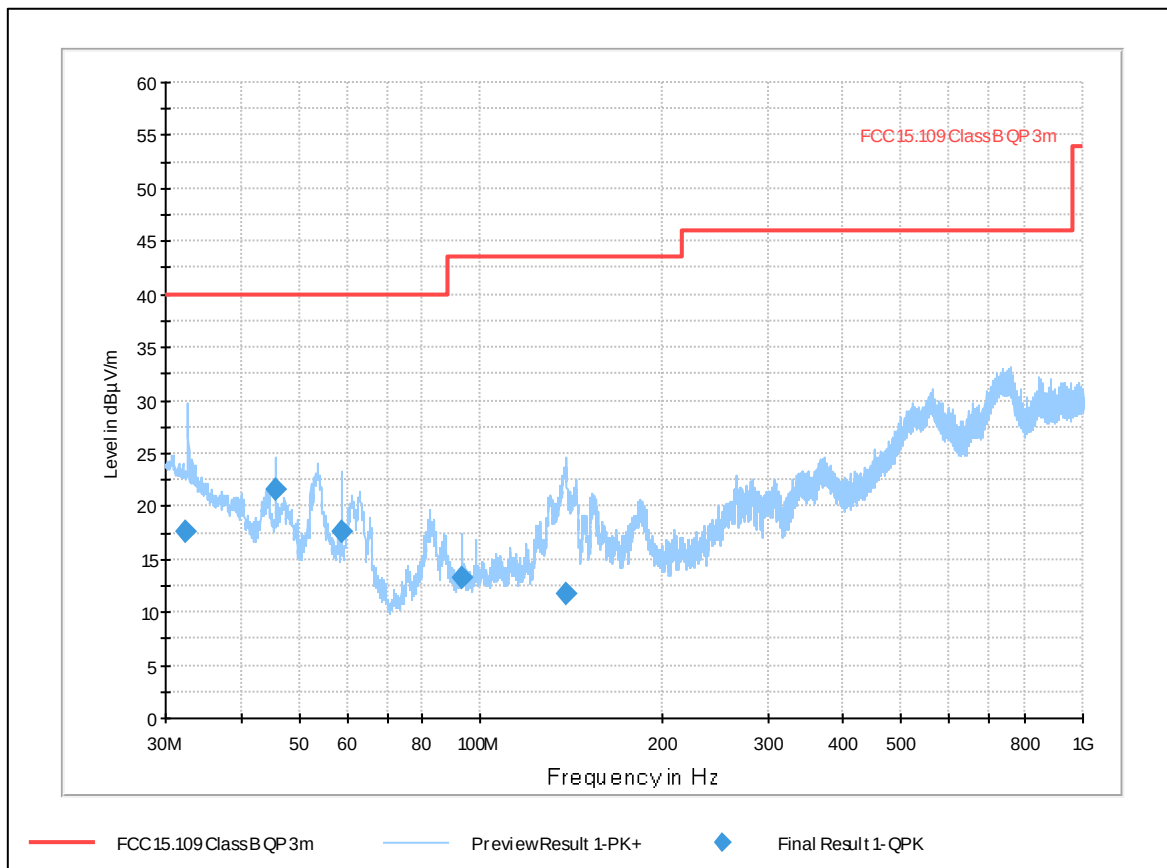


Figure 2. Radiated emission test results. 30 - 1000 MHz.

Frequency [MHz]	QP [dBµV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBµV/m]	Result
32.400000	17.6	120.0	231.0	H	122.0	22.4	40.0	PASSED
45.760000	21.6	120.0	100.0	V	45.0	18.4	40.0	PASSED
58.830000	17.7	120.0	100.0	V	279.0	22.3	40.0	PASSED
92.910000	13.2	120.0	254.0	H	161.0	30.3	43.5	PASSED
138.800000	11.8	120.0	156.0	H	182.0	31.7	43.5	PASSED

Table 2. Radiated emission test results. 30 - 1000 MHz.

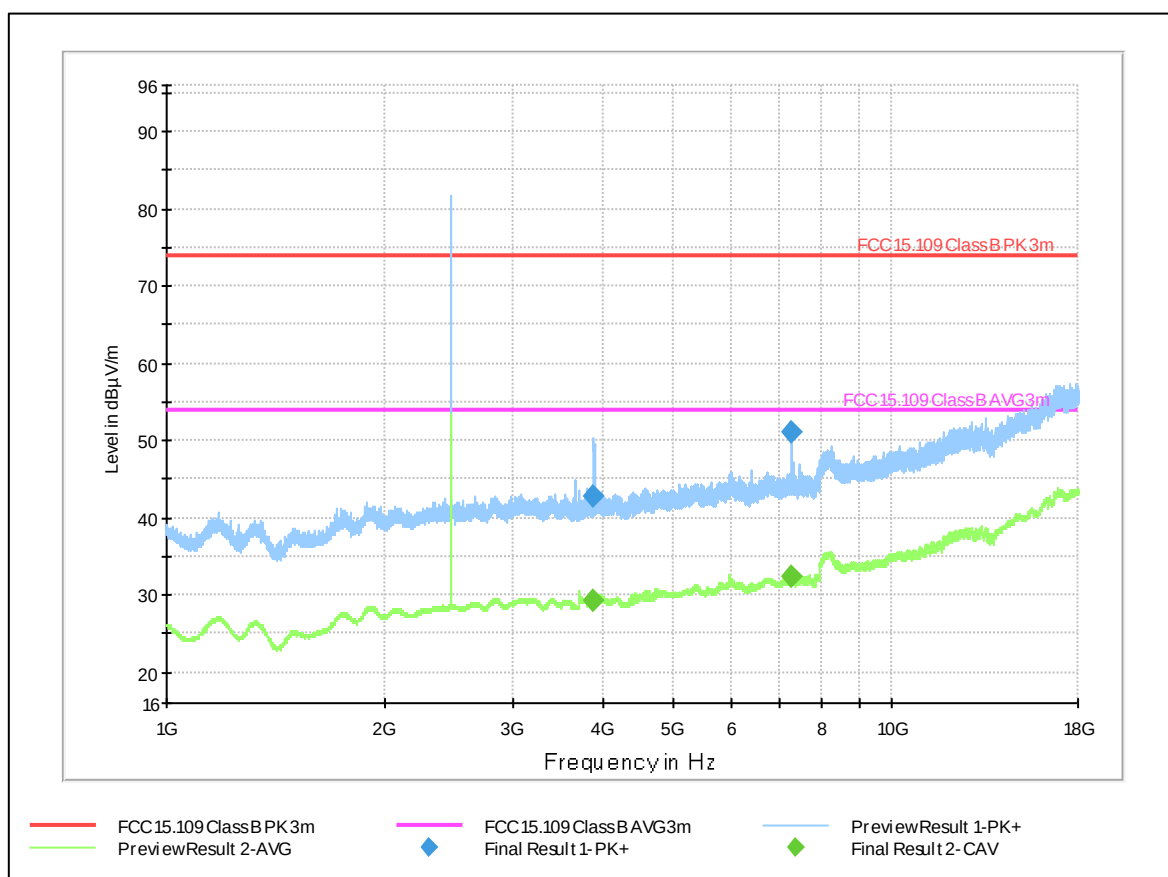


Figure 3. Radiated emission test results 1 - 18 GHz.

Bluetooth carrier 2.4 GHz is excluded from the final measurement results.

The number of a final measurement points were reduced as the prescan result with a peak detector showed a margin of >10 dB to the limit for an average detector.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
3878.450000	42.8	1000	316.0	V	341.0	31.2	74.0	PASSED
7247.550000	50.9	1000	149.0	V	176.0	23.1	74.0	PASSED

Table 3. Radiated emission test results 1 - 18 GHz. Peak detector.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
3879.700000	29.2	1000	100.0	V	5.0	24.8	54.0	PASSED
7245.850000	32.3	1000	100.0	V	219.0	21.7	54.0	PASSED

Table 4. Radiated emission test results- 1 - 18 GHz. Average detector.

2.1.4 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
Antenna, Ultra Broadband, 30 MHz-3 GHz	Rohde&Schwarz	HL562	30090226	2021-10-22
Antenna Horn	ETS Lindgren	3117	30090254	2021-10-22
Amplifier 0.5GHz – 26.5GHz	Agilent	83017A	30090219	2021-10-30
EMI Test Receiver 20 Hz-26.5 GHz	Rohde&Schwarz	ESU26	30090172	2021-10-30

Table 5. Radiated emission test equipment.

2.2 Conducted emission

Test specimen	Airofit Medical E-Unit V2
Test specification	FCC 47 CFR Part 15 Subpart B ICES-003, Issue 6:2016
Test method	ANSI C63.4:2014
Frequency range	0.15 - 30 MHz
Limits	FCC 47 CFR §15.107 (a), Class B
Comments	Tested in charging mode
Temperature / Humidity	22°C / 36%RH
Date of measurements	2021-05-04
Test personnel	Peter Baastrup

2.2.1 Test setup

The test specimen was supplied by the AC/DC adaptor.

Both were placed on the table. The AC/DC adaptor was powered by 120 VAC through an Artificial Mains Network.

Excess lengths of cables were bundled at the cable center.

See photo of the test setup in Appendix 1.

2.2.2 Test results

The measured test results were below the limits.

The measurement time during final measurements were 15 s.

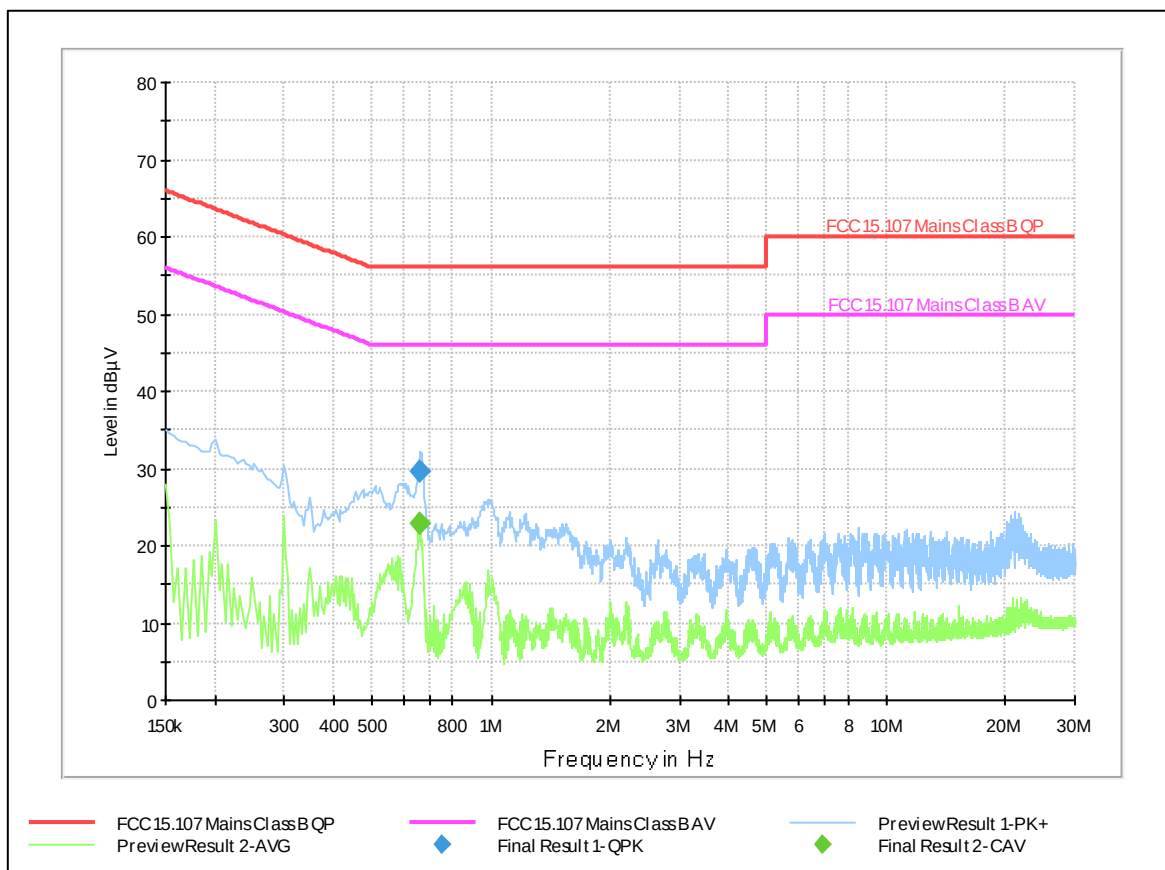


Figure 4. Conducted emission test results. AC Power.

The number of a final measurement points were reduced as the prescan result with a peak detector showed a margin of >10 dB to the limit for an average detector.

Frequency [MHz]	QuasiPeak [dBµV]	BW [kHz]	Line	Margin [dB]	Limit [dBµV]	Result
0.663219	29.7	9.000	L1	26.3	56.0	PASSED

Table 6. Conducted emission test results. QP detector. AC Power.

Frequency [MHz]	Average [dBµV]	BW [kHz]	Line	Margin [dB]	Limit [dBµV]	Result
0.661219	23.0	9.000	L1	23.0	46.0	PASSED

Table 7. Conducted emission test results. Average detector. AC Power.

2.2.3 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
Pulse Limiter 9 KHz-30 MHz	Rohde&Schwarz	ESH3-Z2	30090303	2022-03-10
Receiver EMI Test 9KHz-2750MHz	Rohde&Schwarz	ESCS30	30114993	2021-08-03
V-network Two Line	R&S	ESH3-Z5	30090211	2022-04-11
CDN / ISN Ethernet	Teseq	ISN ST08	30090213	2022-02-12

Table 8. Conducted emission test equipment.

3 MEASURING UNCERTAINTIES

Compliance evaluation is based on a shared risk principle with respect to the measurement uncertainty.

3.1 EMC

<i>EMC tests</i>	Frequency [MHz]	Polarization	Expanded Uncertainty [dB] (k=2)
Radiated emission	30 - 200	Vertical	4.72
	200 - 1000	Vertical	4.07
	1000-18000	Vertical	3.99
	30 - 200	Horizontal	3.60
	200 - 1000	Horizontal	4.15
	1000-18000	Horizontal	4.00
Conducted emission	0.01 - 30		3.44